Model 1: Fbg

Running the crude model

crude\_fbg =   
 multinom(fbg\_cat ~ fuel\_used\_for\_cooking\_percent\_wood\_dung + percent\_public\_source + percent\_private\_toilet + percent\_employed + percent\_without\_hs\_education + percent\_caste, data=total)

## # weights: 24 (14 variable)  
## initial value 147.214047   
## iter 10 value 126.004019  
## iter 20 value 120.958058  
## iter 30 value 120.478616  
## iter 40 value 117.231716  
## iter 50 value 116.951601  
## final value 116.946268   
## converged

crude\_model=  
 crude\_fbg %>%   
 broom::tidy() %>%   
 knitr::kable(digits = 3)  
  
crude\_or=  
 exp(coef(crude\_fbg)) %>%   
 knitr::kable(digits = 3)

crude\_model

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| y.level | term | estimate | std.error | statistic | p.value |
| prediabetes | (Intercept) | 7.116 | 1.510 | 1.299 | 0.194 |
| prediabetes | fuel\_used\_for\_cooking\_percent\_wood\_dung | 240.900 | 6.796 | 0.807 | 0.420 |
| prediabetes | percent\_public\_source | 0.218 | 1.231 | -1.237 | 0.216 |
| prediabetes | percent\_private\_toilet | 1.004 | 0.006 | 0.646 | 0.518 |
| prediabetes | percent\_employed | 0.171 | 3.120 | -0.566 | 0.572 |
| prediabetes | percent\_without\_hs\_education | 0.333 | 1.668 | -0.659 | 0.510 |
| prediabetes | percent\_caste | 0.212 | 0.959 | -1.615 | 0.106 |
| diabetes | (Intercept) | 8.611 | 2.053 | 1.049 | 0.294 |
| diabetes | fuel\_used\_for\_cooking\_percent\_wood\_dung | 2.770 | 17.554 | 0.058 | 0.954 |
| diabetes | percent\_public\_source | 0.000 | 4.655 | -2.084 | 0.037 |
| diabetes | percent\_private\_toilet | 1.003 | 0.007 | 0.345 | 0.730 |
| diabetes | percent\_employed | 0.015 | 4.182 | -1.005 | 0.315 |
| diabetes | percent\_without\_hs\_education | 0.647 | 2.856 | -0.153 | 0.879 |
| diabetes | percent\_caste | 0.973 | 0.319 | -0.087 | 0.931 |

crude\_or

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | (Intercept) | fuel\_used\_for\_cooking\_percent\_wood\_dung | percent\_public\_source | percent\_private\_toilet | percent\_employed | percent\_without\_hs\_education | percent\_caste |
| prediabetes | 7.116 | 240.90 | 0.218 | 1.004 | 0.171 | 0.333 | 0.212 |
| diabetes | 8.611 | 2.77 | 0.000 | 1.003 | 0.015 | 0.647 | 0.973 |

Running the model with age as a confounder

age\_fbg =   
 multinom(fbg\_cat ~ fuel\_used\_for\_cooking\_percent\_wood\_dung + percent\_public\_source + percent\_private\_toilet + percent\_employed + percent\_without\_hs\_education + percent\_caste + median\_age, data=total)

## # weights: 27 (16 variable)  
## initial value 147.214047   
## iter 10 value 120.083806  
## iter 20 value 113.192095  
## iter 30 value 112.331907  
## iter 40 value 111.207763  
## iter 50 value 108.979685  
## iter 60 value 108.947972  
## final value 108.946939   
## converged

summary(age\_fbg)

## Call:  
## multinom(formula = fbg\_cat ~ fuel\_used\_for\_cooking\_percent\_wood\_dung +   
## percent\_public\_source + percent\_private\_toilet + percent\_employed +   
## percent\_without\_hs\_education + percent\_caste + median\_age,   
## data = total)  
##   
## Coefficients:  
## (Intercept) fuel\_used\_for\_cooking\_percent\_wood\_dung  
## prediabetes -9.537129 4.5782739  
## diabetes -14.671208 -0.1011297  
## percent\_public\_source percent\_private\_toilet percent\_employed  
## prediabetes -1.549981 -0.001554108 1.977762  
## diabetes -9.015487 -0.004153350 2.375135  
## percent\_without\_hs\_education percent\_caste median\_age  
## prediabetes 1.086844 -0.9767290 0.2106869  
## diabetes 3.659797 -0.0101799 0.2914880  
##   
## Std. Errors:  
## (Intercept) fuel\_used\_for\_cooking\_percent\_wood\_dung  
## prediabetes 3.908210 7.360951  
## diabetes 5.562783 16.975470  
## percent\_public\_source percent\_private\_toilet percent\_employed  
## prediabetes 1.248331 0.006573568 3.418176  
## diabetes 4.642188 0.008067217 4.702471  
## percent\_without\_hs\_education percent\_caste median\_age  
## prediabetes 1.904495 0.9919181 0.06677395  
## diabetes 3.209016 0.1491680 0.08847521  
##   
## Residual Deviance: 217.8939   
## AIC: 249.8939

age\_model=  
 age\_fbg %>%   
 broom::tidy() %>%   
 knitr::kable(digits = 3)  
  
age\_or=  
 exp(coef(age\_fbg)) %>%   
 knitr::kable(digits = 3)

age\_model

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| y.level | term | estimate | std.error | statistic | p.value |
| prediabetes | (Intercept) | 0.000 | 3.908 | -2.440 | 0.015 |
| prediabetes | fuel\_used\_for\_cooking\_percent\_wood\_dung | 97.346 | 7.361 | 0.622 | 0.534 |
| prediabetes | percent\_public\_source | 0.212 | 1.248 | -1.242 | 0.214 |
| prediabetes | percent\_private\_toilet | 0.998 | 0.007 | -0.236 | 0.813 |
| prediabetes | percent\_employed | 7.227 | 3.418 | 0.579 | 0.563 |
| prediabetes | percent\_without\_hs\_education | 2.965 | 1.904 | 0.571 | 0.568 |
| prediabetes | percent\_caste | 0.377 | 0.992 | -0.985 | 0.325 |
| prediabetes | median\_age | 1.235 | 0.067 | 3.155 | 0.002 |
| diabetes | (Intercept) | 0.000 | 5.563 | -2.637 | 0.008 |
| diabetes | fuel\_used\_for\_cooking\_percent\_wood\_dung | 0.904 | 16.975 | -0.006 | 0.995 |
| diabetes | percent\_public\_source | 0.000 | 4.642 | -1.942 | 0.052 |
| diabetes | percent\_private\_toilet | 0.996 | 0.008 | -0.515 | 0.607 |
| diabetes | percent\_employed | 10.752 | 4.702 | 0.505 | 0.614 |
| diabetes | percent\_without\_hs\_education | 38.853 | 3.209 | 1.140 | 0.254 |
| diabetes | percent\_caste | 0.990 | 0.149 | -0.068 | 0.946 |
| diabetes | median\_age | 1.338 | 0.088 | 3.295 | 0.001 |

age\_or

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | (Intercept) | fuel\_used\_for\_cooking\_percent\_wood\_dung | percent\_public\_source | percent\_private\_toilet | percent\_employed | percent\_without\_hs\_education | percent\_caste | median\_age |
| prediabetes | 0 | 97.346 | 0.212 | 0.998 | 7.227 | 2.965 | 0.377 | 1.235 |
| diabetes | 0 | 0.904 | 0.000 | 0.996 | 10.752 | 38.853 | 0.990 | 1.338 |

Running the model with sex as a confounder

sex\_fbg =   
 multinom(fbg\_cat ~ fuel\_used\_for\_cooking\_percent\_wood\_dung + percent\_public\_source + percent\_private\_toilet + percent\_employed + percent\_without\_hs\_education + percent\_caste + percent\_female, data=total)

## # weights: 27 (16 variable)  
## initial value 147.214047   
## iter 10 value 125.132550  
## iter 20 value 120.689634  
## iter 30 value 119.663226  
## iter 40 value 118.460834  
## iter 50 value 115.640491  
## iter 60 value 115.430617  
## final value 115.256130   
## converged

summary(sex\_fbg)

## Call:  
## multinom(formula = fbg\_cat ~ fuel\_used\_for\_cooking\_percent\_wood\_dung +   
## percent\_public\_source + percent\_private\_toilet + percent\_employed +   
## percent\_without\_hs\_education + percent\_caste + percent\_female,   
## data = total)  
##   
## Coefficients:  
## (Intercept) fuel\_used\_for\_cooking\_percent\_wood\_dung  
## prediabetes -8.788918 4.205755  
## diabetes -8.348199 1.385184  
## percent\_public\_source percent\_private\_toilet percent\_employed  
## prediabetes -1.367466 0.004749212 -0.9709633  
## diabetes -10.111438 0.003015511 -2.8511089  
## percent\_without\_hs\_education percent\_caste percent\_female  
## prediabetes -0.6428292 -1.69374532 15.38484  
## diabetes -0.1700545 -0.04084794 14.70183  
##   
## Std. Errors:  
## (Intercept) fuel\_used\_for\_cooking\_percent\_wood\_dung  
## prediabetes 7.809583 6.766617  
## diabetes 7.978979 16.918901  
## percent\_public\_source percent\_private\_toilet percent\_employed  
## prediabetes 1.237316 0.005988480 3.116130  
## diabetes 4.761686 0.007291984 4.157151  
## percent\_without\_hs\_education percent\_caste percent\_female  
## prediabetes 1.701773 0.9787261 11.23542  
## diabetes 2.889023 0.5833245 11.33858  
##   
## Residual Deviance: 230.5123   
## AIC: 262.5123

sex\_model=  
 sex\_fbg %>%   
 broom::tidy() %>%   
 knitr::kable(digits = 3)  
  
sex\_or=  
 exp(coef(sex\_fbg)) %>%   
 knitr::kable(digits = 3)

sex\_model

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| y.level | term | estimate | std.error | statistic | p.value |
| prediabetes | (Intercept) | 0.000 | 7.810 | -1.125 | 0.260 |
| prediabetes | fuel\_used\_for\_cooking\_percent\_wood\_dung | 67.071 | 6.767 | 0.622 | 0.534 |
| prediabetes | percent\_public\_source | 0.255 | 1.237 | -1.105 | 0.269 |
| prediabetes | percent\_private\_toilet | 1.005 | 0.006 | 0.793 | 0.428 |
| prediabetes | percent\_employed | 0.379 | 3.116 | -0.312 | 0.755 |
| prediabetes | percent\_without\_hs\_education | 0.526 | 1.702 | -0.378 | 0.706 |
| prediabetes | percent\_caste | 0.184 | 0.979 | -1.731 | 0.084 |
| prediabetes | percent\_female | 4803436.422 | 11.235 | 1.369 | 0.171 |
| diabetes | (Intercept) | 0.000 | 7.979 | -1.046 | 0.295 |
| diabetes | fuel\_used\_for\_cooking\_percent\_wood\_dung | 3.996 | 16.919 | 0.082 | 0.935 |
| diabetes | percent\_public\_source | 0.000 | 4.762 | -2.123 | 0.034 |
| diabetes | percent\_private\_toilet | 1.003 | 0.007 | 0.414 | 0.679 |
| diabetes | percent\_employed | 0.058 | 4.157 | -0.686 | 0.493 |
| diabetes | percent\_without\_hs\_education | 0.844 | 2.889 | -0.059 | 0.953 |
| diabetes | percent\_caste | 0.960 | 0.583 | -0.070 | 0.944 |
| diabetes | percent\_female | 2426175.227 | 11.339 | 1.297 | 0.195 |

sex\_or

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | (Intercept) | fuel\_used\_for\_cooking\_percent\_wood\_dung | percent\_public\_source | percent\_private\_toilet | percent\_employed | percent\_without\_hs\_education | percent\_caste | percent\_female |
| prediabetes | 0 | 67.071 | 0.255 | 1.005 | 0.379 | 0.526 | 0.184 | 4803436 |
| diabetes | 0 | 3.996 | 0.000 | 1.003 | 0.058 | 0.844 | 0.960 | 2426175 |

Running the model with marital status as a confounder

marital\_fbg =   
 multinom(fbg\_cat ~ fuel\_used\_for\_cooking\_percent\_wood\_dung + percent\_public\_source + percent\_private\_toilet + percent\_employed + percent\_without\_hs\_education + percent\_caste + percent\_marital\_status, data=total)

## # weights: 27 (16 variable)  
## initial value 147.214047   
## iter 10 value 130.781550  
## iter 20 value 121.136652  
## iter 30 value 120.780273  
## iter 40 value 119.029619  
## iter 50 value 115.954327  
## iter 60 value 115.903704  
## final value 115.902660   
## converged

summary(marital\_fbg)

## Call:  
## multinom(formula = fbg\_cat ~ fuel\_used\_for\_cooking\_percent\_wood\_dung +   
## percent\_public\_source + percent\_private\_toilet + percent\_employed +   
## percent\_without\_hs\_education + percent\_caste + percent\_marital\_status,   
## data = total)  
##   
## Coefficients:  
## (Intercept) fuel\_used\_for\_cooking\_percent\_wood\_dung  
## prediabetes 1.986113 5.560182  
## diabetes 5.313670 2.599120  
## percent\_public\_source percent\_private\_toilet percent\_employed  
## prediabetes -1.521497 0.003771747 -1.801471  
## diabetes -9.472381 0.002049244 -3.745794  
## percent\_without\_hs\_education percent\_caste  
## prediabetes -1.1303649 -1.53230555  
## diabetes -0.9516206 -0.03719445  
## percent\_marital\_status  
## prediabetes -0.0009918383  
## diabetes -3.7319658599  
##   
## Std. Errors:  
## (Intercept) fuel\_used\_for\_cooking\_percent\_wood\_dung  
## prediabetes 1.514304 6.789168  
## diabetes 3.925159 17.689565  
## percent\_public\_source percent\_private\_toilet percent\_employed  
## prediabetes 1.232123 0.005923699 3.155483  
## diabetes 4.772094 0.007290674 4.201607  
## percent\_without\_hs\_education percent\_caste  
## prediabetes 1.703190 0.9607122  
## diabetes 2.942061 0.4092454  
## percent\_marital\_status  
## prediabetes 0.01365773  
## diabetes 3.88993918  
##   
## Residual Deviance: 231.8053   
## AIC: 263.8053

marital\_model=  
 marital\_fbg %>%   
 broom::tidy() %>%   
 knitr::kable(digits = 3)  
  
marital\_or=  
 exp(coef(age\_fbg)) %>%   
 knitr::kable(digits = 3)

marital\_model

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| y.level | term | estimate | std.error | statistic | p.value |
| prediabetes | (Intercept) | 7.287 | 1.514 | 1.312 | 0.190 |
| prediabetes | fuel\_used\_for\_cooking\_percent\_wood\_dung | 259.870 | 6.789 | 0.819 | 0.413 |
| prediabetes | percent\_public\_source | 0.218 | 1.232 | -1.235 | 0.217 |
| prediabetes | percent\_private\_toilet | 1.004 | 0.006 | 0.637 | 0.524 |
| prediabetes | percent\_employed | 0.165 | 3.155 | -0.571 | 0.568 |
| prediabetes | percent\_without\_hs\_education | 0.323 | 1.703 | -0.664 | 0.507 |
| prediabetes | percent\_caste | 0.216 | 0.961 | -1.595 | 0.111 |
| prediabetes | percent\_marital\_status | 0.999 | 0.014 | -0.073 | 0.942 |
| diabetes | (Intercept) | 203.094 | 3.925 | 1.354 | 0.176 |
| diabetes | fuel\_used\_for\_cooking\_percent\_wood\_dung | 13.452 | 17.690 | 0.147 | 0.883 |
| diabetes | percent\_public\_source | 0.000 | 4.772 | -1.985 | 0.047 |
| diabetes | percent\_private\_toilet | 1.002 | 0.007 | 0.281 | 0.779 |
| diabetes | percent\_employed | 0.024 | 4.202 | -0.892 | 0.373 |
| diabetes | percent\_without\_hs\_education | 0.386 | 2.942 | -0.323 | 0.746 |
| diabetes | percent\_caste | 0.963 | 0.409 | -0.091 | 0.928 |
| diabetes | percent\_marital\_status | 0.024 | 3.890 | -0.959 | 0.337 |

marital\_or

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | (Intercept) | fuel\_used\_for\_cooking\_percent\_wood\_dung | percent\_public\_source | percent\_private\_toilet | percent\_employed | percent\_without\_hs\_education | percent\_caste | median\_age |
| prediabetes | 0 | 97.346 | 0.212 | 0.998 | 7.227 | 2.965 | 0.377 | 1.235 |
| diabetes | 0 | 0.904 | 0.000 | 0.996 | 10.752 | 38.853 | 0.990 | 1.338 |