Zimbabwe

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

## # A tibble: 86 x 6
##      age `1969` `1982` `1992` `2002` `2012`
##    <dbl>  <dbl>   <dbl>   <dbl>   <dbl>   <dbl>
## 1      0   215. 137199. 169638. 170997. 215623.
## 2      1   200. 134655. 159190. 172117. 211071.
## 3      2   219. 133815. 158420. 168708. 198666.
## 4      3   229. 131120. 158291. 164925. 190736.
## 5      4   240. 128619. 160494. 162274. 183611.
## 6      5   251. 126617. 162425. 159507. 177197.
## 7      6   258. 125956. 164145. 156778. 173472.
## 8      7   261. 125351. 166412. 155377. 171651.
## 9      8   262. 124105. 167841. 153895. 169450.
## 10     9   259. 118378. 165018. 153789. 171475.
## # ... with 76 more rows

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

## # A tibble: 18 x 2
##      age `1969`
##    <dbl>  <dbl>
## 1      0 1100.
## 2      5 1252.
## 3     10 1181.
## 4     15  935.
## 5     20  709.
## 6     25  541.
## 7     30  437.
## 8     35  379.
## 9     40  303.
## 10    45  227.
## 11    50  168.
## 12    55  124.
## 13    60   95.4
## 14    65   67.1
## 15    70   35.5
## 16    75   17.0
## 17    80    9.26
## 18    85   13.4

## [1] "Census Males"

## # A tibble: 86 x 6
##      age `1969` `1982` `1992` `2002` `2012`
##    <dbl>  <dbl>   <dbl>   <dbl>   <dbl>   <dbl>
## 1      0   238. 133357. 168079. 170637. 213895.
## 2      1   232. 129754. 158096. 172216. 210140.
## 3      2   231. 129163. 156962. 168433. 197420.
## 4      3   235. 127343. 157057. 164960. 189835.
## 5      4   242. 125798. 159247. 162197. 182613.
## 6      5   248. 124587. 161170. 159217. 176094.
```

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## 7      6    255. 124714. 162716. 156209. 172218.
## 8      7    265. 124146. 164082. 154419. 170262.
## 9      8    271. 122838. 164791. 152264. 167883.
## 10     9    271. 117620. 161620. 152041. 170380.
## # ... with 76 more rows

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

## # A tibble: 18 x 2
##      age  `1969`
##    <dbl>   <dbl>
## 1      0 1156.
## 2      5 1278.
## 3     10 1207.
## 4     15  931.
## 5     20  636.
## 6     25  459.
## 7     30  389.
## 8     35  341.
## 9     40  280.
## 10    45  229.
## 11    50  186.
## 12    55  142.
## 13    60   97.1
## 14    65   60.0
## 15    70   32.4
## 16    75   15.2
## 17    80    8.24
## 18    85    7.21
```

Thiele log-Normal Hump Spline

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

##              log_tau2_logpop                 log_tau2_logpop
##                   4.964120974                     6.576940520
##              log_tau2_logpop                 log_tau2_logpop
##                   4.995376721                     6.511638437
##        log_marginal_lambda_fx          log_marginal_lambda_gx
##                   8.291413856                     6.922048881
##                log_dispersion                  log_dispersion
##                   1.240128730                     1.187839705
##                 log_lambda_tp                        tp_slope
##                   4.056740598                    -0.004335276
##                   tp_params_5                     tp_params_10
##                   0.233236332                     0.436211478
##      log_marginal_lambda_phi         log_marginal_lambda_psi
##                   8.626972370                     8.618375649
##  log_marginal_lambda_lambda       log_marginal_lambda_delta
##                   0.214870854                     0.822376253
## log_marginal_lambda_epsilon        log_marginal_lambda_A
##                   2.189672859                     8.601013533
##         log_marginal_lambda_B                   logit_rho_phi
##                   4.319278173                    -1.657315787
##                 logit_rho_psi                logit_rho_lambda
##                  -1.657537311                     1.902974759
##               logit_rho_delta              logit_rho_epsilon
##                   3.015110396                     4.287967694
##                   logit_rho_A                     logit_rho_B
```

2

```
##                    -1.657681360                     -1.762457181
##                logit_rho_fx_age                 logit_rho_fx_time
##                    -1.663901634                     -1.616939393
##                logit_rho_gx_age                 logit_rho_gx_time
##                     1.542671652                     -1.384692389
```
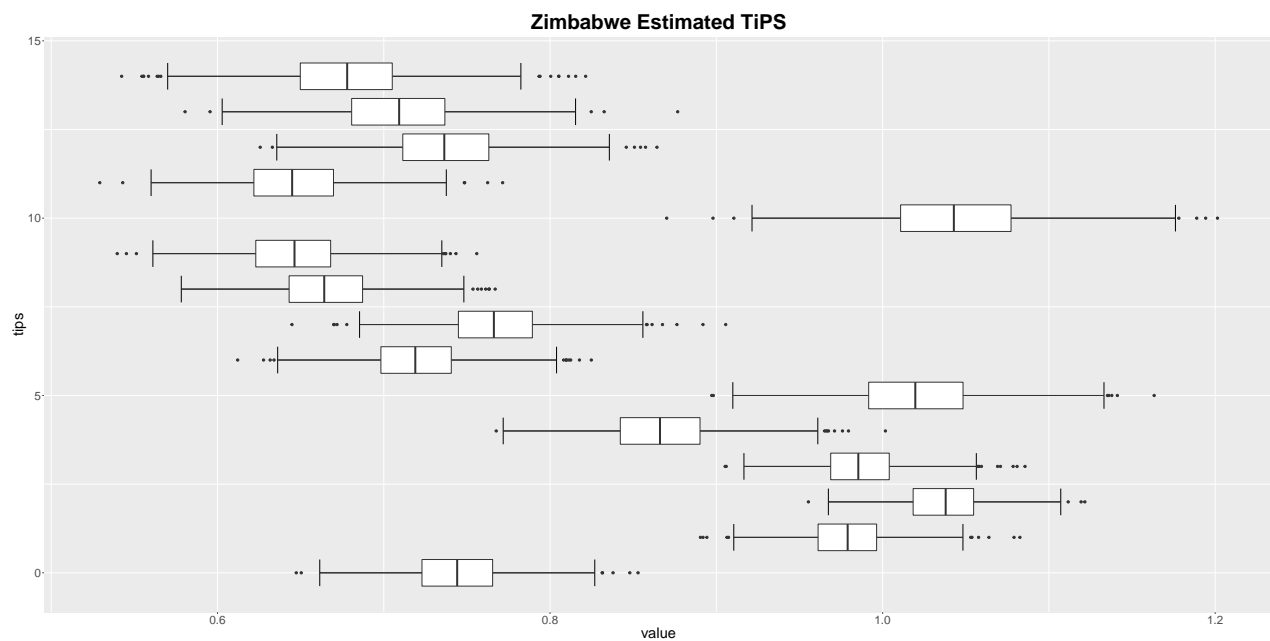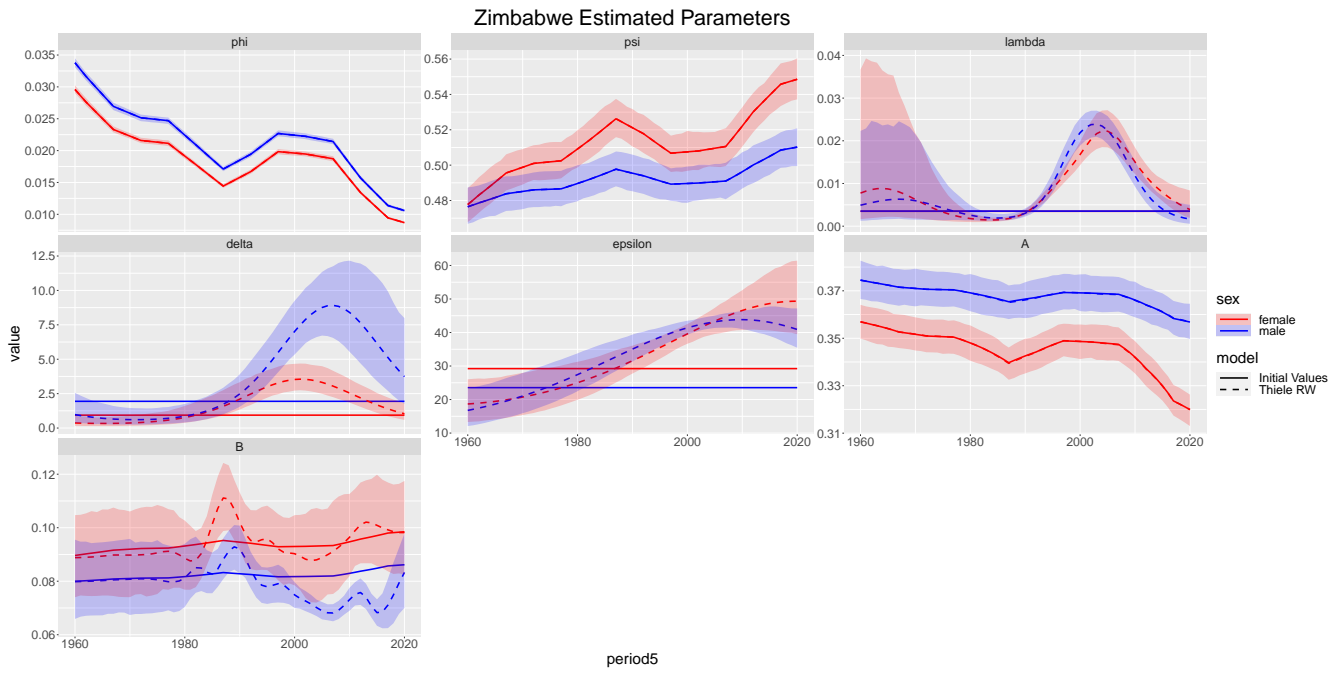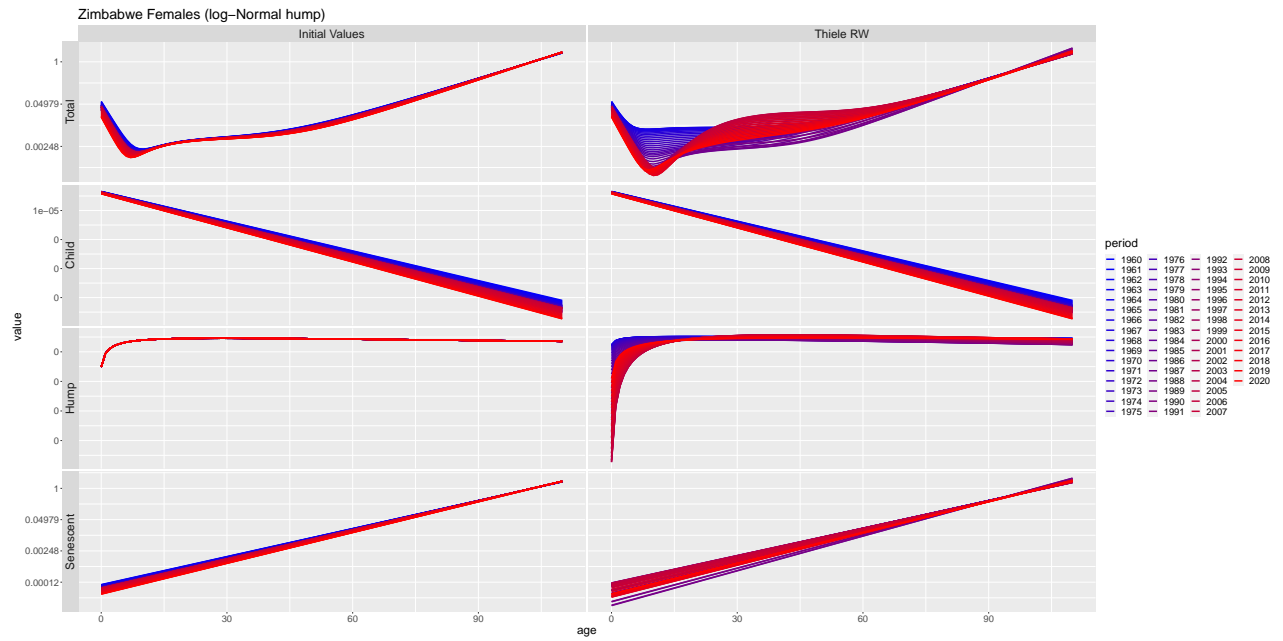

Figure 1: Estimated TiPS

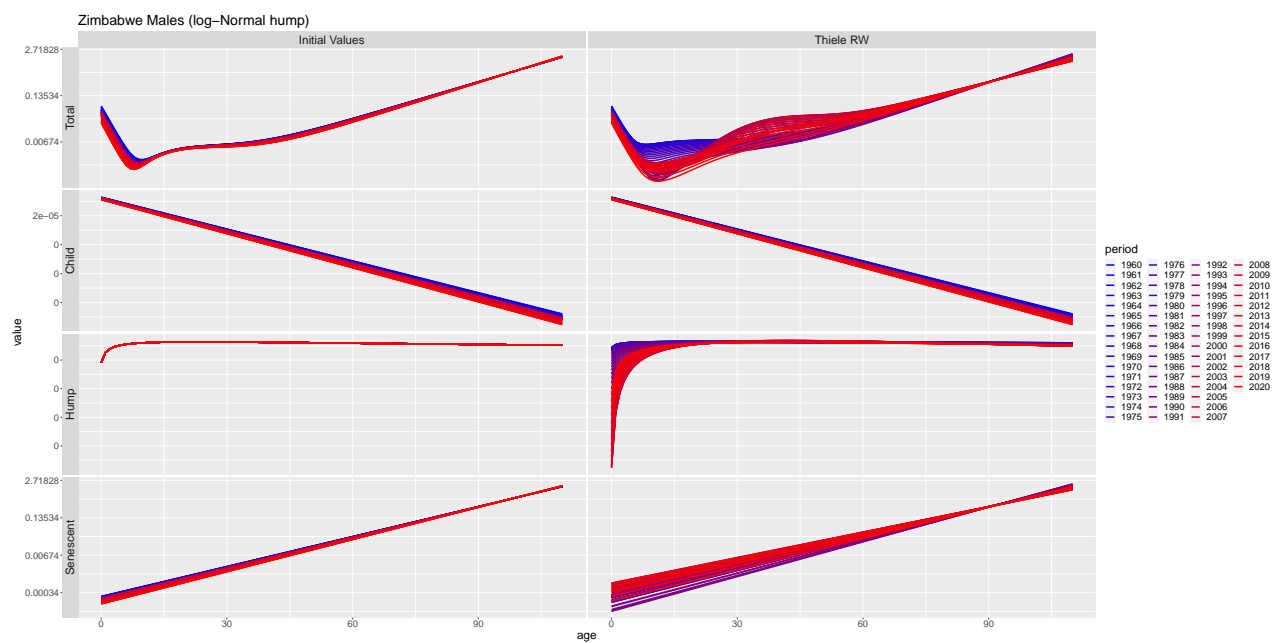Figure 2: Estimated parameters

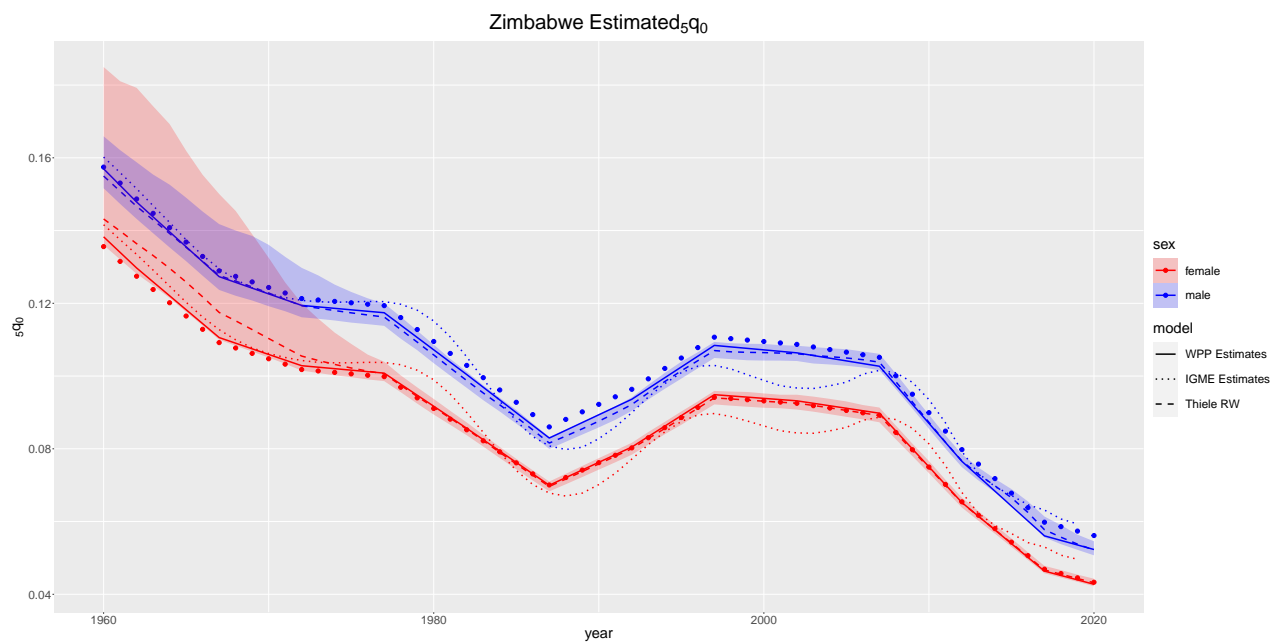Figure 3: Thiele Decomposed

4

Figure 4: Thiele Decomposed

Figure 5: Estimated $_5q_0$
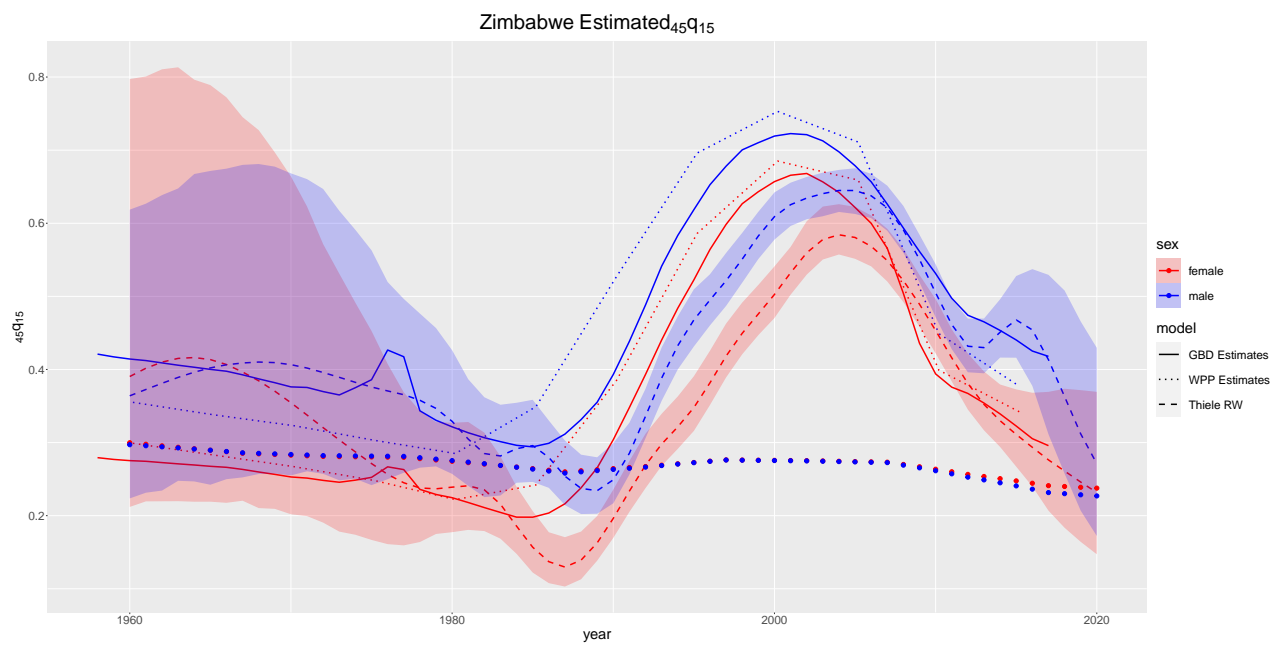
Figure 6: Estimated $_{45}q_{15}$
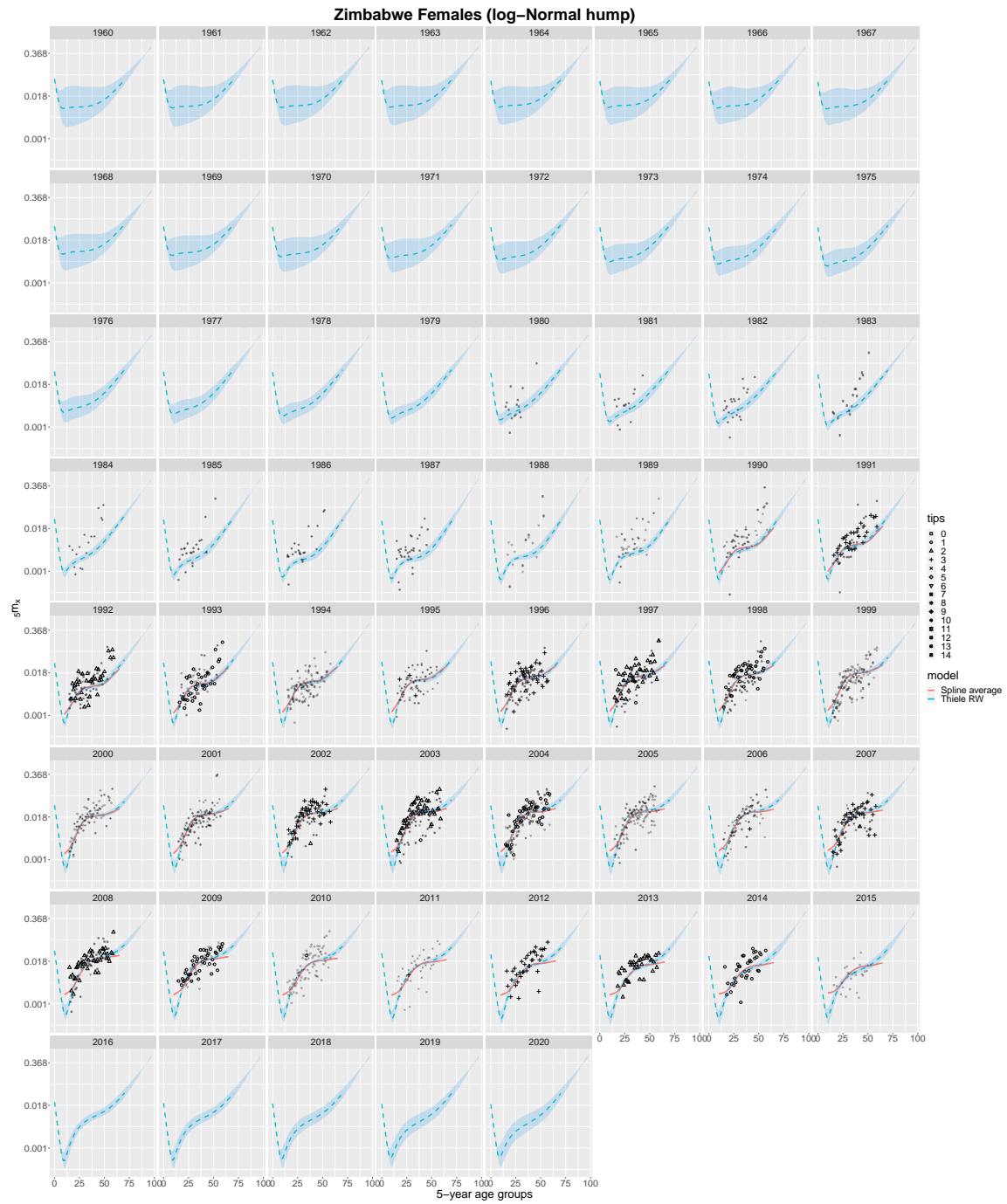
Figure 7: Mortality Schedules
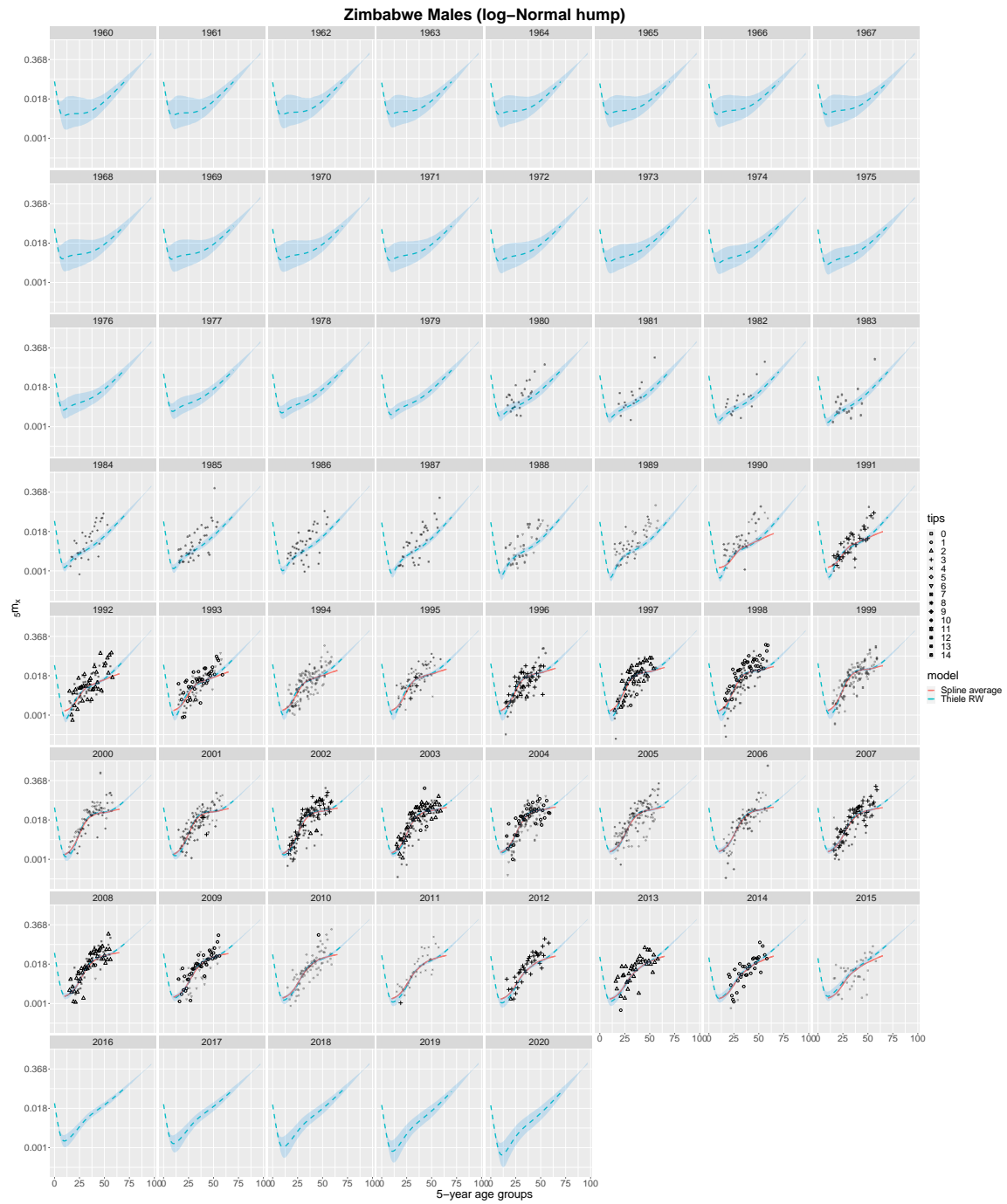
Figure 8: Mortality Schedules
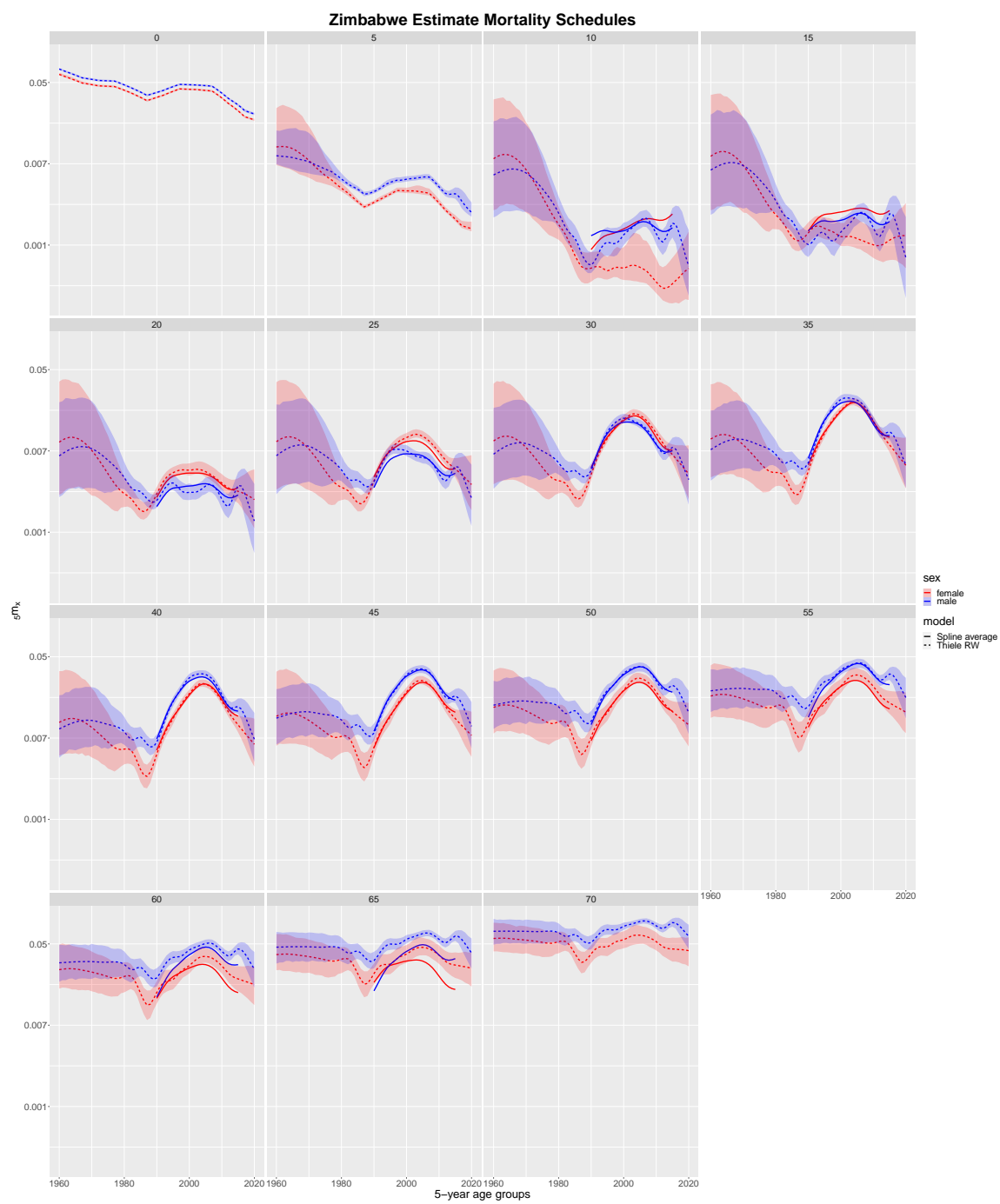
Figure 9: Mortality Schedules
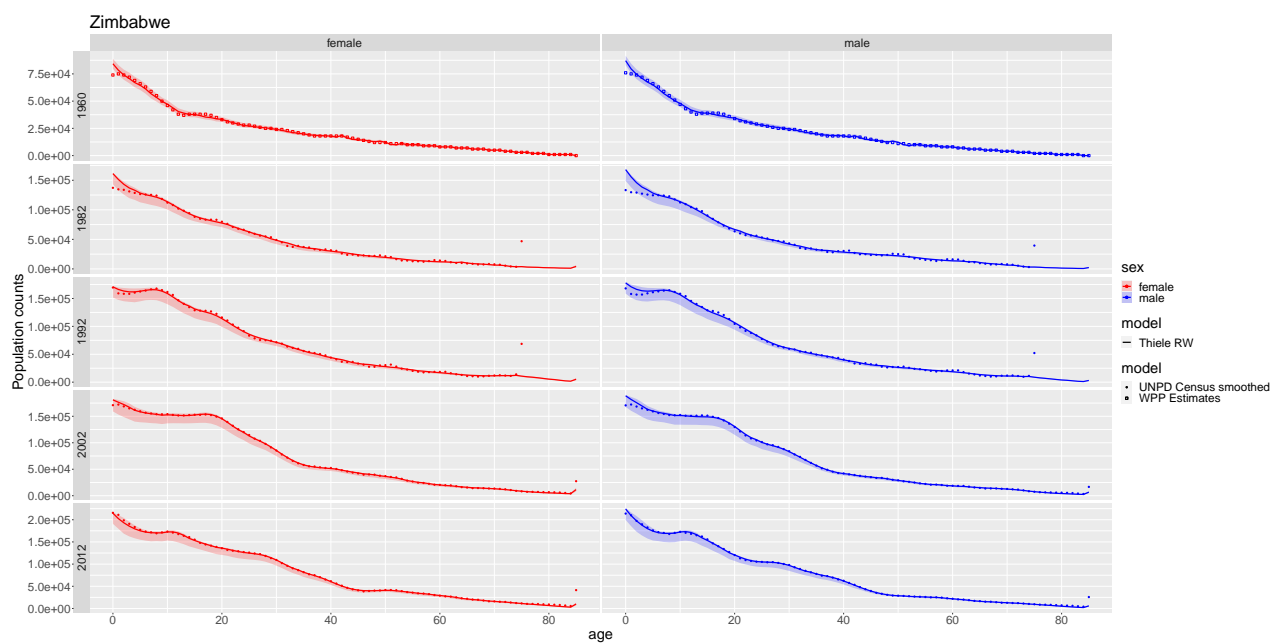
Figure 10: Population
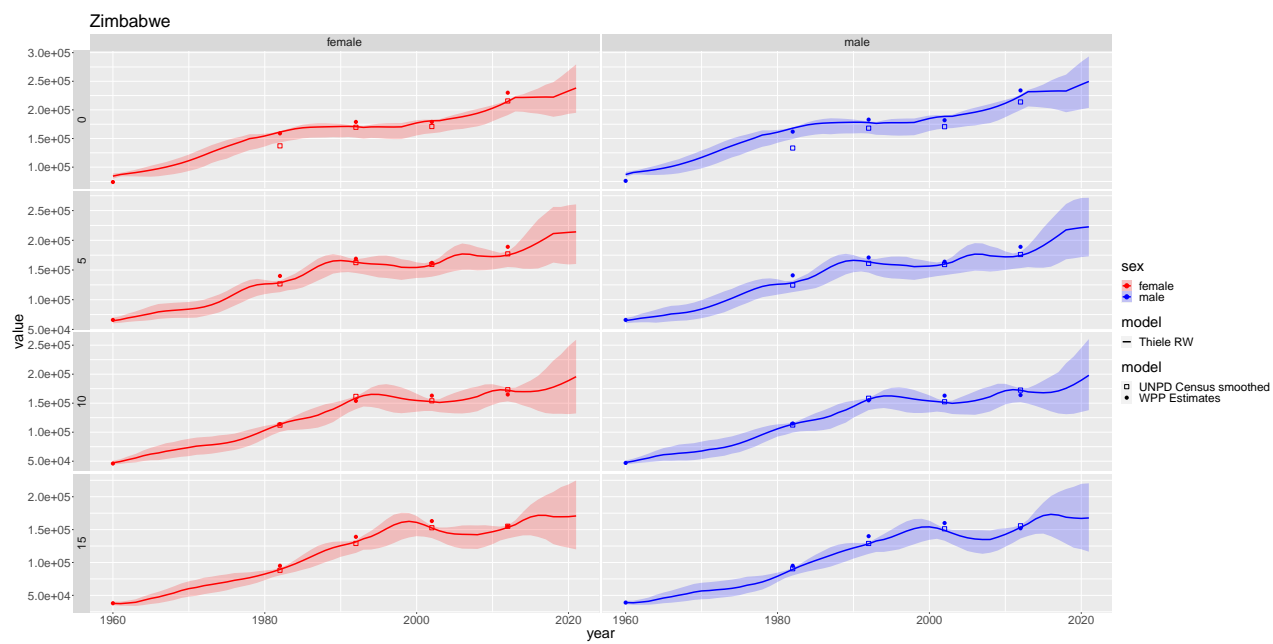
Figure 11: Population
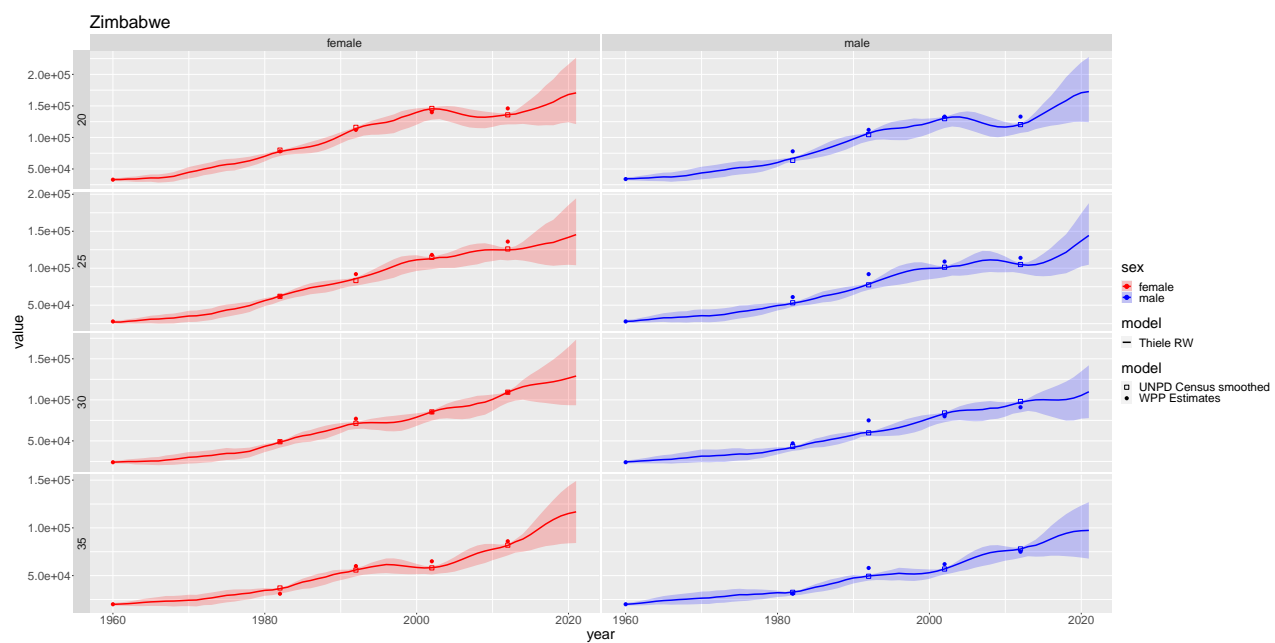
Figure 12: Population
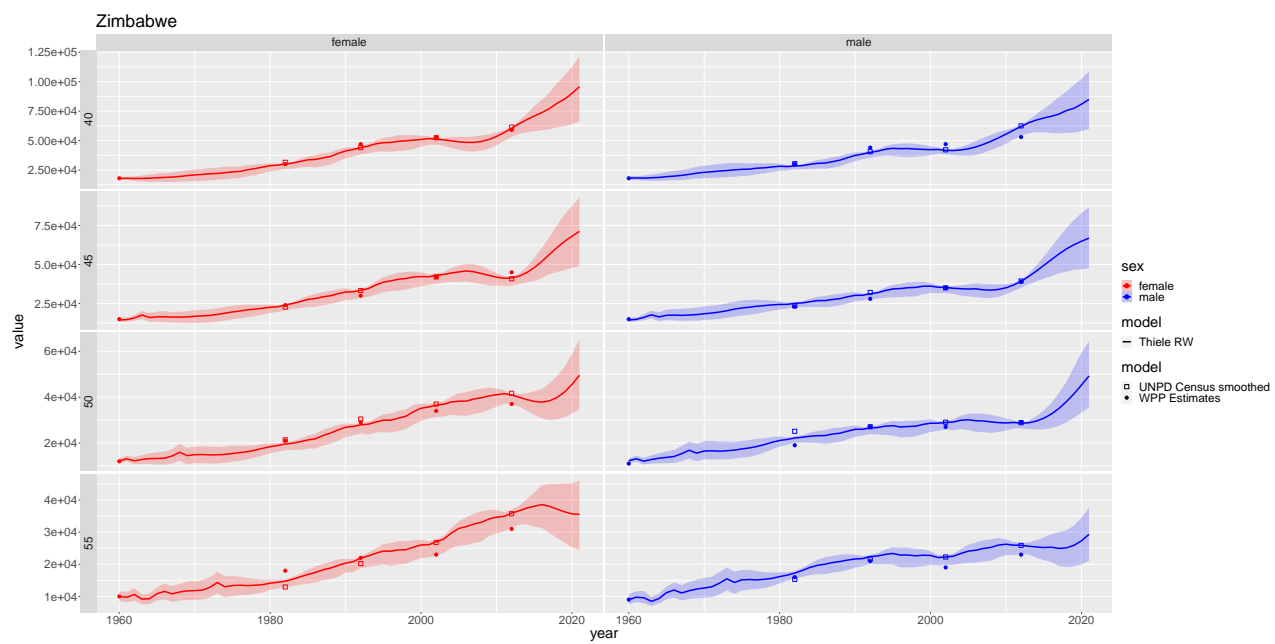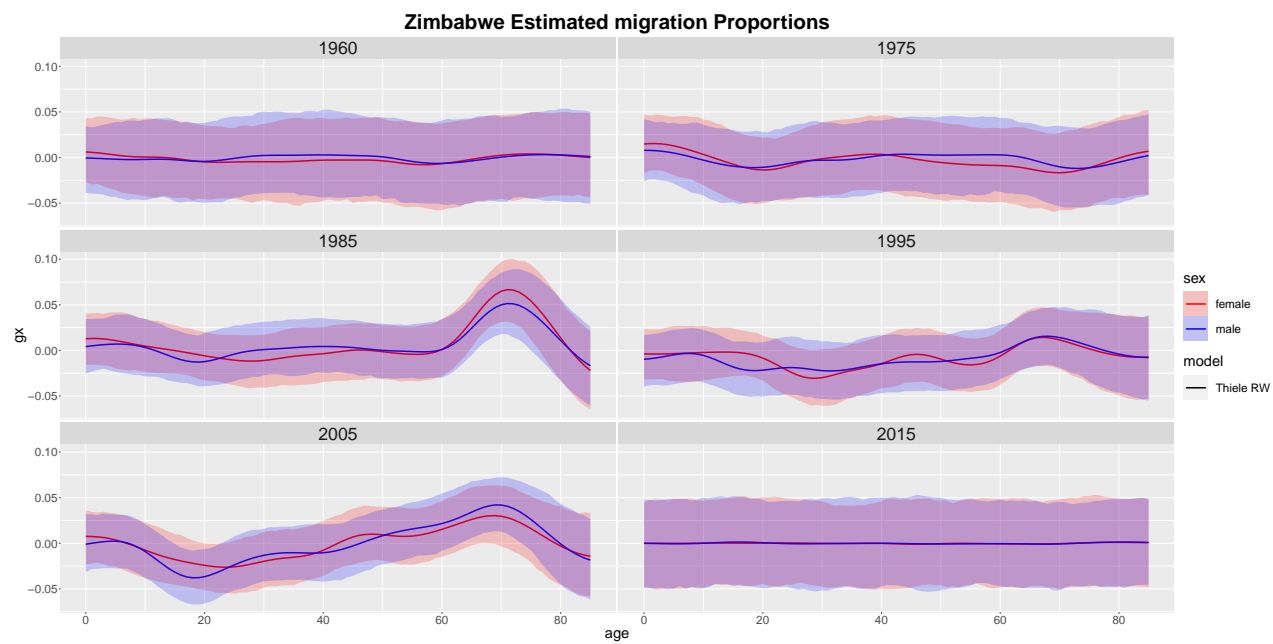

Figure 13: Population
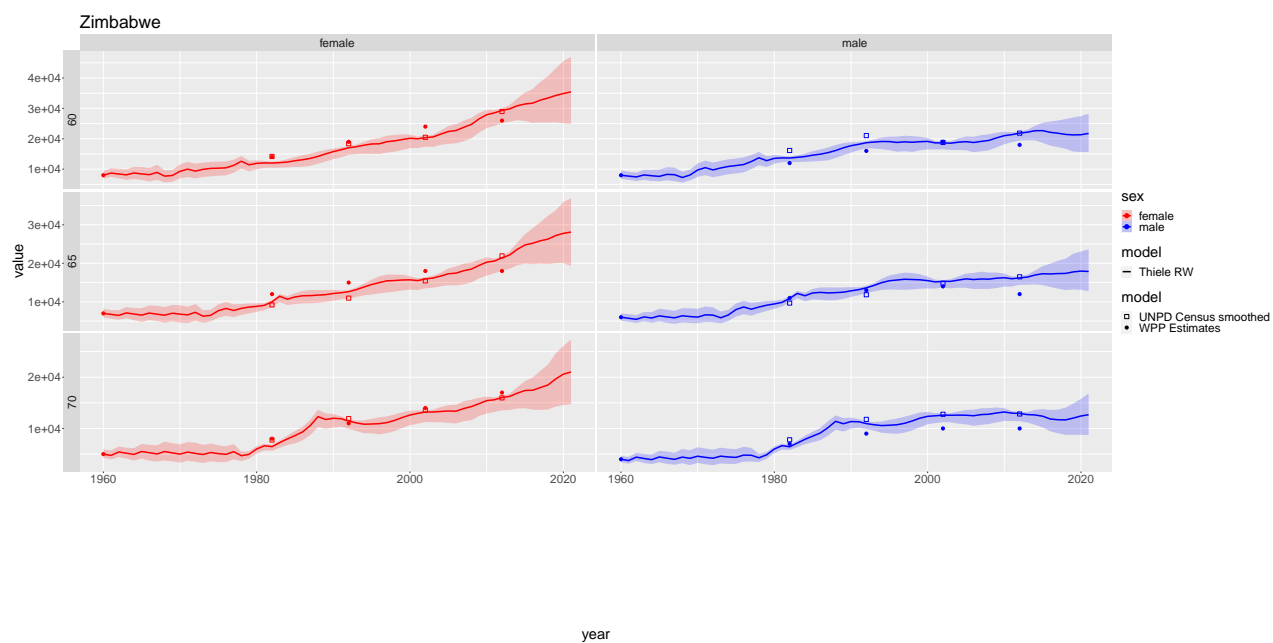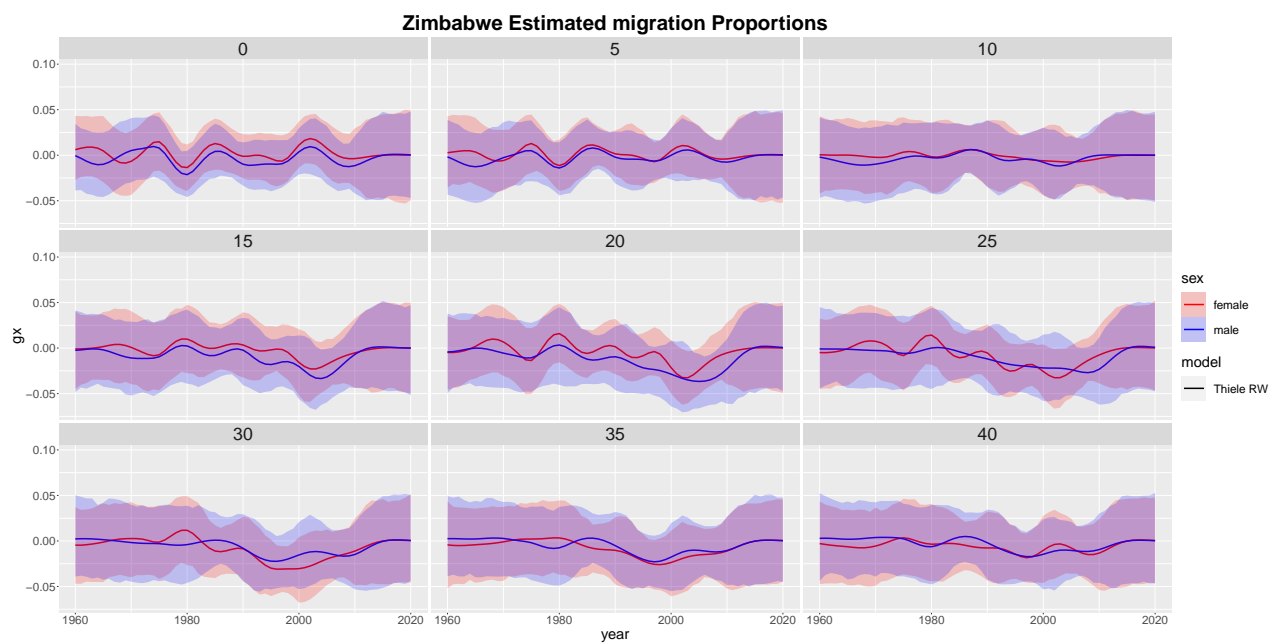
Figure 14: Population

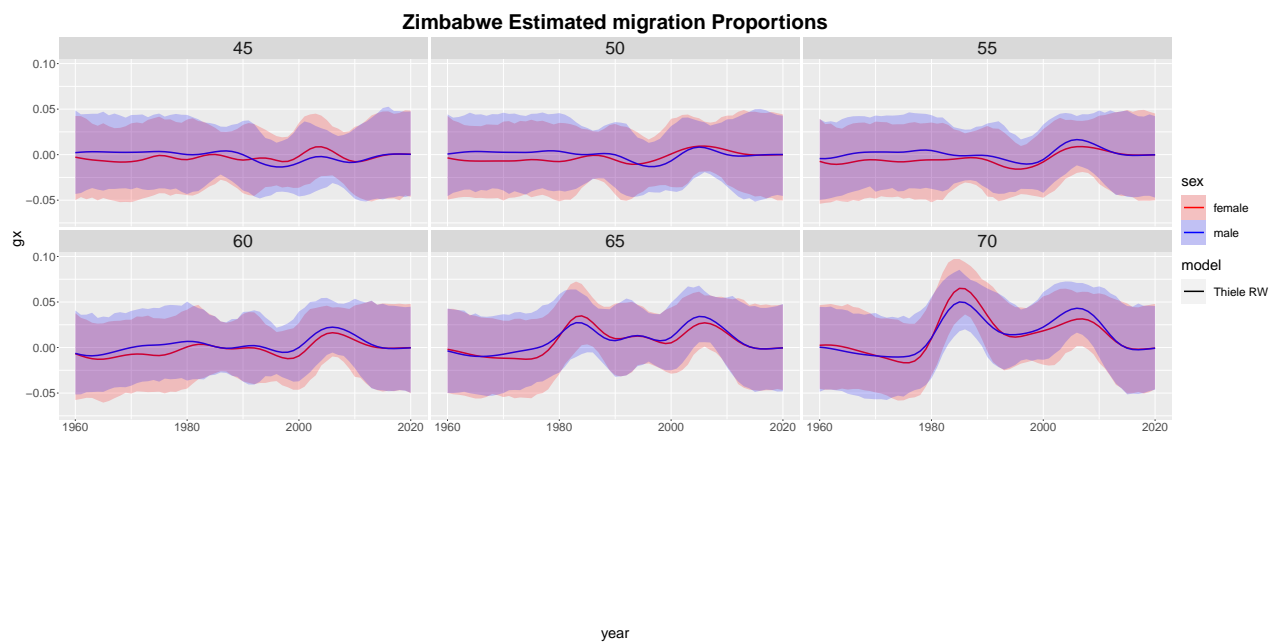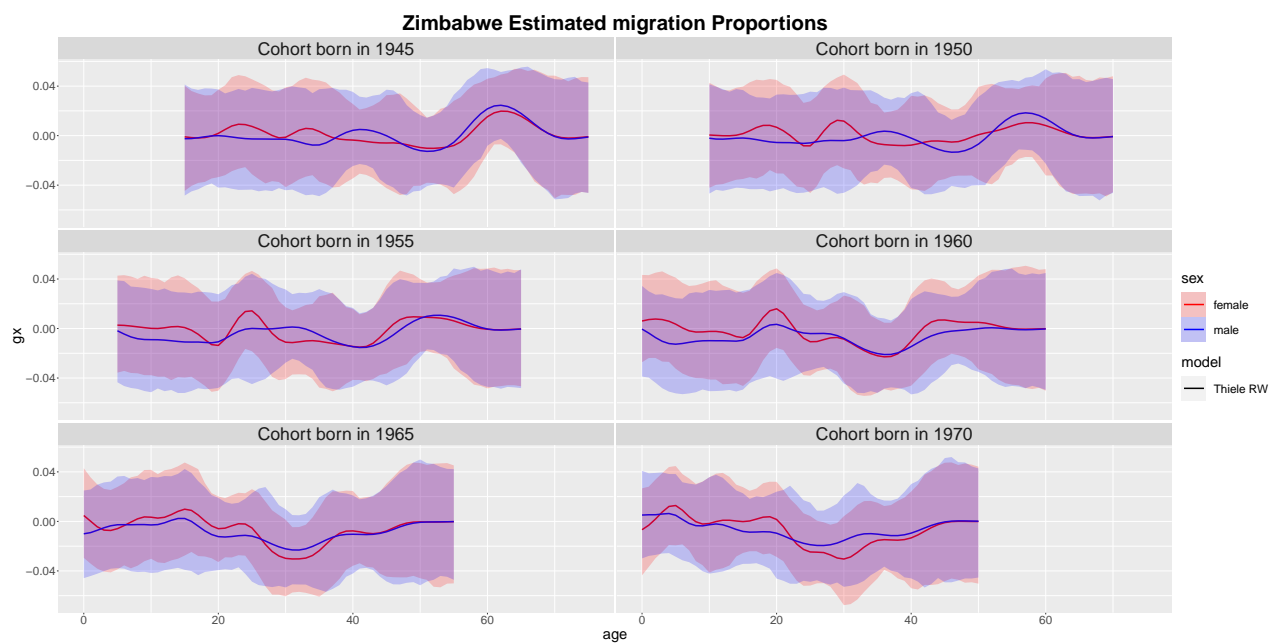Figure 15: Migration

Figure 16: Migration
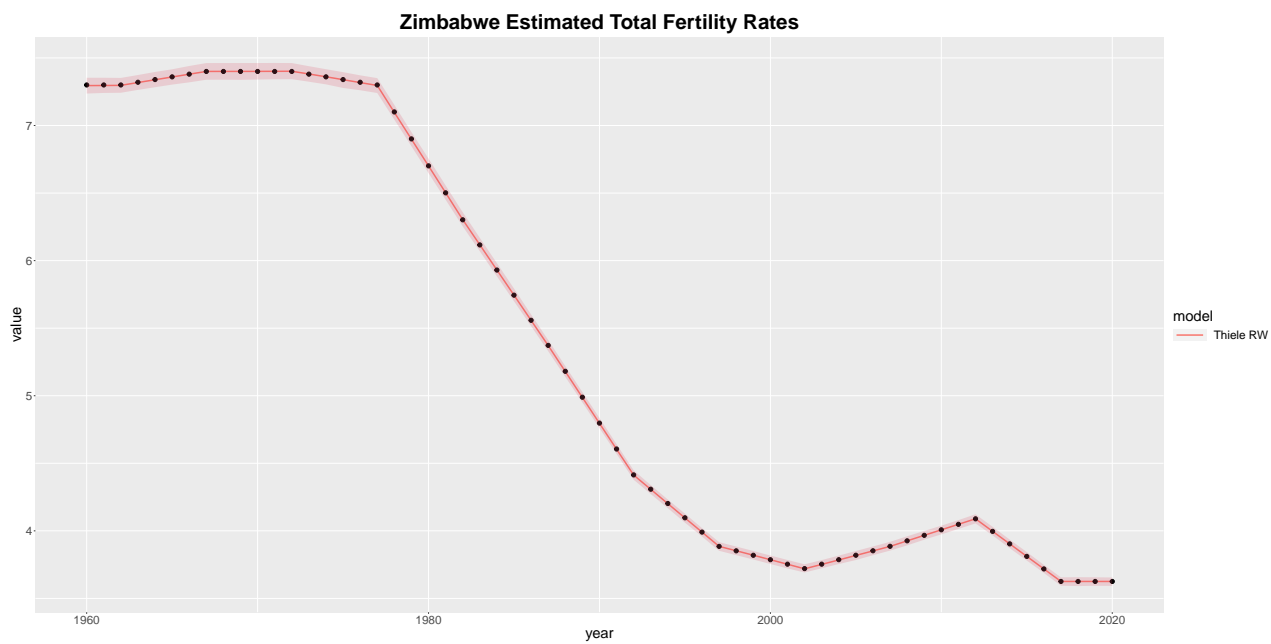

Figure 17: Migration

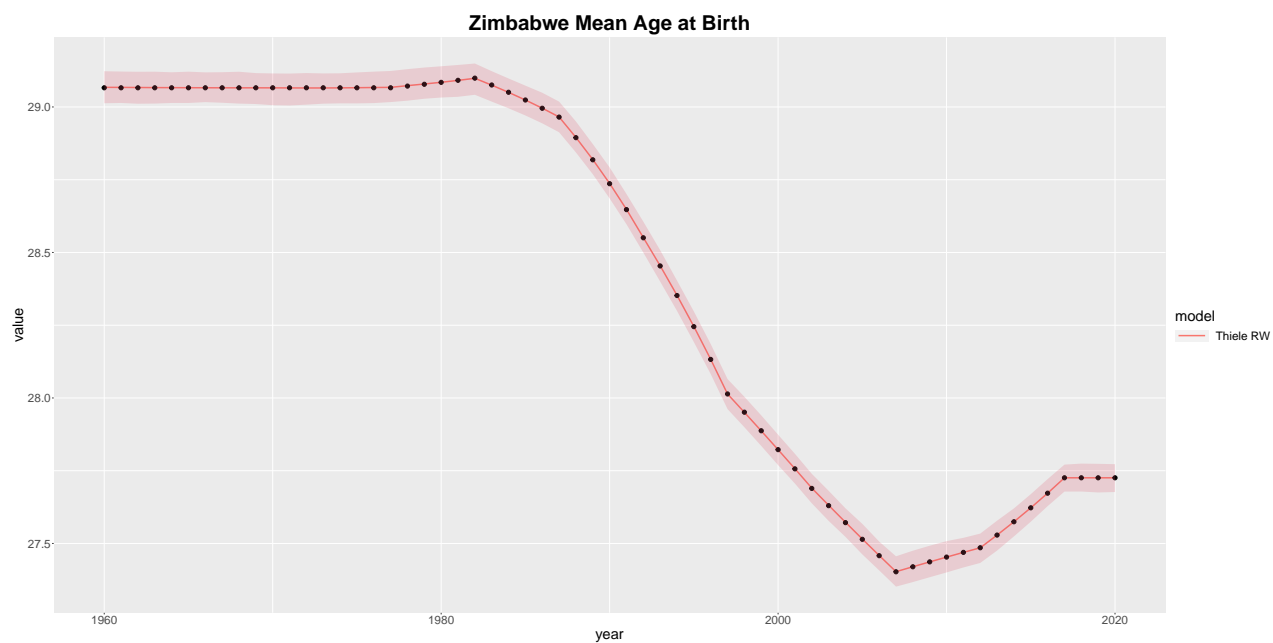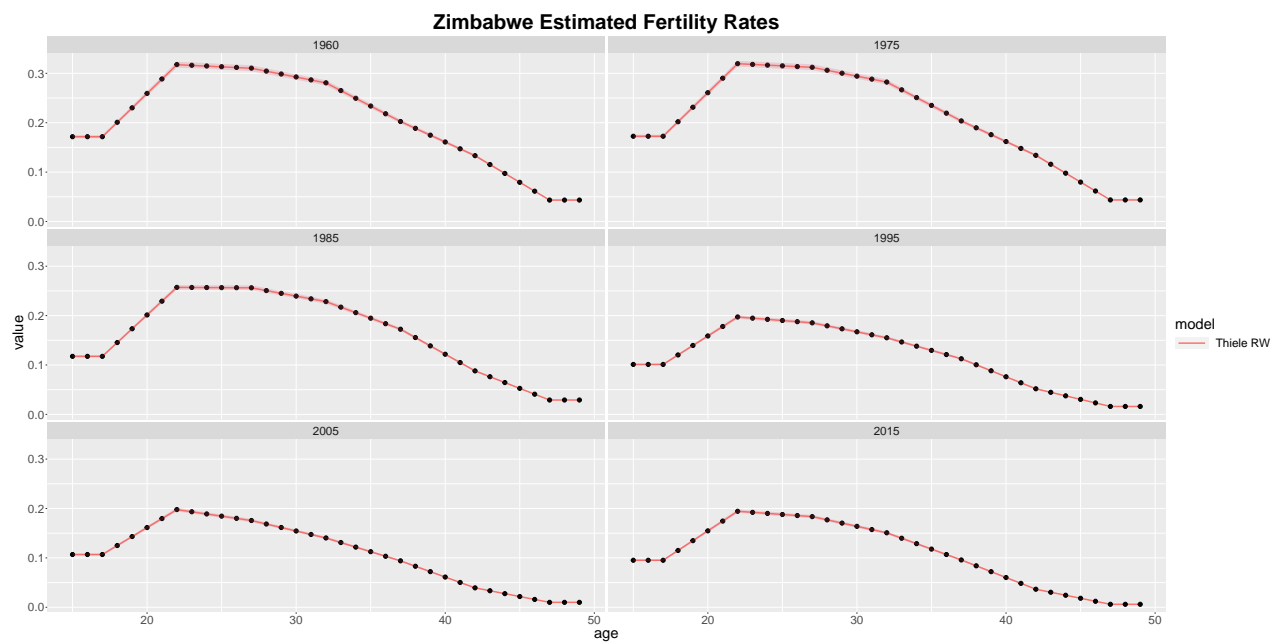Figure 18: Migration

Figure 19: Total Fertility

Figure 20: Mean age at births
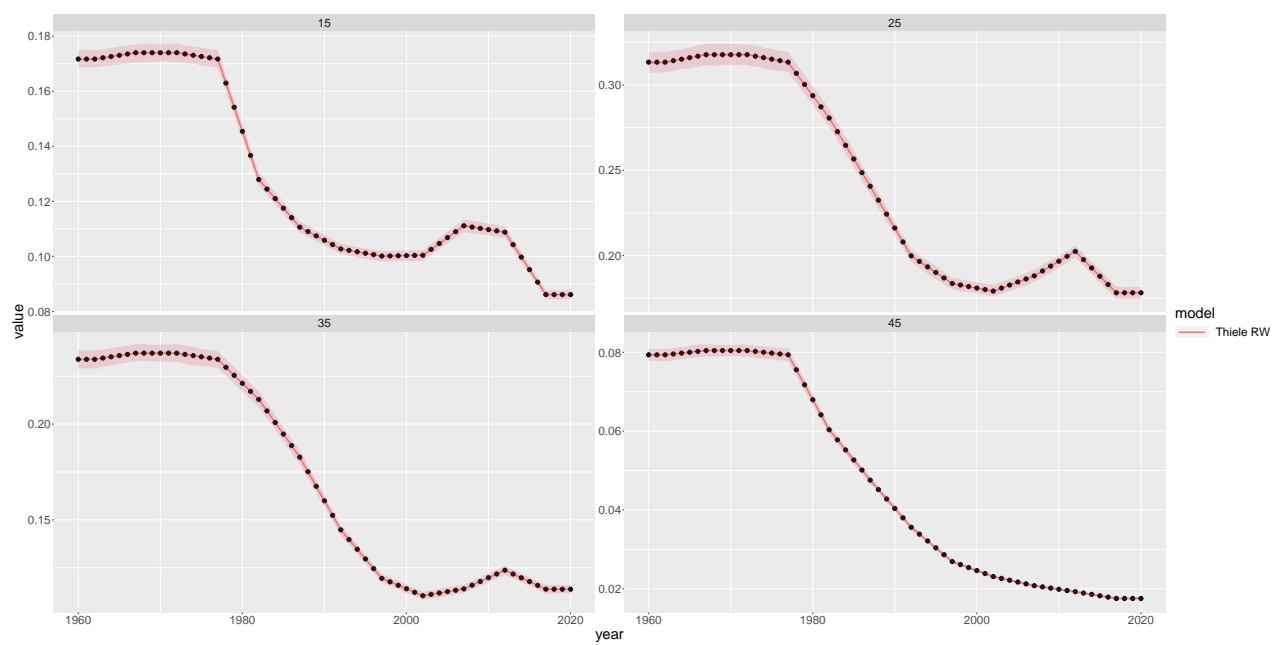

Figure 21: Fertility

Figure 22: Fertility