Zambia

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

## # A tibble: 86 x 6
##      age  `1969`   `1980`   `1990`   `2000`   `2010`
##    <dbl>  <dbl>    <dbl>    <dbl>    <dbl>    <dbl>
## 1      0 84889. 102576.  127337.  170387   220491
## 2      1 80819. 100263.  118568.  158438.  224143
## 3      2 77882. 103185.  119426.  164148.  226622.
## 4      3 75232. 104440.  119078.  165804.  221995.
## 5      4 73199. 104852.  118691.  165026.  215854.
## 6      5 71159. 104750.  117301.  160537.  210007.
## 7      6 68103. 103010.  115491.  153605.  207187.
## 8      7 64885. 100287.  113991.  147259   201344.
## 9      8 61647.  96378.  113300.  143607.  195715.
## 10     9 57518.  91975.  111701.  140017.  189090.
## # ... with 76 more rows

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

## # A tibble: 18 x 1
##      age
##    <dbl>
## 1      0
## 2      5
## 3     10
## 4     15
## 5     20
## 6     25
## 7     30
## 8     35
## 9     40
## 10    45
## 11    50
## 12    55
## 13    60
## 14    65
## 15    70
## 16    75
## 17    80
## 18    85

## [1] "Census Males"

## # A tibble: 86 x 6
##      age  `1969`   `1980`   `1990`   `2000`   `2010`
##    <dbl>  <dbl>    <dbl>    <dbl>    <dbl>    <dbl>
## 1      0 85555. 100973.  125548.  168841   220221
## 2      1 78711.  99404.  117337.  158084.  222980.
## 3      2 75013. 102451.  117859.  163155.  224408.
## 4      3 71853. 104159.  117375.  165029   220488.
## 5      4 70006. 104682.  116907.  164310.  214419
## 6      5 68559. 104553.  115530.  160073.  208240.
```

```
##  7     6 66359. 102749. 113548. 153289. 205290.
##  8     7 64120. 100126. 111633. 146481. 199336.
##  9     8 61976.  95881. 111123. 142884. 193666.
## 10     9 58705.  91264. 110131. 139348. 186816.
## # ... with 76 more rows
```

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

```
## # A tibble: 18 x 1
##      age
##    <dbl>
##  1     0
##  2     5
##  3    10
##  4    15
##  5    20
##  6    25
##  7    30
##  8    35
##  9    40
## 10    45
## 11    50
## 12    55
## 13    60
## 14    65
## 15    70
## 16    75
## 17    80
## 18    85
```

Thiele log-Normal Hump Spline

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

```
##           log_tau2_logpop_f            log_tau2_logpop_f            log_tau2_logpop_m                log_tau2_
##                   6.3197858                    3.9621194                    6.4527787                        3
##               log_tau2_gx_m            log_lambda_gx_age_f          log_lambda_gx_age_m                log_lambda_g
##                   2.4480903                    7.0806699                    7.1321084                        6
##         log_lambda_gx_agetime_m              log_lambda_tp log_lambda_tp_0_inflated_sd              log_disp
##                   6.9077127                    2.1259505                   -1.0290977                        0
##         log_marginal_prec_psi_f         log_marginal_prec_A_f        log_marginal_prec_B_f        log_marginal_pr
##                   6.8057862                    6.7736024                    6.8439065                        6
##           log_marginal_prec_B_m              log_lambda_phi_f             log_lambda_psi_f               log_lambda_
##                   2.1327291                    4.3094433                    4.3080873                        3
##                log_lambda_A_f               log_lambda_B_f             log_lambda_phi_m                   log_lamb
##                   4.3071835                    4.3270826                    4.3111535                        4
##           log_lambda_epsilon_m               log_lambda_A_m               log_lambda_B_m          logit_lambda_slo
##                   4.2881036                    4.2962298                    4.4889613                        2
##         logit_lambda_slope_rho_m      logit_delta_slope_rho_m     logit_epsilon_slope_rho_m
##                   2.0676425                    2.1119011                   -2.8612572
```
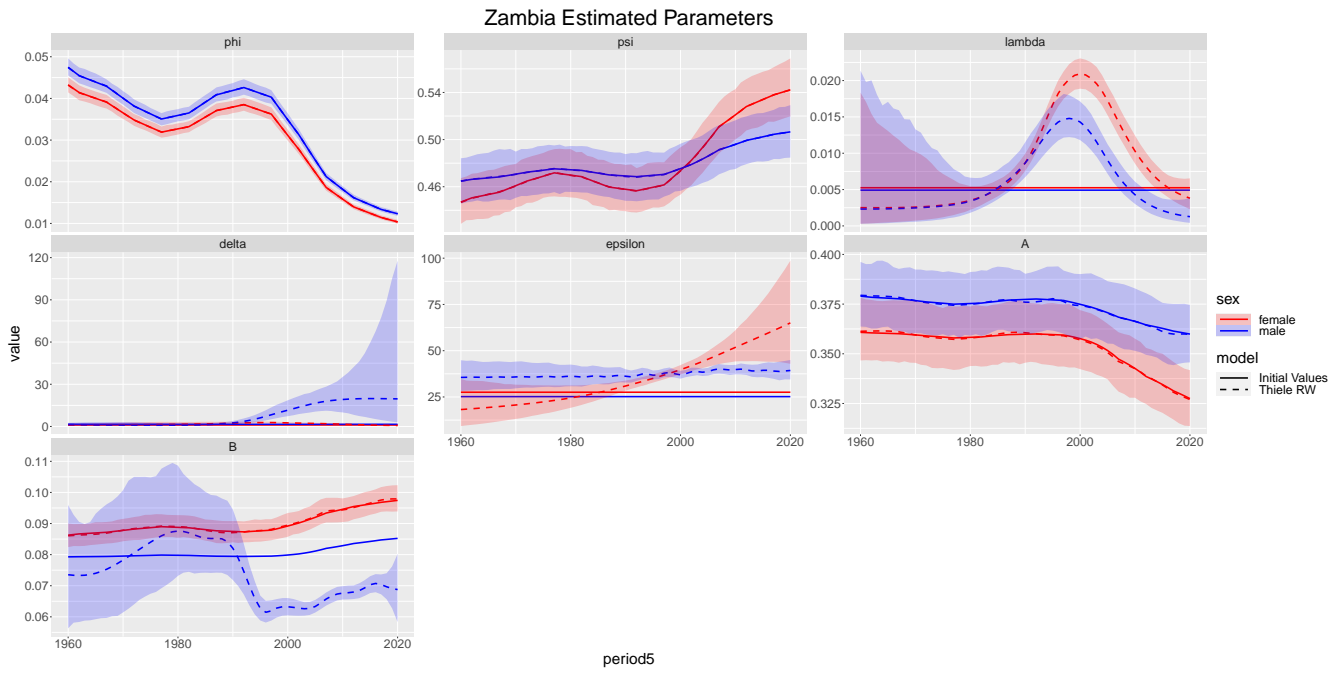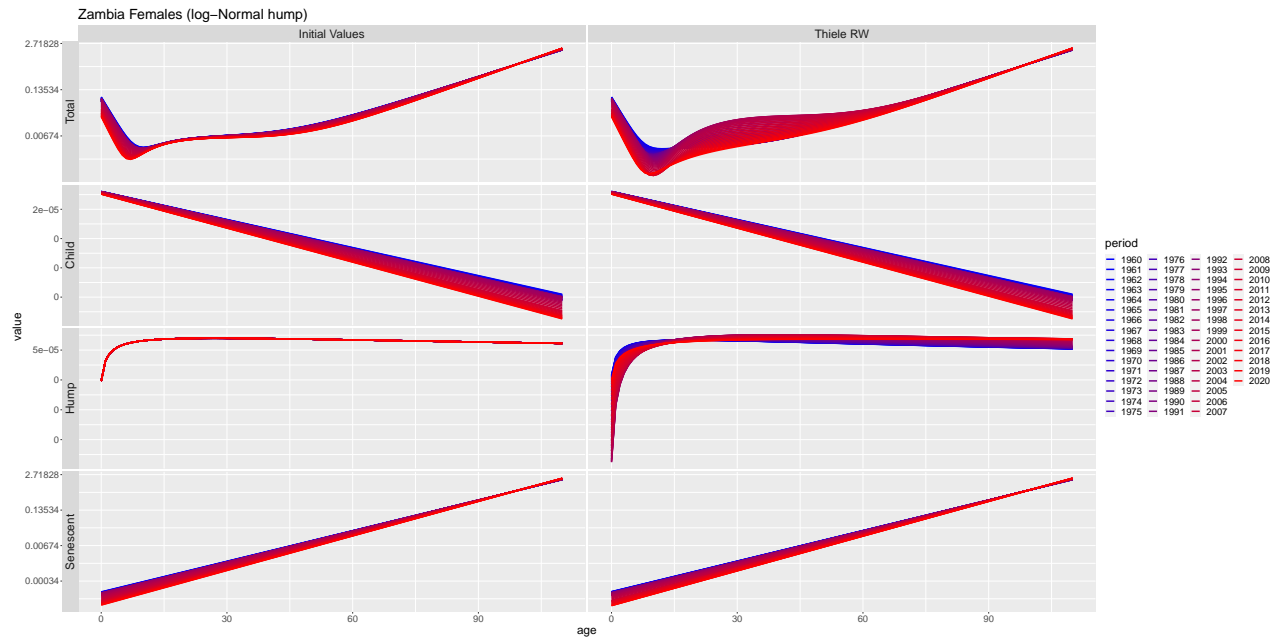
Figure 1: Estimated parameters
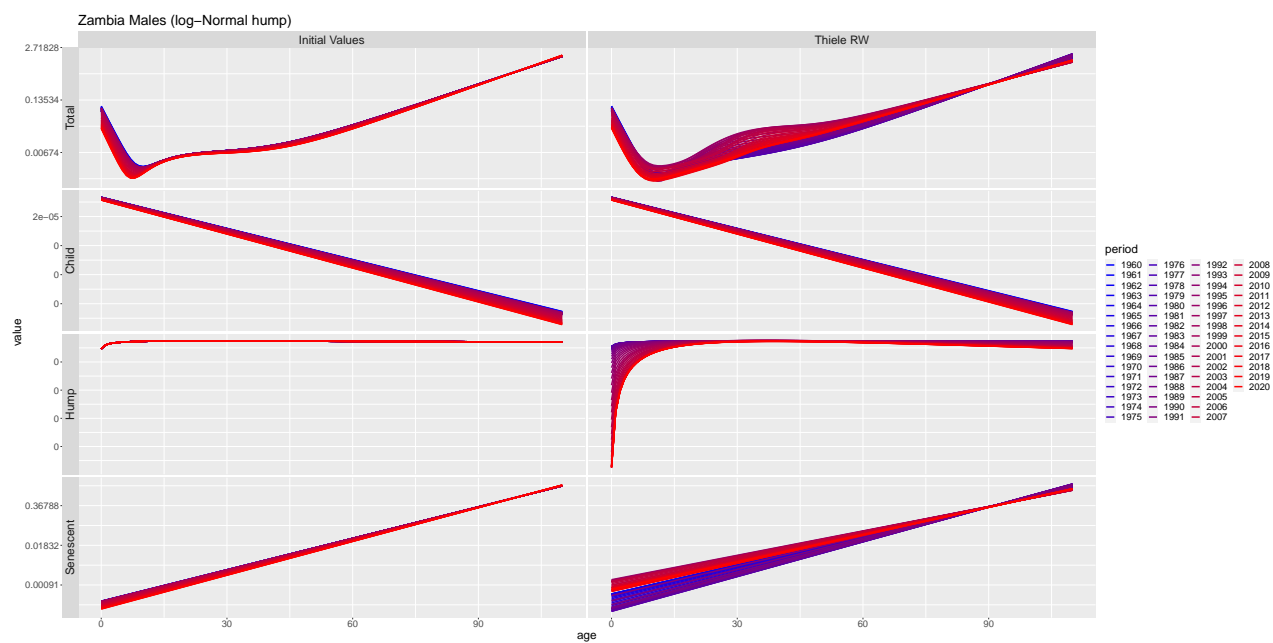

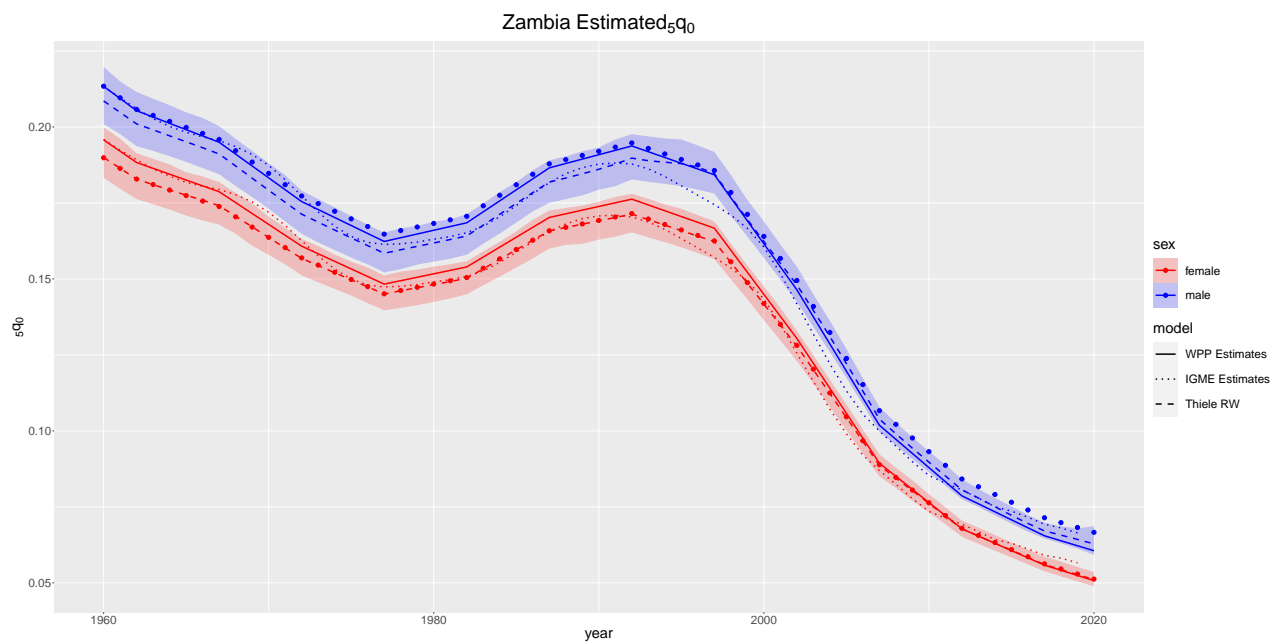Figure 2: Thiele Decomposed

3

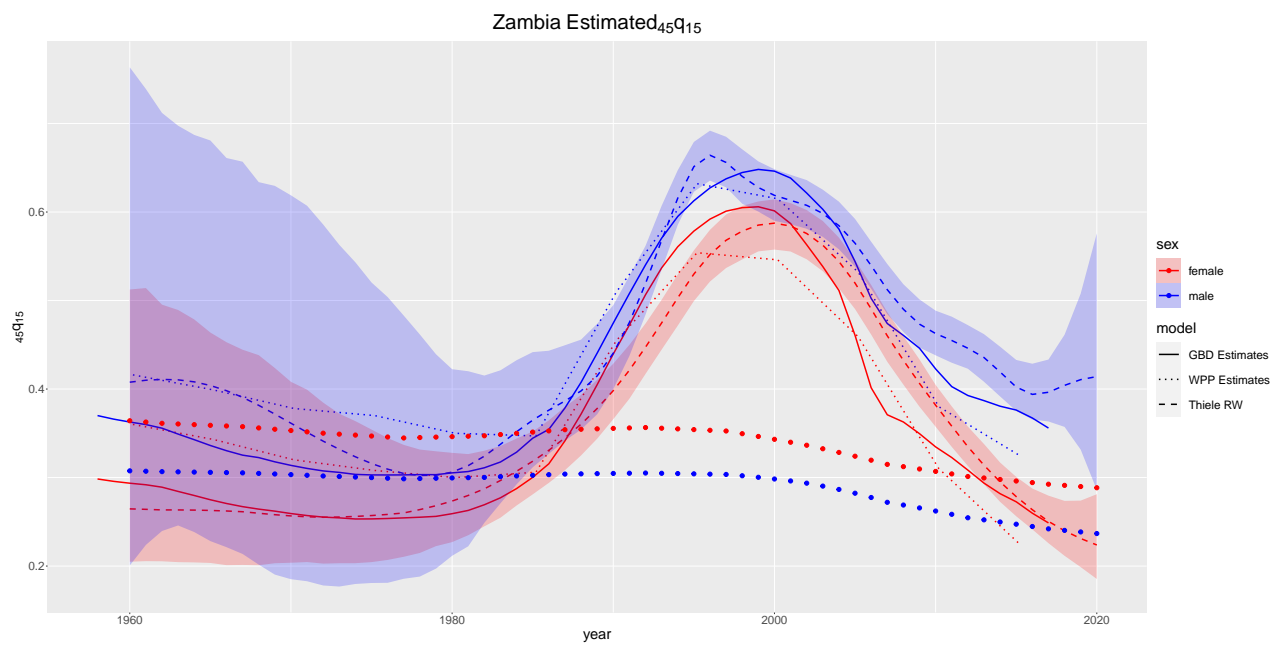Figure 3: Thiele Decomposed

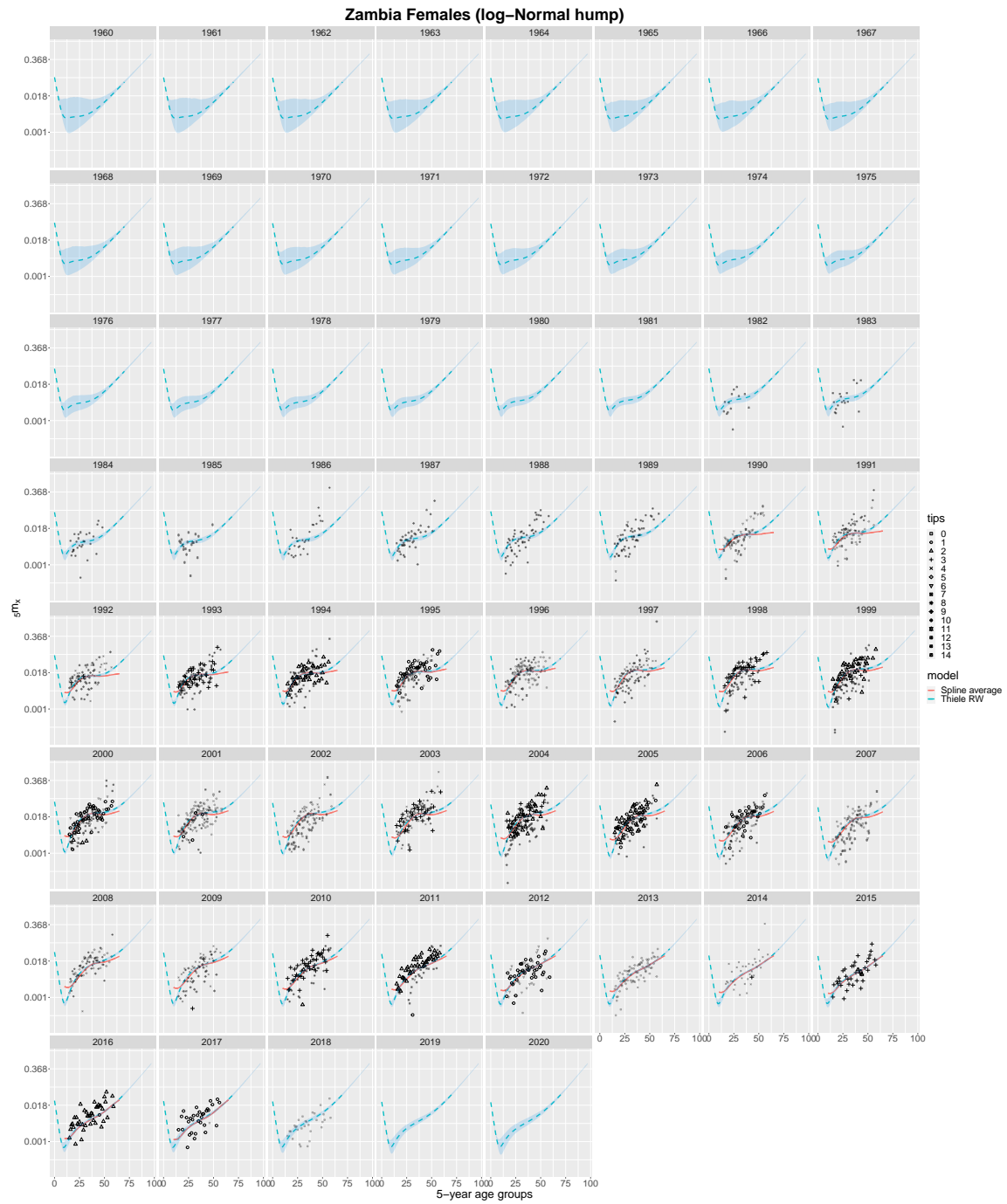Figure 4: Estimated $_5q_0$

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

Figure 6: Mortality Schedules

6
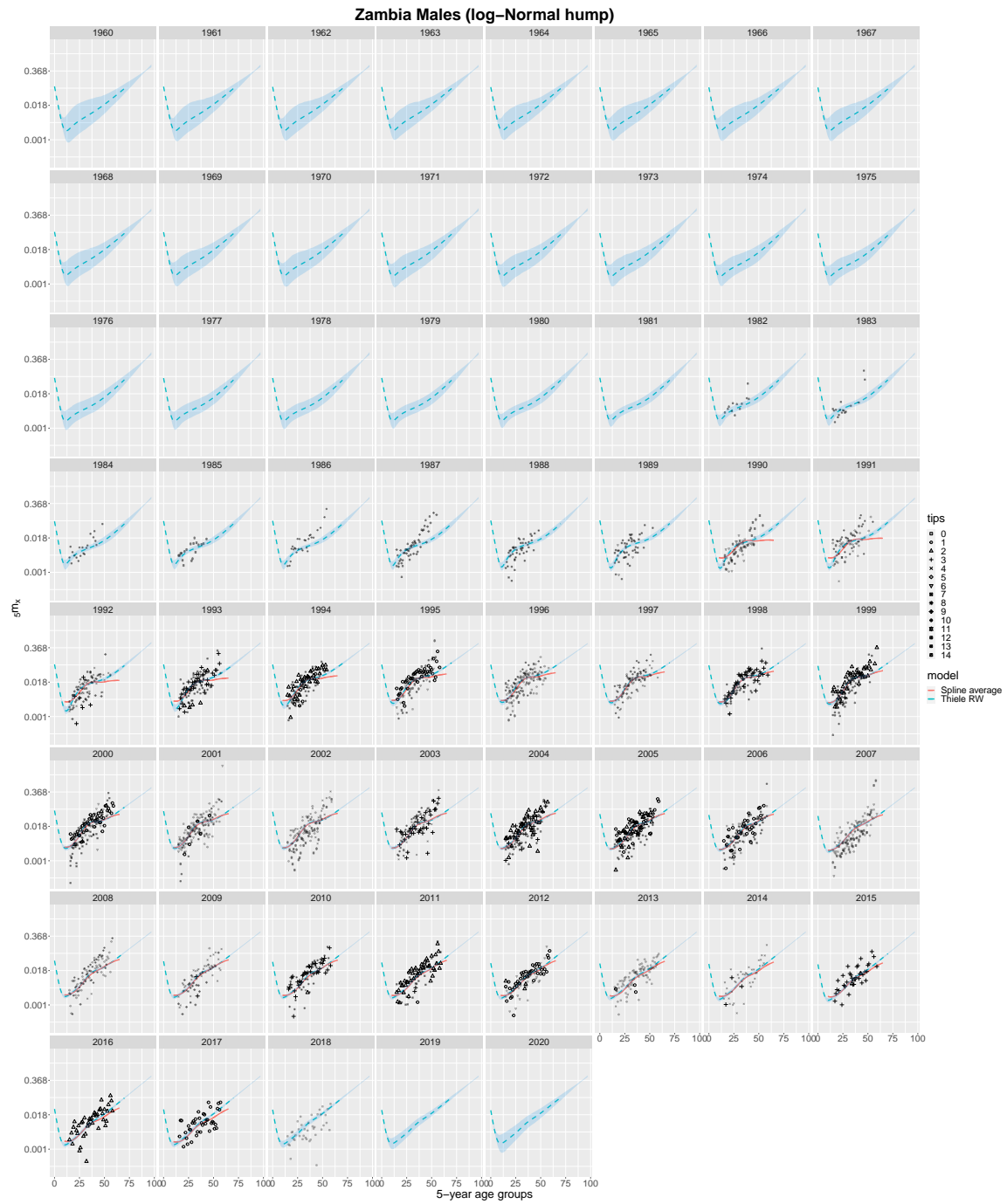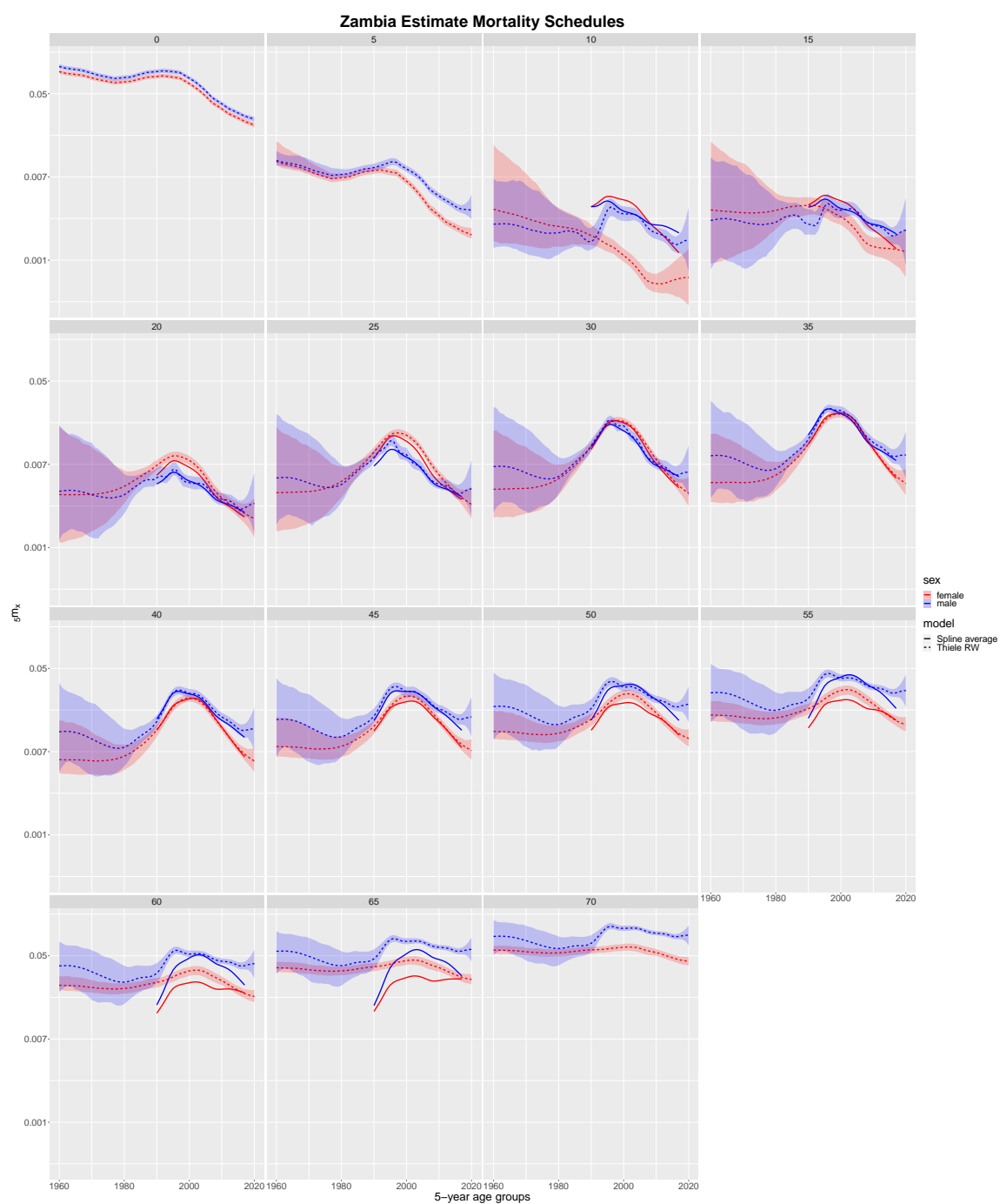
Figure 7: Mortality Schedules

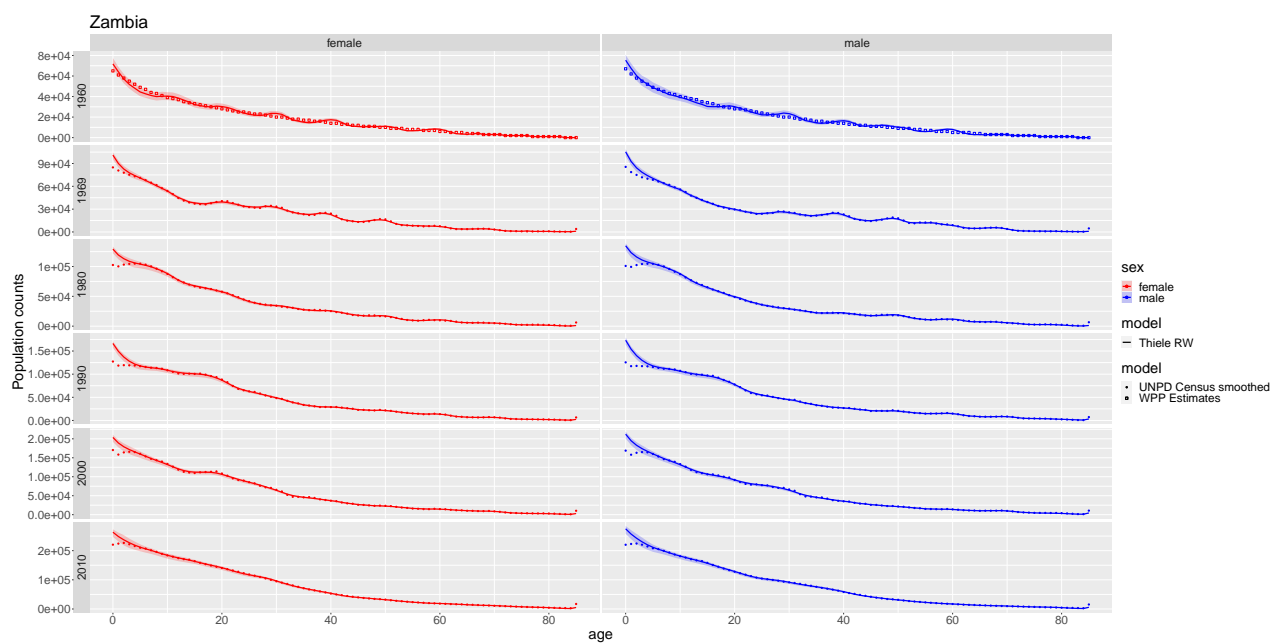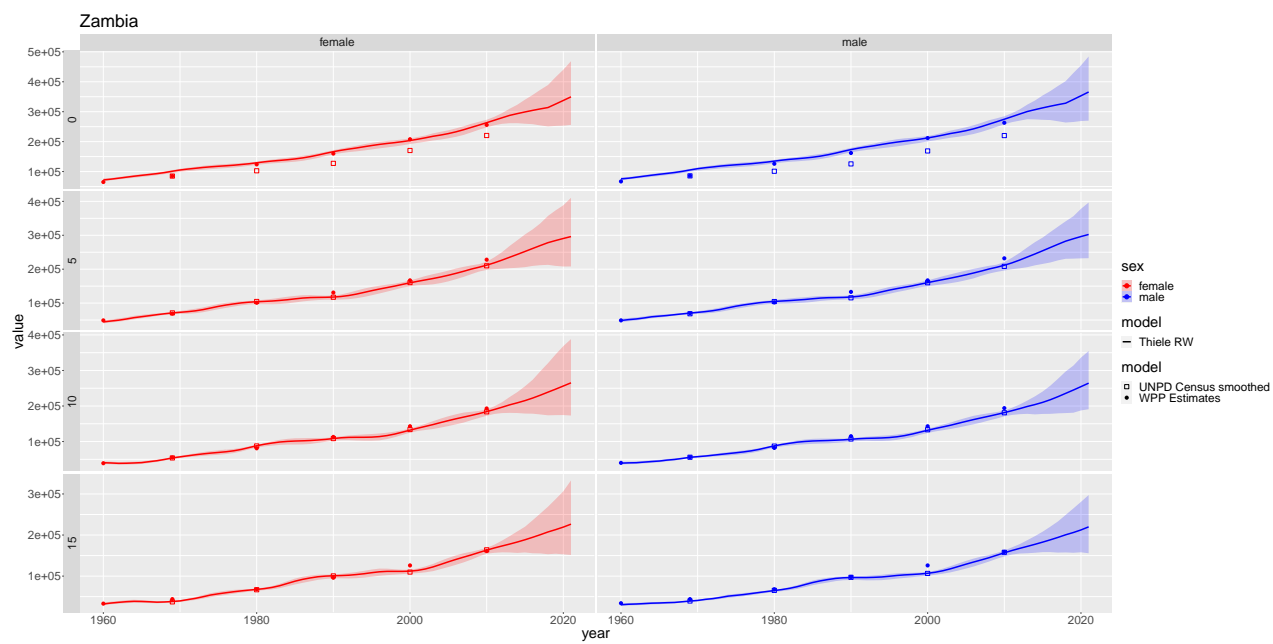Figure 8: Mortality Schedules

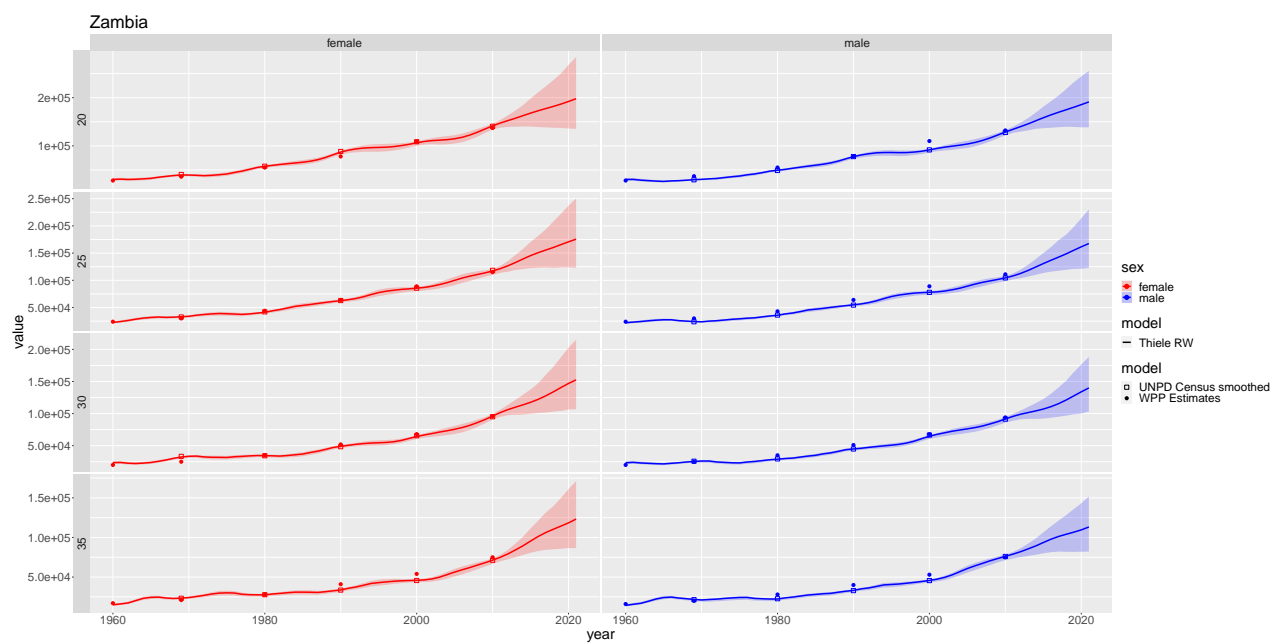Figure 9: Population
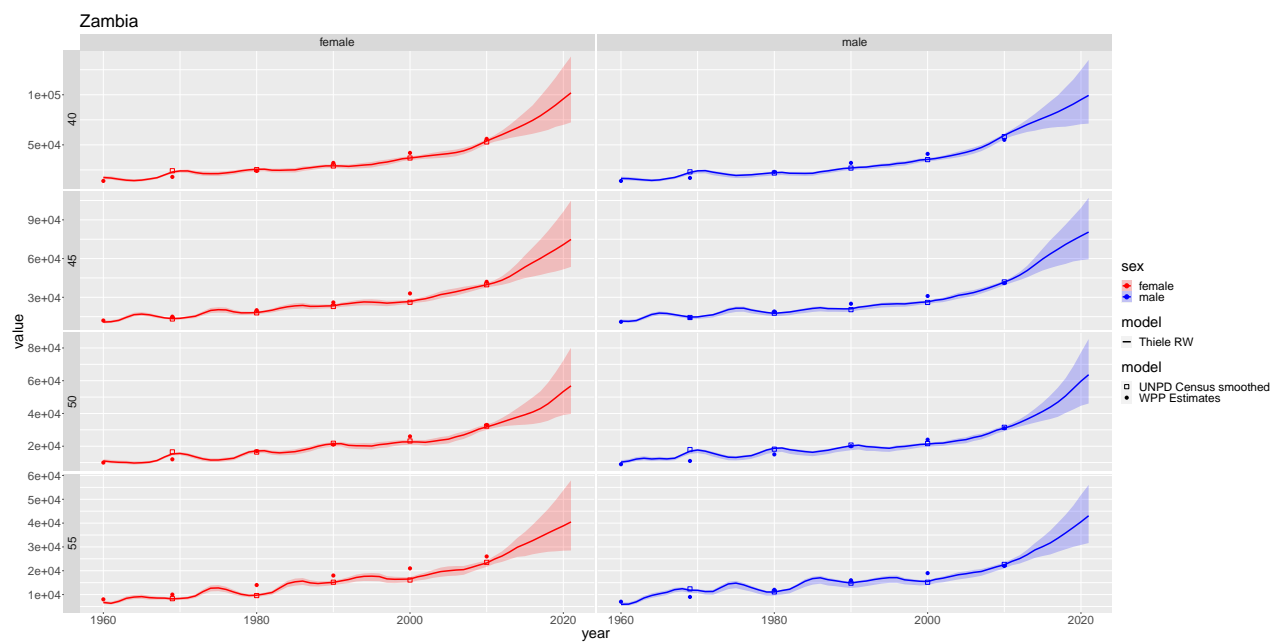

Figure 10: Population
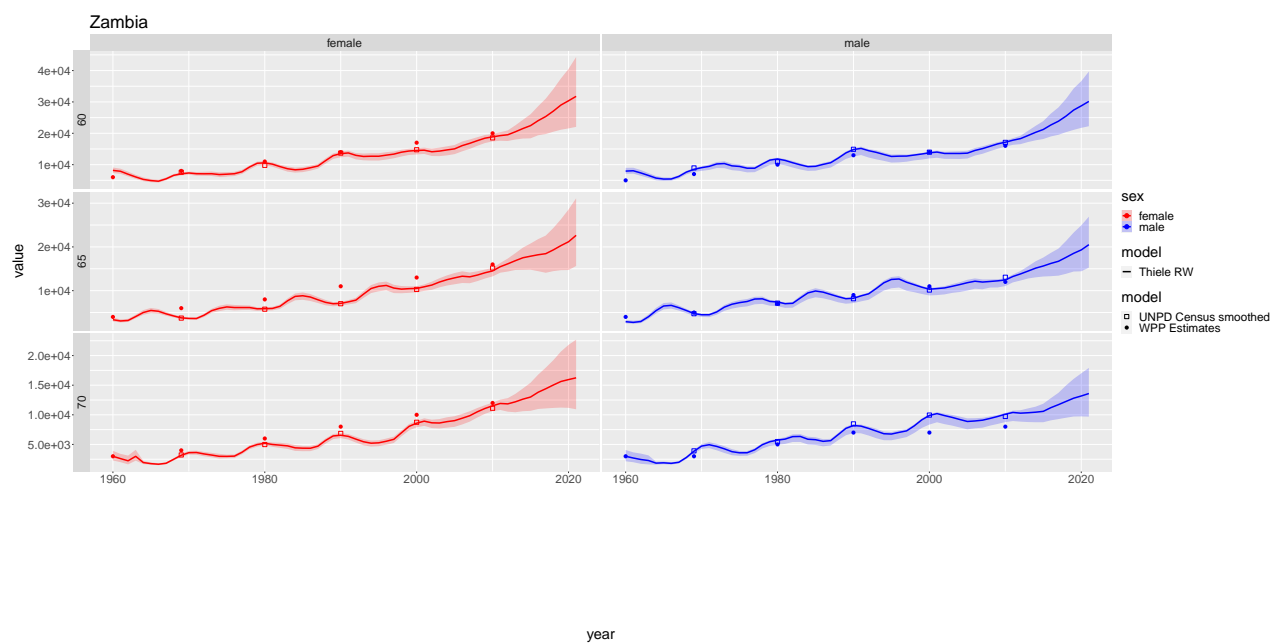
9

Figure 11: Population

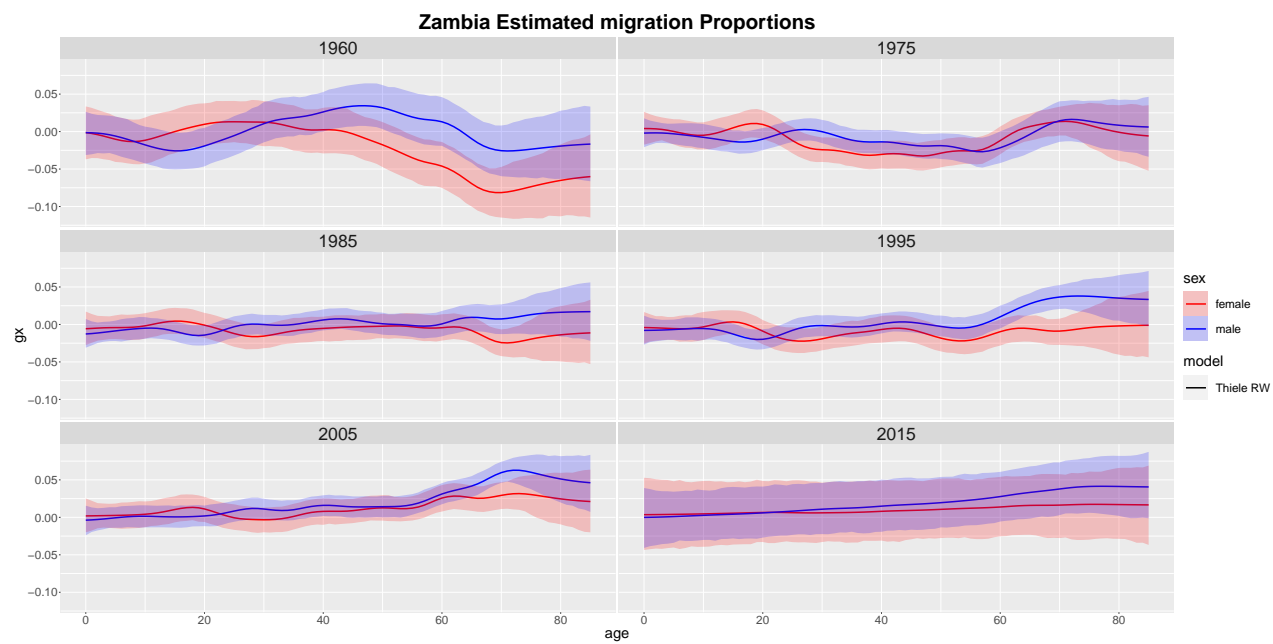Figure 12: Population

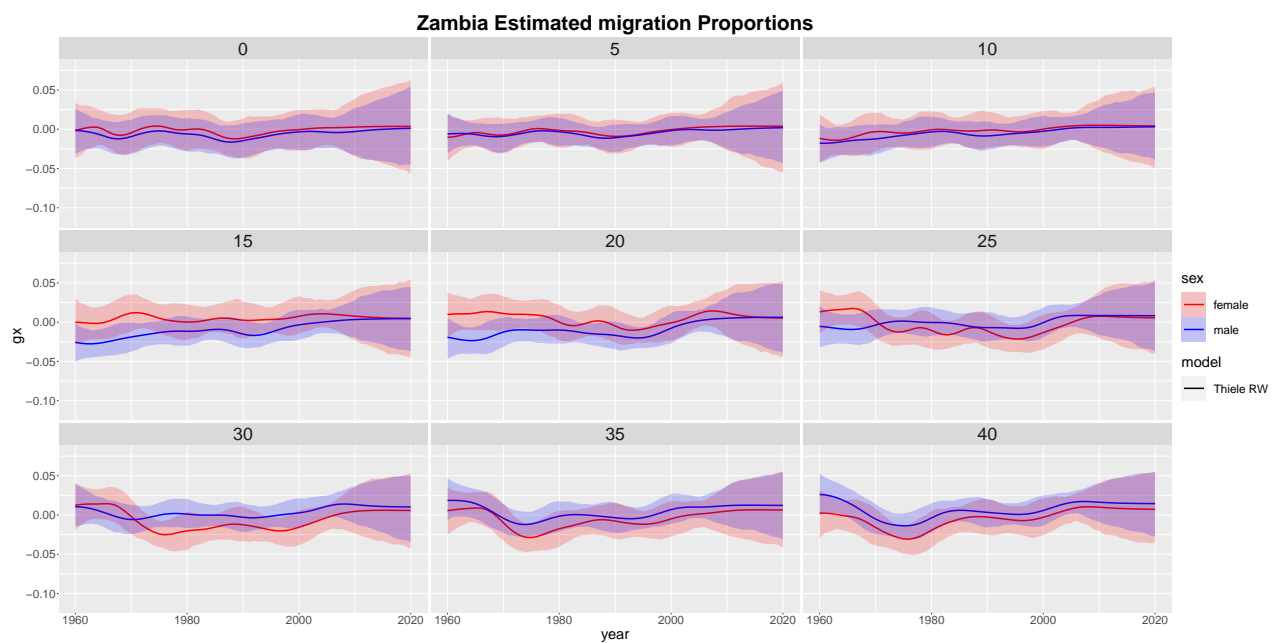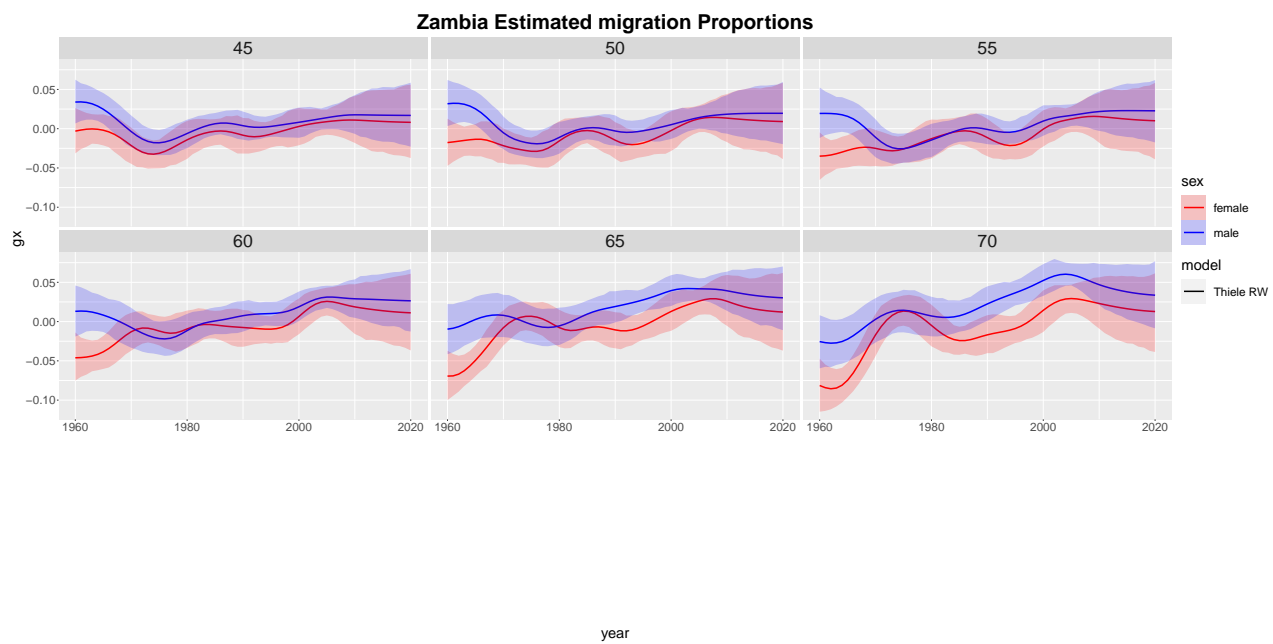Figure 13: Population

Figure 14: Migration

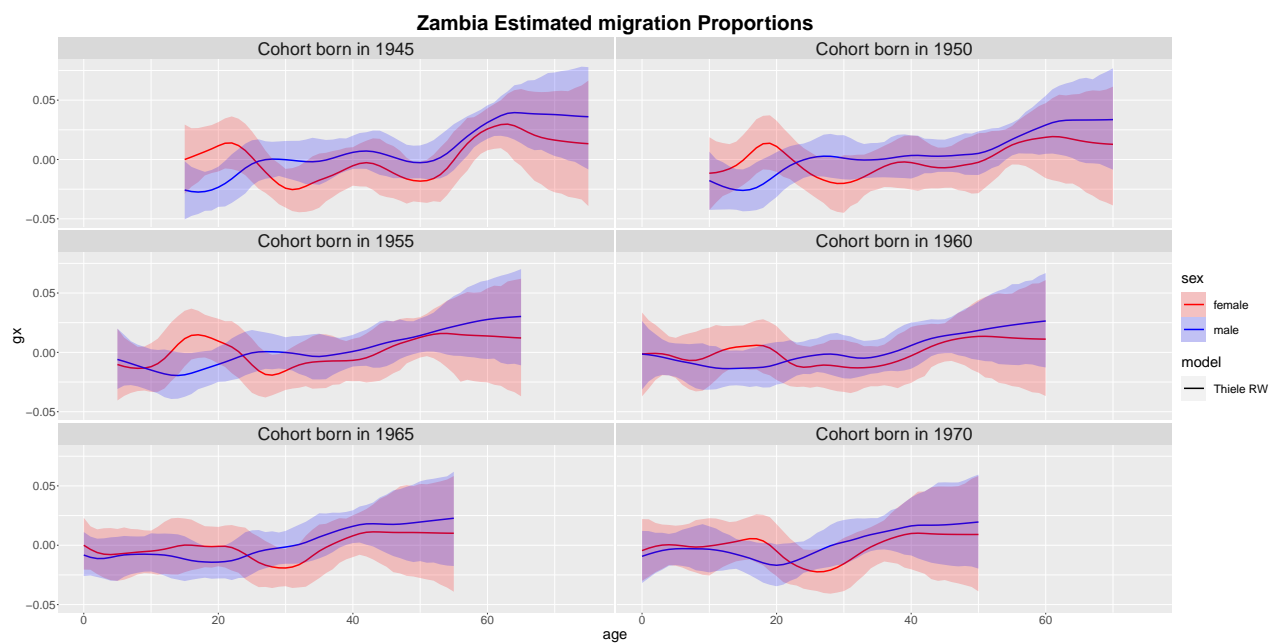11

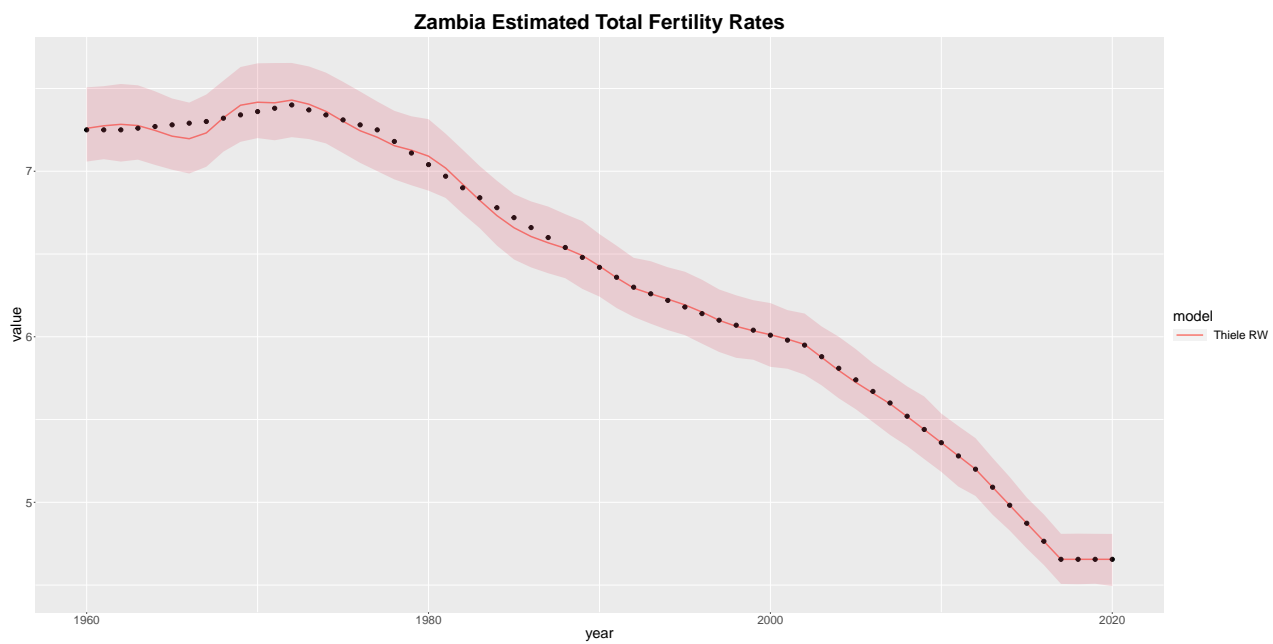Figure 15: Migration

Figure 16: Migration

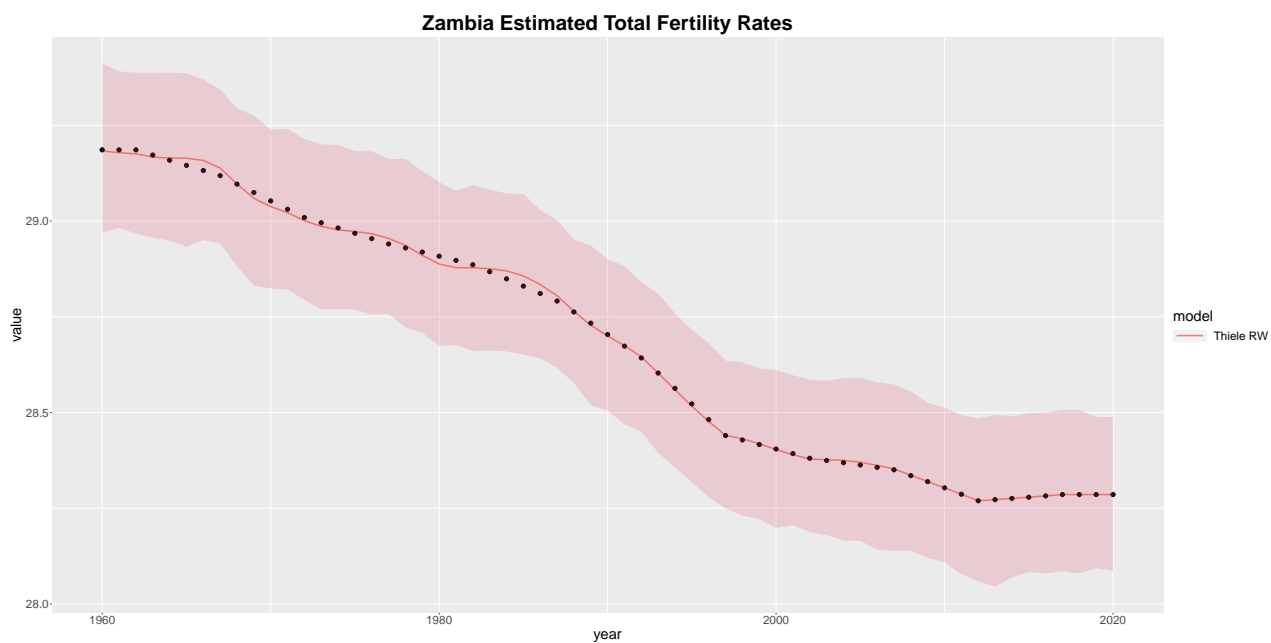Figure 17: Migration

Figure 18: Total Fertility

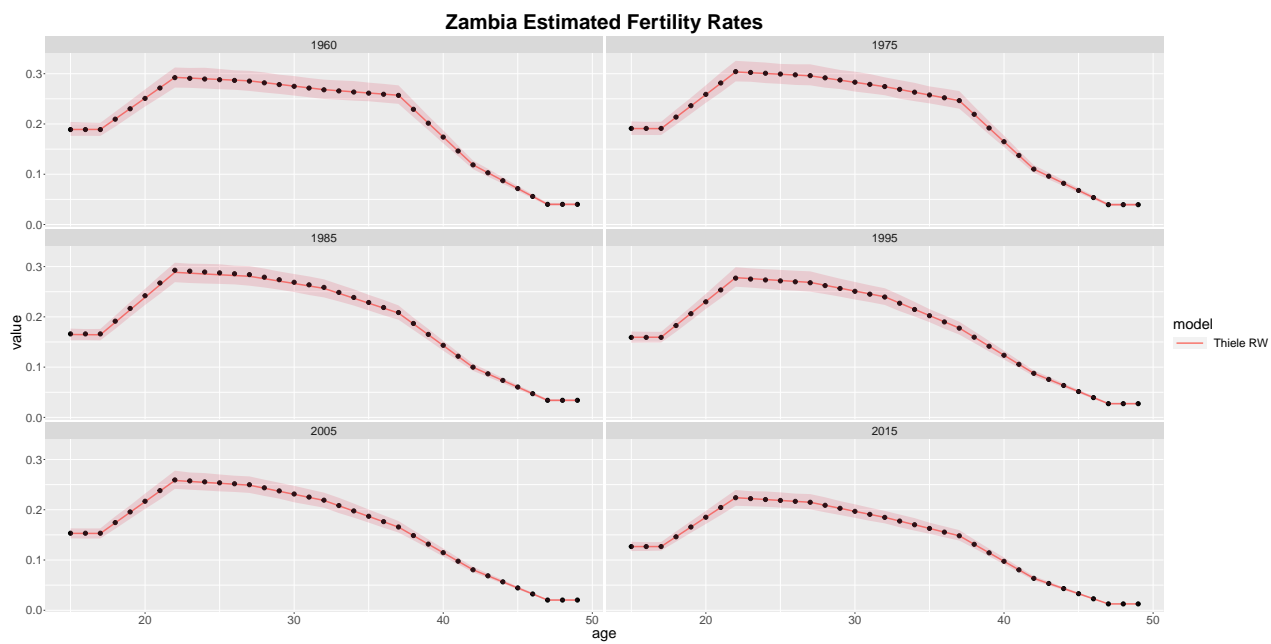**Zambia Estimated Total Fertility Rates**

Figure 19: Mean age at births

Zambia Estimated Fertility Rates

Figure 20: Fertility

Figure 21: Fertility