inla v2

data

```
dat <- readRDS('C:/Users/sympl/Documents/UMass/msthesis/Data/2014data.rds')

#dd<- readRDS('C:/Users/sympl/Documents/UMass/msthesis/Data/regiondata.rds')

ge.shp<-readOGR("C:/Users/sympl/Documents/UMass/msthesis/GPS/GHGE71FL/GHGE71FL.shp")
```

```
## OGR data source with driver: ESRI Shapefile
## Source: "C:\Users\sympl\Documents\UMass\msthesis\GPS\GHGE71FL\GHGE71FL.shp", layer: "GHGE71FL"
## with 427 features
## It has 20 fields
```

```
bound<-readOGR("C:/Users/sympl/Documents/UMass/msthesis/GPS/sdr_subnational_boundaries_2021-03-05/shps/s
```

```
## OGR data source with driver: ESRI Shapefile
## Source: "C:\Users\sympl\Documents\UMass\msthesis\GPS\sdr_subnational_boundaries_2021-03-05\shps\sdr_s
## with 10 features
## It has 27 fields
```

```
# district boundary
dist<-readOGR("C:/Users/sympl/Documents/UMass/msthesis/GPS/Ghana_District_CORRECT/Ghana_districts_corre
```

```
## Warning in OGRSpatialRef(dsn, layer, morphFromESRI = morphFromESRI, dumpSRS
## = dumpSRS, : Discarded ellps War Office in Proj4 definition: +proj=tmerc
## +lat_0=4.66666666666667 +lon_0=-1 +k=0.99975 +x_0=274319.739163358 +y_0=0
## +a=6378300 +rf=296 +to_meter=0.304799710181509 +no_defs

## Warning in OGRSpatialRef(dsn, layer, morphFromESRI = morphFromESRI,
## dumpSRS = dumpSRS, : Discarded datum Accra in Proj4 definition: +proj=tmerc
## +lat_0=4.66666666666667 +lon_0=-1 +k=0.99975 +x_0=274319.739163358 +y_0=0
## +a=6378300 +rf=296 +to_meter=0.304799710181509 +no_defs

## Warning in showSRID(wkt2, "PROJ"): Discarded ellps War Office in Proj4
## definition: +proj=tmerc +lat_0=4.66666666666667 +lon_0=-1 +k=0.99975
## +x_0=274319.739163358 +y_0=0 +a=6378300 +rf=296 +to_meter=0.304799710181509
## +no_defs +type=crs

## Warning in showSRID(wkt2, "PROJ"): Discarded datum Accra in Proj4 definition

## OGR data source with driver: ESRI Shapefile
## Source: "C:\Users\sympl\Documents\UMass\msthesis\GPS\Ghana_District_CORRECT\Ghana_districts_correct.s
## with 110 features
## It has 18 fields
```

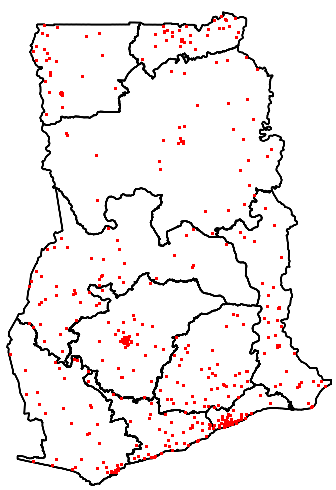
```r
dist2<- readOGR("C:/Users/sympl/Documents/UMass/msthesis/GPS/gadm36_GHA_shp/gadm36_GHA_2.shp")
```

```
## OGR data source with driver: ESRI Shapefile
## Source: "C:\Users\sympl\Documents\UMass\msthesis\GPS\gadm36_GHA_shp\gadm36_GHA_2.shp", layer: "gadm3
## with 137 features
## It has 13 fields
```

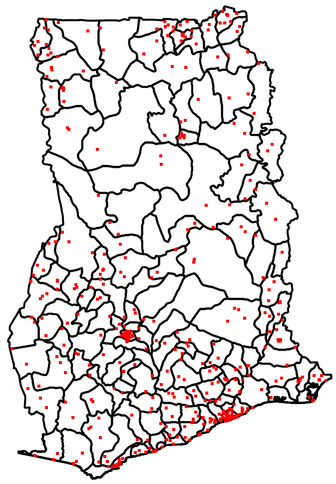
```r
dist3<- readOGR("C:/Users/sympl/Documents/UMass/msthesis/GPS/Ghana_Dist_DHS_Join/GPS_Points_Districts.s
```

```
## OGR data source with driver: ESRI Shapefile
## Source: "C:\Users\sympl\Documents\UMass\msthesis\GPS\Ghana_Dist_DHS_Join\GPS_Points_Districts.shp",
## with 427 features
## It has 41 fields
## Integer64 fields read as strings:  OBJECTID Join_Count TARGET_FID Index Household
```

```r
plot(bound)
points(ge.shp, pch=".", col="red")
```



```r
plot(dist2) #from LA
points(ge.shp, pch=".", col="red")
```



nb

```
library(spdep)
```

```
## Loading required package: spData
```

```
## Loading required package: sf
```

```
## Linking to GEOS 3.8.0, GDAL 3.0.4, PROJ 6.3.1
```

```
nb <- poly2nb(bound, row.names = bound@data$REGCODE) #for calculating neighbors

nb2INLA("map.adj", nb)
g <- inla.read.graph(filename = "map.adj")

##define stuctured and unstructured spatial re vectors
bound$re_u <- 1:nrow(bound@data)
bound$re_v <- 1:nrow(bound@data)

trial<-dat
trial$region<- as.numeric(trial$region)
trial<-trial %>% right_join(bound@data, by= c("region"="REGCODE"))
```

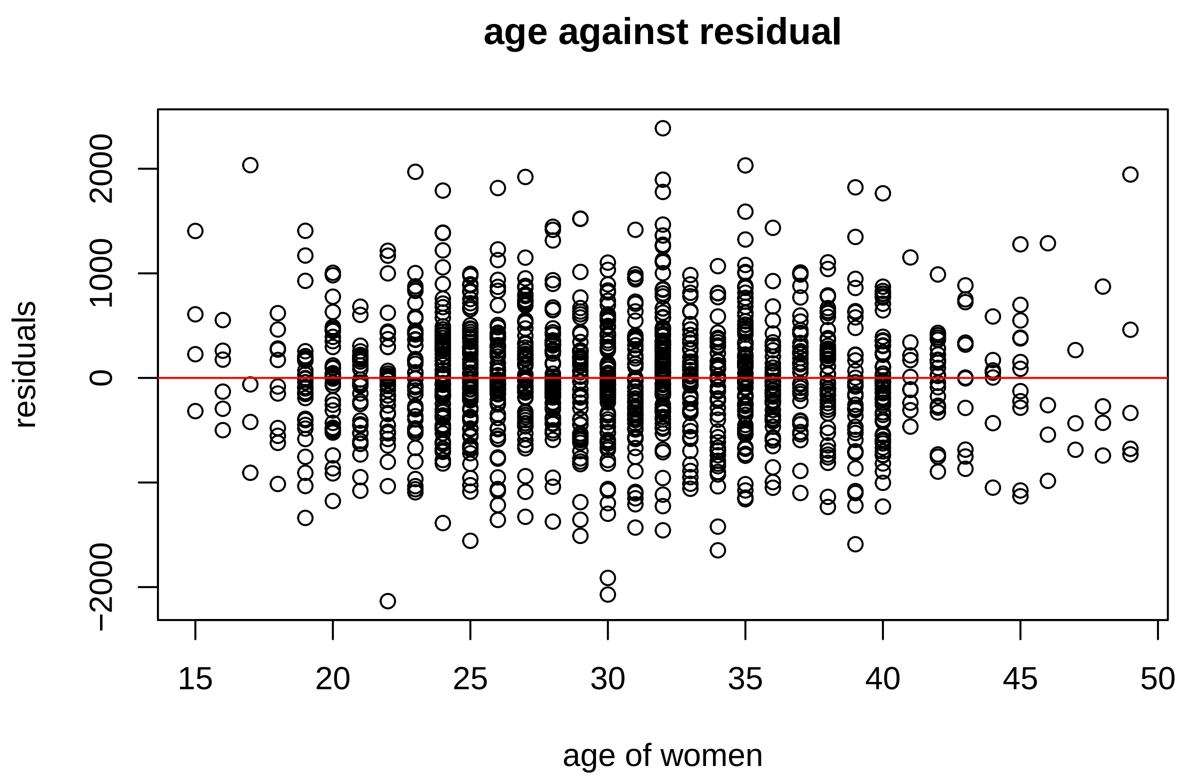
fitting iid random effect

```r
##formula
formula <- c_weight ~ fuel_bin+gender+education+ w_age+ marital_s+wealth+bmi+residence + f(re_v, model =

# inla
res <- inla(formula, family = "gaussian", data = trial,  control.predictor = list(compute = TRUE))

summary(res)
```

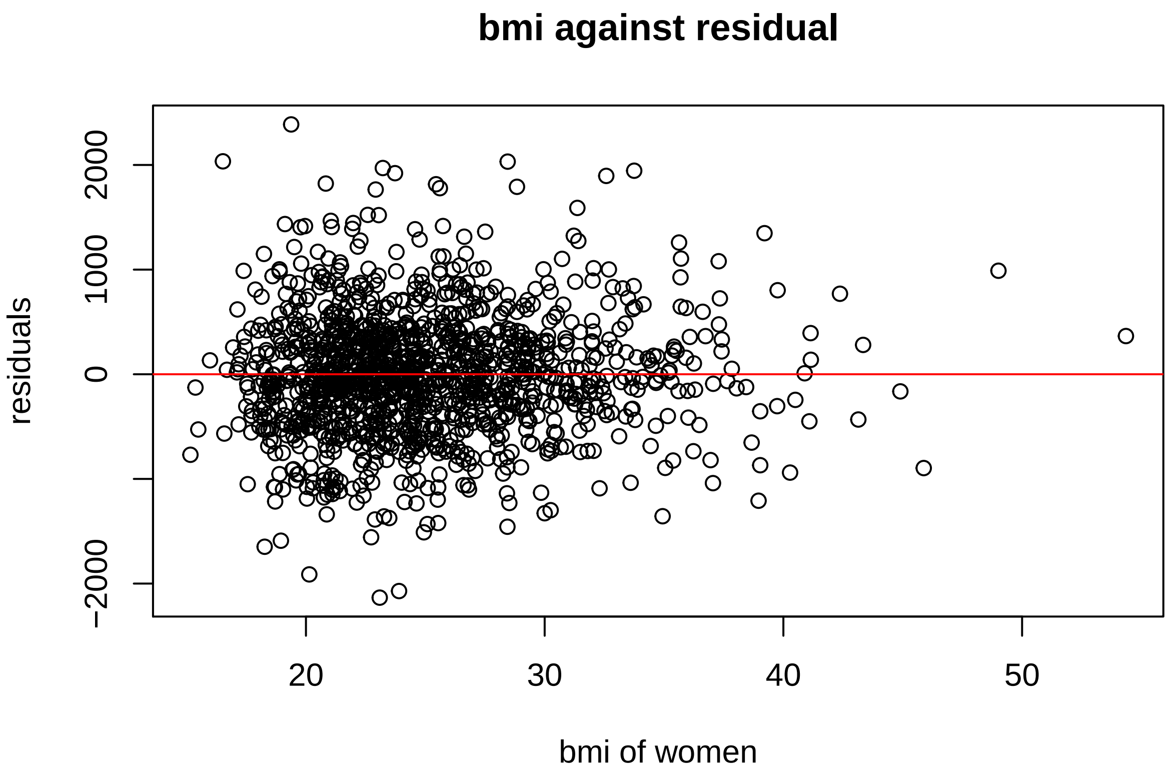
```
##
## Call:
##    "inla(formula = formula, family = \"gaussian\", data = trial,
##    control.predictor = list(compute = TRUE))"
## Time used:
##     Pre = 6.08, Running = 1.9, Post = 2.57, Total = 10.5
## Fixed effects:
##                 mean     sd 0.025quant 0.5quant 0.975quant     mode kld
## (Intercept) 2599.928 69.569   2463.341 2599.926   2736.401 2599.928   0
## fuel_bin1     -5.341 21.811    -48.163   -5.342     37.445   -5.341   0
## gender2     -102.996 17.078   -136.526 -102.996    -69.494 -102.996   0
## education1    11.204 21.372    -30.756   11.203     53.129   11.204   0
## education2    10.220 18.917    -26.921   10.219     47.330   10.220   0
## education3    -2.365 26.511    -54.416   -2.366     49.642   -2.365   0
## w_age          6.167  1.603      3.021    6.167      9.312    6.167   0
## marital_s1     0.951 21.623    -41.503    0.951     43.370    0.951   0
## wealth2       13.386 21.731    -29.279   13.385     56.016   13.386   0
## wealth3       48.649 20.730      7.949   48.648     89.314   48.649   0
## wealth4      -32.544 21.720    -75.188  -32.545     10.064  -32.544   0
## wealth5       31.149 23.734    -15.450   31.148     77.709   31.149   0
## bmi           14.513  1.996     10.594   14.513     18.429   14.513   0
## residence2    14.917 18.851    -22.093   14.916     51.896   14.917   0
##
## Random effects:
##   Name     Model
##     re_v IID model
##
## Model hyperparameters:
##                                         mean    sd 0.025quant 0.5quant
## Precision for the Gaussian observations 0.00 0.000      0.000     0.00
## Precision for re_v                      0.52 0.002      0.517     0.52
##                                         0.975quant mode
## Precision for the Gaussian observations      0.000 0.00
## Precision for re_v                           0.524 0.52
##
## Expected number of effective parameters(stdev): 8.96(0.00)
## Number of equivalent replicates : 146.12
##
## Marginal log-Likelihood:  -10650.49
## Posterior marginals for the linear predictor and
##  the fitted values are computed
```

plotting residuals

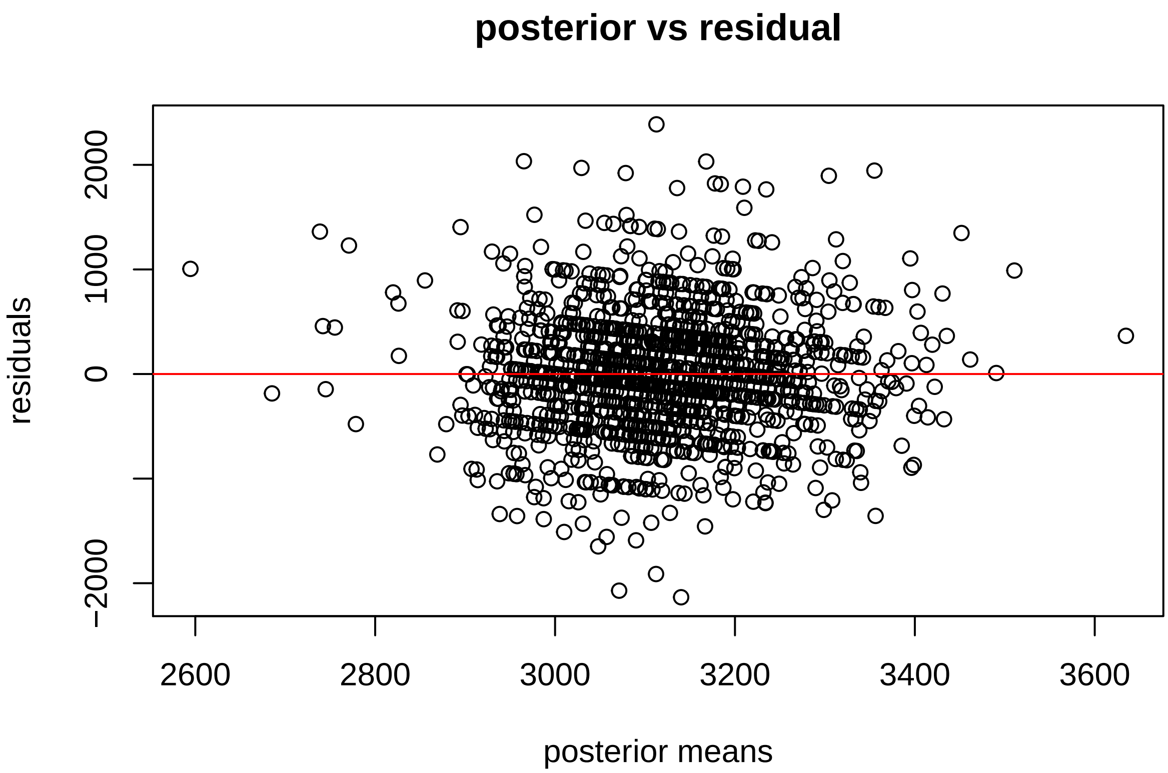
```r
#age
residuals=  trial$c_weight-res$summary.fitted.values[,1]
plot(trial$w_age,residuals, main= "age against residual", xlab="age of women")
abline(h=0, col="red")
```




```r
#bmi
plot(trial$bmi,residuals, main= "bmi against residual", xlab="bmi of women")
abline(h=0, col="red")
```




```r
#posterior
plot(res$summary.fitted.values[,1],residuals, main= "posterior vs residual", xlab="posterior means")
abline(h=0, col="red")
```




```
#priors not sure
```