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      log_tau2_logpop      log_tau2_logpop      log_tau2_logpop          log
##           3.55087375           6.34705451           3.84467237           6.11630624
##       log_dispersion       log_dispersion       log_lambda_tp             tp_slope
##           1.05256437           0.99324373           3.84002023          -0.02314207
##       log_lambda_phi       log_lambda_psi         log_lambda_A         log_lambda_B       log_lar
##          11.29440713          11.23549787           6.98551276           7.28603997
##    log_lambda_epsilon
##           5.20545602
```
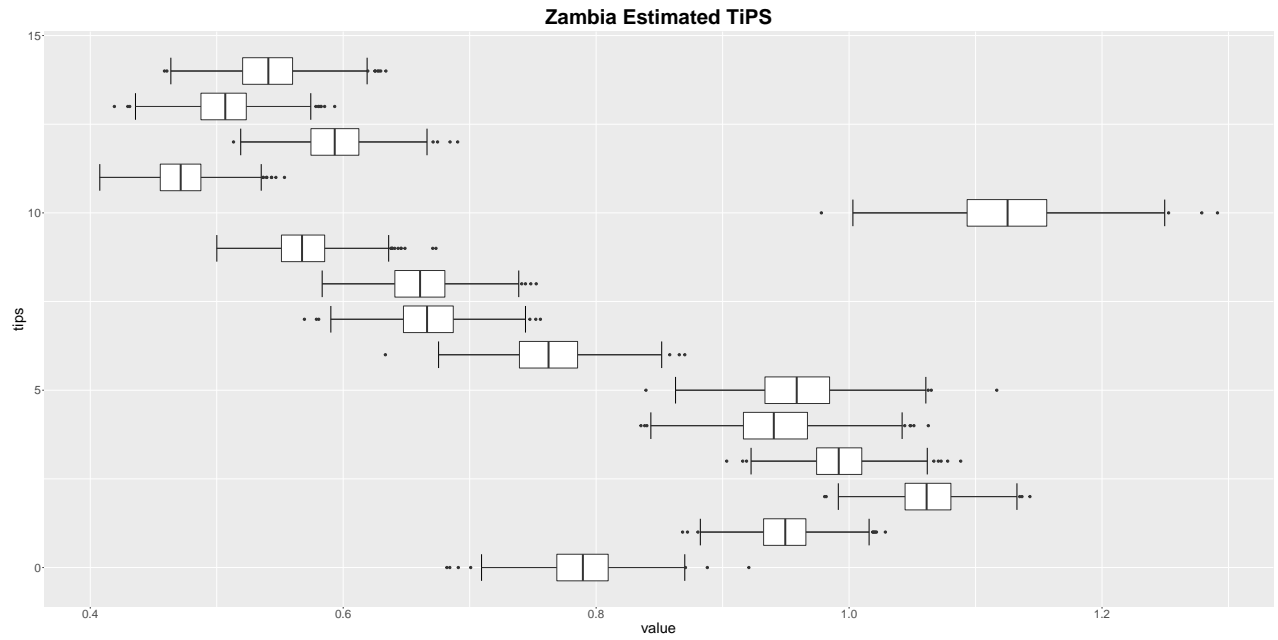
Figure 1: Estimated TiPS
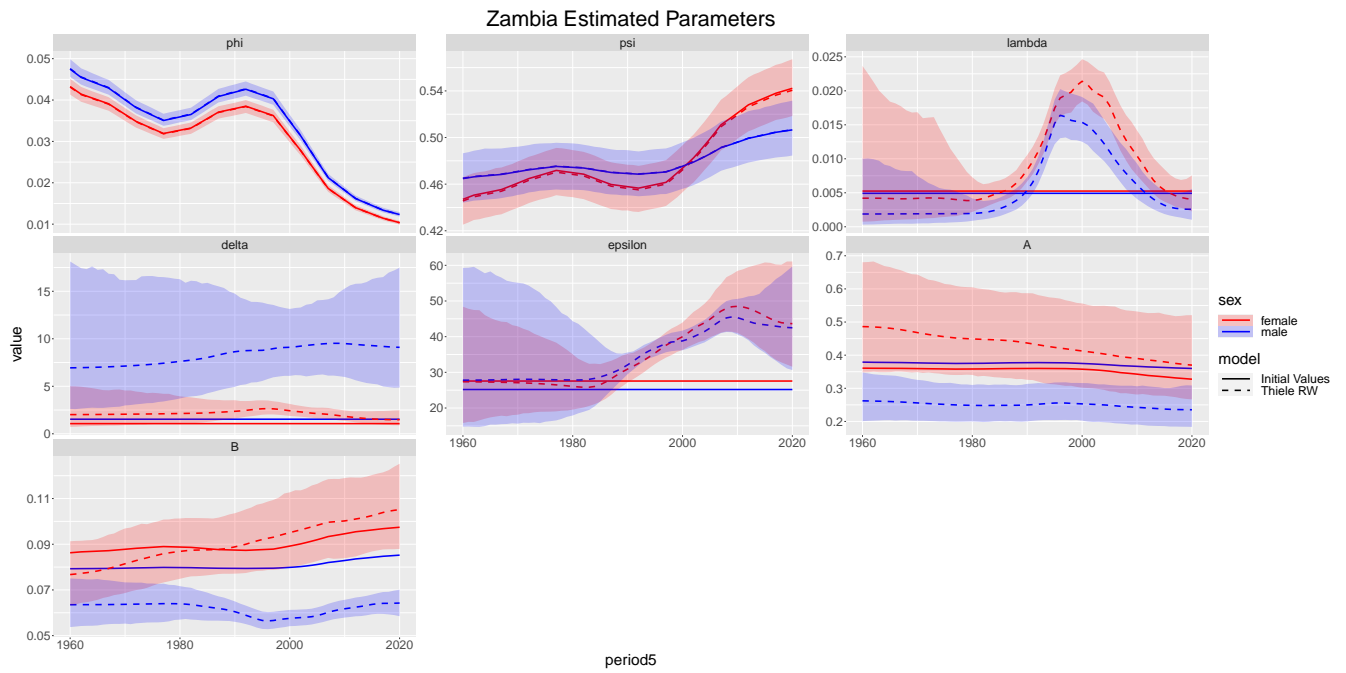
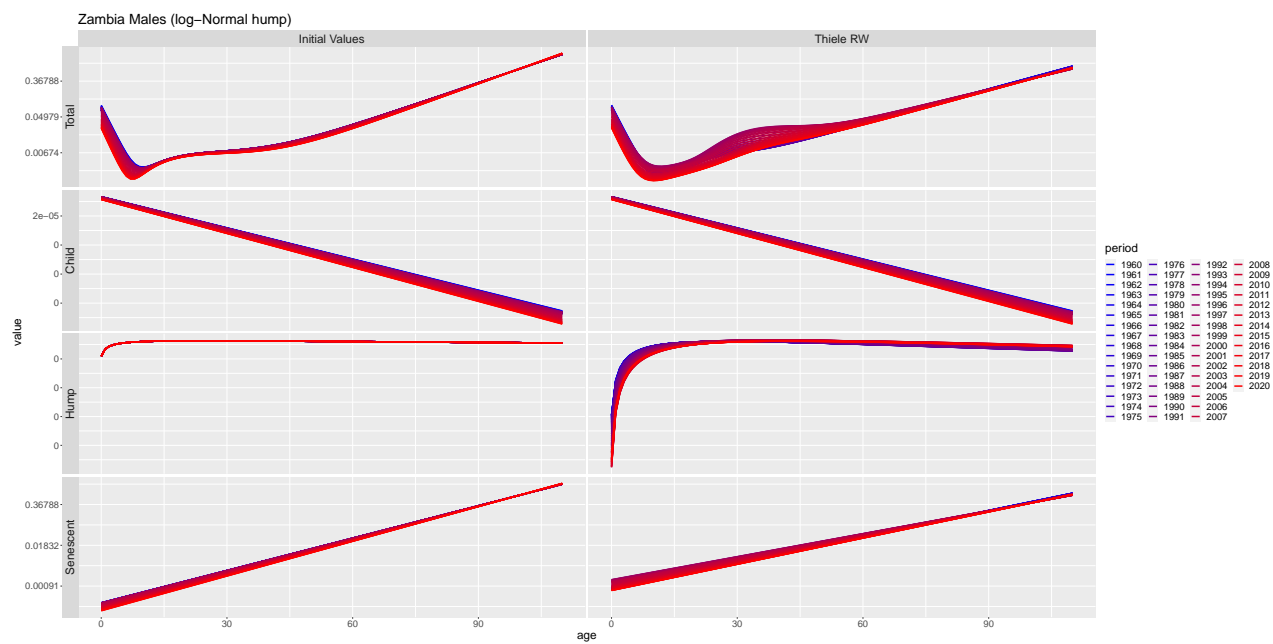Figure 2: Estimated parameters
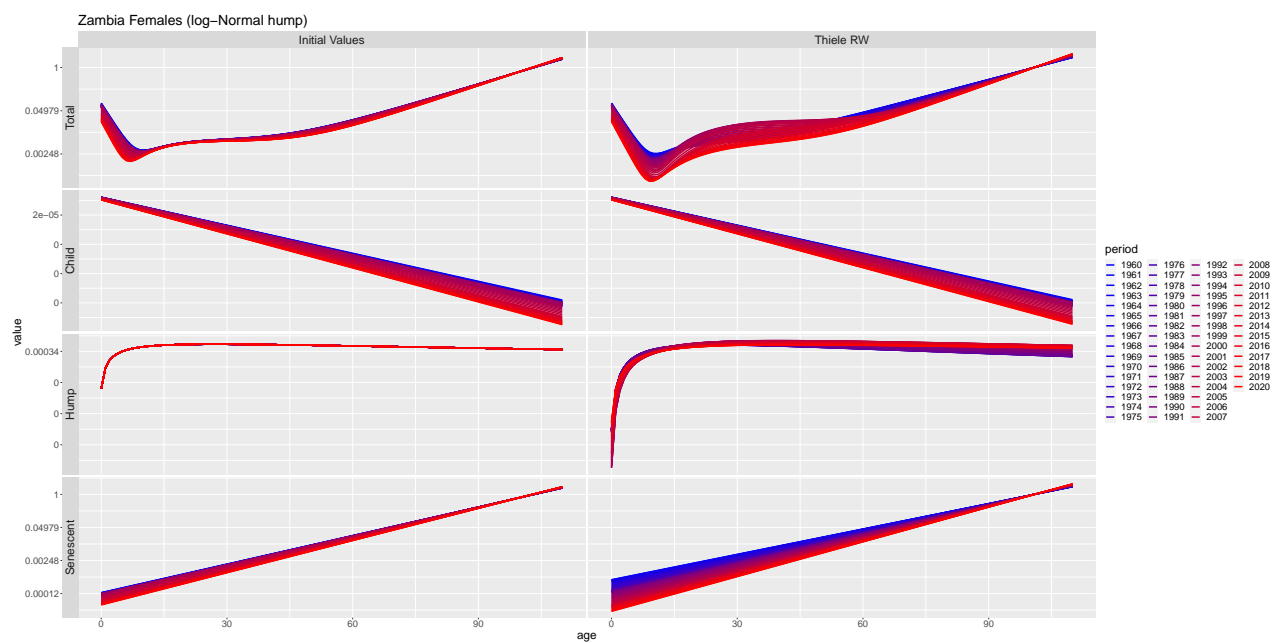
Figure 3: Thiele Decomposed
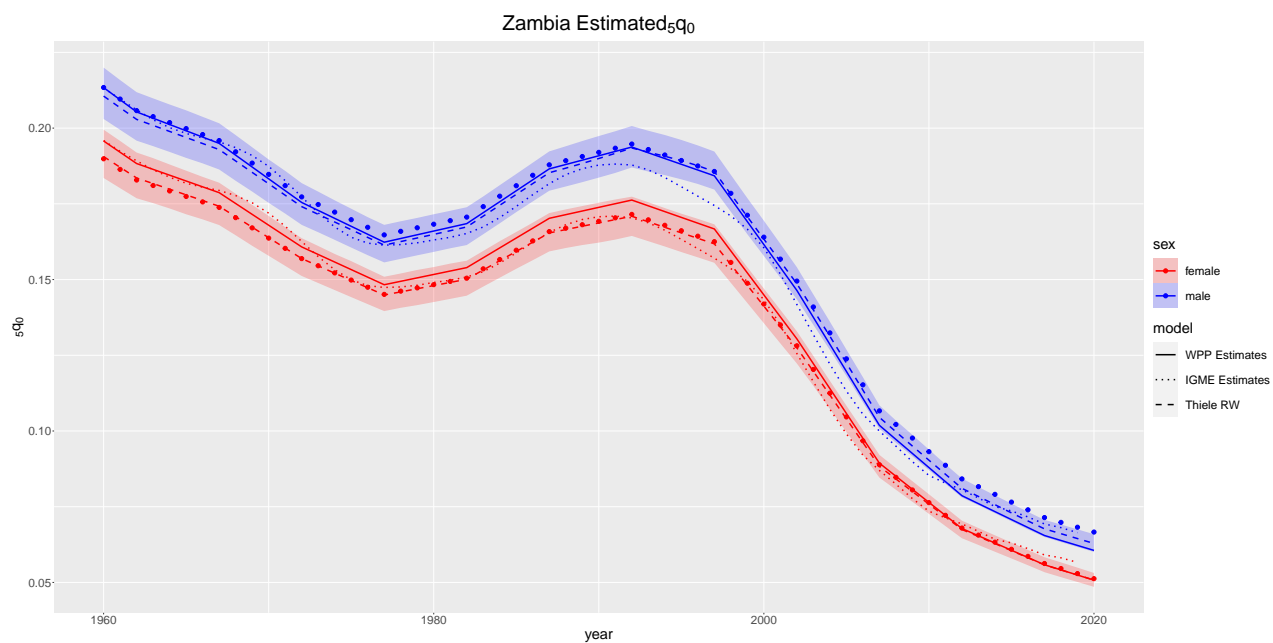

Figure 4: Thiele Decomposed
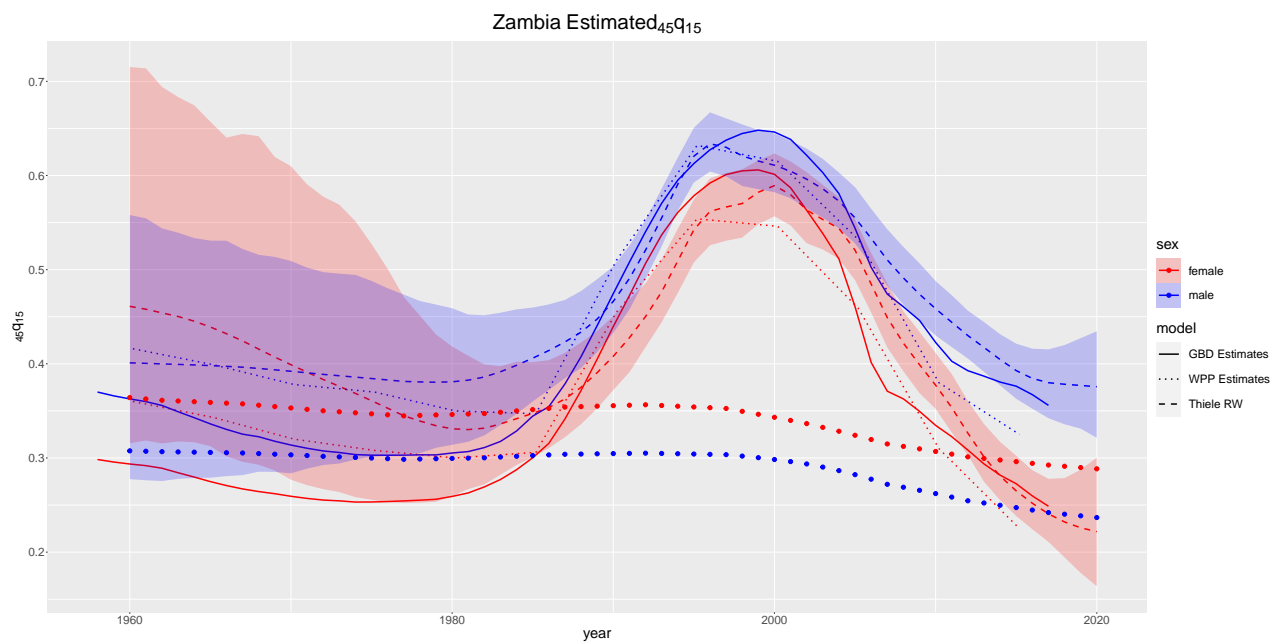
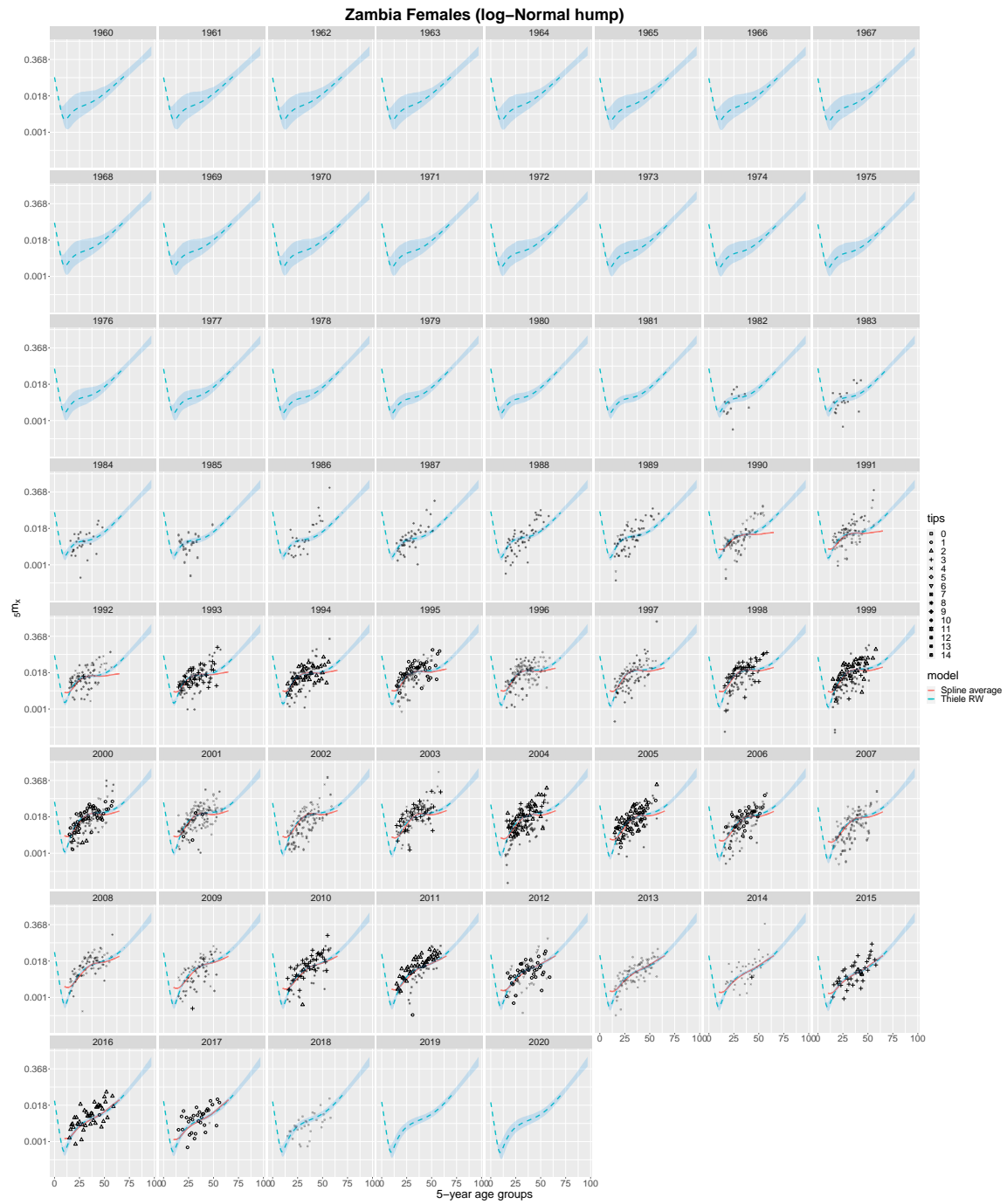Figure 5: Estimated $_5q_0$

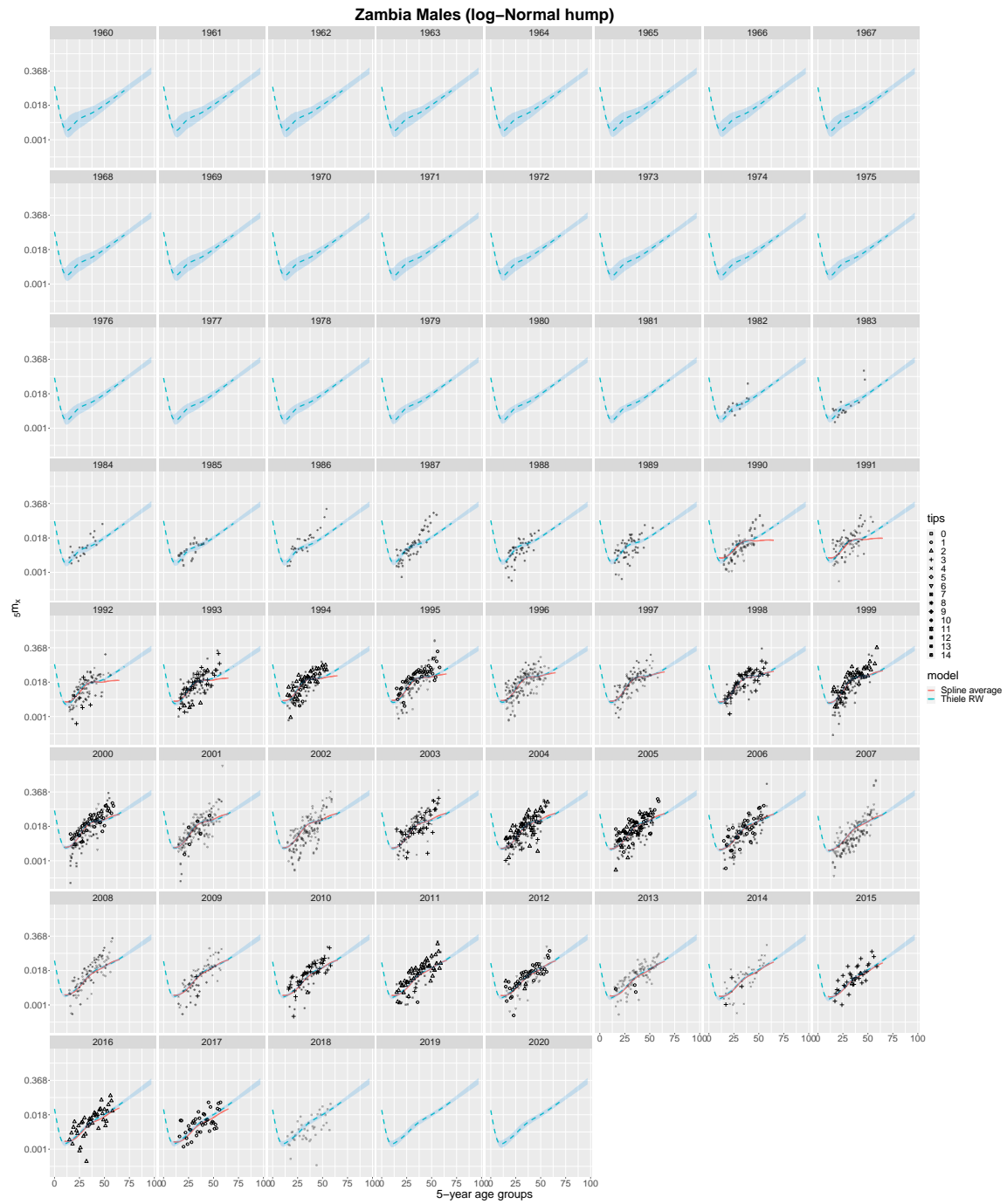Figure 6: Estimated $_{45}q_{15}$

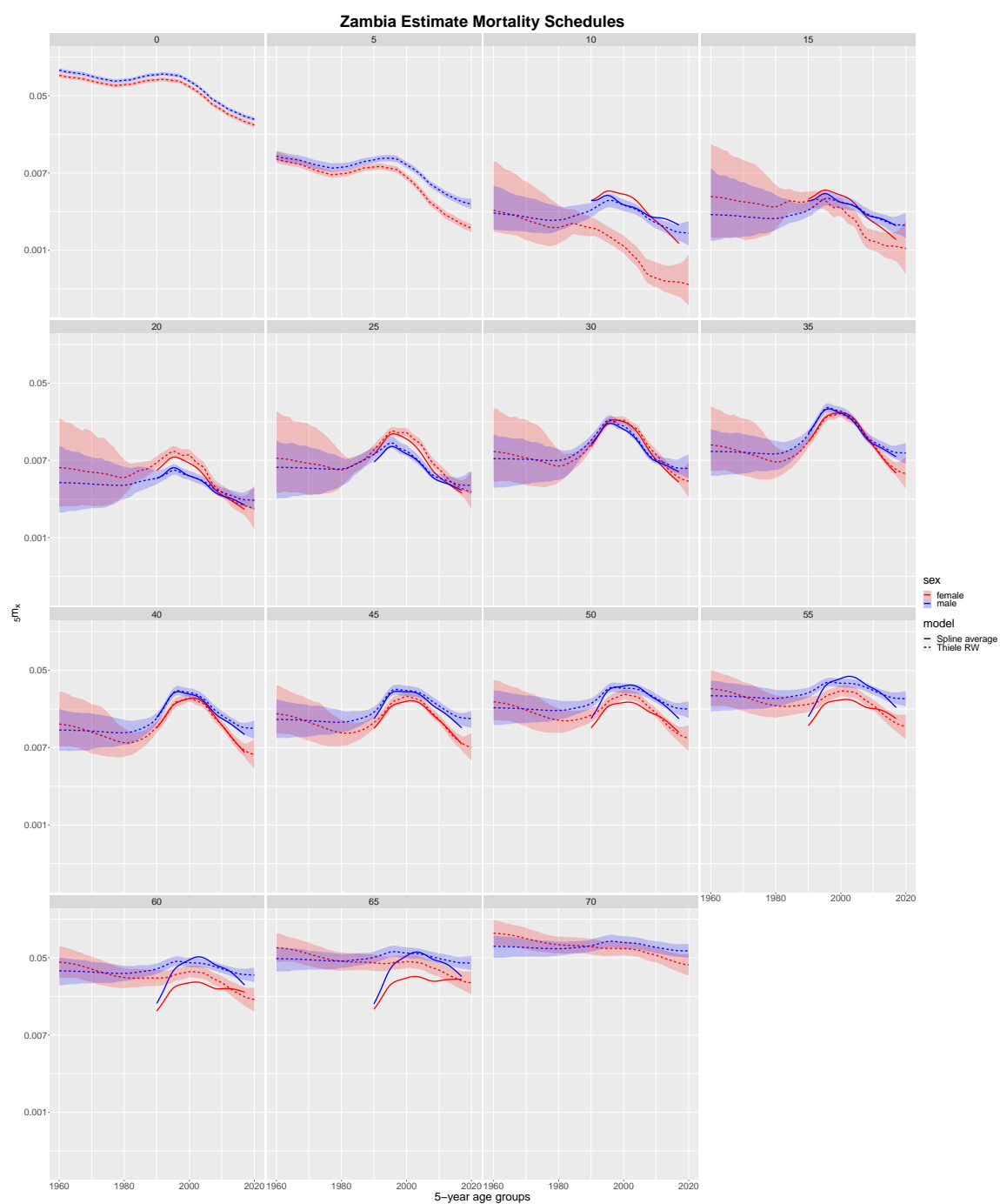Figure 7: Mortality Schedules

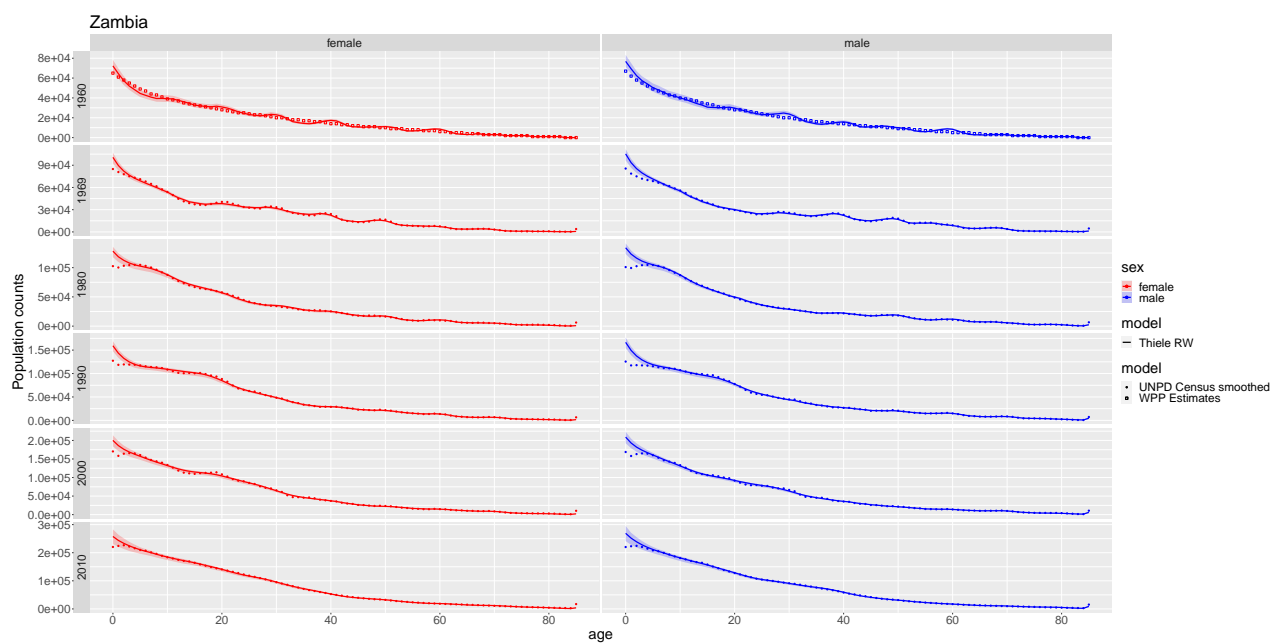Figure 8: Mortality Schedules

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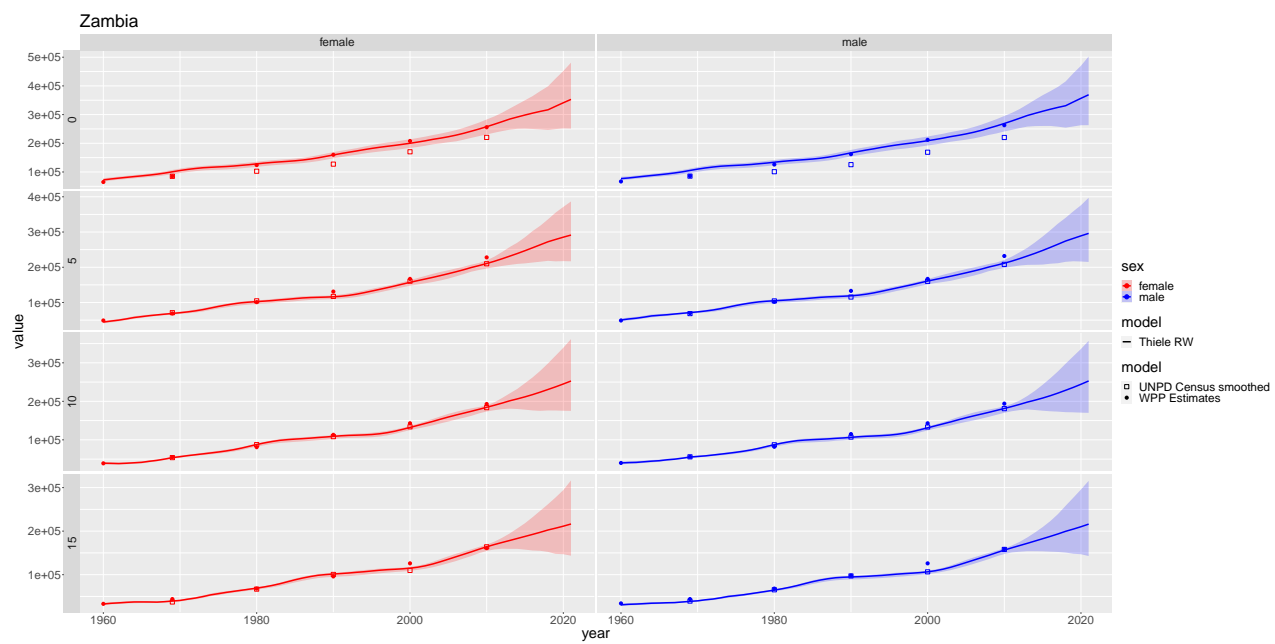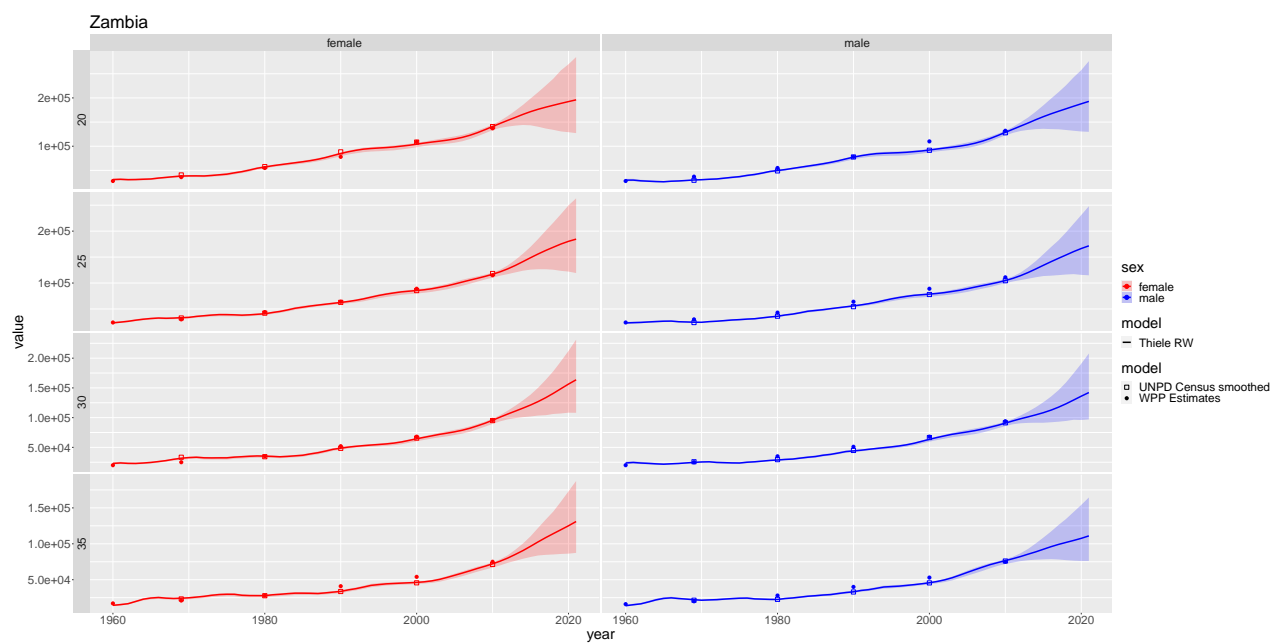Figure 9: Mortality Schedules

Figure 10: Population

Figure 11: Population

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Figure 12: Population
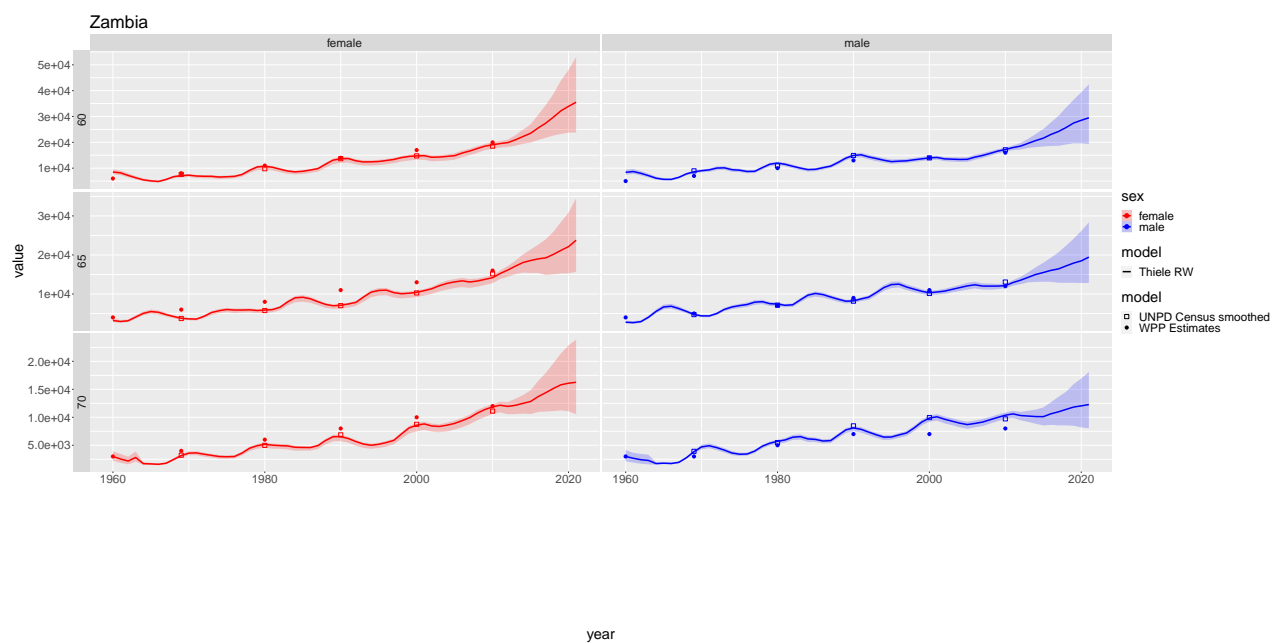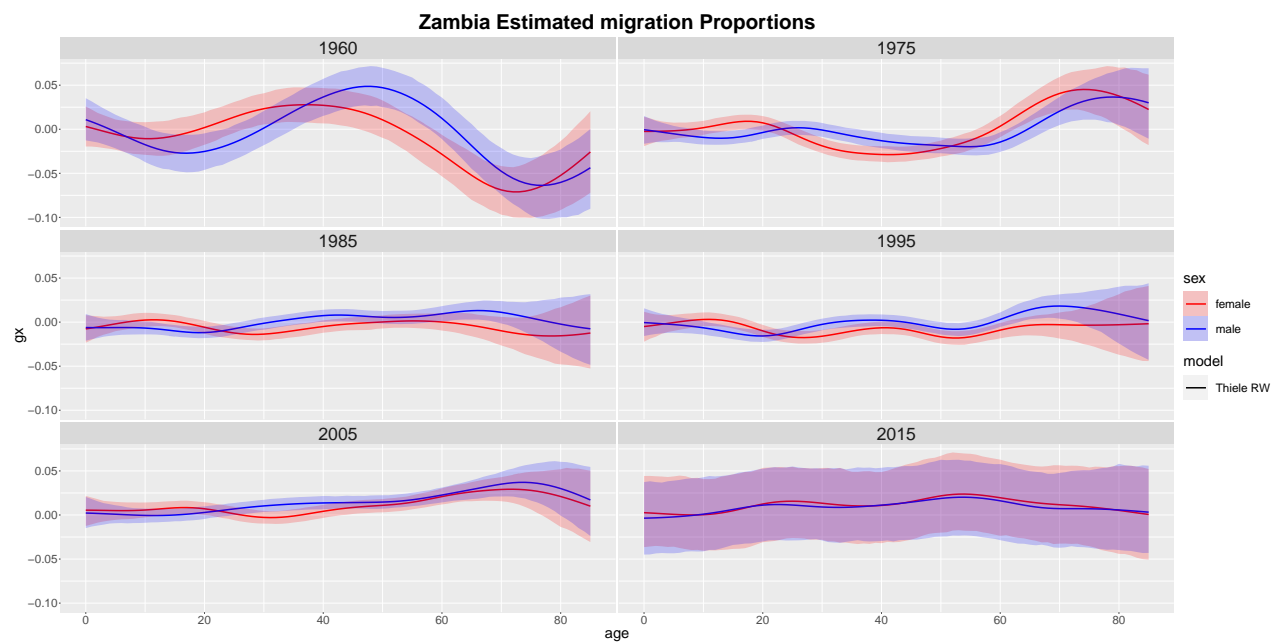

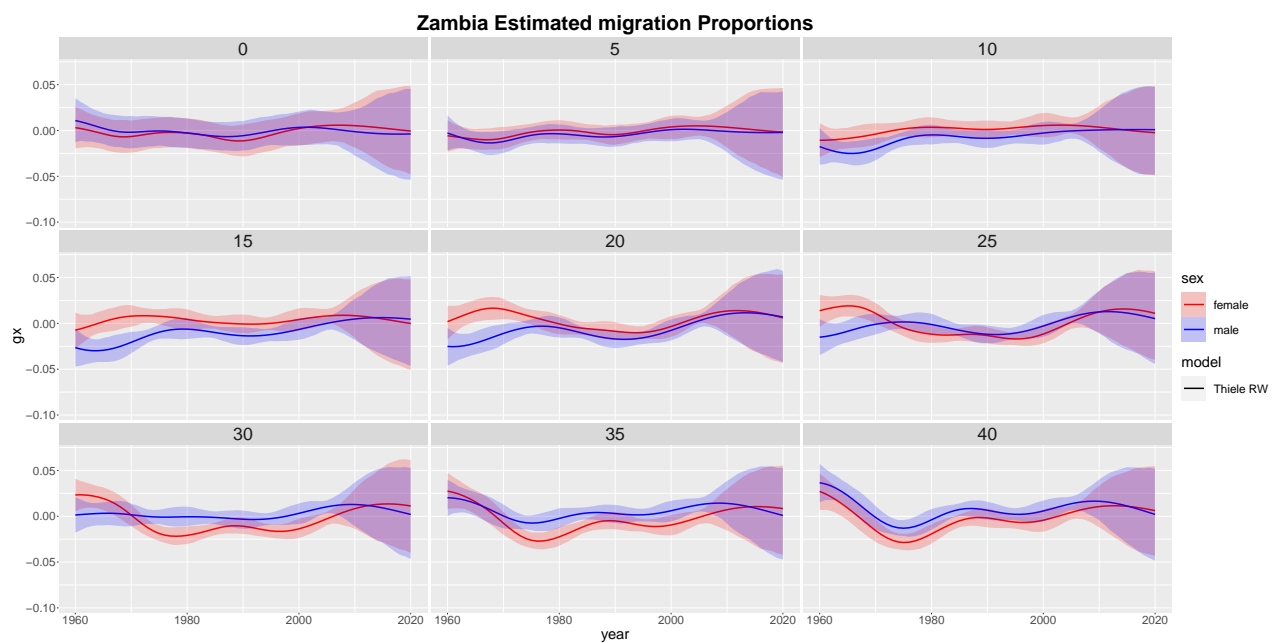Figure 13: Population

Figure 14: Population
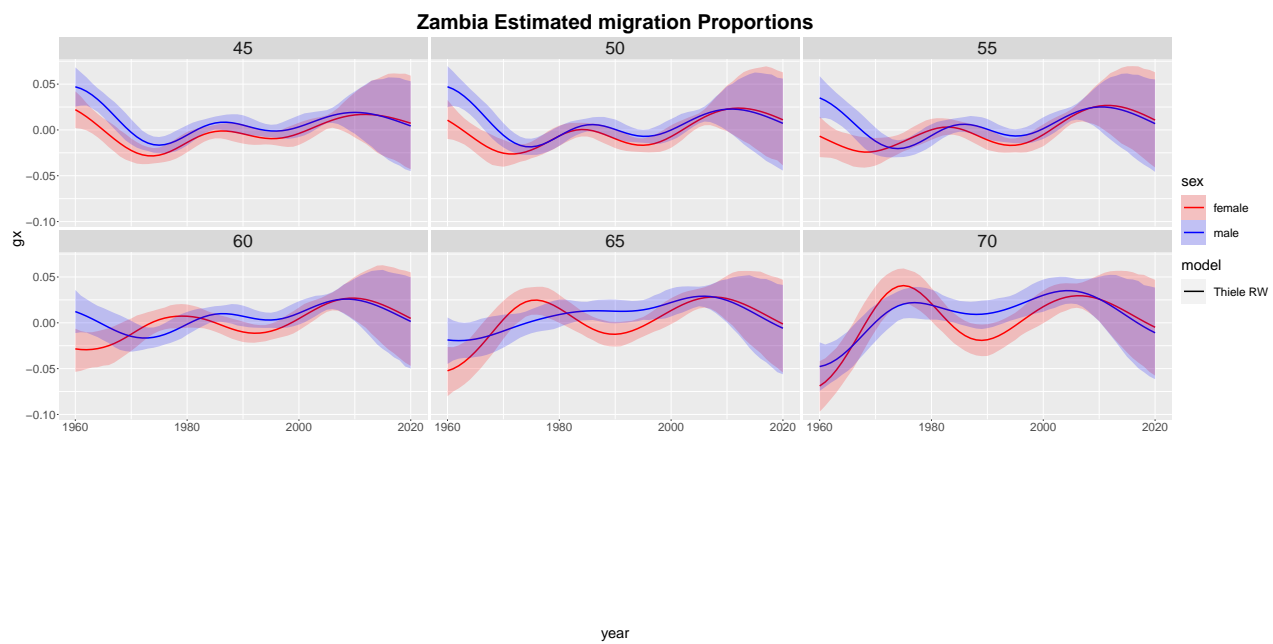

Figure 15: Migration

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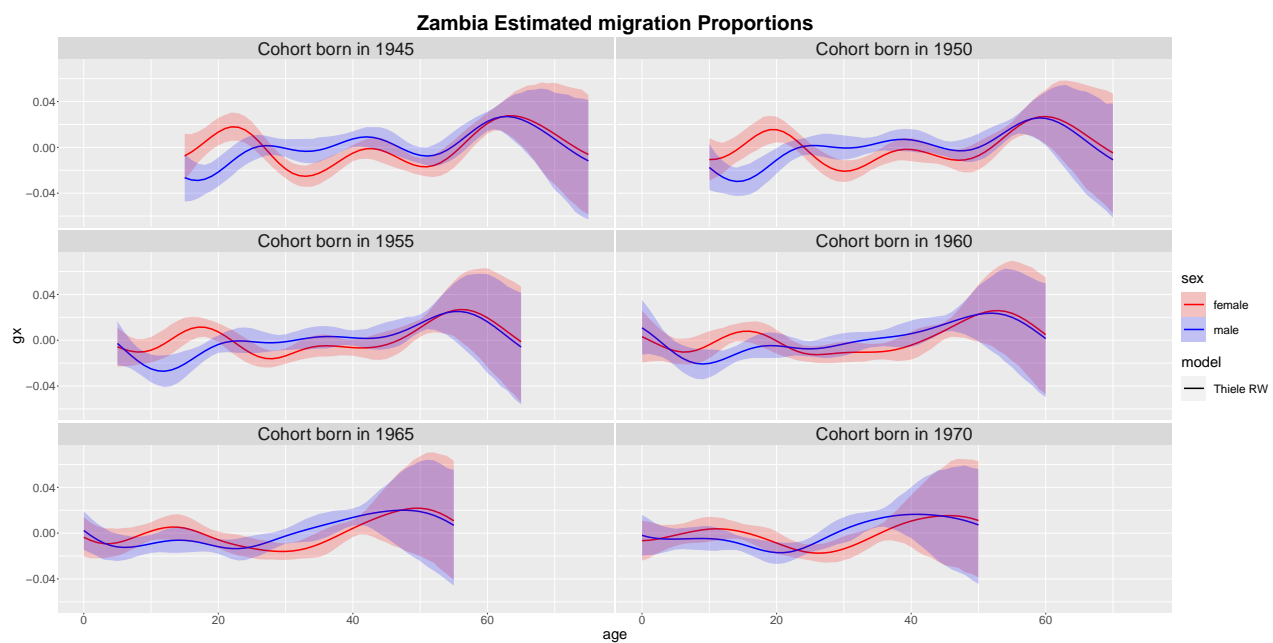Figure 16: Migration
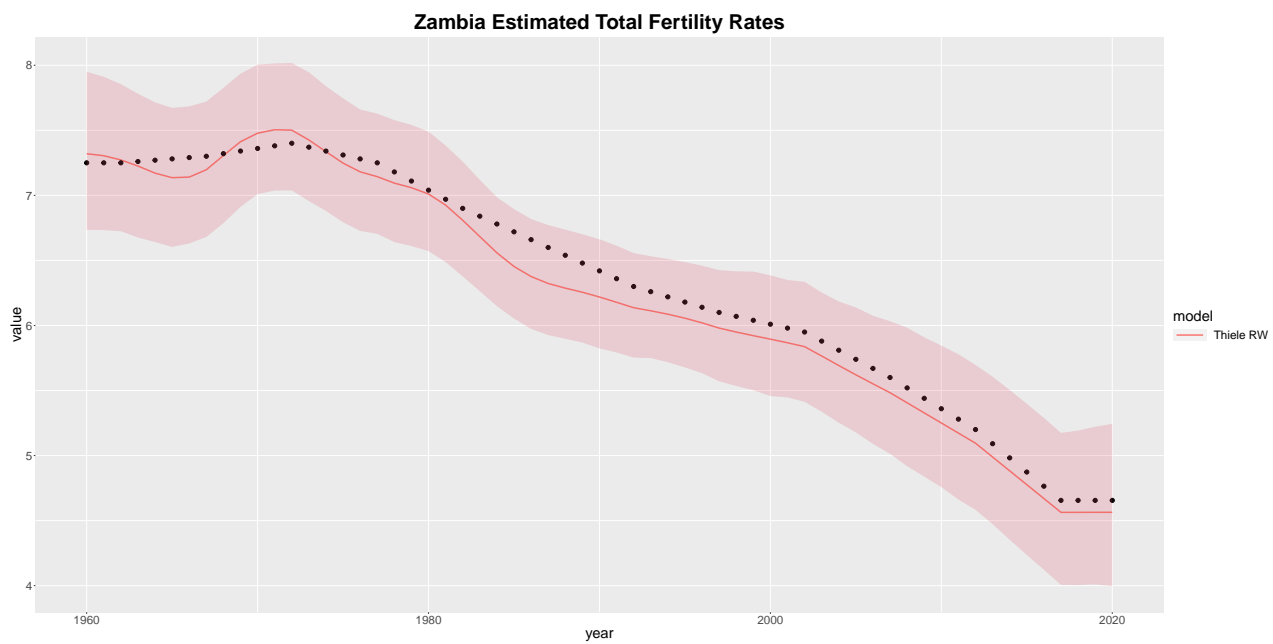

Figure 17: Migration
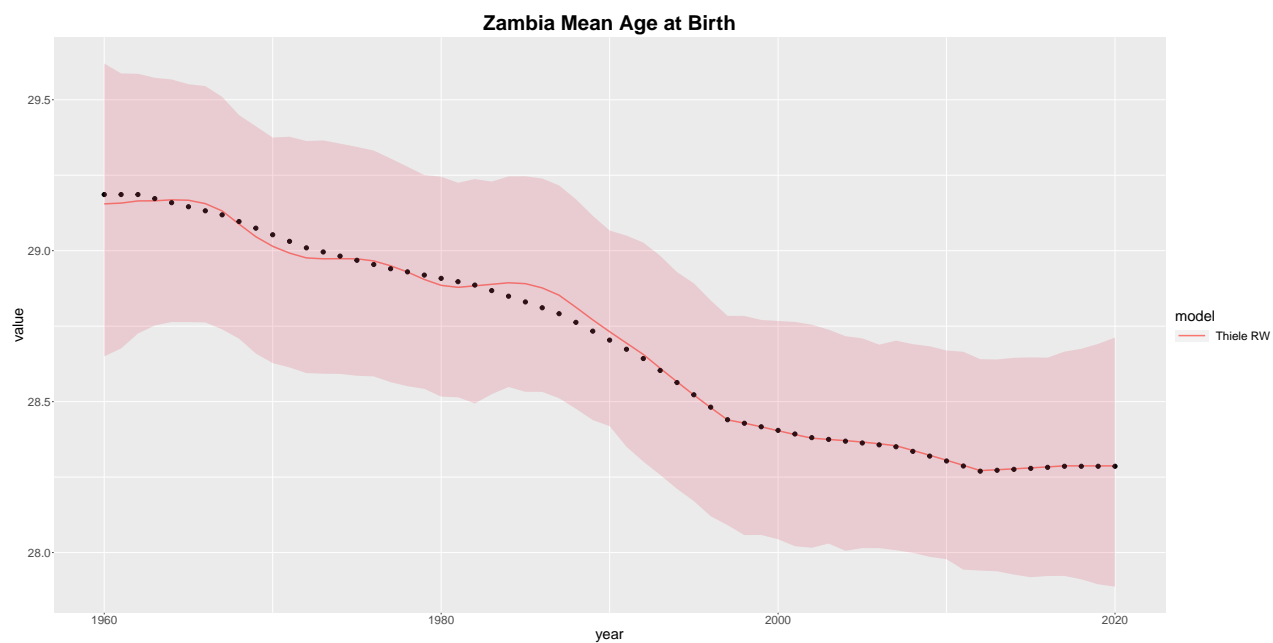
Figure 18: Migration

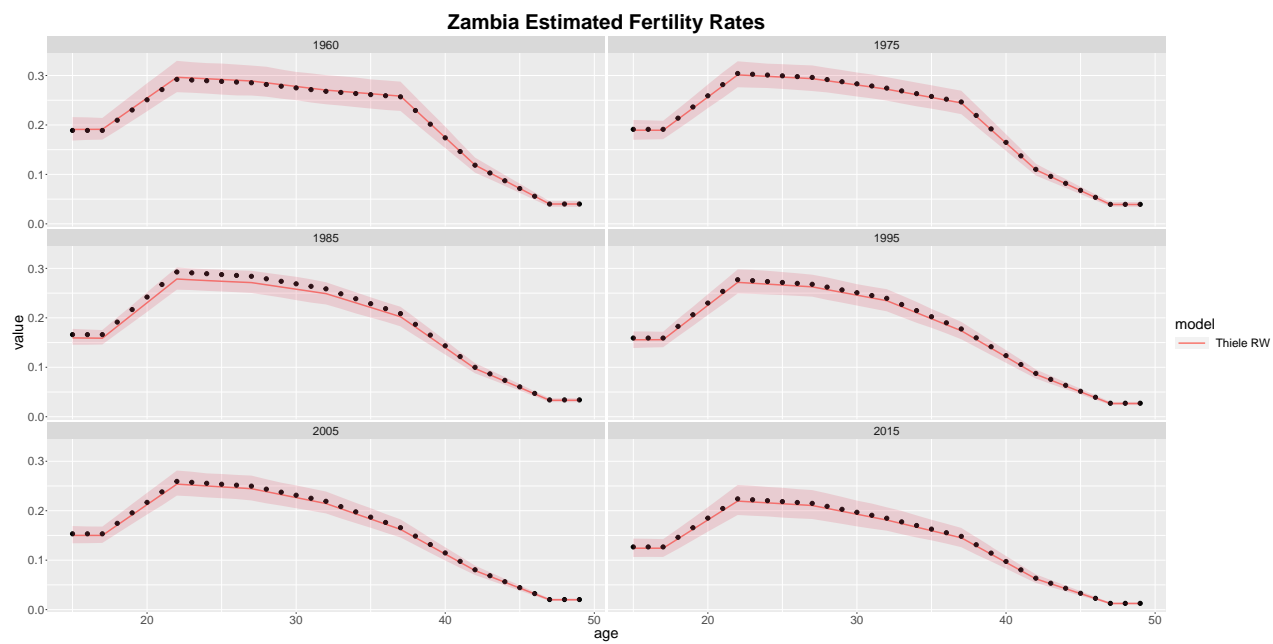Figure 19: Total Fertility

Figure 20: Mean age at births
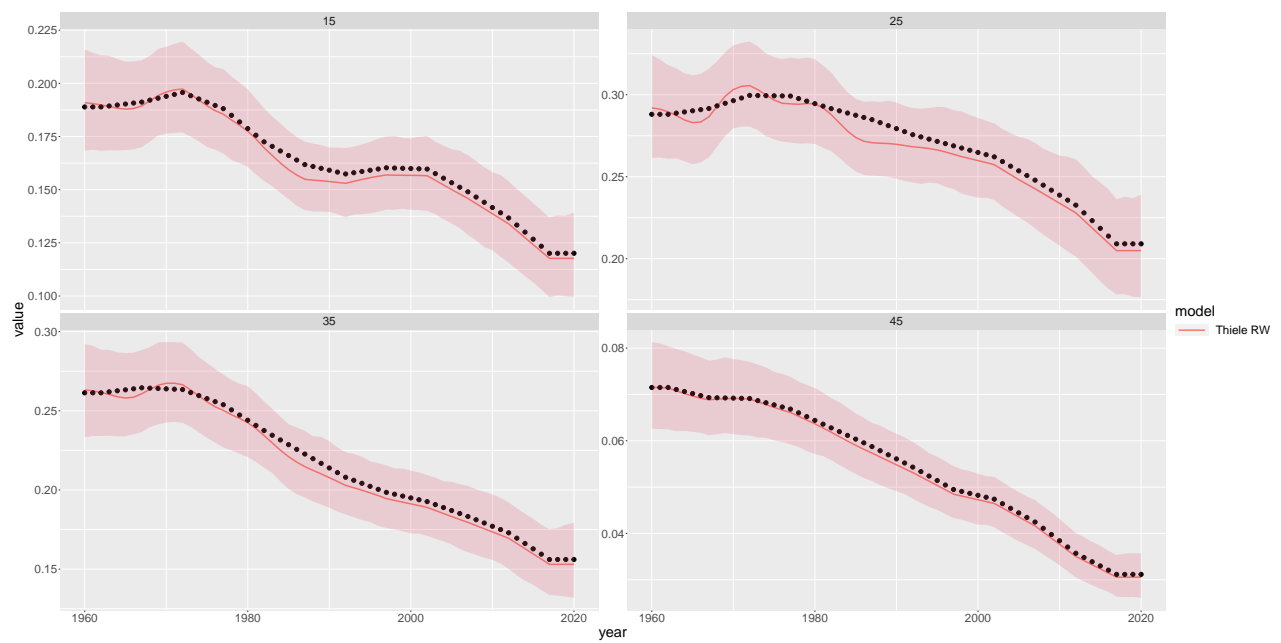

Figure 21: Fertility

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Figure 22: Fertility