Questionnaires data

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```
library("here")
```

```
## here() starts at /Users/corrado/Documents/papers/ED_patients
```

```
library("tidyverse")
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.1 --
```

```
## v ggplot2 3.3.3     v purrr   0.3.4
## v tibble  3.1.2     v dplyr   1.0.6
## v tidyr   1.1.3     v stringr 1.4.0
## v readr   1.4.0     v forcats 0.5.1
```

```
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
library("forcats")
library("readxl")
library("pROC")
```

```
## Type 'citation("pROC")' for a citation.
```

```
##
## Caricamento pacchetto: 'pROC'
```

```
## I seguenti oggetti sono mascherati da 'package:stats':
##
##     cov, smooth, var
```

```
library("brms")
```

```
## Caricamento del pacchetto richiesto: Rcpp
```

```
## Loading 'brms' package (version 2.15.0). Useful instructions
## can be found by typing help('brms'). A more detailed introduction
## to the package is available through vignette('brms_overview').
```

```
##
## Caricamento pacchetto: 'brms'
```

```
## Il seguente oggetto è mascherato da 'package:stats':
##
##     ar
```

```
library("cmdstanr")
```

```
## This is cmdstanr version 0.4.0.9000
```

```
## - Online documentation and vignettes at mc-stan.org/cmdstanr
## - Use set_cmdstan_path() to set the path to CmdStan
## - Use install_cmdstan() to install CmdStan
```

```
set_cmdstan_path("/Users/corrado/cmdstan")
```

```
## CmdStan path set to: /Users/corrado/cmdstan
```

```
library("ROCR")
library("tidybayes")
```

```
##
## Caricamento pacchetto: 'tidybayes'
## I seguenti oggetti sono mascherati da 'package:brms':
##
##     dstudent_t, pstudent_t, qstudent_t, rstudent_t
```

```
source(here::here("lib", "ed_fnc.R"))


# read questionnaries data
patients_codes <- get_patients_codes()

# read PRL params and quest data
quest_data <- readRDS(
  here("data", "processed", "prl", "prl_and_quest",
       "prl_params_and_quest_data.rds")
)

quest_data$eat26_tot <- quest_data$dieting + quest_data$bulimia + quest_data$oral_control

quest_data %>%
  group_by(group) %>%
  summarise(
    avg_eat26_tot = median(eat26_tot, na.rm = TRUE),
    avg_eat26_bu  = median(bulimia, na.rm = TRUE),
    avg_eat26_di  = median(dieting, na.rm = TRUE),
    avg_eat26_oc  = median(oral_control, na.rm = TRUE),
    n = n()
  )
```

```
## # A tibble: 3 x 6
##   group   avg_eat26_tot avg_eat26_bu avg_eat26_di avg_eat26_oc     n
##   <chr>           <dbl>        <dbl>        <dbl>        <dbl> <int>
## 1 at_risk            29            9           17          2.5    34
## 2 control             6            3            2          0     246
## 3 patient            39           11           22          8      25
```

```
quest_data %>%
  group_by(group) %>%
  summarise(
    avg_dass_a = median(dass21_anxiety, na.rm = TRUE),
    avg_dass_s  = median(dass21_stress, na.rm = TRUE),
    avg_dass_d  = median(dass21_dep, na.rm = TRUE),
    n = n()
```

```
  )
```

```
## # A tibble: 3 x 5
##   group   avg_dass_a avg_dass_s avg_dass_d     n
##   <chr>        <dbl>      <dbl>      <dbl> <int>
## 1 at_risk        7.5         13         10    34
## 2 control        4            9          6   246
## 3 patient        8           13         11    25
```

```
quest_data %>%
  group_by(group) %>%
  summarise(
    avg_sias = median(sias, na.rm = TRUE),
    avg_orto  = median(orto_tot, na.rm = TRUE),
    avg_ros  = median(ros_tot, na.rm = TRUE),
    avg_bsq14  = median(bsq14_tot, na.rm = TRUE),
    n = n()
  )
```

```
## # A tibble: 3 x 6
##   group   avg_sias avg_orto avg_ros avg_bsq14     n
##   <chr>      <dbl>    <dbl>   <dbl>     <dbl> <int>
## 1 at_risk     37.5       15    26.5      65.5    34
## 2 control     26         21    21        36     246
## 3 patient     35         13    26        63      25
```

```
quest_data %>%
  group_by(group) %>%
  summarise(
    avg_ps = median(mps_ps, na.rm = TRUE),
    avg_o  = median(mps_o, na.rm = TRUE),
    avg_cmd  = median(mps_cmd, na.rm = TRUE),
    avg_pepc  = median(mps_pepc, na.rm = TRUE),
    n = n()
  )
```

```
## # A tibble: 3 x 6
##   group   avg_ps avg_o avg_cmd avg_pepc     n
##   <chr>    <dbl> <dbl>   <dbl>    <dbl> <int>
## 1 at_risk     25  22.5      51       21    34
## 2 control     21  22        42       18   246
## 3 patient     25  24        48       22    25
```

```
subj_info <- get_subj_info()

quest_data2 <- left_join(quest_data, subj_info, by = "subj_code")
quest_data2$height
```

```
##   [1] 155.0 168.0 176.0 156.0    NA    NA 169.0 165.0 162.0 169.0 170.0    NA
##  [13] 168.0    NA    NA 165.0    NA    NA    NA 168.0 170.0 163.0 158.0    NA
##  [25] 164.0 160.0    NA 160.0    NA 165.0 170.0    NA    NA 148.0 176.0    NA
##  [37] 165.0    NA 184.0 168.0 170.0 165.0 168.0 163.0 160.0 163.0 167.0 167.0
##  [49] 168.0 162.0 165.0 160.0 159.0 164.0 160.0    NA 162.0 162.0    NA 162.0
##  [61] 156.0 160.0 165.0 165.0 174.0 165.0 169.0 150.0 167.0 176.0 160.0 165.0
##  [73] 170.0 165.0 155.0 164.0 169.0 169.0 169.0 162.0 155.0 170.0    NA 168.0
##  [85] 174.0    NA 160.0 168.0 168.0 155.0 158.0 170.0 167.0 162.0 164.0 160.0
```

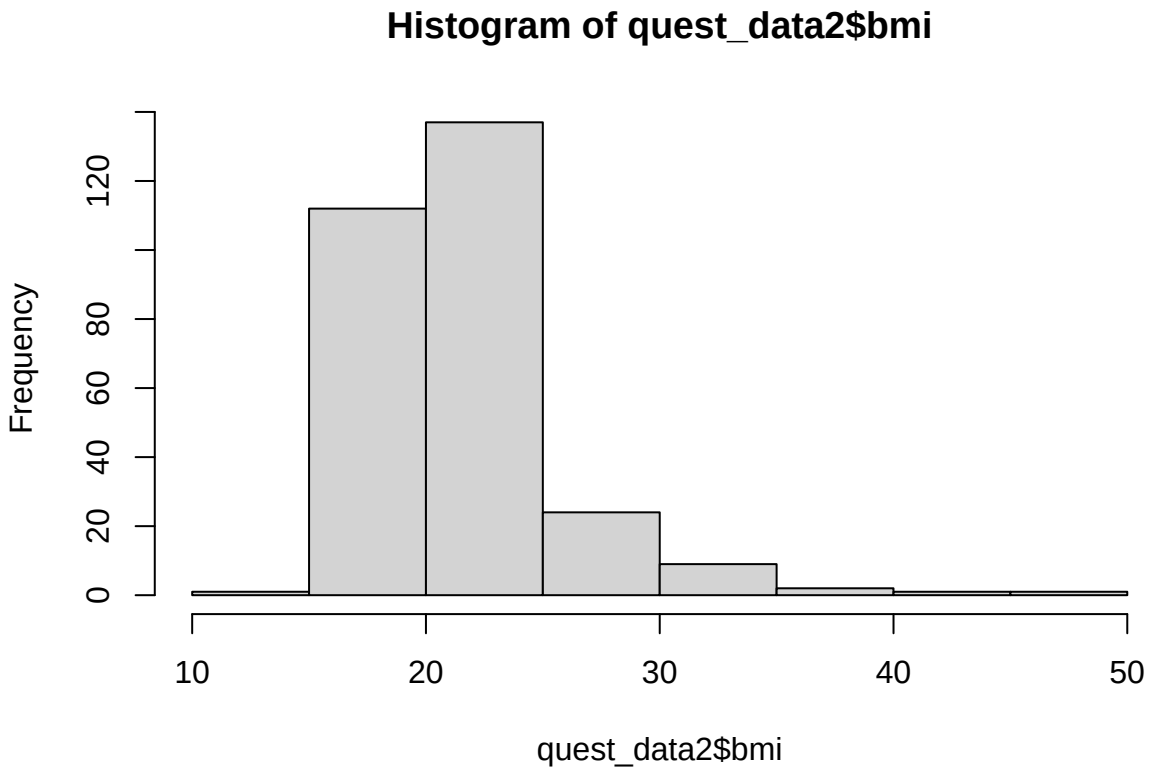
```
##  [97] 167.0 170.0 178.0 171.0 168.0 160.0 170.0 168.0 160.0 164.0    NA 160.0
## [109] 164.0 160.0 160.0 188.0 171.0    NA 158.0 170.0 175.0 177.0 165.0    NA
## [121] 174.0 160.0 165.0 160.0    NA 158.0 163.0 163.0 171.0 160.0 162.0 176.0
## [133] 182.0 160.0 167.0 170.0 179.0 170.0 161.0 163.0 160.0 163.0 174.0 154.0
## [145] 173.0 163.0 173.0 170.0 166.0 183.0 170.0 165.0 163.0 163.0 158.0 170.0
## [157] 153.0    NA 175.0 163.0 180.0 180.0 169.0 174.0 187.0 169.0 165.0 169.0
## [169] 169.0 163.0 165.0 175.0 160.0 160.0 163.0 164.0 175.0 163.0 160.0 165.0
## [181] 165.0 168.0 170.0 174.0 171.0 167.0 180.0 167.0 165.0 168.0 175.0 175.0
## [193] 175.0 180.0 183.0 170.0 166.0 168.0 172.0 175.0 173.0 163.0 169.0 169.0
## [205] 164.0 167.0 167.0 167.0 167.0 167.0 167.0 180.0    NA 156.0 160.0 158.0
## [217] 165.0 155.0 160.0    NA 180.0 158.0 170.0 161.0 167.0 165.0    NA 169.0
## [229] 170.0 163.0    NA 165.0 170.0 158.0 158.0 164.0 180.0 168.0 173.0 150.0
## [241] 164.0    NA 177.0 165.0 162.0 178.0 171.0 165.0 155.0 158.0 160.0 166.0
## [253] 165.0 170.0 170.0 165.0 167.0 158.0    NA 159.0    NA 162.0 165.0 151.0
## [265] 170.0    NA    NA 160.0 160.0 160.0 177.0 173.0 180.0 154.0 165.0 164.0
## [277] 170.0 158.0 165.0 169.0 163.0 170.0 169.0 165.0 165.0 165.0 167.0 187.0
## [289] 187.0 160.0 193.0 170.0 174.0 160.0 157.0 170.0    NA 170.0 158.0 156.0
## [301] 171.5    NA 170.0 170.0 180.0 170.0    NA 162.0 162.0 160.0 173.0 158.0
## [313] 187.0 162.0 174.0 165.0 171.0 170.0 167.0    NA    NA 175.0 166.0 176.0
## [325]    NA 172.0 155.0
```

```
quest_data2$present_weight
```

```
##   [1]  40.00 116.00  52.00  38.00     NA     NA  47.00 100.00  80.00  67.00
##  [11]  55.40     NA  45.00     NA     NA  50.00     NA     NA     NA  47.00
##  [21]  74.00  48.00  40.00     NA  75.00  57.00     NA  50.00     NA  42.00
##  [31]  52.00     NA     NA     NA  53.00     NA  83.00     NA  82.00  56.00
##  [41]  47.00 100.00  52.00  54.00  56.00  52.50  61.00  61.00  62.00  70.00
##  [51]  55.00  49.00  63.00  74.00  78.00     NA  52.00  52.00     NA  57.00
##  [61]  48.00  50.00  50.00  58.00  60.00  56.00  80.00  43.00  75.00  66.40
##  [71]  48.00  55.00  85.00  51.00  60.00  53.00  60.00  60.00  60.00  58.00
##  [81]  52.75  60.00     NA  54.00  82.00     NA  55.00  56.00  56.00  47.00
##  [91]  48.00  61.00  53.00  52.00  50.00  53.00  46.00  53.00  68.00  63.00
## [101]  60.00  64.50  65.00  60.00  56.00  52.00     NA  49.00  54.00  48.00
## [111]  49.00  65.00  56.00     NA  52.00  80.00  65.00  65.00  58.00     NA
## [121]  80.00  43.00  53.00  64.00     NA  60.00  57.00  50.00  68.00  80.00
## [131]  53.00  60.00  70.00  57.00  53.00  64.00  80.00  72.00  67.00  48.00
## [141]  55.00  55.00  71.00  51.00  48.00  52.00  45.00  62.00  56.00  90.00
## [151]  60.00  57.00  58.00  58.00  53.00  60.00  46.00     NA  64.00  52.00
## [161]  65.00  65.00  48.50  68.00  78.00  76.00  65.00  59.50  53.00  48.00
## [171]  57.00  65.00  60.00  60.00  50.00  48.00  72.00  52.00  51.00  49.00
## [181]  60.00  54.00  67.00 103.00  58.00  85.00  83.00  72.00  65.00  65.00
## [191]  55.00  55.00  55.00  77.00  66.00  60.00  56.00  47.00  59.00  50.00
## [201]  68.00  47.00  62.00  59.00  55.00  54.00  54.00  54.00  54.00  54.00
## [211]  54.00 100.00     NA  55.00  70.00  52.00  65.00  48.00  62.00     NA
## [221]  64.00  55.00  54.00  37.00  60.00  50.00     NA  60.00  73.00  52.00
## [231]     NA  65.00  55.00  53.00  55.00  84.00  90.00  70.00  68.00  53.00
## [241]  59.00     NA  78.00  53.00  55.00  60.00  58.00  60.00  57.00  55.00
## [251]  60.00  53.00 130.00  54.00  54.00  49.00  61.00  58.00     NA  61.00
## [261]     NA  51.00  67.00  48.00  80.00     NA     NA  45.00  45.00  45.00
## [271]  75.00  55.00  80.00  52.00  70.00  59.00  55.00  54.00  59.00  70.00
## [281]  60.00  63.00  76.00  55.00  55.00  57.00  62.00  72.00  72.00  51.70
## [291]  70.00  60.00  95.00  48.00  58.00  60.00     NA  84.70  48.00  47.00
## [301]  57.00     NA  70.00  51.00  77.00  61.00     NA  54.50  54.50  49.00
## [311]  68.00  52.00  88.00  62.00  56.00  54.00  69.00  55.00  61.00     NA
```

```
## [321]     NA  68.00  55.00  57.00     NA  62.00  48.00
```

```
quest_data2$bmi <- quest_data2$present_weight / (quest_data2$height/100)^2
hist(quest_data2$bmi)
```




```
# sort(quest_data2$bmi)

m1 <- brm(
  bmi ~ age + sex +
       oral_control + dieting + bulimia +
       bsq14_tot + ros_tot +
       dass21_stress + dass21_anxiety + dass21_dep +
       sias + mps_ps + mps_o + mps_cmd + mps_pepc + orto_tot,
  data = quest_data2,
  # prior = prior_ma,
  family = skew_normal(),
  control = list(adapt_delta = 0.98),
  iter = 4000,
  cores = 6,
  backend = "cmdstan"
)
```

```
## Warning: Rows containing NAs were excluded from the model.
## Start sampling
## Running MCMC with 4 chains, at most 6 in parallel...
## Chain 1 Rejecting initial value:
## Chain 1   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 1   Stan can't start sampling from this initial value.
```

```
## Chain 1 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 2 Rejecting initial value:
## Chain 2   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 2   Stan can't start sampling from this initial value.
## Chain 2 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 3 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 4 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 3 Iteration:  100 / 4000 [  2%]  (Warmup)
## Chain 1 Iteration:  100 / 4000 [  2%]  (Warmup)
## Chain 2 Iteration:  100 / 4000 [  2%]  (Warmup)
## Chain 3 Iteration:  200 / 4000 [  5%]  (Warmup)
## Chain 1 Iteration:  200 / 4000 [  5%]  (Warmup)
## Chain 1 Iteration:  300 / 4000 [  7%]  (Warmup)
## Chain 2 Iteration:  200 / 4000 [  5%]  (Warmup)
## Chain 3 Iteration:  300 / 4000 [  7%]  (Warmup)
## Chain 4 Iteration:  100 / 4000 [  2%]  (Warmup)
## Chain 1 Iteration:  400 / 4000 [ 10%]  (Warmup)
## Chain 3 Iteration:  400 / 4000 [ 10%]  (Warmup)
## Chain 4 Iteration:  200 / 4000 [  5%]  (Warmup)
## Chain 1 Iteration:  500 / 4000 [ 12%]  (Warmup)
## Chain 2 Iteration:  300 / 4000 [  7%]  (Warmup)
## Chain 1 Iteration:  600 / 4000 [ 15%]  (Warmup)
## Chain 2 Iteration:  400 / 4000 [ 10%]  (Warmup)
## Chain 3 Iteration:  500 / 4000 [ 12%]  (Warmup)
## Chain 4 Iteration:  300 / 4000 [  7%]  (Warmup)
## Chain 1 Iteration:  700 / 4000 [ 17%]  (Warmup)
## Chain 3 Iteration:  600 / 4000 [ 15%]  (Warmup)
## Chain 4 Iteration:  400 / 4000 [ 10%]  (Warmup)
## Chain 1 Iteration:  800 / 4000 [ 20%]  (Warmup)
## Chain 2 Iteration:  500 / 4000 [ 12%]  (Warmup)
## Chain 3 Iteration:  700 / 4000 [ 17%]  (Warmup)
## Chain 4 Iteration:  500 / 4000 [ 12%]  (Warmup)
## Chain 1 Iteration:  900 / 4000 [ 22%]  (Warmup)
## Chain 2 Iteration:  600 / 4000 [ 15%]  (Warmup)
## Chain 3 Iteration:  800 / 4000 [ 20%]  (Warmup)
## Chain 4 Iteration:  600 / 4000 [ 15%]  (Warmup)
## Chain 2 Iteration:  700 / 4000 [ 17%]  (Warmup)
## Chain 3 Iteration:  900 / 4000 [ 22%]  (Warmup)
## Chain 4 Iteration:  700 / 4000 [ 17%]  (Warmup)
## Chain 1 Iteration: 1000 / 4000 [ 25%]  (Warmup)
## Chain 3 Iteration: 1000 / 4000 [ 25%]  (Warmup)
## Chain 1 Iteration: 1100 / 4000 [ 27%]  (Warmup)
## Chain 2 Iteration:  800 / 4000 [ 20%]  (Warmup)
## Chain 3 Iteration: 1100 / 4000 [ 27%]  (Warmup)
## Chain 4 Iteration:  800 / 4000 [ 20%]  (Warmup)
## Chain 1 Iteration: 1200 / 4000 [ 30%]  (Warmup)
## Chain 4 Iteration:  900 / 4000 [ 22%]  (Warmup)
## Chain 1 Iteration: 1300 / 4000 [ 32%]  (Warmup)
## Chain 2 Iteration:  900 / 4000 [ 22%]  (Warmup)
## Chain 3 Iteration: 1200 / 4000 [ 30%]  (Warmup)
## Chain 4 Iteration: 1000 / 4000 [ 25%]  (Warmup)
## Chain 1 Iteration: 1400 / 4000 [ 35%]  (Warmup)
```

```
## Chain 2 Iteration: 1000 / 4000 [ 25%]  (Warmup)
## Chain 3 Iteration: 1300 / 4000 [ 32%]  (Warmup)
## Chain 4 Iteration: 1100 / 4000 [ 27%]  (Warmup)
## Chain 2 Iteration: 1100 / 4000 [ 27%]  (Warmup)
## Chain 3 Iteration: 1400 / 4000 [ 35%]  (Warmup)
## Chain 4 Iteration: 1200 / 4000 [ 30%]  (Warmup)
## Chain 1 Iteration: 1500 / 4000 [ 37%]  (Warmup)
## Chain 2 Iteration: 1200 / 4000 [ 30%]  (Warmup)
## Chain 3 Iteration: 1500 / 4000 [ 37%]  (Warmup)
## Chain 4 Iteration: 1300 / 4000 [ 32%]  (Warmup)
## Chain 1 Iteration: 1600 / 4000 [ 40%]  (Warmup)
## Chain 2 Iteration: 1300 / 4000 [ 32%]  (Warmup)
## Chain 3 Iteration: 1600 / 4000 [ 40%]  (Warmup)
## Chain 4 Iteration: 1400 / 4000 [ 35%]  (Warmup)
## Chain 1 Iteration: 1700 / 4000 [ 42%]  (Warmup)
## Chain 2 Iteration: 1400 / 4000 [ 35%]  (Warmup)
## Chain 3 Iteration: 1700 / 4000 [ 42%]  (Warmup)
## Chain 4 Iteration: 1500 / 4000 [ 37%]  (Warmup)
## Chain 1 Iteration: 1800 / 4000 [ 45%]  (Warmup)
## Chain 2 Iteration: 1500 / 4000 [ 37%]  (Warmup)
## Chain 3 Iteration: 1800 / 4000 [ 45%]  (Warmup)
## Chain 1 Iteration: 1900 / 4000 [ 47%]  (Warmup)
## Chain 2 Iteration: 1600 / 4000 [ 40%]  (Warmup)
## Chain 3 Iteration: 1900 / 4000 [ 47%]  (Warmup)
## Chain 4 Iteration: 1600 / 4000 [ 40%]  (Warmup)
## Chain 2 Iteration: 1700 / 4000 [ 42%]  (Warmup)
## Chain 4 Iteration: 1700 / 4000 [ 42%]  (Warmup)
## Chain 1 Iteration: 2000 / 4000 [ 50%]  (Warmup)
## Chain 1 Iteration: 2001 / 4000 [ 50%]  (Sampling)
## Chain 2 Iteration: 1800 / 4000 [ 45%]  (Warmup)
## Chain 4 Iteration: 1800 / 4000 [ 45%]  (Warmup)
## Chain 1 Iteration: 2100 / 4000 [ 52%]  (Sampling)
## Chain 2 Iteration: 1900 / 4000 [ 47%]  (Warmup)
## Chain 3 Iteration: 2000 / 4000 [ 50%]  (Warmup)
## Chain 3 Iteration: 2001 / 4000 [ 50%]  (Sampling)
## Chain 4 Iteration: 1900 / 4000 [ 47%]  (Warmup)
## Chain 2 Iteration: 2000 / 4000 [ 50%]  (Warmup)
## Chain 2 Iteration: 2001 / 4000 [ 50%]  (Sampling)
## Chain 3 Iteration: 2100 / 4000 [ 52%]  (Sampling)
## Chain 1 Iteration: 2200 / 4000 [ 55%]  (Sampling)
## Chain 2 Iteration: 2100 / 4000 [ 52%]  (Sampling)
## Chain 4 Iteration: 2000 / 4000 [ 50%]  (Warmup)
## Chain 4 Iteration: 2001 / 4000 [ 50%]  (Sampling)
## Chain 1 Iteration: 2300 / 4000 [ 57%]  (Sampling)
## Chain 3 Iteration: 2200 / 4000 [ 55%]  (Sampling)
## Chain 4 Iteration: 2100 / 4000 [ 52%]  (Sampling)
## Chain 1 Iteration: 2400 / 4000 [ 60%]  (Sampling)
## Chain 2 Iteration: 2200 / 4000 [ 55%]  (Sampling)
## Chain 3 Iteration: 2300 / 4000 [ 57%]  (Sampling)
## Chain 2 Iteration: 2300 / 4000 [ 57%]  (Sampling)
## Chain 4 Iteration: 2200 / 4000 [ 55%]  (Sampling)
## Chain 1 Iteration: 2500 / 4000 [ 62%]  (Sampling)
## Chain 2 Iteration: 2400 / 4000 [ 60%]  (Sampling)
## Chain 3 Iteration: 2400 / 4000 [ 60%]  (Sampling)
```

```
## Chain 4 Iteration: 2300 / 4000 [ 57%]  (Sampling)
## Chain 1 Iteration: 2600 / 4000 [ 65%]  (Sampling)
## Chain 3 Iteration: 2500 / 4000 [ 62%]  (Sampling)
## Chain 1 Iteration: 2700 / 4000 [ 67%]  (Sampling)
## Chain 2 Iteration: 2500 / 4000 [ 62%]  (Sampling)
## Chain 4 Iteration: 2400 / 4000 [ 60%]  (Sampling)
## Chain 2 Iteration: 2600 / 4000 [ 65%]  (Sampling)
## Chain 3 Iteration: 2600 / 4000 [ 65%]  (Sampling)
## Chain 4 Iteration: 2500 / 4000 [ 62%]  (Sampling)
## Chain 1 Iteration: 2800 / 4000 [ 70%]  (Sampling)
## Chain 2 Iteration: 2700 / 4000 [ 67%]  (Sampling)
## Chain 3 Iteration: 2700 / 4000 [ 67%]  (Sampling)
## Chain 1 Iteration: 2900 / 4000 [ 72%]  (Sampling)
## Chain 2 Iteration: 2800 / 4000 [ 70%]  (Sampling)
## Chain 4 Iteration: 2600 / 4000 [ 65%]  (Sampling)
## Chain 1 Iteration: 3000 / 4000 [ 75%]  (Sampling)
## Chain 3 Iteration: 2800 / 4000 [ 70%]  (Sampling)
## Chain 4 Iteration: 2700 / 4000 [ 67%]  (Sampling)
## Chain 2 Iteration: 2900 / 4000 [ 72%]  (Sampling)
## Chain 1 Iteration: 3100 / 4000 [ 77%]  (Sampling)
## Chain 2 Iteration: 3000 / 4000 [ 75%]  (Sampling)
## Chain 3 Iteration: 2900 / 4000 [ 72%]  (Sampling)
## Chain 4 Iteration: 2800 / 4000 [ 70%]  (Sampling)
## Chain 1 Iteration: 3200 / 4000 [ 80%]  (Sampling)
## Chain 2 Iteration: 3100 / 4000 [ 77%]  (Sampling)
## Chain 3 Iteration: 3000 / 4000 [ 75%]  (Sampling)
## Chain 4 Iteration: 2900 / 4000 [ 72%]  (Sampling)
## Chain 1 Iteration: 3300 / 4000 [ 82%]  (Sampling)
## Chain 2 Iteration: 3200 / 4000 [ 80%]  (Sampling)
## Chain 4 Iteration: 3000 / 4000 [ 75%]  (Sampling)
## Chain 3 Iteration: 3100 / 4000 [ 77%]  (Sampling)
## Chain 1 Iteration: 3400 / 4000 [ 85%]  (Sampling)
## Chain 2 Iteration: 3300 / 4000 [ 82%]  (Sampling)
## Chain 3 Iteration: 3200 / 4000 [ 80%]  (Sampling)
## Chain 4 Iteration: 3100 / 4000 [ 77%]  (Sampling)
## Chain 1 Iteration: 3500 / 4000 [ 87%]  (Sampling)
## Chain 2 Iteration: 3400 / 4000 [ 85%]  (Sampling)
## Chain 4 Iteration: 3200 / 4000 [ 80%]  (Sampling)
## Chain 2 Iteration: 3500 / 4000 [ 87%]  (Sampling)
## Chain 3 Iteration: 3300 / 4000 [ 82%]  (Sampling)
## Chain 1 Iteration: 3600 / 4000 [ 90%]  (Sampling)
## Chain 3 Iteration: 3400 / 4000 [ 85%]  (Sampling)
## Chain 4 Iteration: 3300 / 4000 [ 82%]  (Sampling)
## Chain 1 Iteration: 3700 / 4000 [ 92%]  (Sampling)
## Chain 2 Iteration: 3600 / 4000 [ 90%]  (Sampling)
## Chain 4 Iteration: 3400 / 4000 [ 85%]  (Sampling)
## Chain 1 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 2 Iteration: 3700 / 4000 [ 92%]  (Sampling)
## Chain 3 Iteration: 3500 / 4000 [ 87%]  (Sampling)
## Chain 2 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 4 Iteration: 3500 / 4000 [ 87%]  (Sampling)
## Chain 1 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 2 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 3 Iteration: 3600 / 4000 [ 90%]  (Sampling)
```

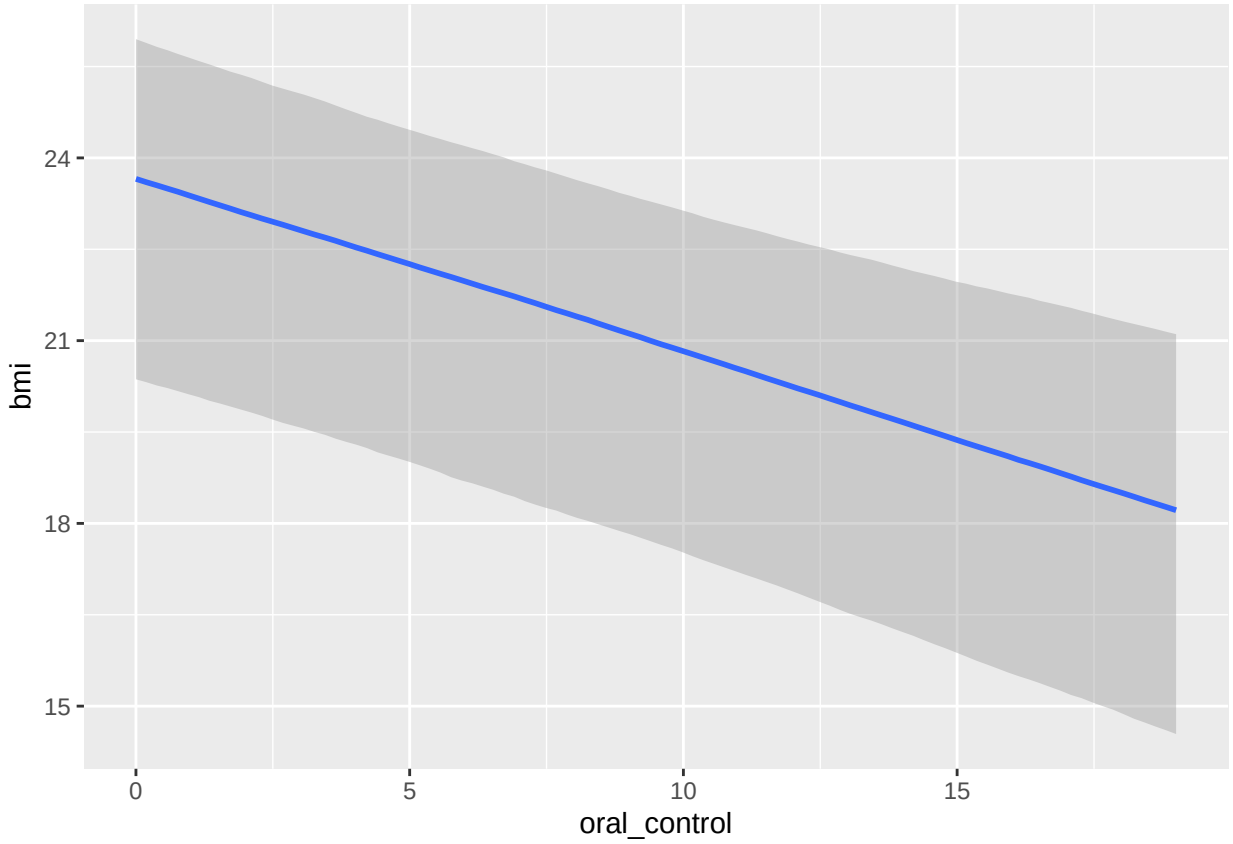
```
## Chain 4 Iteration: 3600 / 4000 [ 90%]  (Sampling)
## Chain 1 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 3 Iteration: 3700 / 4000 [ 92%]  (Sampling)
## Chain 1 finished in 5.6 seconds.
## Chain 2 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 4 Iteration: 3700 / 4000 [ 92%]  (Sampling)
## Chain 2 finished in 5.7 seconds.
## Chain 3 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 4 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 3 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 4 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 3 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 4 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 3 finished in 6.1 seconds.
## Chain 4 finished in 6.2 seconds.
##
## All 4 chains finished successfully.
## Mean chain execution time: 5.9 seconds.
## Total execution time: 6.5 seconds.
```

```
summary(m1)
```

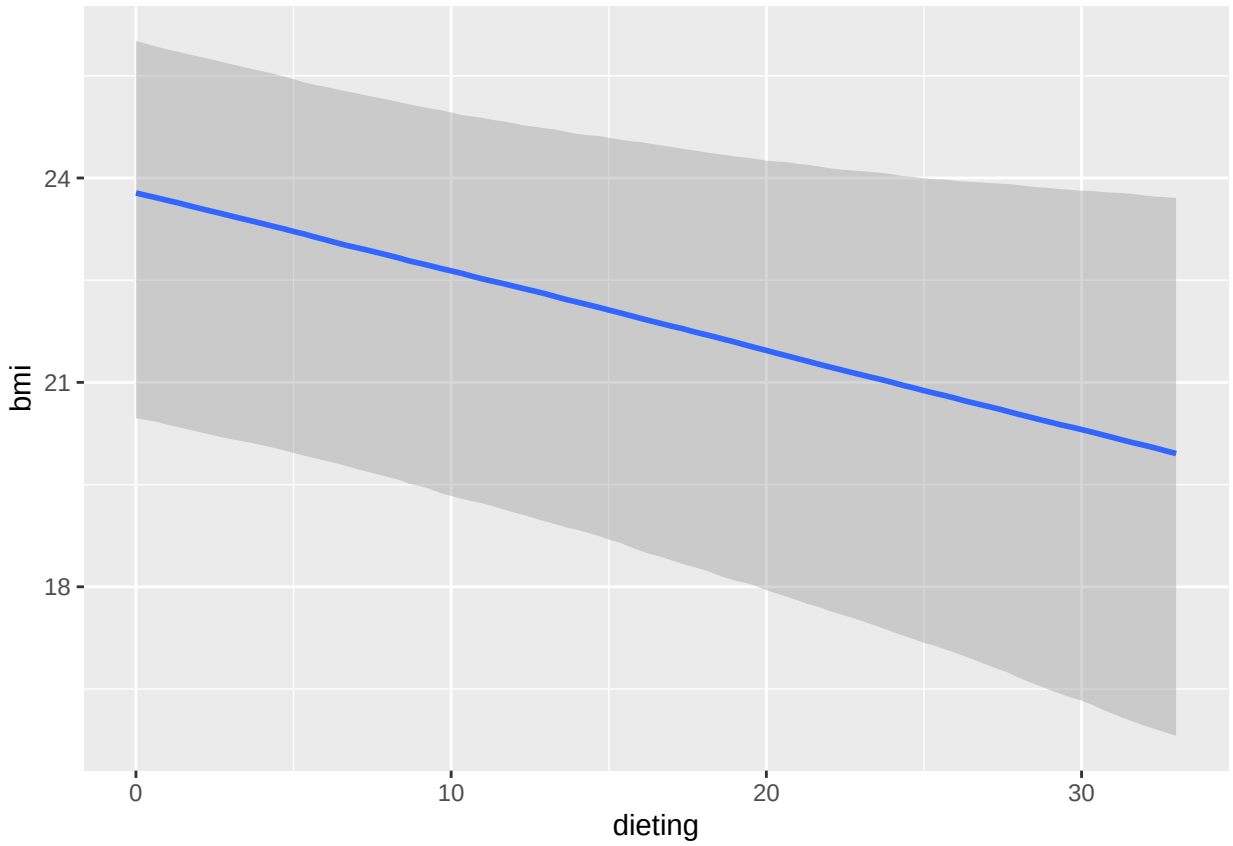
```
##  Family: skew_normal
##   Links: mu = identity; sigma = identity; alpha = identity
## Formula: bmi ~ age + sex + oral_control + dieting + bulimia + bsq14_tot + ros_tot + dass21_stress + d
##    Data: quest_data2 (Number of observations: 269)
## Samples: 4 chains, each with iter = 4000; warmup = 2000; thin = 1;
##          total post-warmup samples = 8000
##
## Population-Level Effects:
##                Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## Intercept         22.85      2.37    18.02    27.34 1.00     7495     5951
## age                0.12      0.03     0.05     0.18 1.00     9114     5376
## sexFemmina        -1.44      1.43    -3.83     1.68 1.00     5487     4549
## sexMaschio        -0.13      1.49    -2.64     3.07 1.00     5495     4411
## oral_control      -0.28      0.06    -0.41    -0.16 1.00     8065     6371
## dieting           -0.11      0.05    -0.21    -0.02 1.00     6800     5815
## bulimia           -0.02      0.10    -0.22     0.18 1.00     7860     5915
## bsq14_tot          0.12      0.02     0.08     0.15 1.00     7431     5800
## ros_tot           -0.07      0.05    -0.16     0.02 1.00     8139     5799
## dass21_stress     -0.15      0.06    -0.28    -0.03 1.00     7295     5869
## dass21_anxiety     0.08      0.06    -0.03     0.18 1.00     8107     6382
## dass21_dep         0.03      0.05    -0.06     0.12 1.00     9258     6300
## sias               0.03      0.02    -0.00     0.06 1.00     8922     6346
## mps_ps            -0.05      0.04    -0.13     0.03 1.00     7595     6071
## mps_o             -0.02      0.04    -0.09     0.05 1.00     8893     6084
## mps_cmd           -0.06      0.03    -0.11    -0.00 1.00     8820     6456
## mps_pepc           0.03      0.03    -0.03     0.08 1.00     9615     6131
## orto_tot          -0.04      0.05    -0.14     0.06 1.00     8641     6290
##
## Family Specific Parameters:
##       Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## sigma     2.90      0.14     2.65     3.19 1.00     7130     5930
## alpha     5.41      1.13     3.57     7.96 1.00     7035     4639
##
```

```
## Samples were drawn using sample(hmc). For each parameter, Bulk_ESS
## and Tail_ESS are effective sample size measures, and Rhat is the potential
## scale reduction factor on split chains (at convergence, Rhat = 1).
```

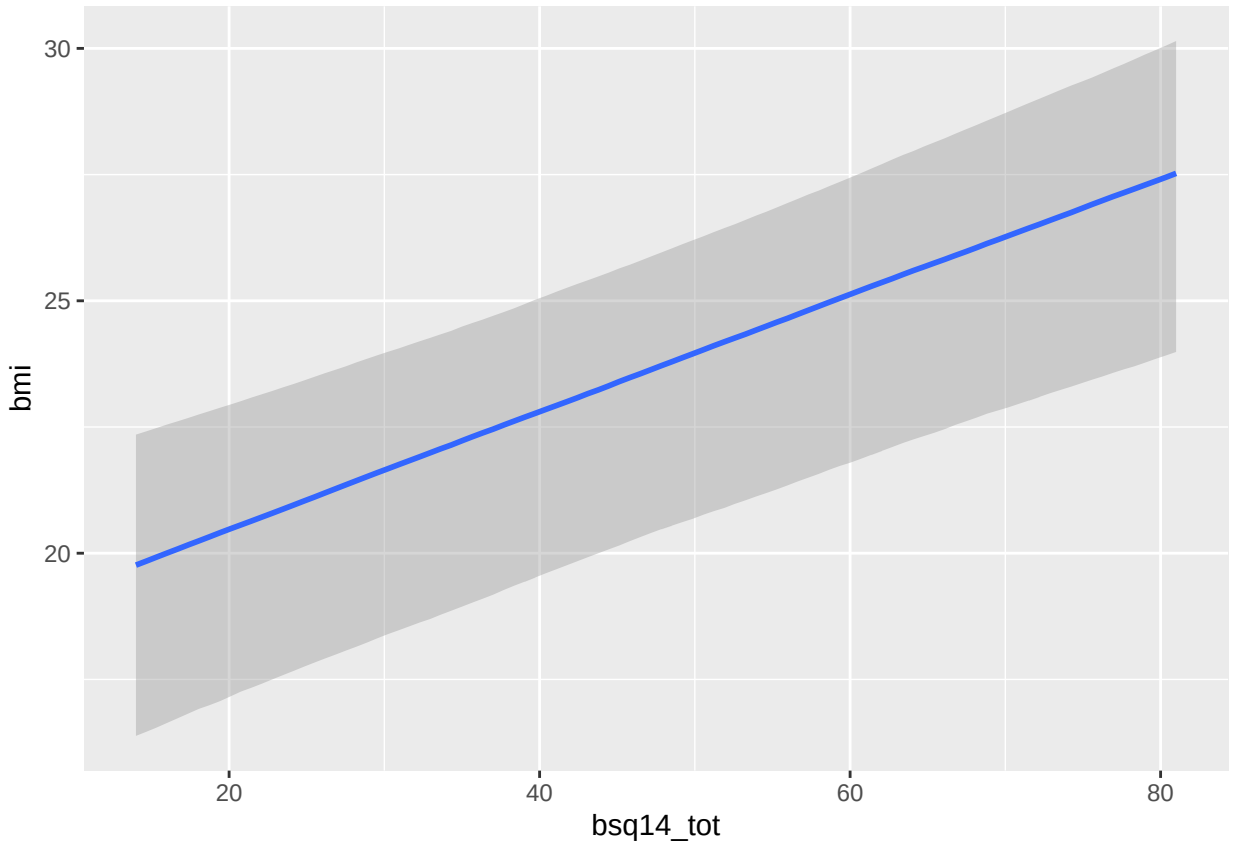
```
plot(conditional_effects(m1, "oral_control"))
```



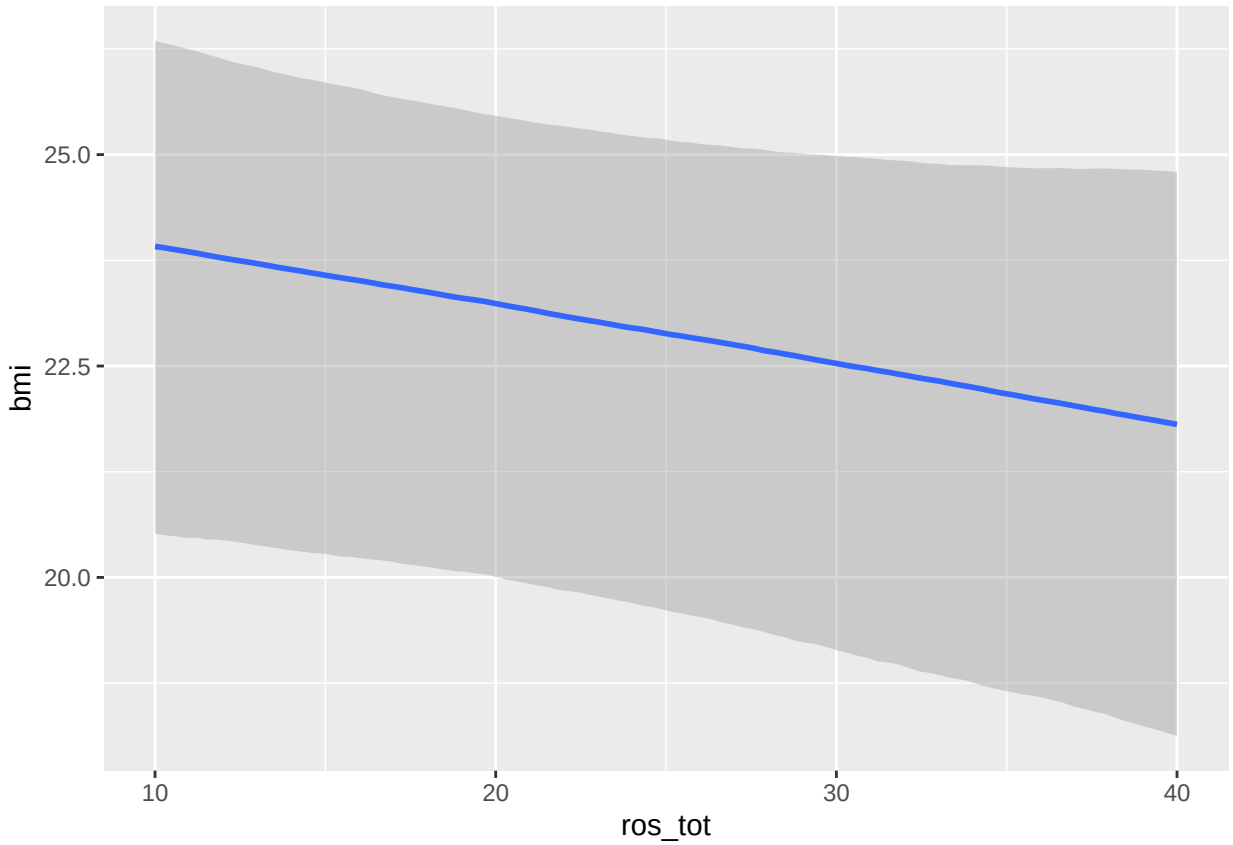

```
plot(conditional_effects(m1, "dieting"))
```



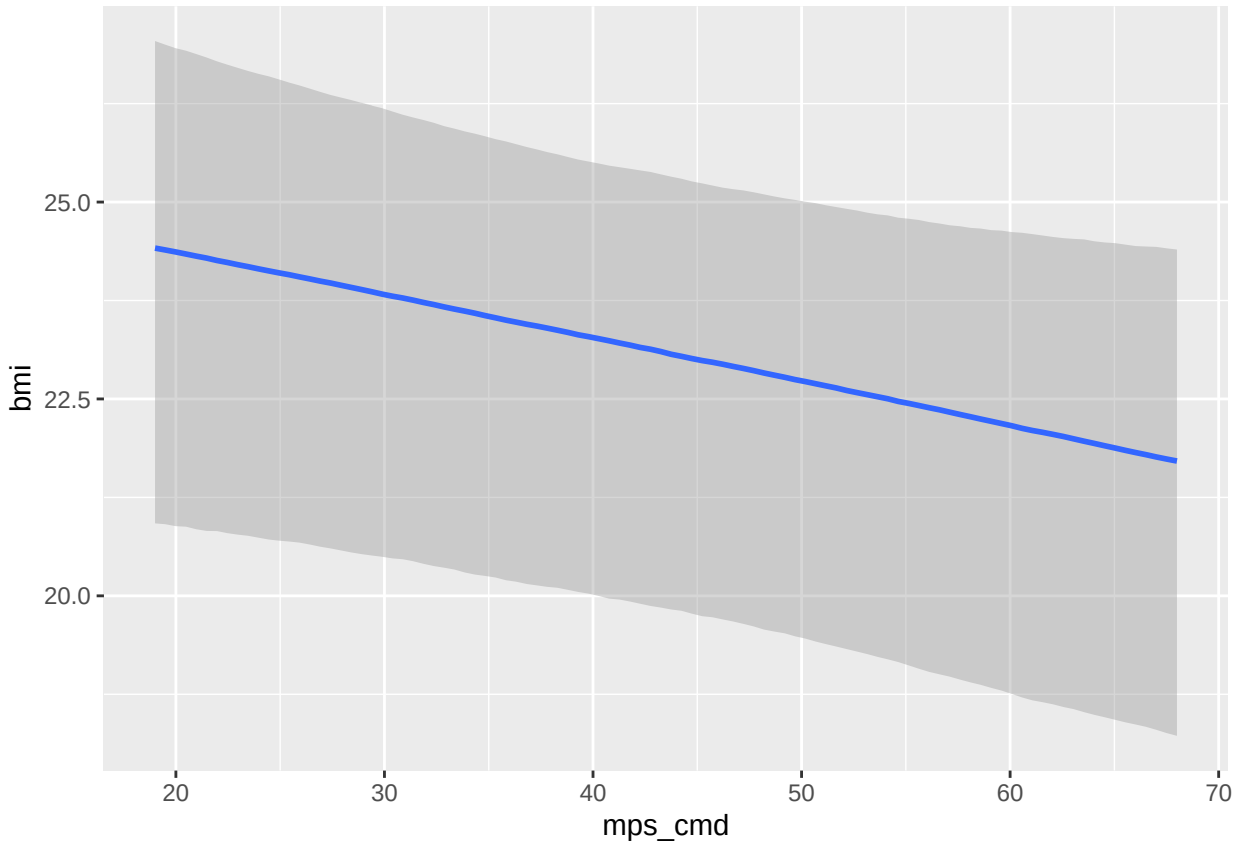

```
plot(conditional_effects(m1, "bsq14_tot"))
```



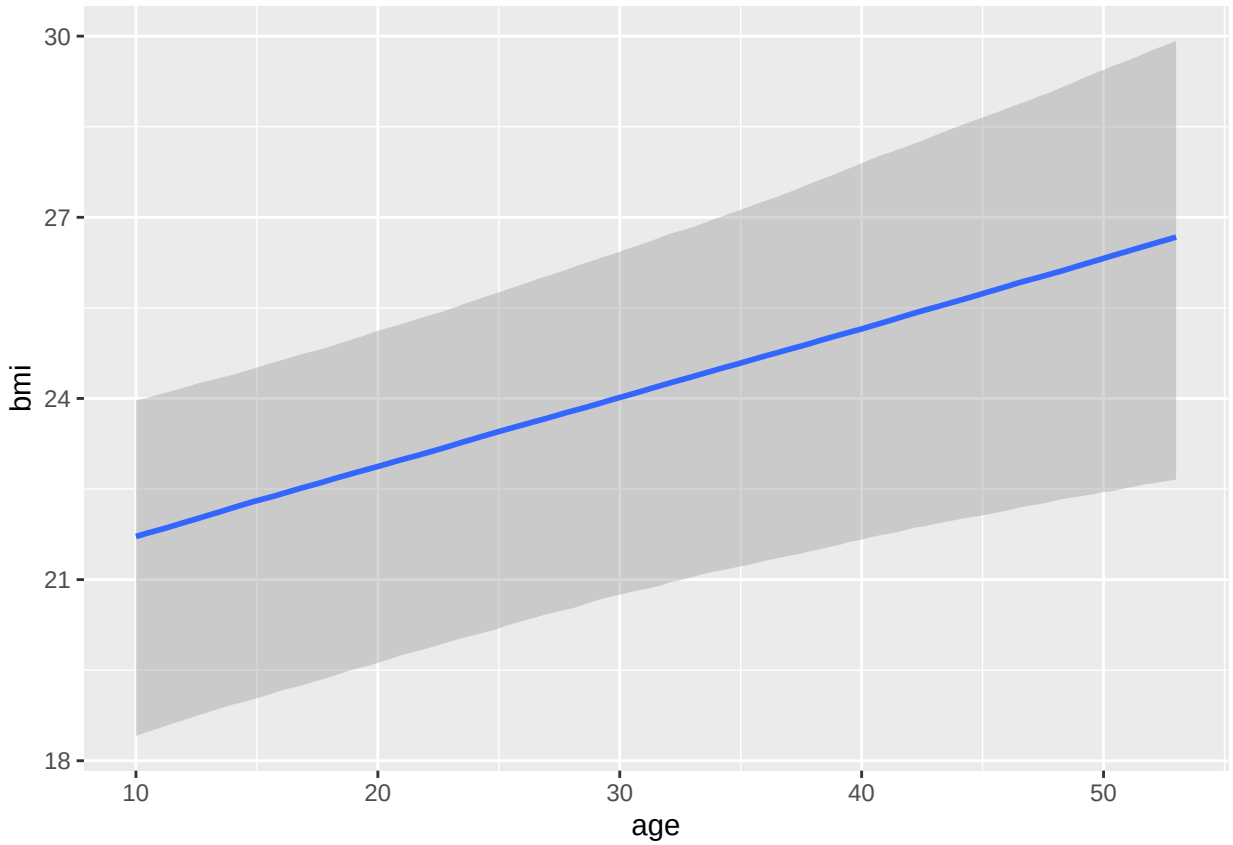

```
plot(conditional_effects(m1, "ros_tot"))
```




```
plot(conditional_effects(m1, "mps_cmd"))
```



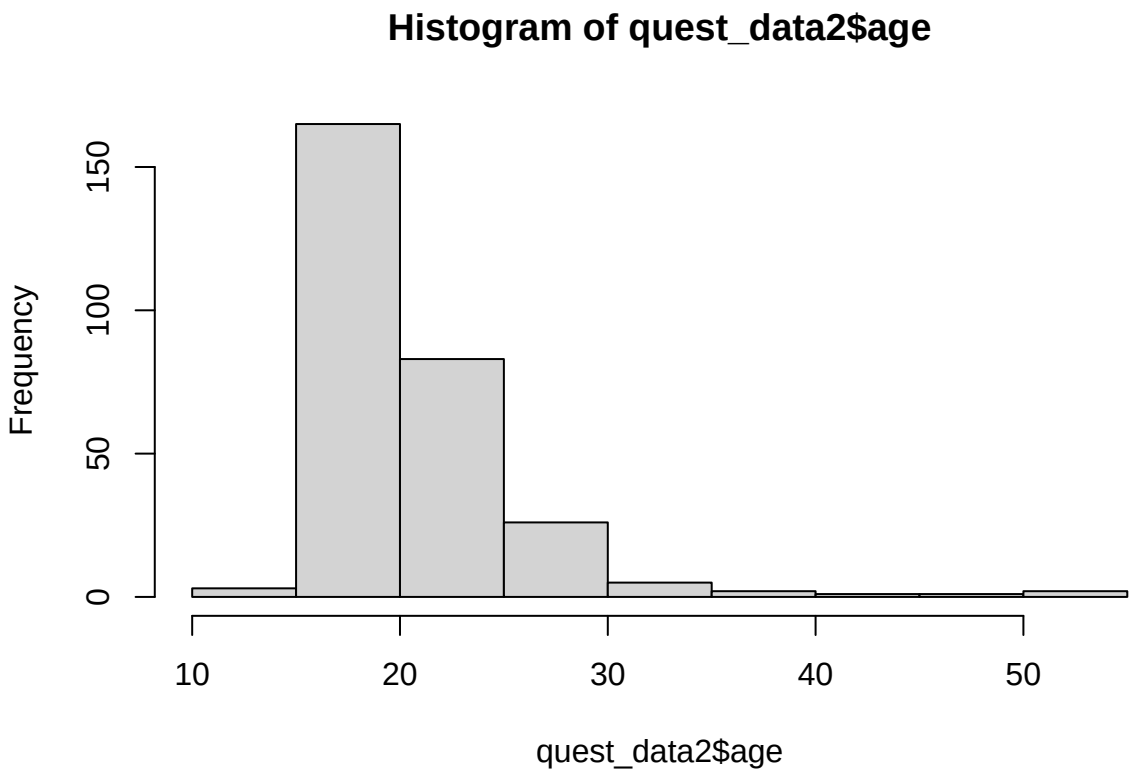

```
plot(conditional_effects(m1, "age"))
```




```
bayes_R2(m1)
```

```
##     Estimate  Est.Error      Q2.5     Q97.5
## R2 0.3084927 0.03378923 0.2399049 0.3729437
```

```
hist(quest_data2$age)
```

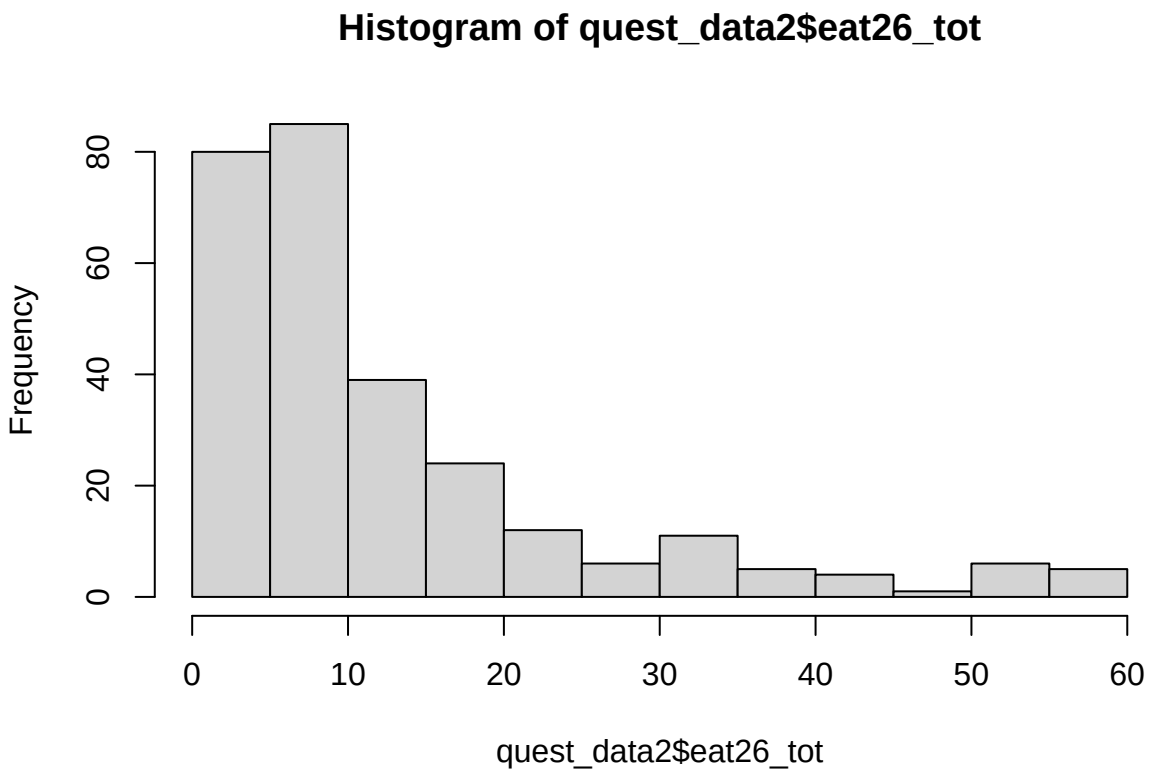


Gender-Dependent Associations of Anxiety and Depression Symptoms With Eating Disorder Psychopathology in a Representative Population Sample Mareike Ernst, Antonia M. Werner, Ana N. Tibubos, Manfred E. Beutel, MartinadeZwaan and ElmarBrähler

```
table(quest_data2$sex)
```

```
##
##   Altro Femmina Maschio
##       4     244      40
```

```
hist(quest_data2$eat26_tot)
```




```
quest_data2$is_patient <- factor(quest_data2$is_patient)

quest_data3 <- quest_data2 %>%
  dplyr::filter(sex != "Altro")

m3 <- brm(
  eat26_tot ~ bmi + age + (dass21_anxiety + dass21_dep) * (is_patient + sex),
  data = quest_data3,
  # prior = prior_ma,
  family = skew_normal(),
  control = list(adapt_delta = 0.98),
  iter = 4000,
  cores = 6,
  backend = "cmdstan"
)
```

```
## Warning: Rows containing NAs were excluded from the model.

## Start sampling

## Running MCMC with 4 chains, at most 6 in parallel...
##
## Chain 1 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 2 Iteration:    1 / 4000 [  0%]  (Warmup)

## Chain 3 Rejecting initial value:

## Chain 3   Log probability evaluates to log(0), i.e. negative infinity.

## Chain 3   Stan can't start sampling from this initial value.

## Chain 3 Rejecting initial value:
```

```
## Chain 3   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 3   Stan can't start sampling from this initial value.
## Chain 3 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 4 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 1 Iteration:  100 / 4000 [  2%]  (Warmup)
## Chain 2 Iteration:  100 / 4000 [  2%]  (Warmup)
## Chain 4 Iteration:  100 / 4000 [  2%]  (Warmup)
## Chain 1 Iteration:  200 / 4000 [  5%]  (Warmup)
## Chain 3 Iteration:  100 / 4000 [  2%]  (Warmup)
## Chain 1 Iteration:  300 / 4000 [  7%]  (Warmup)
## Chain 2 Iteration:  200 / 4000 [  5%]  (Warmup)
## Chain 3 Iteration:  200 / 4000 [  5%]  (Warmup)
## Chain 4 Iteration:  200 / 4000 [  5%]  (Warmup)
## Chain 1 Iteration:  400 / 4000 [ 10%]  (Warmup)
## Chain 3 Iteration:  300 / 4000 [  7%]  (Warmup)
## Chain 4 Iteration:  300 / 4000 [  7%]  (Warmup)
## Chain 1 Iteration:  500 / 4000 [ 12%]  (Warmup)
## Chain 2 Iteration:  300 / 4000 [  7%]  (Warmup)
## Chain 3 Iteration:  400 / 4000 [ 10%]  (Warmup)
## Chain 1 Iteration:  600 / 4000 [ 15%]  (Warmup)
## Chain 2 Iteration:  400 / 4000 [ 10%]  (Warmup)
## Chain 4 Iteration:  400 / 4000 [ 10%]  (Warmup)
## Chain 1 Iteration:  700 / 4000 [ 17%]  (Warmup)
## Chain 2 Iteration:  500 / 4000 [ 12%]  (Warmup)
## Chain 3 Iteration:  500 / 4000 [ 12%]  (Warmup)
## Chain 4 Iteration:  500 / 4000 [ 12%]  (Warmup)
## Chain 1 Iteration:  800 / 4000 [ 20%]  (Warmup)
## Chain 2 Iteration:  600 / 4000 [ 15%]  (Warmup)
## Chain 3 Iteration:  600 / 4000 [ 15%]  (Warmup)
## Chain 4 Iteration:  600 / 4000 [ 15%]  (Warmup)
## Chain 1 Iteration:  900 / 4000 [ 22%]  (Warmup)
## Chain 2 Iteration:  700 / 4000 [ 17%]  (Warmup)
## Chain 3 Iteration:  700 / 4000 [ 17%]  (Warmup)
## Chain 1 Iteration: 1000 / 4000 [ 25%]  (Warmup)
## Chain 2 Iteration:  800 / 4000 [ 20%]  (Warmup)
## Chain 3 Iteration:  800 / 4000 [ 20%]  (Warmup)
## Chain 4 Iteration:  700 / 4000 [ 17%]  (Warmup)
## Chain 1 Iteration: 1100 / 4000 [ 27%]  (Warmup)
## Chain 4 Iteration:  800 / 4000 [ 20%]  (Warmup)
## Chain 3 Iteration:  900 / 4000 [ 22%]  (Warmup)
## Chain 1 Iteration: 1200 / 4000 [ 30%]  (Warmup)
## Chain 2 Iteration:  900 / 4000 [ 22%]  (Warmup)
## Chain 4 Iteration:  900 / 4000 [ 22%]  (Warmup)
## Chain 1 Iteration: 1300 / 4000 [ 32%]  (Warmup)
## Chain 2 Iteration: 1000 / 4000 [ 25%]  (Warmup)
## Chain 3 Iteration: 1000 / 4000 [ 25%]  (Warmup)
## Chain 4 Iteration: 1000 / 4000 [ 25%]  (Warmup)
## Chain 1 Iteration: 1400 / 4000 [ 35%]  (Warmup)
## Chain 2 Iteration: 1100 / 4000 [ 27%]  (Warmup)
## Chain 3 Iteration: 1100 / 4000 [ 27%]  (Warmup)
## Chain 4 Iteration: 1100 / 4000 [ 27%]  (Warmup)
## Chain 3 Iteration: 1200 / 4000 [ 30%]  (Warmup)
## Chain 4 Iteration: 1200 / 4000 [ 30%]  (Warmup)
```

```
## Chain 1 Iteration: 1500 / 4000 [ 37%]  (Warmup)
## Chain 2 Iteration: 1200 / 4000 [ 30%]  (Warmup)
## Chain 3 Iteration: 1300 / 4000 [ 32%]  (Warmup)
## Chain 1 Iteration: 1600 / 4000 [ 40%]  (Warmup)
## Chain 2 Iteration: 1300 / 4000 [ 32%]  (Warmup)
## Chain 4 Iteration: 1300 / 4000 [ 32%]  (Warmup)
## Chain 1 Iteration: 1700 / 4000 [ 42%]  (Warmup)
## Chain 2 Iteration: 1400 / 4000 [ 35%]  (Warmup)
## Chain 3 Iteration: 1400 / 4000 [ 35%]  (Warmup)
## Chain 4 Iteration: 1400 / 4000 [ 35%]  (Warmup)
## Chain 1 Iteration: 1800 / 4000 [ 45%]  (Warmup)
## Chain 3 Iteration: 1500 / 4000 [ 37%]  (Warmup)
## Chain 4 Iteration: 1500 / 4000 [ 37%]  (Warmup)
## Chain 2 Iteration: 1500 / 4000 [ 37%]  (Warmup)
## Chain 3 Iteration: 1600 / 4000 [ 40%]  (Warmup)
## Chain 1 Iteration: 1900 / 4000 [ 47%]  (Warmup)
## Chain 2 Iteration: 1600 / 4000 [ 40%]  (Warmup)
## Chain 4 Iteration: 1600 / 4000 [ 40%]  (Warmup)
## Chain 1 Iteration: 2000 / 4000 [ 50%]  (Warmup)
## Chain 1 Iteration: 2001 / 4000 [ 50%]  (Sampling)
## Chain 2 Iteration: 1700 / 4000 [ 42%]  (Warmup)
## Chain 3 Iteration: 1700 / 4000 [ 42%]  (Warmup)
## Chain 4 Iteration: 1700 / 4000 [ 42%]  (Warmup)
## Chain 3 Iteration: 1800 / 4000 [ 45%]  (Warmup)
## Chain 4 Iteration: 1800 / 4000 [ 45%]  (Warmup)
## Chain 1 Iteration: 2100 / 4000 [ 52%]  (Sampling)
## Chain 2 Iteration: 1800 / 4000 [ 45%]  (Warmup)
## Chain 3 Iteration: 1900 / 4000 [ 47%]  (Warmup)
## Chain 4 Iteration: 1900 / 4000 [ 47%]  (Warmup)
## Chain 1 Iteration: 2200 / 4000 [ 55%]  (Sampling)
## Chain 2 Iteration: 1900 / 4000 [ 47%]  (Warmup)
## Chain 1 Iteration: 2300 / 4000 [ 57%]  (Sampling)
## Chain 2 Iteration: 2000 / 4000 [ 50%]  (Warmup)
## Chain 2 Iteration: 2001 / 4000 [ 50%]  (Sampling)
## Chain 3 Iteration: 2000 / 4000 [ 50%]  (Warmup)
## Chain 3 Iteration: 2001 / 4000 [ 50%]  (Sampling)
## Chain 1 Iteration: 2400 / 4000 [ 60%]  (Sampling)
## Chain 3 Iteration: 2100 / 4000 [ 52%]  (Sampling)
## Chain 4 Iteration: 2000 / 4000 [ 50%]  (Warmup)
## Chain 4 Iteration: 2001 / 4000 [ 50%]  (Sampling)
## Chain 1 Iteration: 2500 / 4000 [ 62%]  (Sampling)
## Chain 2 Iteration: 2100 / 4000 [ 52%]  (Sampling)
## Chain 4 Iteration: 2100 / 4000 [ 52%]  (Sampling)
## Chain 2 Iteration: 2200 / 4000 [ 55%]  (Sampling)
## Chain 3 Iteration: 2200 / 4000 [ 55%]  (Sampling)
## Chain 1 Iteration: 2600 / 4000 [ 65%]  (Sampling)
## Chain 2 Iteration: 2300 / 4000 [ 57%]  (Sampling)
## Chain 3 Iteration: 2300 / 4000 [ 57%]  (Sampling)
## Chain 4 Iteration: 2200 / 4000 [ 55%]  (Sampling)
## Chain 1 Iteration: 2700 / 4000 [ 67%]  (Sampling)
## Chain 2 Iteration: 2400 / 4000 [ 60%]  (Sampling)
## Chain 3 Iteration: 2400 / 4000 [ 60%]  (Sampling)
## Chain 4 Iteration: 2300 / 4000 [ 57%]  (Sampling)
## Chain 1 Iteration: 2800 / 4000 [ 70%]  (Sampling)
```

```
## Chain 3 Iteration: 2500 / 4000 [ 62%]  (Sampling)
## Chain 1 Iteration: 2900 / 4000 [ 72%]  (Sampling)
## Chain 2 Iteration: 2500 / 4000 [ 62%]  (Sampling)
## Chain 4 Iteration: 2400 / 4000 [ 60%]  (Sampling)
## Chain 1 Iteration: 3000 / 4000 [ 75%]  (Sampling)
## Chain 2 Iteration: 2600 / 4000 [ 65%]  (Sampling)
## Chain 3 Iteration: 2600 / 4000 [ 65%]  (Sampling)
## Chain 4 Iteration: 2500 / 4000 [ 62%]  (Sampling)
## Chain 1 Iteration: 3100 / 4000 [ 77%]  (Sampling)
## Chain 2 Iteration: 2700 / 4000 [ 67%]  (Sampling)
## Chain 3 Iteration: 2700 / 4000 [ 67%]  (Sampling)
## Chain 2 Iteration: 2800 / 4000 [ 70%]  (Sampling)
## Chain 3 Iteration: 2800 / 4000 [ 70%]  (Sampling)
## Chain 4 Iteration: 2600 / 4000 [ 65%]  (Sampling)
## Chain 1 Iteration: 3200 / 4000 [ 80%]  (Sampling)
## Chain 3 Iteration: 2900 / 4000 [ 72%]  (Sampling)
## Chain 4 Iteration: 2700 / 4000 [ 67%]  (Sampling)
## Chain 1 Iteration: 3300 / 4000 [ 82%]  (Sampling)
## Chain 2 Iteration: 2900 / 4000 [ 72%]  (Sampling)
## Chain 4 Iteration: 2800 / 4000 [ 70%]  (Sampling)
## Chain 1 Iteration: 3400 / 4000 [ 85%]  (Sampling)
## Chain 2 Iteration: 3000 / 4000 [ 75%]  (Sampling)
## Chain 3 Iteration: 3000 / 4000 [ 75%]  (Sampling)
## Chain 1 Iteration: 3500 / 4000 [ 87%]  (Sampling)
## Chain 2 Iteration: 3100 / 4000 [ 77%]  (Sampling)
## Chain 3 Iteration: 3100 / 4000 [ 77%]  (Sampling)
## Chain 4 Iteration: 2900 / 4000 [ 72%]  (Sampling)
## Chain 2 Iteration: 3200 / 4000 [ 80%]  (Sampling)
## Chain 3 Iteration: 3200 / 4000 [ 80%]  (Sampling)
## Chain 4 Iteration: 3000 / 4000 [ 75%]  (Sampling)
## Chain 1 Iteration: 3600 / 4000 [ 90%]  (Sampling)
## Chain 3 Iteration: 3300 / 4000 [ 82%]  (Sampling)
## Chain 1 Iteration: 3700 / 4000 [ 92%]  (Sampling)
## Chain 2 Iteration: 3300 / 4000 [ 82%]  (Sampling)
## Chain 4 Iteration: 3100 / 4000 [ 77%]  (Sampling)
## Chain 1 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 2 Iteration: 3400 / 4000 [ 85%]  (Sampling)
## Chain 3 Iteration: 3400 / 4000 [ 85%]  (Sampling)
## Chain 4 Iteration: 3200 / 4000 [ 80%]  (Sampling)
## Chain 1 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 2 Iteration: 3500 / 4000 [ 87%]  (Sampling)
## Chain 3 Iteration: 3500 / 4000 [ 87%]  (Sampling)
## Chain 2 Iteration: 3600 / 4000 [ 90%]  (Sampling)
## Chain 3 Iteration: 3600 / 4000 [ 90%]  (Sampling)
## Chain 4 Iteration: 3300 / 4000 [ 82%]  (Sampling)
## Chain 1 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 3 Iteration: 3700 / 4000 [ 92%]  (Sampling)
## Chain 4 Iteration: 3400 / 4000 [ 85%]  (Sampling)
## Chain 1 finished in 6.1 seconds.
## Chain 2 Iteration: 3700 / 4000 [ 92%]  (Sampling)
## Chain 3 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 2 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 4 Iteration: 3500 / 4000 [ 87%]  (Sampling)
## Chain 2 Iteration: 3900 / 4000 [ 97%]  (Sampling)
```

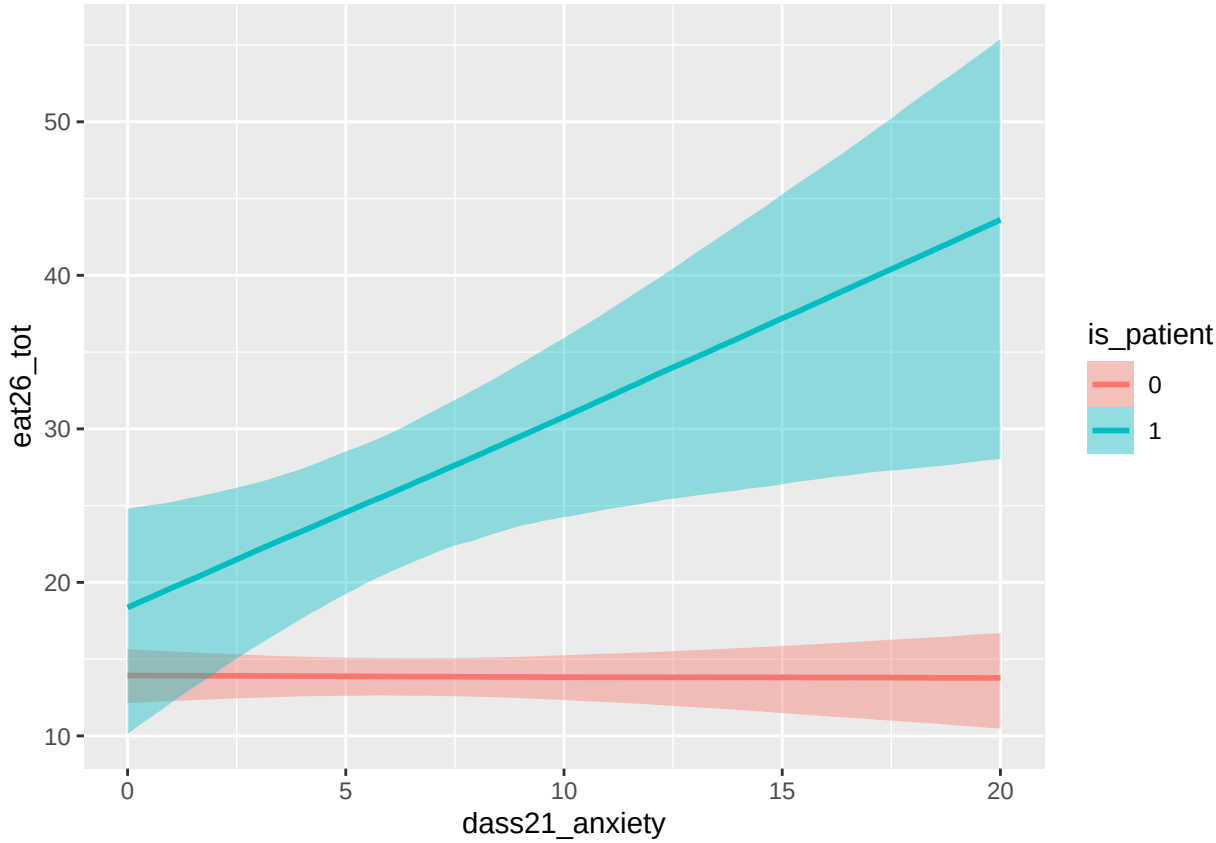
```
## Chain 3 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 4 Iteration: 3600 / 4000 [ 90%]  (Sampling)
## Chain 2 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 3 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 2 finished in 6.6 seconds.
## Chain 3 finished in 6.5 seconds.
## Chain 4 Iteration: 3700 / 4000 [ 92%]  (Sampling)
## Chain 4 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 4 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 4 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 4 finished in 7.0 seconds.
##
## All 4 chains finished successfully.
## Mean chain execution time: 6.6 seconds.
## Total execution time: 7.3 seconds.
```

```
summary(m3)
```

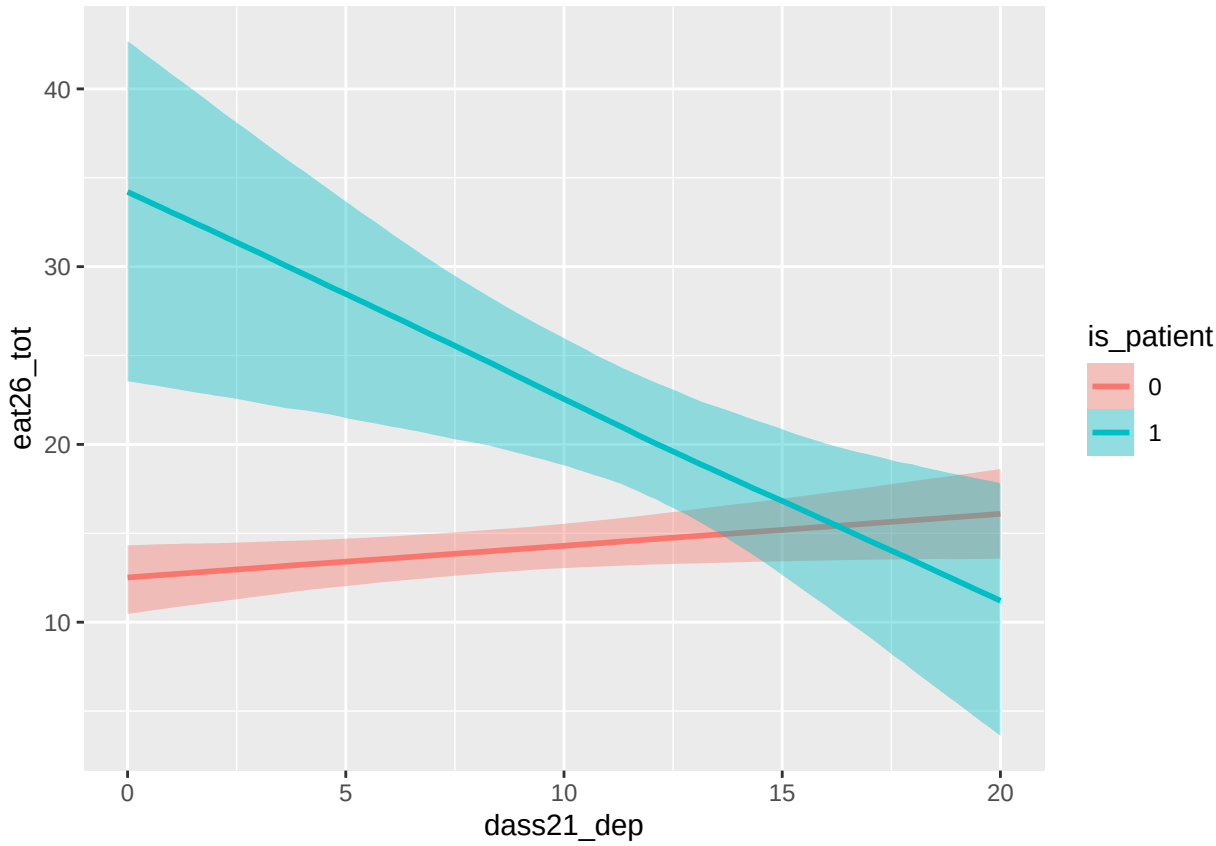
```
##  Family: skew_normal
##   Links: mu = identity; sigma = identity; alpha = identity
## Formula: eat26_tot ~ bmi + age + (dass21_anxiety + dass21_dep) * (is_patient + sex)
##    Data: quest_data3 (Number of observations: 265)
## Samples: 4 chains, each with iter = 4000; warmup = 2000; thin = 1;
##          total post-warmup samples = 8000
##
## Population-Level Effects:
##                            Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS
## Intercept                     19.62      2.72    14.29    24.94 1.00     7666
## bmi                           -0.13      0.12    -0.38     0.10 1.00     7057
## age                           -0.19      0.09    -0.36    -0.03 1.00     6078
## dass21_anxiety                -0.01      0.11    -0.22     0.19 1.00     5815
## dass21_dep                     0.18      0.10     0.00     0.37 1.00     5067
## is_patient1                   14.30      5.44     2.44    23.16 1.00     4734
## sexMaschio                    -0.42      2.19    -5.23     3.39 1.00     5529
## dass21_anxiety:is_patient1     1.26      0.50     0.24     2.16 1.00     5732
## dass21_anxiety:sexMaschio      0.03      0.30    -0.60     0.63 1.00     6633
## dass21_dep:is_patient1        -1.32      0.40    -2.09    -0.52 1.00     5136
## dass21_dep:sexMaschio         -0.17      0.23    -0.65     0.25 1.00     5697
##                            Tail_ESS
## Intercept                      6406
## bmi                            5337
## age                            5773
## dass21_anxiety                 5658
## dass21_dep                     5798
## is_patient1                    4342
## sexMaschio                     4416
## dass21_anxiety:is_patient1     5190
## dass21_anxiety:sexMaschio      5223
## dass21_dep:is_patient1         5783
## dass21_dep:sexMaschio          4543
##
## Family Specific Parameters:
##       Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## sigma     9.06      0.42     8.29     9.92 1.00     5964     5186
## alpha     9.96      2.12     6.43    14.58 1.00     6068     5070
```

```
##
## Samples were drawn using sample(hmc). For each parameter, Bulk_ESS
## and Tail_ESS are effective sample size measures, and Rhat is the potential
## scale reduction factor on split chains (at convergence, Rhat = 1).
```

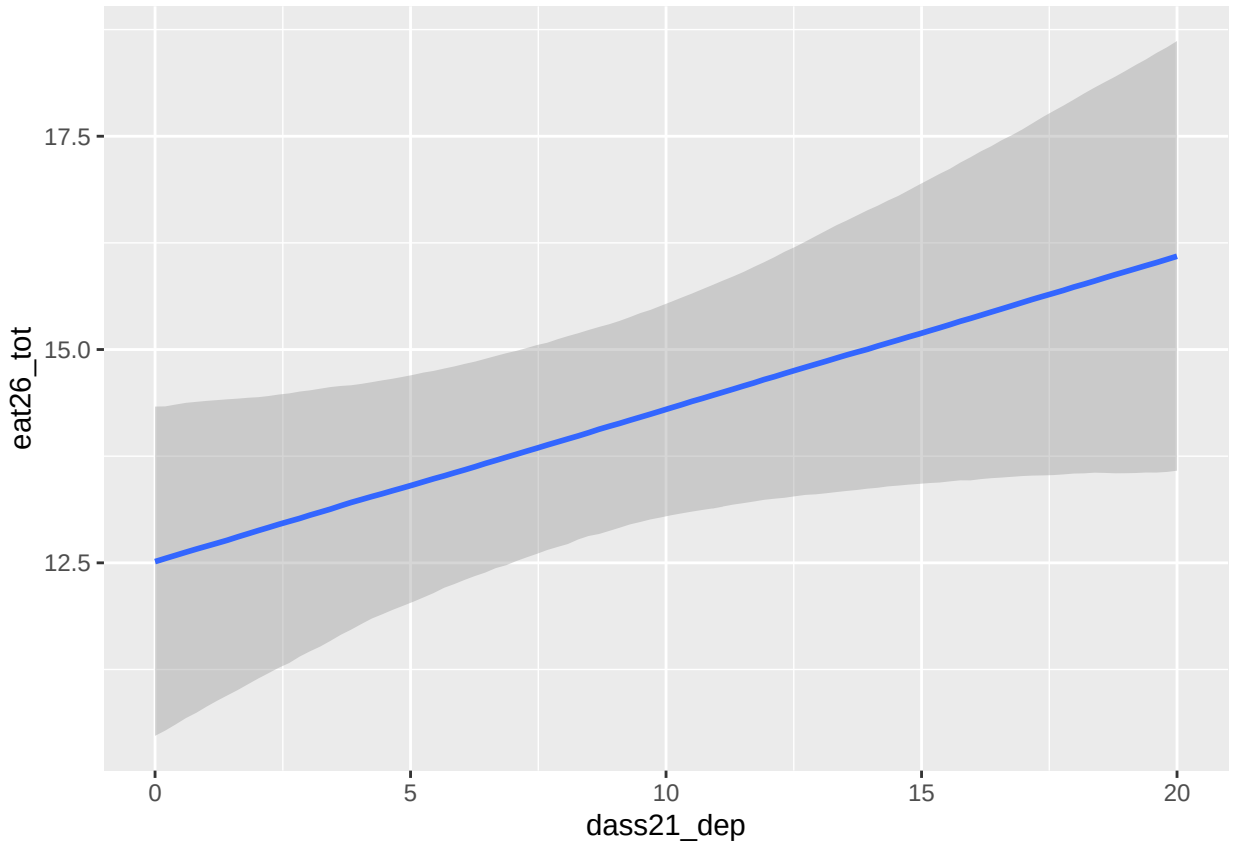
```
plot(conditional_effects(m3, "dass21_anxiety:is_patient"))
```



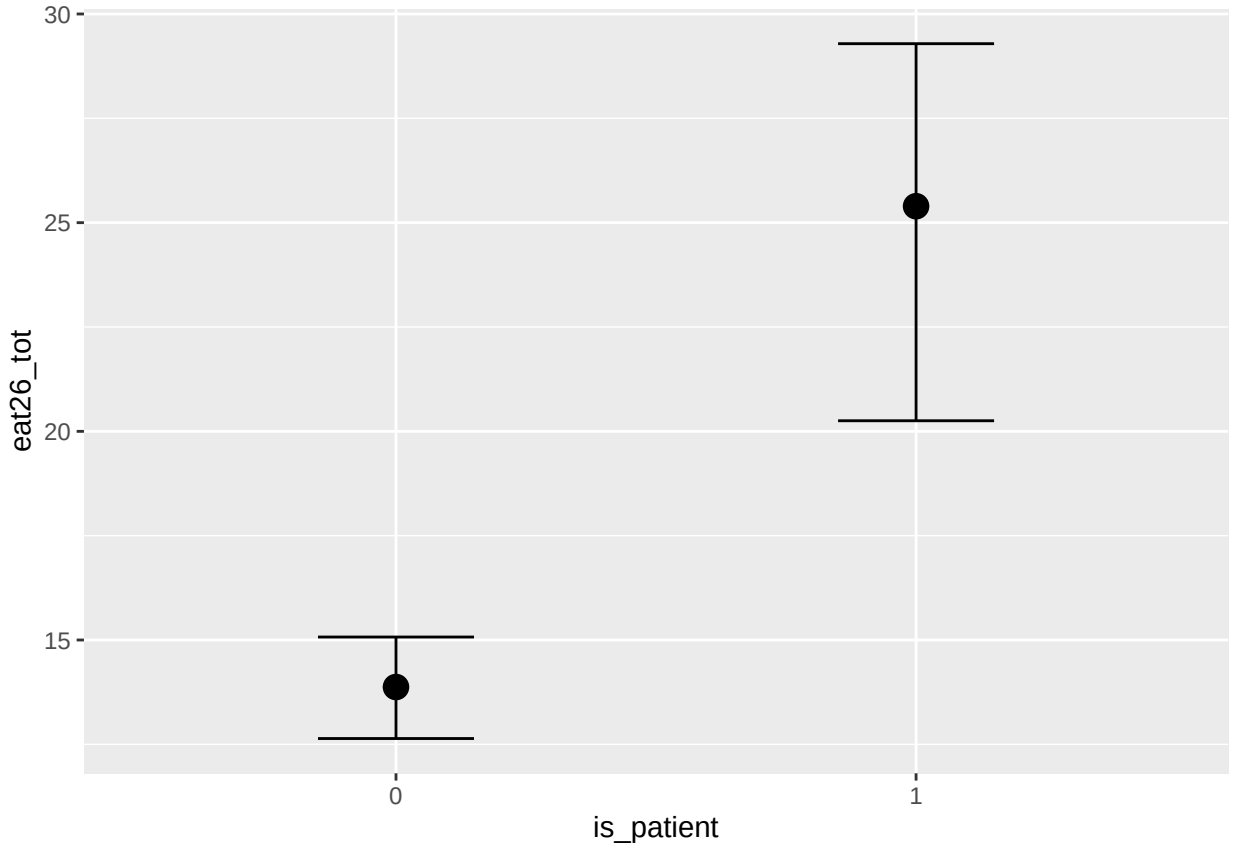

```
plot(conditional_effects(m3, "dass21_dep:is_patient"))
```



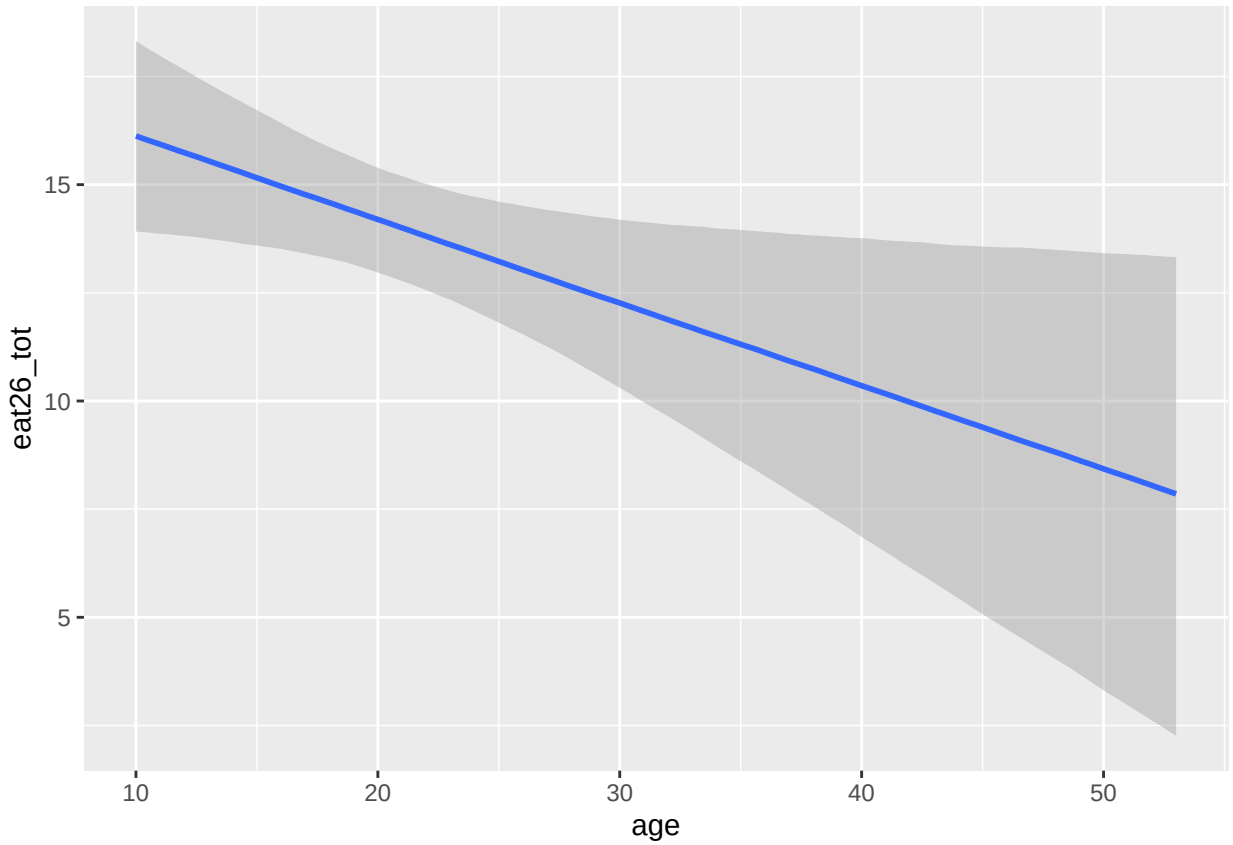

```
plot(conditional_effects(m3, "dass21_dep"))
```




```
plot(conditional_effects(m3, "is_patient"))
```




```
plot(conditional_effects(m3, "age"))
```




```
m4 <- brm(
  eat26_tot ~ bmi + age + (dass21_anxiety + dass21_dep),
  data = quest_data3[quest_data3$sex == "Femmina", ],
  # prior = prior_ma,
  family = skew_normal(),
  control = list(adapt_delta = 0.98),
  iter = 4000,
  cores = 6,
  backend = "cmdstan"
)
```

```
## Warning: Rows containing NAs were excluded from the model.

## Start sampling

## Running MCMC with 4 chains, at most 6 in parallel...
##
## Chain 1 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 2 Iteration:    1 / 4000 [  0%]  (Warmup)

## Chain 3 Rejecting initial value:

## Chain 3   Log probability evaluates to log(0), i.e. negative infinity.

## Chain 3   Stan can't start sampling from this initial value.

## Chain 3 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 4 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 1 Iteration:  100 / 4000 [  2%]  (Warmup)
## Chain 4 Iteration:  100 / 4000 [  2%]  (Warmup)
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## Chain 1 Iteration:  200 / 4000 [  5%]  (Warmup)
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## Chain 1 Iteration: 3800 / 4000 [ 95%]  (Sampling)
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## Chain 2 Iteration: 3600 / 4000 [ 90%]  (Sampling)
## Chain 2 Iteration: 3700 / 4000 [ 92%]  (Sampling)
## Chain 3 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 4 Iteration: 3300 / 4000 [ 82%]  (Sampling)
## Chain 4 Iteration: 3400 / 4000 [ 85%]  (Sampling)
## Chain 1 finished in 1.7 seconds.
## Chain 3 finished in 1.6 seconds.
## Chain 2 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 2 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 2 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 4 Iteration: 3500 / 4000 [ 87%]  (Sampling)
## Chain 4 Iteration: 3600 / 4000 [ 90%]  (Sampling)
## Chain 2 finished in 1.8 seconds.
## Chain 4 Iteration: 3700 / 4000 [ 92%]  (Sampling)
```
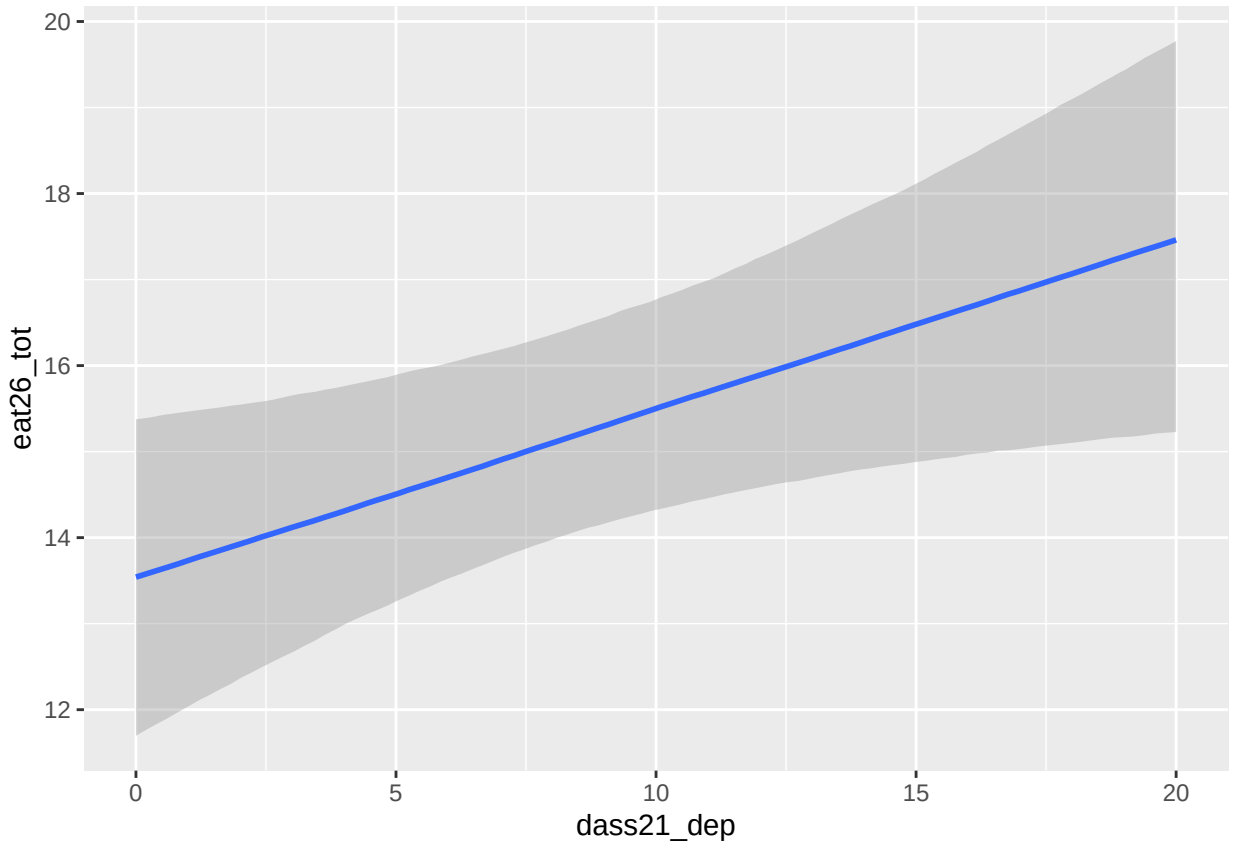

```
## Chain 4 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 4 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 4 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 4 finished in 2.0 seconds.
##
## All 4 chains finished successfully.
## Mean chain execution time: 1.8 seconds.
## Total execution time: 2.2 seconds.
```

```
summary(m4)
```

```
##  Family: skew_normal
##   Links: mu = identity; sigma = identity; alpha = identity
## Formula: eat26_tot ~ bmi + age + (dass21_anxiety + dass21_dep)
##    Data: quest_data3[quest_data3$sex == "Femmina", ] (Number of observations: 225)
## Samples: 4 chains, each with iter = 4000; warmup = 2000; thin = 1;
##          total post-warmup samples = 8000
##
## Population-Level Effects:
##                Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## Intercept         14.55      3.35     8.21    21.37 1.00     7655     5397
## bmi               -0.00      0.13    -0.27     0.24 1.00     7233     5083
## age               -0.04      0.09    -0.25     0.12 1.00     6055     4535
## dass21_anxiety    -0.01      0.09    -0.19     0.17 1.00     5644     5013
## dass21_dep         0.20      0.08     0.04     0.37 1.00     6021     5143
##
## Family Specific Parameters:
##       Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## sigma     9.62      0.47     8.76    10.59 1.00     4641     4747
## alpha    11.74      2.19     7.92    16.45 1.00     6187     5376
##
## Samples were drawn using sample(hmc). For each parameter, Bulk_ESS
## and Tail_ESS are effective sample size measures, and Rhat is the potential
## scale reduction factor on split chains (at convergence, Rhat = 1).
```

```
plot(conditional_effects(m4, "dass21_dep"))
```




```
m4a <- brm(
  eat26_tot ~ bmi + age + (dass21_anxiety + dass21_dep),
  data = quest_data3[quest_data3$sex == "Femmina" & quest_data3$is_patient == 0, ],
  # prior = prior_ma,
  family = skew_normal(),
  control = list(adapt_delta = 0.98),
  iter = 4000,
  cores = 6,
  backend = "cmdstan"
)
```

```
## Warning: Rows containing NAs were excluded from the model.
## Start sampling
## Running MCMC with 4 chains, at most 6 in parallel...
## Chain 1 Rejecting initial value:
## Chain 1   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 1   Stan can't start sampling from this initial value.
## Chain 1 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 2 Rejecting initial value:
## Chain 2   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 2   Stan can't start sampling from this initial value.
## Chain 2 Iteration:    1 / 4000 [  0%]  (Warmup)
```

```
## Chain 3 Rejecting initial value:
## Chain 3   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 3   Stan can't start sampling from this initial value.
## Chain 3 Rejecting initial value:
## Chain 3   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 3   Stan can't start sampling from this initial value.
## Chain 3 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 4 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 1 Iteration:  100 / 4000 [  2%]  (Warmup)
## Chain 1 Iteration:  200 / 4000 [  5%]  (Warmup)
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## Chain 3 Iteration: 3100 / 4000 [ 77%]  (Sampling)
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## Chain 3 Iteration: 3200 / 4000 [ 80%]  (Sampling)
## Chain 3 Iteration: 3300 / 4000 [ 82%]  (Sampling)
## Chain 4 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 4 finished in 1.4 seconds.
## Chain 1 Iteration: 3500 / 4000 [ 87%]  (Sampling)
## Chain 1 Iteration: 3600 / 4000 [ 90%]  (Sampling)
## Chain 1 Iteration: 3700 / 4000 [ 92%]  (Sampling)
```

```
## Chain 2 Iteration: 3700 / 4000 [ 92%]  (Sampling)
## Chain 2 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 2 Iteration: 3900 / 4000 [ 97%]  (Sampling)
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## Chain 1 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 1 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 2 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 3 Iteration: 3700 / 4000 [ 92%]  (Sampling)
## Chain 3 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 2 finished in 1.6 seconds.
## Chain 1 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 3 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 3 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 1 finished in 1.7 seconds.
## Chain 3 finished in 1.8 seconds.
##
## All 4 chains finished successfully.
## Mean chain execution time: 1.6 seconds.
## Total execution time: 2.0 seconds.
```
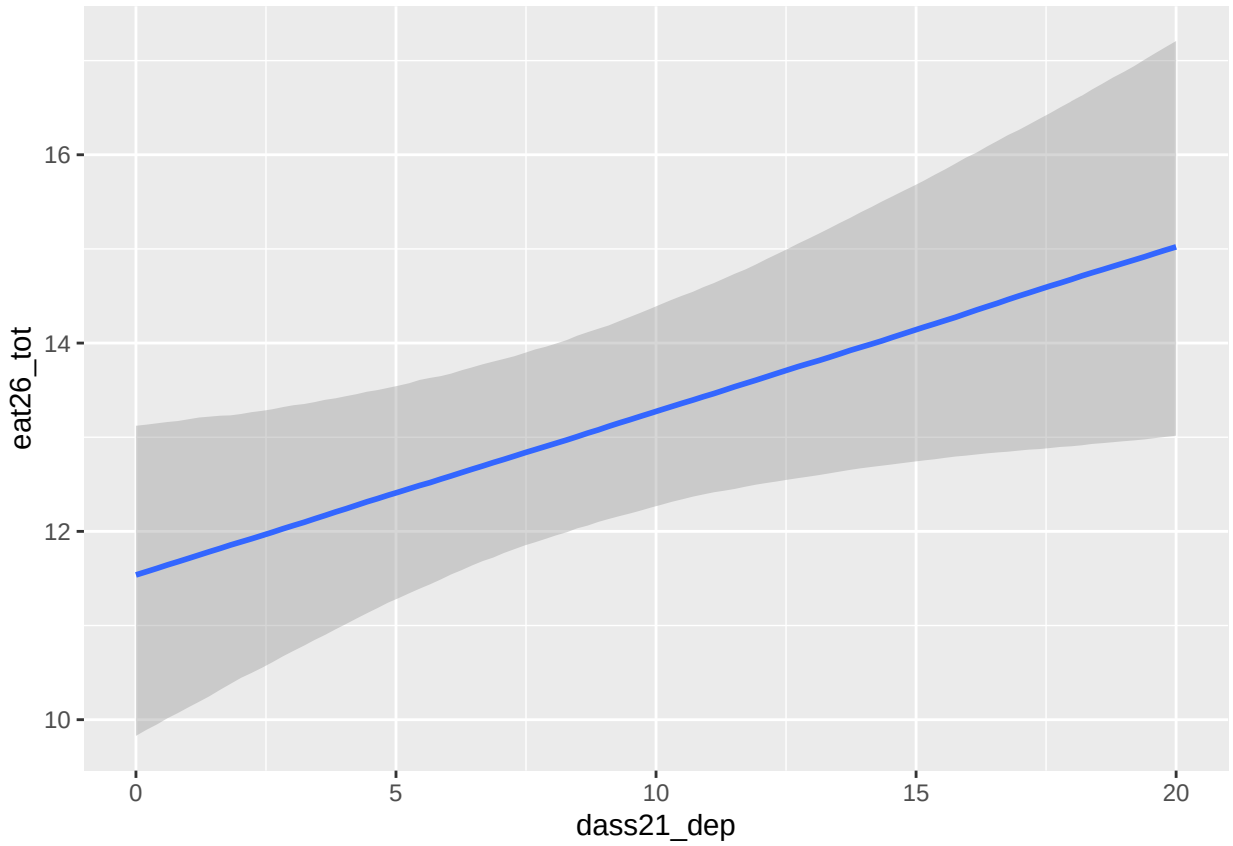

```
summary(m4a)
```

```
##  Family: skew_normal
##   Links: mu = identity; sigma = identity; alpha = identity
## Formula: eat26_tot ~ bmi + age + (dass21_anxiety + dass21_dep)
##    Data: quest_data3[quest_data3$sex == "Femmina" & quest_d (Number of observations: 206)
## Samples: 4 chains, each with iter = 4000; warmup = 2000; thin = 1;
##          total post-warmup samples = 8000
##
## Population-Level Effects:
##                Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## Intercept         11.12      3.43     4.54    18.09 1.00     6304     5028
## bmi                0.10      0.12    -0.14     0.33 1.00     5903     4785
## age               -0.08      0.10    -0.29     0.09 1.00     6683     4189
## dass21_anxiety    -0.02      0.09    -0.20     0.14 1.00     5557     5711
## dass21_dep         0.18      0.08     0.03     0.34 1.00     5173     5149
##
## Family Specific Parameters:
##       Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## sigma     7.75      0.39     7.04     8.55 1.00     4893     5205
## alpha    10.62      2.17     6.90    15.20 1.00     5678     4357
##
## Samples were drawn using sample(hmc). For each parameter, Bulk_ESS
## and Tail_ESS are effective sample size measures, and Rhat is the potential
## scale reduction factor on split chains (at convergence, Rhat = 1).
```

```
plot(conditional_effects(m4a, "dass21_dep"))
```




```
m5 <- brm(
  eat26_tot ~ bmi + age + (dass21_anxiety + dass21_dep),
  data = quest_data3[quest_data3$sex == "Maschio", ],
  # prior = prior_ma,
  family = skew_normal(),
  control = list(adapt_delta = 0.98),
  iter = 4000,
  cores = 6,
  backend = "cmdstan"
)
```

```
## Start sampling
## Running MCMC with 4 chains, at most 6 in parallel...
##
## Chain 1 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 1 Iteration:  100 / 4000 [  2%]  (Warmup)
## Chain 1 Iteration:  200 / 4000 [  5%]  (Warmup)
## Chain 1 Iteration:  300 / 4000 [  7%]  (Warmup)
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## Chain 1 Iteration:  500 / 4000 [ 12%]  (Warmup)
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## Chain 2 Iteration:  500 / 4000 [ 12%]  (Warmup)
## Chain 2 Iteration:  600 / 4000 [ 15%]  (Warmup)
```

```
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## Chain 3 Iteration: 2900 / 4000 [ 72%]  (Sampling)
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## Chain 4 Iteration: 3600 / 4000 [ 90%]  (Sampling)
## Chain 4 Iteration: 3700 / 4000 [ 92%]  (Sampling)
## Chain 4 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 4 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 1 finished in 0.4 seconds.
## Chain 2 finished in 0.4 seconds.
## Chain 3 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 3 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 4 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 3 finished in 0.5 seconds.
## Chain 4 finished in 0.5 seconds.
##
## All 4 chains finished successfully.
## Mean chain execution time: 0.4 seconds.
```
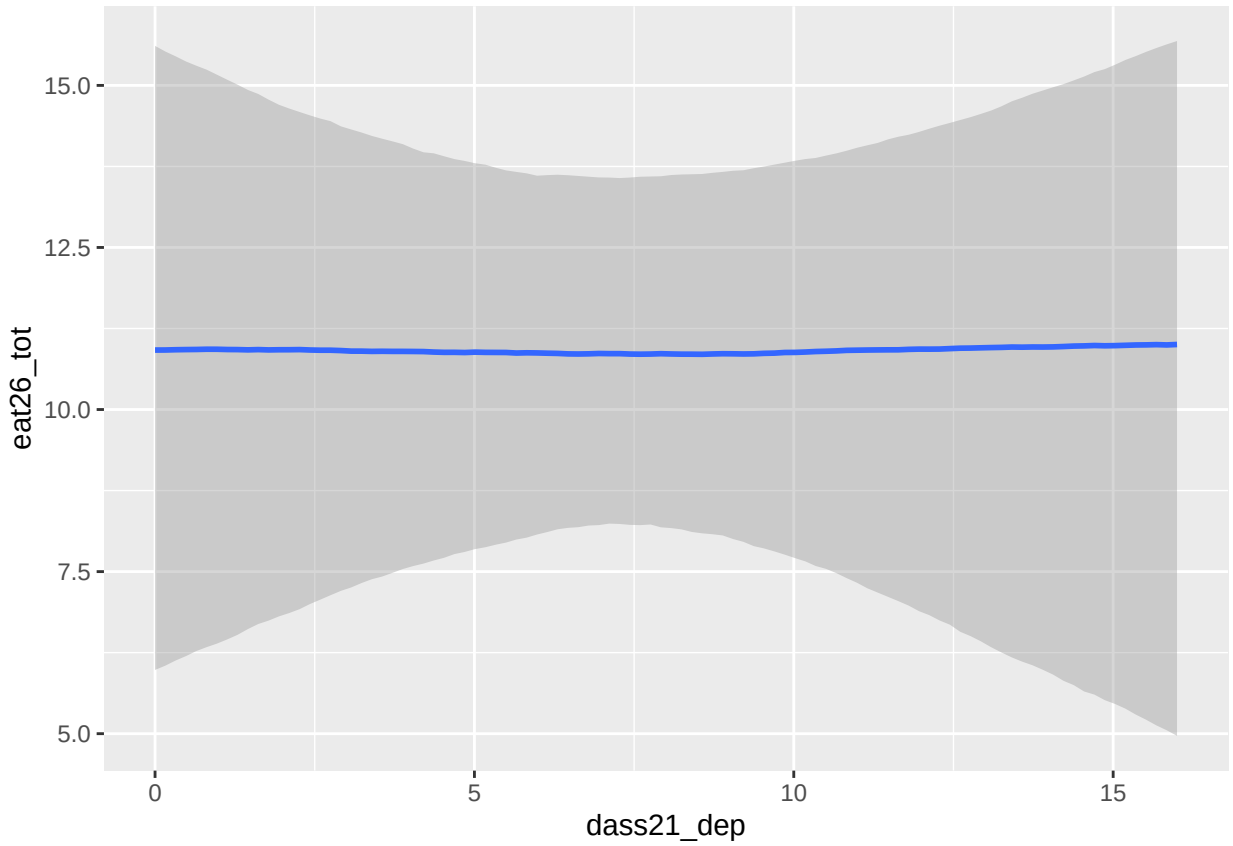

```
## Total execution time: 0.7 seconds.
```

```
summary(m5)
```

```
##  Family: skew_normal
##   Links: mu = identity; sigma = identity; alpha = identity
## Formula: eat26_tot ~ bmi + age + (dass21_anxiety + dass21_dep)
##    Data: quest_data3[quest_data3$sex == "Maschio", ] (Number of observations: 40)
## Samples: 4 chains, each with iter = 4000; warmup = 2000; thin = 1;
##          total post-warmup samples = 8000
##
## Population-Level Effects:
##                Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## Intercept         25.46      8.92     7.59    42.57 1.00     5497     4860
## bmi               -0.66      0.38    -1.44     0.08 1.00     4708     4544
## age               -0.01      0.16    -0.35     0.27 1.00     4968     4316
## dass21_anxiety     0.05      0.35    -0.64     0.75 1.00     5240     4398
## dass21_dep         0.00      0.27    -0.58     0.51 1.00     4552     4385
##
## Family Specific Parameters:
##       Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## sigma     8.77      1.05     7.01    11.08 1.00     4430     4709
## alpha     7.09      2.22     3.45    11.99 1.00     5162     4590
##
## Samples were drawn using sample(hmc). For each parameter, Bulk_ESS
## and Tail_ESS are effective sample size measures, and Rhat is the potential
## scale reduction factor on split chains (at convergence, Rhat = 1).
```

```
plot(conditional_effects(m5, "dass21_dep"))
```




```
quest_data3 %>%
  group_by(sex) %>%
  summarise(
    avg_bu = mean(bulimia, trim = 0.1, na.rm = TRUE),
    avg_di = mean(dieting, trim = 0.1, na.rm = TRUE),
    avg_oc = mean(oral_control, trim = 0.1, na.rm = TRUE),
    n = n()
  )
```

```
## # A tibble: 2 x 5
##   sex     avg_bu avg_di avg_oc     n
##   <chr>    <dbl>  <dbl>  <dbl> <int>
## 1 Femmina   4.18   5.28  1.24    244
## 2 Maschio   3.31   2.12  0.969    40
```

```
dat <- quest_data2 %>%
  dplyr::filter(sex != "Altro")

dat$is_patient <- factor(dat$is_patient)

m6 <- brm(
  bulimia ~ sex,
  data = dat,
  # prior = prior_ma,
  family = skew_normal(),
  control = list(adapt_delta = 0.98),
  iter = 4000,
  cores = 6,
```

```
  backend = "cmdstan"
)
```

```
## Warning: Rows containing NAs were excluded from the model.
```

```
## Start sampling
```

```
## Running MCMC with 4 chains, at most 6 in parallel...
##
## Chain 1 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 2 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 3 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 4 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 4 Iteration:  100 / 4000 [  2%]  (Warmup)
## Chain 1 Iteration:  100 / 4000 [  2%]  (Warmup)
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## Chain 2 Iteration: 3800 / 4000 [ 95%]  (Sampling)
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## Chain 3 Iteration: 3800 / 4000 [ 95%]  (Sampling)
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## Chain 4 Iteration: 3800 / 4000 [ 95%]  (Sampling)
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## Chain 1 Iteration: 3400 / 4000 [ 85%]  (Sampling)
## Chain 1 Iteration: 3500 / 4000 [ 87%]  (Sampling)
## Chain 2 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 3 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 4 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 2 finished in 2.1 seconds.
## Chain 3 finished in 2.1 seconds.
## Chain 4 finished in 2.1 seconds.
## Chain 1 Iteration: 3600 / 4000 [ 90%]  (Sampling)
## Chain 1 Iteration: 3700 / 4000 [ 92%]  (Sampling)
## Chain 1 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 1 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 1 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 1 finished in 2.5 seconds.
##
## All 4 chains finished successfully.
## Mean chain execution time: 2.2 seconds.
## Total execution time: 2.7 seconds.
```
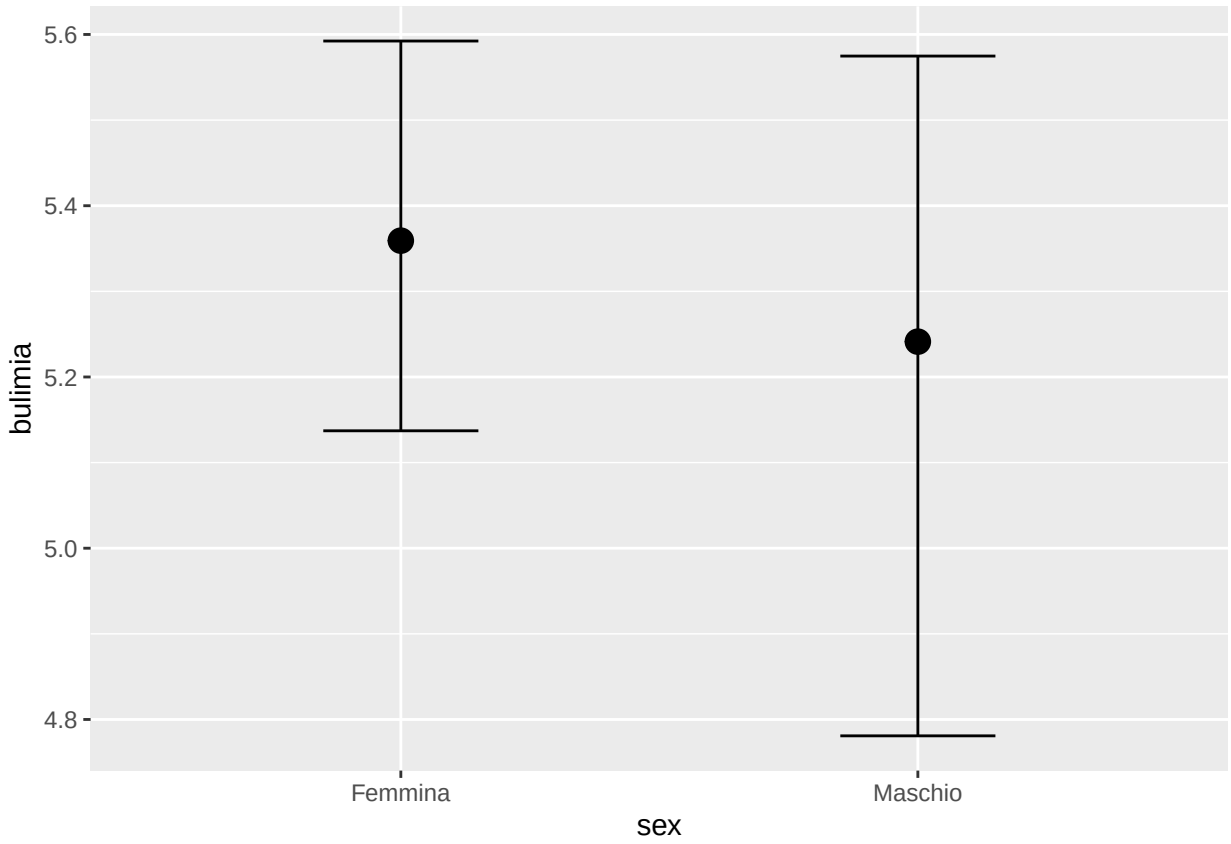

```
summary(m6)
```

```
##  Family: skew_normal
##   Links: mu = identity; sigma = identity; alpha = identity
## Formula: bulimia ~ sex
##    Data: dat (Number of observations: 266)
## Samples: 4 chains, each with iter = 4000; warmup = 2000; thin = 1;
##          total post-warmup samples = 8000
##
## Population-Level Effects:
##             Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## Intercept      5.36      0.12     5.14     5.59 1.00     3210     3842
## sexMaschio    -0.14      0.18    -0.57     0.15 1.00     3876     3036
##
## Family Specific Parameters:
##       Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## sigma     2.10      0.09     1.93     2.29 1.00     3455     3738
## alpha    17.23      2.30    12.99    22.01 1.00     4334     4222
##
## Samples were drawn using sample(hmc). For each parameter, Bulk_ESS
## and Tail_ESS are effective sample size measures, and Rhat is the potential
## scale reduction factor on split chains (at convergence, Rhat = 1).
```

```
plot(conditional_effects(m6, "sex"))
```




```
m7 <- brm(
  dieting ~ sex,
  data = dat,
  # prior = prior_ma,
  family = skew_normal(),
  control = list(adapt_delta = 0.98),
  iter = 4000,
  cores = 6,
  backend = "cmdstan"
)
```

```
## Warning: Rows containing NAs were excluded from the model.
```

```
## Start sampling
```

```
## Running MCMC with 4 chains, at most 6 in parallel...
##
## Chain 1 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 2 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 3 Iteration:    1 / 4000 [  0%]  (Warmup)
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## Chain 2 Iteration:  300 / 4000 [  7%]  (Warmup)
## Chain 3 Iteration:  200 / 4000 [  5%]  (Warmup)
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## Chain 3 Iteration:  300 / 4000 [  7%]  (Warmup)
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## Chain 3 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 4 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 4 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 1 finished in 2.1 seconds.
## Chain 2 finished in 2.1 seconds.
## Chain 3 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 4 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 4 finished in 2.2 seconds.
## Chain 3 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 3 finished in 2.2 seconds.
##
```
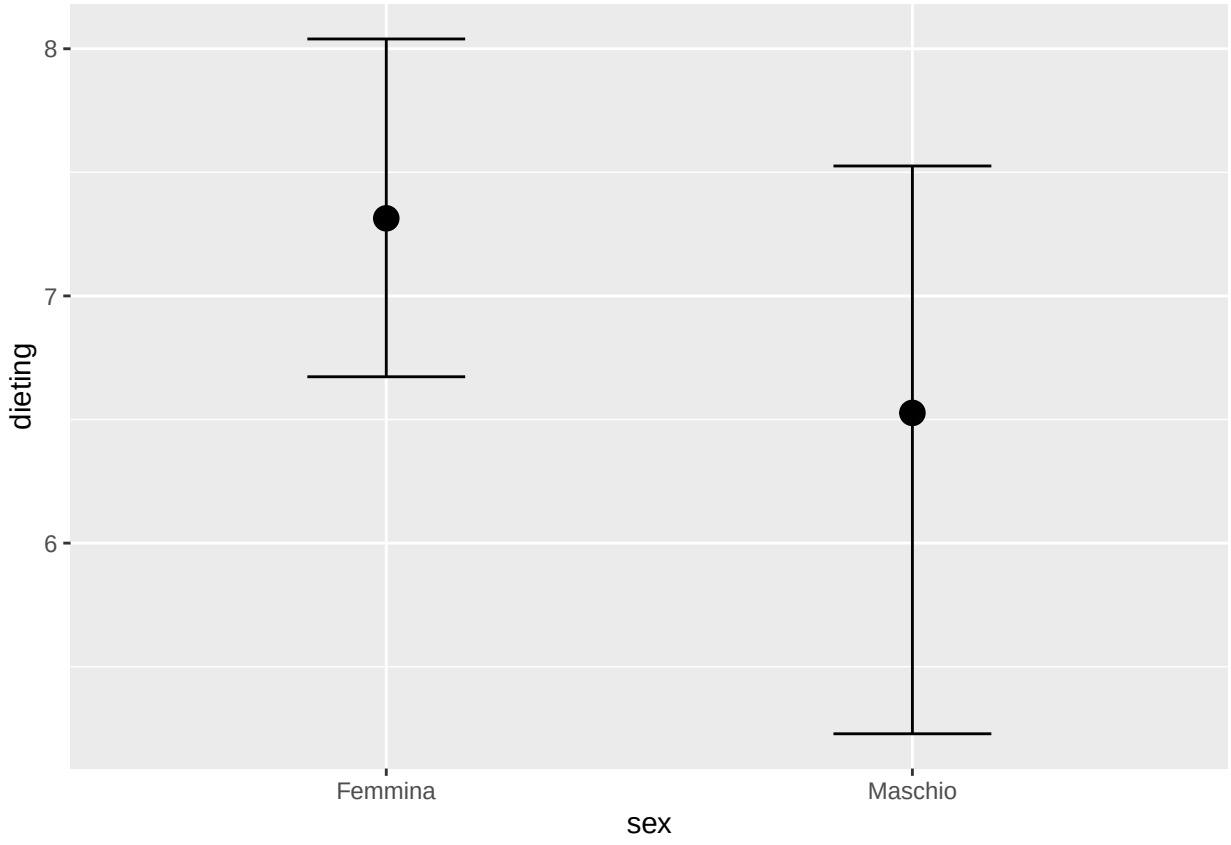

```
## All 4 chains finished successfully.
## Mean chain execution time: 2.1 seconds.
## Total execution time: 2.5 seconds.
```

```
summary(m7)
```

```
##  Family: skew_normal
##   Links: mu = identity; sigma = identity; alpha = identity
## Formula: dieting ~ sex
##    Data: dat (Number of observations: 266)
## Samples: 4 chains, each with iter = 4000; warmup = 2000; thin = 1;
##          total post-warmup samples = 8000
##
## Population-Level Effects:
##             Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## Intercept       7.32      0.35     6.67     8.04 1.00     3226     3521
## sexMaschio     -0.84      0.55    -2.07     0.08 1.00     5028     3454
##
## Family Specific Parameters:
##       Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## sigma     5.87      0.26     5.40     6.40 1.00     3178     3786
## alpha    13.37      2.29     9.32    18.29 1.00     4127     3557
##
## Samples were drawn using sample(hmc). For each parameter, Bulk_ESS
## and Tail_ESS are effective sample size measures, and Rhat is the potential
## scale reduction factor on split chains (at convergence, Rhat = 1).
```

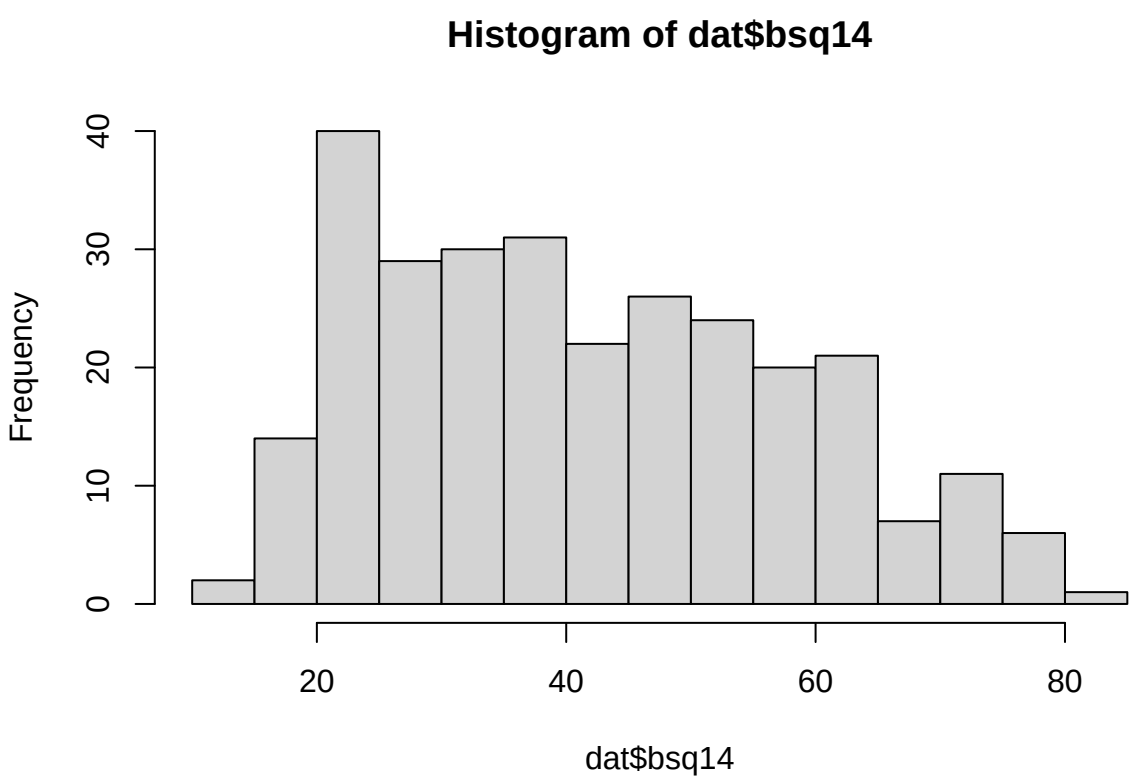
```
plot(conditional_effects(m7, "sex"))
```



```r
dat %>%
  group_by(sex) %>%
  summarise(
    avg_bsq14 = mean(bsq14_tot, trim = 0.1, na.rm = TRUE)
  )
```

```
## # A tibble: 2 x 2
##   sex     avg_bsq14
##   <chr>       <dbl>
## 1 Femmina      43.1
## 2 Maschio      30.0
```

```r
# Prevalence of body image dissatisfaction among youth in the United Arab
# Emirates: gender, age, and body mass index differences
# Siham Alharballeh1 & Hamzeh Dodeen
hist(dat$bsq14)
```




```r
fm0 <- brm(
  bsq14_tot ~ age + bmi + sex,
  data = dat,
  # prior = prior_ma,
  family = skew_normal(),
  control = list(adapt_delta = 0.98),
  iter = 4000,
  cores = 6,
  backend = "cmdstan"
)
```

```
## Warning: Rows containing NAs were excluded from the model.
```

```
## Start sampling
```

```
## Running MCMC with 4 chains, at most 6 in parallel...
##
## Chain 1 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 2 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 3 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 4 Rejecting initial value:
## Chain 4   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 4   Stan can't start sampling from this initial value.
## Chain 4 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 2 Iteration:  100 / 4000 [  2%]  (Warmup)
## Chain 4 Iteration:  100 / 4000 [  2%]  (Warmup)
## Chain 2 Iteration:  200 / 4000 [  5%]  (Warmup)
## Chain 2 Iteration:  300 / 4000 [  7%]  (Warmup)
## Chain 3 Iteration:  100 / 4000 [  2%]  (Warmup)
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## Chain 3 Iteration: 1200 / 4000 [ 30%]  (Warmup)
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## Chain 2 Iteration: 2001 / 4000 [ 50%]  (Sampling)
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## Chain 2 Iteration: 2200 / 4000 [ 55%]  (Sampling)
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## Chain 4 Iteration: 2600 / 4000 [ 65%]  (Sampling)
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## Chain 1 Iteration: 2200 / 4000 [ 55%]  (Sampling)
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## Chain 2 Iteration: 3100 / 4000 [ 77%]  (Sampling)
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## Chain 4 Iteration: 2800 / 4000 [ 70%]  (Sampling)
## Chain 4 Iteration: 2900 / 4000 [ 72%]  (Sampling)
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## Chain 1 Iteration: 2400 / 4000 [ 60%]  (Sampling)
## Chain 2 Iteration: 3200 / 4000 [ 80%]  (Sampling)
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## Chain 2 Iteration: 3400 / 4000 [ 85%]  (Sampling)
## Chain 3 Iteration: 2800 / 4000 [ 70%]  (Sampling)
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## Chain 3 Iteration: 3000 / 4000 [ 75%]  (Sampling)
## Chain 3 Iteration: 3100 / 4000 [ 77%]  (Sampling)
## Chain 3 Iteration: 3200 / 4000 [ 80%]  (Sampling)
## Chain 4 Iteration: 3300 / 4000 [ 82%]  (Sampling)
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## Chain 1 Iteration: 2800 / 4000 [ 70%]  (Sampling)
## Chain 2 Iteration: 3700 / 4000 [ 92%]  (Sampling)
## Chain 2 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 2 Iteration: 3900 / 4000 [ 97%]  (Sampling)
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## Chain 3 Iteration: 3400 / 4000 [ 85%]  (Sampling)
## Chain 4 Iteration: 3500 / 4000 [ 87%]  (Sampling)
## Chain 4 Iteration: 3600 / 4000 [ 90%]  (Sampling)
## Chain 1 Iteration: 2900 / 4000 [ 72%]  (Sampling)
## Chain 1 Iteration: 3000 / 4000 [ 75%]  (Sampling)
## Chain 2 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 3 Iteration: 3500 / 4000 [ 87%]  (Sampling)
## Chain 3 Iteration: 3600 / 4000 [ 90%]  (Sampling)
## Chain 4 Iteration: 3700 / 4000 [ 92%]  (Sampling)
## Chain 4 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 4 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 2 finished in 1.7 seconds.
## Chain 1 Iteration: 3100 / 4000 [ 77%]  (Sampling)
```
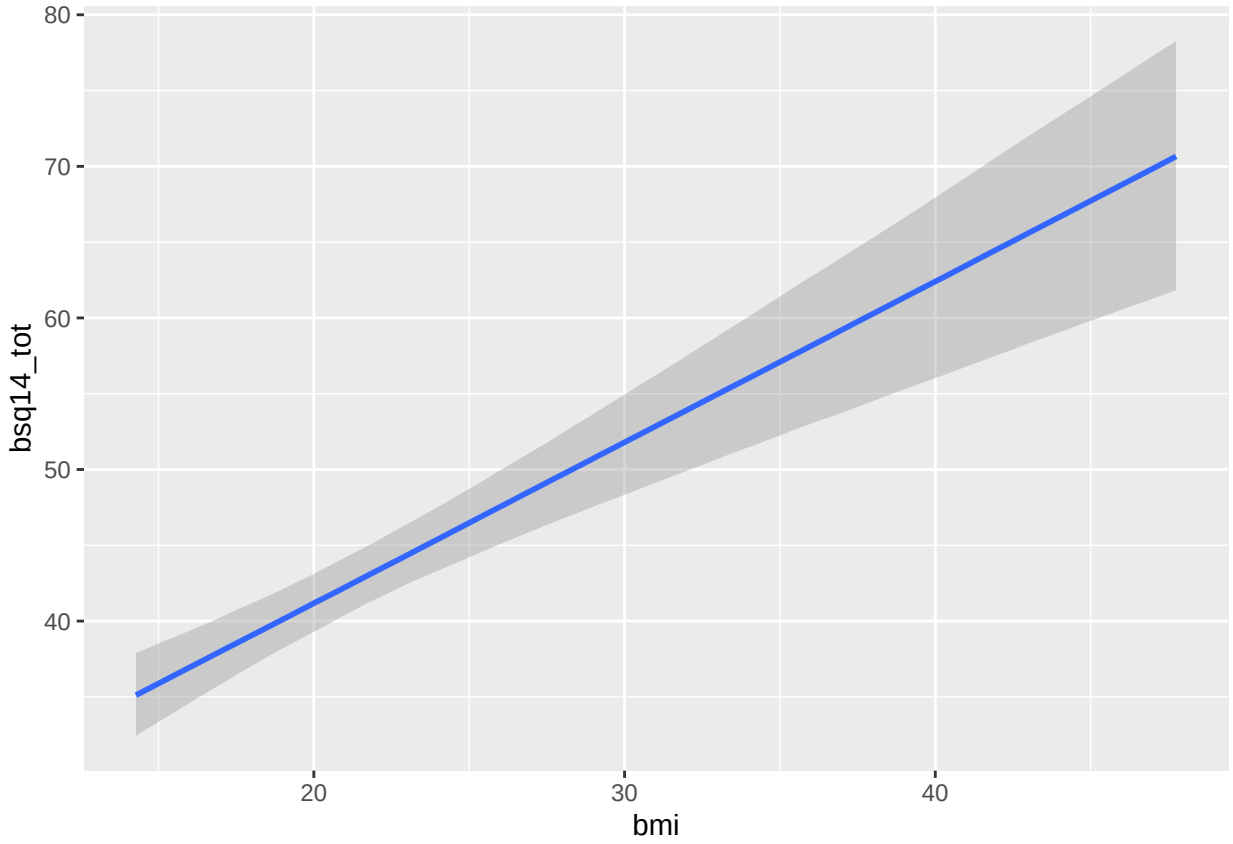

```
## Chain 1 Iteration: 3200 / 4000 [ 80%]  (Sampling)
## Chain 3 Iteration: 3700 / 4000 [ 92%]  (Sampling)
## Chain 3 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 3 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 4 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 4 finished in 1.8 seconds.
## Chain 1 Iteration: 3300 / 4000 [ 82%]  (Sampling)
## Chain 1 Iteration: 3400 / 4000 [ 85%]  (Sampling)
## Chain 3 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 3 finished in 1.9 seconds.
## Chain 1 Iteration: 3500 / 4000 [ 87%]  (Sampling)
## Chain 1 Iteration: 3600 / 4000 [ 90%]  (Sampling)
## Chain 1 Iteration: 3700 / 4000 [ 92%]  (Sampling)
## Chain 1 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 1 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 1 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 1 finished in 2.3 seconds.
##
## All 4 chains finished successfully.
## Mean chain execution time: 1.9 seconds.
## Total execution time: 2.5 seconds.
```

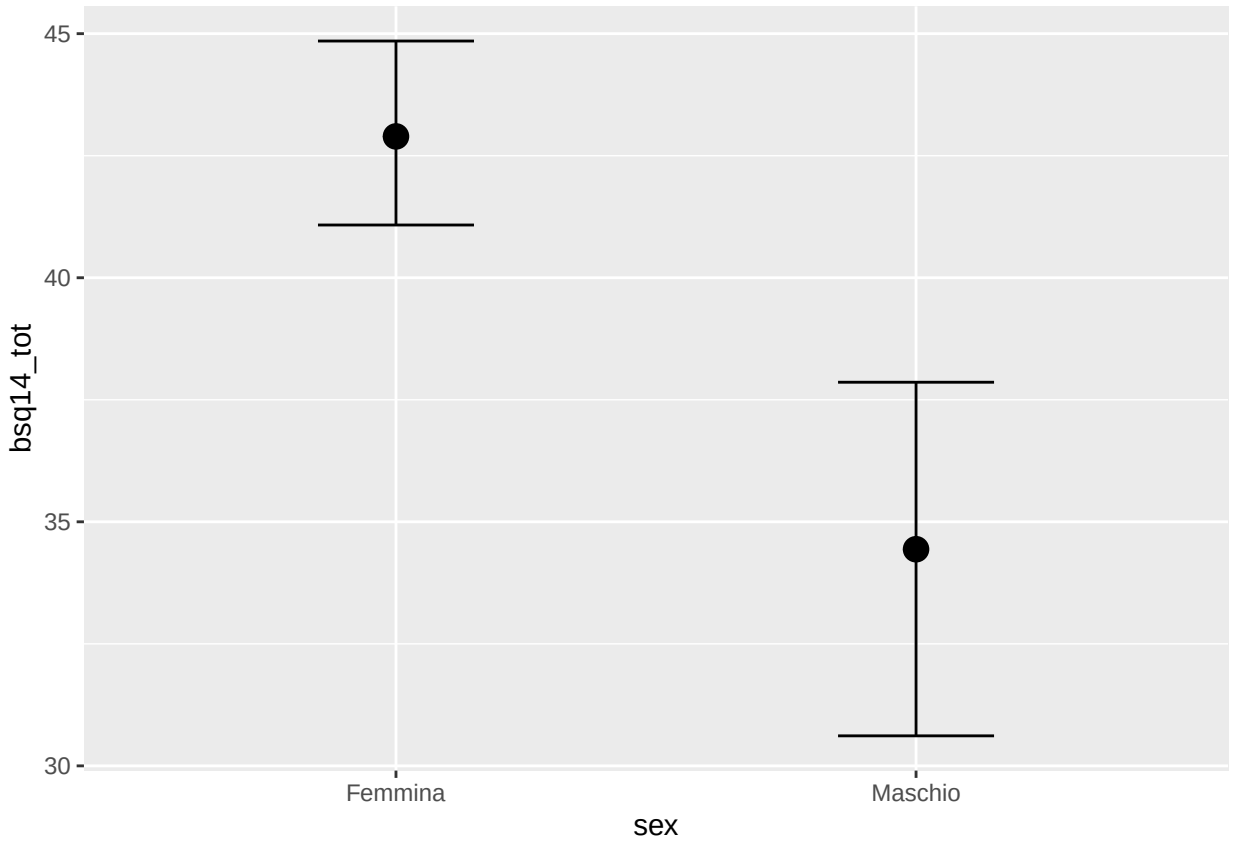
```
summary(fm0)
```

```
##  Family: skew_normal
##   Links: mu = identity; sigma = identity; alpha = identity
## Formula: bsq14_tot ~ age + bmi + sex
##    Data: dat (Number of observations: 283)
## Samples: 4 chains, each with iter = 4000; warmup = 2000; thin = 1;
##          total post-warmup samples = 8000
##
## Population-Level Effects:
##            Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## Intercept     20.66      4.70    11.84    30.42 1.00     8315     5528
## age           -0.03      0.18    -0.41     0.30 1.00     6618     5171
## bmi            1.06      0.15     0.74     1.34 1.00     6798     5099
## sexMaschio    -8.54      1.87   -12.43    -5.05 1.00     6441     5390
##
## Family Specific Parameters:
##       Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## sigma    15.99      0.74    14.59    17.50 1.00     4888     5428
## alpha     7.43      1.79     4.37    11.41 1.00     5025     4541
##
## Samples were drawn using sample(hmc). For each parameter, Bulk_ESS
## and Tail_ESS are effective sample size measures, and Rhat is the potential
## scale reduction factor on split chains (at convergence, Rhat = 1).
```

```
plot(conditional_effects(fm0, "bmi"))
```




```
plot(conditional_effects(fm0, "sex"))
```




```
# plot(conditional_effects(fm1, "is_patient:sex"))

fm1 <- brm(
  eat26_tot ~ bsq14_tot * (sex + is_patient) + age + bmi,
  data = dat,
  # prior = prior_ma,
  family = skew_normal(),
  control = list(adapt_delta = 0.98),
  iter = 4000,
  cores = 6,
  backend = "cmdstan"
)
```

```
## Warning: Rows containing NAs were excluded from the model.

## Start sampling

## Running MCMC with 4 chains, at most 6 in parallel...
##
## Chain 1 Iteration:    1 / 4000 [  0%]  (Warmup)

## Chain 2 Rejecting initial value:

## Chain 2   Log probability evaluates to log(0), i.e. negative infinity.

## Chain 2   Stan can't start sampling from this initial value.

## Chain 2 Rejecting initial value:

## Chain 2   Log probability evaluates to log(0), i.e. negative infinity.
```

```
## Chain 2   Stan can't start sampling from this initial value.
## Chain 2 Rejecting initial value:
## Chain 2   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 2   Stan can't start sampling from this initial value.
## Chain 2 Rejecting initial value:
## Chain 2   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 2   Stan can't start sampling from this initial value.
## Chain 2 Rejecting initial value:
## Chain 2   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 2   Stan can't start sampling from this initial value.
## Chain 2 Rejecting initial value:
## Chain 2   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 2   Stan can't start sampling from this initial value.
## Chain 2 Rejecting initial value:
## Chain 2   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 2   Stan can't start sampling from this initial value.
## Chain 2 Rejecting initial value:
## Chain 2   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 2   Stan can't start sampling from this initial value.
## Chain 2 Rejecting initial value:
## Chain 2   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 2   Stan can't start sampling from this initial value.
## Chain 2 Rejecting initial value:
## Chain 2   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 2   Stan can't start sampling from this initial value.
## Chain 2 Rejecting initial value:
## Chain 2   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 2   Stan can't start sampling from this initial value.
## Chain 2 Rejecting initial value:
## Chain 2   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 2   Stan can't start sampling from this initial value.
## Chain 2 Rejecting initial value:
## Chain 2   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 2   Stan can't start sampling from this initial value.
## Chain 2 Rejecting initial value:
## Chain 2   Log probability evaluates to log(0), i.e. negative infinity.
```

```
## Chain 2   Stan can't start sampling from this initial value.
## Chain 2 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 3 Rejecting initial value:
## Chain 3   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 3   Stan can't start sampling from this initial value.
## Chain 3 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 4 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 4 Iteration:  100 / 4000 [  2%]  (Warmup)
## Chain 2 Iteration:  100 / 4000 [  2%]  (Warmup)
## Chain 4 Iteration:  200 / 4000 [  5%]  (Warmup)
## Chain 1 Iteration:  100 / 4000 [  2%]  (Warmup)
## Chain 2 Iteration:  200 / 4000 [  5%]  (Warmup)
## Chain 3 Iteration:  100 / 4000 [  2%]  (Warmup)
## Chain 4 Iteration:  300 / 4000 [  7%]  (Warmup)
## Chain 3 Iteration:  200 / 4000 [  5%]  (Warmup)
## Chain 4 Iteration:  400 / 4000 [ 10%]  (Warmup)
## Chain 2 Iteration:  300 / 4000 [  7%]  (Warmup)
## Chain 3 Iteration:  300 / 4000 [  7%]  (Warmup)
## Chain 4 Iteration:  500 / 4000 [ 12%]  (Warmup)
## Chain 1 Iteration:  200 / 4000 [  5%]  (Warmup)
## Chain 2 Iteration:  400 / 4000 [ 10%]  (Warmup)
## Chain 1 Iteration:  300 / 4000 [  7%]  (Warmup)
## Chain 3 Iteration:  400 / 4000 [ 10%]  (Warmup)
## Chain 4 Iteration:  600 / 4000 [ 15%]  (Warmup)
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## Chain 4 Iteration: 1000 / 4000 [ 25%]  (Warmup)
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## Chain 4 Iteration: 1400 / 4000 [ 35%]  (Warmup)
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## Chain 2 Iteration: 1000 / 4000 [ 25%]  (Warmup)
## Chain 3 Iteration: 1100 / 4000 [ 27%]  (Warmup)
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## Chain 3 Iteration: 1200 / 4000 [ 30%]  (Warmup)
## Chain 4 Iteration: 1500 / 4000 [ 37%]  (Warmup)
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## Chain 4 Iteration: 2001 / 4000 [ 50%]  (Sampling)
## Chain 3 Iteration: 1800 / 4000 [ 45%]  (Warmup)
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## Chain 4 Iteration: 2300 / 4000 [ 57%]  (Sampling)
## Chain 2 Iteration: 2000 / 4000 [ 50%]  (Warmup)
## Chain 2 Iteration: 2001 / 4000 [ 50%]  (Sampling)
## Chain 3 Iteration: 2200 / 4000 [ 55%]  (Sampling)
## Chain 3 Iteration: 2300 / 4000 [ 57%]  (Sampling)
## Chain 4 Iteration: 2400 / 4000 [ 60%]  (Sampling)
## Chain 1 Iteration: 2000 / 4000 [ 50%]  (Warmup)
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## Chain 4 Iteration: 2500 / 4000 [ 62%]  (Sampling)
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## Chain 3 Iteration: 2500 / 4000 [ 62%]  (Sampling)
## Chain 3 Iteration: 2600 / 4000 [ 65%]  (Sampling)
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## Chain 1 Iteration: 2200 / 4000 [ 55%]  (Sampling)
## Chain 2 Iteration: 2300 / 4000 [ 57%]  (Sampling)
## Chain 4 Iteration: 2600 / 4000 [ 65%]  (Sampling)
## Chain 3 Iteration: 2700 / 4000 [ 67%]  (Sampling)
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## Chain 3 Iteration: 3300 / 4000 [ 82%]  (Sampling)
## Chain 3 Iteration: 3400 / 4000 [ 85%]  (Sampling)
## Chain 1 Iteration: 2700 / 4000 [ 67%]  (Sampling)
## Chain 2 Iteration: 2800 / 4000 [ 70%]  (Sampling)
## Chain 4 Iteration: 3100 / 4000 [ 77%]  (Sampling)
## Chain 3 Iteration: 3500 / 4000 [ 87%]  (Sampling)
## Chain 3 Iteration: 3600 / 4000 [ 90%]  (Sampling)
## Chain 4 Iteration: 3200 / 4000 [ 80%]  (Sampling)
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## Chain 4 Iteration: 3300 / 4000 [ 82%]  (Sampling)
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## Chain 3 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 3 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 4 Iteration: 3400 / 4000 [ 85%]  (Sampling)
## Chain 1 Iteration: 3000 / 4000 [ 75%]  (Sampling)
## Chain 2 Iteration: 3100 / 4000 [ 77%]  (Sampling)
## Chain 3 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 3 finished in 7.5 seconds.
## Chain 1 Iteration: 3100 / 4000 [ 77%]  (Sampling)
## Chain 2 Iteration: 3200 / 4000 [ 80%]  (Sampling)
## Chain 4 Iteration: 3500 / 4000 [ 87%]  (Sampling)
## Chain 1 Iteration: 3200 / 4000 [ 80%]  (Sampling)
## Chain 4 Iteration: 3600 / 4000 [ 90%]  (Sampling)
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## Chain 1 Iteration: 3300 / 4000 [ 82%]  (Sampling)
## Chain 2 Iteration: 3400 / 4000 [ 85%]  (Sampling)
## Chain 4 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 1 Iteration: 3400 / 4000 [ 85%]  (Sampling)
## Chain 2 Iteration: 3500 / 4000 [ 87%]  (Sampling)
```

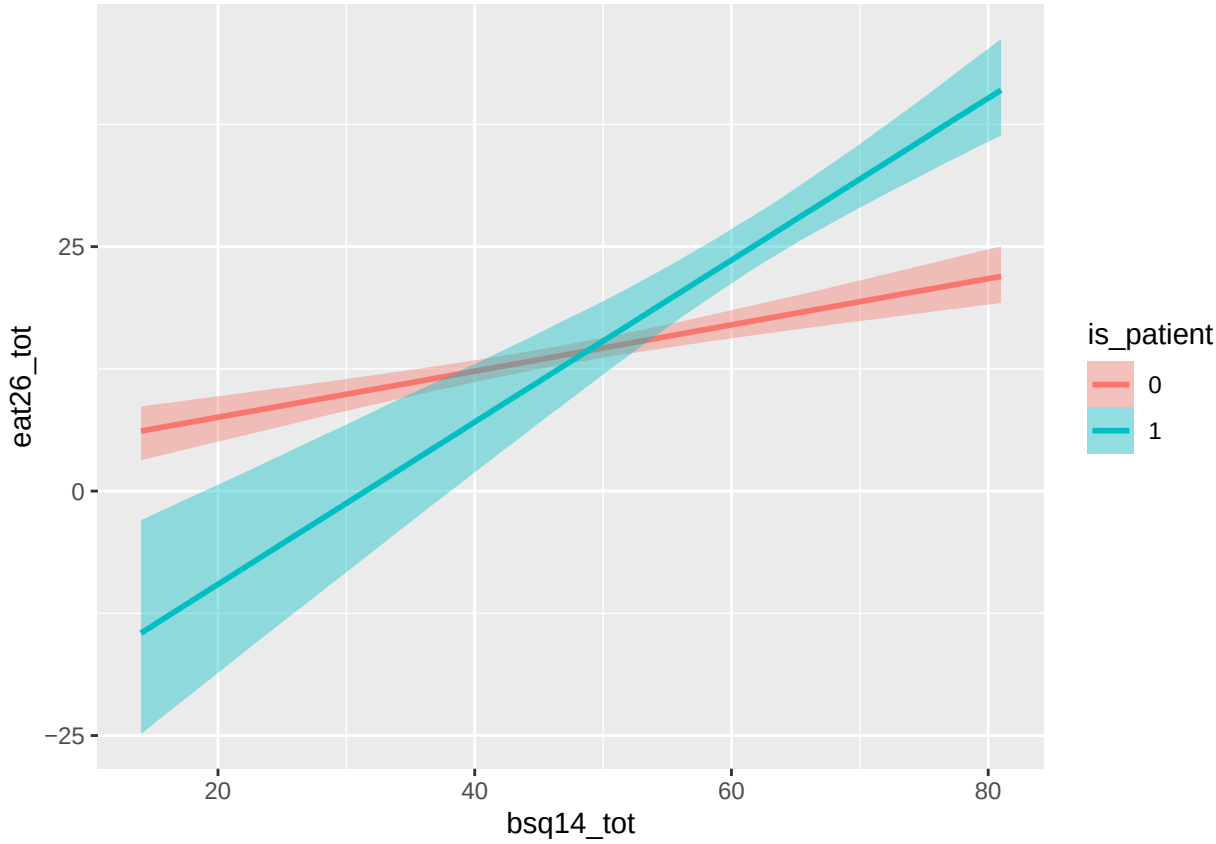
```
## Chain 1 Iteration: 3500 / 4000 [ 87%]  (Sampling)
## Chain 4 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 2 Iteration: 3600 / 4000 [ 90%]  (Sampling)
## Chain 1 Iteration: 3600 / 4000 [ 90%]  (Sampling)
## Chain 4 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 4 finished in 8.7 seconds.
## Chain 2 Iteration: 3700 / 4000 [ 92%]  (Sampling)
## Chain 1 Iteration: 3700 / 4000 [ 92%]  (Sampling)
## Chain 2 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 1 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 2 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 1 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 2 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 2 finished in 9.5 seconds.
## Chain 1 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 1 finished in 9.6 seconds.
##
## All 4 chains finished successfully.
## Mean chain execution time: 8.8 seconds.
## Total execution time: 9.8 seconds.
```

```
summary(fm1)
```

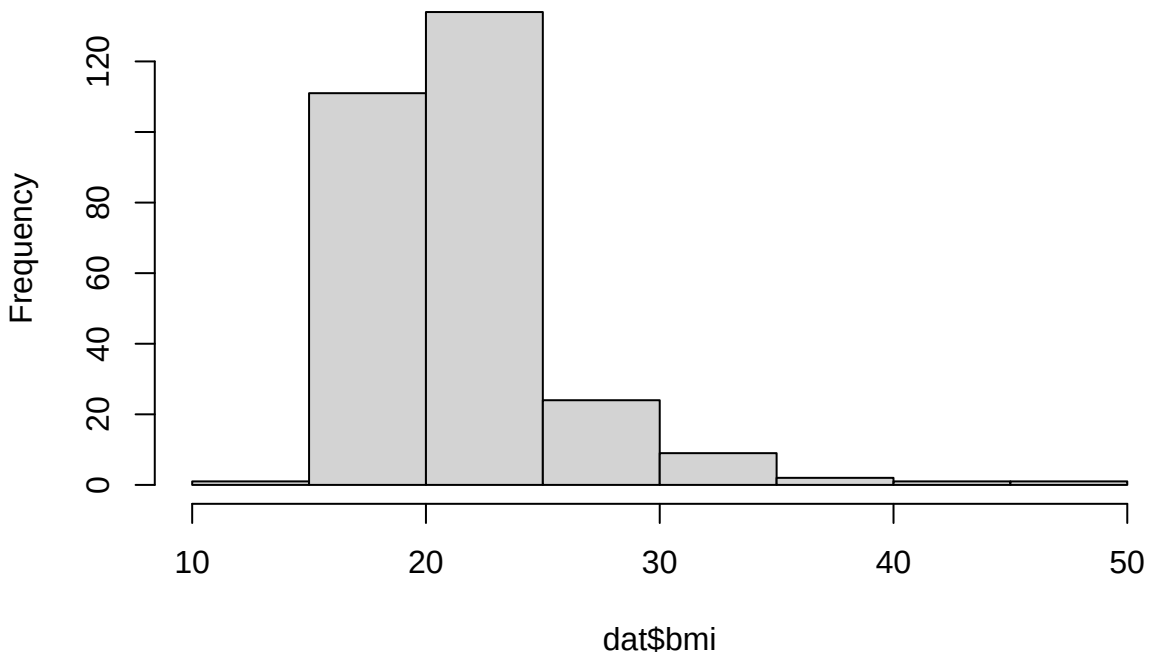
```
##  Family: skew_normal
##   Links: mu = identity; sigma = identity; alpha = identity
## Formula: eat26_tot ~ bsq14_tot * (sex + is_patient) + age + bmi
##    Data: dat (Number of observations: 265)
## Samples: 4 chains, each with iter = 4000; warmup = 2000; thin = 1;
##          total post-warmup samples = 8000
##
## Population-Level Effects:
##                       Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS
## Intercept                18.53      2.67    13.21    23.82 1.00     6788
## bsq14_tot                 0.24      0.04     0.16     0.32 1.00     4470
## sexMaschio                0.25      3.40    -6.84     6.43 1.00     4509
## is_patient1             -28.69      7.21   -42.05   -13.18 1.00     3998
## age                      -0.08      0.08    -0.24     0.06 1.00     6054
## bmi                      -0.65      0.14    -0.93    -0.40 1.00     6018
## bsq14_tot:sexMaschio      0.04      0.09    -0.12     0.21 1.00     4588
## bsq14_tot:is_patient1     0.59      0.11     0.35     0.80 1.00     3990
##                       Tail_ESS
## Intercept                 5665
## bsq14_tot                 5192
## sexMaschio                3958
## is_patient1               4067
## age                       4762
## bmi                       4787
## bsq14_tot:sexMaschio      3688
## bsq14_tot:is_patient1     3909
##
## Family Specific Parameters:
##       Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## sigma     7.76      0.36     7.09     8.51 1.00     5109     5001
## alpha     7.68      1.98     4.33    12.03 1.00     4592     4925
##
```

```
## Samples were drawn using sample(hmc). For each parameter, Bulk_ESS
## and Tail_ESS are effective sample size measures, and Rhat is the potential
## scale reduction factor on split chains (at convergence, Rhat = 1).
```

```
plot(conditional_effects(fm1, "bsq14_tot:is_patient"))
```




```
hist(dat$bmi)
```




```
dat$bmi_cat <- cut(dat$bmi, breaks = c(0, 18.5, 24.9, 29.9, 100))
summary(dat$bmi_cat)
```

```
##    (0,18.5] (18.5,24.9] (24.9,29.9]  (29.9,100]        NA's
##          41         200          29          13           1
```

```
dat$mps <- dat$mps_ps + dat$mps_o + dat$mps_cmd + dat$mps_pepc

fm2 <- brm(
  eat26_tot ~ mps * (sex + is_patient) + age + bmi,
  data = dat,
  # prior = prior_ma,
  family = skew_normal(),
  control = list(adapt_delta = 0.98),
  iter = 4000,
  cores = 6,
  backend = "cmdstan"
)
```

```
## Warning: Rows containing NAs were excluded from the model.
## Start sampling
## Running MCMC with 4 chains, at most 6 in parallel...
## Chain 1 Rejecting initial value:
## Chain 1   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 1   Stan can't start sampling from this initial value.
## Chain 1 Rejecting initial value:
## Chain 1   Log probability evaluates to log(0), i.e. negative infinity.
```

```
## Chain 1   Stan can't start sampling from this initial value.
## Chain 1 Rejecting initial value:
## Chain 1   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 1   Stan can't start sampling from this initial value.
## Chain 1 Rejecting initial value:
## Chain 1   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 1   Stan can't start sampling from this initial value.
## Chain 1 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 2 Rejecting initial value:
## Chain 2   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 2   Stan can't start sampling from this initial value.
## Chain 2 Rejecting initial value:
## Chain 2   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 2   Stan can't start sampling from this initial value.
## Chain 2 Rejecting initial value:
## Chain 2   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 2   Stan can't start sampling from this initial value.
## Chain 2 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 3 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 4 Rejecting initial value:
## Chain 4   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 4   Stan can't start sampling from this initial value.
## Chain 4 Rejecting initial value:
## Chain 4   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 4   Stan can't start sampling from this initial value.
## Chain 4 Rejecting initial value:
## Chain 4   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 4   Stan can't start sampling from this initial value.
## Chain 4 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 1 Iteration:  100 / 4000 [  2%]  (Warmup)
## Chain 3 Iteration:  100 / 4000 [  2%]  (Warmup)
## Chain 1 Iteration:  200 / 4000 [  5%]  (Warmup)
## Chain 2 Iteration:  100 / 4000 [  2%]  (Warmup)
## Chain 1 Iteration:  300 / 4000 [  7%]  (Warmup)
## Chain 3 Iteration:  200 / 4000 [  5%]  (Warmup)
## Chain 4 Iteration:  100 / 4000 [  2%]  (Warmup)
## Chain 2 Iteration:  200 / 4000 [  5%]  (Warmup)
## Chain 1 Iteration:  400 / 4000 [ 10%]  (Warmup)
## Chain 2 Iteration:  300 / 4000 [  7%]  (Warmup)
## Chain 3 Iteration:  300 / 4000 [  7%]  (Warmup)
```

```
## Chain 3 Iteration:  400 / 4000 [ 10%]  (Warmup)
## Chain 4 Iteration:  200 / 4000 [  5%]  (Warmup)
## Chain 1 Iteration:  500 / 4000 [ 12%]  (Warmup)
## Chain 2 Iteration:  400 / 4000 [ 10%]  (Warmup)
## Chain 2 Iteration:  500 / 4000 [ 12%]  (Warmup)
## Chain 4 Iteration:  300 / 4000 [  7%]  (Warmup)
## Chain 1 Iteration:  600 / 4000 [ 15%]  (Warmup)
## Chain 2 Iteration:  600 / 4000 [ 15%]  (Warmup)
## Chain 3 Iteration:  500 / 4000 [ 12%]  (Warmup)
## Chain 4 Iteration:  400 / 4000 [ 10%]  (Warmup)
## Chain 1 Iteration:  700 / 4000 [ 17%]  (Warmup)
## Chain 2 Iteration:  700 / 4000 [ 17%]  (Warmup)
## Chain 3 Iteration:  600 / 4000 [ 15%]  (Warmup)
## Chain 4 Iteration:  500 / 4000 [ 12%]  (Warmup)
## Chain 1 Iteration:  800 / 4000 [ 20%]  (Warmup)
## Chain 2 Iteration:  800 / 4000 [ 20%]  (Warmup)
## Chain 3 Iteration:  700 / 4000 [ 17%]  (Warmup)
## Chain 4 Iteration:  600 / 4000 [ 15%]  (Warmup)
## Chain 2 Iteration:  900 / 4000 [ 22%]  (Warmup)
## Chain 3 Iteration:  800 / 4000 [ 20%]  (Warmup)
## Chain 1 Iteration:  900 / 4000 [ 22%]  (Warmup)
## Chain 3 Iteration:  900 / 4000 [ 22%]  (Warmup)
## Chain 4 Iteration:  700 / 4000 [ 17%]  (Warmup)
## Chain 2 Iteration: 1000 / 4000 [ 25%]  (Warmup)
## Chain 4 Iteration:  800 / 4000 [ 20%]  (Warmup)
## Chain 1 Iteration: 1000 / 4000 [ 25%]  (Warmup)
## Chain 3 Iteration: 1000 / 4000 [ 25%]  (Warmup)
## Chain 2 Iteration: 1100 / 4000 [ 27%]  (Warmup)
## Chain 1 Iteration: 1100 / 4000 [ 27%]  (Warmup)
## Chain 2 Iteration: 1200 / 4000 [ 30%]  (Warmup)
## Chain 3 Iteration: 1100 / 4000 [ 27%]  (Warmup)
## Chain 1 Iteration: 1200 / 4000 [ 30%]  (Warmup)
## Chain 3 Iteration: 1200 / 4000 [ 30%]  (Warmup)
## Chain 4 Iteration:  900 / 4000 [ 22%]  (Warmup)
## Chain 2 Iteration: 1300 / 4000 [ 32%]  (Warmup)
## Chain 4 Iteration: 1000 / 4000 [ 25%]  (Warmup)
## Chain 1 Iteration: 1300 / 4000 [ 32%]  (Warmup)
## Chain 3 Iteration: 1300 / 4000 [ 32%]  (Warmup)
## Chain 1 Iteration: 1400 / 4000 [ 35%]  (Warmup)
## Chain 2 Iteration: 1400 / 4000 [ 35%]  (Warmup)
## Chain 4 Iteration: 1100 / 4000 [ 27%]  (Warmup)
## Chain 2 Iteration: 1500 / 4000 [ 37%]  (Warmup)
## Chain 3 Iteration: 1400 / 4000 [ 35%]  (Warmup)
## Chain 1 Iteration: 1500 / 4000 [ 37%]  (Warmup)
## Chain 4 Iteration: 1200 / 4000 [ 30%]  (Warmup)
## Chain 2 Iteration: 1600 / 4000 [ 40%]  (Warmup)
## Chain 3 Iteration: 1500 / 4000 [ 37%]  (Warmup)
## Chain 4 Iteration: 1300 / 4000 [ 32%]  (Warmup)
## Chain 1 Iteration: 1600 / 4000 [ 40%]  (Warmup)
## Chain 2 Iteration: 1700 / 4000 [ 42%]  (Warmup)
## Chain 3 Iteration: 1600 / 4000 [ 40%]  (Warmup)
## Chain 1 Iteration: 1700 / 4000 [ 42%]  (Warmup)
## Chain 3 Iteration: 1700 / 4000 [ 42%]  (Warmup)
## Chain 4 Iteration: 1400 / 4000 [ 35%]  (Warmup)
```

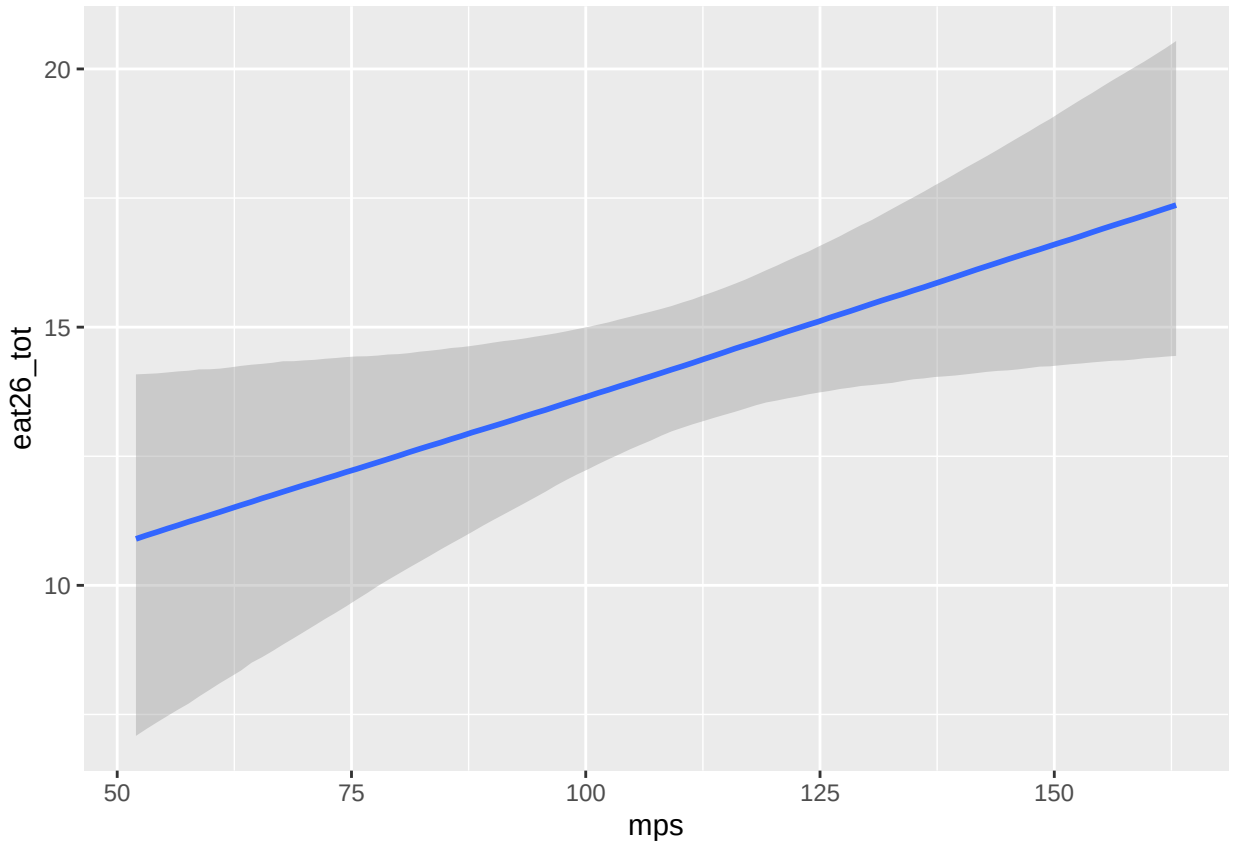
```
## Chain 1 Iteration: 1800 / 4000 [ 45%]  (Warmup)
## Chain 2 Iteration: 1800 / 4000 [ 45%]  (Warmup)
## Chain 4 Iteration: 1500 / 4000 [ 37%]  (Warmup)
## Chain 3 Iteration: 1800 / 4000 [ 45%]  (Warmup)
## Chain 1 Iteration: 1900 / 4000 [ 47%]  (Warmup)
## Chain 2 Iteration: 1900 / 4000 [ 47%]  (Warmup)
## Chain 4 Iteration: 1600 / 4000 [ 40%]  (Warmup)
## Chain 3 Iteration: 1900 / 4000 [ 47%]  (Warmup)
## Chain 4 Iteration: 1700 / 4000 [ 42%]  (Warmup)
## Chain 1 Iteration: 2000 / 4000 [ 50%]  (Warmup)
## Chain 1 Iteration: 2001 / 4000 [ 50%]  (Sampling)
## Chain 2 Iteration: 2000 / 4000 [ 50%]  (Warmup)
## Chain 2 Iteration: 2001 / 4000 [ 50%]  (Sampling)
## Chain 3 Iteration: 2000 / 4000 [ 50%]  (Warmup)
## Chain 3 Iteration: 2001 / 4000 [ 50%]  (Sampling)
## Chain 4 Iteration: 1800 / 4000 [ 45%]  (Warmup)
## Chain 1 Iteration: 2100 / 4000 [ 52%]  (Sampling)
## Chain 3 Iteration: 2100 / 4000 [ 52%]  (Sampling)
## Chain 2 Iteration: 2100 / 4000 [ 52%]  (Sampling)
## Chain 4 Iteration: 1900 / 4000 [ 47%]  (Warmup)
## Chain 1 Iteration: 2200 / 4000 [ 55%]  (Sampling)
## Chain 3 Iteration: 2200 / 4000 [ 55%]  (Sampling)
## Chain 2 Iteration: 2200 / 4000 [ 55%]  (Sampling)
## Chain 3 Iteration: 2300 / 4000 [ 57%]  (Sampling)
## Chain 1 Iteration: 2300 / 4000 [ 57%]  (Sampling)
## Chain 2 Iteration: 2300 / 4000 [ 57%]  (Sampling)
## Chain 3 Iteration: 2400 / 4000 [ 60%]  (Sampling)
## Chain 4 Iteration: 2000 / 4000 [ 50%]  (Warmup)
## Chain 4 Iteration: 2001 / 4000 [ 50%]  (Sampling)
## Chain 1 Iteration: 2400 / 4000 [ 60%]  (Sampling)
## Chain 2 Iteration: 2400 / 4000 [ 60%]  (Sampling)
## Chain 3 Iteration: 2500 / 4000 [ 62%]  (Sampling)
## Chain 4 Iteration: 2100 / 4000 [ 52%]  (Sampling)
## Chain 1 Iteration: 2500 / 4000 [ 62%]  (Sampling)
## Chain 3 Iteration: 2600 / 4000 [ 65%]  (Sampling)
## Chain 4 Iteration: 2200 / 4000 [ 55%]  (Sampling)
## Chain 2 Iteration: 2500 / 4000 [ 62%]  (Sampling)
## Chain 1 Iteration: 2600 / 4000 [ 65%]  (Sampling)
## Chain 3 Iteration: 2700 / 4000 [ 67%]  (Sampling)
## Chain 2 Iteration: 2600 / 4000 [ 65%]  (Sampling)
## Chain 4 Iteration: 2300 / 4000 [ 57%]  (Sampling)
## Chain 1 Iteration: 2700 / 4000 [ 67%]  (Sampling)
## Chain 3 Iteration: 2800 / 4000 [ 70%]  (Sampling)
## Chain 2 Iteration: 2700 / 4000 [ 67%]  (Sampling)
## Chain 3 Iteration: 2900 / 4000 [ 72%]  (Sampling)
## Chain 4 Iteration: 2400 / 4000 [ 60%]  (Sampling)
## Chain 1 Iteration: 2800 / 4000 [ 70%]  (Sampling)
## Chain 3 Iteration: 3000 / 4000 [ 75%]  (Sampling)
## Chain 1 Iteration: 2900 / 4000 [ 72%]  (Sampling)
## Chain 2 Iteration: 2800 / 4000 [ 70%]  (Sampling)
## Chain 4 Iteration: 2500 / 4000 [ 62%]  (Sampling)
## Chain 3 Iteration: 3100 / 4000 [ 77%]  (Sampling)
## Chain 1 Iteration: 3000 / 4000 [ 75%]  (Sampling)
## Chain 2 Iteration: 2900 / 4000 [ 72%]  (Sampling)
```

```
## Chain 4 Iteration: 2600 / 4000 [ 65%]  (Sampling)
## Chain 3 Iteration: 3200 / 4000 [ 80%]  (Sampling)
## Chain 1 Iteration: 3100 / 4000 [ 77%]  (Sampling)
## Chain 2 Iteration: 3000 / 4000 [ 75%]  (Sampling)
## Chain 3 Iteration: 3300 / 4000 [ 82%]  (Sampling)
## Chain 4 Iteration: 2700 / 4000 [ 67%]  (Sampling)
## Chain 1 Iteration: 3200 / 4000 [ 80%]  (Sampling)
## Chain 2 Iteration: 3100 / 4000 [ 77%]  (Sampling)
## Chain 3 Iteration: 3400 / 4000 [ 85%]  (Sampling)
## Chain 4 Iteration: 2800 / 4000 [ 70%]  (Sampling)
## Chain 1 Iteration: 3300 / 4000 [ 82%]  (Sampling)
## Chain 3 Iteration: 3500 / 4000 [ 87%]  (Sampling)
## Chain 2 Iteration: 3200 / 4000 [ 80%]  (Sampling)
## Chain 4 Iteration: 2900 / 4000 [ 72%]  (Sampling)
## Chain 1 Iteration: 3400 / 4000 [ 85%]  (Sampling)
## Chain 3 Iteration: 3600 / 4000 [ 90%]  (Sampling)
## Chain 2 Iteration: 3300 / 4000 [ 82%]  (Sampling)
## Chain 3 Iteration: 3700 / 4000 [ 92%]  (Sampling)
## Chain 4 Iteration: 3000 / 4000 [ 75%]  (Sampling)
## Chain 1 Iteration: 3500 / 4000 [ 87%]  (Sampling)
## Chain 2 Iteration: 3400 / 4000 [ 85%]  (Sampling)
## Chain 3 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 4 Iteration: 3100 / 4000 [ 77%]  (Sampling)
## Chain 1 Iteration: 3600 / 4000 [ 90%]  (Sampling)
## Chain 3 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 2 Iteration: 3500 / 4000 [ 87%]  (Sampling)
## Chain 4 Iteration: 3200 / 4000 [ 80%]  (Sampling)
## Chain 1 Iteration: 3700 / 4000 [ 92%]  (Sampling)
## Chain 3 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 3 finished in 8.6 seconds.
## Chain 2 Iteration: 3600 / 4000 [ 90%]  (Sampling)
## Chain 1 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 4 Iteration: 3300 / 4000 [ 82%]  (Sampling)
## Chain 2 Iteration: 3700 / 4000 [ 92%]  (Sampling)
## Chain 1 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 4 Iteration: 3400 / 4000 [ 85%]  (Sampling)
## Chain 2 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 1 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 1 finished in 9.3 seconds.
## Chain 4 Iteration: 3500 / 4000 [ 87%]  (Sampling)
## Chain 2 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 4 Iteration: 3600 / 4000 [ 90%]  (Sampling)
## Chain 2 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 2 finished in 9.7 seconds.
## Chain 4 Iteration: 3700 / 4000 [ 92%]  (Sampling)
## Chain 4 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 4 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 4 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 4 finished in 10.5 seconds.
##
## All 4 chains finished successfully.
## Mean chain execution time: 9.5 seconds.
## Total execution time: 10.6 seconds.
```

```
summary(fm2)
```

```
##  Family: skew_normal
##   Links: mu = identity; sigma = identity; alpha = identity
## Formula: eat26_tot ~ mps * (sex + is_patient) + age + bmi
##    Data: dat (Number of observations: 265)
## Samples: 4 chains, each with iter = 4000; warmup = 2000; thin = 1;
##          total post-warmup samples = 8000
##
## Population-Level Effects:
##                 Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## Intercept          12.03      3.90     4.33    19.79 1.00     5378     5298
## mps                 0.06      0.03     0.01     0.12 1.00     3554     5111
## sexMaschio          2.43      5.55    -9.05    12.84 1.00     3336     3882
## is_patient1        13.32      8.44    -2.63    30.87 1.00     3442     3702
## age                -0.07      0.08    -0.25     0.07 1.00     5837     4233
## bmi                -0.13      0.14    -0.41     0.13 1.00     5827     5784
## mps:sexMaschio     -0.03      0.05    -0.13     0.07 1.00     3255     4060
## mps:is_patient1    -0.06      0.07    -0.20     0.07 1.00     3566     3901
##
## Family Specific Parameters:
##       Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## sigma     9.23      0.42     8.43    10.11 1.00     4674     4773
## alpha     9.31      2.28     5.53    14.25 1.00     3957     4824
##
## Samples were drawn using sample(hmc). For each parameter, Bulk_ESS
## and Tail_ESS are effective sample size measures, and Rhat is the potential
## scale reduction factor on split chains (at convergence, Rhat = 1).
```

```
plot(conditional_effects(fm2, "mps"))
```




```r
fm3 <- brm(
  eat26_tot ~ sias * (sex + is_patient) + age + bmi,
  data = dat,
  # prior = prior_ma,
  family = skew_normal(),
  control = list(adapt_delta = 0.98),
  iter = 4000,
  cores = 6,
  backend = "cmdstan"
)
```

```
## Warning: Rows containing NAs were excluded from the model.
## Start sampling
## Running MCMC with 4 chains, at most 6 in parallel...
## Chain 1 Rejecting initial value:
## Chain 1   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 1   Stan can't start sampling from this initial value.
## Chain 1 Rejecting initial value:
## Chain 1   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 1   Stan can't start sampling from this initial value.
## Chain 1 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 2 Iteration:    1 / 4000 [  0%]  (Warmup)
```

```
## Chain 3 Rejecting initial value:
## Chain 3   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 3   Stan can't start sampling from this initial value.
## Chain 3 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 4 Rejecting initial value:
## Chain 4   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 4   Stan can't start sampling from this initial value.
## Chain 4 Rejecting initial value:
## Chain 4   Log probability evaluates to log(0), i.e. negative infinity.
## Chain 4   Stan can't start sampling from this initial value.
## Chain 4 Iteration:    1 / 4000 [  0%]  (Warmup)
## Chain 1 Iteration:  100 / 4000 [  2%]  (Warmup)
## Chain 2 Iteration:  100 / 4000 [  2%]  (Warmup)
## Chain 4 Iteration:  100 / 4000 [  2%]  (Warmup)
## Chain 1 Iteration:  200 / 4000 [  5%]  (Warmup)
## Chain 2 Iteration:  200 / 4000 [  5%]  (Warmup)
## Chain 3 Iteration:  100 / 4000 [  2%]  (Warmup)
## Chain 4 Iteration:  200 / 4000 [  5%]  (Warmup)
## Chain 1 Iteration:  300 / 4000 [  7%]  (Warmup)
## Chain 3 Iteration:  200 / 4000 [  5%]  (Warmup)
## Chain 4 Iteration:  300 / 4000 [  7%]  (Warmup)
## Chain 2 Iteration:  300 / 4000 [  7%]  (Warmup)
## Chain 4 Iteration:  400 / 4000 [ 10%]  (Warmup)
## Chain 1 Iteration:  400 / 4000 [ 10%]  (Warmup)
## Chain 2 Iteration:  400 / 4000 [ 10%]  (Warmup)
## Chain 3 Iteration:  300 / 4000 [  7%]  (Warmup)
## Chain 1 Iteration:  500 / 4000 [ 12%]  (Warmup)
## Chain 3 Iteration:  400 / 4000 [ 10%]  (Warmup)
## Chain 4 Iteration:  500 / 4000 [ 12%]  (Warmup)
## Chain 1 Iteration:  600 / 4000 [ 15%]  (Warmup)
## Chain 2 Iteration:  500 / 4000 [ 12%]  (Warmup)
## Chain 3 Iteration:  500 / 4000 [ 12%]  (Warmup)
## Chain 3 Iteration:  600 / 4000 [ 15%]  (Warmup)
## Chain 4 Iteration:  600 / 4000 [ 15%]  (Warmup)
## Chain 1 Iteration:  700 / 4000 [ 17%]  (Warmup)
## Chain 2 Iteration:  600 / 4000 [ 15%]  (Warmup)
## Chain 4 Iteration:  700 / 4000 [ 17%]  (Warmup)
## Chain 1 Iteration:  800 / 4000 [ 20%]  (Warmup)
## Chain 2 Iteration:  700 / 4000 [ 17%]  (Warmup)
## Chain 3 Iteration:  700 / 4000 [ 17%]  (Warmup)
## Chain 4 Iteration:  800 / 4000 [ 20%]  (Warmup)
## Chain 1 Iteration:  900 / 4000 [ 22%]  (Warmup)
## Chain 2 Iteration:  800 / 4000 [ 20%]  (Warmup)
## Chain 3 Iteration:  800 / 4000 [ 20%]  (Warmup)
## Chain 1 Iteration: 1000 / 4000 [ 25%]  (Warmup)
## Chain 4 Iteration:  900 / 4000 [ 22%]  (Warmup)
## Chain 1 Iteration: 1100 / 4000 [ 27%]  (Warmup)
## Chain 2 Iteration:  900 / 4000 [ 22%]  (Warmup)
## Chain 3 Iteration:  900 / 4000 [ 22%]  (Warmup)
```

```
## Chain 4 Iteration: 1000 / 4000 [ 25%]  (Warmup)
## Chain 4 Iteration: 1100 / 4000 [ 27%]  (Warmup)
## Chain 1 Iteration: 1200 / 4000 [ 30%]  (Warmup)
## Chain 2 Iteration: 1000 / 4000 [ 25%]  (Warmup)
## Chain 3 Iteration: 1000 / 4000 [ 25%]  (Warmup)
## Chain 1 Iteration: 1300 / 4000 [ 32%]  (Warmup)
## Chain 2 Iteration: 1100 / 4000 [ 27%]  (Warmup)
## Chain 3 Iteration: 1100 / 4000 [ 27%]  (Warmup)
## Chain 4 Iteration: 1200 / 4000 [ 30%]  (Warmup)
## Chain 1 Iteration: 1400 / 4000 [ 35%]  (Warmup)
## Chain 2 Iteration: 1200 / 4000 [ 30%]  (Warmup)
## Chain 3 Iteration: 1200 / 4000 [ 30%]  (Warmup)
## Chain 4 Iteration: 1300 / 4000 [ 32%]  (Warmup)
## Chain 1 Iteration: 1500 / 4000 [ 37%]  (Warmup)
## Chain 2 Iteration: 1300 / 4000 [ 32%]  (Warmup)
## Chain 3 Iteration: 1300 / 4000 [ 32%]  (Warmup)
## Chain 4 Iteration: 1400 / 4000 [ 35%]  (Warmup)
## Chain 1 Iteration: 1600 / 4000 [ 40%]  (Warmup)
## Chain 4 Iteration: 1500 / 4000 [ 37%]  (Warmup)
## Chain 2 Iteration: 1400 / 4000 [ 35%]  (Warmup)
## Chain 3 Iteration: 1400 / 4000 [ 35%]  (Warmup)
## Chain 1 Iteration: 1700 / 4000 [ 42%]  (Warmup)
## Chain 2 Iteration: 1500 / 4000 [ 37%]  (Warmup)
## Chain 3 Iteration: 1500 / 4000 [ 37%]  (Warmup)
## Chain 4 Iteration: 1600 / 4000 [ 40%]  (Warmup)
## Chain 1 Iteration: 1800 / 4000 [ 45%]  (Warmup)
## Chain 3 Iteration: 1600 / 4000 [ 40%]  (Warmup)
## Chain 4 Iteration: 1700 / 4000 [ 42%]  (Warmup)
## Chain 1 Iteration: 1900 / 4000 [ 47%]  (Warmup)
## Chain 2 Iteration: 1600 / 4000 [ 40%]  (Warmup)
## Chain 4 Iteration: 1800 / 4000 [ 45%]  (Warmup)
## Chain 1 Iteration: 2000 / 4000 [ 50%]  (Warmup)
## Chain 1 Iteration: 2001 / 4000 [ 50%]  (Sampling)
## Chain 2 Iteration: 1700 / 4000 [ 42%]  (Warmup)
## Chain 3 Iteration: 1700 / 4000 [ 42%]  (Warmup)
## Chain 2 Iteration: 1800 / 4000 [ 45%]  (Warmup)
## Chain 3 Iteration: 1800 / 4000 [ 45%]  (Warmup)
## Chain 4 Iteration: 1900 / 4000 [ 47%]  (Warmup)
## Chain 1 Iteration: 2100 / 4000 [ 52%]  (Sampling)
## Chain 3 Iteration: 1900 / 4000 [ 47%]  (Warmup)
## Chain 4 Iteration: 2000 / 4000 [ 50%]  (Warmup)
## Chain 4 Iteration: 2001 / 4000 [ 50%]  (Sampling)
## Chain 1 Iteration: 2200 / 4000 [ 55%]  (Sampling)
## Chain 2 Iteration: 1900 / 4000 [ 47%]  (Warmup)
## Chain 3 Iteration: 2000 / 4000 [ 50%]  (Warmup)
## Chain 3 Iteration: 2001 / 4000 [ 50%]  (Sampling)
## Chain 1 Iteration: 2300 / 4000 [ 57%]  (Sampling)
## Chain 2 Iteration: 2000 / 4000 [ 50%]  (Warmup)
## Chain 2 Iteration: 2001 / 4000 [ 50%]  (Sampling)
## Chain 3 Iteration: 2100 / 4000 [ 52%]  (Sampling)
## Chain 4 Iteration: 2100 / 4000 [ 52%]  (Sampling)
## Chain 1 Iteration: 2400 / 4000 [ 60%]  (Sampling)
## Chain 2 Iteration: 2100 / 4000 [ 52%]  (Sampling)
## Chain 4 Iteration: 2200 / 4000 [ 55%]  (Sampling)
```

```
## Chain 1 Iteration: 2500 / 4000 [ 62%]  (Sampling)
## Chain 3 Iteration: 2200 / 4000 [ 55%]  (Sampling)
## Chain 4 Iteration: 2300 / 4000 [ 57%]  (Sampling)
## Chain 1 Iteration: 2600 / 4000 [ 65%]  (Sampling)
## Chain 2 Iteration: 2200 / 4000 [ 55%]  (Sampling)
## Chain 3 Iteration: 2300 / 4000 [ 57%]  (Sampling)
## Chain 4 Iteration: 2400 / 4000 [ 60%]  (Sampling)
## Chain 1 Iteration: 2700 / 4000 [ 67%]  (Sampling)
## Chain 2 Iteration: 2300 / 4000 [ 57%]  (Sampling)
## Chain 3 Iteration: 2400 / 4000 [ 60%]  (Sampling)
## Chain 3 Iteration: 2500 / 4000 [ 62%]  (Sampling)
## Chain 4 Iteration: 2500 / 4000 [ 62%]  (Sampling)
## Chain 1 Iteration: 2800 / 4000 [ 70%]  (Sampling)
## Chain 2 Iteration: 2400 / 4000 [ 60%]  (Sampling)
## Chain 3 Iteration: 2600 / 4000 [ 65%]  (Sampling)
## Chain 4 Iteration: 2600 / 4000 [ 65%]  (Sampling)
## Chain 1 Iteration: 2900 / 4000 [ 72%]  (Sampling)
## Chain 2 Iteration: 2500 / 4000 [ 62%]  (Sampling)
## Chain 3 Iteration: 2700 / 4000 [ 67%]  (Sampling)
## Chain 4 Iteration: 2700 / 4000 [ 67%]  (Sampling)
## Chain 1 Iteration: 3000 / 4000 [ 75%]  (Sampling)
## Chain 2 Iteration: 2600 / 4000 [ 65%]  (Sampling)
## Chain 3 Iteration: 2800 / 4000 [ 70%]  (Sampling)
## Chain 1 Iteration: 3100 / 4000 [ 77%]  (Sampling)
## Chain 3 Iteration: 2900 / 4000 [ 72%]  (Sampling)
## Chain 4 Iteration: 2800 / 4000 [ 70%]  (Sampling)
## Chain 1 Iteration: 3200 / 4000 [ 80%]  (Sampling)
## Chain 2 Iteration: 2700 / 4000 [ 67%]  (Sampling)
## Chain 3 Iteration: 3000 / 4000 [ 75%]  (Sampling)
## Chain 4 Iteration: 2900 / 4000 [ 72%]  (Sampling)
## Chain 1 Iteration: 3300 / 4000 [ 82%]  (Sampling)
## Chain 2 Iteration: 2800 / 4000 [ 70%]  (Sampling)
## Chain 3 Iteration: 3100 / 4000 [ 77%]  (Sampling)
## Chain 4 Iteration: 3000 / 4000 [ 75%]  (Sampling)
## Chain 2 Iteration: 2900 / 4000 [ 72%]  (Sampling)
## Chain 3 Iteration: 3200 / 4000 [ 80%]  (Sampling)
## Chain 4 Iteration: 3100 / 4000 [ 77%]  (Sampling)
## Chain 1 Iteration: 3400 / 4000 [ 85%]  (Sampling)
## Chain 1 Iteration: 3500 / 4000 [ 87%]  (Sampling)
## Chain 2 Iteration: 3000 / 4000 [ 75%]  (Sampling)
## Chain 3 Iteration: 3300 / 4000 [ 82%]  (Sampling)
## Chain 4 Iteration: 3200 / 4000 [ 80%]  (Sampling)
## Chain 1 Iteration: 3600 / 4000 [ 90%]  (Sampling)
## Chain 2 Iteration: 3100 / 4000 [ 77%]  (Sampling)
## Chain 3 Iteration: 3400 / 4000 [ 85%]  (Sampling)
## Chain 4 Iteration: 3300 / 4000 [ 82%]  (Sampling)
## Chain 1 Iteration: 3700 / 4000 [ 92%]  (Sampling)
## Chain 3 Iteration: 3500 / 4000 [ 87%]  (Sampling)
## Chain 4 Iteration: 3400 / 4000 [ 85%]  (Sampling)
## Chain 1 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 2 Iteration: 3200 / 4000 [ 80%]  (Sampling)
## Chain 3 Iteration: 3600 / 4000 [ 90%]  (Sampling)
## Chain 2 Iteration: 3300 / 4000 [ 82%]  (Sampling)
## Chain 3 Iteration: 3700 / 4000 [ 92%]  (Sampling)
```

```
## Chain 4 Iteration: 3500 / 4000 [ 87%]  (Sampling)
## Chain 1 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 3 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 4 Iteration: 3600 / 4000 [ 90%]  (Sampling)
## Chain 1 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 2 Iteration: 3400 / 4000 [ 85%]  (Sampling)
## Chain 3 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 4 Iteration: 3700 / 4000 [ 92%]  (Sampling)
## Chain 1 finished in 5.6 seconds.
## Chain 2 Iteration: 3500 / 4000 [ 87%]  (Sampling)
## Chain 3 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 4 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 3 finished in 5.8 seconds.
## Chain 2 Iteration: 3600 / 4000 [ 90%]  (Sampling)
## Chain 4 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 2 Iteration: 3700 / 4000 [ 92%]  (Sampling)
## Chain 4 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 4 finished in 6.0 seconds.
## Chain 2 Iteration: 3800 / 4000 [ 95%]  (Sampling)
## Chain 2 Iteration: 3900 / 4000 [ 97%]  (Sampling)
## Chain 2 Iteration: 4000 / 4000 [100%]  (Sampling)
## Chain 2 finished in 6.4 seconds.
##
## All 4 chains finished successfully.
## Mean chain execution time: 6.0 seconds.
## Total execution time: 6.5 seconds.
```

```
summary(fm3)
```

```
##  Family: skew_normal
##   Links: mu = identity; sigma = identity; alpha = identity
## Formula: eat26_tot ~ sias * (sex + is_patient) + age + bmi
##    Data: dat (Number of observations: 265)
## Samples: 4 chains, each with iter = 4000; warmup = 2000; thin = 1;
##          total post-warmup samples = 8000
##
## Population-Level Effects:
##                  Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## Intercept           19.18      3.05    13.26    25.28 1.00     6549     5615
## sias                 0.07      0.03     0.00     0.14 1.00     4963     4782
## sexMaschio           1.89      2.28    -2.93     6.17 1.00     4570     5485
## is_patient1         -4.70      5.61   -15.01     6.77 1.00     4155     4676
## age                 -0.10      0.08    -0.26     0.04 1.00     5871     4800
## bmi                 -0.24      0.13    -0.50     0.01 1.00     6467     5354
## sias:sexMaschio     -0.09      0.08    -0.25     0.05 1.00     4635     4910
## sias:is_patient1     0.34      0.16     0.01     0.64 1.00     4249     4796
##
## Family Specific Parameters:
##       Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## sigma     9.16      0.41     8.40    10.03 1.00     5122     4906
## alpha    10.49      2.33     6.46    15.54 1.00     5268     5552
##
## Samples were drawn using sample(hmc). For each parameter, Bulk_ESS
## and Tail_ESS are effective sample size measures, and Rhat is the potential
## scale reduction factor on split chains (at convergence, Rhat = 1).
```

```
plot(conditional_effects(fm3, "sias:is_patient"))
```