Evaluating Necessity for UR Stratification

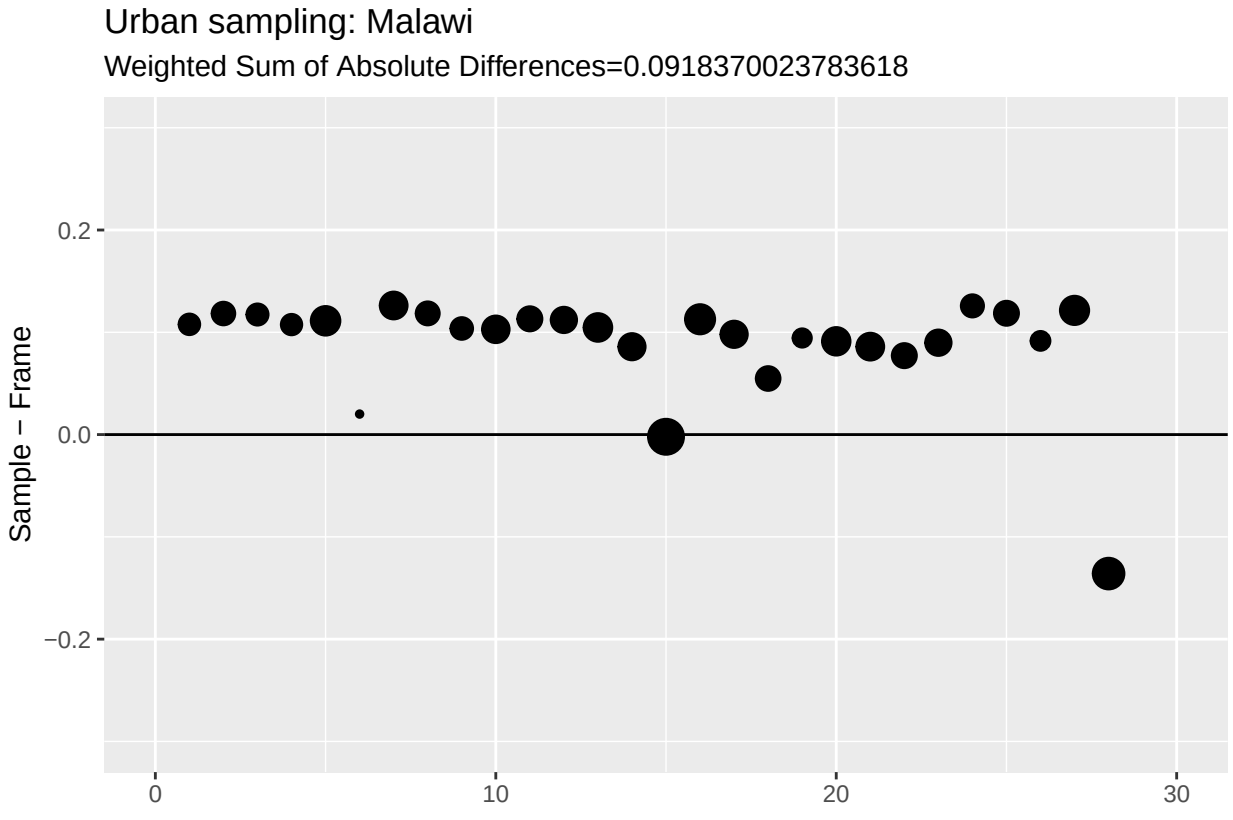
Country of Interest: Malawi

This report provides results which will help the team to decide whether it is necessary that we include urban-rural stratification in the Betabinomial models. There are two country-specific factors that must be evaluated to determine this: 1) over or under-sampling of urban households and 2) association between child mortality and type of household (urban or rural).

1) Urban/Rural Sampling

The plot below indicates the difference between the urban proportion of the sampled households and the actual urban proportion of households in the sampling frame. Each dot represents a different Admin1 region and the size of each dot is proportional to the total number of households in that region. The sum of absolute differences across all regions has been calculated, weighted by the total number of households in each region.

Note that a dot above the line indicates urban oversampling in that region, whereas a dot below the line indicates urban undersampling.



2) Association between mortality and urban/rural

We fit 3 simple Betabinomial models in INLA with the following covariate patterns and will compare them to address the association between mortality and urban/rural.

- Model 1: admin1 + f(years,model='iid')

```
##                         mean    sd 0.025quant 0.5quant 0.975quant
## admin1.nameCentral  -6.243 0.101     -6.445   -6.243     -6.043
## admin1.nameNorthern -6.508 0.104     -6.714   -6.507     -6.303
## admin1.nameSouthern -6.224 0.101     -6.424   -6.223     -6.024
```

- Model 2: admin1 + urban + f(years,model='iid')

```
##                         mean    sd 0.025quant 0.5quant 0.975quant
## admin1.nameCentral  -6.523 0.108     -6.737   -6.523     -6.311
## admin1.nameNorthern -6.782 0.110     -7.000   -6.782     -6.566
## admin1.nameSouthern -6.502 0.107     -6.715   -6.502     -6.290
## urbanrural           0.322 0.036      0.251    0.322      0.394
```

- Model 3: admin1 + urban + admin1*urban + f(years,model='iid')

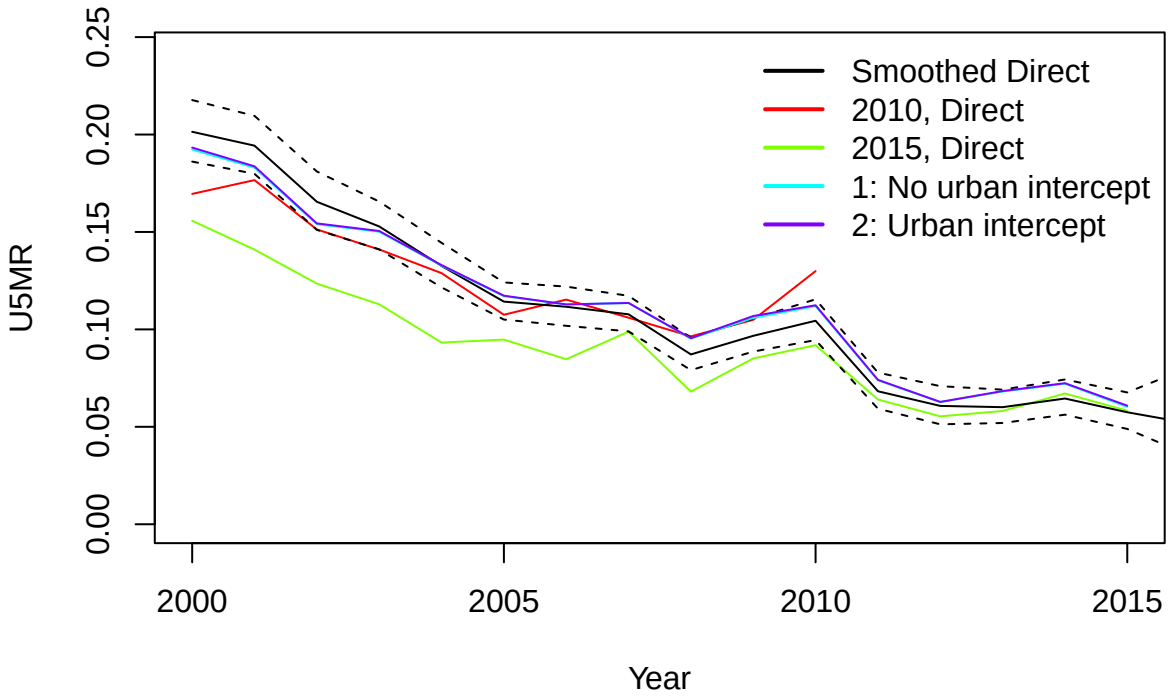
```
##                                  mean    sd 0.025quant 0.5quant 0.975quant
## admin1.nameCentral             -6.481 0.115     -6.710   -6.480     -6.254
## admin1.nameNorthern            -6.761 0.130     -7.019   -6.760     -6.507
## admin1.nameSouthern            -6.541 0.111     -6.762   -6.540     -6.321
## urbanrural                      0.274 0.061      0.155    0.273      0.395
## admin1.nameNorthern:urbanrural  0.022 0.108     -0.187    0.022      0.236
## admin1.nameSouthern:urbanrural  0.091 0.081     -0.068    0.091      0.249
```

The Bayes factor for model 2 v. model 1 is 3.1004248×10^{15}.

The Bayes factor for model 3 v. model 1 is 5.4610379×10^{10}.

The Bayes factor for model 3 v. model 2 is 1.7613838×10^{-5}.

The plot below compares the smoothed direct national estimates with aggregated national level estimates from each of the first two models. By comparing these national estimates, we can assess whether including the urban intercept provides more or less accurate estimates.


Malawi
U5MR
0.00
0.05
0.10
0.15
0.20
0.25
2000
2005
2010
2015
Year
Smoothed Direct
2010, Direct
2015, Direct
1: No urban intercept
2: Urban intercept