# Model Check

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#loading data set

```
library(haven)
bdhs<- read_sav("adolescent fertility new_1.SAV")
View(bdhs)
table(bdhs$V106)
```

```
##
##    0    1    2    3
##   40  339 1879  191
```

```
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"             "V023"
```

```
library(dplyr)
```

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(haven)
bdhs<- bdhs %>%
  rename ( division = V024,
           education = V106,
           husband_education = V701,
           empowerment = WomenEmpowerment,
           age = V012,
```

```
            wealth = V190,
            contraceptive = V312New,
            age_gap = Age_Gap,
            sample_weight = V005,
            cluster_id = V001
    )
bdhs <- bdhs %>%
  mutate(weight = sample_weight / 1000000)
names(bdhs)
```

```
##  [1] "V013"              "division"          "V025"
##  [4] "education"         "V130"              "V151"
##  [7] "husband_education" "empowerment"       "age"
## [10] "wealth"            "contraceptive"     "age_gap"
## [13] "V201"              "CEB"               "filter_$"
## [16] "cluster_id"        "sample_weight"     "V023"
## [19] "weight"
```

```
bdhs <- bdhs %>%
  mutate(
    wealth = as_factor(wealth),
    division = as_factor(division),
    education            = as_factor(education),
    husband_education    = as_factor(husband_education),
    empowerment     = as_factor(empowerment),
    contraceptive = as_factor(contraceptive),
    age_gap = as_factor(age_gap),
    age= as_factor(age)
  )
```

## Fit Multi-level logistic regression

```
library(glmmTMB)
model_gmlr <- glmmTMB(
  CEB ~ education + husband_education + division +
              age_gap + wealth + age + empowerment + contraceptive +
              (1 | cluster_id),
  data = bdhs,
  weights = weight,
  family = binomial(link = "logit")
)
```

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

#Fit Logistic regression

```
model_glm <- glm(
  CEB ~ education + husband_education + division +
              age_gap + wealth + age + empowerment + contraceptive,
```

```
  data = bdhs,
  family = binomial(link = "logit"),
  weights = weight
)
```

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

#Compare AIC Value

```
AIC(model_glm, model_gmlr) #lower AIC Better model
```

```
##            df      AIC
## model_glm  24 1604.323
## model_gmlr 25 1518.549
```

#Compute ICC (Extract variance of random effect)

```
var_cluster <- as.numeric(VarCorr(model_gmlr)$cond$cluster_id[1])
icc <- var_cluster / (var_cluster + (pi^2 / 3))
print(paste("ICC =", round(icc, 3)))
```

```
## [1] "ICC = 0"
```

```
summary(model_gmlr)
```

```
##  Family: binomial  ( logit )
## Formula:
## CEB ~ education + husband_education + division + age_gap + wealth +
##     age + empowerment + contraceptive + (1 | cluster_id)
## Data: bdhs
## Weights: weight
##
##       AIC       BIC    logLik -2*log(L)  df.resid
##    1518.5    1663.6    -734.3    1468.5      2424
##
## Random effects:
##
## Conditional model:
##  Groups     Name        Variance  Std.Dev.
##  cluster_id (Intercept) 1.127e-09 3.358e-05
## Number of obs: 2449, groups:  cluster_id, 54
##
## Conditional model:
##                              Estimate Std. Error z value Pr(>|z|)
## (Intercept)                   0.77193    0.84406   0.915  0.36043
## educationPrimary             -0.25947    0.59573  -0.436  0.66317
## educationSecondary           -0.78439    0.57985  -1.353  0.17614
## educationHigher              -1.74634    0.63335  -2.757  0.00583 **
## husband_educationPrimary     -0.07776    0.33585  -0.232  0.81690
## husband_educationSecondary -0.73724    0.31715  -2.325  0.02009 *
## husband_educationHigher    -0.91856    0.35577  -2.582  0.00983 **
```

```
## divisionChattogram          0.60734    0.46635   1.302  0.19280
## divisionDhaka               0.61577    0.42579   1.446  0.14812
## divisionKhulna              0.62623    0.41063   1.525  0.12725
## divisionMymensingh          0.14652    0.41169   0.356  0.72192
## divisionRajshahi            0.37323    0.40415   0.923  0.35575
## divisionRangpur             0.68515    0.40303   1.700  0.08913 .
## divisionSylhet             -0.01292    0.43318  -0.030  0.97620
## age_gap6-10                -0.86901    0.20132  -4.316 1.59e-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 **
## ageAge 16                   0.91547    0.35685   2.565  0.01031 *
## ageAge 17                   1.39497    0.34144   4.086 4.40e-05 ***
## ageAge 18                   1.98862    0.32673   6.086 1.15e-09 ***
## ageAge 19                   2.55472    0.32937   7.756 8.74e-15 ***
## empowermentNo              -0.54284    0.29359  -1.849  0.06446 .
## contraceptiveNo            -1.32795    0.15625  -8.499  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

#Plot to check cluster effect

```
library(sjPlot)
plot_model(model_gmlr, type = "re")
```