Mali

```
## [1] "Census Females"

## # A tibble: 81 x 4
##      age  `1987`  `1998`  `2009`
##    <dbl>   <dbl>   <dbl>   <dbl>
## 1      0 124801. 142036  223369.
## 2      1 130699. 143506. 257789.
## 3      2 143705. 166117. 268530.
## 4      3 145236. 169658. 265587.
## 5      4 145604. 175557. 266091.
## 6      5 142436. 177505. 259251.
## 7      6 133063. 169191. 247642.
## 8      7 123495. 159883. 237080.
## 9      8 112436. 150065. 224554.
## 10     9 102337. 139890. 210831.
## # ... with 71 more rows

## [1] "Census Females 5-year"

## # A tibble: 18 x 2
##      age  `1976`
##    <dbl>   <dbl>
## 1      0 589461.
## 2      5 469318.
## 3     10 365111.
## 4     15 313740.
## 5     20 283085.
## 6     25 256486.
## 7     30 221242.
## 8     35 176439.
## 9     40 140031.
## 10    45 112098.
## 11    50  92157.
## 12    55  77736.
## 13    60  65678.
## 14    65  48225.
## 15    70  32268.
## 16    75  22262.
## 17    80  17833.
## 18    85  14930.

## [1] "Census Males"

## # A tibble: 81 x 4
##      age  `1987`  `1998`  `2009`
##    <dbl>   <dbl>   <dbl>   <dbl>
## 1      0 125225. 144399  228866.
## 2      1 132390. 146371. 265188.
## 3      2 145200. 169490. 275420.
## 4      3 146748. 173008  272373.
## 5      4 147629. 179622. 273244.
## 6      5 144982. 182525. 266880.
```

```
## 7      6 136266. 174741. 255699.
## 8      7 128089. 166574. 246234.
## 9      8 118465. 158195. 234852.
## 10     9 109481. 149394. 222229.
## # ... with 71 more rows

## [1] "Census Males 5-year"

## # A tibble: 18 x 2
##      age `1976`
##    <dbl>  <dbl>
## 1     0 587090.
## 2     5 478652.
## 3    10 371670.
## 4    15 294640.
## 5    20 236401.
## 6    25 201103.
## 7    30 183257.
## 8    35 162001.
## 9    40 137909.
## 10   45 116691.
## 11   50  99549.
## 12   55  84109.
## 13   60  67783.
## 14   65  47273.
## 15   70  30306.
## 16   75  20072.
## 17   80  14093.
## 18   85  14057.
```

Thiele log-Normal Hump Spline

```
## [1] "relative convergence (4)"

##     log_tau2_logpop    log_tau2_logpop    log_tau2_logpop    log_tau2_logpop    log_lambda_fx    log
##          4.80087252         6.03611677         4.34694704         5.52498770       4.89840378       1
##       log_lambda_tp           tp_slope        tp_params_5       tp_params_10    log_lambda_phi    log_
##          2.88006243        -0.04455827         0.24811371         0.89780325      11.19350157       1
##  log_lambda_lambda    log_lambda_delta log_lambda_epsilon
##          3.80971317         8.48087698         5.68440259
```
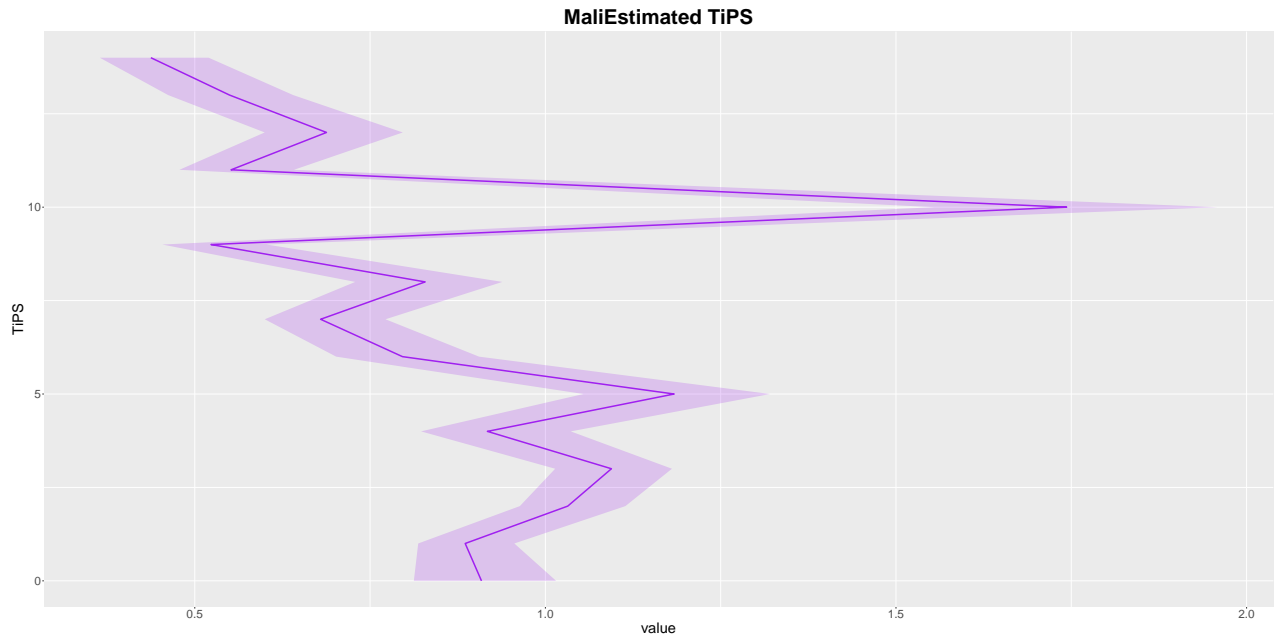
Figure 1: Estimated TiPS
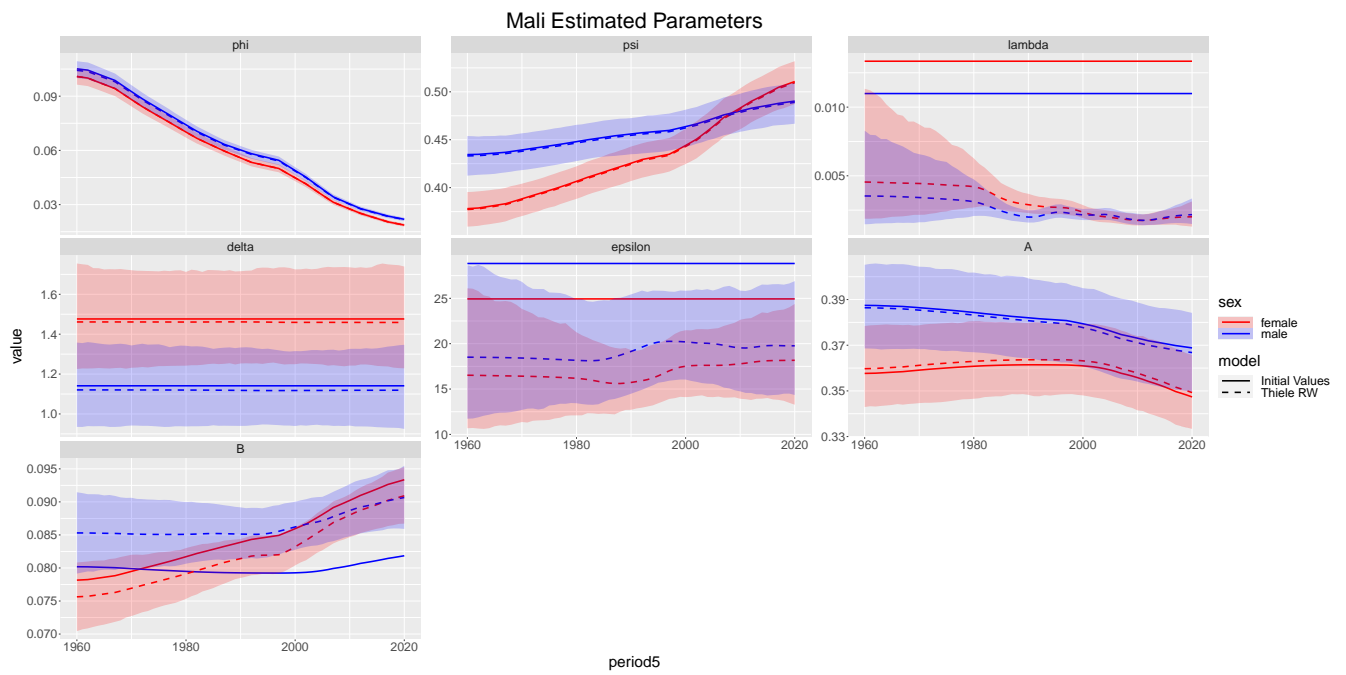
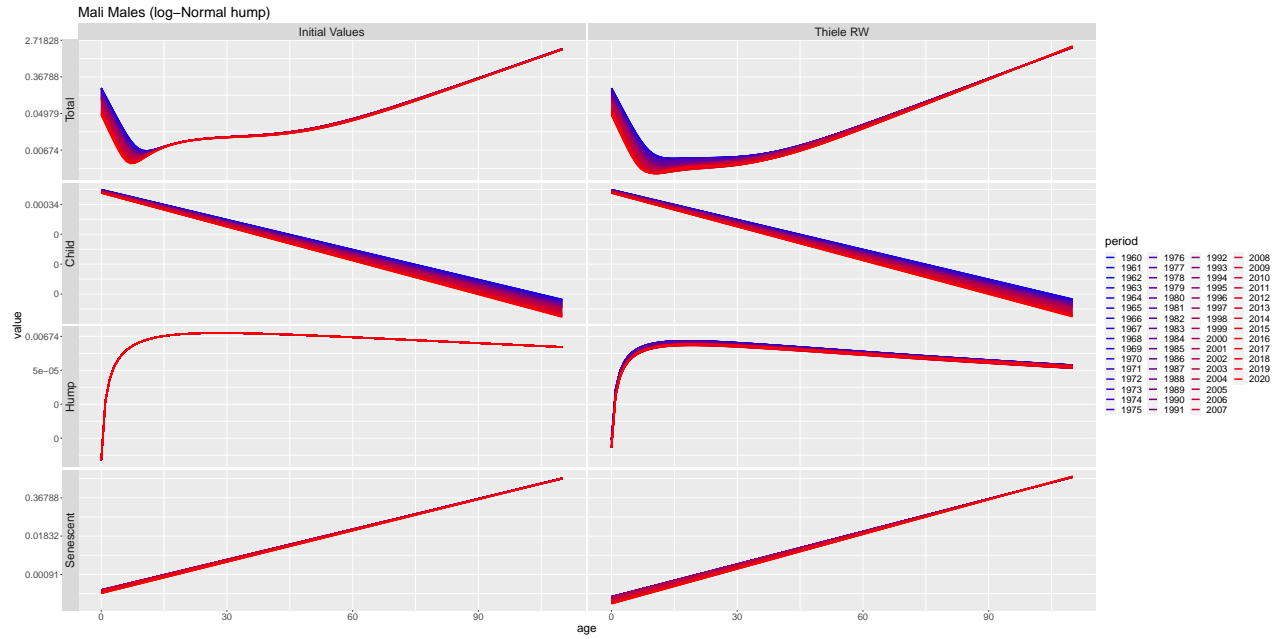Figure 2: Estimated parameters
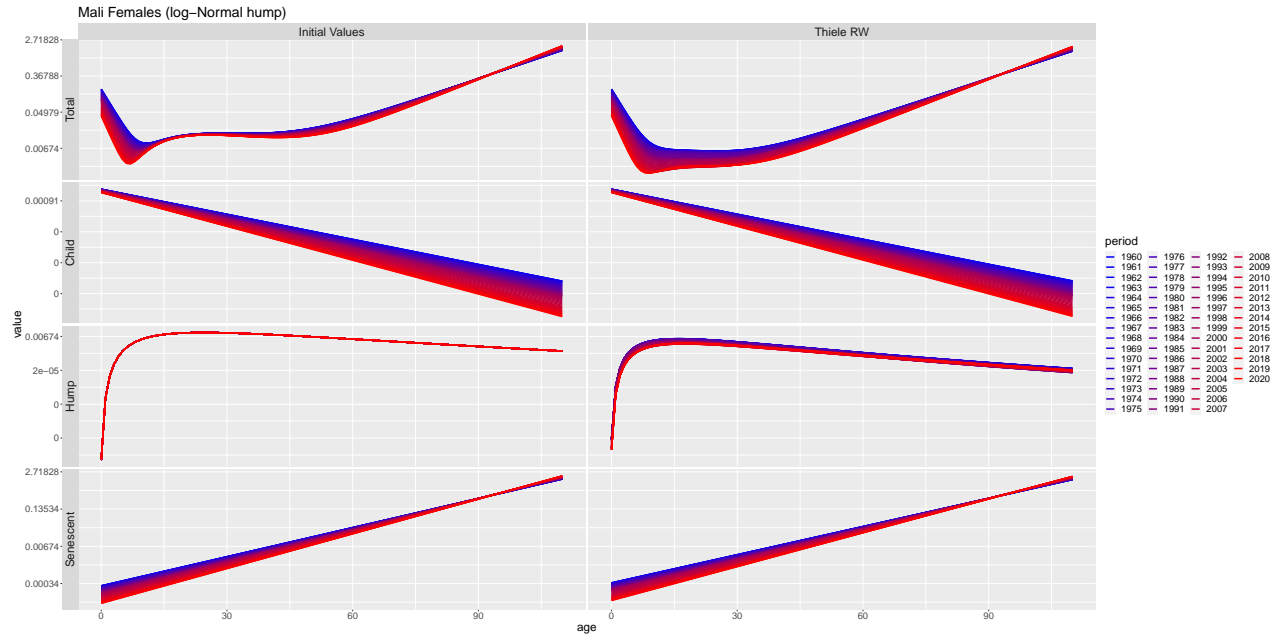
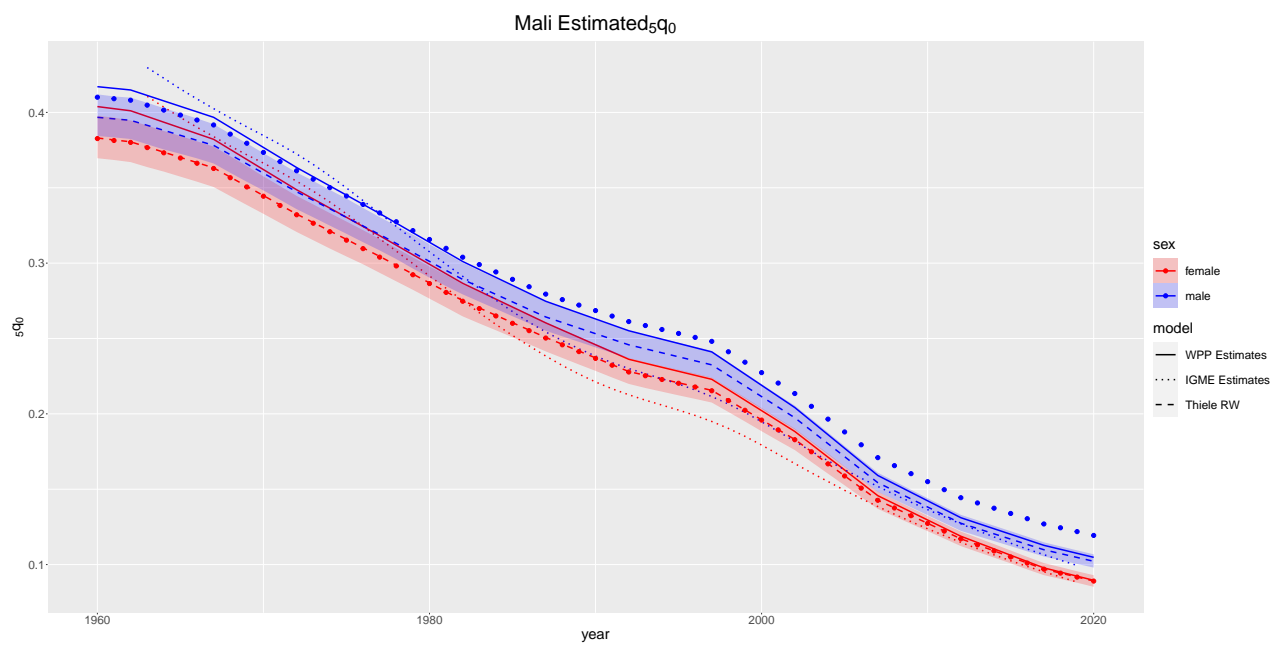Figure 3: Thiele Decomposed

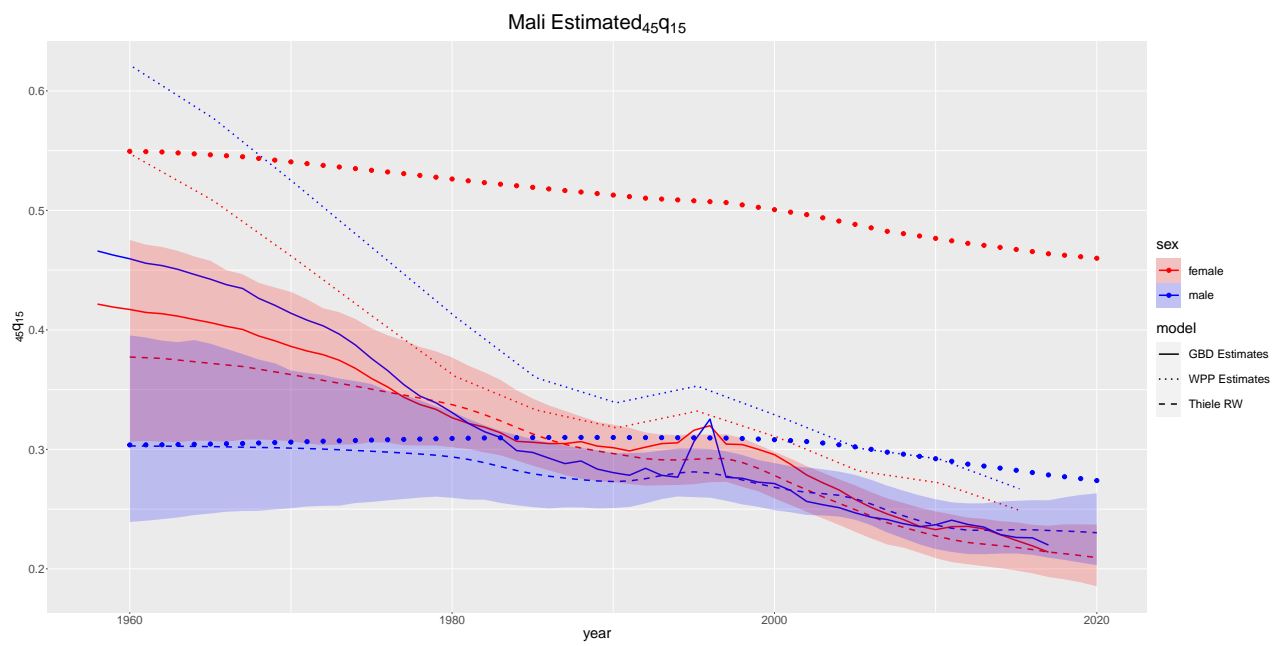Figure 4: Thiele Decomposed

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Figure 5: Estimated $_5q_0$
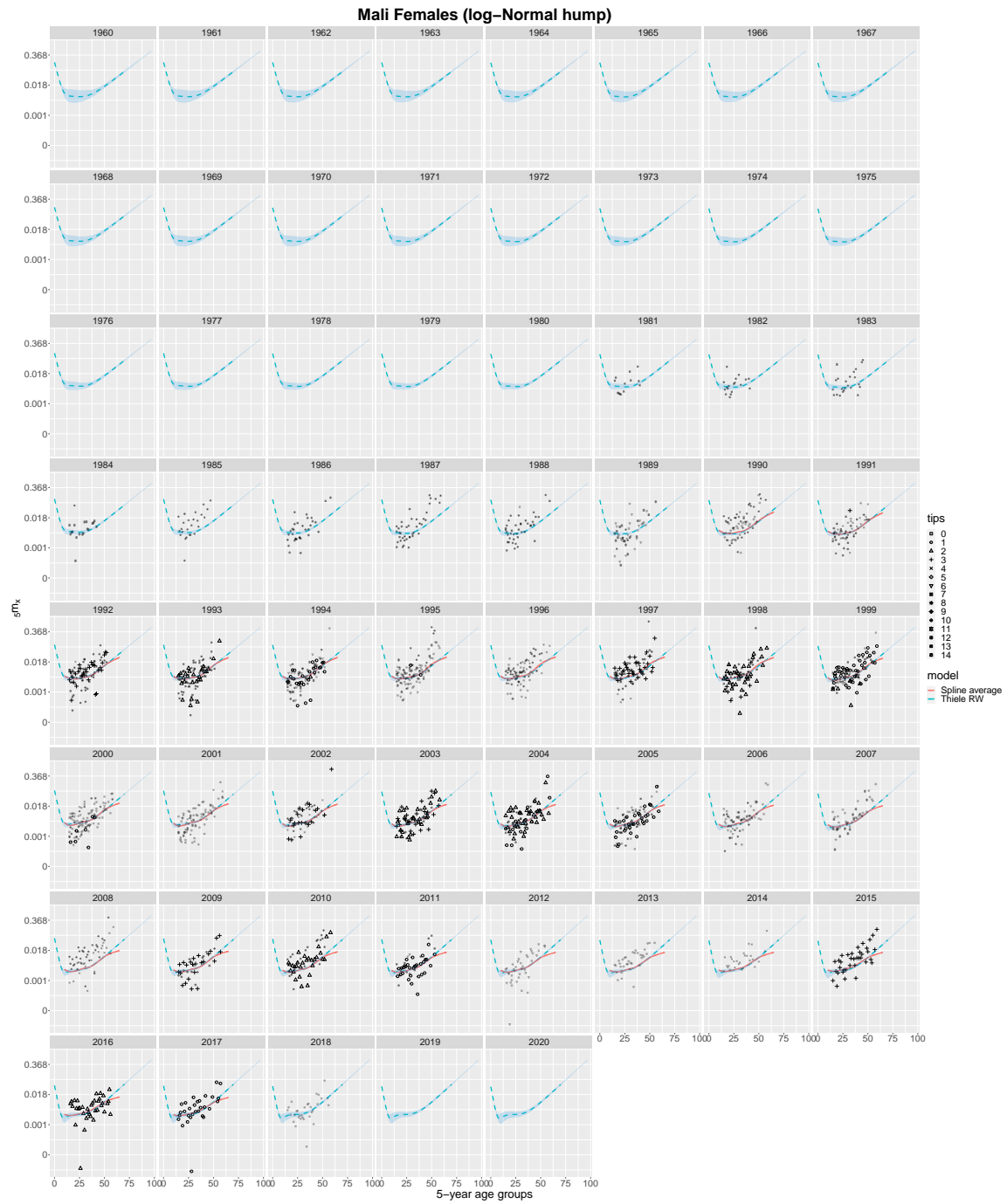

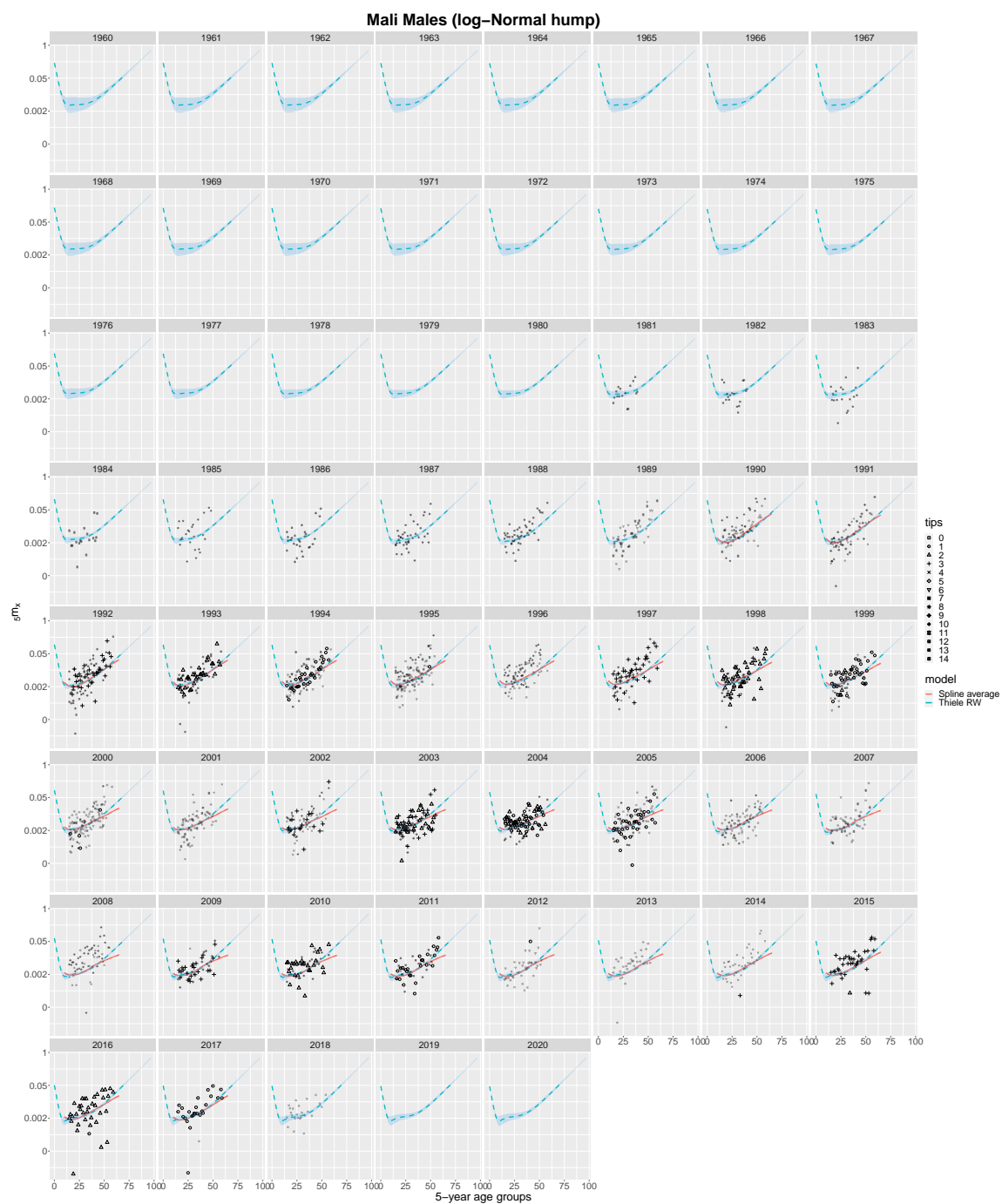Figure 6: Estimated $_{45}q_{15}$

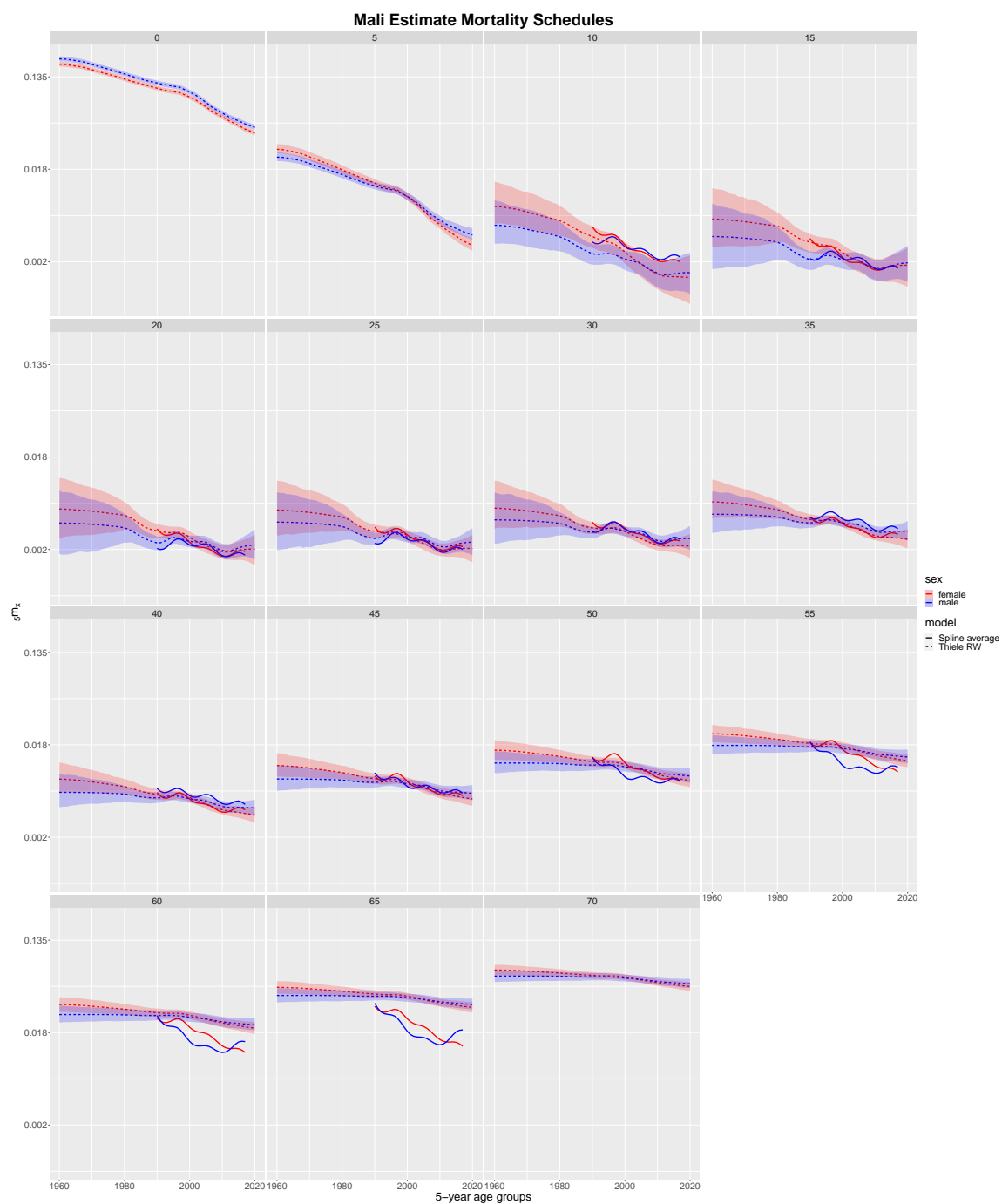Figure 7: Mortality Schedules

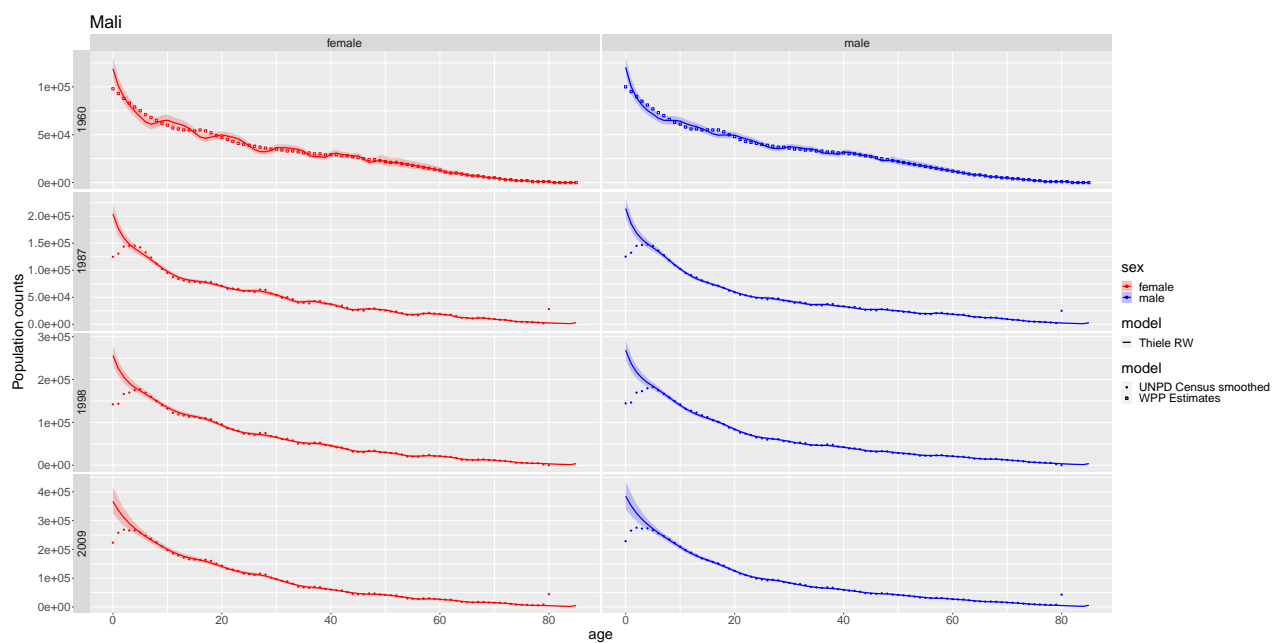Figure 8: Mortality Schedules

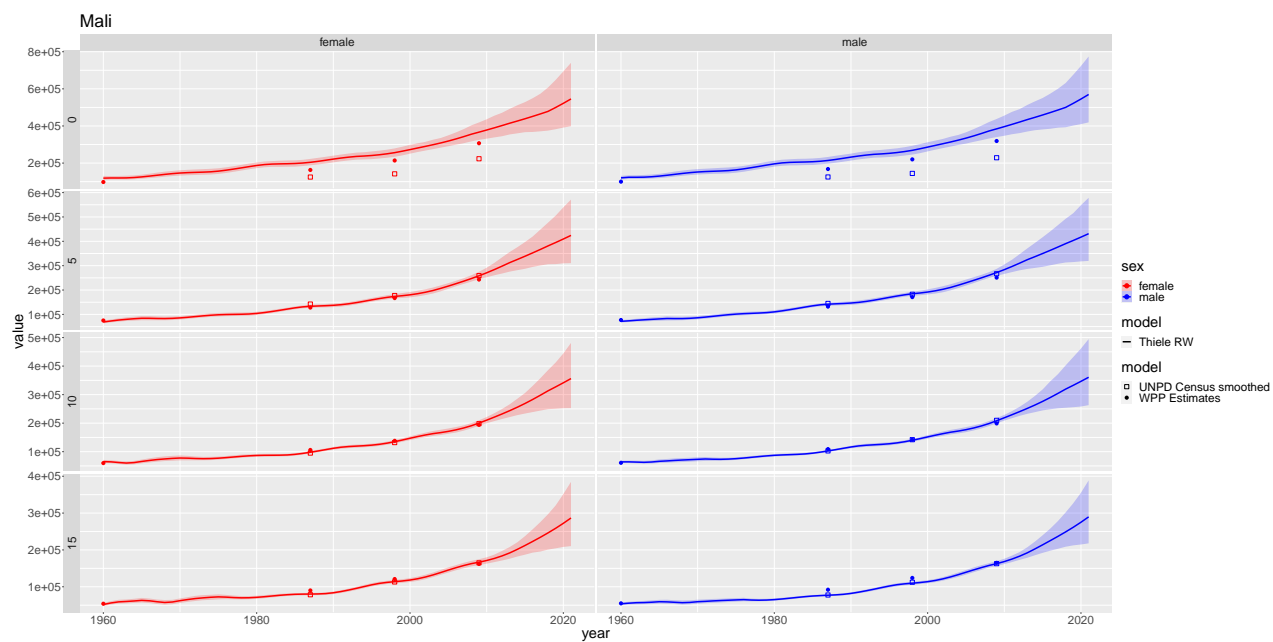Figure 9: Mortality Schedules

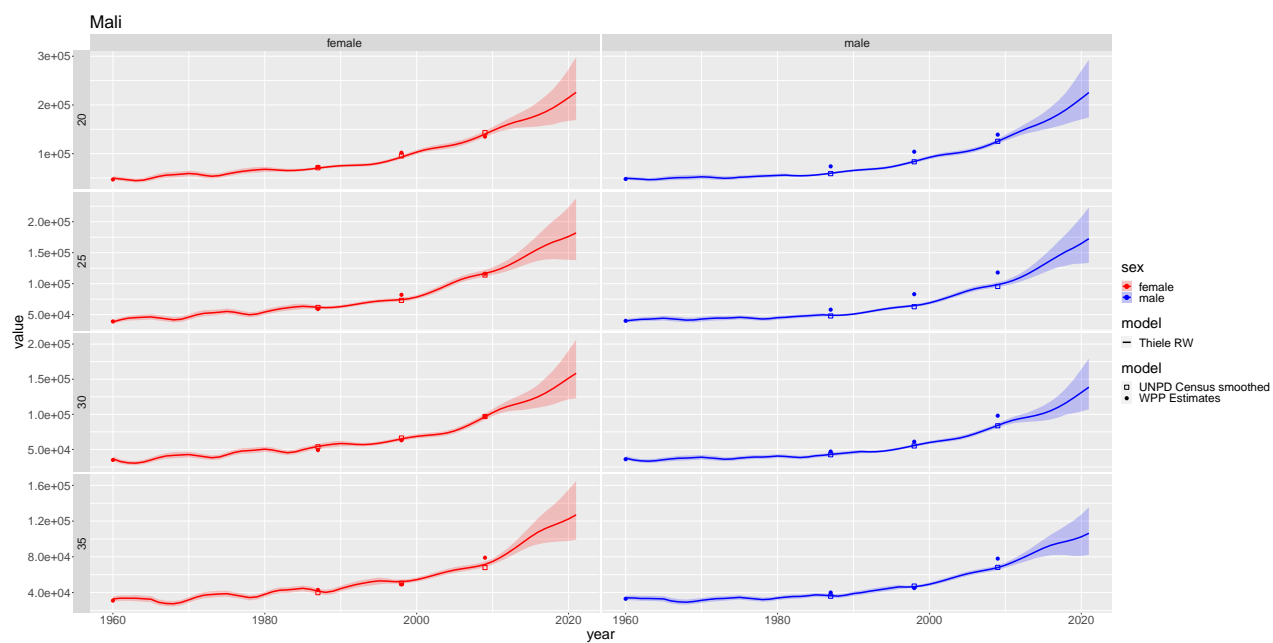Figure 10: Population

Figure 11: Population
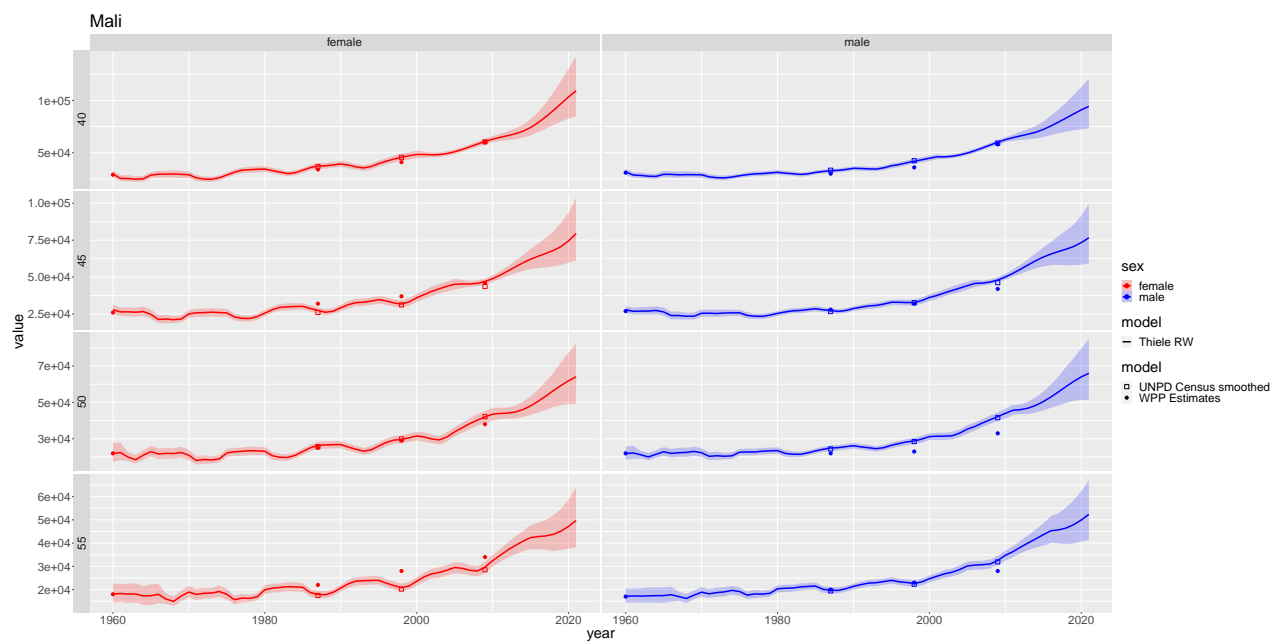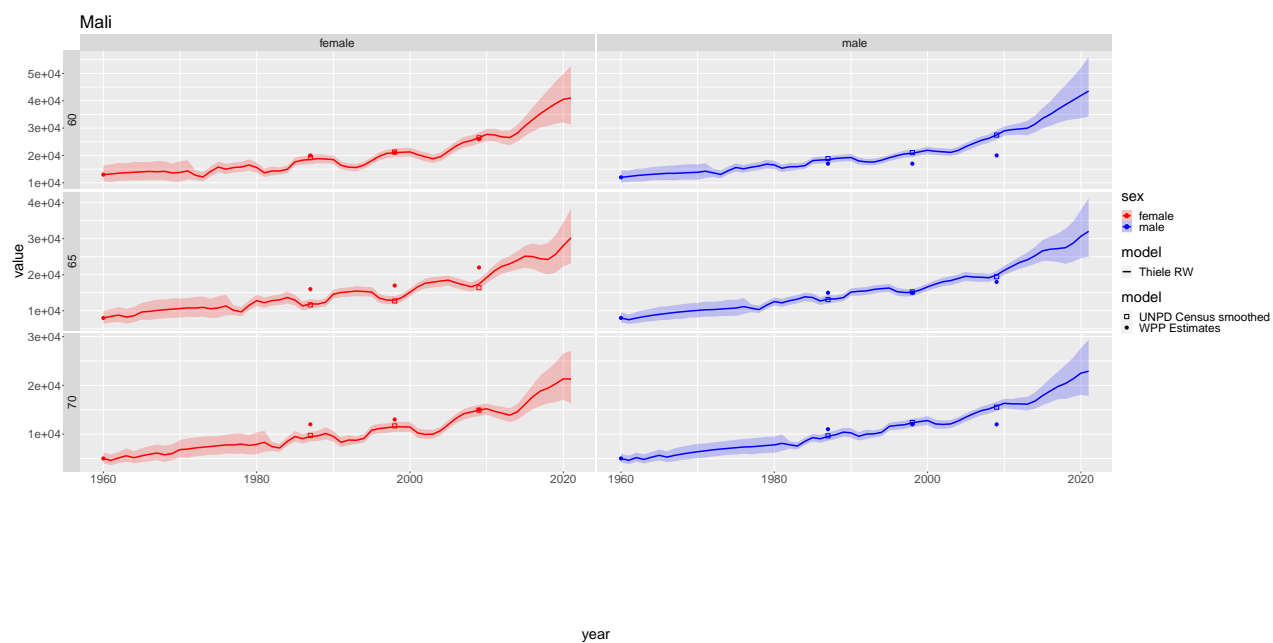
Figure 12: Population
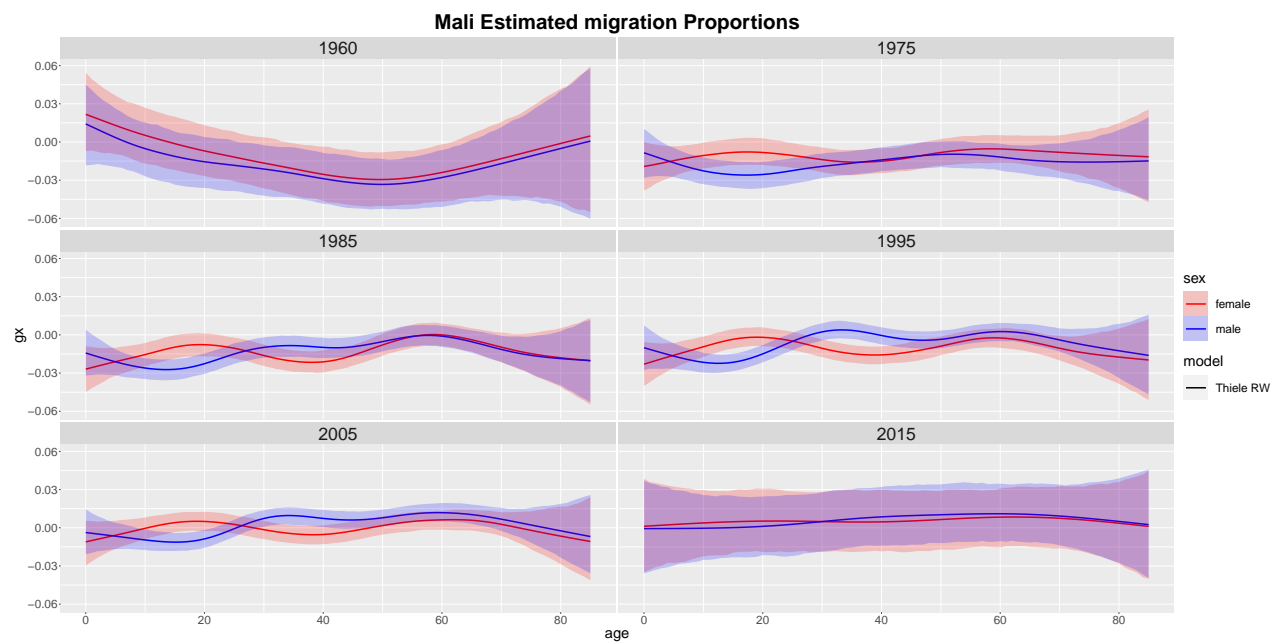

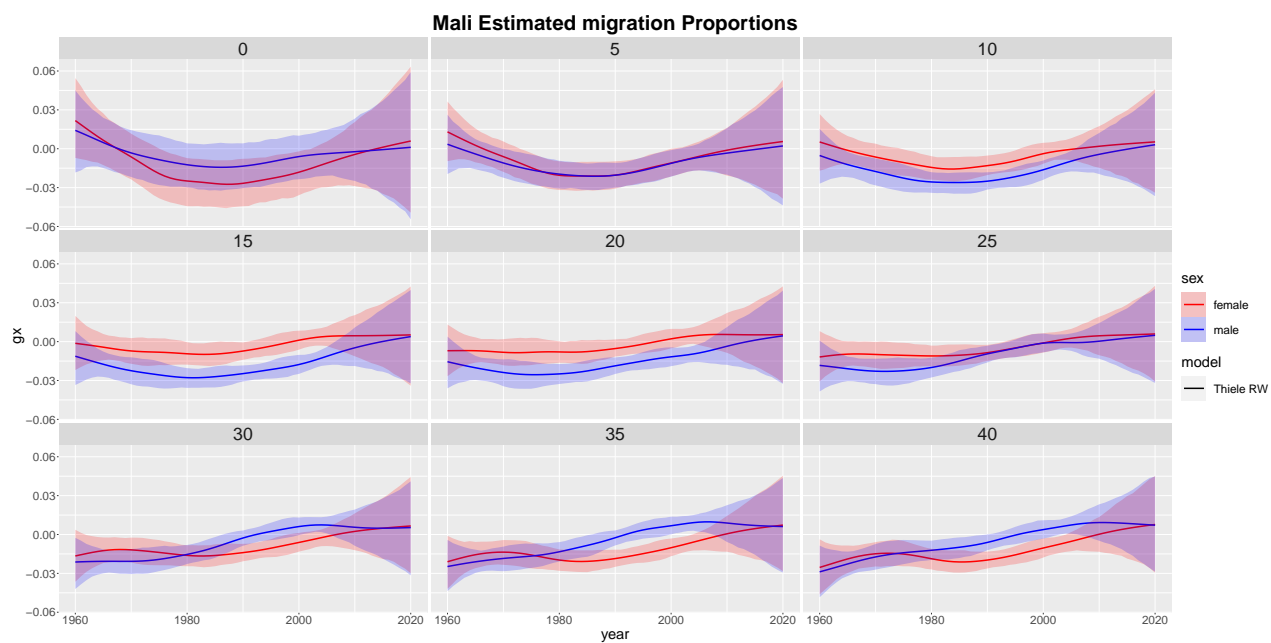Figure 13: Population

Figure 14: Population
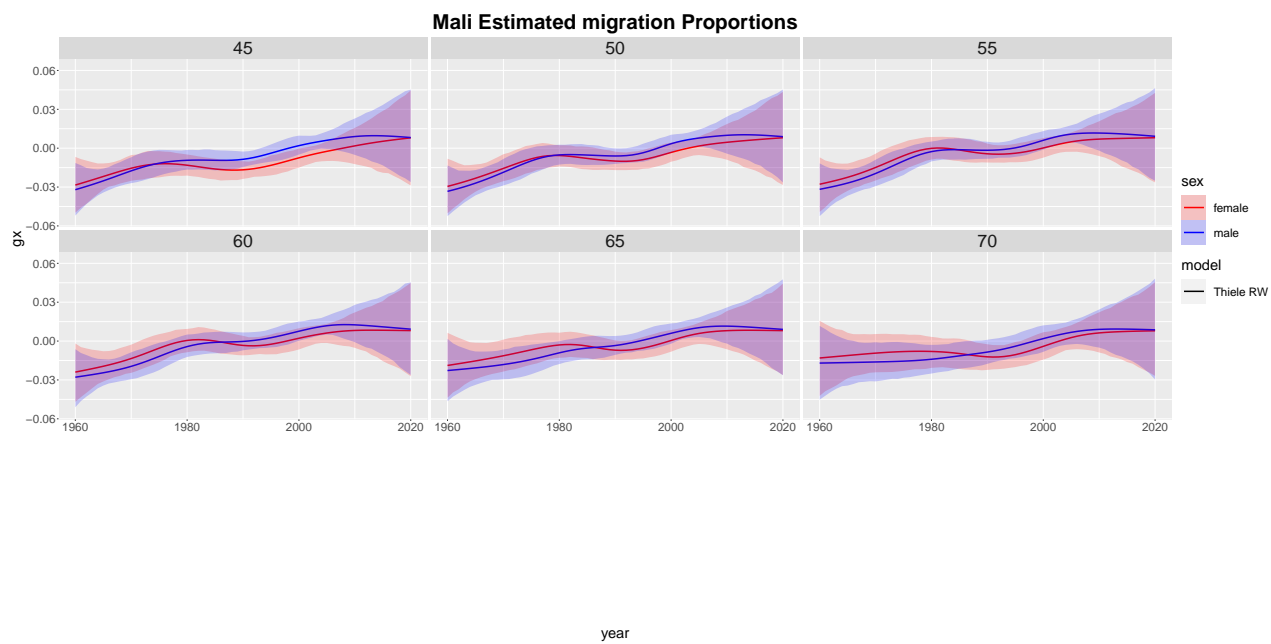

Figure 15: Migration
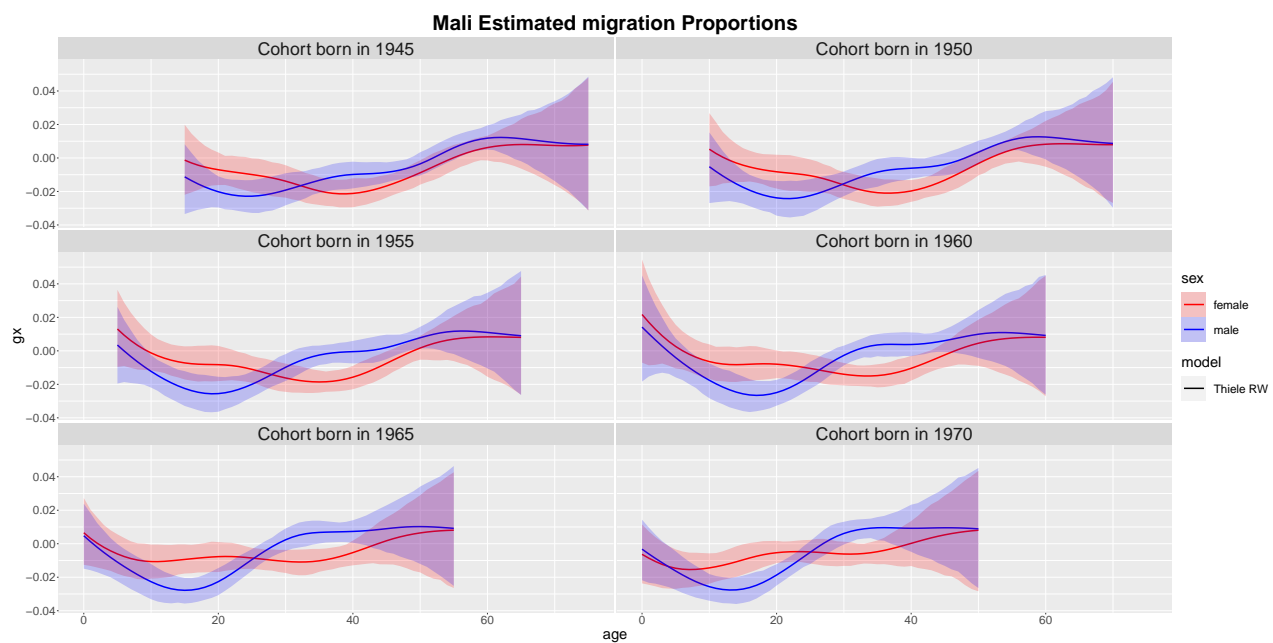
Figure 16: Migration

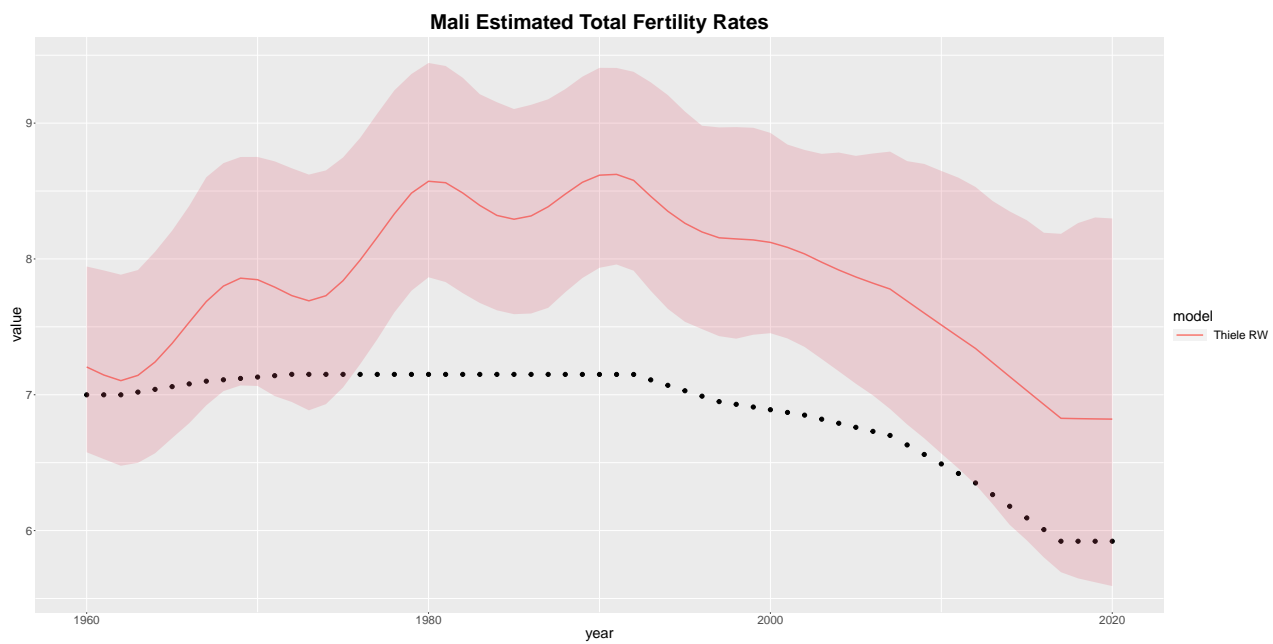Figure 17: Migration
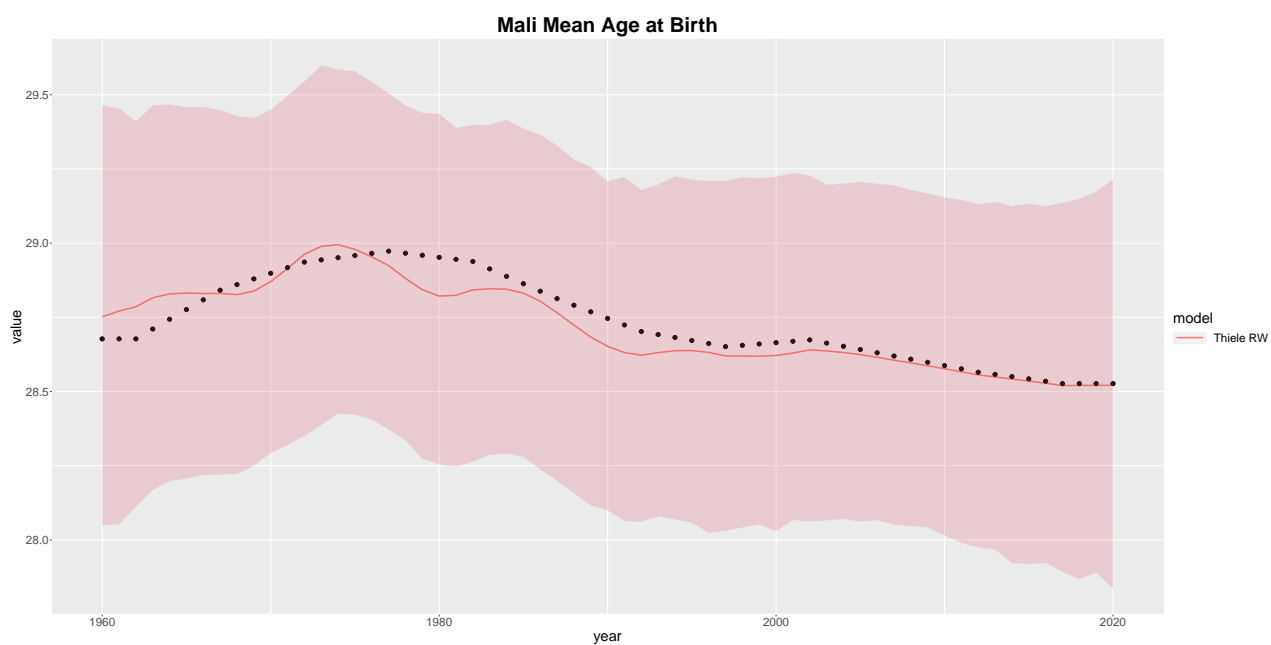
Figure 18: Migration

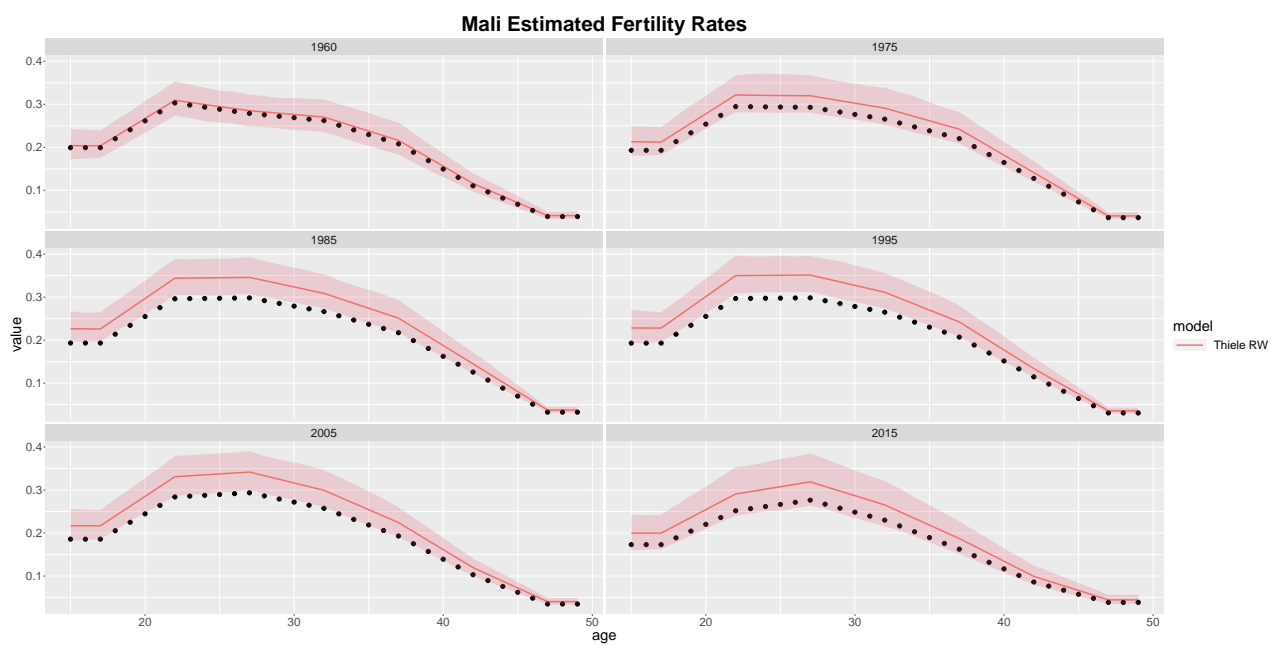Figure 19: Total Fertility

Figure 20: Mean age at births
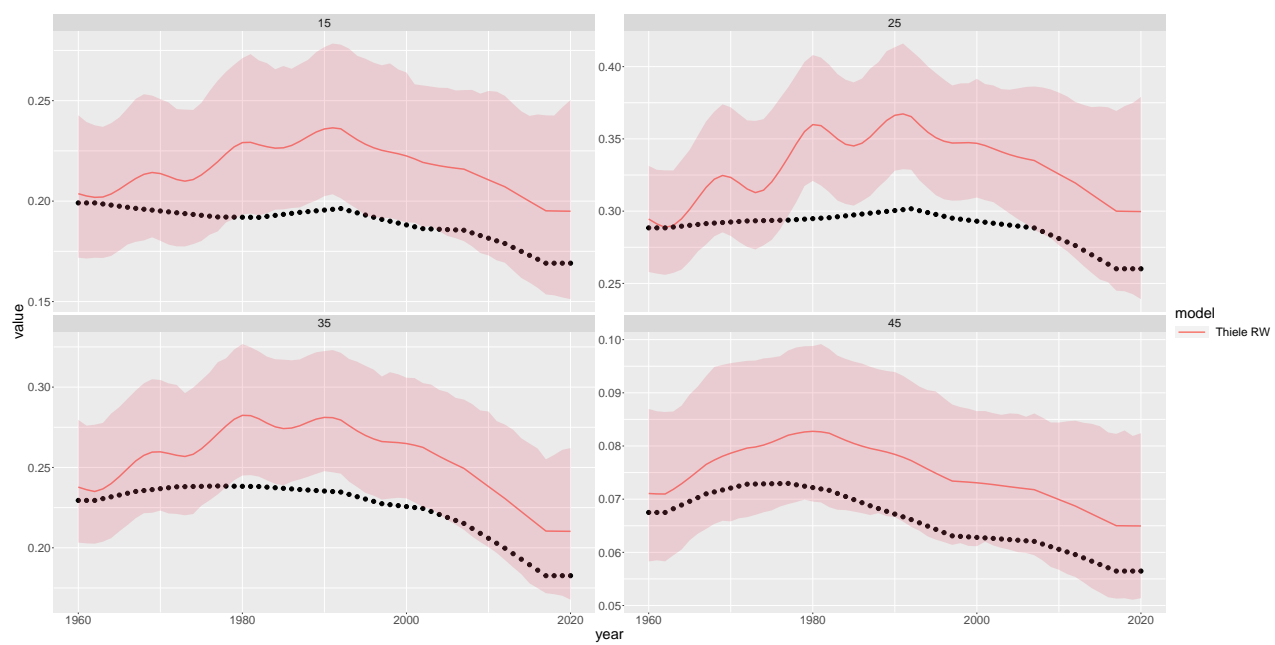

Figure 21: Fertility

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Figure 22: Fertility