# Det_adol_fertility

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## Contents



##Loading Data

```
bdhs <- read_sav("adolescent fertility new.SAV")
bdhs
```

```
## # A tibble: 2,449 x 17
##    V013      V024       V025    V106    V130    V151    V701    WomenEmpowerment
##    <dbl+lbl> <dbl+lbl>  <dbl+l> <dbl+l> <dbl+l> <dbl+l> <dbl+l> <dbl+lbl>
##  1 1 [15-19] 1 [Barish~ 1 [Urb~ 2 [Sec~ 1 [Mus~ 1 [Mal~ 2 [Sec~ 1 [No]
##  2 1 [15-19] 1 [Barish~ 1 [Urb~ 2 [Sec~ 1 [Mus~ 1 [Mal~ 2 [Sec~ 1 [No]
##  3 1 [15-19] 1 [Barish~ 1 [Urb~ 1 [Pri~ 1 [Mus~ 2 [Fem~ 2 [Sec~ 1 [No]
##  4 1 [15-19] 1 [Barish~ 1 [Urb~ 2 [Sec~ 1 [Mus~ 1 [Mal~ 2 [Sec~ 1 [No]
##  5 1 [15-19] 1 [Barish~ 1 [Urb~ 1 [Pri~ 1 [Mus~ 1 [Mal~ 0 [No ~ 0 [Empowered]
##  6 1 [15-19] 1 [Barish~ 1 [Urb~ 0 [No ~ 1 [Mus~ 2 [Fem~ 1 [Pri~ 0 [Empowered]
##  7 1 [15-19] 1 [Barish~ 1 [Urb~ 2 [Sec~ 1 [Mus~ 1 [Mal~ 2 [Sec~ 1 [No]
##  8 1 [15-19] 1 [Barish~ 1 [Urb~ 2 [Sec~ 1 [Mus~ 1 [Mal~ 0 [No ~ 0 [Empowered]
##  9 1 [15-19] 1 [Barish~ 1 [Urb~ 2 [Sec~ 1 [Mus~ 1 [Mal~ 2 [Sec~ 1 [No]
## 10 1 [15-19] 1 [Barish~ 1 [Urb~ 2 [Sec~ 1 [Mus~ 1 [Mal~ 1 [Pri~ 1 [No]
## # i 2,439 more rows
## # i 9 more variables: V012 <dbl+lbl>, V190 <dbl+lbl>, V312New <dbl+lbl>,
## #   Age_Gap <dbl+lbl>, V201 <dbl>, CEB <dbl+lbl>, `filter_$` <dbl+lbl>,
## #   V001 <dbl>, V005 <dbl>
```

```
names(bdhs)
```

```
##  [1] "V013"             "V024"             "V025"             "V106"
##  [5] "V130"             "V151"             "V701"             "WomenEmpowerment"
```

```
##  [9] "V012"              "V190"              "V312New"           "Age_Gap"
## [13] "V201"              "CEB"               "filter_$"          "V001"
## [17] "V005"
```

```
bdhs <- bdhs %>%
  rename(
    cluster_id = V001,
    current_age = V012,
    sampling_weight = V005,
    wealth_index= V190,
    respondent_education = V106,
    partner_education = V701,
    division = V024,
    contraceptive_status= V312New)
names(bdhs)
```

```
##  [1] "V013"                 "division"             "V025"
##  [4] "respondent_education" "V130"                 "V151"
##  [7] "partner_education"    "WomenEmpowerment"     "current_age"
## [10] "wealth_index"         "contraceptive_status" "Age_Gap"
## [13] "V201"                 "CEB"                  "filter_$"
## [16] "cluster_id"           "sampling_weight"
```

```
bdhs$CEB
```

```
## <labelled<double>[2449]>: Children ever born (groups)
##    [1] 1 0 0 1 1 1 1 1 1 1 0 0 1 0 1 0 1 1 1 1 0 1 0 0 0 0 1 1 0 0 0 0 0 1 1 0 0
##   [38] 1 0 1 0 1 0 0 0 1 0 1 0 0 1 1 0 0 0 0 0 1 0 0 0 1 1 0 0 0 1 0 0 0 0 0 0 1
##   [75] 0 0 0 1 0 0 0 1 0 0 0 1 0 0 1 1 1 1 1 0 0 1 0 1 0 0 0 0 0 1 0 0 1 0 1 0 1
##  [112] 1 0 0 1 1 0 0 1 0 1 1 0 0 1 0 0 1 1 0 1 0 0 1 1 1 1 0 0 0 0 0 0 0 1 1 0 1
##  [149] 0 1 1 1 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 1 1 1 0 1 1 0 0 0 0 1 0 0 1 1 1
##  [186] 0 0 1 0 1 0 0 1 0 1 1 0 0 0 1 0 1 0 1 1 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 1
##  [223] 0 0 1 0 0 0 1 1 1 1 0 1 1 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 1
##  [260] 0 0 0 1 1 0 0 0 1 0 0 0 0 0 0 0 1 1 1 0 0 0 0 0 0 0 1 1 1 0 0 0 1 0 1 1 1
##  [297] 1 0 1 1 1 1 0 1 1 1 1 0 0 0 1 1 0 0 1 0 0 1 1 1 0 0 0 0 0 1 1 1 0 1 0 1 1
##  [334] 1 1 1 1 1 1 1 0 0 0 1 1 0 0 1 1 1 1 1 0 1 0 0 0 1 0 0 0 0 1 1 0 0 0 1 0 1
##  [371] 0 0 0 1 0 1 0 0 0 1 1 1 1 1 0 0 1 1 1 1 1 0 0 1 1 1 0 0 0 1 0 1 0 1 0 0 1
##  [408] 1 1 1 0 0 1 0 1 0 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 1 1 0 0 0 1 0 1 0 0 1
##  [445] 1 0 0 1 1 0 0 1 1 1 0 0 1 1 0 1 0 1 0 1 1 0 0 1 0 1 1 1 1 0 0 0 1 0 1 1 1
##  [482] 1 0 0 0 0 1 1 0 0 0 0 0 0 1 0 1 1 0 1 0 1 0 1 0 0 1 0 0 0 0 1 0 0 1 0 0 1
##  [519] 1 1 1 1 1 1 0 0 0 1 0 1 1 1 0 1 0 0 0 0 0 0 1 0 1 0 1 0 1 1 0 0 1 1 1 0 1
##  [556] 0 1 1 1 1 1 0 0 1 0 1 0 1 0 0 1 0 1 0 1 1 1 1 0 1 1 0 1 0 1 1 0 0 0 0 0 1
##  [593] 0 0 1 0 1 1 1 0 0 0 1 0 0 1 1 1 0 1 1 0 0 0 0 0 1 0 0 0 0 1 1 0 1 0 0 0 1
##  [630] 1 0 1 1 1 0 1 0 1 1 0 1 1 1 1 0 0 0 1 0 0 0 0 1 0 1 1 1 0 0 0 1 0 0 1 0 0
##  [667] 0 0 1 0 1 0 1 1 0 1 1 1 1 0 0 1 1 1 0 1 0 1 1 0 1 0 1 1 0 1 1 1 0 1 1 0 1
##  [704] 0 0 0 0 0 0 0 0 0 1 0 1 1 0 1 0 1 1 1 0 1 1 0 0 0 0 0 1 0 0 1 1 1 0 0 0 1
##  [741] 1 0 1 1 1 1 0 0 0 1 1 0 1 0 0 1 0 0 1 1 0 0 0 1 0 1 1 1 1 0 1 0 1 0 0 1 1
##  [778] 1 0 0 1 1 0 0 0 1 0 0 1 0 0 0 0 1 0 1 1 1 0 1 0 1 1 1 0 0 0 1 0 0 0 0 0 1
##  [815] 0 0 0 1 0 0 0 0 0 0 0 1 1 0 0 0 0 1 1 1 1 1 0 0 0 1 0 1 0 0 0 0 1 0 0 1 1
##  [852] 0 1 0 1 1 0 1 0 0 1 0 1 1 1 0 0 0 0 1 1 0 1 1 1 0 1 0 0 1 0 1 1 1 1 0 0 0
##  [889] 0 0 0 1 1 1 1 0 1 1 0 1 1 0 1 1 1 1 1 0 1 0 0 1 1 0 1 0 1 1 1 0 0 0 1 1 1
##  [926] 1 1 0 1 0 1 0 1 1 0 0 1 0 1 0 1 1 0 0 0 1 0 0 0 0 1 1 1 1 1 1 0 0 1 0 0 0
##  [963] 0 0 0 1 0 0 1 0 1 1 1 0 0 1 0 1 1 1 0 1 0 0 1 1 0 0 1 0 0 1 1 0 1 1 0 0 0
```

```
## [1000] 0 1 1 0 1 1 1 1 0 0 0 1 0 0 1 1 1 0 1 1 0 1 1 0 1 0 1 1 0 1 1 1 1 0 0 1 1
## [1037] 1 0 0 1 0 0 0 1 1 0 1 1 1 0 0 0 0 0 1 0 1 1 1 1 0 0 1 1 1 0 1 1 0 0 1 1 0
## [1074] 1 0 0 0 1 0 1 0 0 0 0 0 1 0 0 1 1 1 1 1 1 0 0 0 0 1 0 0 0 0 1 1 0 1 1 0 0
## [1111] 1 1 0 1 0 1 1 0 0 1 0 0 0 0 1 0 0 1 1 0 0 0 0 0 1 1 1 0 0 1 1 0 0 0 1 1 0
## [1148] 0 1 0 1 1 1 0 0 1 0 1 0 1 1 0 0 1 1 1 0 1 0 1 0 0 0 0 1 0 0 1 0 1 0 0 0 0
## [1185] 0 1 0 1 1 0 0 1 0 1 1 0 0 1 1 1 1 0 0 1 0 0 1 1 0 1 1 0 0 0 1 0 1 1 1 1 0
## [1222] 0 0 1 0 1 0 1 0 0 1 1 1 1 0 1 1 0 1 0 0 1 0 0 0 1 1 0 1 1 1 0 1 0 1 1 1 0
## [1259] 1 0 0 1 1 0 0 1 0 0 1 1 0 0 1 1 0 0 1 0 0 1 1 1 0 1 1 1 0 0 1 0 0 1 0 0 1
## [1296] 0 1 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 1 1 1 1 0 0 1 0 0 1 1 1 0 1 0 0 1 1 0 0
## [1333] 0 0 1 0 0 0 0 1 0 0 0 0 0 1 0 0 1 0 1 0 1 0 1 0 1 0 1 0 0 0 1 1 0 0 0 0 0
## [1370] 0 1 0 1 0 1 1 1 1 1 0 1 0 0 0 1 0 0 0 0 0 0 1 1 1 1 0 1 0 1 0 0 0 1 0 1 1
## [1407] 0 1 1 0 1 0 0 0 0 0 1 0 0 1 1 0 1 0 1 0 0 1 0 0 1 0 0 0 1 0 1 1 0 0 0 0 0
## [1444] 1 1 0 1 1 1 0 1 0 0 0 0 0 0 0 1 0 0 1 1 1 0 0 0 1 1 1 0 0 1 0 0 0 0 0 0 1
## [1481] 1 0 0 0 1 0 0 0 1 1 1 0 1 0 0 1 0 0 1 1 1 1 0 0 0 0 0 0 0 1 0 0 1 1 0 1 1
## [1518] 1 1 1 0 0 0 1 0 1 0 0 0 0 0 0 1 1 1 0 1 0 0 0 1 0 0 0 1 1 0 0 0 1 0 0 1 0
## [1555] 1 0 0 0 0 0 0 0 1 1 0 1 0 0 0 0 1 1 0 1 0 1 1 0 0 0 1 0 0 1 1 1 1 0 1 0 0
## [1592] 0 1 1 0 1 0 1 1 1 0 1 0 0 0 1 0 1 0 0 1 0 0 0 0 0 0 0 0 1 1 0 1 0 0 1 0 1
## [1629] 0 1 1 1 0 1 0 0 1 1 0 1 1 1 0 0 0 1 0 1 0 0 1 0 1 1 0 1 1 1 0 1 0 0 0 0 0
## [1666] 0 0 1 1 1 0 1 0 1 1 1 0 1 0 1 0 0 0 1 1 0 0 0 0 0 1 0 1 1 0 0 0 1 0 0 1 0
## [1703] 1 0 1 0 0 0 0 1 1 0 0 0 0 0 1 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 1 0 0
## [1740] 0 0 0 0 0 0 0 0 0 1 0 1 0 1 0 0 1 1 1 1 1 0 0 0 1 0 0 0 1 0 1 1 1 0 0 1 0
## [1777] 1 0 0 1 1 0 0 0 1 0 1 1 0 0 1 1 0 1 0 0 1 0 0 1 1 0 0 1 0 0 1 1 1 1 0 1 0
## [1814] 1 0 0 1 1 1 1 1 0 0 0 0 0 1 1 1 1 0 1 0 0 1 1 0 0 1 0 1 0 0 0 1 1 1 0 0 0
## [1851] 1 0 1 1 1 1 1 1 0 0 1 0 0 1 0 1 0 0 0 0 0 0 0 1 1 0 0 1 1 0 0 0 0 1 0 0 0
## [1888] 1 1 1 0 0 0 0 0 0 1 1 1 1 1 0 1 0 0 1 1 1 1 0 0 0 0 1 1 0 1 0 0 0 0 1 1 0
## [1925] 1 1 0 1 1 0 0 1 1 1 1 1 0 1 1 0 0 1 0 0 1 0 1 1 0 0 1 1 1 0 0 1 1 1 0 0 0
## [1962] 0 1 0 1 0 1 1 0 0 0 1 0 0 1 1 0 0 0 0 1 1 1 1 0 0 0 1 0 0 0 1 1 0 1 1 1 1
## [1999] 0 0 1 0 1 1 1 1 1 0 1 0 0 0 1 0 0 1 0 1 0 1 0 0 0 1 1 1 1 0 0 0 0 0 1 1 1
## [2036] 1 0 1 1 1 0 0 0 1 1 0 1 1 1 1 0 0 0 1 0 0 1 0 0 1 0 1 0 0 0 0 0 1 0 0 0 1
## [2073] 0 1 1 1 0 1 0 1 1 0 0 1 1 0 1 0 0 0 1 1 1 1 1 0 0 1 0 1 1 1 0 1 0 1 0 0 0
## [2110] 0 0 1 0 1 0 1 1 1 1 0 1 1 0 1 0 1 0 0 0 1 0 0 1 1 0 0 1 0 1 0 0 1 0 1 1 0
## [2147] 0 1 1 0 0 0 0 1 1 1 0 1 1 0 0 0 1 0 0 1 0 0 0 1 0 1 1 1 0 1 0 0 0 0 0 1 1
## [2184] 1 1 0 1 0 1 1 0 0 0 1 1 1 1 0 1 0 1 0 1 1 1 1 0 0 0 0 1 1 0 0 1 1 1 1 1 0
## [2221] 0 1 1 0 0 1 0 0 1 0 1 1 1 0 1 1 1 1 1 0 0 1 1 1 0 1 0 0 1 1 0 1 1 1 1 1 1
## [2258] 1 1 1 0 0 1 0 0 1 1 0 0 0 1 0 0 1 0 0 1 1 0 0 0 0 1 1 0 1 0 1 1 1 1 1 0 1
## [2295] 0 0 1 0 0 1 0 1 0 0 0 0 0 1 0 0 1 0 0 1 0 1 1 0 0 1 0 1 1 1 1 0 1 0 0 0 1
## [2332] 0 0 0 0 1 0 0 1 0 1 0 0 0 1 1 0 0 0 0 0 0 1 1 0 0 1 0 0 0 0 0 0 1 0 1 1 1
## [2369] 0 1 0 1 0 1 0 1 1 0 1 0 0 0 0 0 0 1 1 1 0 0 0 1 1 0 0 0 1 1 1 1 0 0 0 0 1
## [2406] 1 1 0 1 0 1 1 0 0 0 1 1 1 0 1 0 0 0 0 1 1 0 0 0 0 1 0 0 0 1 1 0 1 1 0 0 0
## [2443] 0 0 0 0 1 1 1
##
## Labels:
##  value        label
##      0  No Children
##      1 One or more
```

```r
bdhs <- bdhs %>%
  mutate(
    weight = sampling_weight / 1000000,
    cluster_id = as.factor(cluster_id),
    CEB_binary = ifelse(CEB > 0, 1, 0),  #  use numeric binary
    education = as_factor(respondent_education),
    partner_education = as_factor(partner_education),
    division = as_factor(division),
```

```r
    age_gap = as_factor(Age_Gap),
    wealth = as_factor(wealth_index),
    age = as.factor(current_age),
    age_group_5yr = as_factor(V013),
    WomenEmpowerment = as_factor(WomenEmpowerment),
    contraceptive_status = as_factor(contraceptive_status)
  )
```

# 1 2. Descriptive Analysis

```r
table(bdhs$education)
```

```
##
## No education      Primary    Secondary       Higher
##           40          339         1879          191
```

```r
table(bdhs$CEB_binary)
```

```
##
##    0    1
## 1340 1109
```

#Multilevel Logistic regression model

```r
model <- glmer(CEB_binary ~ education + partner_education + division +
                 age_gap + wealth + age + WomenEmpowerment + contraceptive_status +
                 (1 | cluster_id),
               data = bdhs,
               family = binomial(link = "logit"),
               weights = weight,
               control = glmerControl(optimizer = "bobyqa"))
```

```
## Warning in eval(family$initialize, rho): non-integer #successes in a binomial
## glm!
```

```
## boundary (singular) fit: see help('isSingular')
```

```r
summary(model)
```

```
## Warning in vcov.merMod(object, use.hessian = use.hessian): variance-covariance matrix computed from f
## not positive definite or contains NA values: falling back to var-cov estimated from RX
```

```
## Warning in vcov.merMod(object, correlation = correlation, sigm = sig): variance-covariance matrix con
## not positive definite or contains NA values: falling back to var-cov estimated from RX
```

```
## Generalized linear mixed model fit by maximum likelihood (Laplace
##   Approximation) [glmerMod]
##  Family: binomial  ( logit )
## Formula: CEB_binary ~ education + partner_education + division + age_gap +
##     wealth + age + WomenEmpowerment + contraceptive_status +
##     (1 | cluster_id)
##    Data: bdhs
## Weights: weight
## Control: glmerControl(optimizer = "bobyqa")
##
##      AIC       BIC    logLik -2*log(L)  df.resid
##    1182.5    1327.6    -566.2    1132.5      2424
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -2.1313 -0.5123 -0.1922  0.5232  4.4070
##
## Random effects:
##  Groups     Name        Variance Std.Dev.
##  cluster_id (Intercept) 0        0
## Number of obs: 2449, groups:  cluster_id, 54
##
## Fixed effects:
##                           Estimate Std. Error z value Pr(>|z|)
## (Intercept)                0.63095    0.84592   0.746 0.455740
## educationPrimary          -0.04806    0.58911  -0.082 0.934984
## educationSecondary        -0.51375    0.57268  -0.897 0.369663
## educationHigher           -1.53151    0.62691  -2.443 0.014567 *
## partner_educationPrimary  -0.22102    0.34073  -0.649 0.516551
## partner_educationSecondary -0.88989    0.32252  -2.759 0.005795 **
## partner_educationHigher   -1.07727    0.36086  -2.985 0.002833 **
## divisionChattogram         0.48937    0.46706   1.048 0.294746
## divisionDhaka              0.64560    0.42607   1.515 0.129709
## divisionKhulna             0.53188    0.41061   1.295 0.195201
## divisionMymensingh         0.03942    0.41160   0.096 0.923695
## divisionRajshahi           0.26405    0.40402   0.654 0.513386
## divisionRangpur            0.56312    0.40272   1.398 0.162028
## divisionSylhet            -0.11630    0.43295  -0.269 0.788224
## age_gap6-10               -0.85680    0.20282  -4.225 2.39e-05 ***
## age_gap<=5                -0.92041    0.22617  -4.070 4.71e-05 ***
## wealthMiddle              -0.23889    0.14125  -1.691 0.090781 .
## wealthRich                -0.77462    0.22197  -3.490 0.000484 ***
## age16                      1.06643    0.36913   2.889 0.003864 **
## age17                      1.61042    0.35417   4.547 5.44e-06 ***
## age18                      2.10797    0.34014   6.197 5.74e-10 ***
## age19                      2.76989    0.34336   8.067 7.21e-16 ***
## WomenEmpowermentNo        -0.57647    0.29489  -1.955 0.050600 .
## contraceptive_statusNo    -1.34015    0.15708  -8.532  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

##
## Correlation matrix not shown by default, as p = 24 > 12.
## Use print(x, correlation=TRUE)  or
```

```
##     vcov(x)        if you need it

## optimizer (bobyqa) convergence code: 0 (OK)
## boundary (singular) fit: see help('isSingular')
```

# 2 Odds Ratios and Confidence Intervals

```r
exp(coef(summary(model))[, "Estimate"])
```

```
## Warning in vcov.merMod(object, use.hessian = use.hessian): variance-covariance matrix computed from i
## not positive definite or contains NA values: falling back to var-cov estimated from RX

## Warning in vcov.merMod(object, correlation = correlation, sigm = sig): variance-covariance matrix co
## not positive definite or contains NA values: falling back to var-cov estimated from RX

##               (Intercept)          educationPrimary
##                 1.8794038                 0.9530793
##        educationSecondary           educationHigher
##                 0.5982479                 0.2162088
##   partner_educationPrimary partner_educationSecondary
##                 0.8017001                 0.4107000
##    partner_educationHigher        divisionChattogram
##                 0.3405226                 1.6312926
##             divisionDhaka            divisionKhulna
##                 1.9071258                 1.7021314
##        divisionMymensingh          divisionRajshahi
##                 1.0402108                 1.3021991
##           divisionRangpur            divisionSylhet
##                 1.7561488                 0.8902098
##               age_gap6-10                age_gap<=5
##                 0.4245183                 0.3983555
##              wealthMiddle                wealthRich
##                 0.7875005                 0.4608804
##                     age16                     age17
##                 2.9049866                 5.0048928
##                     age18                     age19
##                 8.2315001                15.9568856
##        WomenEmpowermentNo     contraceptive_statusNo
##                 0.5618808                 0.2618053
```

```r
exp(confint(model, method = "Wald"))
```

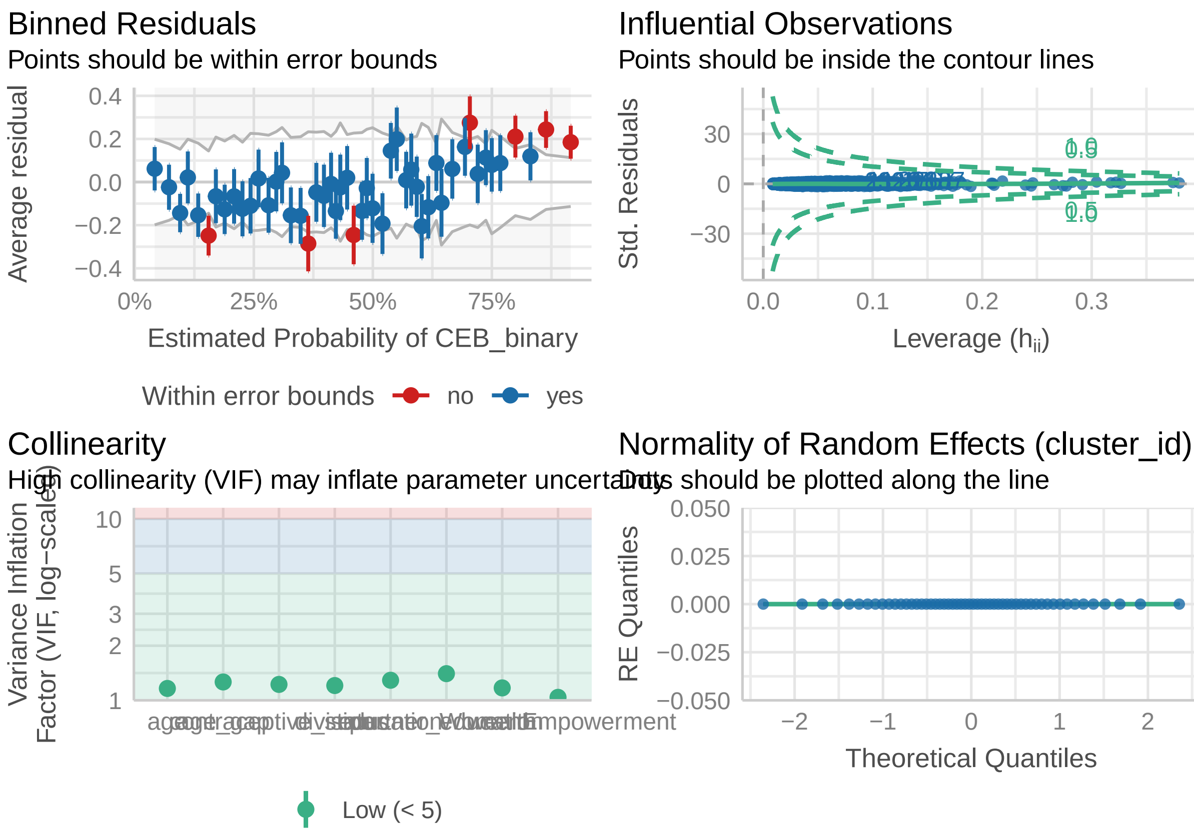
```
## Warning in vcov.merMod(object): variance-covariance matrix computed from finite-difference Hessian i
## not positive definite or contains NA values: falling back to var-cov estimated from RX

##                                  2.5 %     97.5 %
## .sig01                              NA         NA
## (Intercept)                 0.35807376  9.8643327
## educationPrimary            0.30038271  3.0240094
```

```
## educationSecondary         0.19472377  1.8379913
## educationHigher            0.06327752  0.7387497
## partner_educationPrimary   0.41113396  1.5632937
## partner_educationSecondary 0.21826944  0.7727812
## partner_educationHigher    0.16787336  0.6907327
## divisionChattogram         0.65308228  4.0747017
## divisionDhaka              0.82739192  4.3958959
## divisionKhulna             0.76116993  3.8063134
## divisionMymensingh         0.46426613  2.3306429
## divisionRajshahi           0.58990006  2.8745928
## divisionRangpur            0.79755698  3.8668817
## divisionSylhet             0.38103451  2.0797946
## age_gap6-10                0.28527226  0.6317325
## age_gap<=5                 0.25571331  0.6205666
## wealthMiddle               0.59706331  1.0386788
## wealthRich                 0.29829434  0.7120845
## age16                      1.40910474  5.9888713
## age17                      2.49993392 10.0198456
## age18                      4.22617474 16.0328427
## age19                      8.14097957 31.2766044
## WomenEmpowermentNo         0.31523448  1.0015084
## contraceptive_statusNo     0.19243025  0.3561914
```

# 3 Model Diagnostics

```
check_model(model)
```

```
## Cannot simulate residuals for models of class `glmerMod`. Please try
##   `check_model(..., residual_type = "normal")` instead.
```




```r
model_performance(model)
```

```
## boundary (singular) fit: see help('isSingular')

## Random effect variances not available. Returned R2 does not account for random effects.

## boundary (singular) fit: see help('isSingular')

## # Indices of model performance
##
## AIC      |     AICc |      BIC | R2 (cond.) | R2 (marg.) |  RMSE | Sigma
## ------------------------------------------------------------------------
## 1182.468 | 1183.004 | 1327.553 |            |      0.292 | 0.446 | 1.000
##
## AIC      | Log_loss | Score_log | Score_spherical
## -----------------------------------------------
## 1182.468 |    0.583 |      -Inf |       4.100e-04
```

# 4 Fit standard logistic regression model (no random effects)

```r
model_simple <- glm(CEB_binary ~ education + partner_education + division +
                      age_gap + wealth + age + WomenEmpowerment + contraceptive_status,
                    data = bdhs,
                    family = binomial(link = "logit"),
                    weights = weight)
```

```
## Warning in eval(family$initialize): non-integer #successes in a binomial glm!
```

```r
summary(model_simple)
```

```
##
## Call:
## glm(formula = CEB_binary ~ education + partner_education + division +
##     age_gap + wealth + age + WomenEmpowerment + contraceptive_status,
##     family = binomial(link = "logit"), data = bdhs, weights = weight)
##
## Coefficients:
##                            Estimate Std. Error z value Pr(>|z|)
## (Intercept)                 0.77193    0.84404   0.915  0.36042
## educationPrimary           -0.25947    0.59572  -0.436  0.66316
## educationSecondary         -0.78439    0.57984  -1.353  0.17613
## educationHigher            -1.74634    0.63335  -2.757  0.00583 **
## partner_educationPrimary   -0.07776    0.33585  -0.232  0.81690
## partner_educationSecondary -0.73724    0.31715  -2.325  0.02009 *
## partner_educationHigher    -0.91856    0.35577  -2.582  0.00983 **
## divisionChattogram          0.60734    0.46634   1.302  0.19280
## divisionDhaka               0.61577    0.42578   1.446  0.14812
## divisionKhulna              0.62623    0.41063   1.525  0.12724
## divisionMymensingh          0.14652    0.41169   0.356  0.72192
## divisionRajshahi            0.37323    0.40415   0.924  0.35575
## divisionRangpur             0.68515    0.40303   1.700  0.08913 .
## divisionSylhet             -0.01292    0.43317  -0.030  0.97620
## age_gap6-10                -0.86901    0.20132  -4.317 1.58e-05 ***
## age_gap<=5                 -0.97615    0.22519  -4.335 1.46e-05 ***
## wealthMiddle               -0.24358    0.14070  -1.731  0.08342 .
## wealthRich                 -0.63624    0.21914  -2.903  0.00369 **
## age16                       0.91547    0.35682   2.566  0.01030 *
## age17                       1.39496    0.34141   4.086 4.39e-05 ***
## age18                       1.98862    0.32669   6.087 1.15e-09 ***
## age19                       2.55471    0.32934   7.757 8.68e-15 ***
## WomenEmpowermentNo         -0.54284    0.29358  -1.849  0.06446 .
## contraceptive_statusNo     -1.32795    0.15625  -8.499  < 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: 1741.9  on 2448  degrees of freedom
## Residual deviance: 1468.5  on 2425  degrees of freedom
## AIC: 1604.3
##
## Number of Fisher Scoring iterations: 4
```

```r
# Likelihood Ratio Test to compare models
anova(model_simple, model, test = "Chisq")
```

```
## Warning in eval(family$initialize): non-integer #successes in a binomial glm!
## Warning in eval(family$initialize): non-integer #successes in a binomial glm!
## Warning in eval(family$initialize): non-integer #successes in a binomial glm!
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## Warning in eval(family$initialize): non-integer #successes in a binomial glm!
## Warning in eval(family$initialize): non-integer #successes in a binomial glm!
```

```
## Analysis of Deviance Table
##
## Model: binomial, link: logit
##
## Response: CEB_binary
##
## Terms added sequentially (first to last)
##
##
##                       Df Deviance Resid. Df Resid. Dev  Pr(>Chi)
## NULL                                  2448     1741.9
## education              3   17.140      2445     1724.8 0.0006614 ***
## partner_education      3   16.454      2442     1708.3 0.0009150 ***
## division               7   12.011      2435     1696.3 0.1002043
## age_gap                2   10.941      2433     1685.3 0.0042097 **
## wealth                 2    7.318      2431     1678.0 0.0257531 *
## age                    4  128.926      2427     1549.1 < 2.2e-16 ***
## WomenEmpowerment       1    0.980      2426     1548.1 0.3221401
## contraceptive_status   1   79.576      2425     1468.5 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
# Compare model fit using AIC
AIC(model, model_simple)
```

```
##              df      AIC
## model        25 1182.468
## model_simple 24 1604.323
```

# 5 10. Publication-Ready Table

```r
tab_model(model, show.ci = TRUE, show.icc = TRUE, show.re.var = TRUE)
```

```
## boundary (singular) fit: see help('isSingular')
```

CEB_binary

Predictors

Odds Ratios

CI

p

(Intercept)

1.88

0.00 – Inf

0.456

Highest educationallevel: Primary

0.95

0.00 – Inf

0.935

Highest educationallevel: Secondary

0.60

0.00 – Inf

0.370

Highest educationallevel: Higher

0.22

0.00 – Inf

0.015

Husband/partner'seducation level: Primary

0.80

0.00 – Inf

0.517

Husband/partner'seducation level:Secondary

0.41

0.00 – Inf

0.006

Husband/partner'seducation level: Higher

0.34

0.00 – Inf

0.003

Division: Chattogram

1.63

0.00 – Inf

0.295

Division: Dhaka

1.91

0.00 – Inf

0.130

Division: Khulna

1.70

0.00 – Inf

0.195

Division: Mymensingh

1.04

0.00 – Inf

0.924

Division: Rajshahi

1.30

0.00 – Inf

0.513

Division: Rangpur

1.76

0.00 – Inf

0.162

Division: Sylhet

0.89

0.00 – Inf

0.788

age_gap6-10

0.42

0.00 – Inf

<0.001

age: Age Gap betweenHasband and Respondant:<=5

0.40

0.00 – Inf

<0.001

Wealth index combined:Middle

0.79

0.00 – Inf

0.091

Wealth index combined:Rich

0.46

0.00 – Inf

<0.001

age: age16

2.90

0.00 – Inf

0.004

age: age17

5.00

0.00 – Inf

<0.001

age: age18

8.23

0.00 – Inf

<0.001

age: age19

15.96

0.00 – Inf

<0.001

Respondant can makedecisions: No

0.56

0.00 – Inf

0.051

Contraceptive Use: No

0.26

0.00 – Inf

<0.001

Random Effects

2

3.29

00 cluster_id

0.00

N cluster_id

54

Observations

2449

Marginal R2 / Conditional R2

0.292 / NA