

# South Africa

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

```
## # A tibble: 86 x 7
```

```
##   age `1970` `1985` `1991` `1996` `2001` `2011`  
##   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>  
## 1 0 347577 265629 334664 434223. 454482 575028  
## 2 1 327004. 260708. 364874. 434296. 440667 567032.  
## 3 2 325266 271447. 381647. 449406. 442266. 564236.  
## 4 3 320516. 274451. 377053. 461697. 449032. 556210.  
## 5 4 318140. 273011. 379364. 474658. 459546. 544576.  
## 6 5 313147. 267934. 375903. 480788. 469845. 526048.  
## 7 6 309948 265764 368341. 479310. 477704. 502114.  
## 8 7 306471. 267165. 360249. 473457. 482862. 478502.  
## 9 8 303223. 272819. 354368. 467138. 492895. 460004.  
## 10 9 295460. 275083. 348572. 464657. 503893. 451534.  
## # ... with 76 more rows
```

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

```
## # A tibble: 18 x 2
```

```
##   age `1980`  
##   <dbl> <dbl>  
## 1 0 1736315  
## 2 5 1575298  
## 3 10 1382085  
## 4 15 1296548  
## 5 20 1187044  
## 6 25 956402  
## 7 30 799542  
## 8 35 680398  
## 9 40 576749  
## 10 45 488030  
## 11 50 401384  
## 12 55 339598  
## 13 60 289582  
## 14 65 221493  
## 15 70 160492  
## 16 75 93129  
## 17 80 59494  
## 18 85 52494
```

```
## [1] "Census Males"
```

```
## # A tibble: 86 x 7
```

```
##   age `1970` `1985` `1991` `1996` `2001` `2011`  
##   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>  
## 1 0 353187 266840 332158 432514. 453924 584097  
## 2 1 328995. 262455 371515 433911. 441106. 577574.  
## 3 2 322879 272988. 389101. 448461. 441893 574048.  
## 4 3 316004. 276266. 384583. 461203. 448540. 565571.  
## 5 4 313864. 275394. 387601. 475238. 459394. 553093.  
## 6 5 310881. 270720. 383920. 482371. 470590. 534653
```

```
## 7      6 309771. 268497. 375467. 481068. 478769. 510001.
## 8      7 307354. 269153. 366494. 473935. 482864. 485063.
## 9      8 304558. 274192. 360549. 465731. 491967. 465714.
## 10     9 296602. 275718. 354626. 461874. 503328. 457150.
## # ... with 76 more rows
```

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

```
## # A tibble: 18 x 2
```

```
##   age `1980`
##   <dbl> <dbl>
```

```
## 1      0 1756592
## 2      5 1582313
## 3     10 1387903
## 4     15 1336257
## 5     20 1316011
## 6     25 1089762
## 7     30  908968
## 8     35  754899
## 9     40  626078
## 10    45  513247
## 11    50  416271
## 12    55  326920
## 13    60  262972
## 14    65  189590
## 15    70  123694
## 16    75   68244
## 17    80   33990
## 18    85   26737
```

### *Thiele log-Normal Hump Spline*

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

##	log_tau2_logpop_f	log_tau2_logpop_f	log_tau2_logpop_m	log_tau2_
##	6.82730166	4.97480167	6.85709730	4.
##	log_tau2_gx_m	log_lambda_gx_age_f	log_lambda_gx_age_m	log_lambda_g
##	3.40666055	6.23183743	7.48021387	5.
##	log_lambda_gx_agemtime_m	log_lambda_tp	log_lambda_tp_0_inflated_sd	log_disp
##	6.90775118	6.13712976	0.04339397	0.
##	log_marginal_prec_psi_f	log_marginal_prec_A_f	log_marginal_prec_B_f	log_marginal_pr
##	6.80776730	6.79603749	6.79282157	6.
##	log_marginal_prec_B_m	log_lambda_phi_f	log_lambda_psi_f	log_lambda_
##	6.75358280	4.30818893	4.30774386	2.
##	log_lambda_A_f	log_lambda_B_f	log_lambda_phi_m	log_lamb
##	4.30577921	4.27969332	4.30845287	4.
##	log_lambda_epsilon_m	log_lambda_A_m	log_lambda_B_m	logit_lambda_slo
##	4.49808336	4.30665186	4.30337594	1.
##	logit_lambda_slope_rho_m	logit_delta_slope_rho_m	logit_epsilon_slope_rho_m	
##	1.45355089	-1.43283151	-0.14548803	

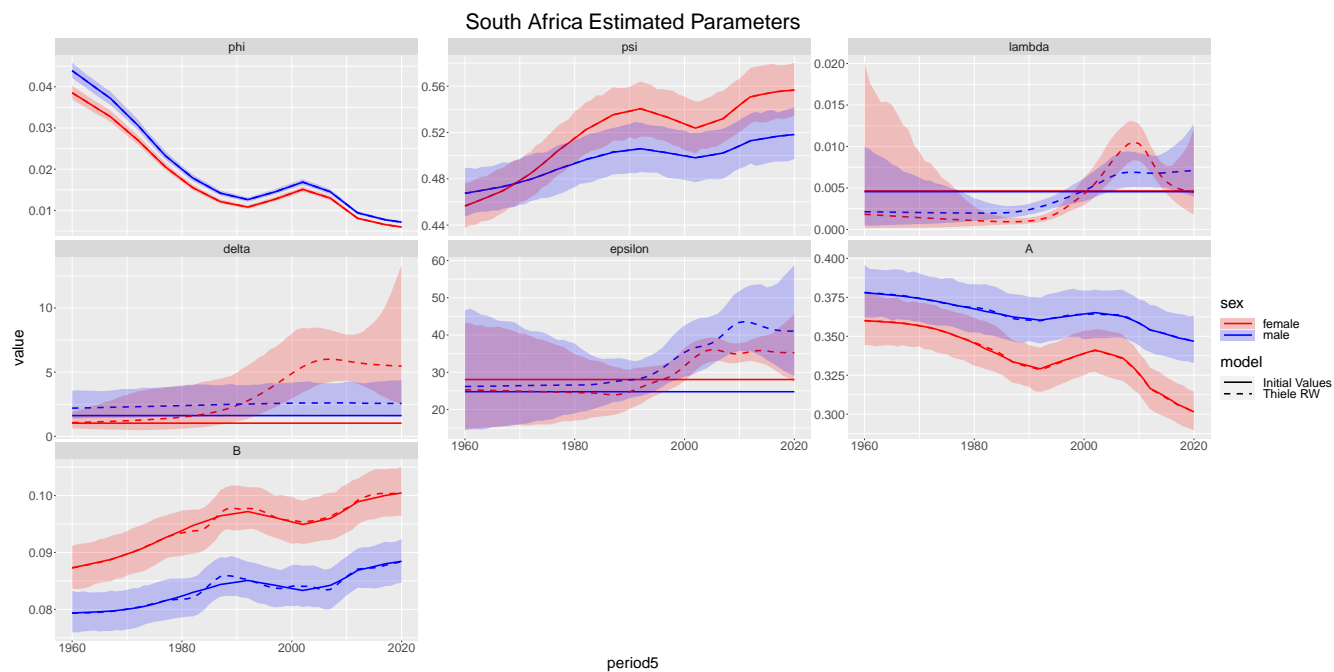


Figure 1: Estimated parameters

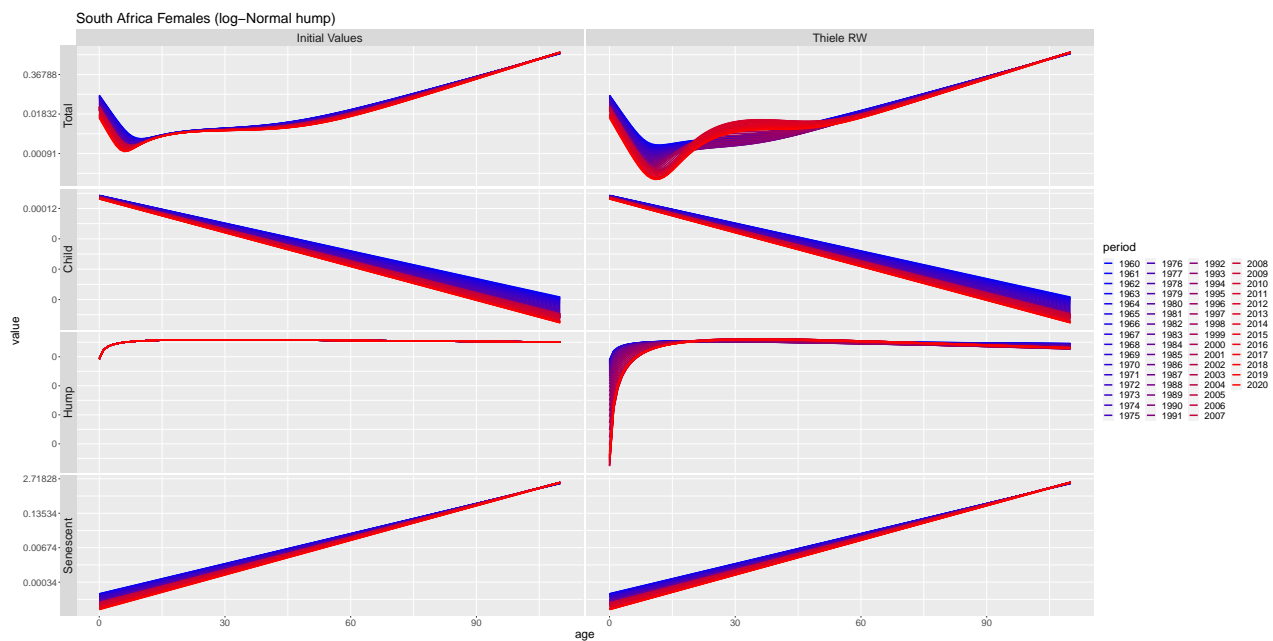


Figure 2: Thiele Decomposed

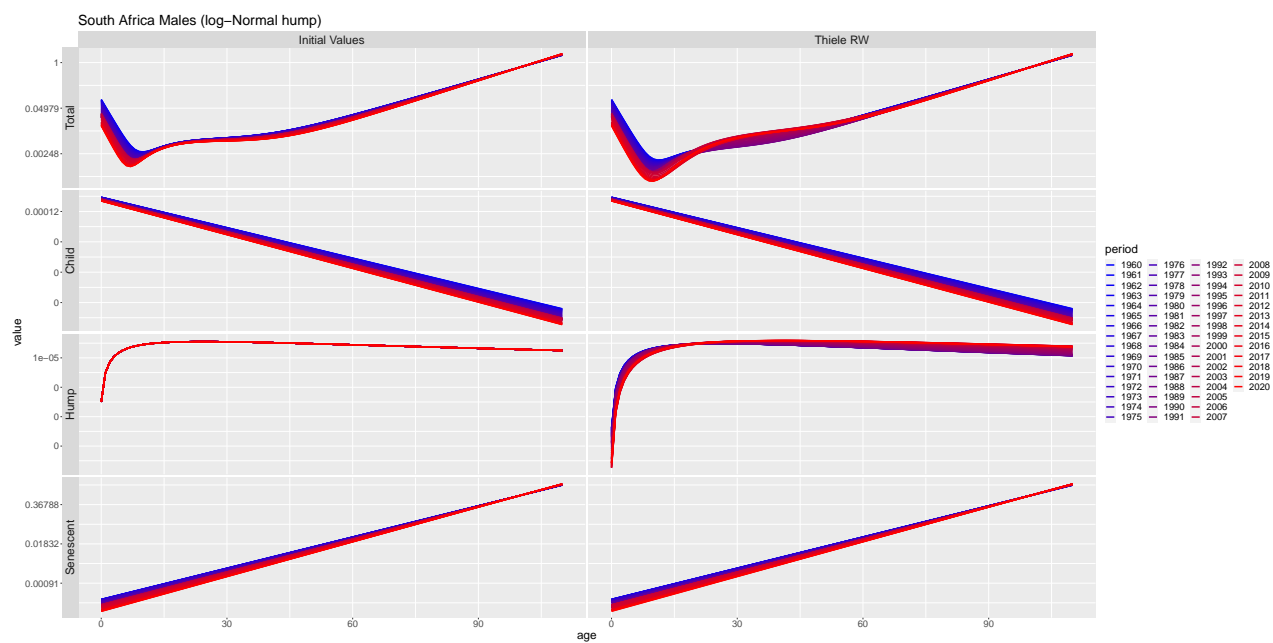


Figure 3: Thiele Decomposed

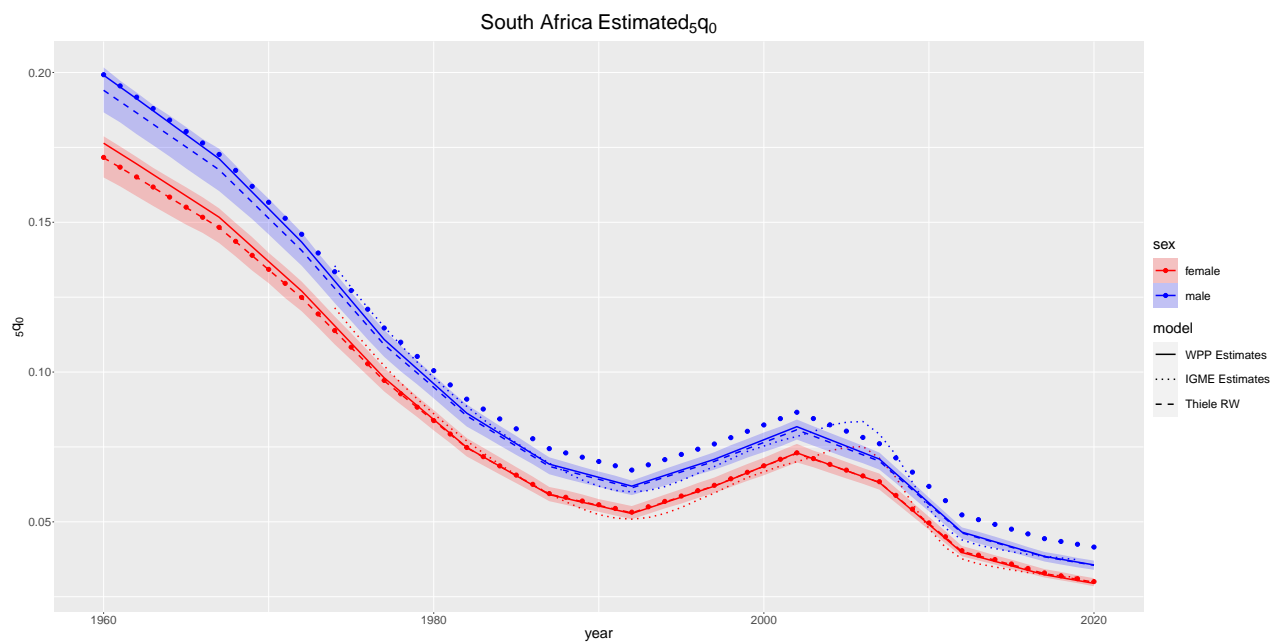


Figure 4: Estimated  $_5q_0$

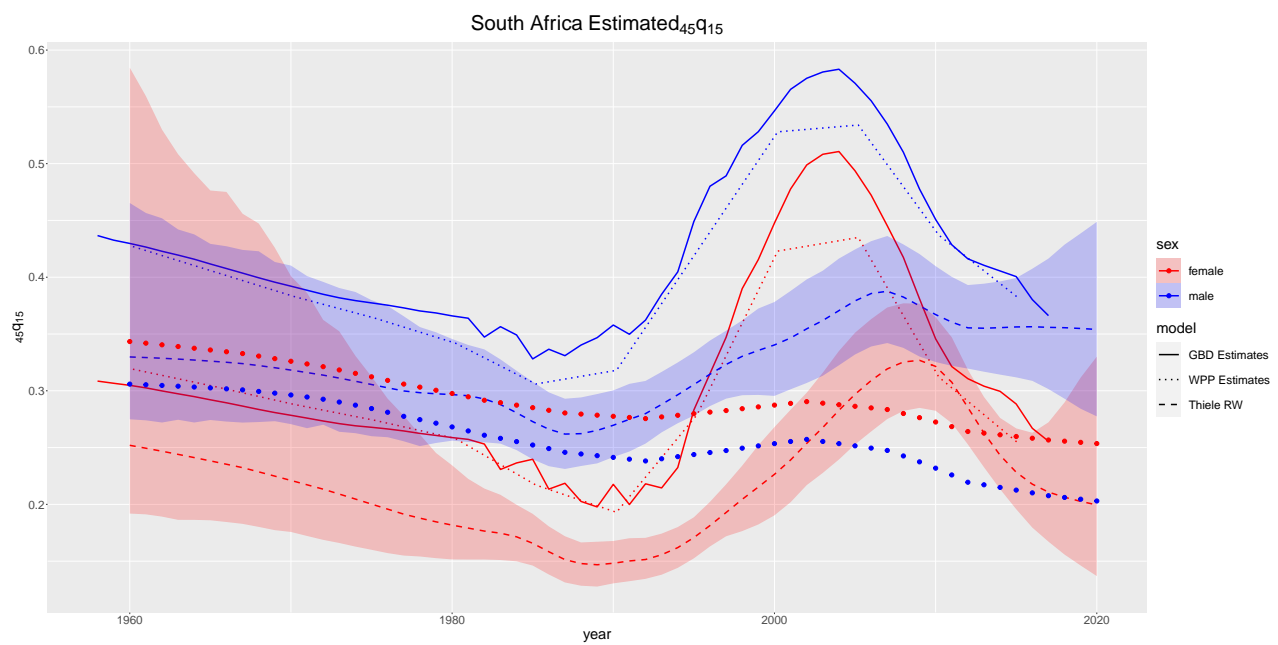


Figure 5: Estimated  $_{45}q_{15}$

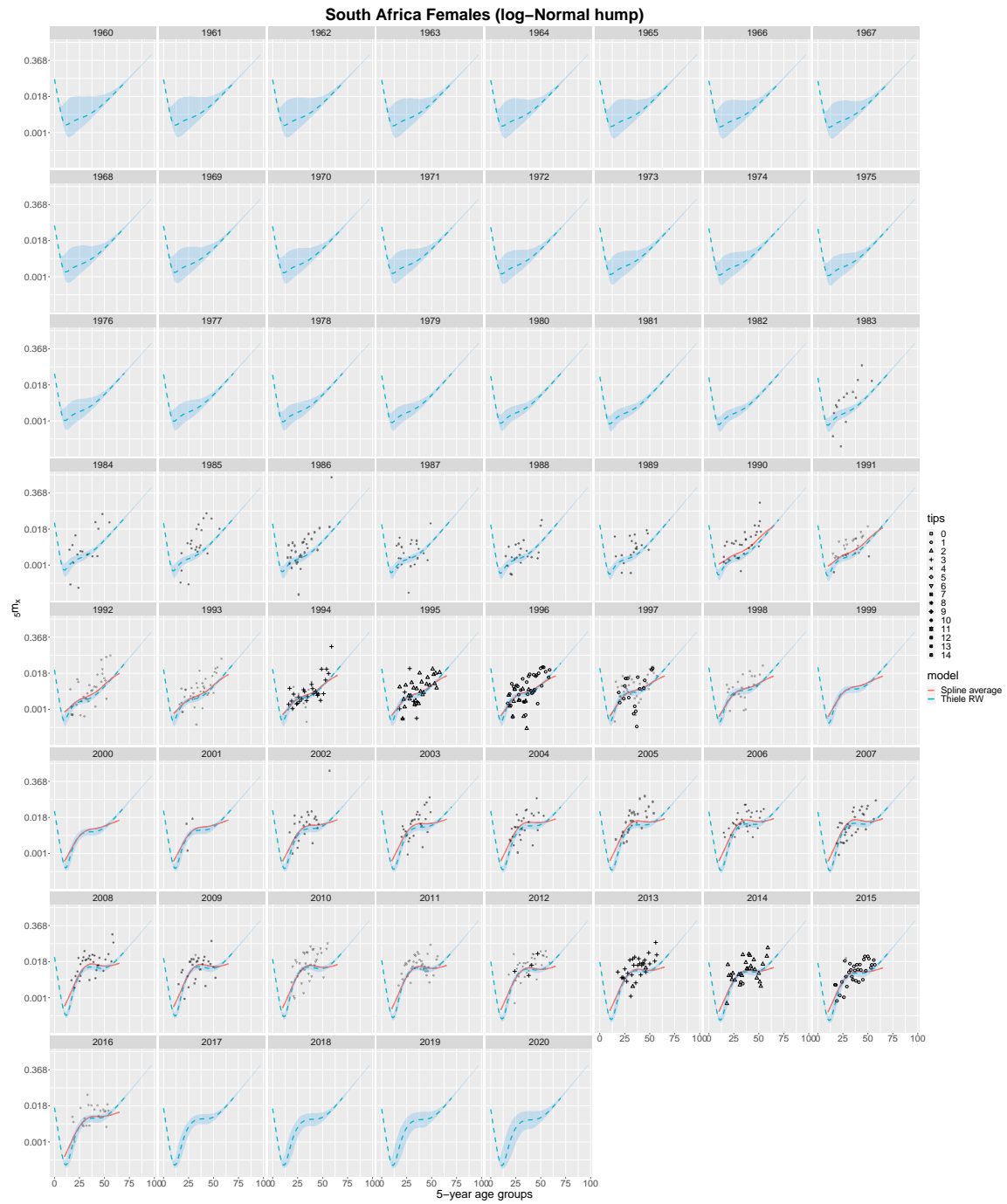


Figure 6: Mortality Schedules

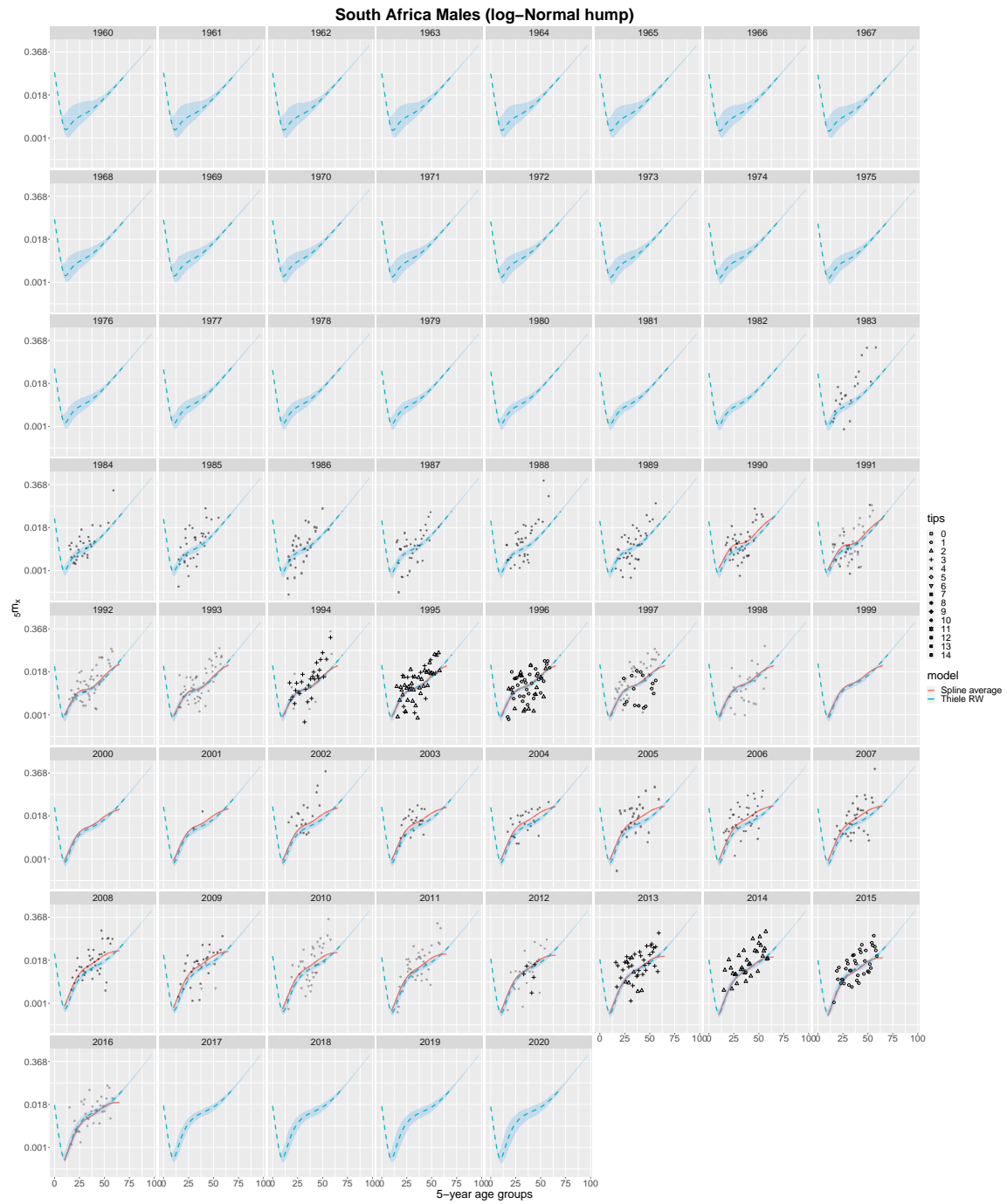


Figure 7: Mortality Schedules

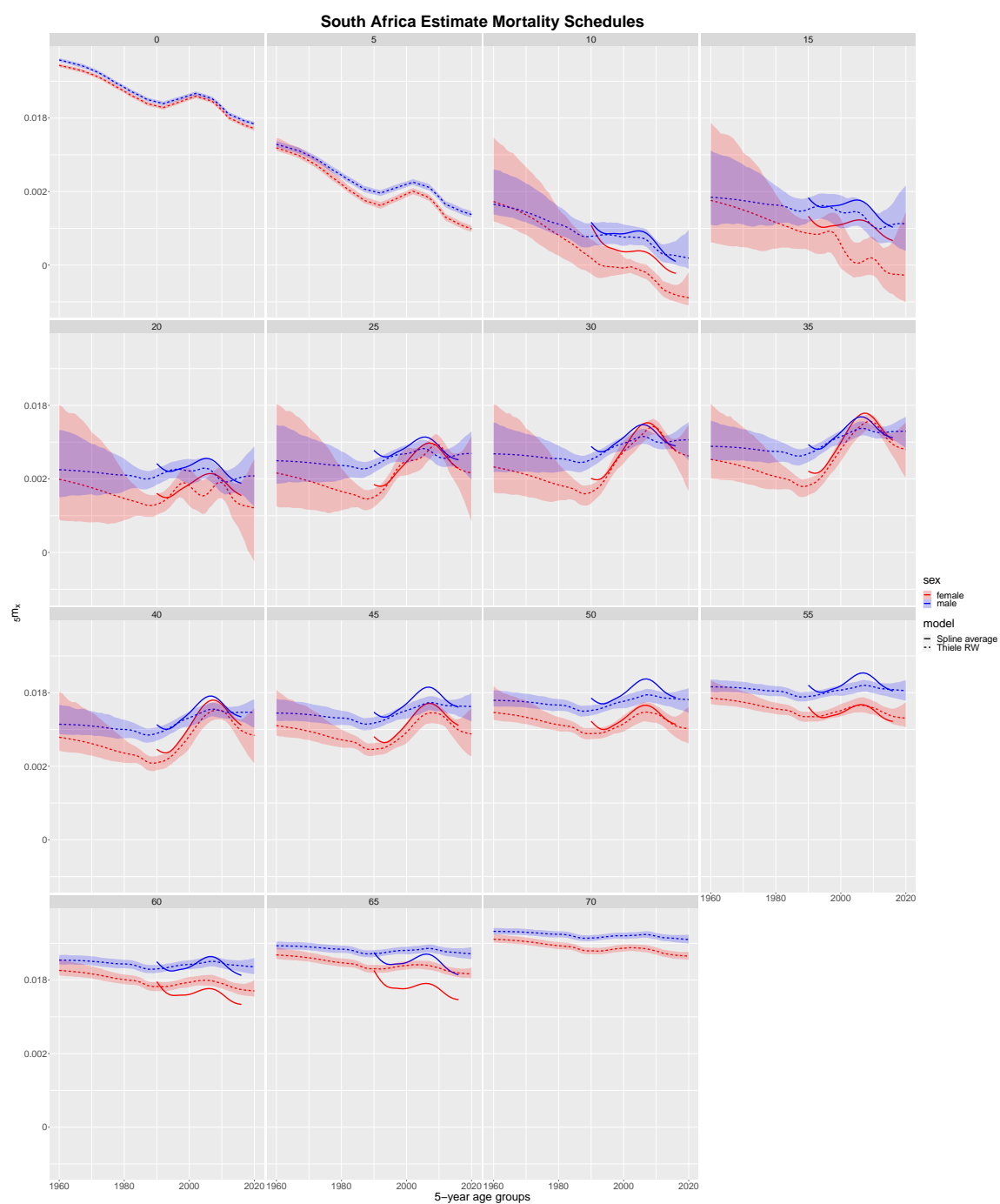


Figure 8: Mortality Schedules



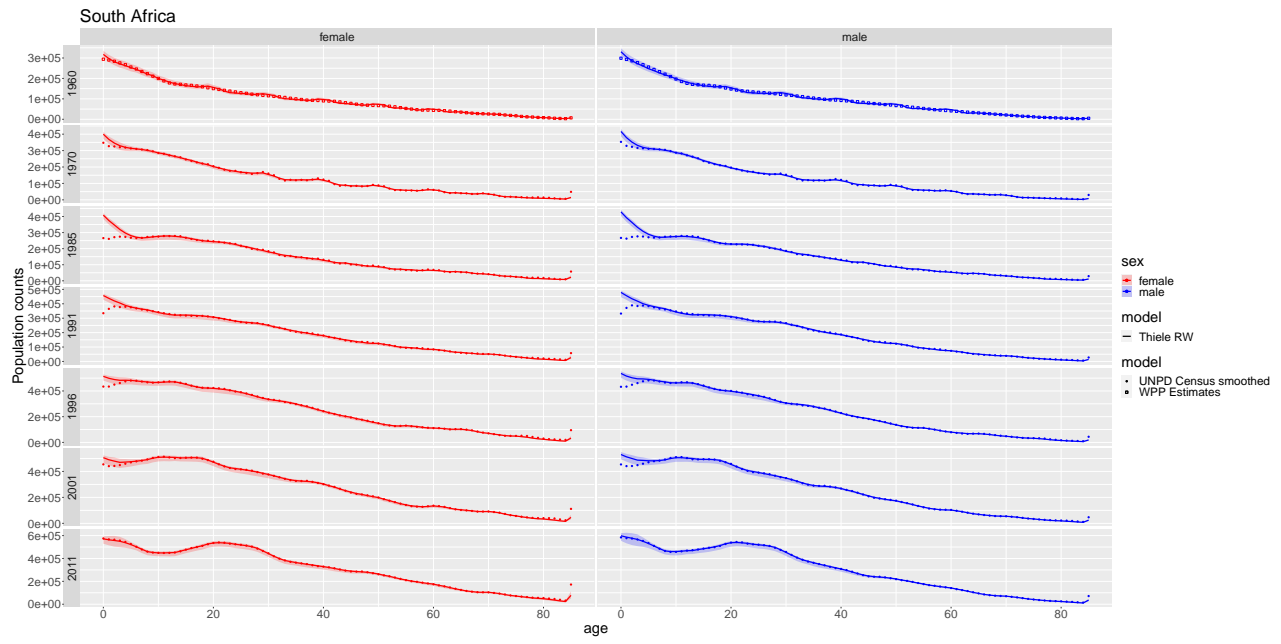


Figure 9: Population



Figure 10: Population

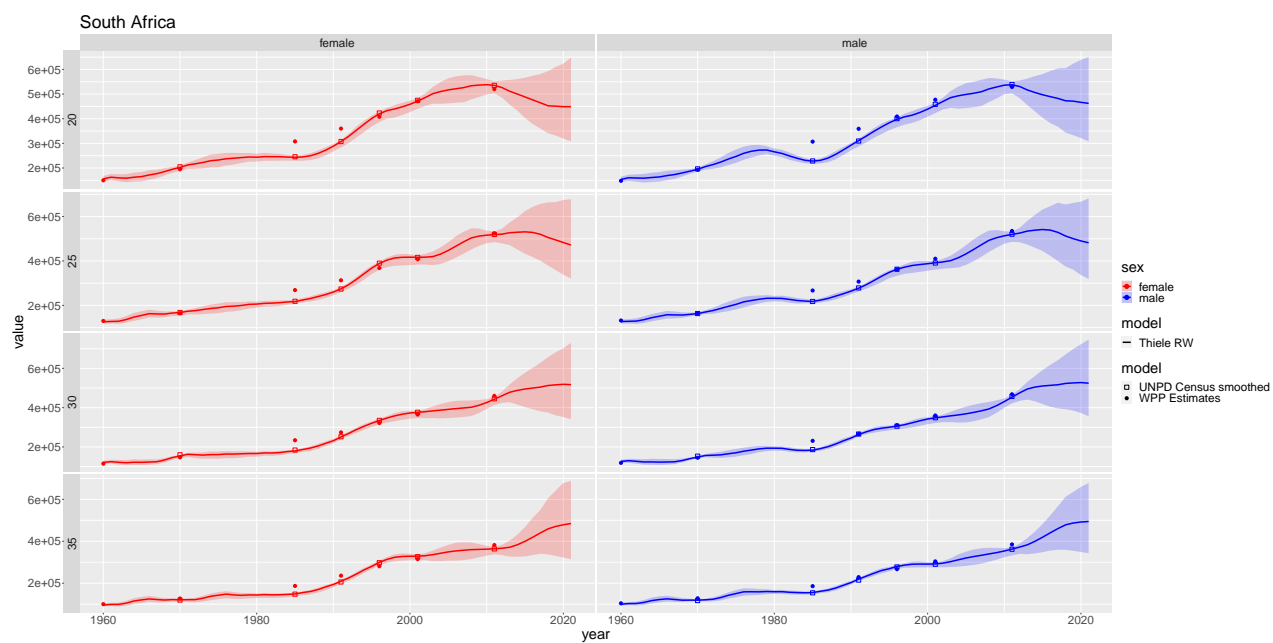


Figure 11: Population

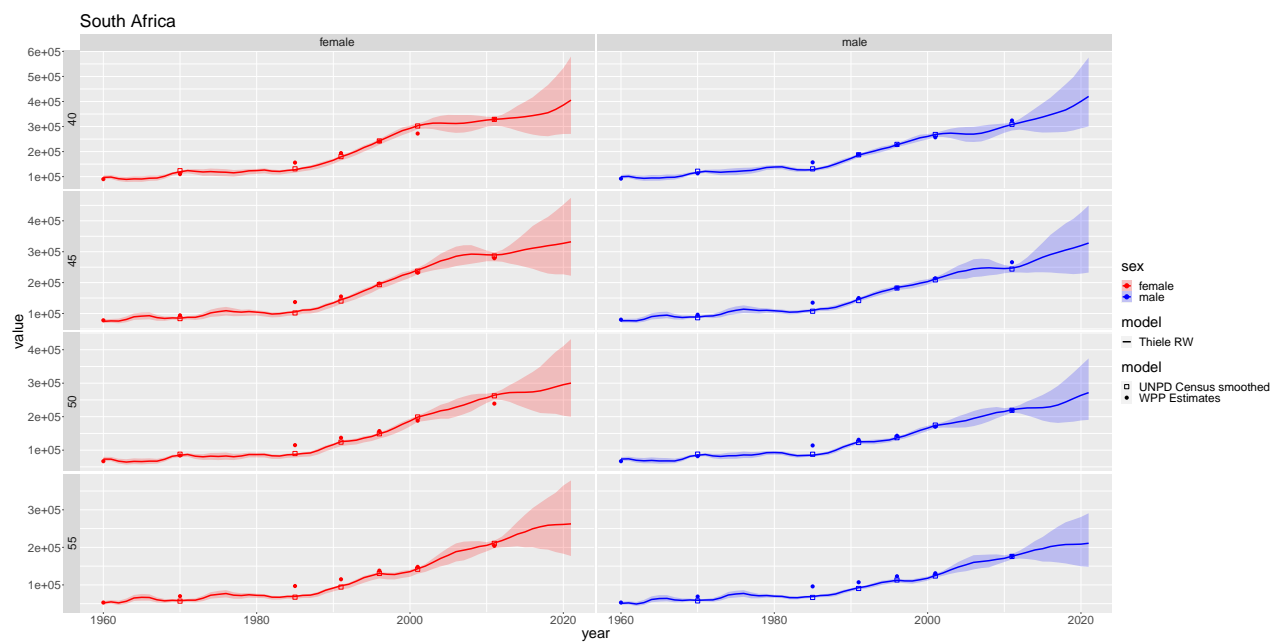


Figure 12: Population



Figure 13: Population

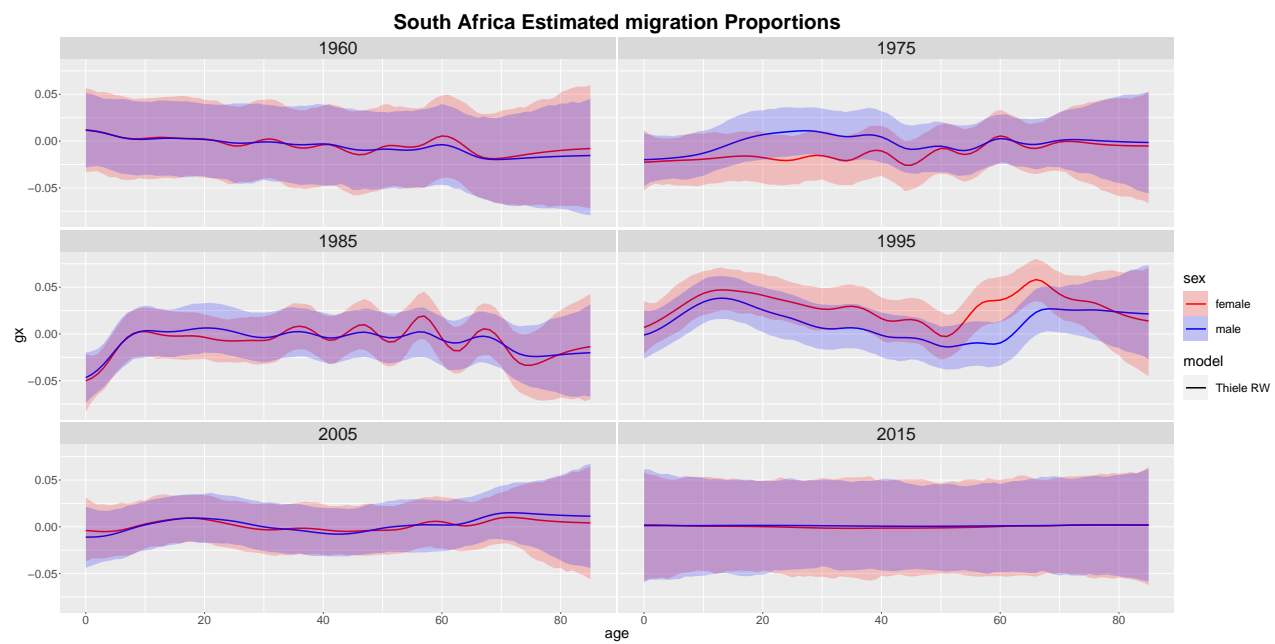


Figure 14: Migration

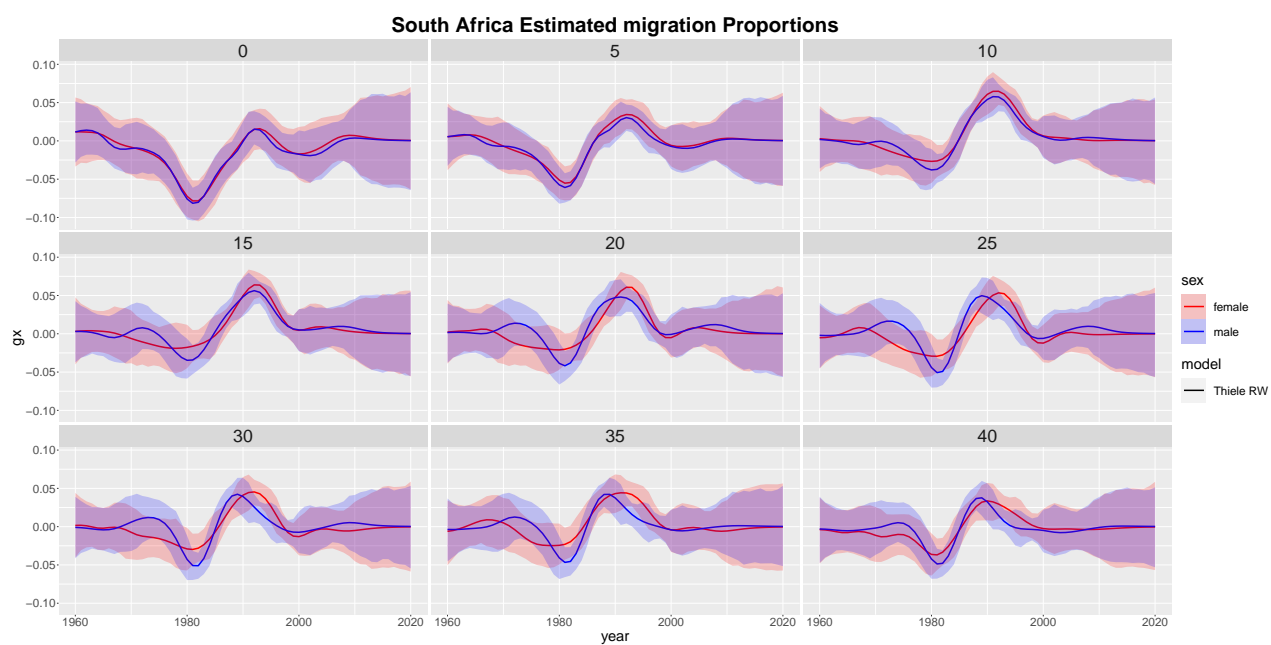


Figure 15: Migration

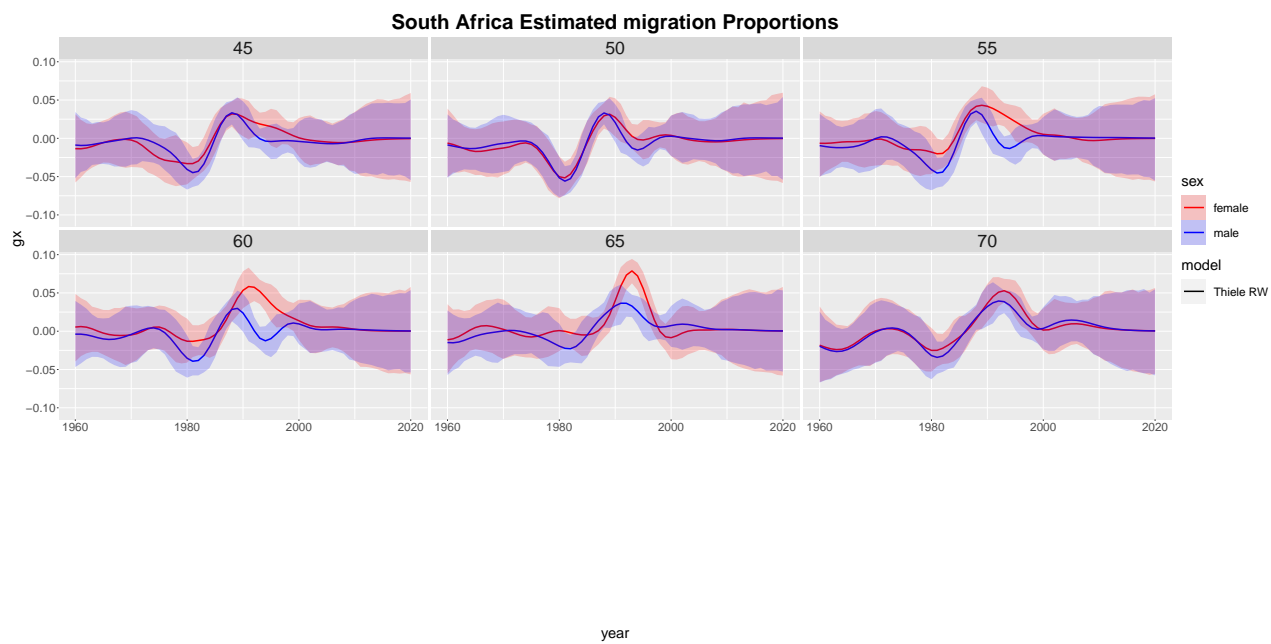


Figure 16: Migration

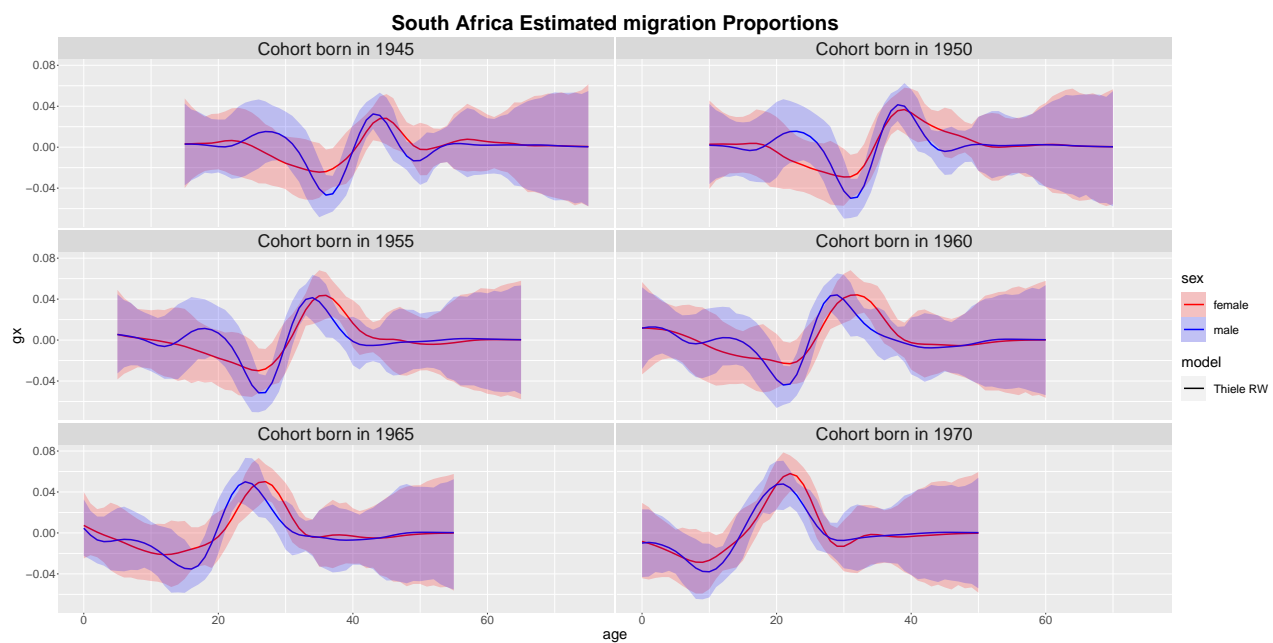


Figure 17: Migration

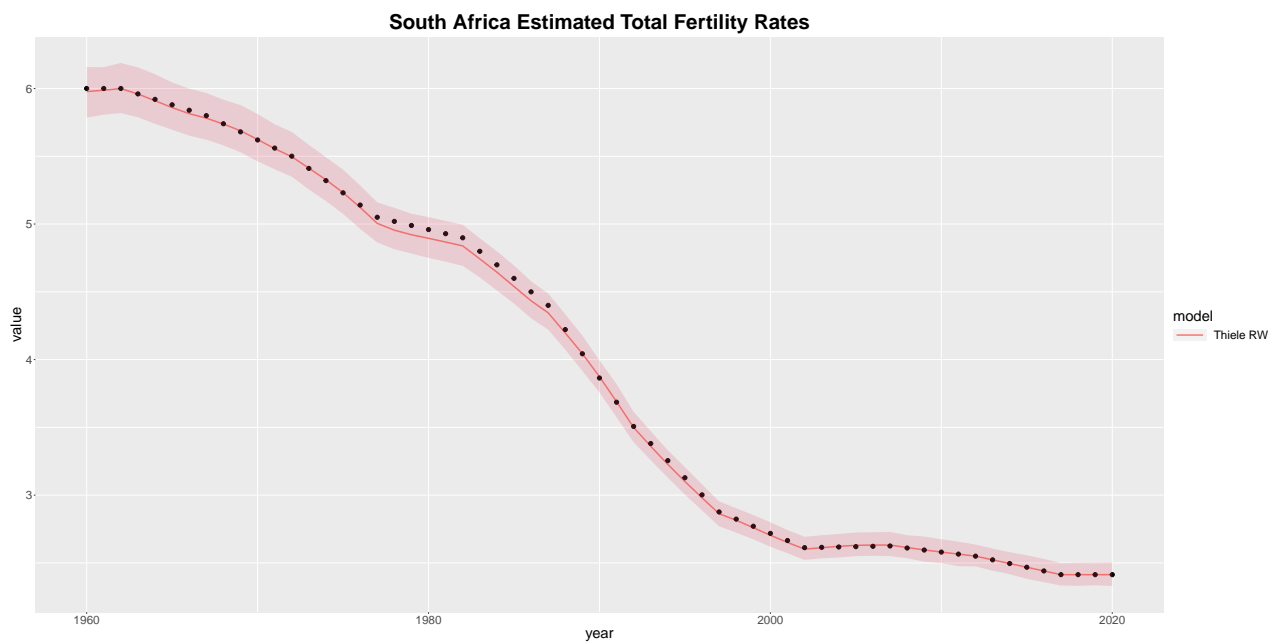


Figure 18: Total Fertility

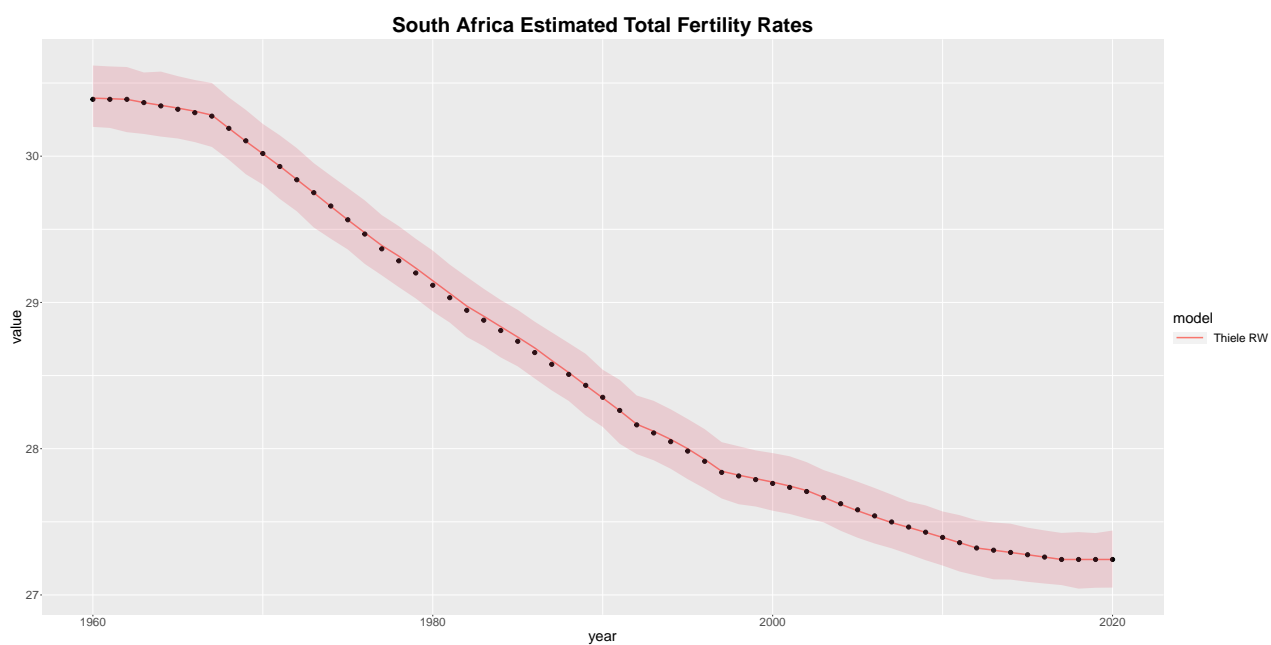


Figure 19: Mean age at births

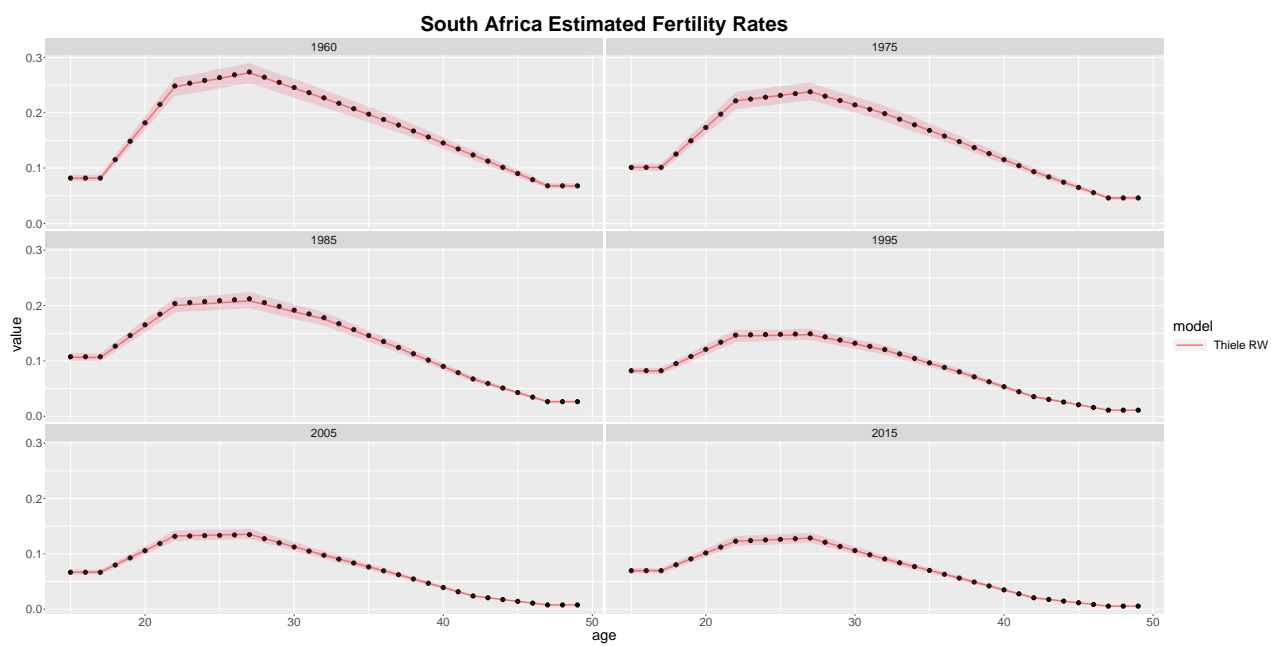


Figure 20: Fertility

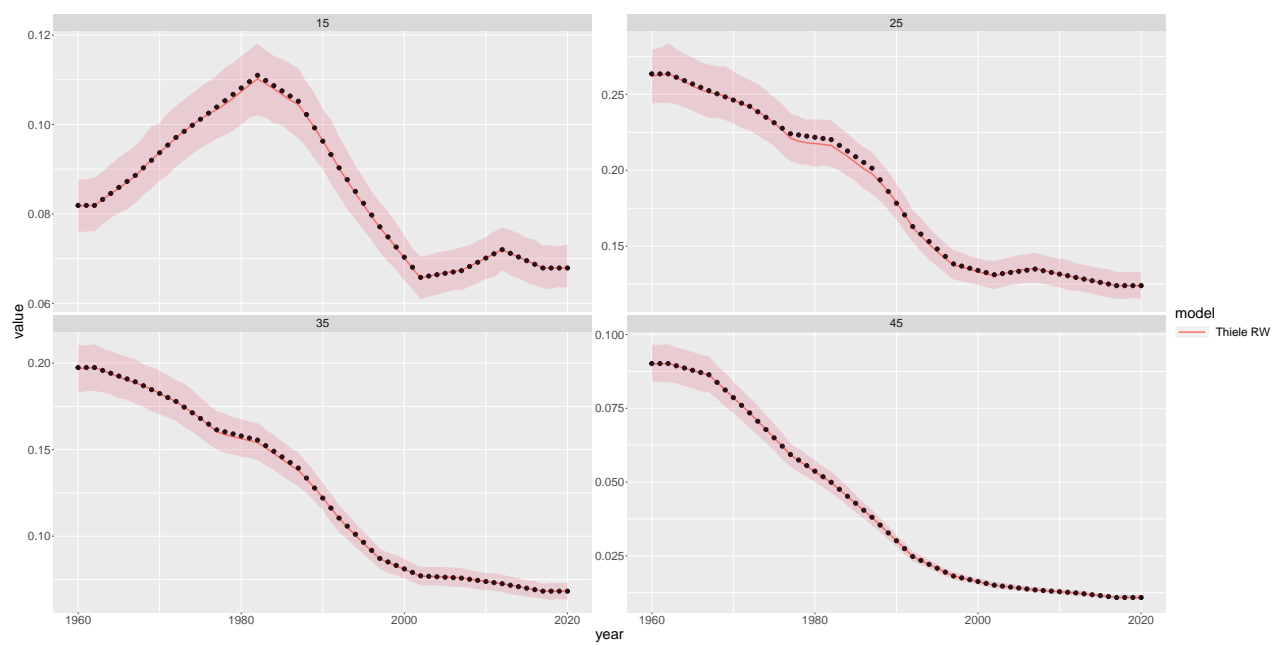


Figure 21: Fertility