Madagascar

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

## # A tibble: 86 x 2
##      age  `2018`
##    <dbl>   <dbl>
##  1     0 357691
##  2     1 357578.
##  3     2 373911.
##  4     3 382000.
##  5     4 383486.
##  6     5 374668.
##  7     6 365993
##  8     7 355233.
##  9     8 349398.
## 10     9 346686.
## # ... with 76 more rows

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

## # A tibble: 18 x 2
##      age   `1993`
##    <dbl>    <dbl>
##  1     0 1112652
##  2     5  887806.
##  3    10  762170.
##  4    15  681774.
##  5    20  578889.
##  6    25  476792.
##  7    30  394886.
##  8    35  317271.
##  9    40  242574.
## 10    45  186136.
## 11    50  153940.
## 12    55  130986.
## 13    60  105274
## 14    65   77069
## 15    70   51143.
## 16    75   26121
## 17    80   26112
## 18    85      NA

## [1] "Census Males"

## # A tibble: 86 x 2
##      age  `2018`
##    <dbl>   <dbl>
##  1     0 354033
##  2     1 354710
##  3     2 370674.
##  4     3 380199.
##  5     4 383242
##  6     5 376076.
```

```
##  7       6 369810.
##  8       7 359838.
##  9       8 355567
## 10       9 354478
## # ... with 76 more rows

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

## # A tibble: 18 x 2
##      age   `1993`
##    <dbl>    <dbl>
##  1     0  1121953
##  2     5   904633
##  3    10   770146.
##  4    15   665691.
##  5    20   549330.
##  6    25   451859
##  7    30   383614.
##  8    35   317992.
##  9    40   242723.
## 10    45   178846.
## 11    50   144310
## 12    55   124371.
## 13    60   103204.
## 14    65    79529.
## 15    70    55241.
## 16    75    28062
## 17    80    23935
## 18    85       NA
```

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
##          4.06105769         5.40445917          3.96972446          5.31808045          4.21236240           1
##       log_lambda_tp           tp_slope          tp_params_5         tp_params_10      log_lambda_phi      log_
##          3.28850529         0.04863566          0.13463280          0.67174411         11.32812298           1
##  log_lambda_lambda    log_lambda_delta log_lambda_epsilon
##          3.91224329         8.87364282          2.22537903
```
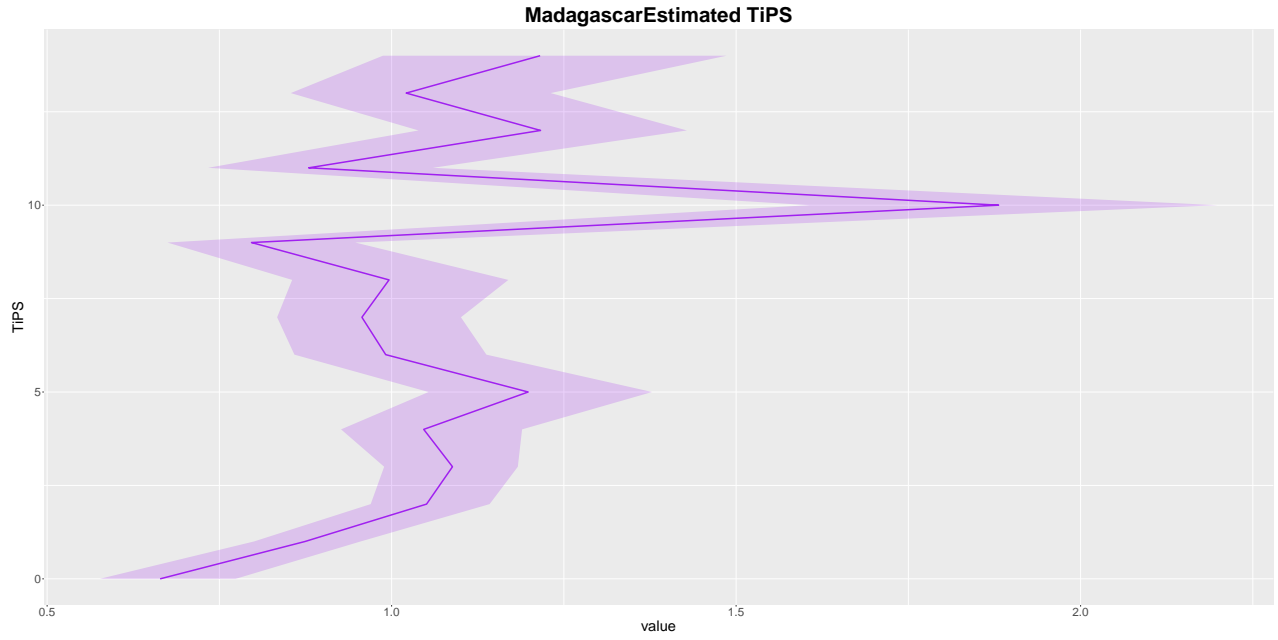
Figure 1: Estimated TiPS
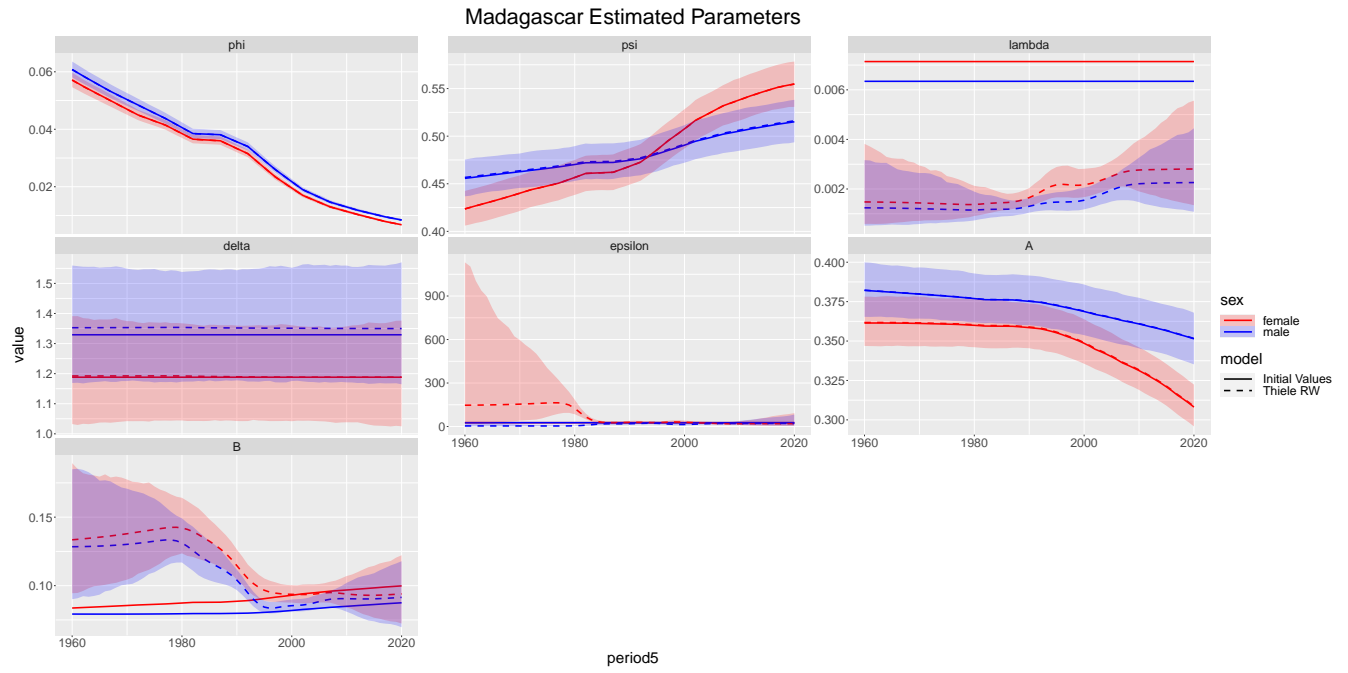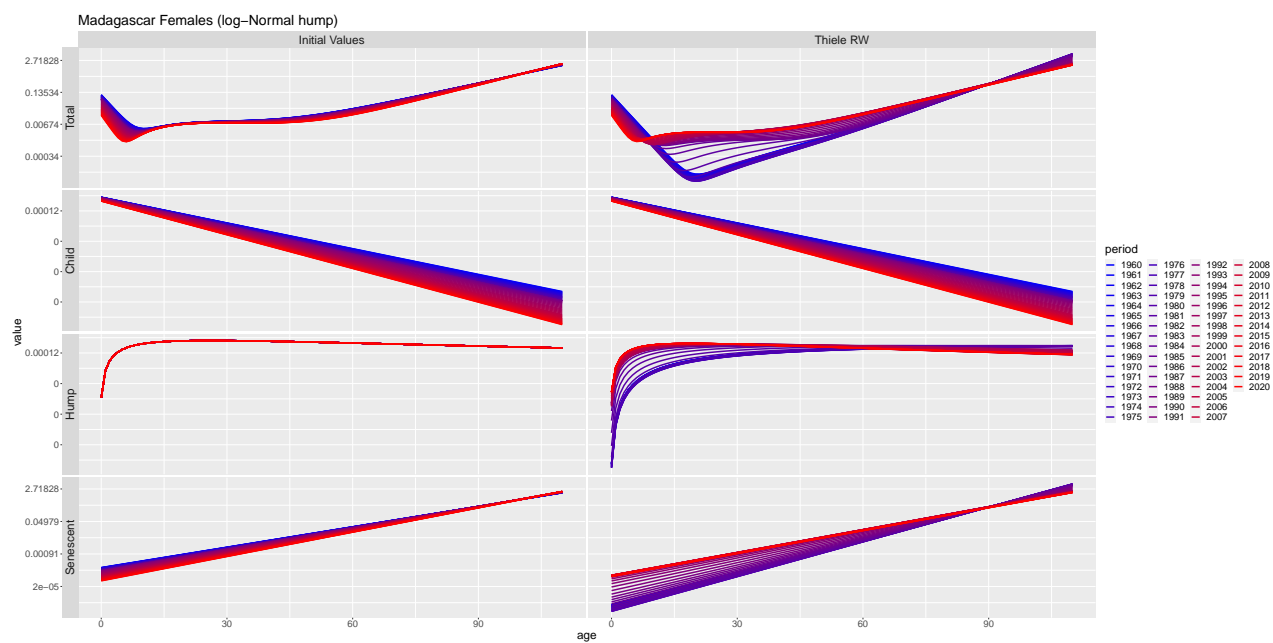

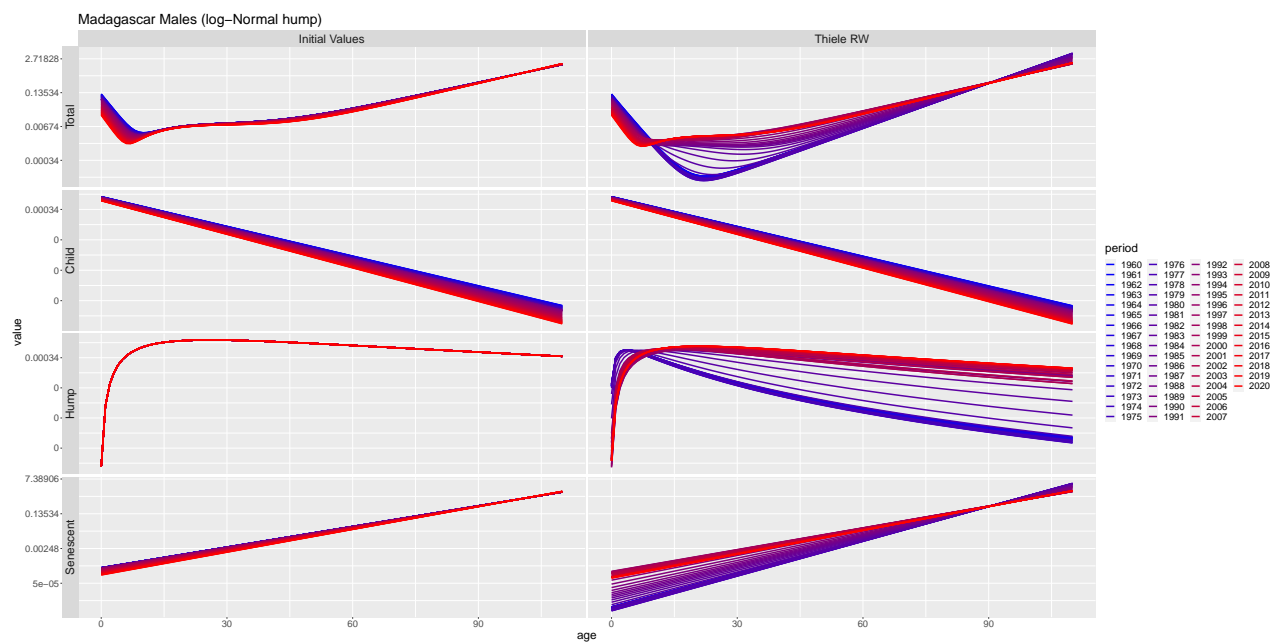Figure 2: Estimated parameters
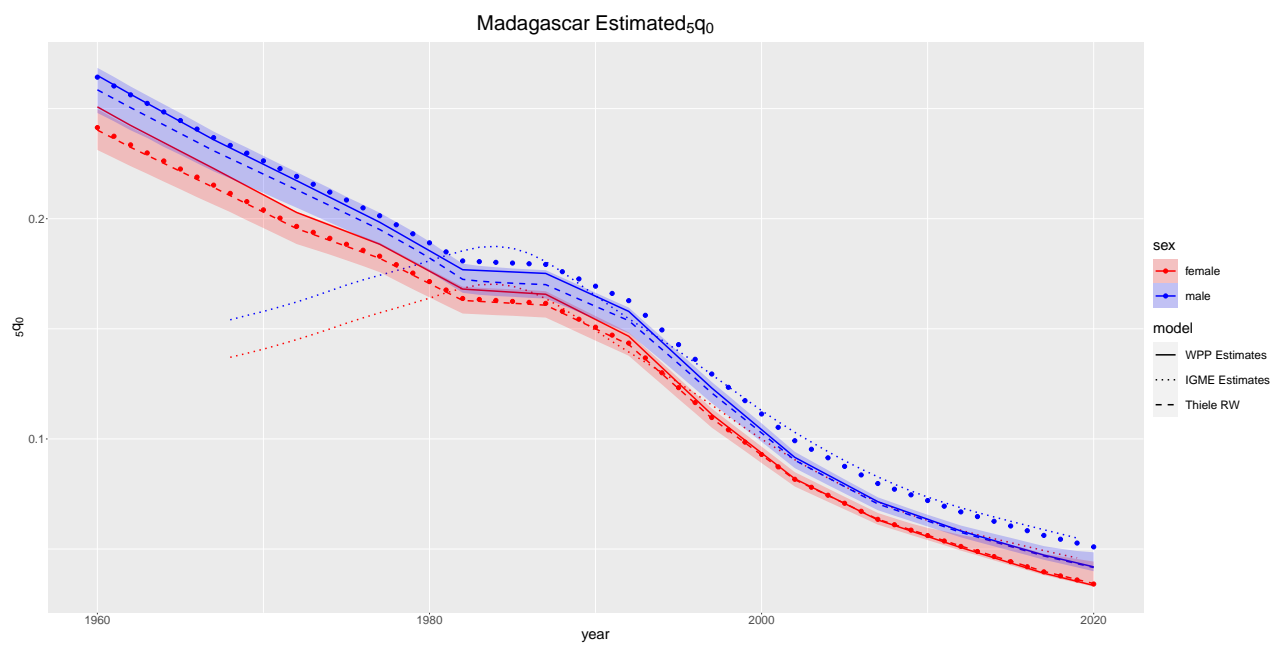
Figure 3: Thiele Decomposed
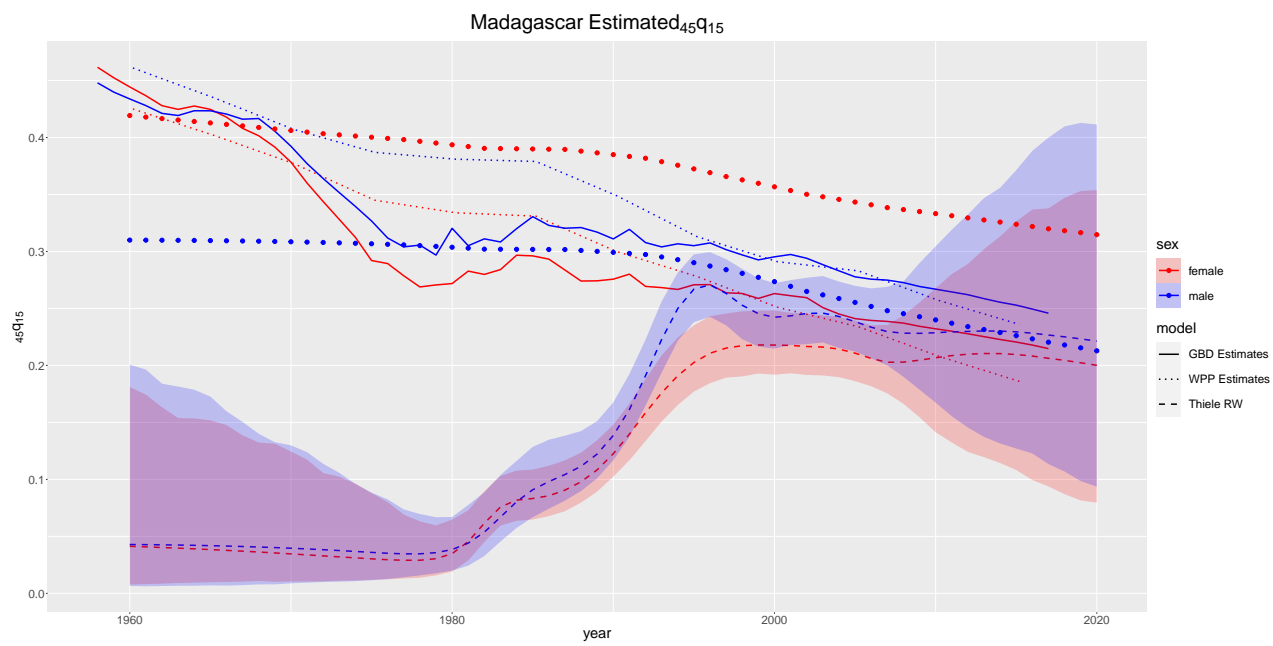

Figure 4: Thiele Decomposed

Figure 5: Estimated $_5q_0$

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

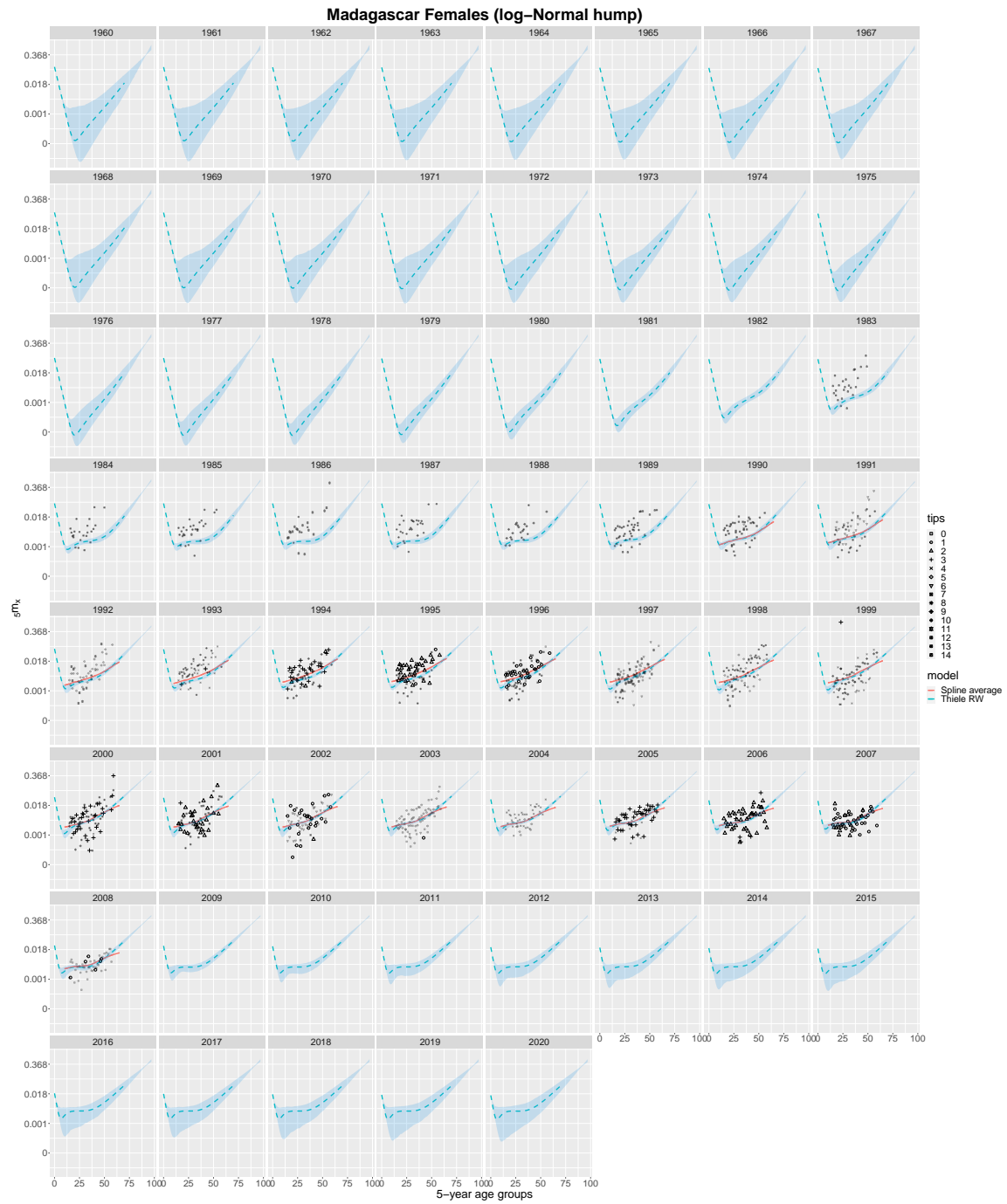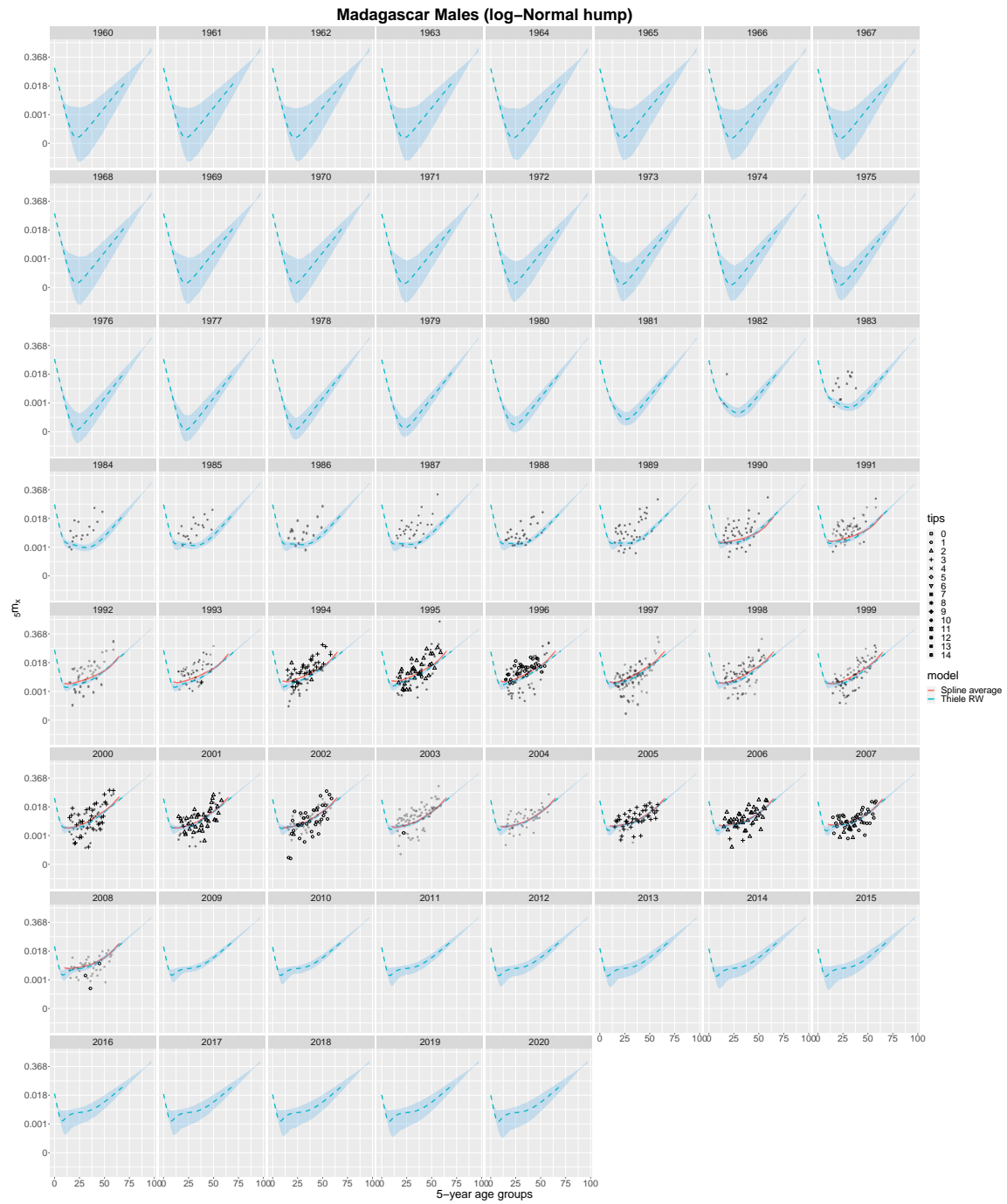**Madagascar Females (log−Normal hump)**

Figure 7: Mortality Schedules
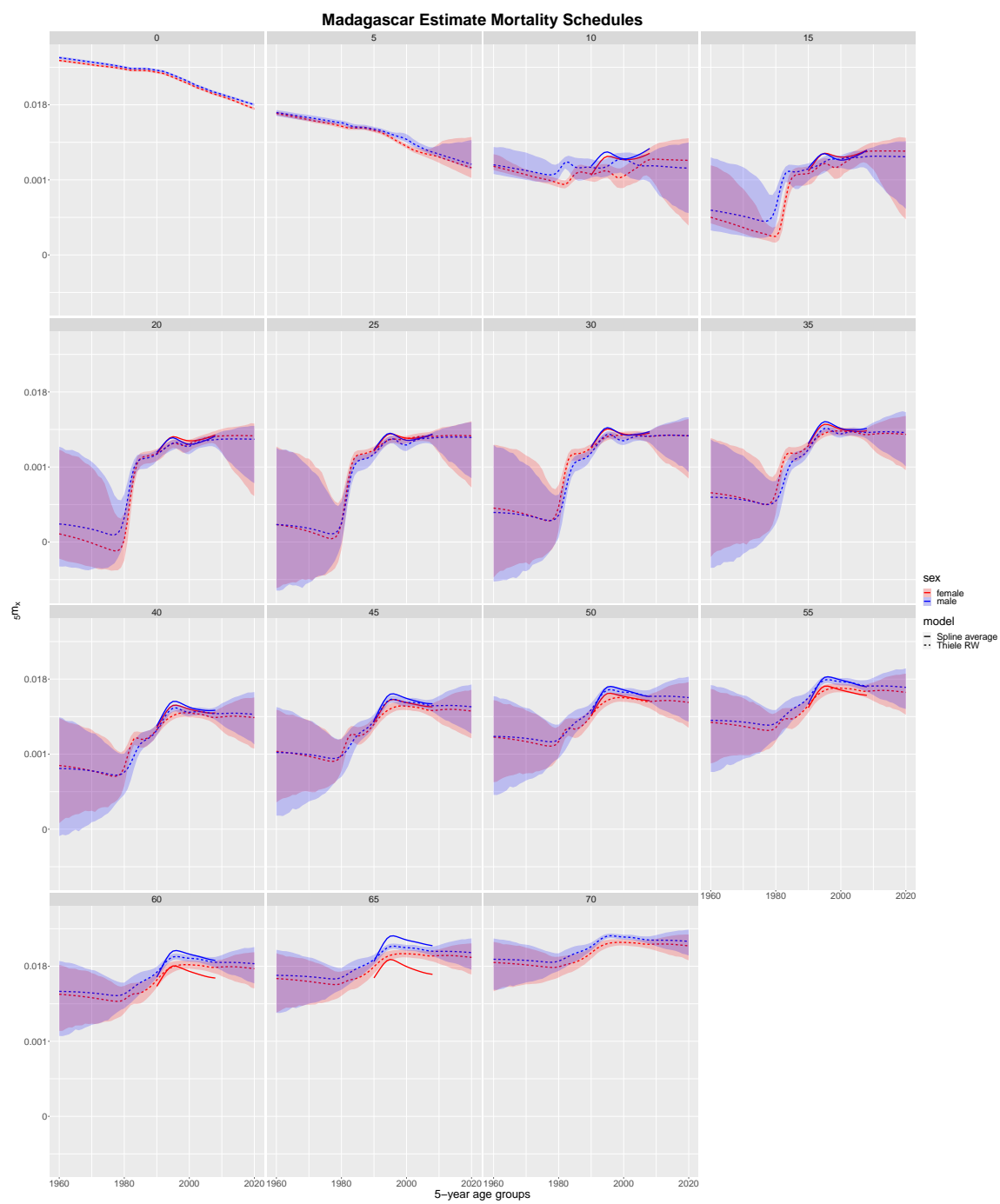
Figure 8: Mortality Schedules
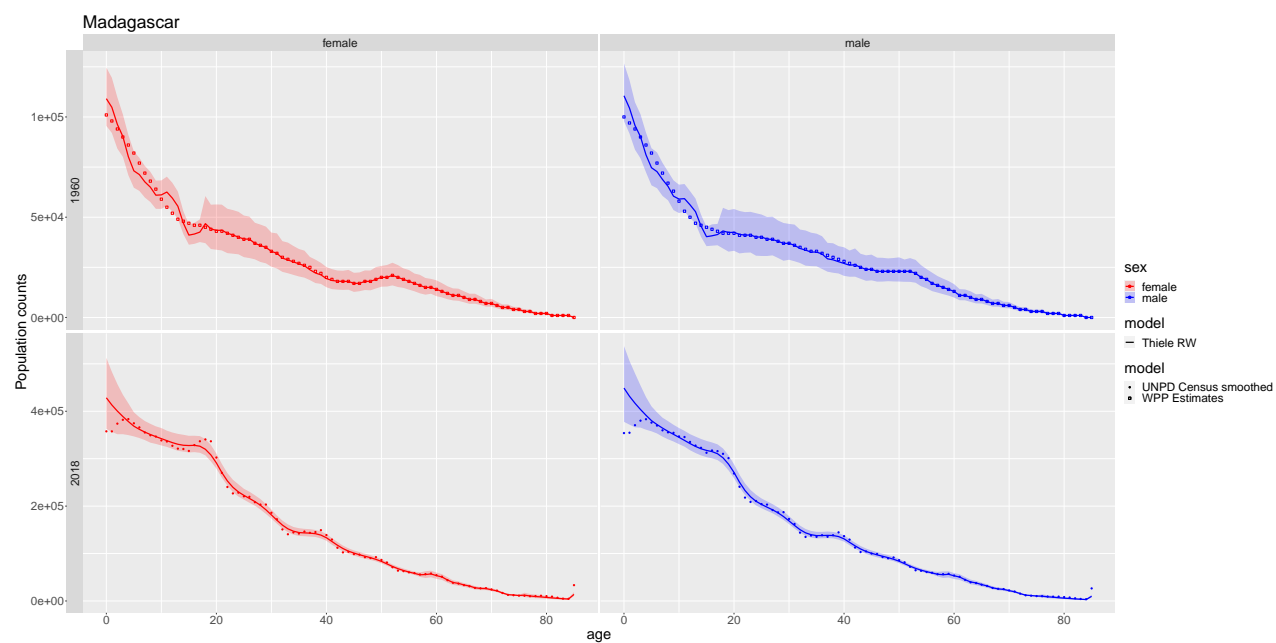
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Figure 9: Mortality Schedules
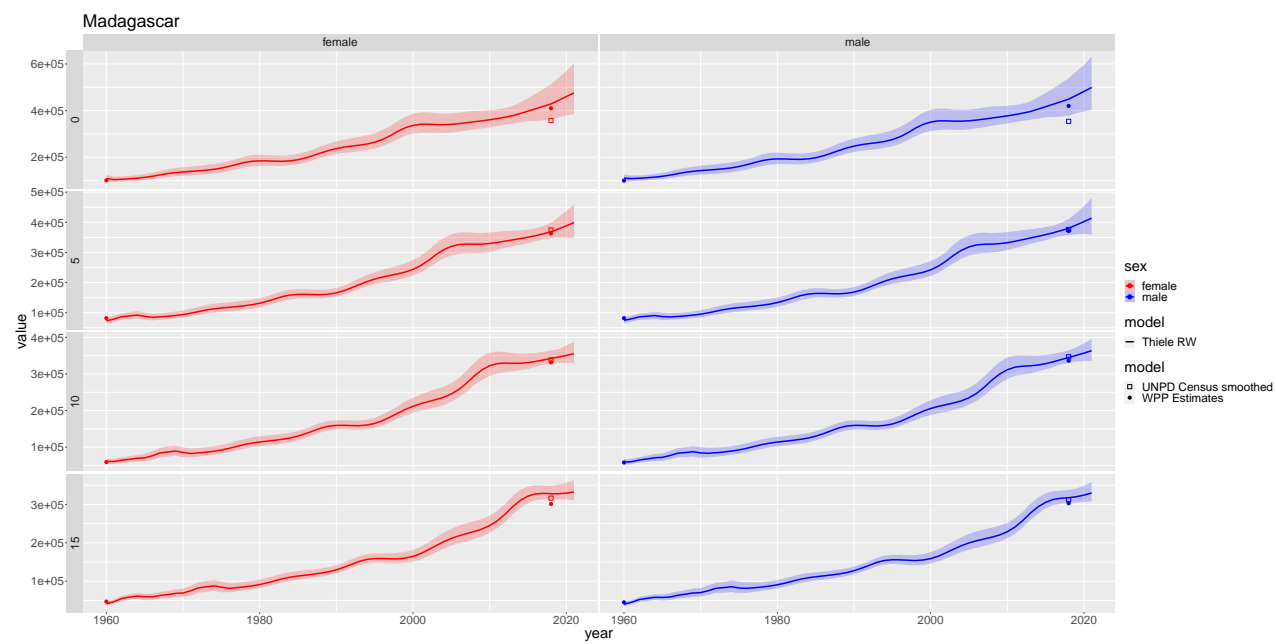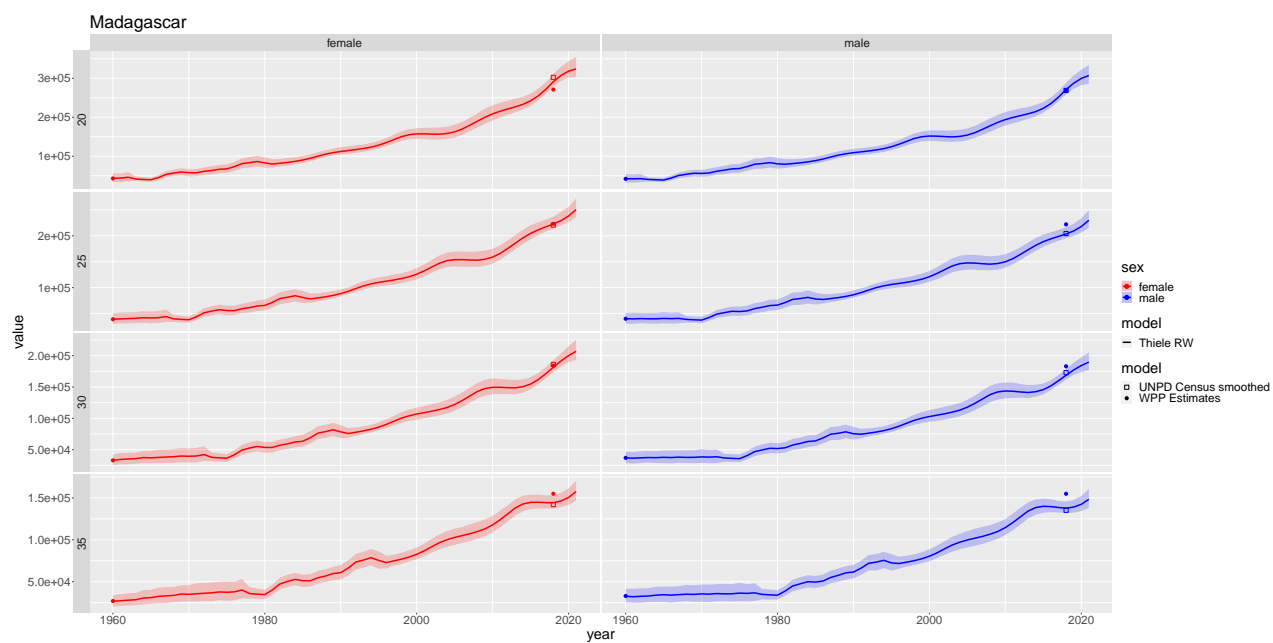
Figure 10: Population

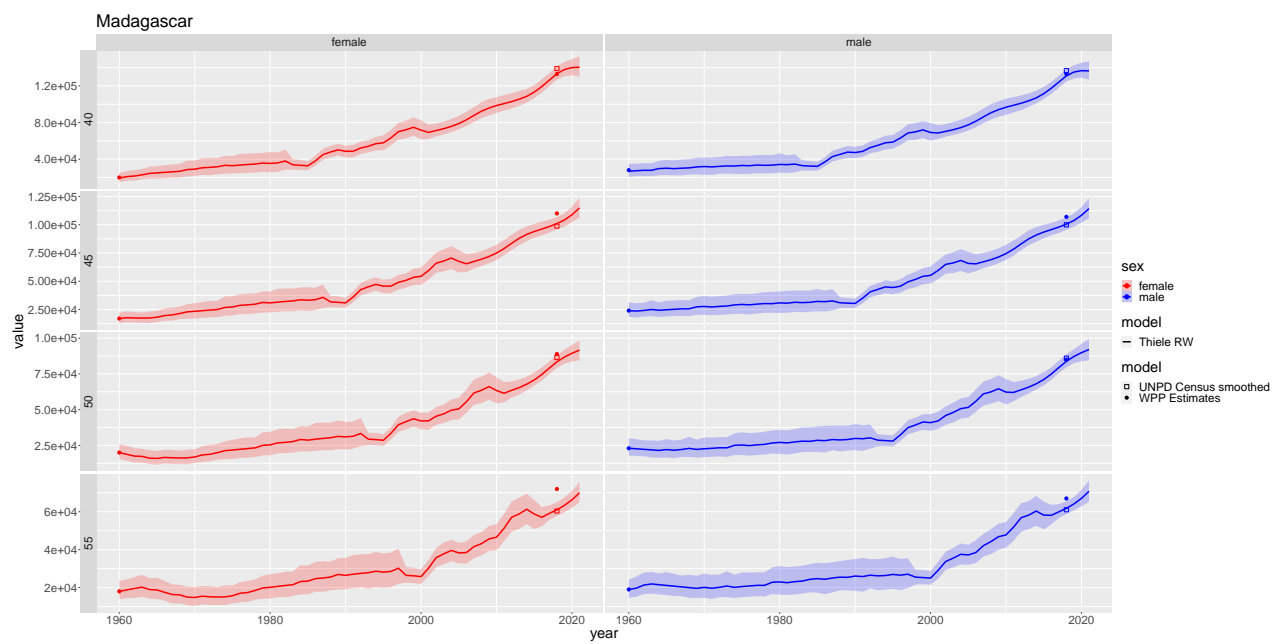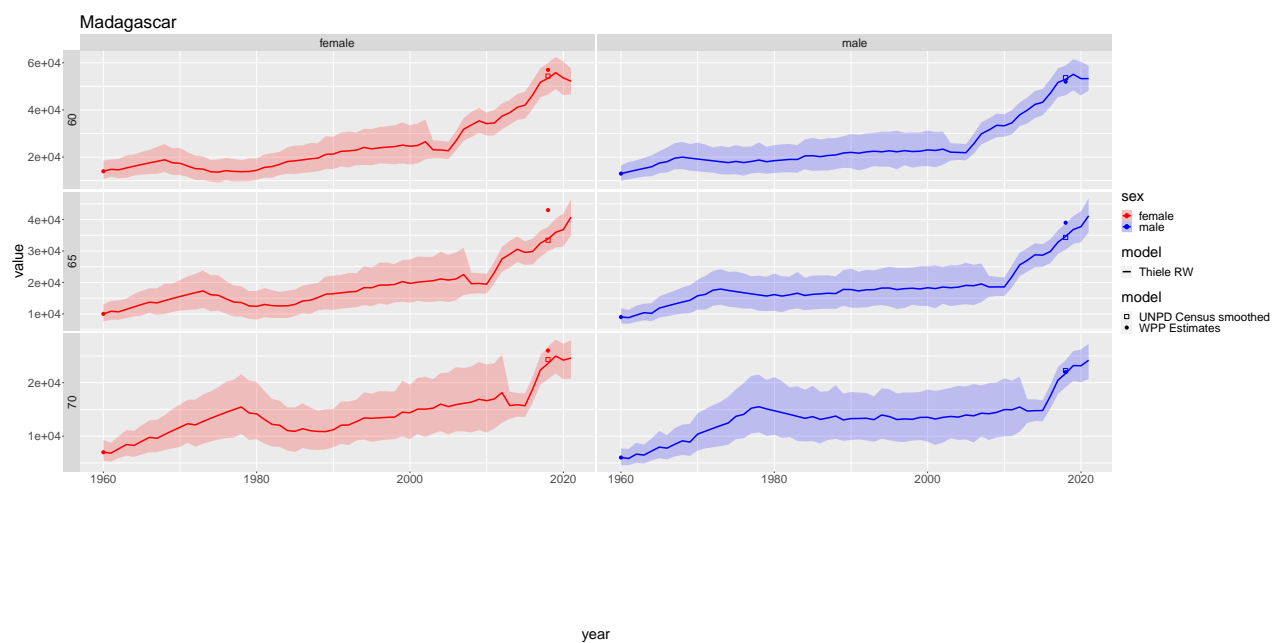Figure 11: Population

Figure 12: Population
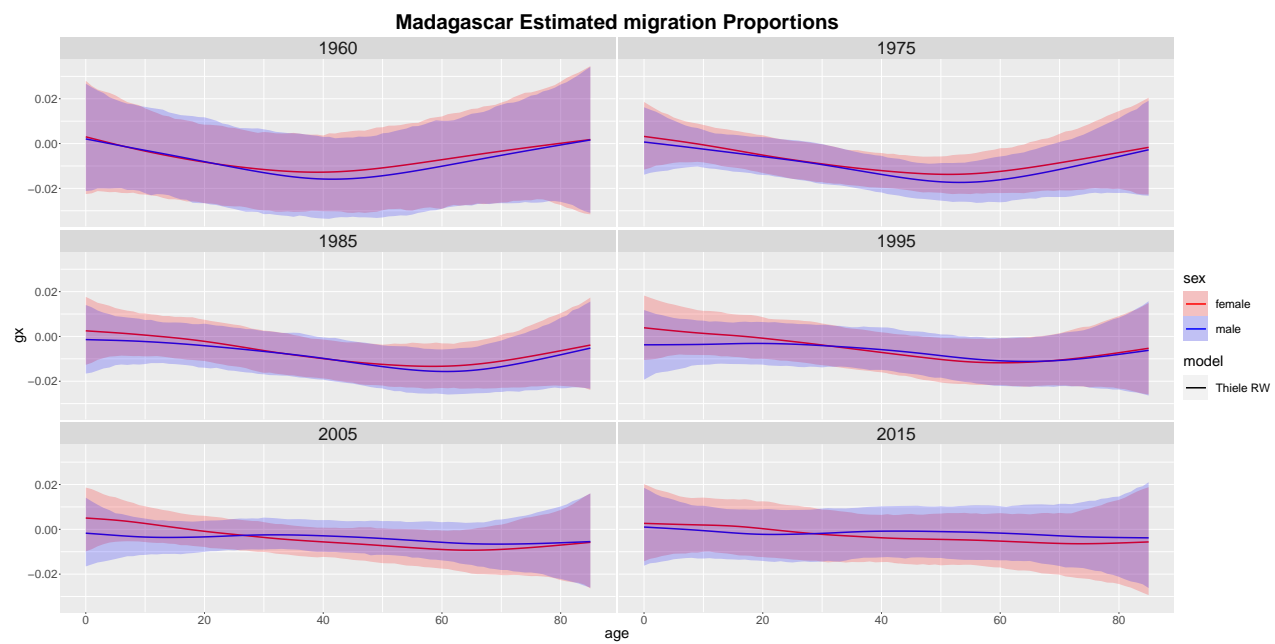

Figure 13: Population

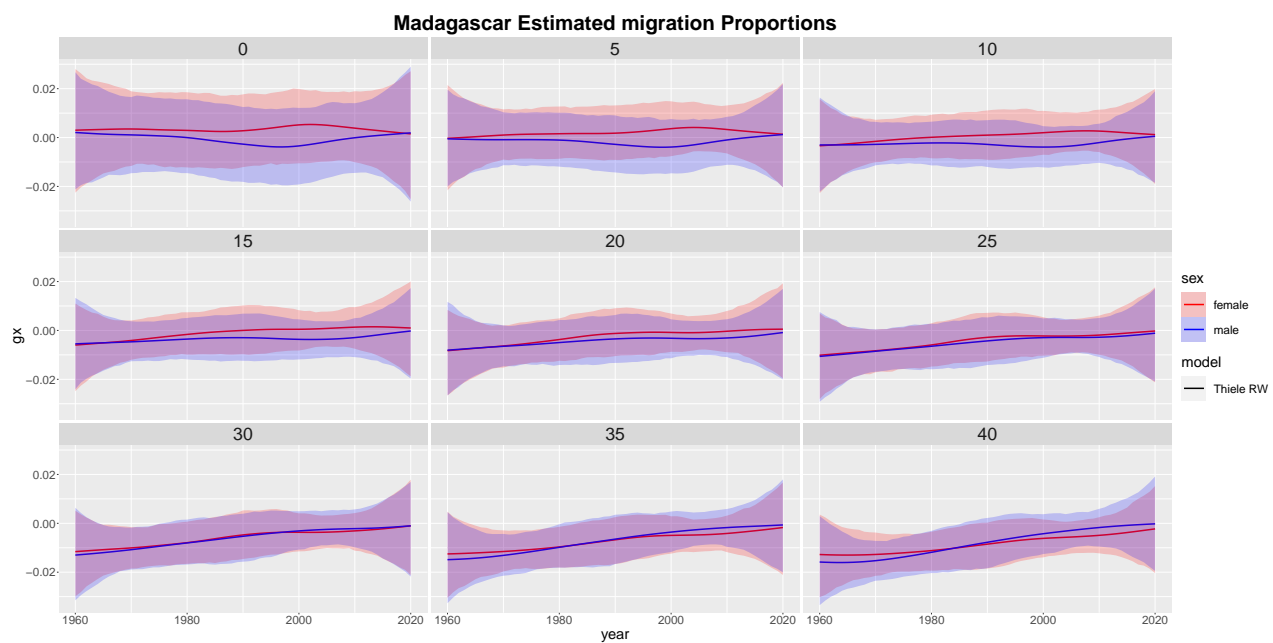Figure 14: Population
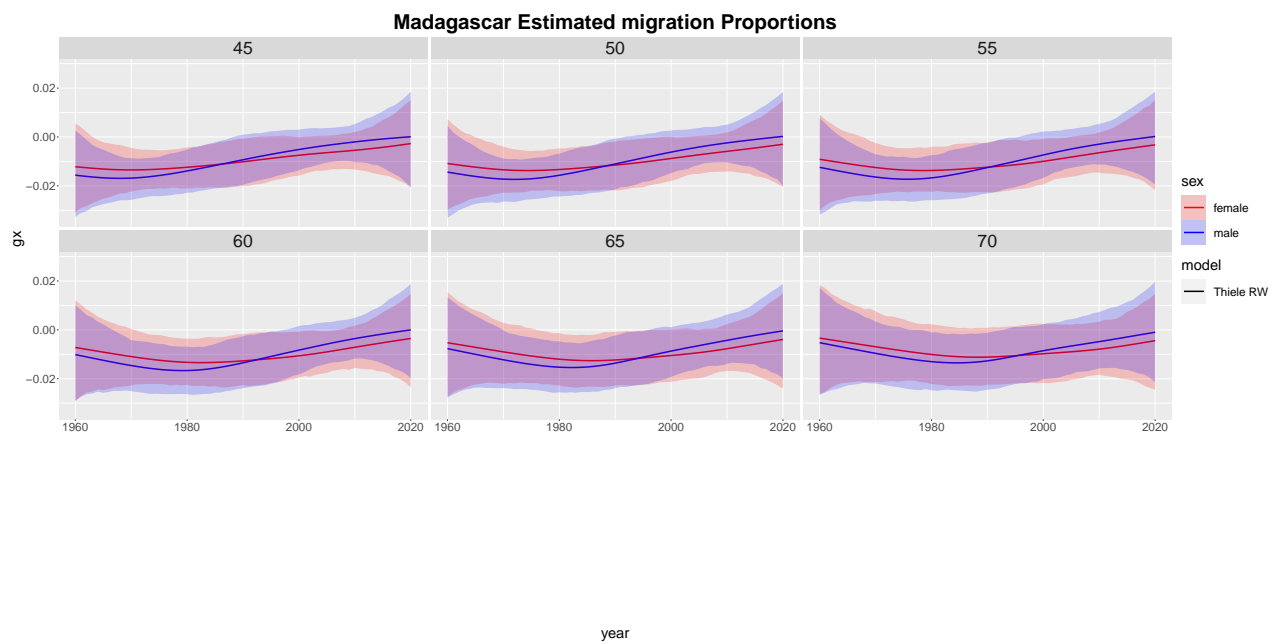

Figure 15: Migration

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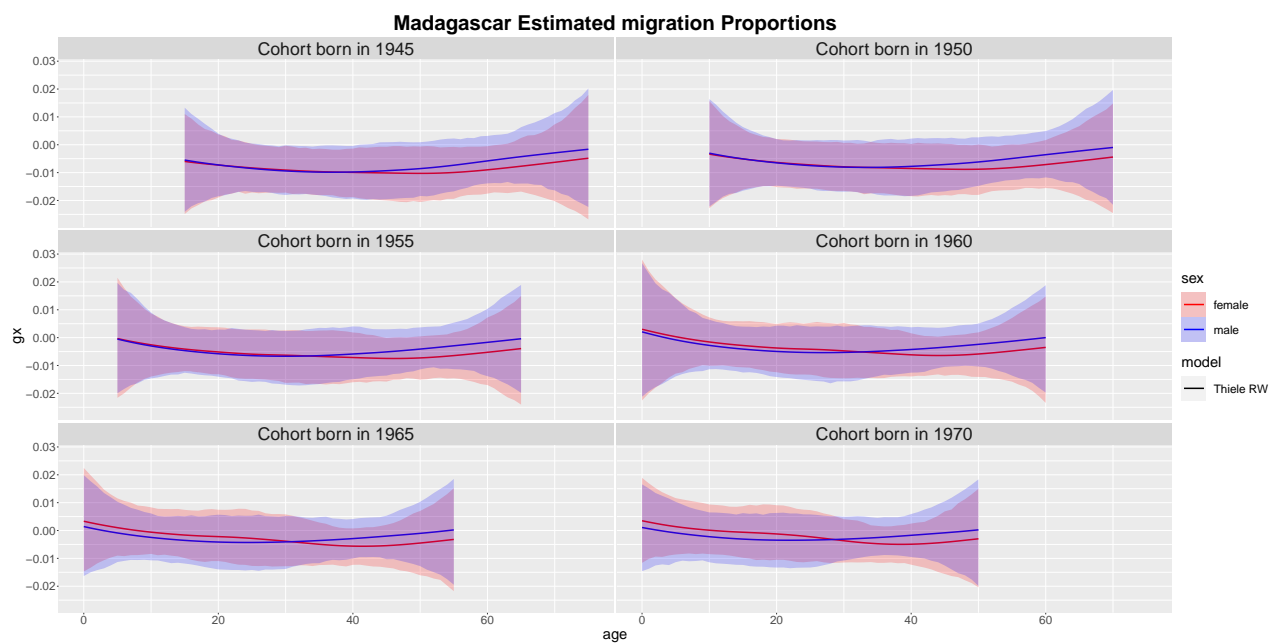Figure 16: Migration
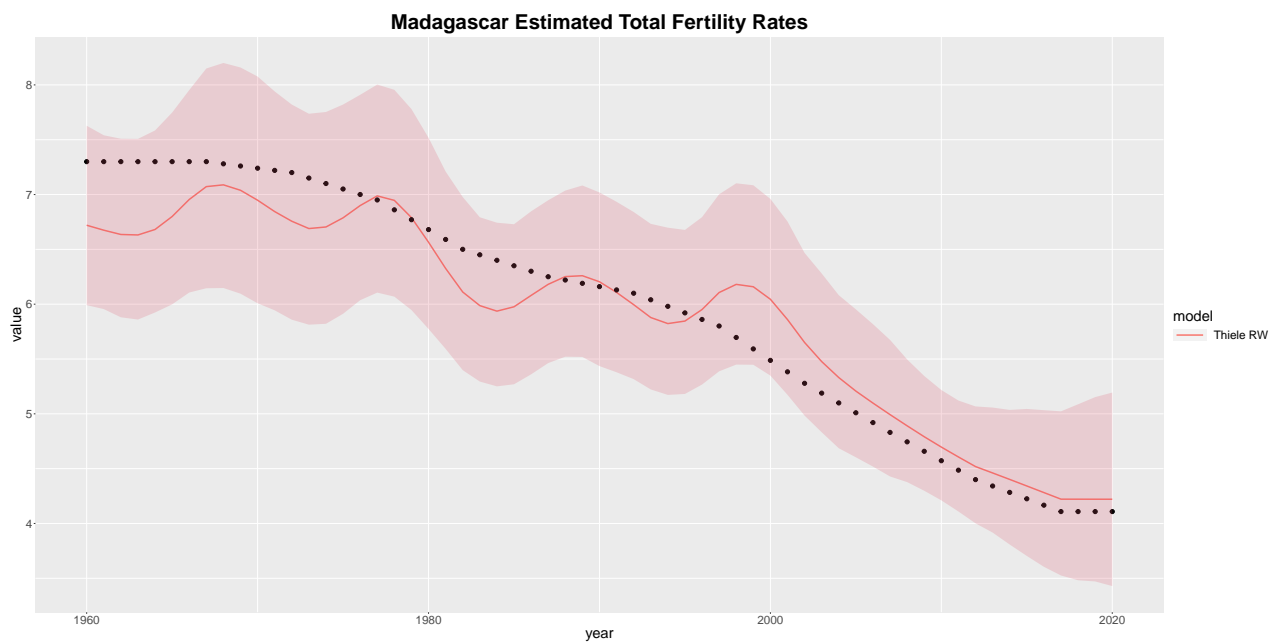

Figure 17: Migration
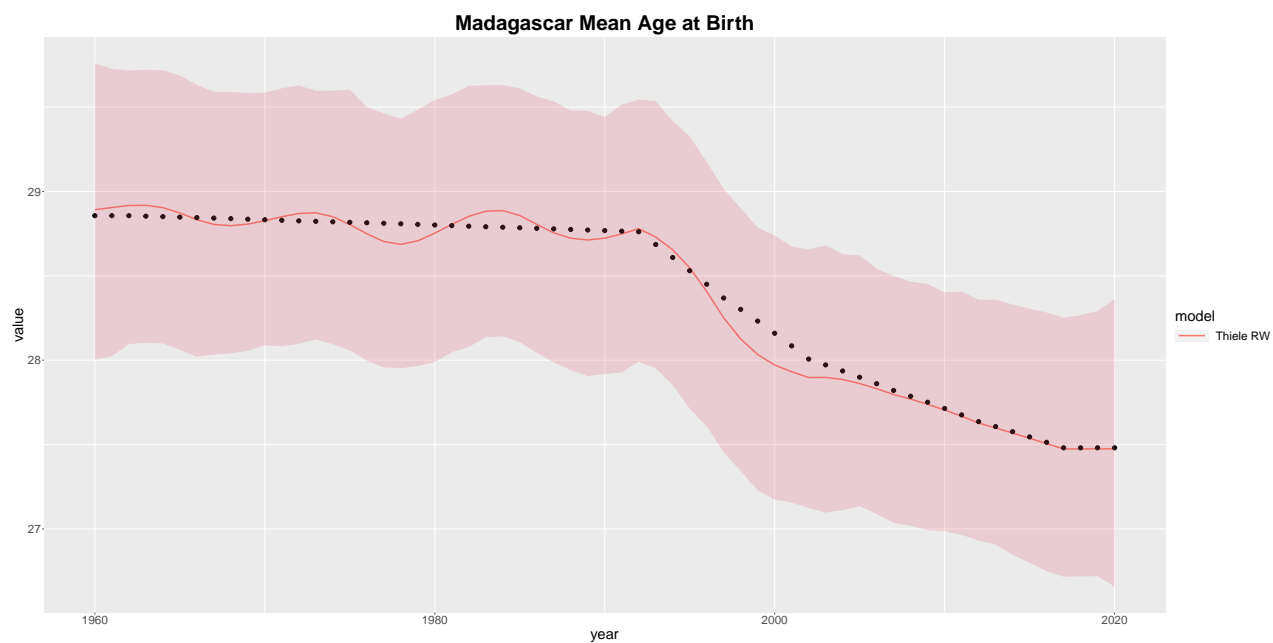
Figure 18: Migration
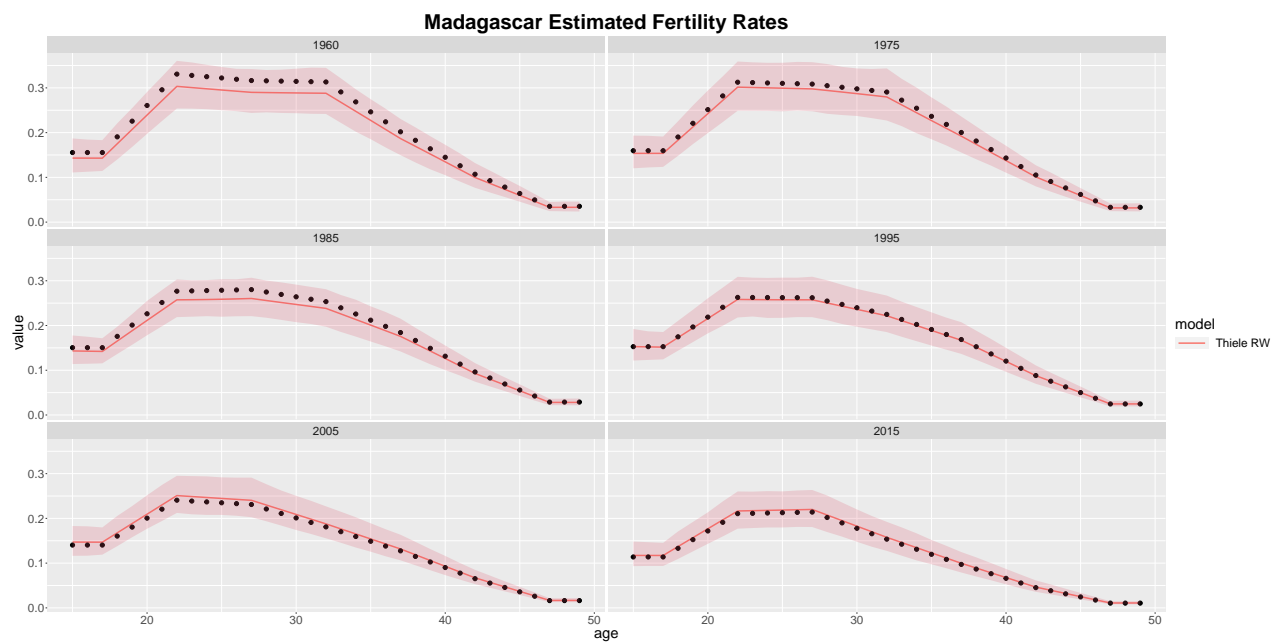

Figure 19: Total Fertility

Figure 20: Mean age at births
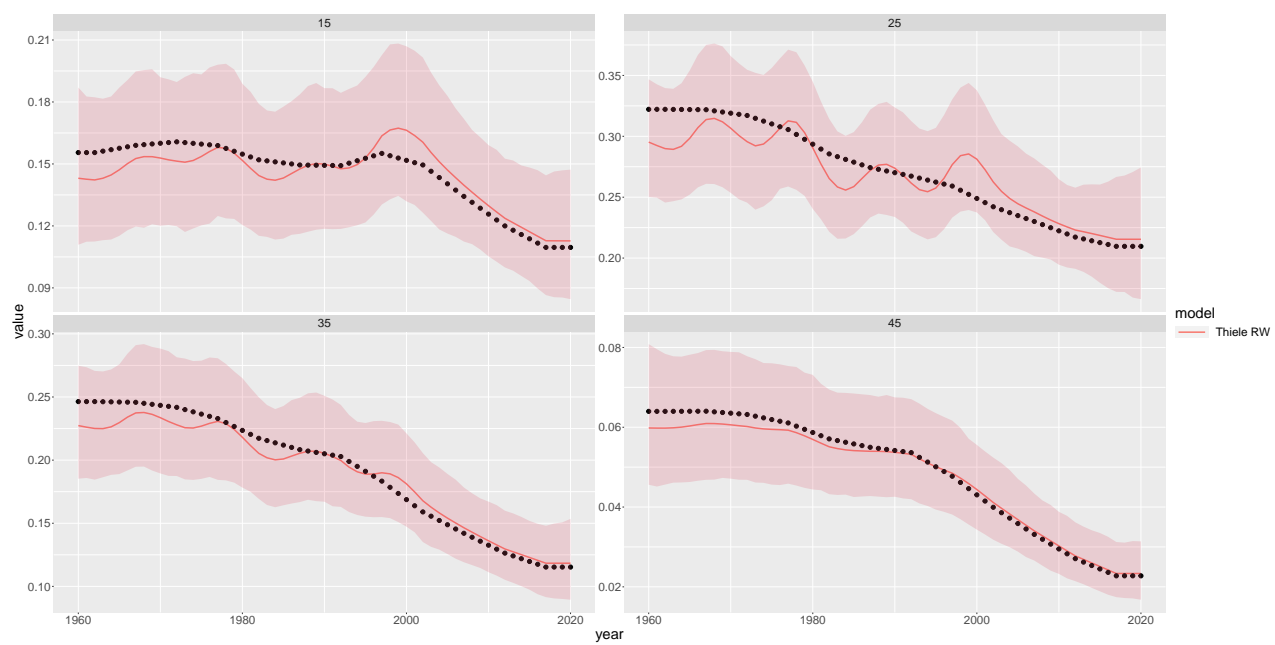

Figure 21: Fertility

Figure 22: Fertility