

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. 130631. 160059. 164925. 190736.
## 5     4  240. 129885. 161282. 162274. 183611.
## 6     5  251. 128021. 163172. 159507. 177197.
## 7     6  258. 125143. 162237. 156778. 173472.
## 8     7  261. 121845. 161873. 155377. 171651.
## 9     8  262. 118680. 161182. 153895. 169450.
## 10    9  259. 115303. 158541. 153789. 171475.
## # ... with 76 more rows
```

```
## [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. 127117. 158863. 164960. 189835.
## 5     4  242. 126939. 159839. 162197. 182613.
## 6     5  248. 125405. 161234. 159217. 176094.
## 7     6  255. 123103. 160066. 156209. 172218.
## 8     7  265. 120555. 159669. 154419. 170262.
## 9     8  271. 118210. 159182. 152264. 167883.
## 10    9  271. 115542. 156666. 152041. 170380.
## # ... with 76 more rows
```

Thiele log-Normal Hump Spline

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

##           log_tau2_logpop_f           log_tau2_logpop_f
##           6.3431539             4.6687457
##           log_tau2_logpop_m           log_tau2_logpop_m
##           6.3881800             4.3328901
##           log_tau2_fx                 log_tau2_gx_f
##           5.2044842             3.6846151
##           log_tau2_gx_m               log_lambda_gx_age_f
##           2.5814446             4.5923864
##           log_lambda_gx_age_m         log_lambda_gx_time_f
##           6.1519233             7.4111489
##           log_lambda_gx_time_m       log_lambda_gx_agemtime_f
##           8.2333549             6.3866906
##           log_lambda_gx_agemtime_m   log_lambda_tp
##           6.9077747             2.8507019
```

```

## log_lambda_tp_0_inflated_sd          log_dispersion_f
##                                0.3830602          1.1874898
##                                log_dispersion_m    log_marginal_prec_phi_f
##                                1.2440733          6.8095872
##                                log_marginal_prec_psi_f    log_marginal_prec_A_f
##                                6.8045405          6.7754421
##                                log_marginal_prec_B_f    log_marginal_prec_phi_m
##                                6.2087015          6.8095818
##                                log_marginal_prec_psi_m    log_marginal_prec_A_m
##                                6.8072055          6.7858693
##                                log_marginal_prec_B_m    log_lambda_phi_f
##                                2.5903856          4.3078736
##                                log_lambda_psi_f    log_lambda_lambda_f
##                                4.3073118          2.5549993
##                                log_lambda_delta_f    log_lambda_epsilon_f
##                                4.3846218          4.8545432
##                                log_lambda_A_f    log_lambda_B_f
##                                4.3048368          4.2077822
##                                log_lambda_phi_m    log_lambda_psi_m
##                                4.3083226          4.3077932
##                                log_lambda_lambda_m    log_lambda_delta_m
##                                2.6762897          4.0751430
##                                log_lambda_epsilon_m    log_lambda_A_m
##                                4.6707424          4.2999599
##                                log_lambda_B_m    log_lambda_lambda_1_f
##                                3.8160539          1.0619603
##                                log_lambda_delta_1_f    log_lambda_epsilon_1_f
##                                4.3927867          4.1138744
##                                log_lambda_lambda_1_m    log_lambda_delta_1_m
##                                0.8829858          1.3449635
##                                log_lambda_epsilon_1_m
##                                5.0028992

```

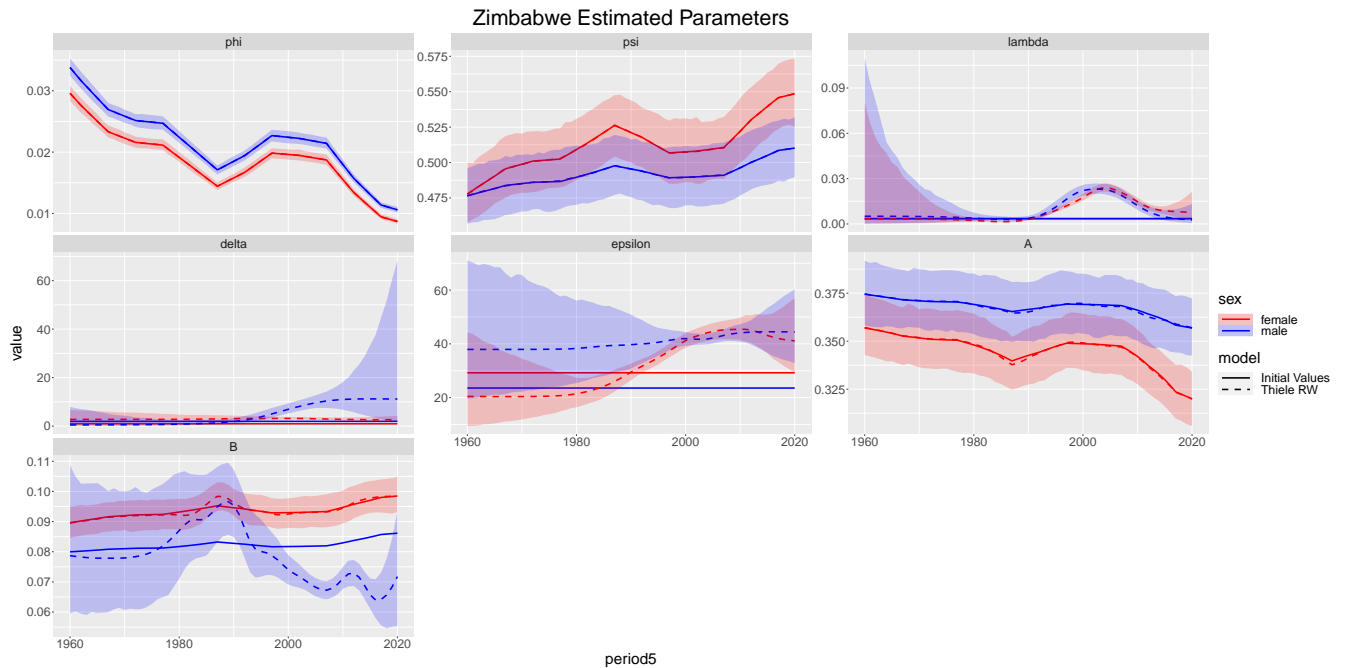


Figure 1: Estimated parameters

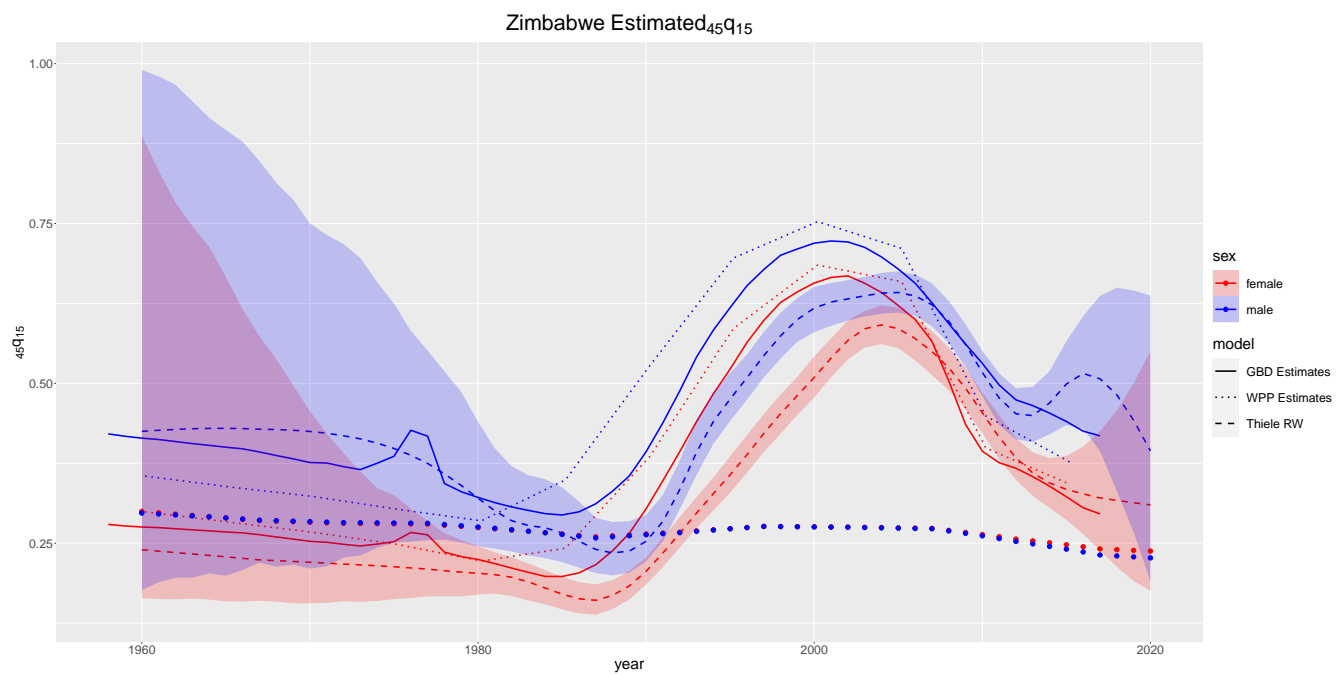


Figure 2: Estimated ${}_{45}q_{15}$

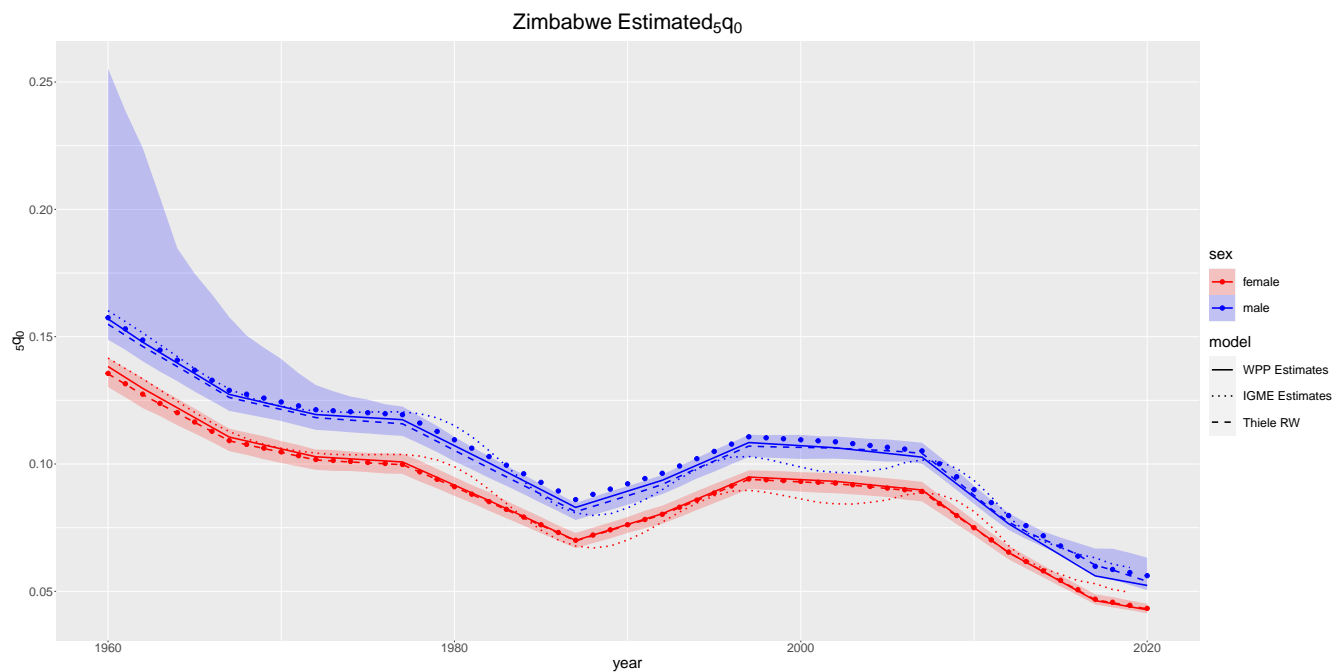


Figure 3: Estimated $5q_0$

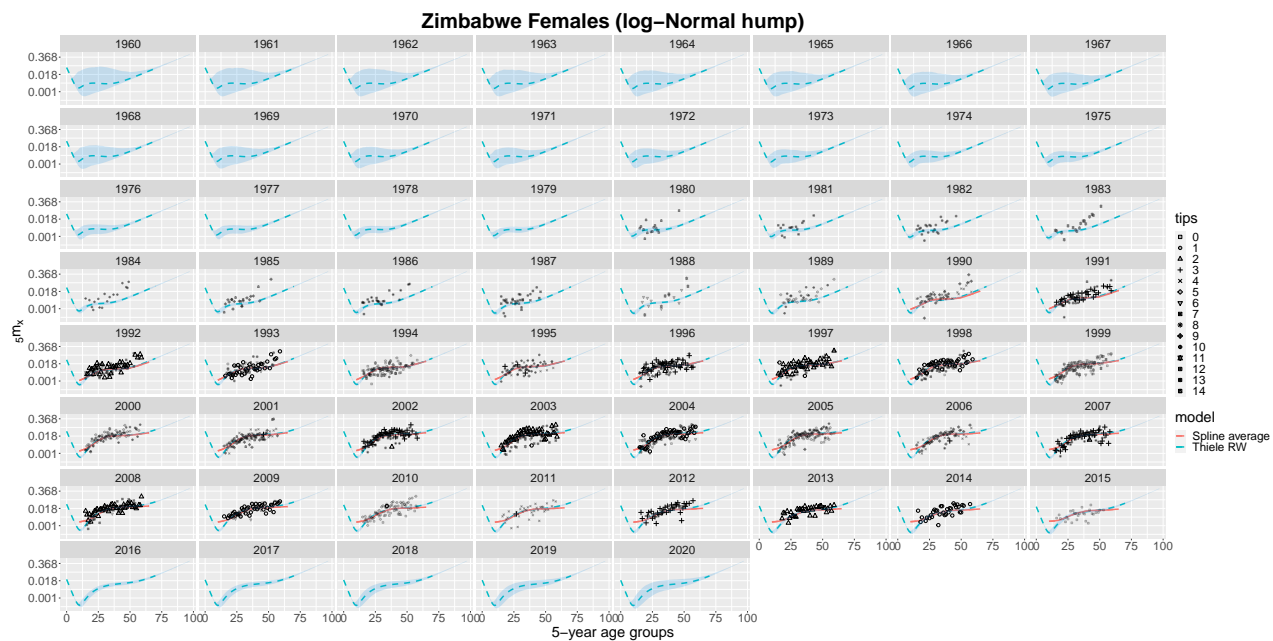


Figure 4: Mortality Schedules

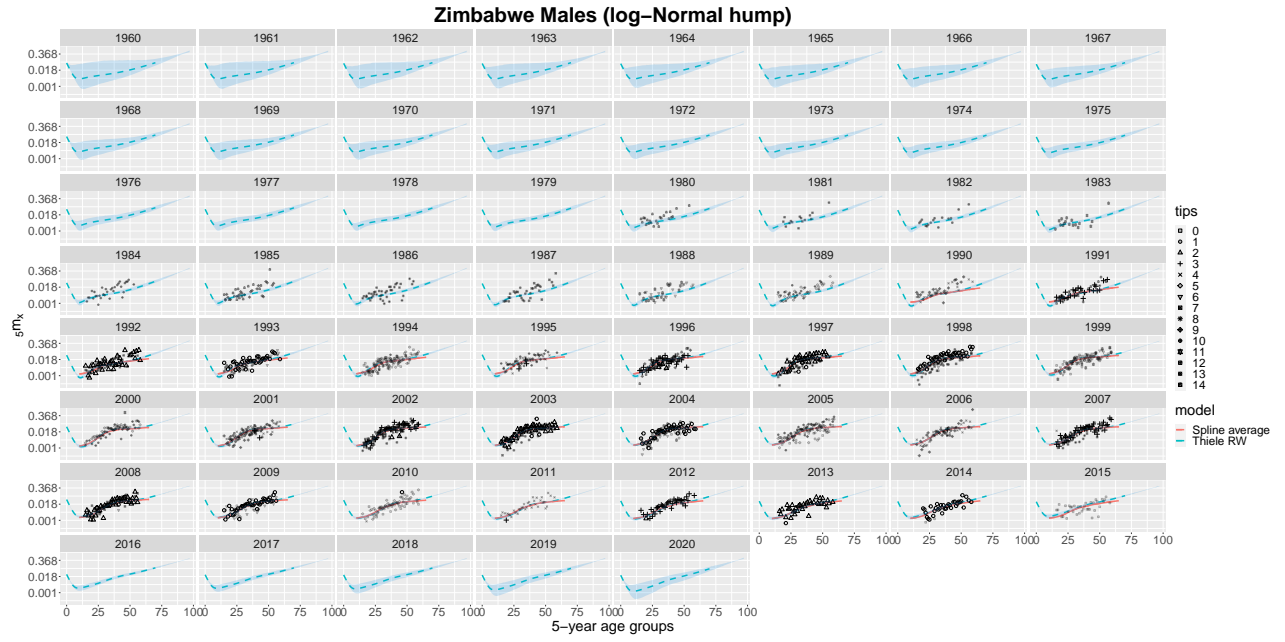


Figure 5: Mortality Schedules

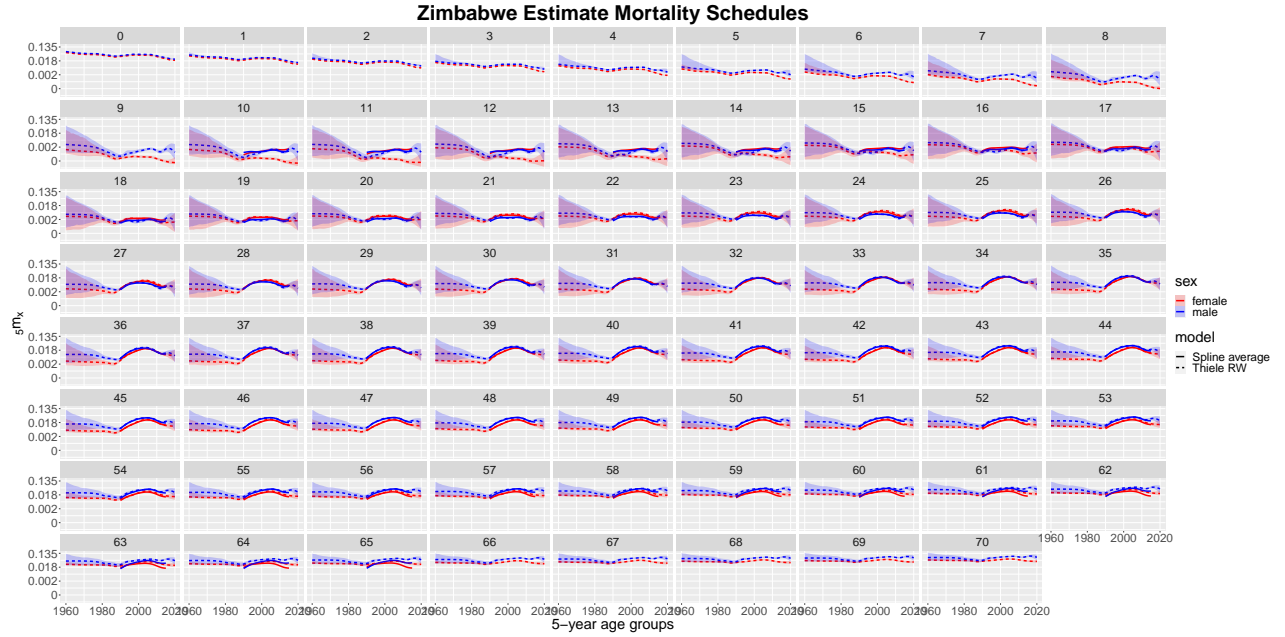


Figure 6: Mortality Schedules

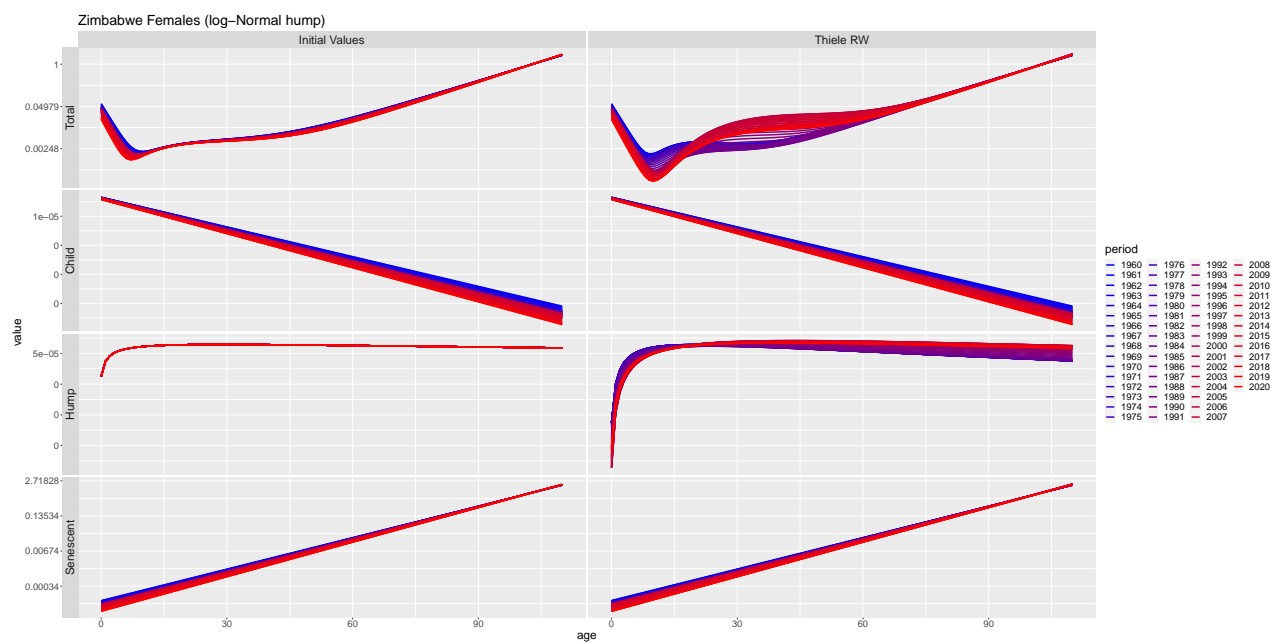


Figure 7: Thiele Decomposed

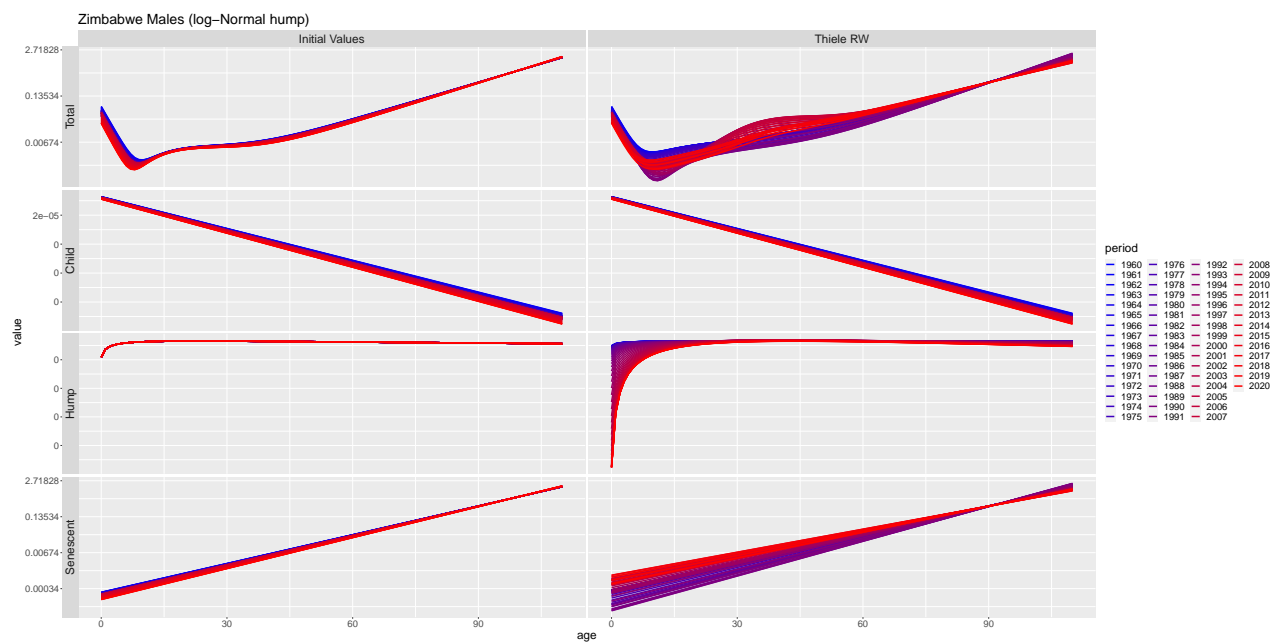


Figure 8: Thiele Decomposed

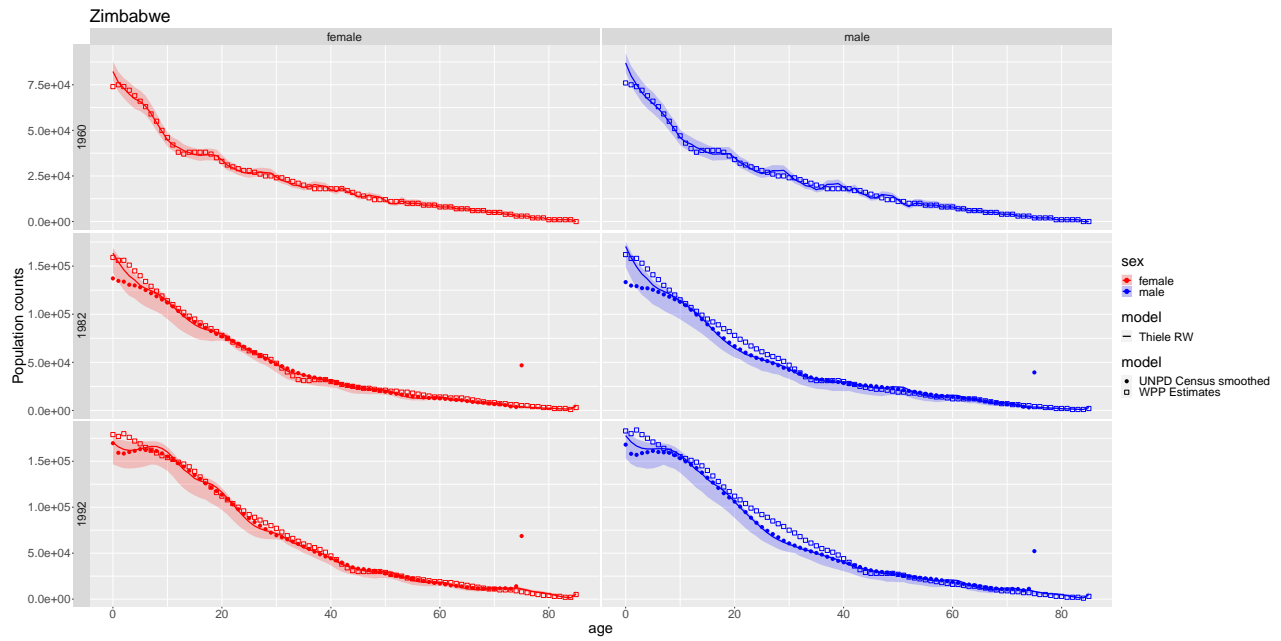


Figure 9: Population

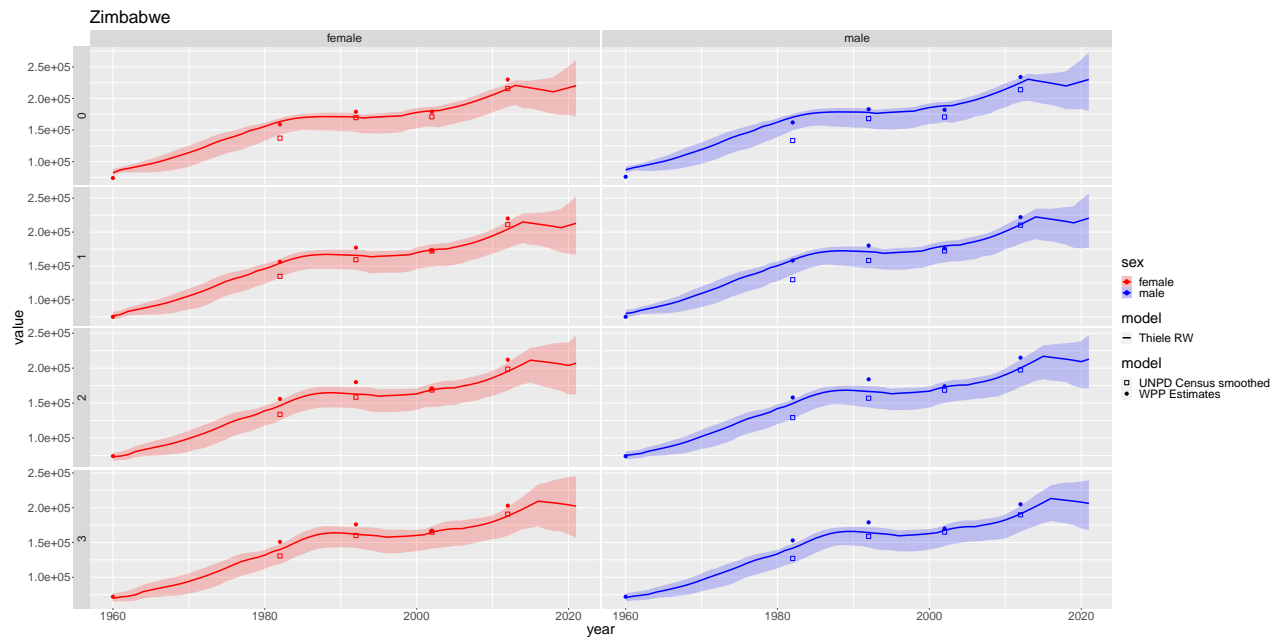


Figure 10: Population

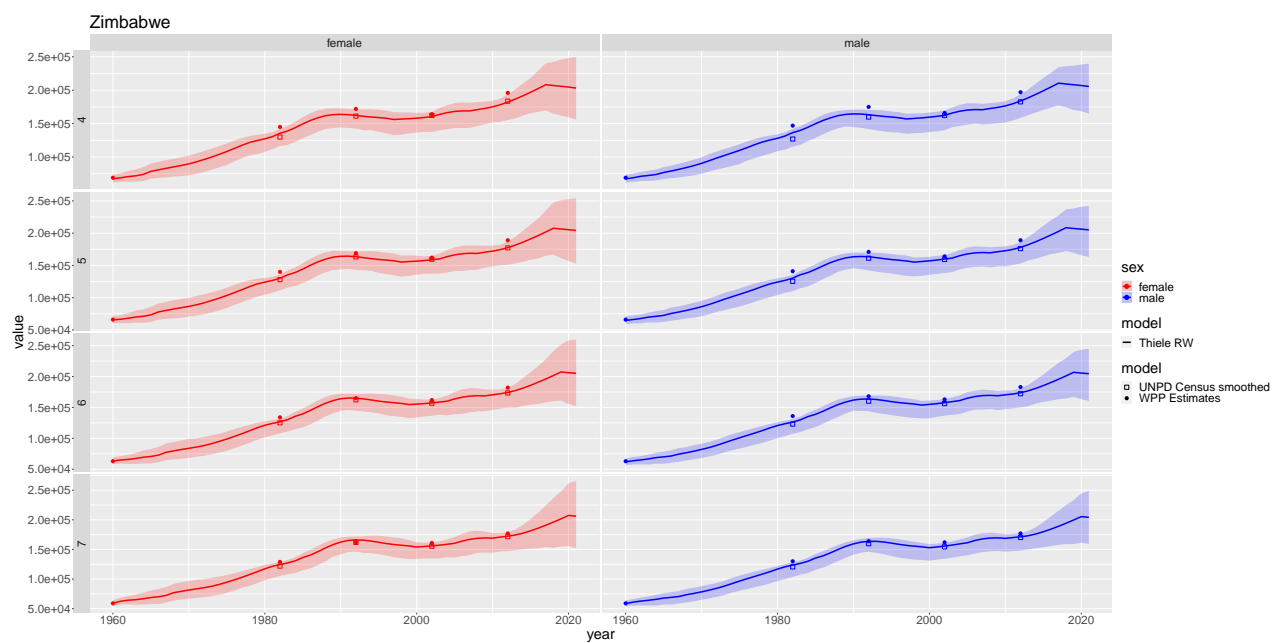


Figure 11: Population

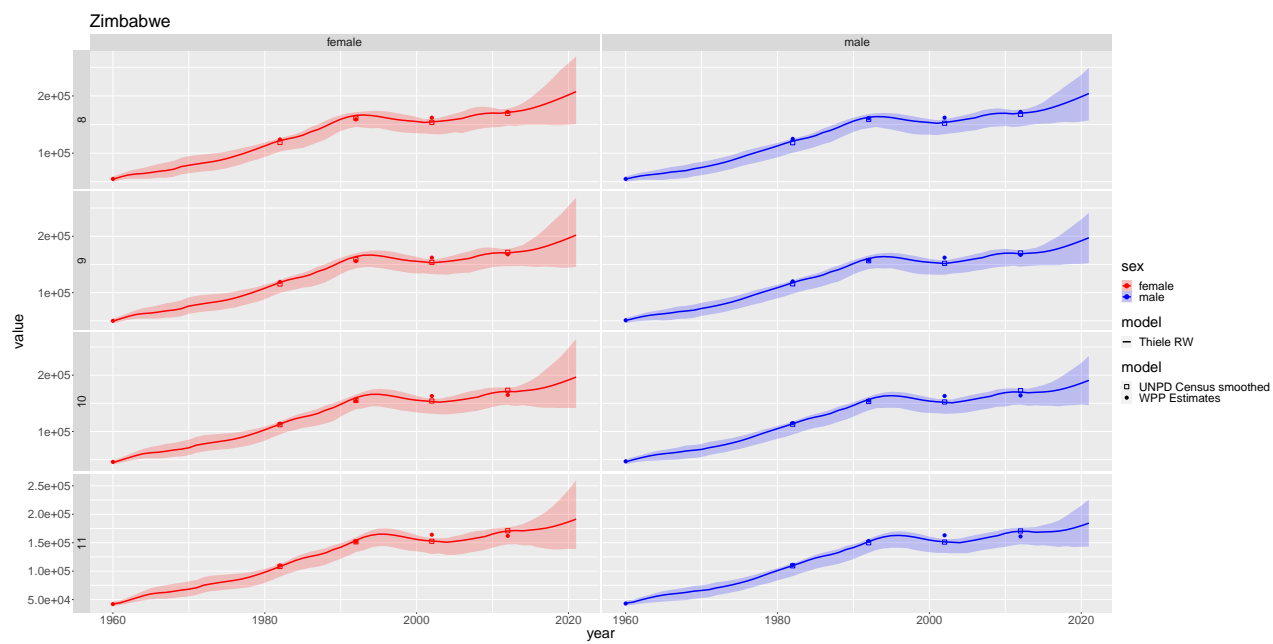


Figure 12: Population

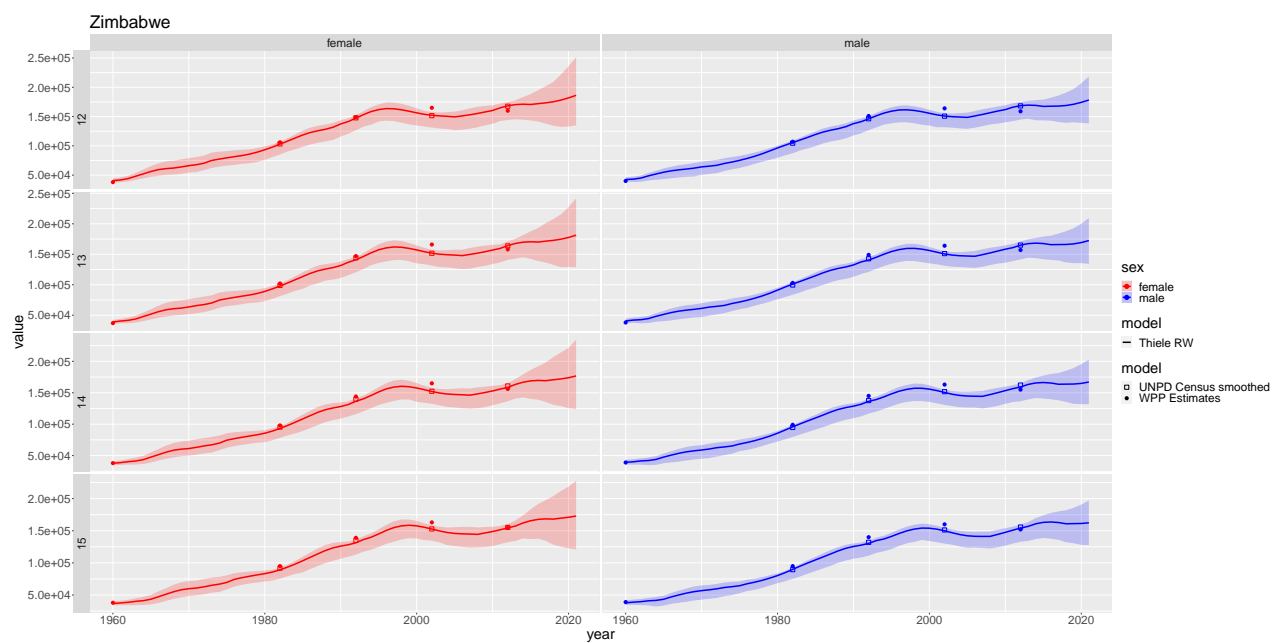


Figure 13: Population

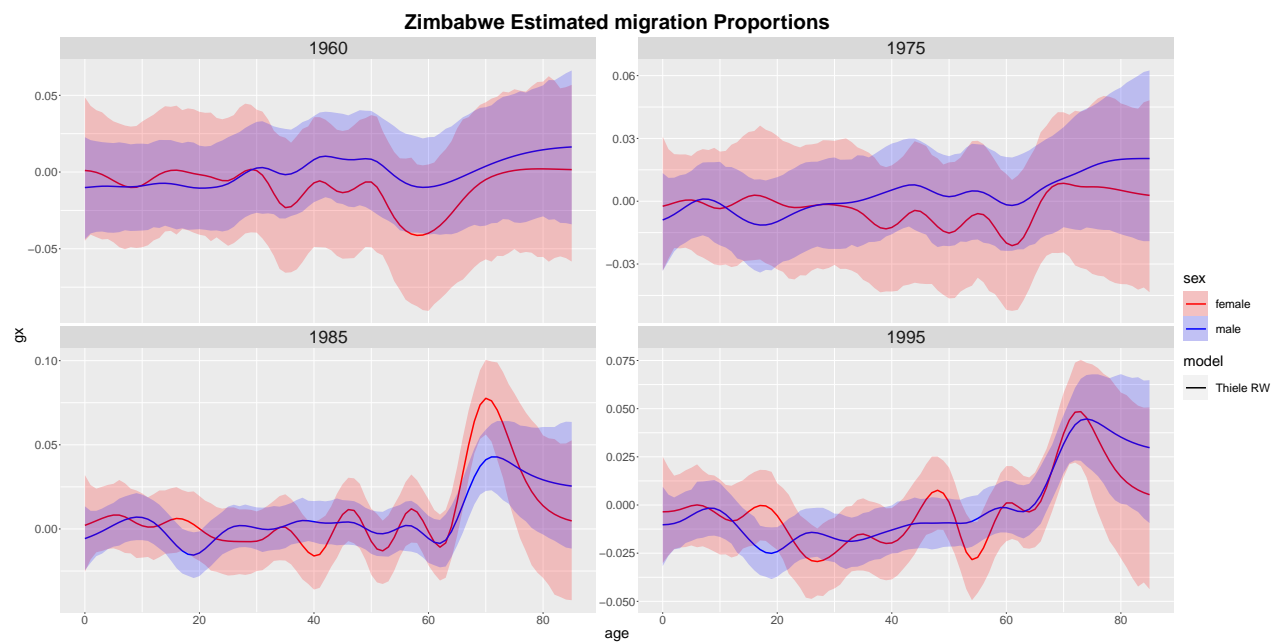


Figure 14: Migration

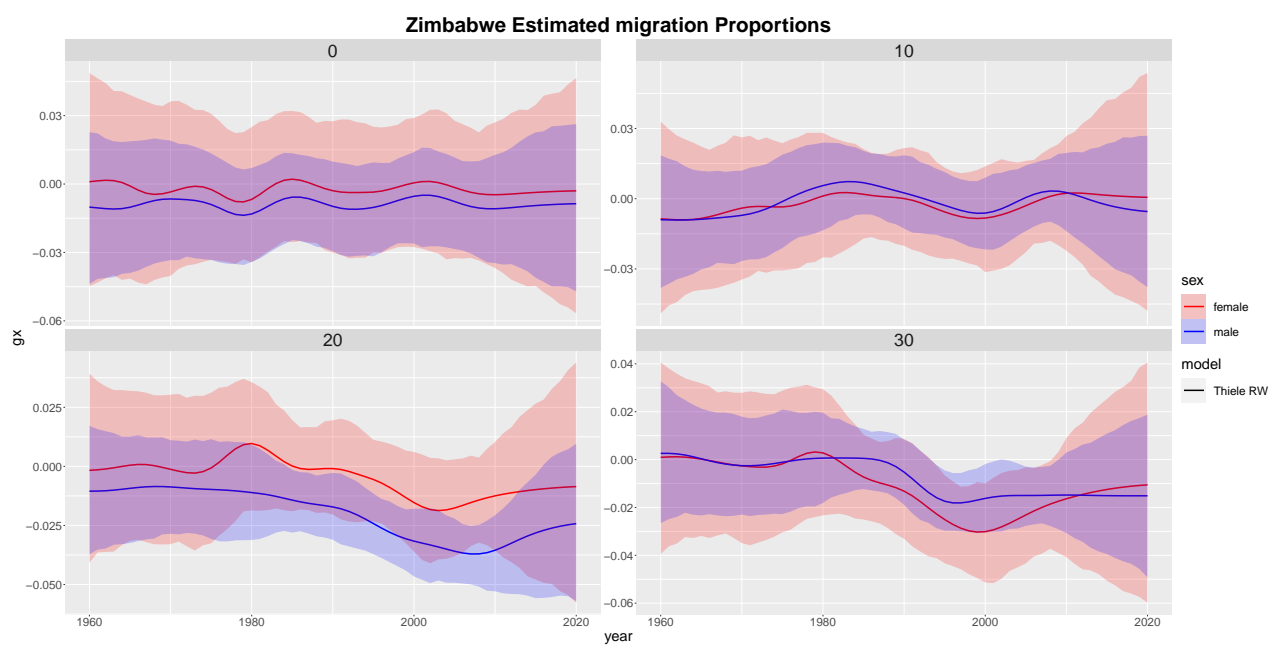


Figure 15: Migration

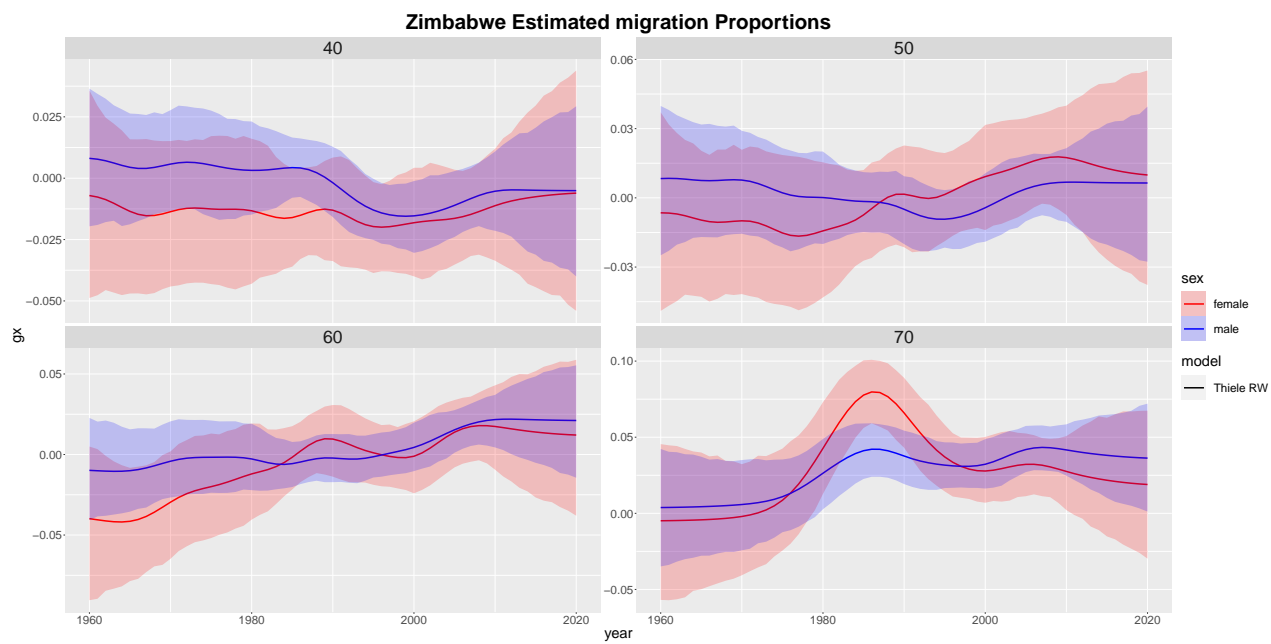


Figure 16: Migration

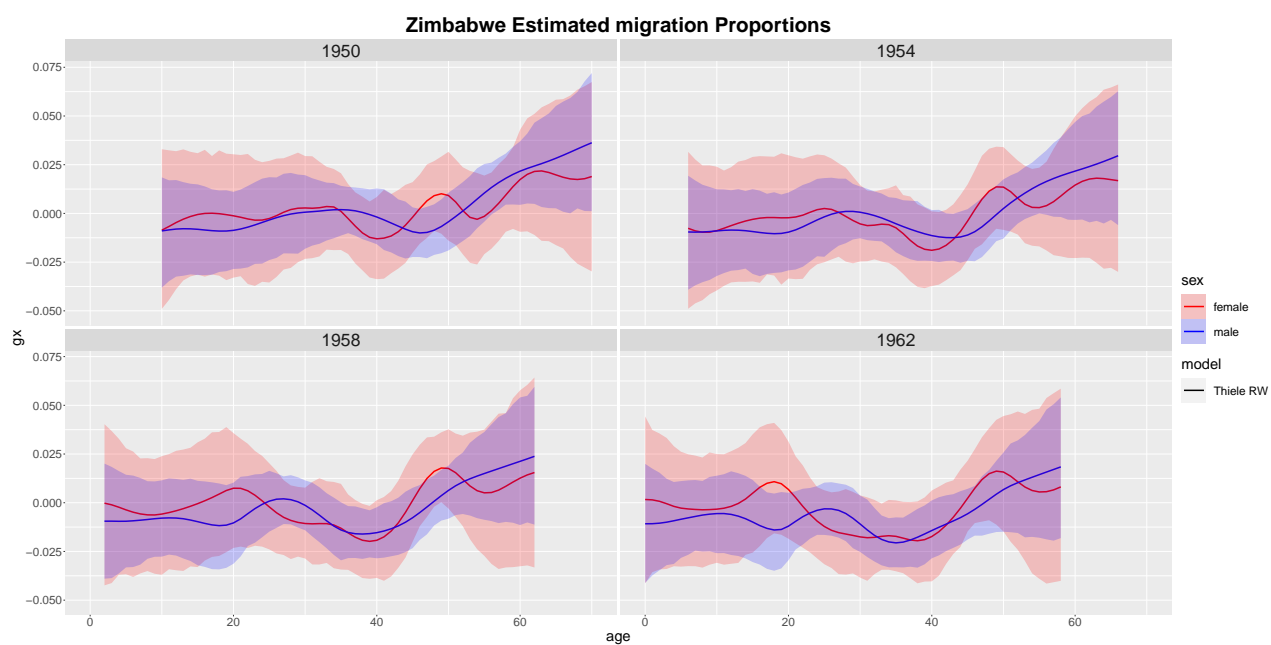


Figure 17: Migration

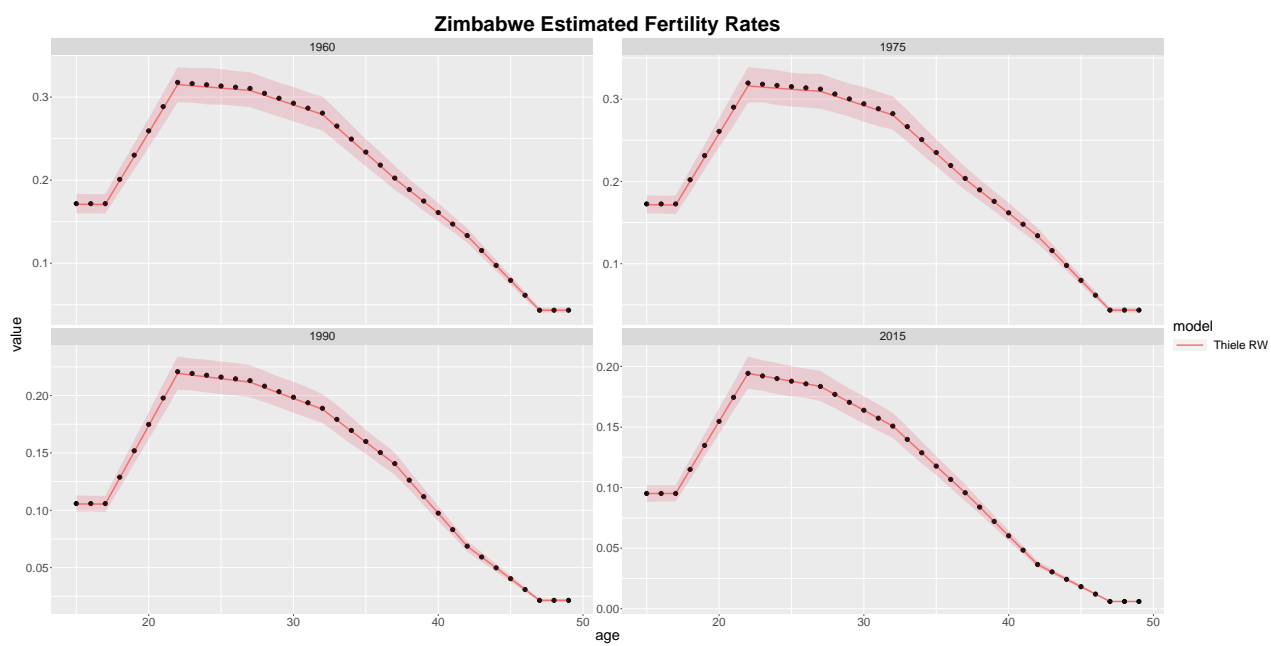


Figure 18: Fertility

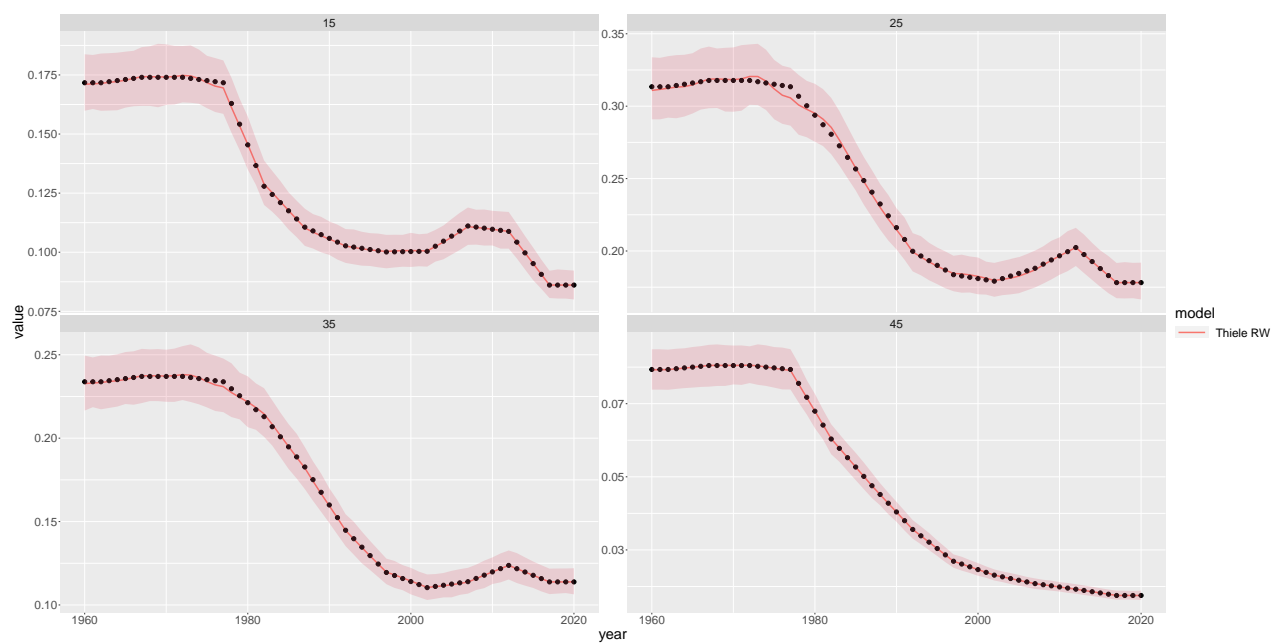


Figure 19: Fertility

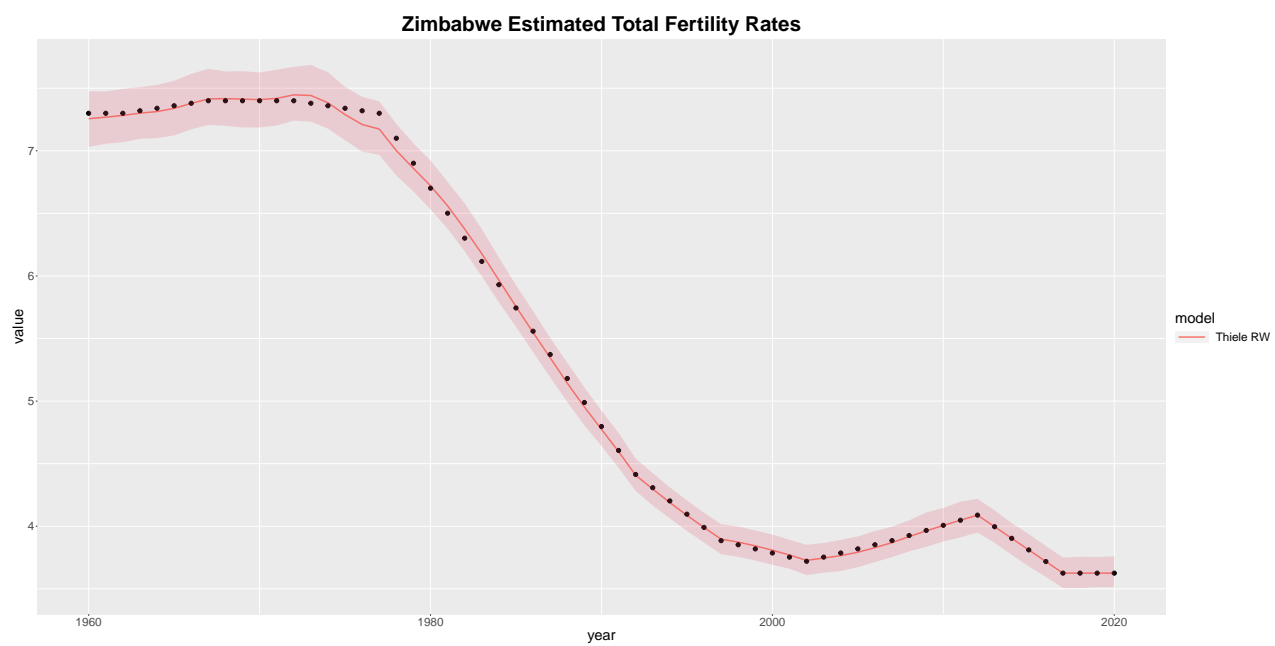


Figure 20: Total Fertility