

Missing data strategy: Practical demonstration

Martina Narayanan, Richard Silverwood,
Brian Dodgeon & George B. Ploubidis

Missing Data Seminar, April 27th 2023

Agenda

1. Our concrete example and data exploration
2. Complete case analysis
3. Exploration of missingness
4. Deciding on a set of auxiliary variables for MI
5. Setup MI
6. Run MI
7. Check
8. Analyse

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Stata/SE 15.0 — Missing Data Workshop Practical Data.dta

Log Viewer Graph Do-file Editor Data Editor Data Browser

More Break Search Help

Review

^ Command _rc

```
1 use "/Users/martina/Documents/work/UCL research associate/Presentations:Lectures/..."
```

Results

Single-user Stata perpetual license:
Serial number: 401506299584
Licensed to: Martina Gere

Notes:

1. Unicode is supported; see [help unicode_advice](#).
2. Maximum number of variables is set to 5000; see [help set_maxvar](#).
3. New update available; type `-update all-`

use "/Users/martina/Documents/work/UCL research associate/Presentations:Lectures/Missing Data Seminar 2021/Missing Data Workshop Practical Data.dta"

Variables

| Name | Label |
|-----------------------|---------------------------------------|
| id | PSEUDO-DATA: ID number |
| log_total_income_55 | PSEUDO-DATA: log_total_income_55 |
| ParStat42R | PSEUDO-DATA: ParStat42R |
| n622 | PSEUDO-DATA: 0-3D Sex of child |
| LBW | PSEUDO-DATA: LBW |
| maw5 | PSEUDO-DATA: Mother worked birth to 5 |
| MotherNeverReads7 | PSEUDO-DATA: Mother Reads to Child |
| SocialClassHusband | PSEUDO-DATA: SocialClassHusband |
| DifficultiesFinancial | PSEUDO-DATA: DifficultiesFinancial |

Properties

▼ Variables

| Name | Label | Type | Format |
|------|-------|------|--------|
| | | | |

Command



Handling missing data in the National Child Development Study

User guide (Version 2)

July 2021



Open Save Print

Review

^ Command

1 use "/Users/martina/Documents,"

Variables

| Name |
|-----------------------|
| id |
| log_total_income_55 |
| ParStat42R |
| n622 |
| LBW |
| maw5 |
| MotherNeverReads7 |
| SocialClassHusband |
| DifficultiesFinancial |

Properties

▼ Variables

| Name | Label | Type | Format |
|------|-------|------|--------|
| | | | |

Handling missing data in the National Child Development Study

User guide (Version 2)

July 2021

Search

Break

Search Help

70-4001 (TAX)

code_advice.

: to 5000; see help

e all-

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Review

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. use "/Users/martina/Documents/work/UCL research associate/Presentations:
> :Lectures/Missing Data Seminar 2021/Missing Data Workshop Practical Dat
> a.dta"

Variables

| Name | Label |
|-----------------------|---------------------------------------|
| id | PSEUDO-DATA: ID number |
| log_total_income_55 | PSEUDO-DATA: log_total_income_55 |
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Properties

▼ Variables

| Name | Label | Type | Format |
|------|-------|------|--------|
| | | | |

Command

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Review

^ Command _rc
1 use "/Users/martina/Documents/work/UCL research as..."

Variables

| Name | Label |
|-----------------------|---------------------------------------|
| id | PSEUDO-DATA: ID number |
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| DifficultiesFinancial | PSEUDO-DATA: DifficultiesFinancial |

Results

ovv-STATA-rc http://www.stata.com
979-696-4600 stata@stata.com
979-696-4601 (fax)

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. use "/Users/martina/Documents/work/UCL research associate/Presentations:Lectures/Missing Data Seminar 2021/Missing Data Workshop Practical Data.dta"
> ar 2021/Missing Data Workshop Practical Data.dta"

Command: sum log_total_income_55

Properties

▼ Variables

| Name | Label | Type | Format | Value label |
|------|-------|------|--------|-------------|
| | | | | |

/Users/martina/Documents/work/UCL research associate/Presentations:Lectures/Missing Data Seminar 2021

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Review

Command

```
_rc  
1 use "/Users/martina/Documents/work/UCL research as...  
2 sum log_total_income_55
```

Results

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Properties

▼ Variables

| Name | Label | Type | Format | Value label |
|------|-------|------|--------|---|
| | | | | /Users/martina/Documents/work/UCL research associate/Presentations:Lectures/Missing Data Seminar 2021 |

Command

```
. use "/Users/martina/Documents/work/UCL research associate/Presentations:Lectures/Missing Data Seminar 2021/Missing Data Workshop Practical Data.dta"  
> ar 2021/Missing Data Workshop Practical Data.dta"
```

sum log_total_income_55

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|--------------|-------|----------|-----------|-----|----------|
| log_total~55 | 6,306 | 6.099053 | 1.150698 | 0 | 8.415228 |

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Review

Command

```
_rc  
1 use "/Users/martina/Documents/work/UCL research as...  
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| log_total~55 | 6,306 | 6.099053 | 1.150698 | 0 | 8.415228 |

Properties

Variables

Name: ParStat42R

Command: tab1 ParStat42R

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Review

^ Command -rc

```
1 use "/Users/martina/Documents/work/UCL research as...
2 sum log_total_income_55
3 tab1 ParStat42R
```

Variables

| Name | Label |
|-----------------------|---------------------------------------|
| id | PSEUDO-DATA: ID number |
| log_total_income_55 | PSEUDO-DATA: log_total_income_55 |
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▼ Variables

Name
Label
Type
Format
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|--------------|-------|----------|-----------|-----|----------|
| log_total~55 | 6,306 | 6.099053 | 1.150698 | 0 | 8.415228 |

. tab1 ParStat42R

-> tabulation of ParStat42R

| PSEUDO-DATA: ParStat42R | Freq. | Percent | Cum. |
|----------------------------|--------|---------|--------|
| Married/Cohabiting | 8,644 | 78.85 | 78.85 |
| Seperated/Divorced/Widowed | 1,372 | 12.52 | 91.37 |
| Single/NeverMarried | 946 | 8.63 | 100.00 |
| Total | 10,962 | 100.00 | |

.

Command

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| Single/NeverMarried | 946 | 8.63 | 100.00 |
| Total | 10,962 | 100.00 | |

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Command

```
regress log_total_income_55 i.ParStat42R i.n622 i.LBW i.maw5 i.MotherNeverReads7 i.SocialClassHusband DiffucultiesFinancial CogAbil7 LogIncome42 i.EconAct42R, base
```

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2 sum log_total_income_55
3 tab1 ParStat42R
4 regress log_total_income_55 i.ParStat42R i.n622 i.LBW i.maw5 i.MotherNeverReads7 i.SocialClassHusba
> nd DiffucultiesFinancial CogAbil7 LogIncome42 i.EconAct42R, base
```

Results

| Source | SS | df | MS | Number of obs | = | 3,754 |
|----------|-------------------|--------------|-------------------|---------------|---|---------------|
| Model | 408.007729 | 16 | 25.5004831 | Prob > F | = | 0.0000 |
| Residual | 4418.45073 | 3,737 | 1.18235235 | R-squared | = | 0.0845 |
| Total | 4826.45846 | 3,753 | 1.28602677 | Adj R-squared | = | 0.0806 |
| | | | | Root MSE | = | 1.0874 |

Variables

| Name | Label | log_total_income_55 | Coef. | Std. Err. | t | P> t | [95% Conf. Interval] |
|-----------------------|---|----------------------------|------------------|-----------------|--------------|--------------|-----------------------------------|
| id | PSEUDO-DATA: ID number | ParStat42R | 0 | (base) | | | |
| log_total_income_55 | PSEUDO-DATA: log_total_income_55 | Married/Cohabiting | -.1004092 | .0585358 | -1.72 | 0.086 | -.2151744 .014356 |
| ParStat42R | PSEUDO-DATA: ParStat42R | Seperated/Divorced/Widowed | -.3699864 | .0688743 | -5.37 | 0.000 | -.5050212 -.2349516 |
| n622 | PSEUDO-DATA: 0-3D Sex of child | Single/NeverMarried | | | | | |
| LBW | PSEUDO-DATA: LBW | n622 | 0 | (base) | | | |
| maw5 | PSEUDO-DATA: Mother worked birth to 5 | Male | .0101729 | .0398782 | 0.26 | 0.799 | -.0680123 .088358 |
| MotherNeverReads7 | PSEUDO-DATA: Mother Reads to Child | Female | | | | | |
| SocialClassHusband | PSEUDO-DATA: SocialClassHusband | LBW | 0 | (base) | | | |
| DiffucultiesFinancial | PSEUDO-DATA: DiffucultiesFinancial | Normal | -.0067913 | .0634324 | -0.11 | 0.915 | -.1311569 .1175743 |
| CogAbil7 | PSEUDO-DATA: Cognitive Ability Summa... | Low | | | | | |
| LogIncome42 | PSEUDO-DATA: LogIncome42 | | | | | | |
| EconAct42R | PSEUDO-DATA: EconAct42R | | | | | | |

Properties

▼ Variables

| | |
|-------------|--|
| Name | |
| Label | |
| Type | |
| Format | |
| Value label | |
| Notes | |

Command

```
/Users/martina/Documents/work/UCL research associate/Presentations:Lectures/Missing Data Seminar 2021
```

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3 tab1 ParStat42R
4 regress log_total_income_55 i.ParStat42R i.n622 i.LBW i.maw5 i.MotherNeverReads7 i.SocialClassHusba
```

Results

```
. regress log_total_income_55 i.ParStat42R i.n622 i.LBW i.maw5 i.MotherNeverReads7 i.SocialClassHusba
> nd DiffucultiesFinancial CogAbil7 LogIncome42 i.EconAct42R, base
```

| Source | SS | df | MS | Number of obs | = | 3,754 |
|----------|------------|-------|------------|---------------|---|--------|
| Model | 408.007729 | 16 | 25.5004831 | Prob > F | = | 0.0000 |
| Residual | 4418.45073 | 3,737 | 1.18235235 | R-squared | = | 0.0845 |
| Total | 4826.45846 | 3,753 | 1.28602677 | Adj R-squared | = | 0.0806 |
| | | | | Root MSE | = | 1.0874 |

Variables

| Name | Label | log_total_income_55 | Coef. | Std. Err. | t | P> t | [95% Conf. Interval] |
|-----------------------|---|----------------------------|-----------|-----------|-------|-------|----------------------|
| id | PSEUDO-DATA: ID number | ParStat42R | 0 | (base) | | | |
| log_total_income_55 | PSEUDO-DATA: log_total_income_55 | Married/Cohabiting | -.1004092 | .0585358 | -1.72 | 0.086 | -.2151744 .014356 |
| ParStat42R | PSEUDO-DATA: ParStat42R | Separated/Divorced/Widowed | -.3699864 | .0688743 | -5.37 | 0.000 | -.5050212 -.2349516 |
| n622 | PSEUDO-DATA: 0-3D Sex of child | Single/NeverMarried | | | | | |
| LBW | PSEUDO-DATA: LBW | n622 | | | | | |
| maw5 | PSEUDO-DATA: Mother worked birth to 5 | Male | 0 | (base) | | | |
| MotherNeverReads7 | PSEUDO-DATA: Mother Reads to Child | Female | .0101729 | .0398782 | 0.26 | 0.799 | -.0680123 .088358 |
| SocialClassHusband | PSEUDO-DATA: SocialClassHusband | LBW | 0 | (base) | | | |
| DiffucultiesFinancial | PSEUDO-DATA: DiffucultiesFinancial | Normal | -.0067913 | .0634324 | -0.11 | 0.915 | -.1311569 .1175743 |
| CogAbil7 | PSEUDO-DATA: Cognitive Ability Summa... | Low | | | | | |
| LogIncome42 | PSEUDO-DATA: LogIncome42 | | | | | | |
| EconAct42R | PSEUDO-DATA: EconAct42R | | | | | | |

Properties

▼ Variables

| | |
|-------------|--|
| Name | |
| Label | |
| Type | |
| Format | |
| Value label | |
| Notes | |

▼ Data

Command

```
/Users/martina/Documents/work/UCL research associate/Presentations:Lectures/Missing Data Seminar 2021
```

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> nd DiffucultiesFinancial CogAbil7 LogIncome42 i.EconAct42R, base
```

Variables

| Name | Label |
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| log_total_income_55 | PSEUDO-DATA: log_total_income_55 |
| ParStat42R | PSEUDO-DATA: ParStat42R |
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| LogIncome42 | PSEUDO-DATA: LogIncome42 |
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Name
Label
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Notes

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. regress log_total_income_55 i.ParStat42R i.n622 i.LBW i.maw5 i.MotherNeverReads7 i.SocialClassHusband
> nd DiffucultiesFinancial CogAbil7 LogIncome42 i.EconAct42R, base
```

| Source | S |
|----------|--------|
| Model | 408.00 |
| Residual | 4418.4 |
| Total | 4826.4 |

Number of obs = 3,754

Original sample = 15,613
(NCDS alive and not emigrated by 55)

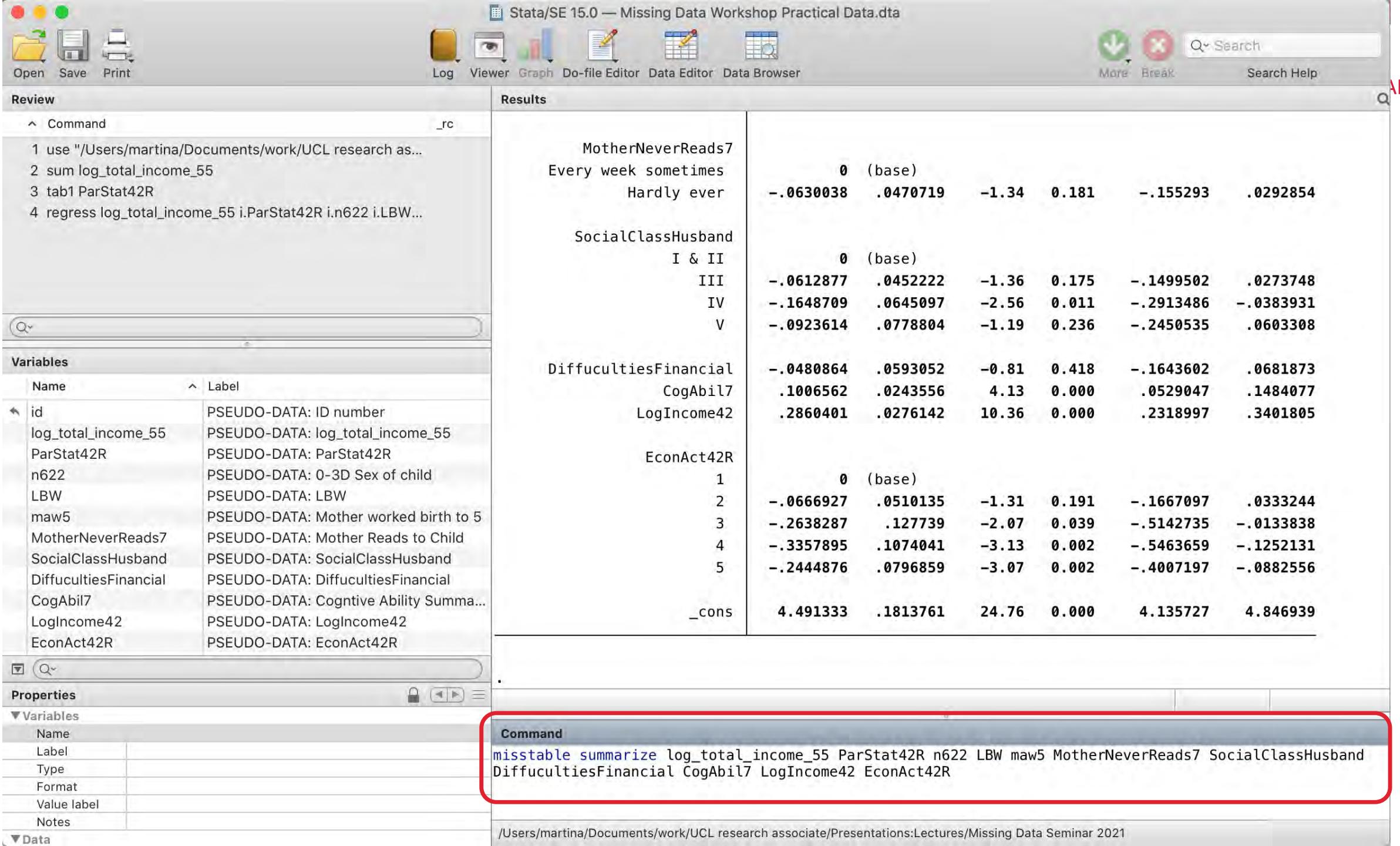
| log_total_income_55 | ParStat42R | Married/Cohabiting | 0 (base) | .1004092 | .0585358 | -1.72 | 0.086 | -.2151744 | .014356 |
|---------------------|----------------------------|---------------------|----------|-----------|----------|-------|-------|-----------|-----------|
| | Separated/Divorced/Widowed | Single/NeverMarried | | -.3699864 | .0688743 | -5.37 | 0.000 | -.5050212 | -.2349516 |
| | n622 | Male | 0 (base) | .0101729 | .0398782 | 0.26 | 0.799 | -.0680123 | .088358 |
| | | Female | | | | | | | |
| | LBW | Normal | 0 (base) | -.0067913 | .0634324 | -0.11 | 0.915 | -.1311569 | .1175743 |
| | | Low | | | | | | | |

Command

```
/Users/martina/Documents/work/UCL research associate/Presentations:Lectures/Missing Data Seminar 2021
```

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1. Our concrete example and data exploration
2. Complete case analysis
3. **Exploration of missingness**
4. Deciding on a set of auxiliary variables for MI
5. Setup MI
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Review

```

^ Command _rc
1 use "/Users/martina/Documents/work/UCL research as...
2 sum log_total_income_55
3 tab1 ParStat42R
4 regress log_total_income_55 i.ParStat42R i.n622 i.LBW...
5 misstable summarize log_total_income_55 ParStat42R...

```

Results

| | 5 | -.2444876 | .0796859 | -3.07 | 0.002 | -.4007197 | -.0882556 |
|---|----------|-----------|----------|-------|----------|-----------|-----------|
| _cons | 4.491333 | .1813761 | 24.76 | 0.000 | 4.135727 | 4.846939 | |
| misstable summarize log_total_income_55 ParStat42R n622 LBW maw5 MotherNeverReads7 SocialClassHusband | | | | | | | |
| > nd DifficultiesFinancial CogAbil7 LogIncome42 EconAct42R | | | | | | | |
| Obs<. | | | | | | | |

Variables

| Name | Label | Variable | Obs=. | Obs>. | Obs<. | Unique values | Min | Max |
|-----------------------|---|-----------------------|-------|--------|-------|---------------|----------|----------|
| id | PSEUDO-DATA: ID number | log_total~55 | 9,307 | 6,306 | | >500 | 0 | 8.415228 |
| log_total_income_55 | PSEUDO-DATA: log_total_income_55 | ParStat42R | 4,651 | 10,962 | | 3 | 1 | 3 |
| ParStat42R | PSEUDO-DATA: ParStat42R | n622 | 1 | 15,612 | | 2 | 0 | 1 |
| n622 | PSEUDO-DATA: 0-3D Sex of child | LBW | 1,442 | 14,171 | | 2 | 0 | 1 |
| LBW | PSEUDO-DATA: LBW | maw5 | 3,069 | 12,544 | | 2 | 0 | 1 |
| maw5 | PSEUDO-DATA: Mother worked birth to 5 | MotherNeve~7 | 2,639 | 12,974 | | 2 | 0 | 1 |
| MotherNeverReads7 | PSEUDO-DATA: Mother Reads to Child | SocialClas~d | 1,723 | 13,890 | | 4 | 2 | 5 |
| SocialClassHusband | PSEUDO-DATA: SocialClassHusband | DifficultiesFinancial | 3,901 | 11,712 | | 2 | 0 | 1 |
| DifficultiesFinancial | PSEUDO-DATA: DifficultiesFinancial | CogAbil7 | 2,675 | 12,938 | >500 | -3.432384 | 2.283514 | |
| CogAbil7 | PSEUDO-DATA: Cognitive Ability Summa... | LogIncome42 | 4,596 | 11,017 | >500 | 0 | 8.494054 | |
| LogIncome42 | PSEUDO-DATA: LogIncome42 | EconAct42R | 4,729 | 10,884 | 5 | 1 | 5 | |

Properties

Variables

| | |
|-------------|--|
| Name | |
| Label | |
| Type | |
| Format | |
| Value label | |
| Notes | |

Command

/Users/martina/Documents/work/UCL research associate/Presentations:Lectures/Missing Data Seminar 2021

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Review

```
^ Command _rc
1 use "/Users/martina/Documents/work/UCL research as...
2 sum log_total_income_55
3 tab1 ParStat42R
4 regress log_total_income_55 i.ParStat42R i.n622 i.LBW...
5 misstable summarize log_total_income_55 ParStat42R...
```

Results

| | 5 | -.2444876 | .0796859 | -3.07 | 0.002 | -.4007197 | -.0882556 |
|-------|----------|-----------|----------|-------|----------|-----------|-----------|
| _cons | 4.491333 | .1813761 | 24.76 | 0.000 | 4.135727 | 4.846939 | |

```
. misstable summarize log_total_income_55 ParStat42R n622 LBW maw5 MotherNeverReads7 SocialClassHusband
> nd DifficultiesFinancial CogAbil7 LogIncome42 EconAct42R
```

Obs<.

| Variable | Obs=. | Obs>. | Obs<. | Unique values | Min | Max |
|--------------|-------|-------|--------|---------------|-----------|----------|
| log_total~55 | 9,307 | | 6,306 | >500 | 0 | 8,415228 |
| ParStat42R | 4,651 | | 10,962 | 3 | 1 | 3 |
| n622 | 1 | | 15,612 | 2 | 0 | 1 |
| LBW | 1,442 | | 14,171 | 2 | 0 | 1 |
| maw5 | 3,069 | | 12,544 | 2 | 0 | 1 |
| MotherNeve~7 | 2,639 | | 12,974 | 2 | 0 | 1 |
| SocialClas~d | 1,723 | | 13,890 | 4 | 2 | 5 |
| Difficulti~l | 3,901 | | 11,712 | 2 | 0 | 1 |
| CogAbil7 | 2,675 | | 12,938 | >500 | -3.432384 | 2.283514 |
| LogIncome42 | 4,596 | | 11,017 | >500 | 0 | 8,494054 |
| EconAct42R | 4,729 | | 10,884 | 5 | 1 | 5 |

Variables

| Name | Label |
|-----------------------|---|
| id | PSEUDO-DATA: ID number |
| log_total_income_55 | PSEUDO-DATA: log_total_income_55 |
| ParStat42R | PSEUDO-DATA: ParStat42R |
| n622 | PSEUDO-DATA: 0-3D Sex of child |
| LBW | PSEUDO-DATA: LBW |
| maw5 | PSEUDO-DATA: Mother worked birth to 5 |
| MotherNeverReads7 | PSEUDO-DATA: Mother Reads to Child |
| SocialClassHusband | PSEUDO-DATA: SocialClassHusband |
| DifficultiesFinancial | PSEUDO-DATA: DifficultiesFinancial |
| CogAbil7 | PSEUDO-DATA: Cognitive Ability Summa... |
| LogIncome42 | PSEUDO-DATA: LogIncome42 |
| EconAct42R | PSEUDO-DATA: EconAct42R |

Properties

Variables

| Name | |
|-------------|--|
| Label | |
| Type | |
| Format | |
| Value label | |
| Notes | |

Command

```
gen cc = (log_total_income_55<. & ParStat42R<. & n622<. & LBW<. & maw5<. & MotherNeverReads7<. & SocialClassHusband<. & DifficultiesFinancial<. & CogAbil7<. & LogIncome42<. & EconAct42R<.)
```

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Review

^ Command _rc

```

1 use "/Users/martina/Documents/work/UCL research as...
2 sum log_total_income_55
3 tab1 ParStat42R
4 regress log_total_income_55 i.ParStat42R i.n622 i.LBW...
5 misstable summarize log_total_income_55 ParStat42R...
6 gen cc = (log_total_income_55<. & ParStat42R<. & n62...

```

Variables

| Name | Label |
|-------------------------|---|
| id | PSEUDO-DATA: ID number |
| log_total_income_55 | PSEUDO-DATA: log_total_income_55 |
| ParStat42R | PSEUDO-DATA: ParStat42R |
| n622 | PSEUDO-DATA: 0-3D Sex of child |
| LBW | PSEUDO-DATA: LBW |
| maw5 | PSEUDO-DATA: Mother worked birth to 5 |
| MotherNeverReads7 | PSEUDO-DATA: Mother Reads to Child |
| SocialClassHusband | PSEUDO-DATA: SocialClassHusband |
| DiffuctilitiesFinancial | PSEUDO-DATA: DiffuctilitiesFinancial |
| CogAbil7 | PSEUDO-DATA: Cognitive Ability Summa... |
| LogIncome42 | PSEUDO-DATA: LogIncome42 |
| EconAct42R | PSEUDO-DATA: EconAct42R |

Properties

Results

```

misstable summarize log_total_income_55 ParStat42R n622 LBW maw5 MotherNeverReads7 SocialClassHusband
> nd DiffuctilitiesFinancial CogAbil7 LogIncome42 EconAct42R
Obs<.

Variable Obs=. Obs>. Obs<.
Unique values Min Max

```

| Variable | Obs=. | Obs>. | Obs<. | Unique values | Min | Max |
|---------------|-------|-------|--------|---------------|-----------|----------|
| log_total~55 | 9,307 | | 6,306 | >500 | 0 | 8.415228 |
| ParStat42R | 4,651 | | 10,962 | 3 | 1 | 3 |
| n622 | 1 | | 15,612 | 2 | 0 | 1 |
| LBW | 1,442 | | 14,171 | 2 | 0 | 1 |
| maw5 | 3,069 | | 12,544 | 2 | 0 | 1 |
| MotherNeve~7 | 2,639 | | 12,974 | 2 | 0 | 1 |
| SocialClas~d | 1,723 | | 13,890 | 4 | 2 | 5 |
| Diffuctulti~l | 3,901 | | 11,712 | 2 | 0 | 1 |
| CogAbil7 | 2,675 | | 12,938 | >500 | -3.432384 | 2.283514 |
| LogIncome42 | 4,596 | | 11,017 | >500 | 0 | 8.494054 |
| EconAct42R | 4,729 | | 10,884 | 5 | 1 | 5 |

```

gen cc = (log_total_income_55<. & ParStat42R<. & n622<. & LBW<. & maw5<. & MotherNeverReads7<. & So
> cialClassHusband<. & DiffuctilitiesFinancial<. & CogAbil7<. & LogIncome42<. & EconAct42R<.)

.

```

Command

```

foreach var in log_total_income_55 i.ParStat42R n622 i.LBW i.maw5 i.MotherNeverReads7 i.
SocialClassHusband i.DiffuctilitiesFinancial CogAbil7 LogIncome42 i.EconAct42R {
    logistic cc `var', base
    testparm `var'
}

```

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Review

```

^ Command
2 sum log_total_income_55
3 tab1 ParStat42R
4 regress log_total_income_55 i.ParStat42R i.n622 i.LBW...
5 misstable summarize log_total_income_55 ParStat42R...
6 gen cc = (log_total_income_55<. & ParStat42R<. & n62...
7 foreach var in log_total_income_55 i.ParStat42R n622 i....
8 logistic cc `var', base
9 testparm `var'
10 }

```

Variables

| Name | Label |
|-----------------------|---|
| id | PSEUDO-DATA: ID number |
| log_total_income_55 | PSEUDO-DATA: log_total_income_55 |
| ParStat42R | PSEUDO-DATA: ParStat42R |
| n622 | PSEUDO-DATA: 0-3D Sex of child |
| LBW | PSEUDO-DATA: LBW |
| maw5 | PSEUDO-DATA: Mother worked birth to 5 |
| MotherNeverReads7 | PSEUDO-DATA: Mother Reads to Child |
| SocialClassHusband | PSEUDO-DATA: SocialClassHusband |
| DiffucultiesFinancial | PSEUDO-DATA: DiffucultiesFinancial |
| CogAbil7 | PSEUDO-DATA: Cognitive Ability Summa... |
| LogIncome42 | PSEUDO-DATA: LogIncome42 |
| EconAct42R | PSEUDO-DATA: EconAct42R |

Properties

Variables

| Name | Label |
|-------------|-------|
| Type | |
| Format | |
| Value label | |
| Notes | |

Results

Logistic regression

Number of obs = 10,962
LR chi2(2) = 15.36
Prob > chi2 = 0.0005
Pseudo R2 = 0.0011

Log likelihood = -7037.0585

| cc | Odds Ratio | Std. Err. | z | P> z | [95% Conf. Interval] |
|----------------------------|------------|-----------|--------|-------|----------------------|
| ParStat42R | | | | | |
| Married/Cohabiting | 1 (base) | | | | |
| Seperated/Divorced/Widowed | .7884545 | .0497817 | -3.76 | 0.000 | .6966797 .892319 |
| Single/NeverMarried | .9060549 | .0659504 | -1.36 | 0.175 | .7855916 1.04499 |
| _cons | .5405454 | .0121824 | -27.30 | 0.000 | .5171879 .5649576 |

Note: _cons estimates baseline odds.

(1) [cc]2.ParStat42R = 0
(2) [cc]3.ParStat42R = 0

chi2(2) = 15.06
Prob > chi2 = 0.0005

Logistic regression

Number of obs = 15,612
LR chi2(1) = 0.00

Command

Agenda

1. Our concrete example and data exploration
2. Complete case analysis
3. Exploration of missingness
4. Deciding on a set of auxiliary variables for MI
5. Setup MI
6. Run MI
7. Check
8. Analyse

Agenda

1. Our concrete example and data exploration
2. Complete case analysis
3. Exploration of missingness
4. Deciding on a set of auxiliary variables for MI
5. Setup MI
6. Run MI
 - a) Variables predictive of missingness and underlying missing values themselves
 - b) Variables predictive of underlying missing values only
7. Check
8. Analyse

Handling missing data in the National Child Development Study

User guide (Version 2)

July 2021

MI

5. Set up MI
6. Run MI
7. Check
8. Analyse

- a) Variables predictive of missingness and underlying missing values themselves
- b) Variables predictive of underlying missing values only

How do we identify good auxiliary variables?

Table 10. Predictors of non-response at sweep 9 (age 55).

| Sweep | Variable description | Variable name |
|------------------|--|---------------|
| Sweep 0 (age 0) | Mother's age | aconnn553 |
| | Number of persons per room | aconnn512 |
| | Parity | aconnn504 |
| | Social class of mother's father when she left school | acatnn660 |
| | Sex of child | bingender |
| | Social class of mother's husband | acatnn236 |
| Sweep 1 (age 7) | Dad stayed on at school after minimum age | bbinnn194 |
| | Social problems (alcoholism etc.) | bconnage7dv10 |
| | Cognitive ability summary | CogAbil7 |
| | Ever breastfed | bfever |
| Sweep 2 (age 11) | Cognitive ability summary | genability11 |
| | Conduct problems | Ext11Dec18 |
| Sweep 3 (age 16) | Child receiving help at school – backwardness | dbinnn2250 |
| | Child's school attendance | dconnn1721 |
| | How long since child drank alcohol | dcatnn2888 |
| | Test 2 – mathematics comprehension | dconnn2930 |
| | Conduct problems | Ext16MTDec18 |

How do we identify good auxiliary variables?

| | | |
|---------------------------|---|------------------------|
| Sweep 4 (age 23) | Legal marital status | ecatnn5113 |
| | Voted in 1979 general election | ebinnn5960 |
| Sweep 5 (age 33) | Telephone in home | fbinn502977 |
| | How much physical effort in job | fconnn504361_cont |
| | Voted in 1987 general election | fbinnn504636_bin |
| | Housing tenure | fbinntenure91_bin |
| | Social capital score (people turn to for advice, support) | fconndvsoccapital_cont |
| Sweep 6 (age 42) | Participated in NCDS V | gbindmpart |
| | Membership in organisations | Org42 |
| Biomedical Sweep (age 44) | Self-rated general health | mconngenhlth |
| Sweep 7 (age 46) | Marital status - de facto | hcatnnd7ms_cat |
| Sweep 8 (age 50) | Total number of natural children | iconnnd8nchtt_cont |
| | Employer provided pension scheme | ibinn8j2101 |
| | Non-response at sweeps 1-8 | [Derived] |

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Review

```

^ Command _rc
2 sumlog_total_income_55
3 tab1 ParStat42R
4 regress log_total_income_55 i.ParStat42R i.n622 i.LBW...
5 misstable summarize log_total_income_55 ParStat42R...
6 gen cc = (log_total_income_55<. & ParStat42R<. & n62...
7 foreach var in log_total_income_55 i.ParStat42R n622 i....
8 logistic cc `var', base
9 testparm `var'
10 }

```

Variables

| Name | Label |
|-----------------------|---|
| id | PSEUDO-DATA: ID number |
| log_total_income_55 | PSEUDO-DATA: log_total_income_55 |
| ParStat42R | PSEUDO-DATA: ParStat42R |
| n622 | PSEUDO-DATA: 0-3D Sex of child |
| LBW | PSEUDO-DATA: LBW |
| maw5 | PSEUDO-DATA: Mother worked birth to 5 |
| MotherNeverReads7 | PSEUDO-DATA: Mother Reads to Child |
| SocialClassHusband | PSEUDO-DATA: SocialClassHusband |
| DifficultiesFinancial | PSEUDO-DATA: DifficultiesFinancial |
| CogAbil7 | PSEUDO-DATA: Cognitive Ability Summa... |
| LogIncome42 | PSEUDO-DATA: LogIncome42 |
| EconAct42R | PSEUDO-DATA: EconAct42R |

Properties

Results

| | cc | Odds Ratio | Std. Err. | z | P> z | [95% Conf. Interval] |
|------------|----|------------|-----------|--------|-------|----------------------|
| EconAct42R | 1 | 1 (base) | | | | |
| | 2 | .8658487 | .0451768 | -2.76 | 0.006 | .7816808 .9590793 |
| | 3 | .6978701 | .0932218 | -2.69 | 0.007 | .5371192 .9067311 |
| | 4 | .5946367 | .0663218 | -4.66 | 0.000 | .4778751 .7399273 |
| | 5 | .734228 | .0608538 | -3.73 | 0.000 | .6241403 .8637333 |
| _cons | | .5689581 | .0138913 | -23.10 | 0.000 | .5423728 .5968465 |

Note: _cons estimates baseline odds.

```

( 1) [cc]2.EconAct42R = 0
( 2) [cc]3.EconAct42R = 0
( 3) [cc]4.EconAct42R = 0
( 4) [cc]5.EconAct42R = 0

chi2( 4) = 41.81
Prob > chi2 = 0.0000

```

Command

```

foreach var in aconnn512 aconnn504 i.acatnn660 bbinnn194 bconnage7dv10 bfever genability11 Ext11Dec18
dbinnn2250 dconnn1721 i.dcatnn2888 dconnn2930 Ext16MTDec18 i.ecatnn5113 ebinnn5960 fbinnn502977
fconnn504361_cont fbinnn504636_bin fbinntenure91_bin fconnndvsoccaptial_cont gbindmpart Org42
mconngenhlth i.hcatnn7ms_cat iconnnd8nchtt_cont ibinn8j2101 NR08priorNR {
    regress log_total_income_55 `var'
    testparm `var'
}

```

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Review

```

^ Command _rc
1 gen cc = log_total_income_55 if ParStat42R & n622...
2 foreach var in log_total_income_55 i.ParStat42R n622 i...
3 logistic cc `var', base
4 testparm `var'
5
6 foreach var in aconnn512 aconnn504 i.acatnn660 bbin...
7 regress log_total_income_55 `var'
8 testparm `var'
9
10 foreach var in aconnn512 aconnn504 i.acatnn660 bbin...
11 regress log_total_income_55 `var'
12 testparm `var'
13
14 }

```

Variables

| Name | Label |
|-----------------------|---|
| id | PSEUDO-DATA: ID number |
| log_total_income_55 | PSEUDO-DATA: log_total_income_55 |
| ParStat42R | PSEUDO-DATA: ParStat42R |
| n622 | PSEUDO-DATA: 0-3D Sex of child |
| LBW | PSEUDO-DATA: LBW |
| maw5 | PSEUDO-DATA: Mother worked birth to 5 |
| MotherNeverReads7 | PSEUDO-DATA: Mother Reads to Child |
| SocialClassHusband | PSEUDO-DATA: SocialClassHusband |
| DiffucultiesFinancial | PSEUDO-DATA: DiffucultiesFinancial |
| CogAbil7 | PSEUDO-DATA: Cognitive Ability Summa... |
| LogIncome42 | PSEUDO-DATA: LogIncome42 |
| EconAct42R | PSEUDO-DATA: EconAct42R |

Properties

Variables

| Name | Label | Type | Format | Value label | Notes |
|------|-------|------|--------|-------------|-------|
|------|-------|------|--------|-------------|-------|

Results

```

> nhlth i.hcatnnd7ms_cat iconnnd8nchtt_cont ibinn8j2101 NR08priorNR {
  2. regress log_total_income_55 `var'
  3. testparm `var'
  4.

```

| Source | SS | df | MS | Number of obs | = | 5,823 |
|----------|------------|-------|------------|---------------|---|--------|
| Model | 24.8241475 | 1 | 24.8241475 | F(1, 5821) | = | 19.29 |
| Residual | 7492.75129 | 5,821 | 1.28719314 | Prob > F | = | 0.0000 |
| Total | 7517.57544 | 5,822 | 1.2912359 | R-squared | = | 0.0033 |
| | | | | Adj R-squared | = | 0.0031 |
| | | | | Root MSE | = | 1.1345 |

| log_total~55 | Coef. | Std. Err. | t | P> t | [95% Conf. Interval] |
|--------------|-----------|-----------|--------|-------|----------------------|
| aconnn512 | -.0710254 | .0161733 | -4.39 | 0.000 | -.102731 - .0393197 |
| _cons | 6.206207 | .0280578 | 221.19 | 0.000 | 6.151203 6.261211 |

(1) aconnn512 = 0

F(1, 5821) = 19.29
Prob > F = 0.0000

Command

Agenda

1. Our concrete example and data exploration
2. Complete case analysis
3. Exploration of missingness
4. Deciding on a set of auxiliary variables for MI
5. Setup MI
6. Run MI
 - a) Variables predictive of missingness and underlying missing values themselves
 - b) Variables predictive of underlying missing values only
7. Check
8. Analyse

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Review

```

^ Command _rc
1 gen cc = log_total_income_55. & ParStat42R. & n622...
2 foreach var in log_total_income_55 i.ParStat42R n622 i...
3 logistic cc `var', base
4 testparm `var'
5 10 }
6 foreach var in aconnn512 aconnn504 i.acatnn660 bbin...
7 regress log_total_income_55 `var'
8 testparm `var'
9 14 }

```

Variables

| Name | Label |
|-----------------------|---|
| id | PSEUDO-DATA: ID number |
| log_total_income_55 | PSEUDO-DATA: log_total_income_55 |
| ParStat42R | PSEUDO-DATA: ParStat42R |
| n622 | PSEUDO-DATA: 0-3D Sex of child |
| LBW | PSEUDO-DATA: LBW |
| maw5 | PSEUDO-DATA: Mother worked birth to 5 |
| MotherNeverReads7 | PSEUDO-DATA: Mother Reads to Child |
| SocialClassHusband | PSEUDO-DATA: SocialClassHusband |
| DiffucultiesFinancial | PSEUDO-DATA: DiffucultiesFinancial |
| CogAbil7 | PSEUDO-DATA: Cognitive Ability Summa... |
| LogIncome42 | PSEUDO-DATA: LogIncome42 |
| EconAct42R | PSEUDO-DATA: EconAct42R |

Properties

Variables

Results

F(1, 5842) = **90.04**
Prob > F = **0.0000**

| Source | SS | df | MS | Number of obs | = | 6,232 |
|----------|-------------------|--------------|-------------------|---------------|---|---------------|
| Model | 7.61701217 | 1 | 7.61701217 | F(1, 6230) | = | 5.79 |
| Residual | 8195.91809 | 6,230 | 1.31555668 | Prob > F | = | 0.0161 |
| Total | 8203.5351 | 6,231 | 1.31656798 | R-squared | = | 0.0009 |
| | | | | Adj R-squared | = | 0.0008 |
| | | | | Root MSE | = | 1.147 |

log_total~55 | Coef. Std. Err. t P>|t| [95% Conf. Interval]

| | Coef. | Std. Err. | t | P> t | [95% Conf. Interval] |
|-------------|------------------|-----------------|---------------|--------------|-----------------------------------|
| NR08priorNR | -.0702345 | .0291886 | -2.41 | 0.016 | -.1274541 -.0130148 |
| _cons | 6.121886 | .0196416 | 311.68 | 0.000 | 6.083381 6.16039 |

(1) **NR08priorNR = 0**

F(1, 6230) = **5.79**
Prob > F = **0.0161**

Command

sum log_total_income_50

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Review

```

^ Command _rc
1 foreach var in log_total_income_55 ParStat42R n622 ...
2 8 logistic cc `var', base
3 9 testparm `var'
4 10 }
5 11 foreach var in aconnn512 aconnn504 i.acatnn660 bbin...
6 12 regress log_total_income_55 `var'
7 13 testparm `var'
8 14 }
9 15 sum log_total_income_50

```

Variables

| Name | Label |
|-----------------------|---|
| id | PSEUDO-DATA: ID number |
| log_total_income_55 | PSEUDO-DATA: log_total_income_55 |
| ParStat42R | PSEUDO-DATA: ParStat42R |
| n622 | PSEUDO-DATA: 0-3D Sex of child |
| LBW | PSEUDO-DATA: LBW |
| maw5 | PSEUDO-DATA: Mother worked birth to 5 |
| MotherNeverReads7 | PSEUDO-DATA: Mother Reads to Child |
| SocialClassHusband | PSEUDO-DATA: SocialClassHusband |
| DiffucultiesFinancial | PSEUDO-DATA: DiffucultiesFinancial |
| CogAbil7 | PSEUDO-DATA: Cognitive Ability Summa... |
| LogIncome42 | PSEUDO-DATA: LogIncome42 |
| EconAct42R | PSEUDO-DATA: EconAct42R |

Results

| | Residual | 8195.91809 | 6,230 | 1.31555668 | R-squared | = | 0.0009 |
|-------|-----------|------------|------------|---------------|-----------|--------|--------|
| Total | 8203.5351 | 6,231 | 1.31656798 | Adj R-squared | = | 0.0008 | |
| | | | | Root MSE | = | 1.147 | |

| log_total~55 | Coef. | Std. Err. | t | P> t | [95% Conf. Interval] |
|--------------|-----------|-----------|--------|-------|----------------------|
| NR08priorNR | -.0702345 | .0291886 | -2.41 | 0.016 | -.1274541 - .0130148 |
| _cons | 6.121886 | .0196416 | 311.68 | 0.000 | 6.083381 6.16039 |

(1) NR08priorNR = 0

F(1, 6230) = 5.79
Prob > F = 0.0161

. sum log_total_income_50

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|--------------|-------|---------|-----------|-----|----------|
| log_total~50 | 8,209 | 6.29442 | .966489 | 0 | 11.10419 |

Properties

Variables

| Name |
|-------------|
| Label |
| Type |
| Format |
| Value label |
| Notes |

Command

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Review

```

^ Command _rc
1 foreach var in log_total_income_55 ParStat42R n622...
2 logistic cc `var', base
3 testparm `var'
4
5 foreach var in aconnn512 aconnn504 i.acatnn660 bbin...
6 regress log_total_income_55 `var'
7 testparm `var'
8
9 sum log_total_income_50

```

Variables

| Name | Label |
|-----------------------|---|
| id | PSEUDO-DATA: ID number |
| log_total_income_55 | PSEUDO-DATA: log_total_income_55 |
| ParStat42R | PSEUDO-DATA: ParStat42R |
| n622 | PSEUDO-DATA: 0-3D Sex of child |
| LBW | PSEUDO-DATA: LBW |
| maw5 | PSEUDO-DATA: Mother worked birth to 5 |
| MotherNeverReads7 | PSEUDO-DATA: Mother Reads to Child |
| SocialClassHusband | PSEUDO-DATA: SocialClassHusband |
| DiffucultiesFinancial | PSEUDO-DATA: DiffucultiesFinancial |
| CogAbil7 | PSEUDO-DATA: Cognitive Ability Summa... |
| LogIncome42 | PSEUDO-DATA: LogIncome42 |
| EconAct42R | PSEUDO-DATA: EconAct42R |

Properties

Results

| Residual | 8195.91809 | 6,230 | 1.31555668 | R-squared | = | 0.0009 |
|----------|------------|-------|------------|---------------|---|--------|
| Total | 8203.5351 | 6,231 | 1.31656798 | Adj R-squared | = | 0.0008 |
| | | | | Root MSE | = | 1.147 |

| log_total~55 | Coef. | Std. Err. | t | P> t | [95% Conf. Interval] |
|--------------|-----------|-----------|--------|-------|----------------------|
| NR08priorNR | -.0702345 | .0291886 | -2.41 | 0.016 | -.1274541 - .0130148 |
| _cons | 6.121886 | .0196416 | 311.68 | 0.000 | 6.083381 6.16039 |

(1) NR08priorNR = 0

F(1, 6230) = 5.79
Prob > F = 0.0161

. sum log_total_income_50

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|--------------|-------|---------|-----------|-----|----------|
| log_total~50 | 8,209 | 6.29442 | .966489 | 0 | 11.10419 |

Command

```
regress log_total_income_55 log_total_income_50
```

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Log Viewer Graph Do-file Editor Data Editor Data Browser More Break Search Help

Enter Full Screen
 Tile Window to Left of Screen
 Tile Window to Right of Screen

Results

```
. sum log_total_income_50
      Variable          Obs        Mean       Std. Dev.        Min        Max
log_total~50      8,209    6.29442     .966489         0    11.10419

. regress log_total_income_55 log_total_income_50
      Source          SS           df          MS      Number of obs = 5,262
                           F(1, 5260) = 428.99
      Model   497.007724           1  497.007724  Prob > F = 0.0000
      Residual  6093.92621      5,260  1.1585411  R-squared = 0.0754
                           Adj R-squared = 0.0752
      Total   6590.93393      5,261  1.25279109  Root MSE = 1.0764
```

| | Coef. | Std. Err. | t | P> t | [95% Conf. Interval] |
|---------------------|----------|-----------|-------|-------|----------------------|
| log_total_income_55 | .336789 | .0162604 | 20.71 | 0.000 | .3049118 .3686662 |
| _cons | 4.000798 | .1050362 | 38.09 | 0.000 | 3.794883 4.206712 |

Variables

| Name | Label |
|-----------------------|---|
| id | PSEUDO-DATA: ID number |
| log_total_income_55 | PSEUDO-DATA: log_total_income_55 |
| ParStat42R | PSEUDO-DATA: ParStat42R |
| n622 | PSEUDO-DATA: 0-3D Sex of child |
| LBW | PSEUDO-DATA: LBW |
| maw5 | PSEUDO-DATA: Mother worked birth to 5 |
| MotherNeverReads7 | PSEUDO-DATA: Mother Reads to Child |
| SocialClassHusband | PSEUDO-DATA: SocialClassHusband |
| DiffucultiesFinancial | PSEUDO-DATA: DiffucultiesFinancial |
| CogAbil7 | PSEUDO-DATA: Cognitive Ability Summa... |
| LogIncome42 | PSEUDO-DATA: LogIncome42 |
| EconAct42R | PSEUDO-DATA: EconAct42R |

Properties

Variables

Name
Label
Type
Format
Value label
Notes

Command

Multiple Imputation Model should include ...

Substantive model (11)



- 1. Outcome: Income
- 2. Exposure: Relationship status
- 3. 9 Confounders

Variables associated
with non-response as
well as underlying
missing values
(income) (18)



E.g.

- 1. Cognitive ability age 11
- 2. Conduct problems age 16
- 3. Self rated general health age 44

Predictors of
underlying missing
values (income at age
55) (1)



- 1. Income at age 50

Agenda

1. Our concrete example and data exploration
2. Complete case analysis
3. Exploration of missingness
4. Deciding on a set of auxiliary variables for MI
5. **Setup MI**
6. Run MI
7. Check
8. Analyse

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Review

```

^ Command
rc
9 testparm `var'
10 }
11 foreach var in aconnn512 aconnn504 i.acatnn660 bbin...
12 regress log_total_income_55 `var'
13 testparm `var'
14 }
15 sum log_total_income_50
16 regress log_total_income_55 log_total_income_50

```

Variables

| Name | Label |
|-----------------------|---|
| id | PSEUDO-DATA: ID number |
| log_total_income_55 | PSEUDO-DATA: log_total_income_55 |
| ParStat42R | PSEUDO-DATA: ParStat42R |
| n622 | PSEUDO-DATA: 0-3D Sex of child |
| LBW | PSEUDO-DATA: LBW |
| maw5 | PSEUDO-DATA: Mother worked birth to 5 |
| MotherNeverReads7 | PSEUDO-DATA: Mother Reads to Child |
| SocialClassHusband | PSEUDO-DATA: SocialClassHusband |
| DiffucultiesFinancial | PSEUDO-DATA: DiffucultiesFinancial |
| CogAbil7 | PSEUDO-DATA: Cognitive Ability Summa... |
| LogIncome42 | PSEUDO-DATA: LogIncome42 |
| EconAct42R | PSEUDO-DATA: EconAct42R |

Results

```

. sum log_total_income_50

Variable          Obs        Mean    Std. Dev.      Min      Max
log_total~50     8,209     6.29442     .966489      0     11.10419

. regress log_total_income_55 log_total_income_50

Source           SS            df            MS      Number of obs = 5,262
                 497.007724      1   497.007724  F(1, 5260) = 428.99
Model            Residual    6093.92621   5,260   1.1585411  Prob > F    = 0.0000
                           R-squared = 0.0754
                           Adj R-squared = 0.0752
Total            6590.93393   5,261   1.25279109 Root MSE = 1.0764

log_total_income_55   Coef.    Std. Err.      t    P>|t| [95% Conf. Interval]
log_total_income_50
                     .336789   .0162604   20.71   0.000   .3049118   .3686662
                     _cons   4.000798   .1050362   38.09   0.000   3.794883   4.206712

```

Command

mi set wide

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Review

```

^ Command
3 testparm `var'
10 }
11 foreach var in aconnn512 aconnn504 i.acatnn660 bbin...
12 regress log_total_income_55 `var'
13 testparm `var'
14 }
15 sum log_total_income_50
16 regress log_total_income_55 log_total_income_50
17 mi set wide

```

Variables

| Name | Label |
|-----------------------|---|
| id | PSEUDO-DATA: ID number |
| log_total_income_55 | PSEUDO-DATA: log_total_income_55 |
| ParStat42R | PSEUDO-DATA: ParStat42R |
| n622 | PSEUDO-DATA: 0-3D Sex of child |
| LBW | PSEUDO-DATA: LBW |
| maw5 | PSEUDO-DATA: Mother worked birth to 5 |
| MotherNeverReads7 | PSEUDO-DATA: Mother Reads to Child |
| SocialClassHusband | PSEUDO-DATA: SocialClassHusband |
| DiffucultiesFinancial | PSEUDO-DATA: DiffucultiesFinancial |
| CogAbil7 | PSEUDO-DATA: Cognitive Ability Summa... |
| LogIncome42 | PSEUDO-DATA: LogIncome42 |
| EconAct42R | PSEUDO-DATA: EconAct42R |

Results

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|--------------|-------|---------|-----------|-----|----------|
| log_total~50 | 8,209 | 6.29442 | .966489 | 0 | 11.10419 |

. regress log_total_income_55 log_total_income_50

| Source | SS | df | MS | Number of obs | = | 5,262 |
|----------|------------|-------|------------|---------------|---|--------|
| Model | 497.007724 | 1 | 497.007724 | F(1, 5260) | = | 428.99 |
| Residual | 6093.92621 | 5,260 | 1.1585411 | Prob > F | = | 0.0000 |
| Total | 6590.93393 | 5,261 | 1.25279109 | R-squared | = | 0.0754 |
| | | | | Adj R-squared | = | 0.0752 |
| | | | | Root MSE | = | 1.0764 |

| log_total_income_55 | Coef. | Std. Err. | t | P> t | [95% Conf. Interval] |
|---------------------|----------|-----------|-------|-------|----------------------|
| log_total_income_50 | .336789 | .0162604 | 20.71 | 0.000 | .3049118 .3686662 |
| _cons | 4.000798 | .1050362 | 38.09 | 0.000 | 3.794883 4.206712 |

. mi set wide

Properties

Variables

Command

```

mi register imputed log_total_income_55 ParStat42R n622 LBW maw5 MotherNeverReads7 SocialClassHusband
DiffucultiesFinancial CogAbil7 LogIncome42 EconAct42R aconnn512 aconnn504 acatnn660 bbinnn194
bconnage7dv10 genability11 dconnn1721 dcatnn2888 dconnn2930 Ext16MTDec18 fbinn502977 fconnn504361_cont
fbinnntenure91_bin fconnndvsoccapital_cont Org42 mconngenhlth hcatnn7ms_cat ibinn8j2101
log_total_income_50

```



| Review | | Results | | | | | |
|---|---|---------------------|------------|---------|------------|----------------------|----------|
| ^ Command | _rc | Variable | Obs | Mean | Std. Dev. | Min | Max |
| testparm `var' | | log_total~50 | 8,209 | 6.29442 | .966489 | 0 | 11.10419 |
| . regress log_total_income_55 log_total_income_50 | | | | | | | |
| | | Source | SS | df | MS | Number of obs | = 5,262 |
| | | Model | 497.007724 | 1 | 497.007724 | F(1, 5260) | = 428.99 |
| | | Residual | 6093.92621 | 5,260 | 1.1585411 | Prob > F | = 0.0000 |
| | | Total | 6590.93393 | 5,261 | 1.25279109 | R-squared | = 0.0754 |
| | | | | | | Adj R-squared | = 0.0752 |
| | | | | | | Root MSE | = 1.0764 |
| Variables | | log_total_income_55 | | | | | |
| Name | ^ Label | Coef. | Std. Err. | t | P> t | [95% Conf. Interval] | |
| id | PSEUDO-DATA: ID number | | | | | | |
| log_total_income_55 | PSEUDO-DATA: log_total_income_55 | .336789 | .0162604 | 20.71 | 0.000 | .3049118 | .3686662 |
| ParStat42R | PSEUDO-DATA: ParStat42R | 4.000798 | .1050362 | 38.09 | 0.000 | 3.794883 | 4.206712 |
| n622 | PSEUDO-DATA: 0-3D Sex of child | | | | | | |
| LBW | PSEUDO-DATA: LBW | | | | | | |
| maw5 | PSEUDO-DATA: Mother worked birth to 5 | | | | | | |
| MotherNeverReads7 | PSEUDO-DATA: Mother Reads to Child | | | | | | |
| SocialClassHusband | PSEUDO-DATA: SocialClassHusband | | | | | | |
| DiffucultiesFinancial | PSEUDO-DATA: DiffucultiesFinancial | | | | | | |
| CogAbil7 | PSEUDO-DATA: Cognitive Ability Summa... | | | | | | |
| LogIncome42 | PSEUDO-DATA: LogIncome42 | | | | | | |
| EconAct42R | PSEUDO-DATA: EconAct42R | | | | | | |

| Properties | | Command |
|------------|--|--|
| Variables | | mi register imputed log_total_income_55 ParStat42R n622 LBW maw5 MotherNeverReads7 SocialClassHusband DiffucultiesFinancial CogAbil7 LogIncome42 EconAct42R aconnn512 aconnn504 acatnn660 bbinnn194 bconnage7dv10 genability11 dconnn1721 dcatnn2888 dconnn2930 Ext16MTDec18 fbinn502977 fconnn504361_cont fbinntenure91_bin fconndvsoccapital_cont Org42 mconngenhlth hcatnn7ms_cat ibinn8j2101 log_total_income_50 |
| Name | | |
| Label | | |
| Type | | |
| Format | | |

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Review

```
^ Command _rc
11 foreach var in aconnn512 aconnn504 i.acatnn660 bbin...
12 regress log_total_income_55 `var'
13 testparm `var'
14 }
15 sum log_total_income_50
16 regress log_total_income_55 log_total_income_50
17 mi set wide
18 mi register imputed log_total_income_55 ParStat42R n6...
```

Variables

| Name | Label |
|-----------------------|---|
| id | PSEUDO-DATA: ID number |
| log_total_income_55 | PSEUDO-DATA: log_total_income_55 |
| ParStat42R | PSEUDO-DATA: ParStat42R |
| n622 | PSEUDO-DATA: 0-3D Sex of child |
| LBW | PSEUDO-DATA: LBW |
| maw5 | PSEUDO-DATA: Mother worked birth to 5 |
| MotherNeverReads7 | PSEUDO-DATA: Mother Reads to Child |
| SocialClassHusband | PSEUDO-DATA: SocialClassHusband |
| DiffucultiesFinancial | PSEUDO-DATA: DiffucultiesFinancial |
| CogAbil7 | PSEUDO-DATA: Cognitive Ability Summa... |
| LogIncome42 | PSEUDO-DATA: LogIncome42 |
| EconAct42R | PSEUDO-DATA: EconAct42R |

Results

| Source | SS | df | MS | Number of obs | = | 5,262 |
|----------|-------------------|--------------|-------------------|---------------|---|---------------|
| Model | 497.007724 | 1 | 497.007724 | F(1, 5260) | = | 428.99 |
| Residual | 6093.92621 | 5,260 | 1.1585411 | Prob > F | = | 0.0000 |
| Total | 6590.93393 | 5,261 | 1.25279109 | R-squared | = | 0.0754 |
| | | | | Adj R-squared | = | 0.0752 |
| | | | | Root MSE | = | 1.0764 |

| log_total_income_55 | Coef. | Std. Err. | t | P> t | [95% Conf. Interval] |
|---------------------|----------|-----------|-------|-------|----------------------|
| log_total_income_50 | .336789 | .0162604 | 20.71 | 0.000 | .3049118 .3686662 |
| _cons | 4.000798 | .1050362 | 38.09 | 0.000 | 3.794883 4.206712 |

Command

```
help (mi impute chained)
```

Properties

▼ Variables

Name Label

Agenda

1. Our concrete example and data exploration
2. Complete case analysis
3. Exploration of missingness
4. Deciding on a set of auxiliary variables for MI
5. Setup MI
6. Run MI
7. Check
8. Analyse

Stata/SE 15.0 — Missing Data Workshop Practical Data.dta

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Review

```

^ Command _rc
11 foreach var in aconnn512 aconnn504 i.acatnn660 bbin...
12 regress log_total_income_55 `var'
13 testparm `var'
14 }
15 sum log_total_income_50
16 regress log_total_income_55 log_total_income_50
17 mi set wide
18 mi register imputed log_total_income_55 ParStat42R n6...

```

Variables

| Name | Label |
|-----------------------|---|
| id | PSEUDO-DATA: ID number |
| log_total_income_55 | PSEUDO-DATA: log_total_income_55 |
| ParStat42R | PSEUDO-DATA: ParStat42R |
| n622 | PSEUDO-DATA: 0-3D Sex of child |
| LBW | PSEUDO-DATA: LBW |
| maw5 | PSEUDO-DATA: Mother worked birth to 5 |
| MotherNeverReads7 | PSEUDO-DATA: Mother Reads to Child |
| SocialClassHusband | PSEUDO-DATA: SocialClassHusband |
| DiffucultiesFinancial | PSEUDO-DATA: DiffucultiesFinancial |
| CogAbil7 | PSEUDO-DATA: Cognitive Ability Summa... |
| LogIncome42 | PSEUDO-DATA: LogIncome42 |
| EconAct42R | PSEUDO-DATA: EconAct42R |

Results

| Source | SS | df | MS | Number of obs | = | 5,262 |
|----------|-------------------|--------------|-------------------|---------------|---|---------------|
| Model | 497.007724 | 1 | 497.007724 | F(1, 5260) | = | 428.99 |
| Residual | 6093.92621 | 5,260 | 1.1585411 | Prob > F | = | 0.0000 |
| Total | 6590.93393 | 5,261 | 1.25279109 | R-squared | = | 0.0754 |
| | | | | Adj R-squared | = | 0.0752 |
| | | | | Root MSE | = | 1.0764 |

| log_total_income_55 | Coef. | Std. Err. | t | P> t | [95% Conf. Interval] |
|---------------------|----------|-----------|-------|-------|----------------------|
| log_total_income_50 | .336789 | .0162604 | 20.71 | 0.000 | .3049118 .3686662 |
| _cons | 4.000798 | .1050362 | 38.09 | 0.000 | 3.794883 4.206712 |

. mi set wide

. mi register imputed log_total_income_55 ParStat42R n622 LBW maw5 MotherNeverReads7 SocialClassHusband
> nd DiffucultiesFinancial CogAbil7 LogIncome42 EconAct42R aconnn512 aconnn504 acatnn660 bbinnn194 bc
> onnage7dv10 genability11 dconnn1721 dcatnn2888 dconnn2930 Ext16MTDec18 fbinn502977 fconnn504361_con
> t fbinntenure91_bin fconnndvsoccaptial_cont Org42 mconngenhlth hcatnnd7ms_cat ibinn8j2101 log_total_

> income_50

.

Properties

Command: help (mi impute chained)

Variables

Name Label

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Viewer — help (mi impute chained)

help (mi impute chained) Search

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Title

[MI] **mi impute chained** — Impute missing values using chained equations

Syntax

Default specification of prediction equations, basic syntax

```
mi impute chained (uvmethod) ivars [= indepvars] [if] [weight] [, impute_options options]
```

Default specification of prediction equations, full syntax

```
mi impute chained lhs [= indepvars] [if] [weight] [, impute_options options]
```

Variables

| Name | Label |
|-----------------------|-------------------------|
| id | PSEUDO-DATA |
| log_total_income_55 | PSEUDO-DATA |
| ParStat42R | PSEUDO-DATA |
| n622 | PSEUDO-DATA |
| LBW | PSEUDO-DATA |
| maw5 | PSEUDO-DATA |
| MotherNeverReads7 | PSEUDO-DATA |
| SocialClassHusband | PSEUDO-DATA |
| DifficultiesFinancial | PSEUDO-DATA |
| CogAbil7 | PSEUDO-DATA |
| LogIncome42 | PSEUDO-DATA |
| EconAct42R | PSEUDO-DATA: EconAct42R |

Properties

▼ Variables

Name Label

More Break Search Help

0 = 0.000
d = 0.0754
quared = 0.0752
= 1.0764

[95% Conf. Interval]

| | | |
|---|----------|----------|
| 0 | .3049118 | .3686662 |
| 0 | 3.794883 | 4.206712 |

BW maw5 MotherNeverReads7 SocialClassHusband
aconnn512 aconnn504 acatnn660 bbinnn194 bc
Ext16MTDec18 fbinn502977 fconnn504361 con
hlth hcatnd7ms_cat ibinn8j2101 log_total_

Stata/SE 15.0 — Missing Data Workshop Practical Data.dta

Open Save Print

Review

Command

```
11 foreach var in aconnn512 aconnn504  
12 regress log_total_income_55 `var'  
13 testparm `var'  
14 }  
15 sum log_total_income_50  
16 regress log_total_income_55 log_total_  
17 mi set wide  
18 mi register imputed log_total_income_55  
19 help (mi impute chained)
```

Variables

| Name | Label |
|-----------------------|-------------------------|
| id | PSEUDO-DATA |
| log_total_income_55 | PSEUDO-DATA |
| ParStat42R | PSEUDO-DATA |
| n622 | PSEUDO-DATA |
| LBW | PSEUDO-DATA |
| maw5 | PSEUDO-DATA |
| MotherNeverReads7 | PSEUDO-DATA |
| SocialClassHusband | PSEUDO-DATA |
| DifficultiesFinancial | PSEUDO-DATA |
| CogAbil7 | PSEUDO-DATA |
| LogIncome42 | PSEUDO-DATA |
| EconAct42R | PSEUDO-DATA: EconAct42R |

Properties

Variables

Viewer — help (mi impute chained)

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help (mi impute chained)

| uvmethod | Description |
|----------------|---|
| regress | linear regression for a continuous variable; [MI] mi impute regress |
| pmm | predictive mean matching for a continuous variable; [MI] mi impute pmm |
| truncreg | truncated regression for a continuous variable with a restricted range; [MI] mi impute truncreg |
| intreg | interval regression for a continuous partially observed (censored) variable; [MI] mi impute intreg |
| logit | logistic regression for a binary variable; [MI] mi impute logit |
| ologit | ordered logistic regression for an ordinal variable; [MI] mi impute ologit |
| mlogit | multinomial logistic regression for a nominal variable; [MI] mi impute mlogit |
| poisson | Poisson regression for a count variable; [MI] mi impute poisson |
| nbreg | negative binomial regression for an overdispersed |

[95% Conf. Interval]

| | .3049118 | .3686662 |
|---|----------|----------|
| 0 | 3.794883 | 4.206712 |

BW maw5 MotherNeverReads7 SocialClassHusband aconnn512 aconnn504 acatnn660 bbinnn194 bc Ext16MTDec18 fbinn502977 fconnn504361 con hlnth hcatnnd7ms_cat ibinn8j2101 log_total_

File Editor Data Editor Data Browser

More Help Search Help

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Review

```

^ Command _rc
15 sum log_total_income_50
16 regress log_total_income_55 log_total_income_50
17 mi set wide
18 mi register imputed log_total_income_55 ParStat42R n6...
19 help (mi impute chained)
20 sum log_total_income_55 CogAbil7 LogIncome42
21 tab1 n622 LBW maw5 MotherNeverReads7 Diffuculties...
22 tab1 ParStat42R SocialClassHusband EconAct42R

```

Variables

| Name | Label |
|-----------------------|---|
| id | PSEUDO-DATA: ID number |
| log_total_income_55 | PSEUDO-DATA: log_total_income_55 |
| ParStat42R | PSEUDO-DATA: ParStat42R |
| n622 | PSEUDO-DATA: 0-3D Sex of child |
| LBW | PSEUDO-DATA: LBW |
| maw5 | PSEUDO-DATA: Mother worked birth to 5 |
| MotherNeverReads7 | PSEUDO-DATA: Mother Reads to Child |
| SocialClassHusband | PSEUDO-DATA: SocialClassHusband |
| DiffucultiesFinancial | PSEUDO-DATA: DiffucultiesFinancial |
| CogAbil7 | PSEUDO-DATA: Cognitive Ability Summa... |
| LogIncome42 | PSEUDO-DATA: LogIncome42 |
| EconAct42R | PSEUDO-DATA: EconAct42R |

Properties

Variables

| Name | Label |
|-------------|-------|
| Label | |
| Type | |
| Format | |
| Value label | |
| Notes | |

Results

| I & II | 2,591 | 18.65 | 18.65 |
|--------|--------|--------|--------|
| III | 8,090 | 58.24 | 76.90 |
| IV | 1,851 | 13.33 | 90.22 |
| V | 1,358 | 9.78 | 100.00 |
| Total | 13,890 | 100.00 | |

PSEUDO-DATA

| | Freq. | Percent | Cum. |
|------------|--------|---------|--------|
| EconAct42R | | | |
| 1 | 7,258 | 66.69 | 66.69 |
| 2 | 2,127 | 19.54 | 86.23 |
| 3 | 285 | 2.62 | 88.85 |
| 4 | 447 | 4.11 | 92.95 |
| 5 | 767 | 7.05 | 100.00 |
| Total | 10,884 | 100.00 | |

Command

```

log using "MI.log", replace
mi impute chained (logit, augment) n622 LBW maw5 MotherNeverReads7 DiffucultiesFinancial bbinnn194
fbinn502977 fbinntenure91_bin Org42 ibinn8j2101 (mlogit, augment) ParStat42R SocialClassHusband
EconAct42R acatnn660 dcatnn2888 hcatnnd7ms_cat (regress) log_total_income_55 CogAbil7 LogIncome42
aconnn512 aconnn504 bconnage7dv10 genability11 dconnn1721 dconnn2930 Ext16MTDec18 fconnn504361_cont
fconndvsoccapital_cont mconngenhlth log_total_income_50, rseed(12345) dots noisily force add(5)
savetrace(MI_trace, replace)
log close

```

Multiple Imputation: Run

```
log using "MI.log", replace /* opens log file */ ///
mi impute chained /* this will run imputation using chained equations */ ///
(logit, augment) V1 V2 /* specify (logit) for binary variables */ ///
(mlogit, augment) V3 V4 /* specify (mlogit) for nominal variables */ ///
(regress) V5 V6 /* specify (regress) for continuous variables */ ///
, rseed(12345) dots noisily force add(5) savetrace(MI_trace, replace)
    /* rseed specifies a random number seed, to reproduce results exactly */
    /* dots displays dots as imputation is performed */
    /* noisily returns output for each imputation */
    /* force proceeds with imputation even when missing imputed values encountered */
    /* add(5) specifies number of imputations */
    /* savetrace saves summaries of imputed values from each iteration */
    /* replace replaces old imputations if there are any */
log close /* closing log file */
save "Imputed", replace /* save imputed data for later use */
```

Multiple Imputation: Run

```
log using "MI.log", replace /* opens log file */ ///
mi impute chained /* this will run imputation using chained equations */ ///
(logit, augment) V1 V2 /* specify (logit) for binary variables */ ///
(mlogit, augment) V3 V4 /* specify (mlogit) for nominal variables */ ///
(regress) V5 V6 /* specify (regress) for continuous variables */ ///
, rseed(12345) dots noisily force add(5) savetrace(MI_trace, replace)
    /* rseed specifies a random number seed, to reproduce results exactly */
    /* dots displays dots as imputation is performed */
    /* noisily returns output for each imputation */
    /* force proceeds with imputation even when missing imputed values encountered */
    /* add(5) specifies number of imputations */
    /* savetrace saves summaries of imputed values from each iteration */
    /* replace replaces old imputations if there are any */
log close /* closing log file */
save "Imputed", replace /* save imputed data for later use */
```

Multiple Imputation: Run

```
log using "MI.log", replace /* opens log file */ ///
mi impute chained /* this will run imputation using chained equations */ ///
(logit, augment) V1 V2 /* specify (logit) for binary variables */ ///
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/* rseed specifies a random number seed, to reproduce results exactly */
/* dots displays dots as imputation is performed */
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save "Imputed", replace /* save imputed data for later use */
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Multiple Imputation: Run

```
log using "MI.log", replace /* opens log file */ ///
mi impute chained /* this will run imputation using chained equations */ ///
(logit, augment) V1 V2 /* specify (logit) for binary variables */ ///
(mlogit, augment) V3 V4 /* specify (mlogit) for nominal variables */ ///
(regress) V5 V6 /* specify (regress) for continuous variables */ ///
, rseed(12345) dots noisily force add(5) savetrace(MI_trace, replace)
    /* rseed specifies a random number seed, to reproduce results exactly */
    /* dots displays dots as imputation is performed */
    /* noisily returns output for each imputation */
    /* force proceeds with imputation even when missing imputed values encountered */
    /* add(5) specifies number of imputations */
    /* savetrace saves summaries of imputed values from each iteration */
    /* replace replaces old imputations if there are any */
log close /* closing log file */
save "Imputed", replace /* save imputed data for later use */
```

Stata/SE 15.0 — Missing Data Workshop Practical Data.dta

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Review

```
^ Command _rc
  15 sum log_total_income_50
  16 regress log_total_income_55 log_total_income_50
  17 mi set wide
  18 mi register imputed log_total_income_55 ParStat42R n6...
  19 help (mi impute chained)
  20 sum log_total_income_55 CogAbil7 LogIncome42
  21 tab1 n622 LBW maw5 MotherNeverReads7 Diffuculties...
  22 tab1 ParStat42R SocialClassHusband EconAct42R
```

Variables

| Name | Label |
|-----------------------|---|
| id | PSEUDO-DATA: ID number |
| log_total_income_55 | PSEUDO-DATA: log_total_income_55 |
| ParStat42R | PSEUDO-DATA: ParStat42R |
| n622 | PSEUDO-DATA: 0-3D Sex of child |
| LBW | PSEUDO-DATA: LBW |
| maw5 | PSEUDO-DATA: Mother worked birth to 5 |
| MotherNeverReads7 | PSEUDO-DATA: Mother Reads to Child |
| SocialClassHusband | PSEUDO-DATA: SocialClassHusband |
| DiffucultiesFinancial | PSEUDO-DATA: DiffucultiesFinancial |
| CogAbil7 | PSEUDO-DATA: Cognitive Ability Summa... |
| LogIncome42 | PSEUDO-DATA: LogIncome42 |
| EconAct42R | PSEUDO-DATA: EconAct42R |

Properties

Variables

| Name | Label |
|-------------|-------|
| Label | |
| Type | |
| Format | |
| Value label | |
| Notes | |

Results

| I & II | 2,591 | 18.65 | 18.65 |
|--------|--------|--------|--------|
| III | 8,090 | 58.24 | 76.90 |
| IV | 1,851 | 13.33 | 90.22 |
| V | 1,358 | 9.78 | 100.00 |
| Total | 13,890 | 100.00 | |

PSEUDO-DATA

| | Freq. | Percent | Cum. |
|------------|--------|---------|--------|
| EconAct42R | | | |
| 1 | 7,258 | 66.69 | 66.69 |
| 2 | 2,127 | 19.54 | 86.23 |
| 3 | 285 | 2.62 | 88.85 |
| 4 | 447 | 4.11 | 92.95 |
| 5 | 767 | 7.05 | 100.00 |
| Total | 10,884 | 100.00 | |

Command

```
log using "MT_log", replace
mi impute chained (logit, augment) n622 LBW maw5 MotherNeverReads7 DiffucultiesFinancial bbinnn194
bbinn502977 bbinntenure91_bin Org42 ibinn8j2101 (mlogit, augment) ParStat42R SocialClassHusband
EconAct42R acatnn660 dcatnn2888 hcatnnd7ms_cat (regress) log_total_income_55 CogAbil7 LogIncome42
aconn512 aconn504 bconnage7dv10 genability11 dconnn1721 dconnm2930 Ext16MTDec10 fconnn504361 cont
fconnndyccapital_cont mconnghlth log_total_income_50, rseed(12345) dots nosily force add(5)
savetrace(MI_trace, replace)
log close
```



Review

^ Command

1 use "/Users/martina/Documents/work/UCL research as..."

Results

/ _ / _ / _ / _ / 15.0
/ _ / _ / _ / _ /

Statistics/Data Analysis**Special Edition**

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Notes:

1. Unicode is supported; see [help unicode_advice](#).
2. Maximum number of variables is set to 5000; see [help set_maxvar](#).
3. New update available; type **-update all-**

. use "/Users/martina/Documents/work/UCL research associate/Presentations:Lectures/Missing Data Seminar
> ar 2021/Imputed.dta"

Command

Properties

▼ Variables

Name

Label

Type

Format

Value label

Notes

Agenda

1. Our concrete example and data exploration
2. Complete case analysis
3. Exploration of missingness
4. Deciding on a set of auxiliary variables for MI
5. Setup MI
6. Run MI
7. Check
8. Analyse

Stata/SE 15.0 — MI_50_trace.dta

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Review

^ Command _rc
1 use "/Users/martina/Documents/work/UCL research as..."

Results

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1. Unicode is supported; see [help unicode_advice](#).
2. Maximum number of variables is set to 5000; see [help set_maxvar](#).
3. New update available; type [-update all-](#)

. use "/Users/martina/Documents/work/UCL research associate/Presentations:Lectures/Missing Data Seminar 2021/MI_50_trace.dta"
(Summaries of imputed values from -mi impute chained-)

Command

```
pause on
foreach var in log_total_income_55 ParStat42R n622 LBW maw5 MotherNeverReads7 SocialClassHusband DifficultiesFinancial CogAbilit7 LogIncome42 EconAct42R aconnn512 aconnn504 acatnn660 bbinnn194 bconnage7dv10 genability11 dcatnn2888 dconnn2930 Ext16MTDec18 fbinn502977 fconnn504361_cont fbinntenure91_bin fconndvsocccapital_cont Org42 mconngenhlt hcatnnd7ms_cat |ibinn8j2101
log_total_income_50 {
    xtline `var'_mean, t(iter) i(m) overlay legend(off) name(graph1, replace)
    xtline `var'_sd, t(iter) i(m) overlay legend(off) name(graph2, replace)
    graph combine graph1 graph2, xcommon cols(1)
}
pause
pause off
```

/Users/martina/Documents/work/UCL research associate/Presentations:Lectures/Missing Data Seminar 2021

Variables

| Name | Label |
|-------------------------|---------------------------------|
| iter | Iteration numbers |
| m | Imputation numbers |
| n622_mean | Mean of n622 |
| n622_sd | Std. Dev. of n622 |
| aconnn504_mean | Mean of aconnn504 |
| aconnn504_sd | Std. Dev. of aconnn504 |
| aconnn512_mean | Mean of aconnn512 |
| aconnn512_sd | Std. Dev. of aconnn512 |
| LBW_mean | Mean of LBW |
| LBW_sd | Std. Dev. of LBW |
| SocialClass...band_mean | Mean of SocialClassHusband |
| SocialClassHusband_sd | Std. Dev. of SocialClassHusband |

Properties

▼ Variables

| Name | |
|-------------|--|
| Label | |
| Type | |
| Format | |
| Value label | |
| Notes | |

Stata/SE 15.0 — MI_50_trace.dta

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3. New update available; type [-update all-](#)

. use "/Users/martina/Documents/work/UCL research associate/Presentations:Lectures/Missing Data Seminar 2021/MI_50_trace.dta"
(Summaries of imputed values from -mi impute chained-)

Command

```
pause on
foreach var in log_total_income_55 ParStat42R n622 LBW maw5 MotherNeverReads7 SocialClassHusband DifficultiesFinancial CogAbilit7 LogIncome42 EconAct42R aconnn512 aconnn504 acatnn660 bbinnn194 bconnage7dv10 genability11 dcatnn2888 dconnn2930 Ext16MTDec18 fbinn502977 fconnn504361_cont fbinntenure91_bin fconndvsocccapital_cont Org42 mconngenhlt hcatnnd7ms_cat |ibinn8j2101
log_total_income_50 {
    xtline `var'_mean, t(iter) i(m) overlay legend(off) name(graph1, replace)
    xtline `var'_sd, t(iter) i(m) overlay legend(off) name(graph2, replace)
    graph combine graph1 graph2, xcommon cols(1)
    pause
}
pause off
```

Properties

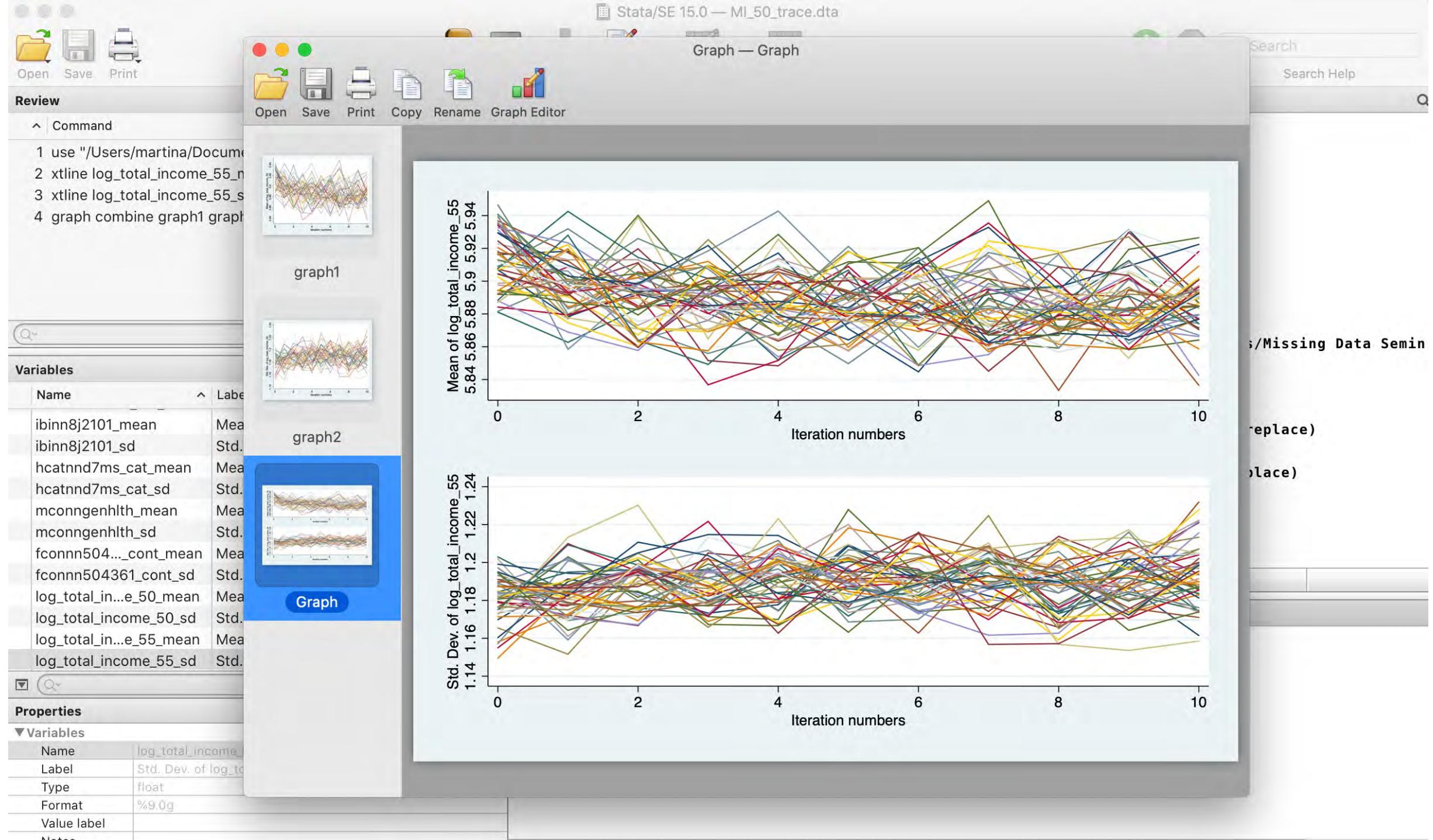
Variables

| Name | Label |
|-------------------------|---------------------------------|
| iter | Iteration numbers |
| m | Imputation numbers |
| n622_mean | Mean of n622 |
| n622_sd | Std. Dev. of n622 |
| aconnn504_mean | Mean of aconnn504 |
| aconnn504_sd | Std. Dev. of aconnn504 |
| aconnn512_mean | Mean of aconnn512 |
| aconnn512_sd | Std. Dev. of aconnn512 |
| LBW_mean | Mean of LBW |
| LBW_sd | Std. Dev. of LBW |
| SocialClass...band_mean | Mean of SocialClassHusband |
| SocialClassHusband_sd | Std. Dev. of SocialClassHusband |

Properties

Variables

| Name | Label |
|-------------|-------|
| Type | |
| Format | |
| Value label | |
| Notes | |



Agenda

1. Our concrete example and data exploration
2. Complete case analysis
3. Exploration of missingness
4. Deciding on a set of auxiliary variables for MI
5. Setup MI
6. Run MI
7. Check
8. Analyse

Stata/SE 15.0 — Imputed_50.dta

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Review

^ Command _rc

1 use "/Users/martina/Documents/work/UCL research as..."

Variables

| Name | Label |
|-----------------------|---|
| id | PSEUDO-DATA: ID number |
| log_total_income_55 | PSEUDO-DATA: log_total_income_55 |
| ParStat42R | PSEUDO-DATA: ParStat42R |
| n622 | PSEUDO-DATA: 0-3D Sex of child |
| LBW | PSEUDO-DATA: LBW |
| maw5 | PSEUDO-DATA: Mother worked birth to 5 |
| MotherNeverReads7 | PSEUDO-DATA: Mother Reads to Child |
| SocialClassHusband | PSEUDO-DATA: SocialClassHusband |
| DiffucultiesFinancial | PSEUDO-DATA: DiffucultiesFinancial |
| CogAbil7 | PSEUDO-DATA: Cognitive Ability Summa... |
| LogIncome42 | PSEUDO-DATA: LogIncome42 |
| EconAct42R | PSEUDO-DATA: EconAct42R |

Properties

▼ Variables

| Name |
|-------------|
| Label |
| Type |
| Format |
| Value label |
| Notes |

Results

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Notes:

1. Unicode is supported; see [help unicode_advice](#).
2. Maximum number of variables is set to 5000; see [help set_maxvar](#).
3. New update available; type `-update all-`

. use "/Users/martina/Documents/work/UCL research associate/Presentations:Lectures/Missing Data Semin> ar 2021/Imputed_50.dta"

.

Command

mi estimate, dots: regress log_total_income_55 i.ParStat42R i.n622 i.LBW i.maw5 i.MotherNeverReads7 i.SocialClassHusband i.DiffucultiesFinancial CogAbil7 LogIncome42 i.EconAct42R

Stata/SE 15.0 — Imputed_50.dta

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Review Results

^ Command _rc

```
1 use "/Users/martina/Documents/work/UCL research as...
2 mi estimate, dots: regress log_total_income_55 i.ParStat...
```

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Notes:

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2. Maximum number of variables is set to 5000; see [help set_maxvar](#).
3. New update available; type [-update all-](#)

```
. use "/Users/martina/Documents/work/UCL research associate/Presentations:Lectures/Missing Data Semin> ar 2021/Imputed_50.dta"

. mi estimate, dots: regress log_total_income_55 i.ParStat42R i.n622 i.LBW i.maw5 i.MotherNeverReads7> i.SocialClassHusband i.DiffucultiesFinancial CogAbil7 LogIncome42 i.EconAct42R
```

Imputations (50):
.....10.....20.....30.....40.....

Properties

▼ Variables

| Name | Label |
|-----------------------|---|
| id | PSEUDO-DATA: ID number |
| log_total_income_55 | PSEUDO-DATA: log_total_income_55 |
| ParStat42R | PSEUDO-DATA: ParStat42R |
| n622 | PSEUDO-DATA: 0-3D Sex of child |
| LBW | PSEUDO-DATA: LBW |
| maw5 | PSEUDO-DATA: Mother worked birth to |
| MotherNeverReads7 | PSEUDO-DATA: Mother Reads to Child |
| SocialClassHusband | PSEUDO-DATA: SocialClassHusband |
| DiffucultiesFinancial | PSEUDO-DATA: DiffucultiesFinancial |
| CogAbil7 | PSEUDO-DATA: Cognitive Ability Summa... |
| LogIncome42 | PSEUDO-DATA: LogIncome42 |
| EconAct42R | PSEUDO-DATA: EconAct42R |

Command

Stata/SE 15.0 — Imputed_50.dta

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Review

^ Command rc
 1 use "/Users/martina/Documents/work/UCL research as...
 2 mi estimate, dots: regress log_total_income_55 i.ParStat...

Results

Multiple-imputation estimates
 Linear regression
 DF adjustment: Small sample
 Model F test: Equal FMI
 Within VCE type: OLS

| Imputations | = | 50 |
|----------------|---|--------|
| Number of obs | = | 15,613 |
| Average RVI | = | 2.1866 |
| Largest FMI | = | 0.8037 |
| Complete DF | = | 15596 |
| DF: min | = | 75.00 |
| avg | = | 107.78 |
| max | = | 161.61 |
| F(16, 1478.4) | = | 45.71 |
| Prob > F | = | 0.0000 |

Variables

| Name | Label | log_total_income_55 | Coef. | Std. Err. | t | P> t | [95% Conf. Interval] |
|-----------------------|---|----------------------------|-----------|-----------|-------|-------|----------------------|
| id | PSEUDO-DATA: ID number | | | | | | |
| log_total_income_55 | PSEUDO-DATA: log_total_income_55 | | | | | | |
| ParStat42R | PSEUDO-DATA: ParStat42R | ParStat42R | -.1352915 | .045742 | -2.96 | 0.004 | -.2259017 -.0446812 |
| n622 | PSEUDO-DATA: 0-3D Sex of child | Separated/Divorced/Widowed | -.388491 | .06193 | -6.27 | 0.000 | -.5114941 -.2654878 |
| LBW | PSEUDO-DATA: LBW | Single/NeverMarried | | | | | |
| maw5 | PSEUDO-DATA: Mother worked birth to 5 | n622 | | | | | |
| MotherNeverReads7 | PSEUDO-DATA: Mother Reads to Child | Female | .0157283 | .0335821 | 0.47 | 0.640 | -.0508084 .082265 |
| SocialClassHusband | PSEUDO-DATA: SocialClassHusband | LBW | | | | | |
| DiffucultiesFinancial | PSEUDO-DATA: DiffucultiesFinancial | Low | -.034047 | .0515163 | -0.66 | 0.510 | -.1361495 .0680555 |
| CogAbil7 | PSEUDO-DATA: Cognitive Ability Summa... | maw5 | | | | | |
| LogIncome42 | PSEUDO-DATA: LogIncome42 | Yes | .0053023 | .0329244 | 0.16 | 0.872 | -.0599509 .0705556 |
| EconAct42R | PSEUDO-DATA: EconAct42R | MotherNeverReads7 | | | | | |
| | | Hardly ever | -.06596 | .0369219 | -1.79 | 0.077 | -.1390572 .0071372 |

Properties

▼ Variables

| Name | Label | Type | Format | Value label |
|------|-------|------|--------|-------------|
|------|-------|------|--------|-------------|

Command

| Source | SS | df | MS | Number of obs | = | 3,754 | |
|----------------------------|---|---------------------|------------|---------------|-----------|----------------------|----------------------|
| | | | | F(16, 3737) | = | 21.57 | |
| Model | 408.007729 | 16 | 25.5004831 | Prob > F | = | 0.0000 | |
| Residual | 4418.45073 | 3,737 | 1.18235235 | R-squared | = | 0.0845 | |
| | | | | Adj R-squared | = | 0.0806 | |
| Total | 4826.45846 | 3,753 | 1.28602677 | Root MSE | = | 1.0874 | |
| <hr/> | | | | | | | |
| log_total_income_55 | | Coef. | Std. Err. | t | P> t | [95% Conf. Interval] | |
| ParStat42R | | 0 (base) | | | | | |
| Married/Cohabiting | | | | | | | |
| Seperated/Divorced/Widowed | -.1004092 | .0585358 | -1.72 | 0.086 | -.2151744 | .014356 | |
| Single/NeverMarried | -.3699864 | .0688743 | -5.37 | 0.000 | -.5050212 | -.2349516 | |
| <hr/> | | | | | | | |
| Name | Label | log_total_income_55 | Coef. | Std. Err. | t | P> t | [95% Conf. Interval] |
| id | PSEUDO-DATA: ID number | | | | | | |
| log_total_income_55 | PSEUDO-DATA: log_total_income_55 | | | | | | |
| ParStat42R | PSEUDO-DATA: ParStat42R | | | | | | |
| n622 | PSEUDO-DATA: 0-3D Sex of child | | | | | | |
| LBW | PSEUDO-DATA: LBW | | | | | | |
| maw5 | PSEUDO-DATA: Mother worked birth to 5 | | | | | | |
| MotherNeverReads7 | PSEUDO-DATA: Mother Reads to Child | | | | | | |
| SocialClassHusband | PSEUDO-DATA: SocialClassHusband | | | | | | |
| DiffucultiesFinancial | PSEUDO-DATA: DiffucultiesFinancial | | | | | | |
| CogAbil7 | PSEUDO-DATA: Cognitive Ability Summa... | | | | | | |
| LogIncome42 | PSEUDO-DATA: LogIncome42 | | | | | | |
| EconAct42R | PSEUDO-DATA: EconAct42R | | | | | | |
| <hr/> | | | | | | | |
| Properties | | | | | | | |
| ▼ Variables | | | | | | | |
| Name | | | | | | | |
| Label | | | | | | | |
| Type | | | | | | | |
| Format | | | | | | | |
| Value label | | | | | | | |
| Command | | | | | | | |

Imputations = 50
 Number of obs = 15,613
 Average RVI = 2.1866
 Largest FMI = 0.8037
 Complete DF = 15596
 DF: min = 75.00
 avg = 107.78
 max = 161.61
 F(16, 1478.4) = 45.71
 Prob > F = 0.0000

THANK YOU FOR
YOUR ATTENTION

CENTRE FOR
LONGITUDINAL
STUDIES

m.narayanan@ucl.ac.uk