

Mental Health Data Analysis

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1 Read data

```
## [1] 2486    5
```

```
##      father      health      y      parent_report
##  Min.   :0.0000  Min.   :0.0000  Min.   :-1.0000  Min.   :0.0000
## 1st Qu.:1.0000  1st Qu.:0.0000  1st Qu.: -1.0000  1st Qu.:0.0000
## Median :1.0000  Median :0.0000  Median :  0.0000  Median :0.0000
## Mean   :0.7932  Mean   :0.4686  Mean   :-0.3218  Mean   :0.1858
## 3rd Qu.:1.0000  3rd Qu.:1.0000  3rd Qu.:  0.0000  3rd Qu.:0.0000
## Max.   :1.0000  Max.   :1.0000  Max.    : 1.0000  Max.   :1.0000
##      r
##  Min.   :0.0000
## 1st Qu.:0.0000
## Median :1.0000
## Mean   :0.5732
## 3rd Qu.:1.0000
## Max.   :1.0000
```

```
##      father      health      y parent_report      r
##      2486      2486      2486      2486      2486
```

```
##      father      health      y parent_report      r
##      0      0      0      0      0
```

2 Data description:

3 Some primary analysis:

```
##
## Call:
## glm(formula = y ~ I(-father) + health + parent_report, family = "binomial",
##      data = dat, subset = r == 1)
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -1.1338  -0.5205  -0.5205  -0.5081   2.0549
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
```

```

## (Intercept)   -1.56544    0.17213   -9.095   <2e-16 ***
## I(-father)    0.36524    0.16903    2.161   0.0307 *
## health        -0.05161    0.14801   -0.349   0.7273
## parent_report 1.46206    0.15827    9.238   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##    Null deviance: 1357.0  on 1424  degrees of freedom
## Residual deviance: 1259.9  on 1421  degrees of freedom
## AIC: 1267.9
##
## Number of Fisher Scoring iterations: 4

##
## Call:
## glm(formula = r ~ health + father, family = "binomial", data = dat)
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -1.3736  -1.2909   0.9932   1.0680   1.1774
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept) -3.414e-05  9.729e-02   0.000  0.99972
## health       1.874e-01  8.159e-02   2.297  0.02163 *
## father       2.628e-01  9.962e-02   2.638  0.00834 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##    Null deviance: 3392.8  on 2485  degrees of freedom
## Residual deviance: 3381.0  on 2483  degrees of freedom
## AIC: 3387
##
## Number of Fisher Scoring iterations: 4

```

4 Analysis with our proposed methods

4.1 Results of Ibrahim (2001) and ZhaoMa (2022)

4.1.1 ZhaoMa (2022)

```

## [1] 0.1718119

##           [,1]      [,2]      [,3]
## [1,] 0.1204766 0.2543089 0.4016547

##           [,1]      [,2]      [,3]
## [1,] 0.1854391 0.1956498 0.9359307

```

health = 1	health = 0	odds ratio
0.1204766	0.2543089	0.4016547

4.1.1.1 Mean estimate

4.1.1.2 The odds ratio of Health = 1 vs Health = 0

4.1.1.3 The odds ratio of Father = 1 vs Father = 0

4.2 Overall data

4.2.1 Code

```
## [1] 1 1
## [1] 1 2
## [1] 1 3
## [1] 2 1
## [1] 2 2
## [1] 2 3
## [1] 3 1
```

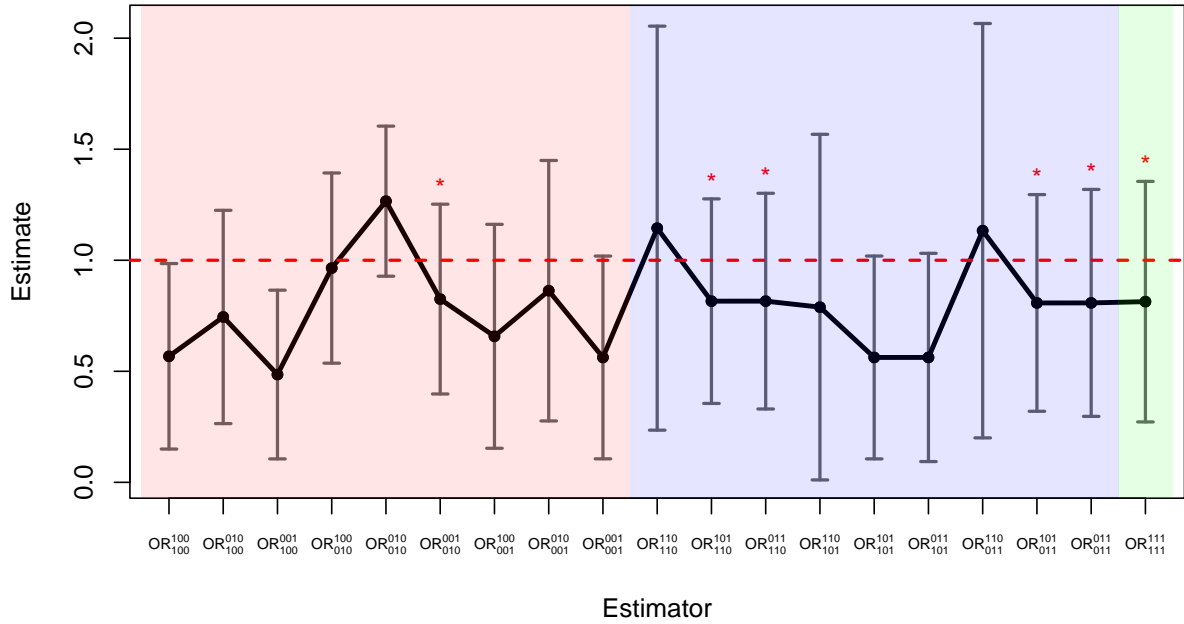
4.2.2 Results

```
## [1] 1 1
## [1] 1 2
## [1] 1 3
## [1] 2 1
## [1] 2 2
## [1] 2 3
## [1] 3 1
```

Table 1:

	PE	SE	Bootstrap SE	Bootstrap CI of SE	95% CI
OR_{100}^{100}	0.5675	0.2131	0.3159	[0.165, 0.6039]	[0.1499, 0.9851]
OR_{100}^{010}	0.7447	0.2450	0.3092	[0.1582, 0.5968]	[0.2646, 1.2249]
OR_{100}^{001}	0.4854	0.1938	0.2711	[0.1599, 0.5642]	[0.1055, 0.8652]
OR_{010}^{100}	0.9647	0.2185	0.1880	[0.1286, 0.2492]	[0.5365, 1.393]
OR_{010}^{010}	1.2660	0.1724	0.1387	[0.1036, 0.1745]	[0.928, 1.6039]
OR_{010}^{001}	0.8251	0.2180	0.1571	[0.1328, 0.2526]	[0.3978, 1.2523]
OR_{001}^{100}	0.6575	0.2572	0.3488	[0.1948, 0.7049]	[0.1534, 1.1616]
OR_{001}^{010}	0.8628	0.2992	0.3354	[0.1974, 0.7775]	[0.2763, 1.4493]
OR_{001}^{001}	0.5623	0.2329	0.3169	[0.1862, 0.6852]	[0.1058, 1.0187]
OR_{110}^{100}	1.1445	0.4641	0.1862	[0.1085, 0.6092]	[0.2347, 2.0542]
OR_{110}^{010}	0.8158	0.2350	0.1588	[0.1347, 0.3992]	[0.3552, 1.2763]
OR_{110}^{011}	0.8159	0.2478	0.1674	[0.1128, 0.5665]	[0.3303, 1.3015]
OR_{101}^{100}	0.7889	0.3970	0.3400	[0.2072, 0.9918]	[0.0108, 1.5669]
OR_{101}^{010}	0.5623	0.2330	0.2947	[0.1879, 0.6718]	[0.1056, 1.019]
OR_{101}^{011}	0.5624	0.2392	0.2963	[0.1828, 0.6991]	[0.0935, 1.0313]
OR_{011}^{100}	1.1331	0.4760	0.3327	[0.1476, 3.0819]	[0.2002, 2.066]
OR_{011}^{010}	0.8077	0.2489	0.2926	[0.1573, 2.8331]	[0.3199, 1.2954]
OR_{011}^{011}	0.8079	0.2607	0.2912	[0.1346, 2.9213]	[0.2968, 1.3189]
OR_{111}^{111}	0.8135	0.2763	0.2643	[0.1366, 43.384]	[0.2719, 1.355]
OR_{CC}	1.2938	0.1778	0.1423		[0.9452, 1.6423]

PE with 95% Large sample CI



4.3 Conditional on health = 1

4.3.1 Summary statistics

##	father	health	parent_report	r
##	Min. :0.0000	Min. :1	Min. :0.0000	Min. :0.0000
##	1st Qu.:1.0000	1st Qu.:1	1st Qu.:0.0000	1st Qu.:0.0000
##	Median :1.0000	Median :1	Median :0.0000	Median :1.0000
##	Mean :0.7794	Mean :1	Mean :0.2567	Mean :0.5966
##	3rd Qu.:1.0000	3rd Qu.:1	3rd Qu.:1.0000	3rd Qu.:1.0000
##	Max. :1.0000	Max. :1	Max. :1.0000	Max. :1.0000

4.3.2 Code

```
y = dat$y
r = dat$r
dat$fh = dat$father*dat$health
dat$fp = dat$father*dat$parent_report
dat$hp = dat$health*dat$parent_report

outcome.formula.list = list("y~father+parent_report+father:parent_report")
propensity.list = list(list(w = function(theta, y, x, L) 1+exp(cbind(rep(1, L), x)%*%theta),
                           w.prime = function(theta, y, x, L) exp(cbind(rep(1, L), x)%*%theta),
                           model.y = function(y) NULL,
                           model.x1.names = c("father"),
                           model.x2.names = NULL))
```

4.4 Conditional on health = 0

4.4.1 Summary statistics

##	father	health	parent_report	r
##	Min. :0.0000	Min. :0	Min. :0.0000	Min. :0.0000
##	1st Qu.:1.0000	1st Qu.:0	1st Qu.:0.0000	1st Qu.:0.0000
##	Median :1.0000	Median :0	Median :0.0000	Median :1.0000
##	Mean :0.8055	Mean :0	Mean :0.1234	Mean :0.5526
##	3rd Qu.:1.0000	3rd Qu.:0	3rd Qu.:0.0000	3rd Qu.:1.0000
##	Max. :1.0000	Max. :0	Max. :1.0000	Max. :1.0000

4.4.2 Code

4.4.3 Result

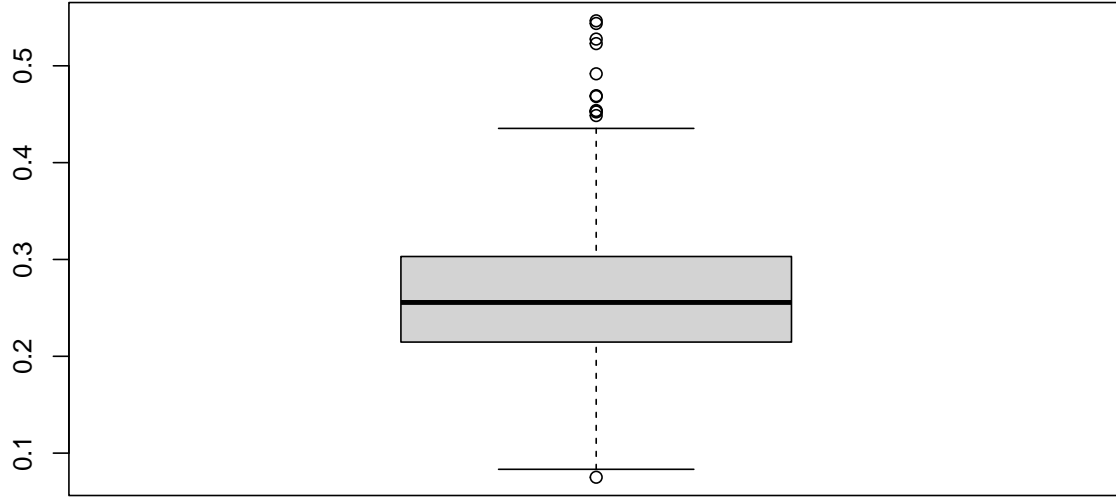


Table 2:

	PE	SE	Bootstrap.SE	95% CI
$\hat{\mu}_{\text{MNAR}}$	0.1704	0.0294	0.074	[0.1127, 0.2281]
$\hat{\mu}_{\text{MAR}}$	0.1684	0.0139	0.0127	[0.1412, 0.1955]
$\hat{\mu}_{\text{CC}}$	0.1644	0.0137	0.0138	[0.1375, 0.1913]

4.5 Conditional on father = 1

4.5.1 Code

4.6 Conditional on father = 0

4.6.1 Code

4.7 Results

```
##      mu.IPW      se.IPW se.IPW.true
## 0.16339899 0.02785284          NA
```

```
## [1] "=====
##      mu.IPW      se.IPW se.IPW.true
## 0.19836253 0.01472084      NA

## [1] "=====
##      mu.IPW      se.IPW se.IPW.true
## 0.14312697 0.03004503      NA

## [1] "=====
##      mu.IPW      se.IPW se.IPW.true
## 0.19836242 0.01472062      NA

## [1] "=====
##      mu.IPW      se.IPW se.IPW.true
## 0.14312767 0.03008741      NA

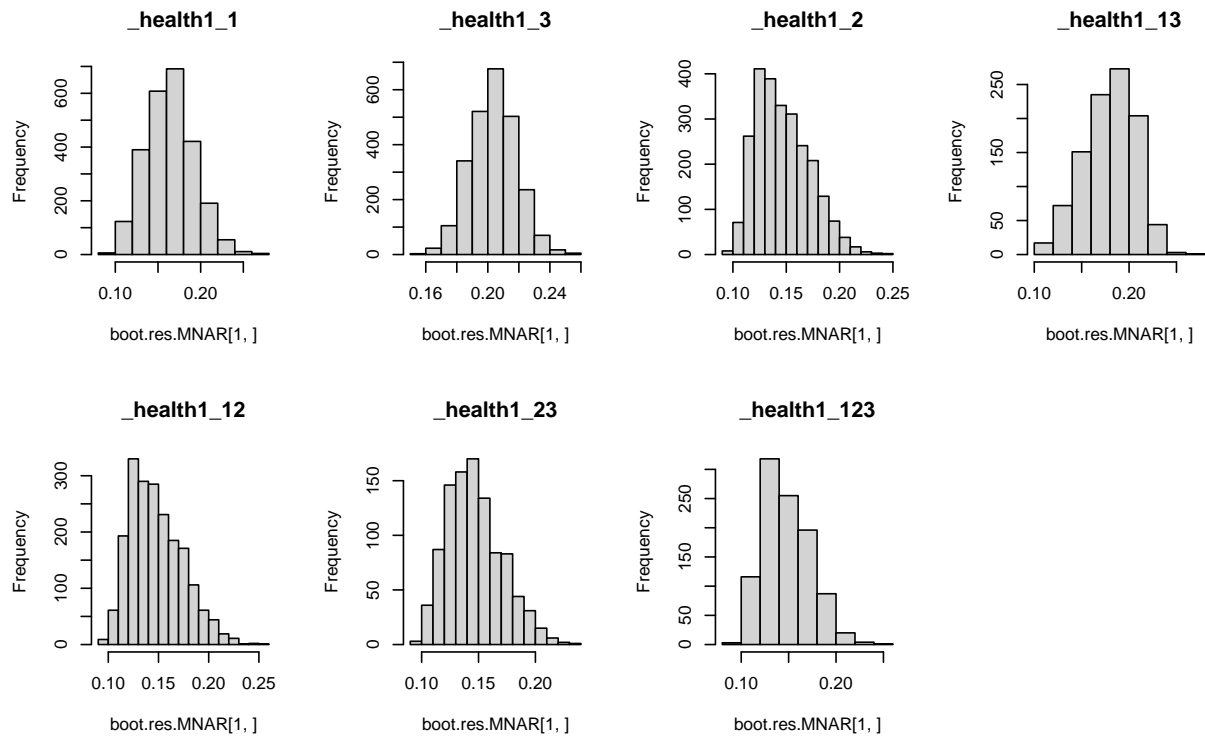
## [1] "=====
##      mu.IPW      se.IPW se.IPW.true
## 0.14319147 0.03683441      NA

## [1] "=====
##      mu.IPW      se.IPW se.IPW.true
## 0.1641154  1.3296107      NA

## [1] "=====
```

Table 3:

	PE	SE	Bootstrap.SE	95% CI
$\hat{\mu}_{100}$	0.1634	0.0279	0.0281	[0.1088, 0.218]
$\hat{\mu}_{010}$	0.1984	0.0147	0.0148	[0.1695, 0.2272]
$\hat{\mu}_{001}$	0.1431	0.0300	0.0249	[0.0842, 0.202]
$\hat{\mu}_{110}$	0.1984	0.0147	0.0273	[0.1695, 0.2272]
$\hat{\mu}_{101}$	0.1431	0.0301	0.0261	[0.0842, 0.2021]
$\hat{\mu}_{011}$	0.1432	0.0368	0.0240	[0.071, 0.2154]
$\hat{\mu}_{111}$	0.1641	1.3296	0.0244	[-2.4419, 2.7701]
$\hat{\mu}_{CC}$	0.2565	0.0267	0.0153	[0.2042, 0.3088]



PE with 95% Large sample CI

