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.
```

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##  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

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

```
##          log_tau2_logpop_f             log_tau2_logpop_f              log_tau2_logpop_m                  log_tau2_
##                 5.37346779                    3.99396043                     5.42170787                       4.
##             log_tau2_gx_m            log_lambda_gx_age_f            log_lambda_gx_age_m              log_lambda_g
##                 3.70279437                    8.19241868                     8.27264844                       7.
##     log_lambda_gx_agetime_m               log_lambda_tp log_lambda_tp_0_inflated_sd                log_disp
##                 6.90774291                    1.83680255                     0.06464907                       0.
##     log_marginal_prec_psi_f        log_marginal_prec_A_f          log_marginal_prec_B_f            log_marginal_pr
##                 6.81078895                    6.80963061                     0.06125568                       6.
##         log_marginal_prec_B_m              log_lambda_phi_f               log_lambda_psi_f                log_lambda_
##                -0.18501356                    4.30725860                     4.30769784                       4.
##               log_lambda_A_f               log_lambda_B_f               log_lambda_phi_m                   log_lamb
##                 4.30804734                    4.62312031                     4.30778368                       4.
##         log_lambda_epsilon_m               log_lambda_A_m                 log_lambda_B_m            logit_lambda_slo
##                 0.18016828                    4.30857104                     4.39582761                       1.
##     logit_lambda_slope_rho_m      logit_delta_slope_rho_m        logit_epsilon_slope_rho_m
##                 0.52381498                   -1.36272918                     0.24447764
```
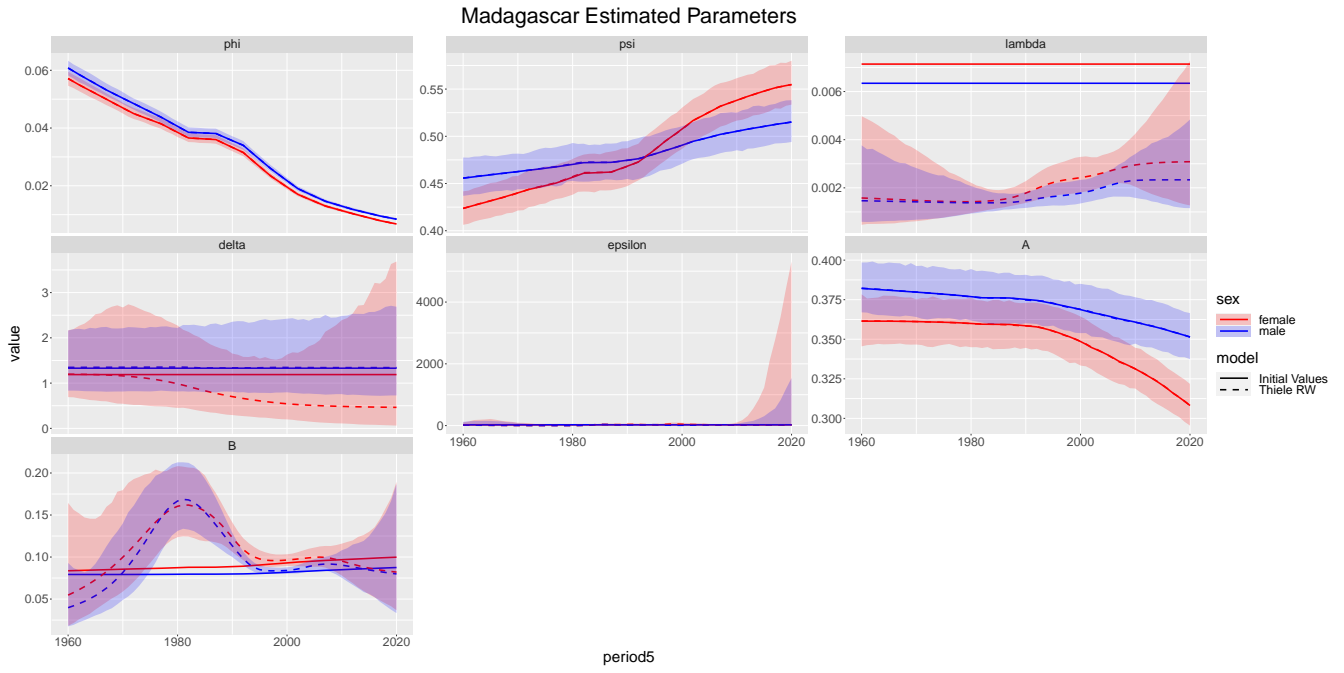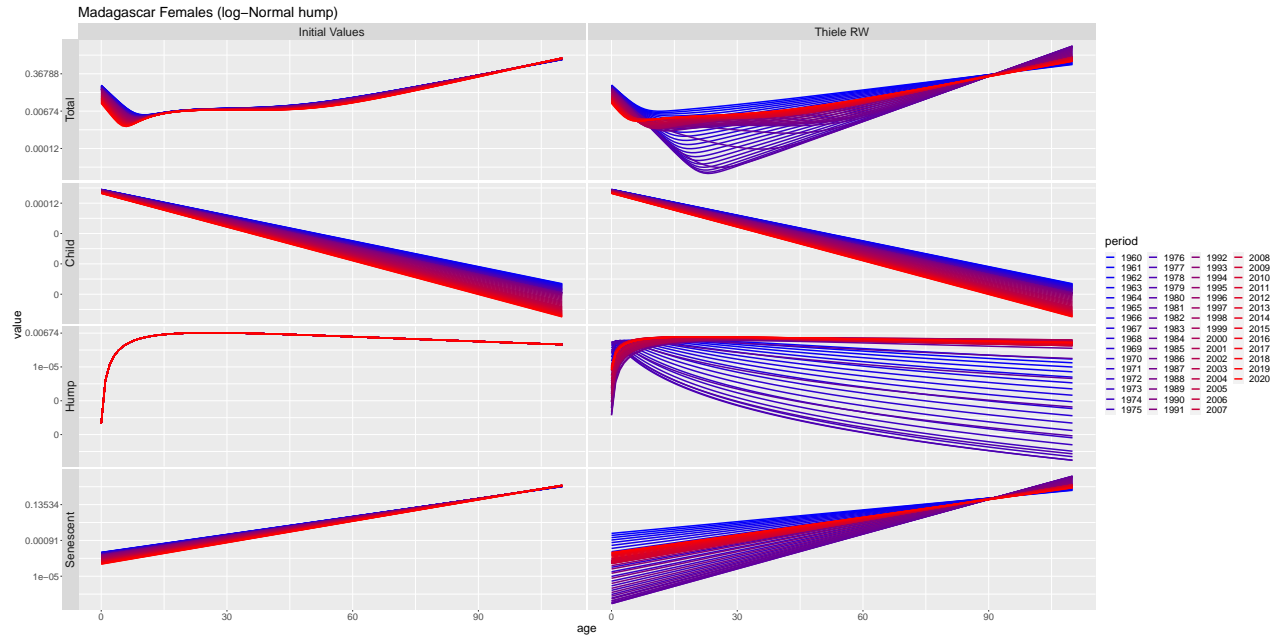
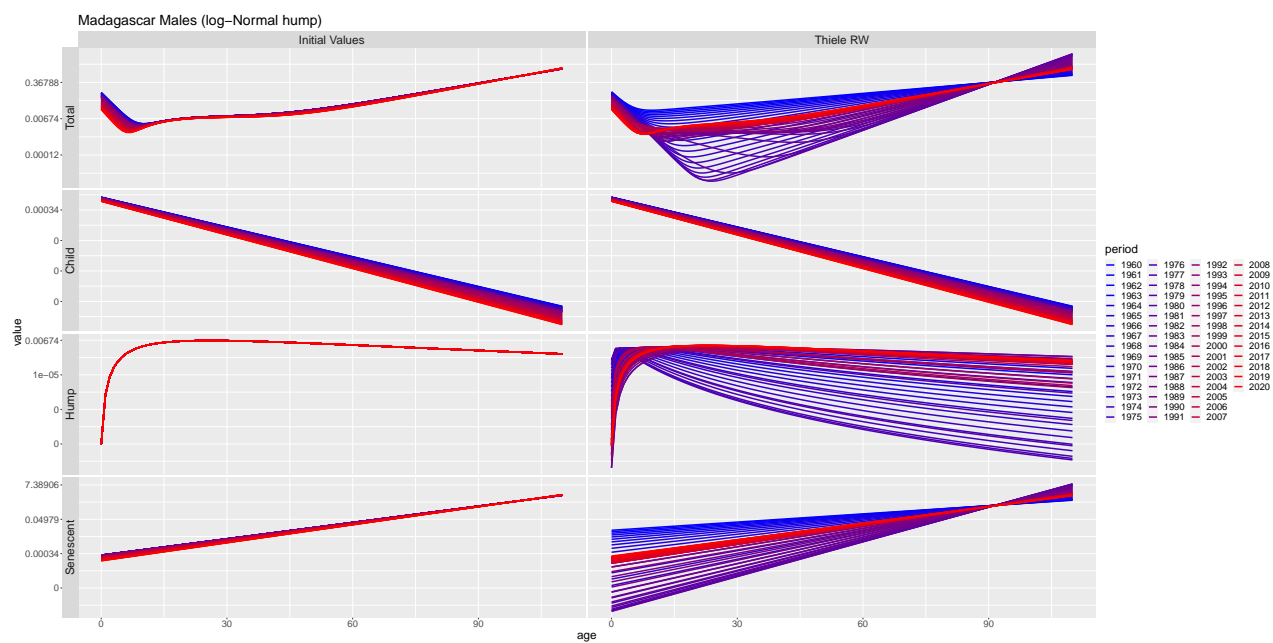Figure 1: Estimated parameters

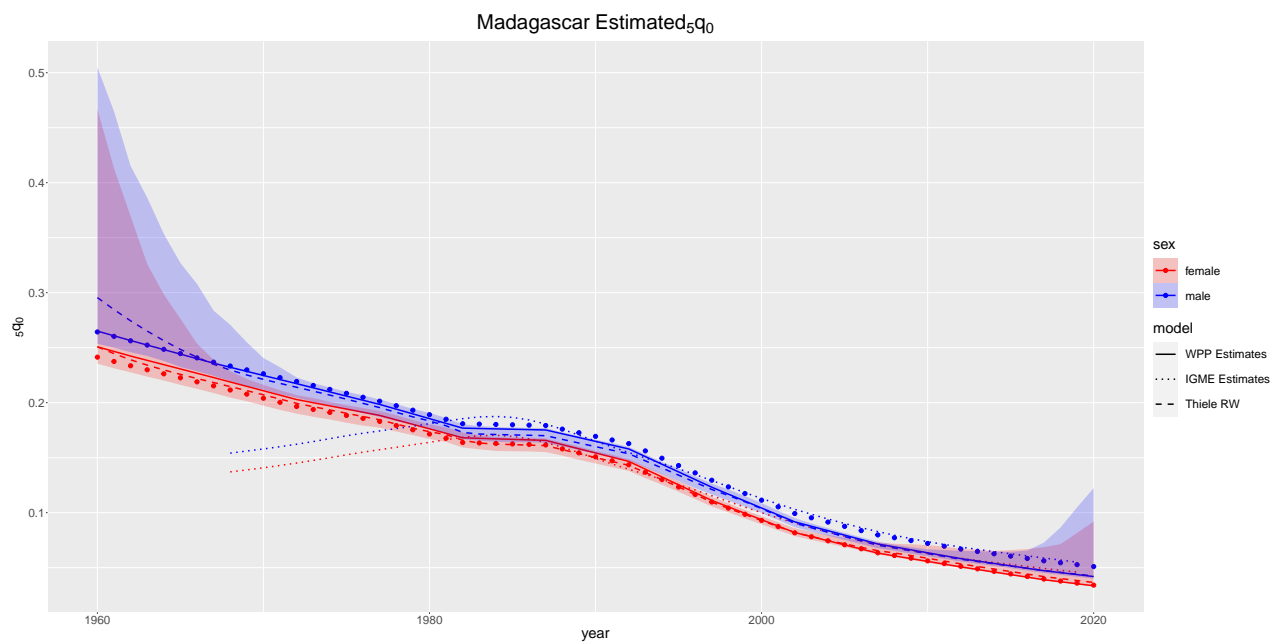Figure 2: Thiele Decomposed

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Figure 3: Thiele Decomposed
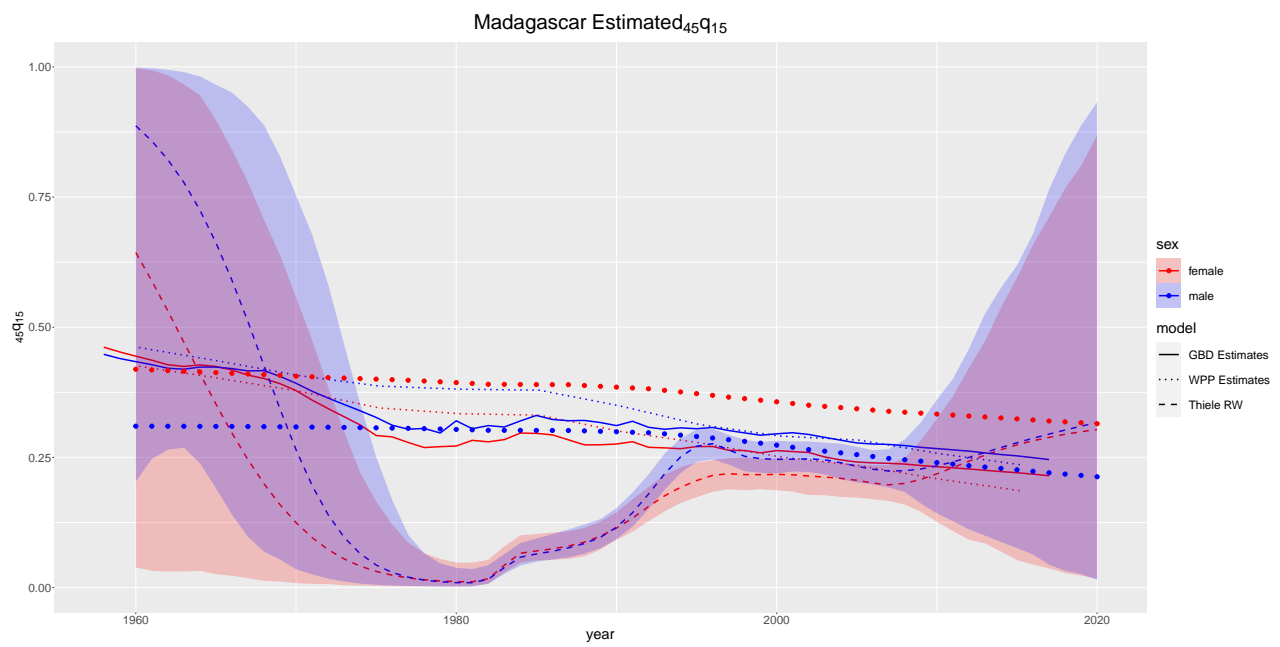

Figure 4: Estimated $_5q_0$
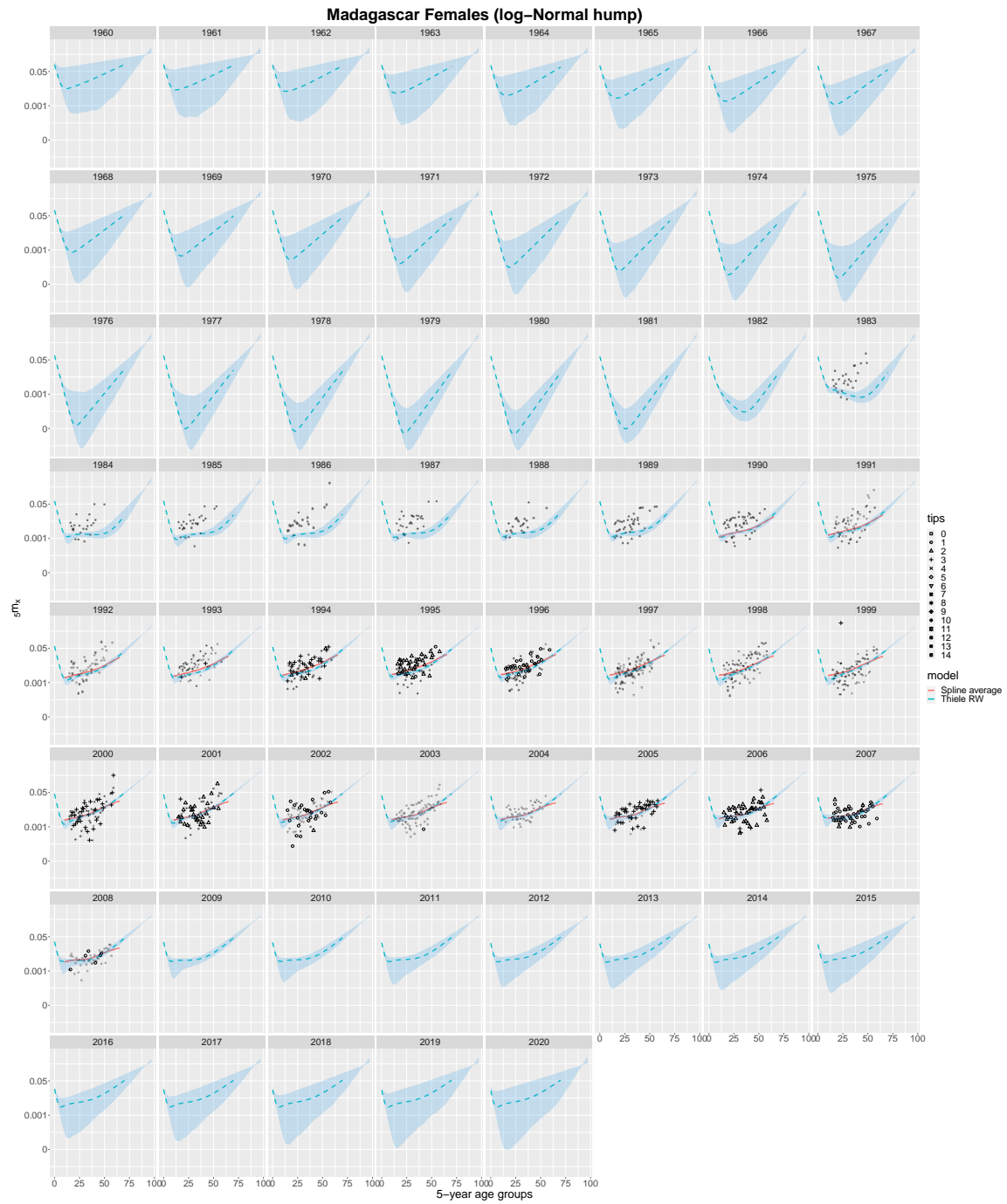
Figure 5: Estimated $_{45}q_{15}$

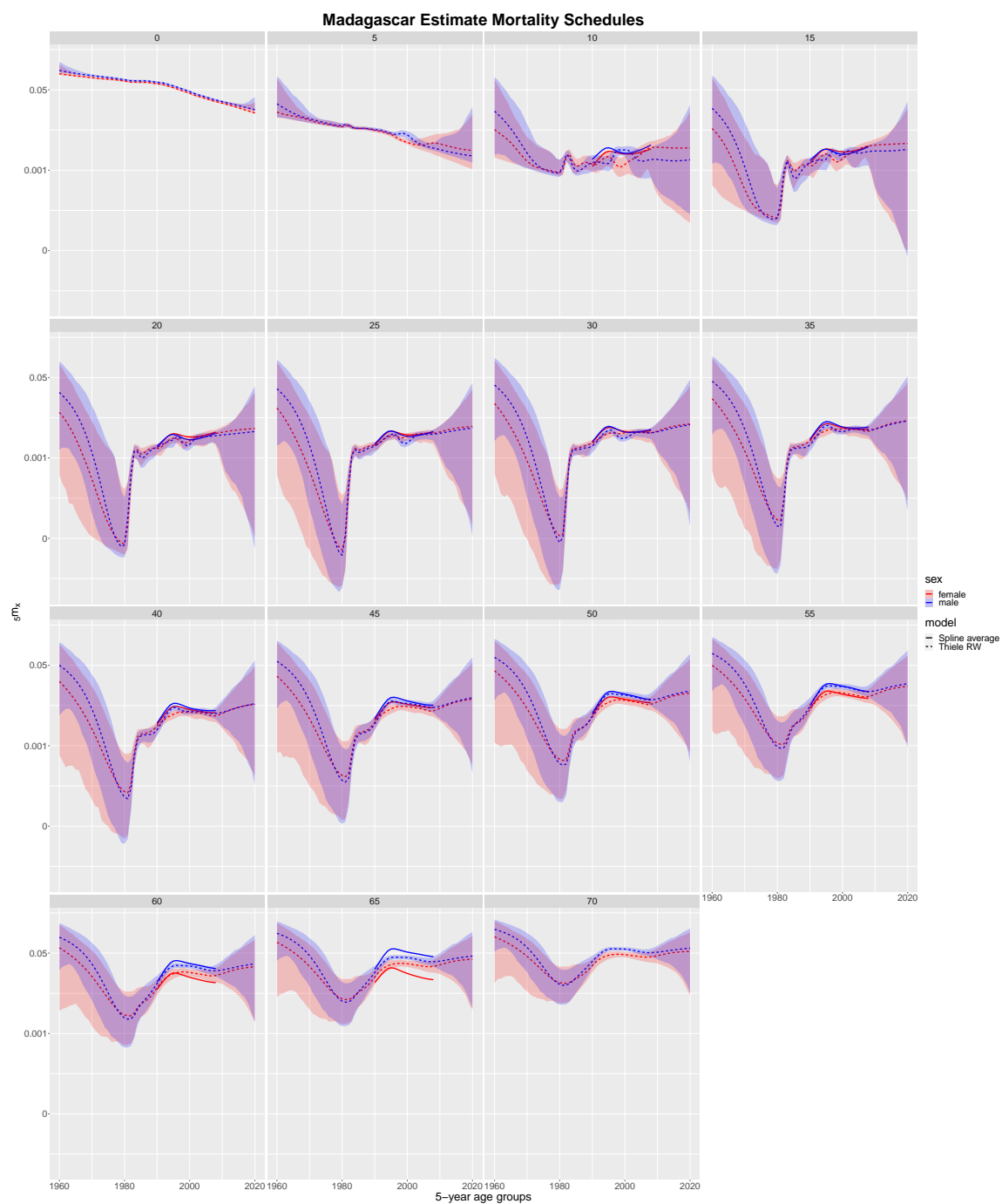Figure 6: Mortality Schedules

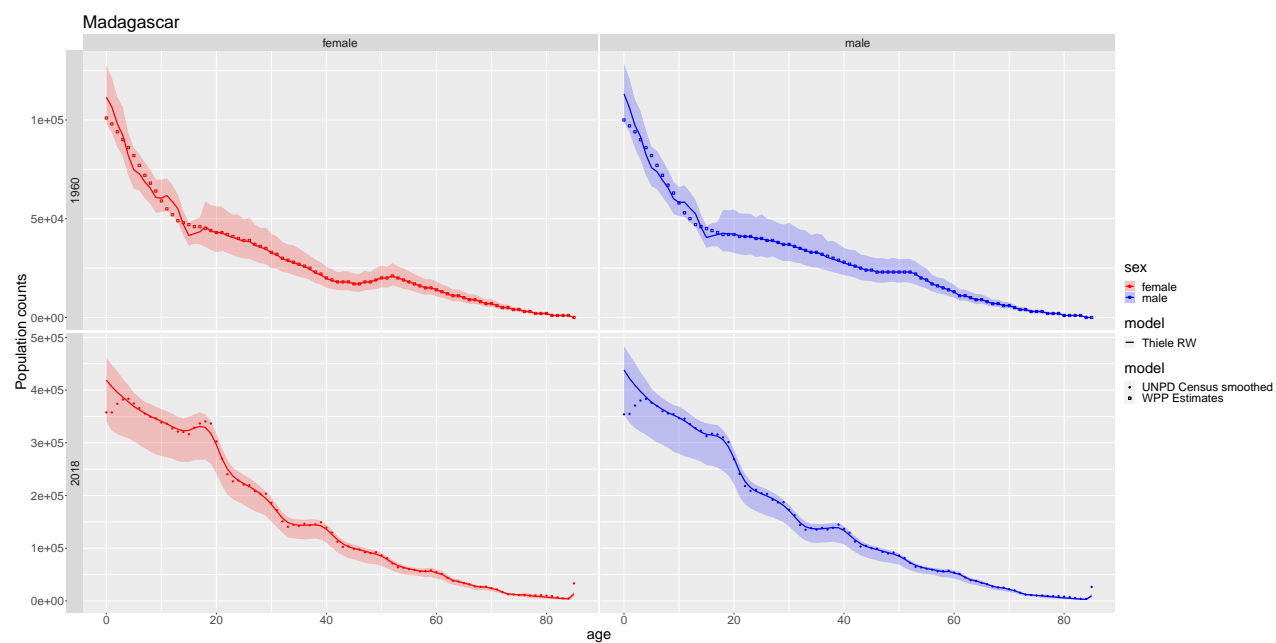Figure 7: Mortality Schedules

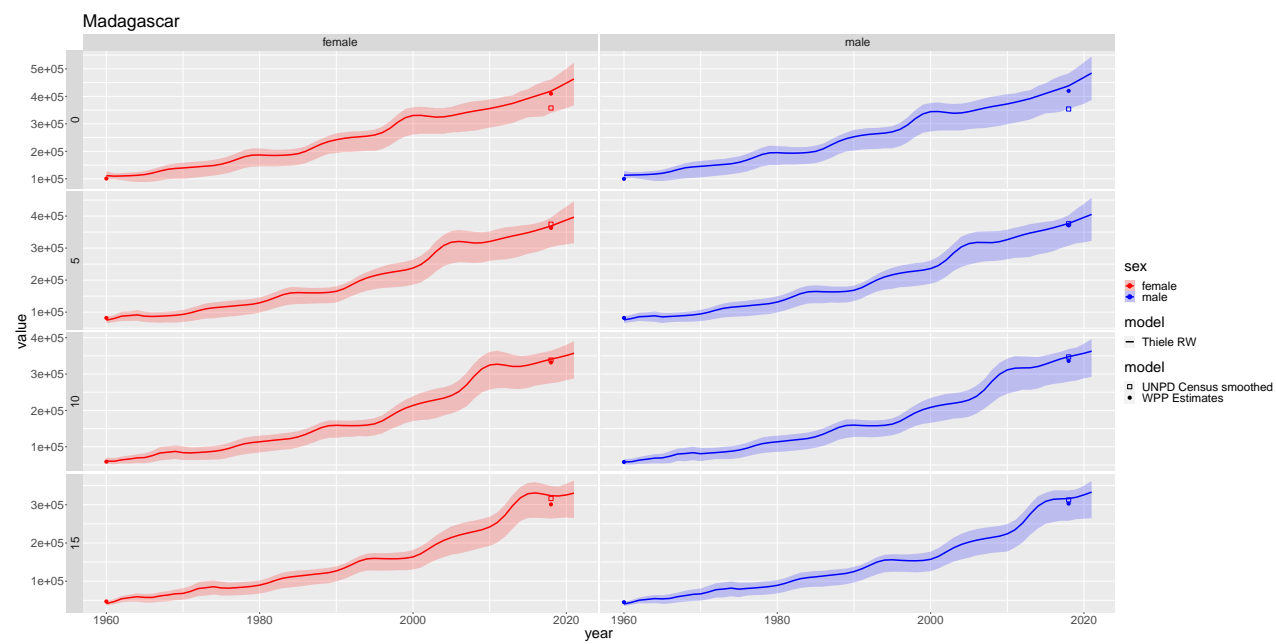Figure 8: Mortality Schedules

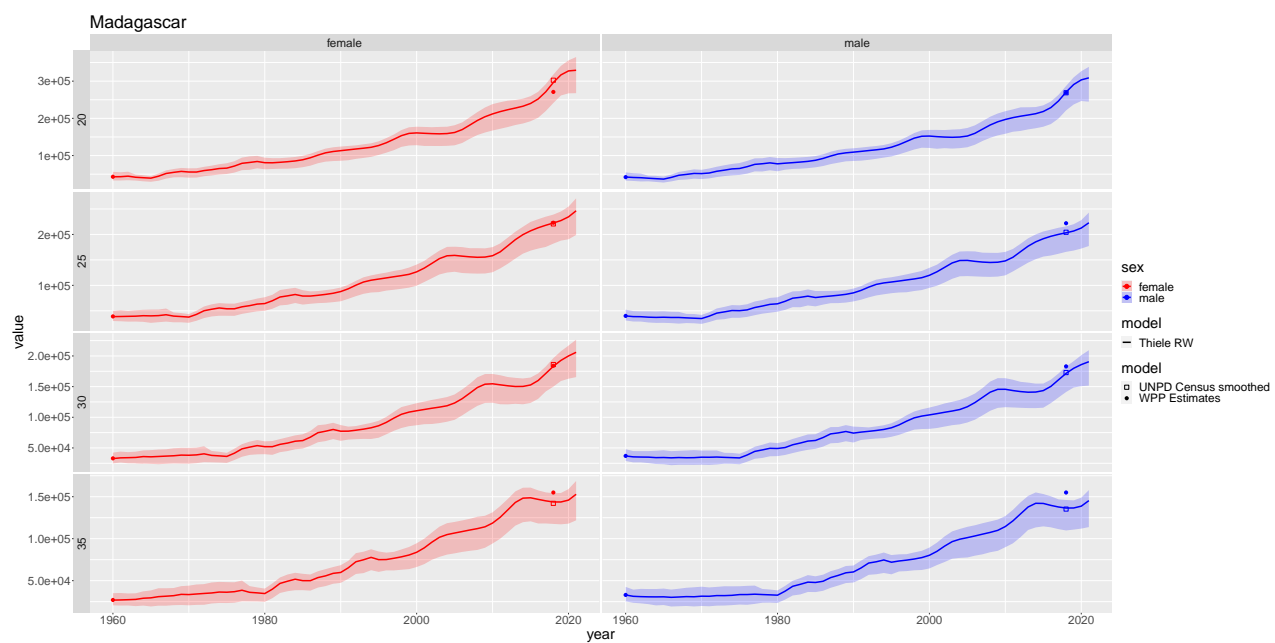Figure 9: Population

Figure 10: Population
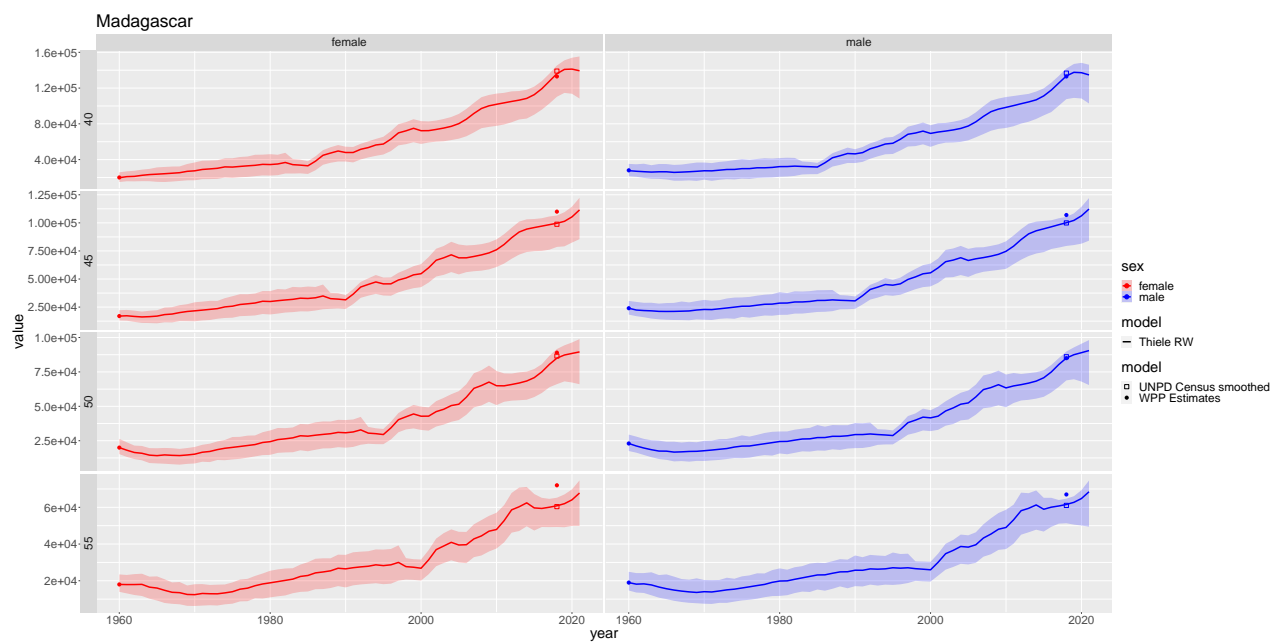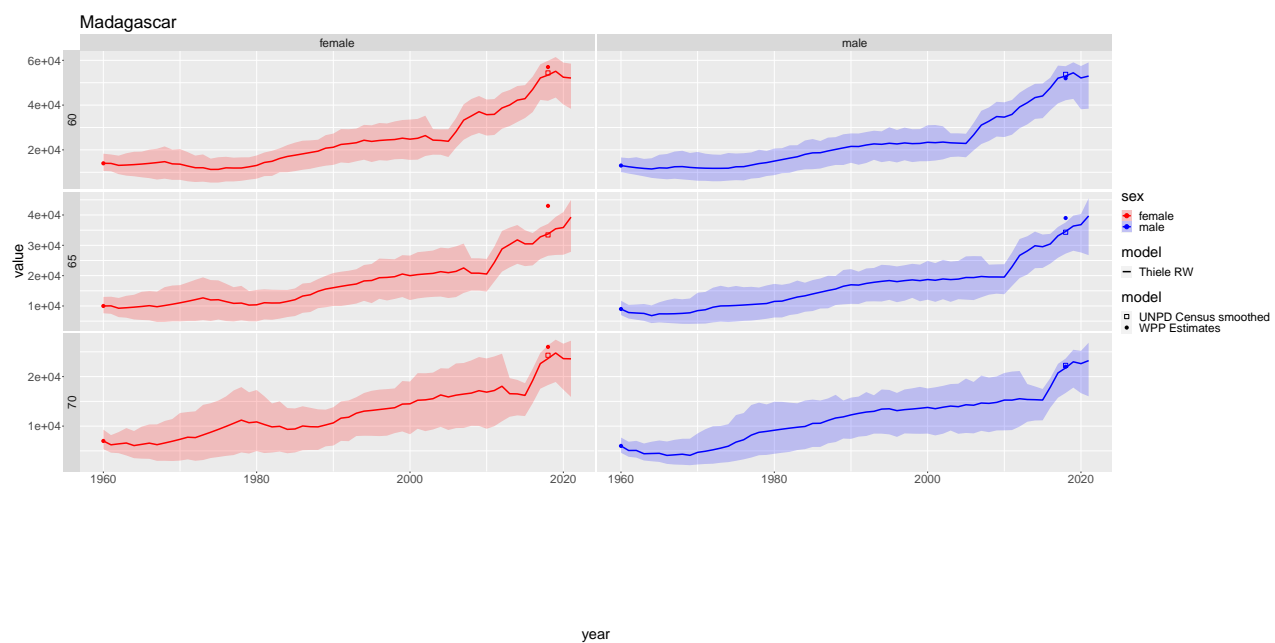
Figure 11: Population
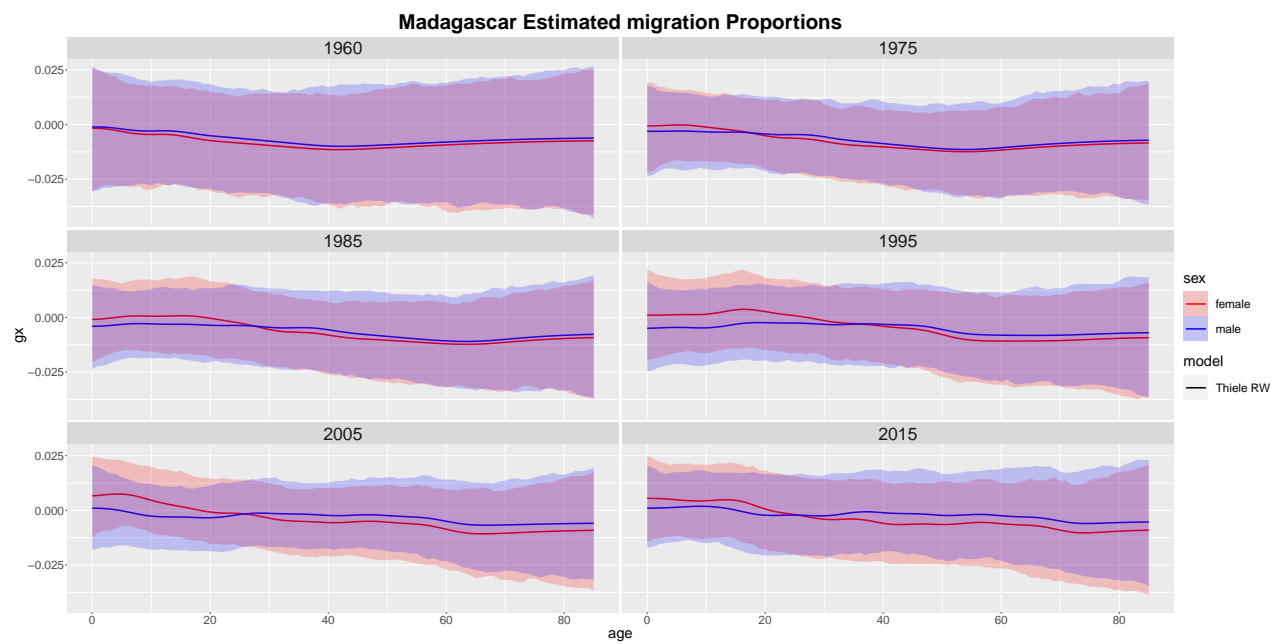

Figure 12: Population
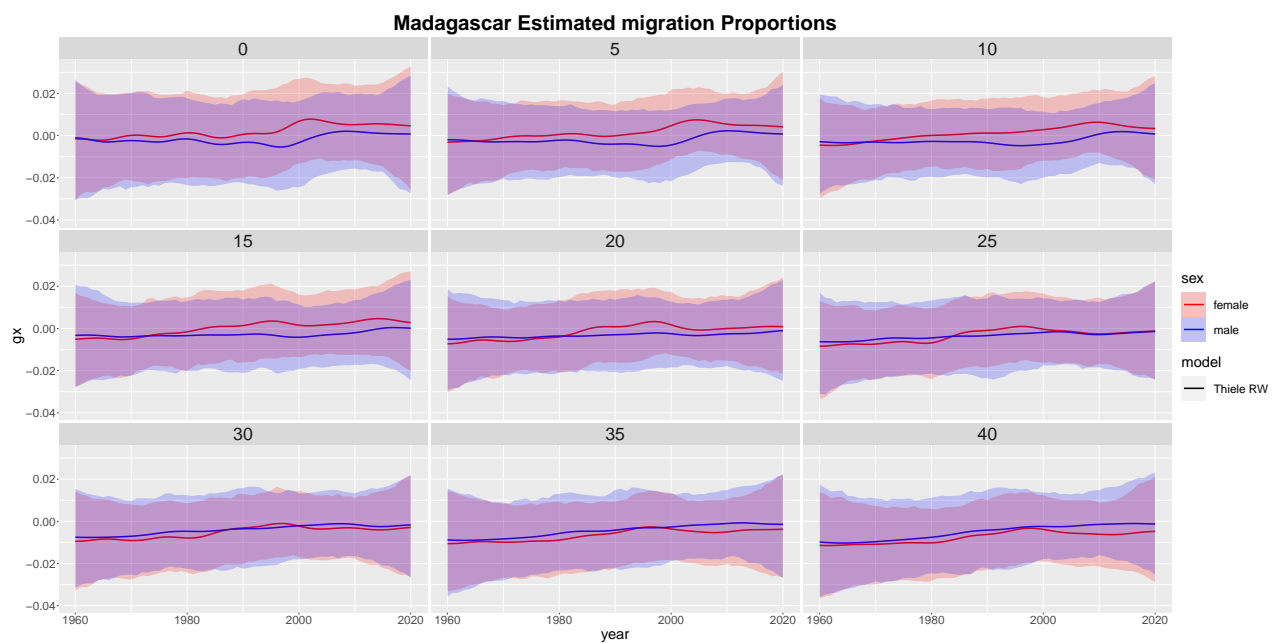
Figure 13: Population
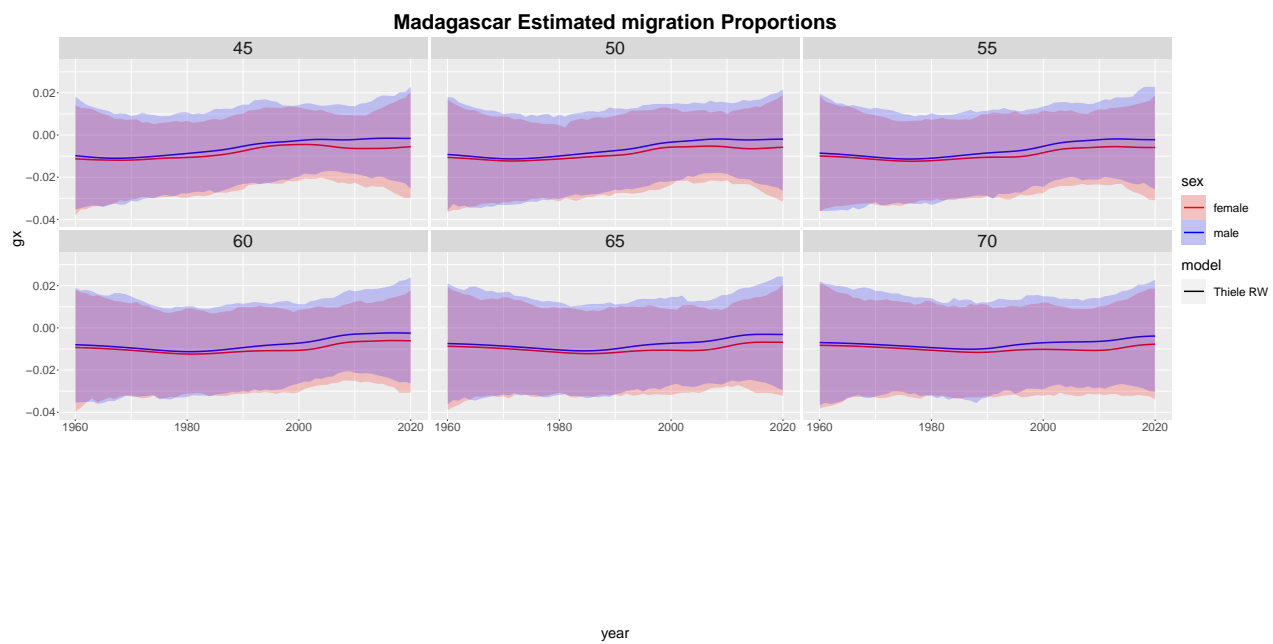

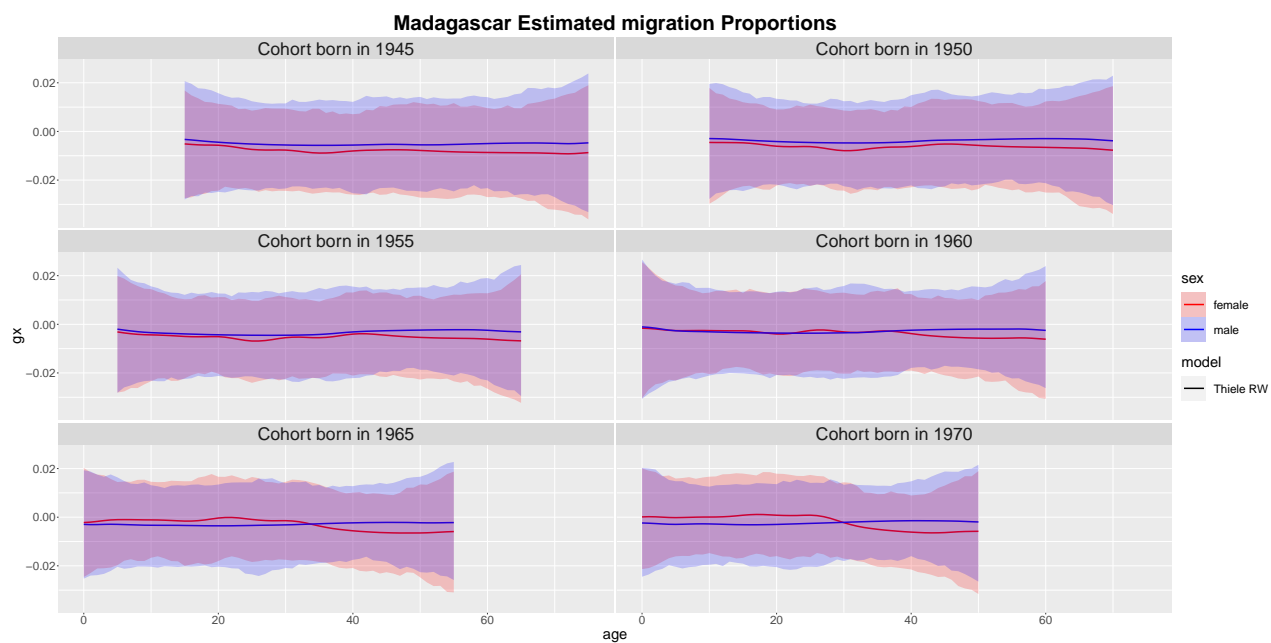Figure 14: Migration

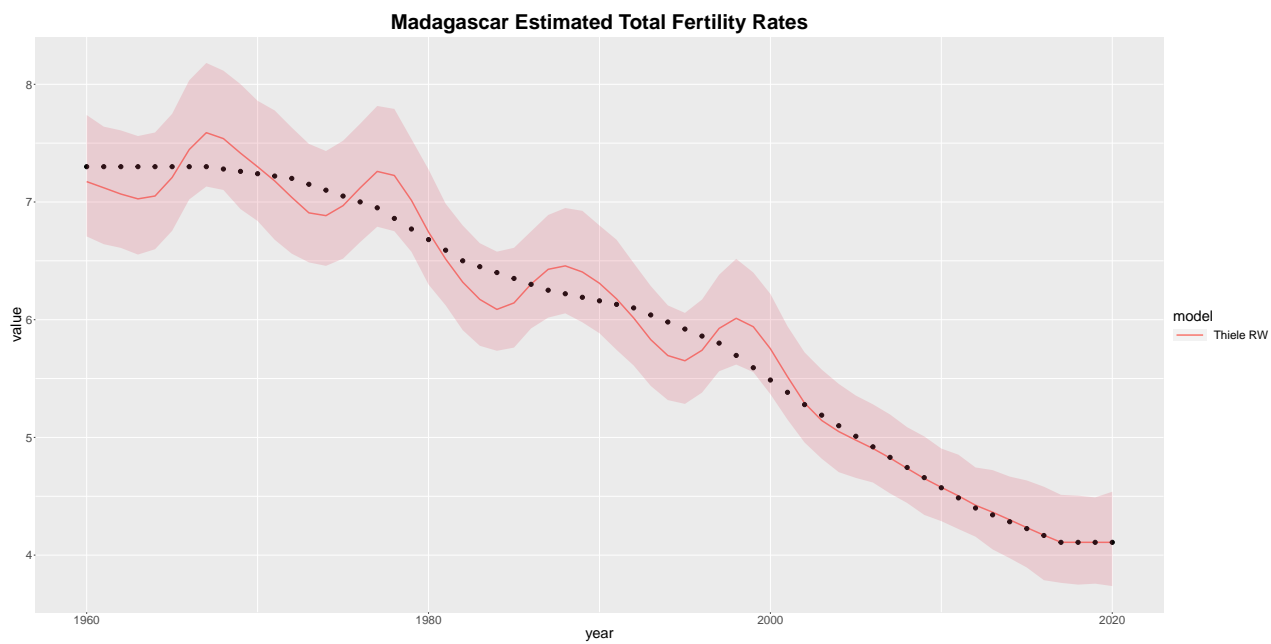Figure 15: Migration

Figure 16: Migration

Figure 17: Migration
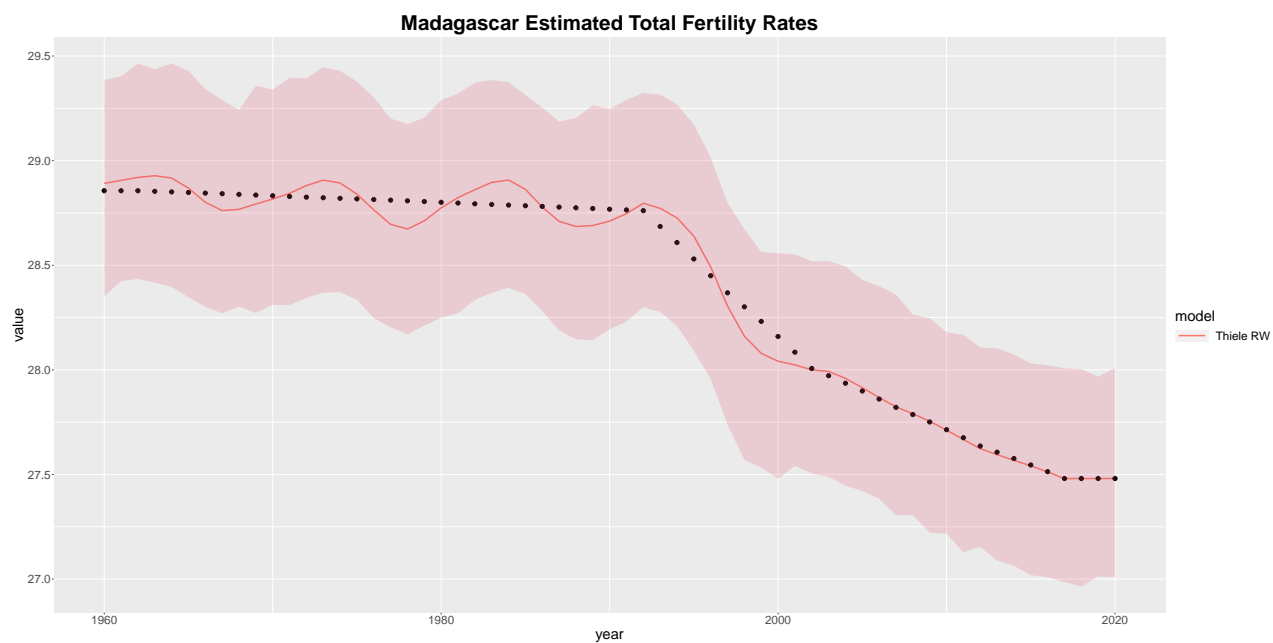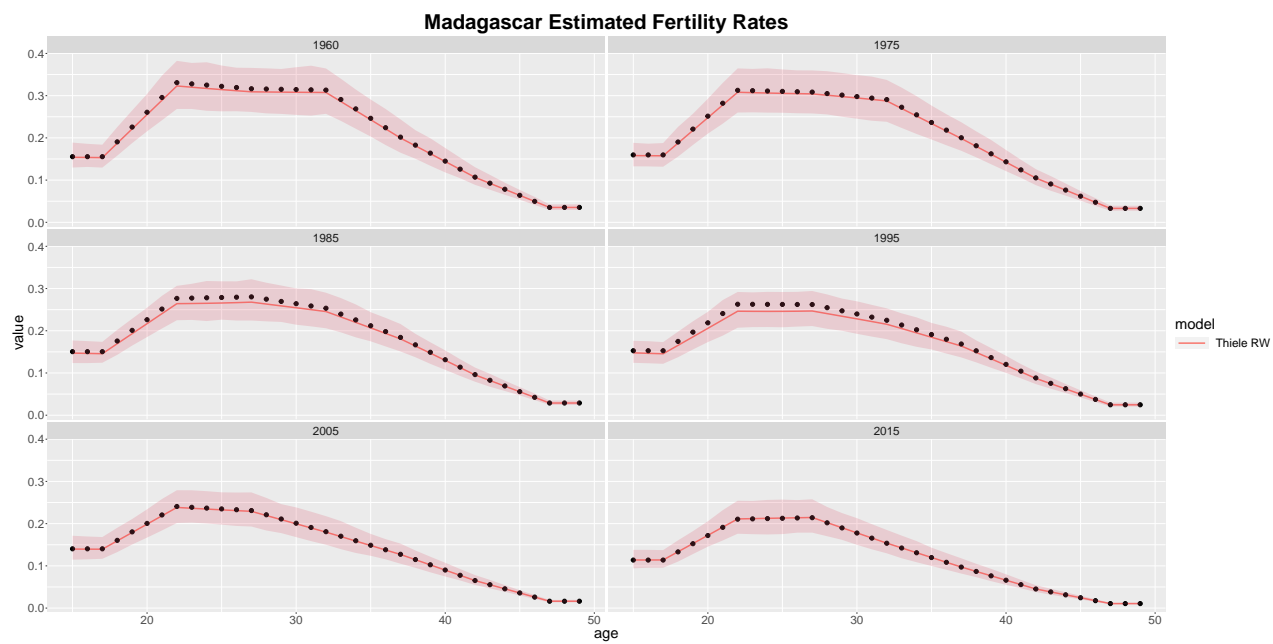

Figure 18: Total Fertility

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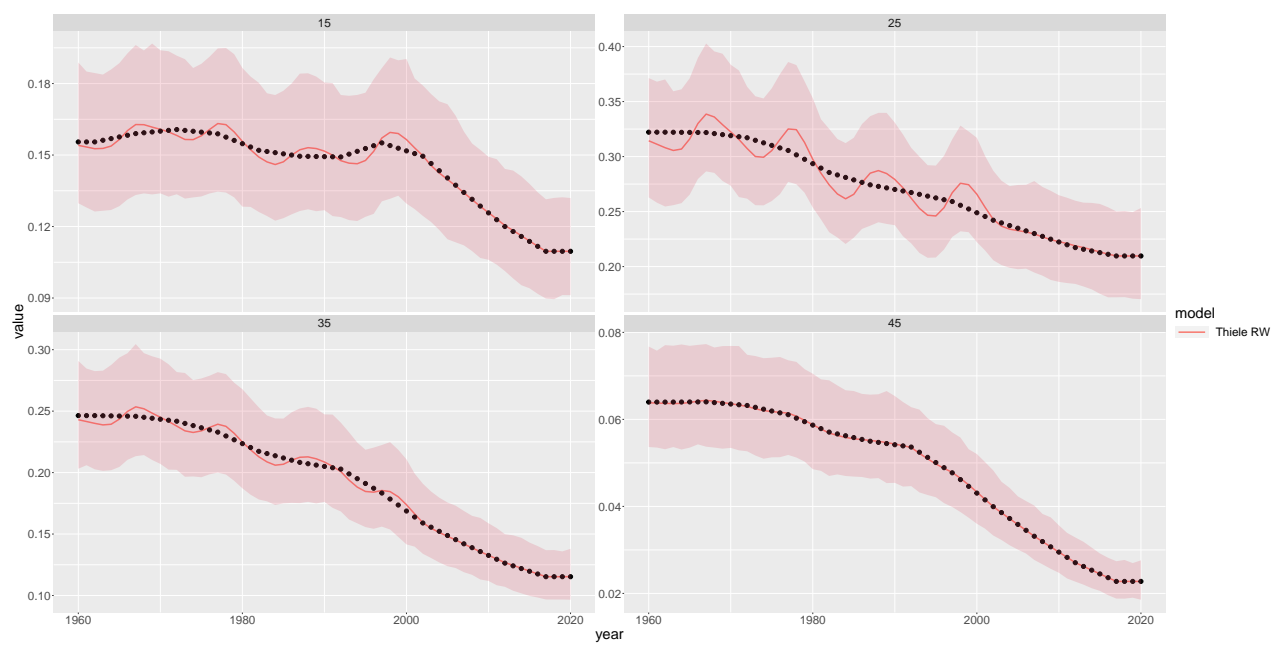Figure 19: Mean age at births

Figure 20: Fertility

Figure 21: Fertility