Chad

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

```
## # A tibble: 87 x 2
##      age   `2009`
##    <dbl>    <dbl>
## 1      0 223013.
## 2      1 225725.
## 3      2 224369.
## 4      3 218945.
## 5      4 209452.
## 6      5 200769.
## 7      6 194799.
## 8      7 187613.
## 9      8 179213.
## 10     9 169597.
## # ... with 77 more rows
```

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

```
## # A tibble: 87 x 2
##      age   `2009`
##    <dbl>    <dbl>
## 1      0 228811.
## 2      1 231470.
## 3      2 230141.
## 4      3 224823.
## 5      4 215516.
## 6      5 207311.
## 7      6 201765.
## 8      7 194567.
## 9      8 185716.
## 10     9 175213.
## # ... with 77 more rows
```

Thiele log-Normal Hump Spline

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

```
##            log_tau2_logpop_f        log_tau2_logpop_f        log_tau2_logpop_m            log_tau2_
##                    5.3400363                4.5010522                5.3625744                    4
##            log_tau2_gx_m        log_lambda_gx_age_f        log_lambda_gx_age_m          log_lambda_g
##                    3.6182139                7.8731905                7.8488666                    7
##        log_lambda_gx_agetime_m           log_lambda_tp log_lambda_tp_0_inflated_sd          log_disp
##                    6.9077187                2.1213071               -3.4275796                    0
##        log_marginal_prec_psi_f      log_marginal_prec_A_f      log_marginal_prec_B_f     log_marginal_pr
##                    4.3115168                6.7746505                6.1128269                    4
##        log_marginal_prec_B_m          log_lambda_phi_f          log_lambda_psi_f           log_lambda_
##                    5.0545553                4.3485618                4.3229657                    4
##            log_lambda_A_f            log_lambda_B_f          log_lambda_phi_m             log_lamb
##                    4.3051504                4.2669413                4.3616079                    4
##        log_lambda_epsilon_m          log_lambda_A_m            log_lambda_B_m
##                    4.3875601                4.3059857                4.2152046
```
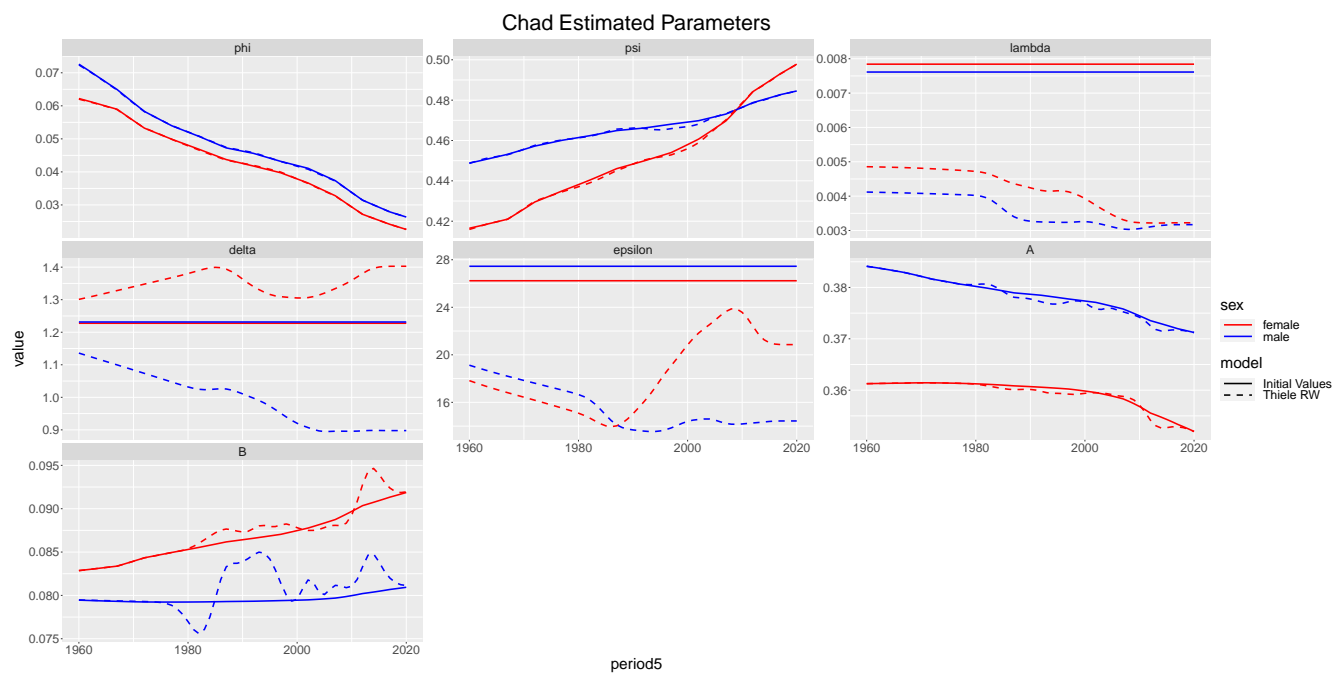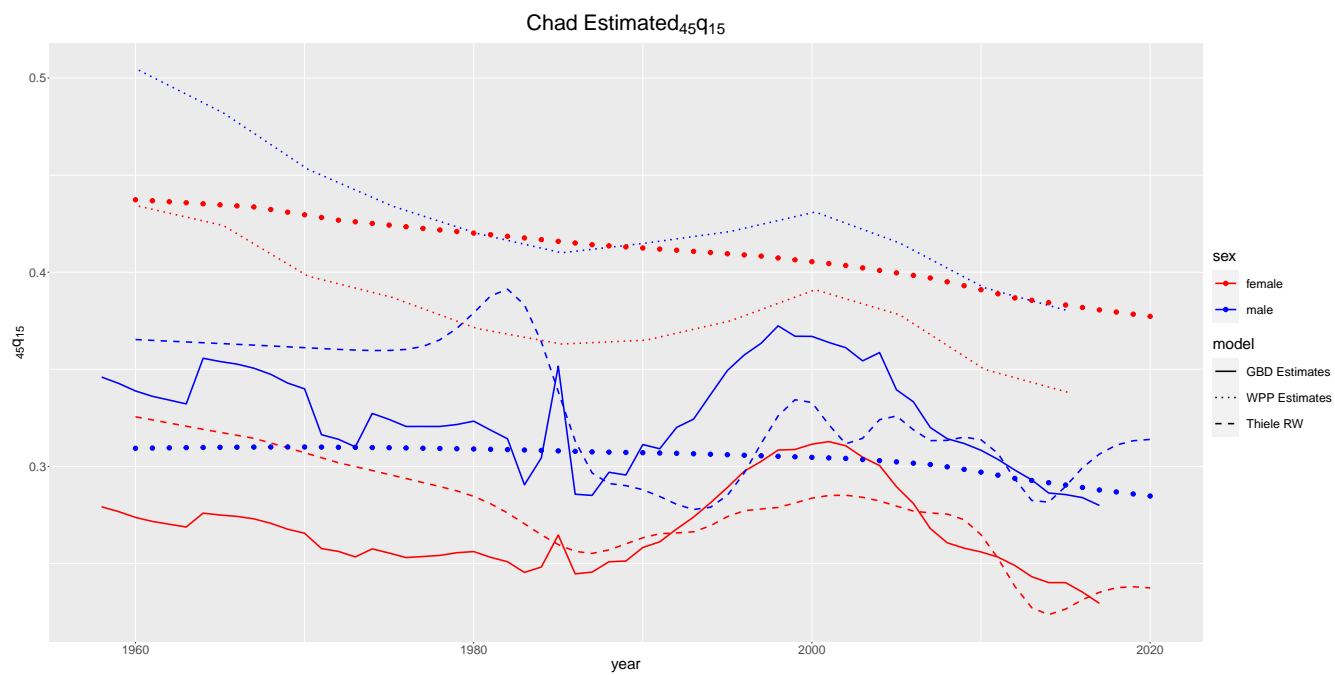
Figure 1: Estimated parameters
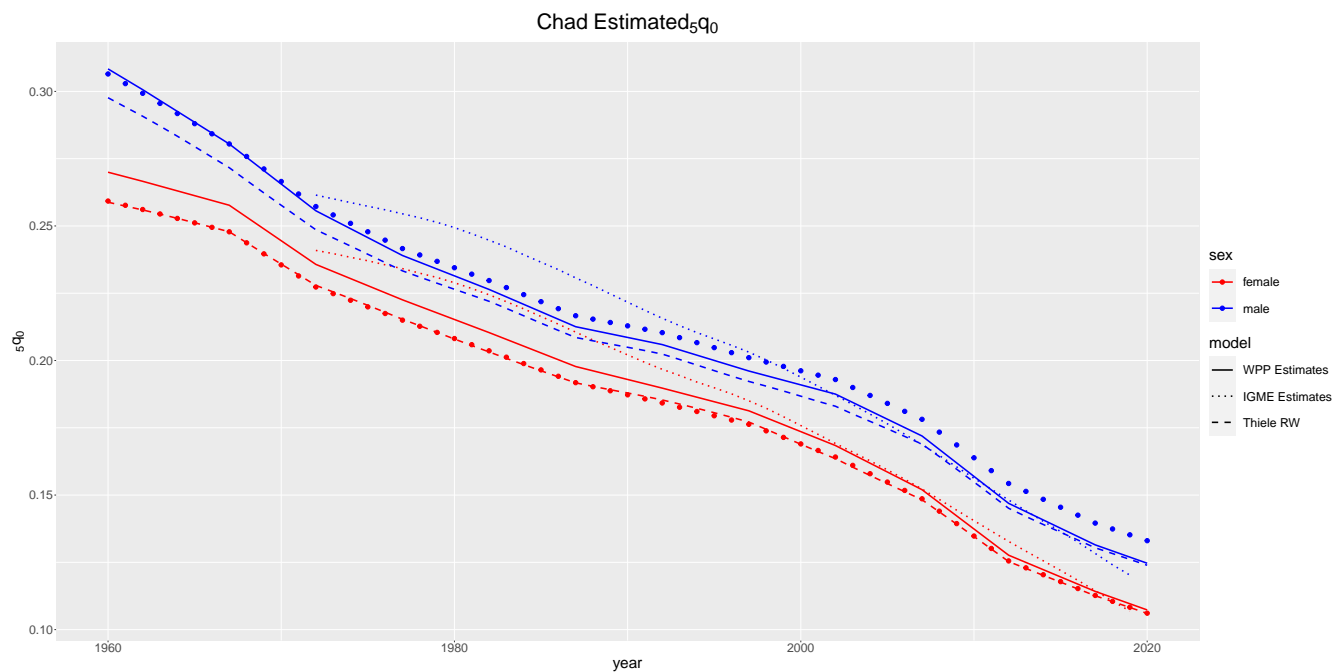
Figure 2: Estimated $_{45}q_{15}$
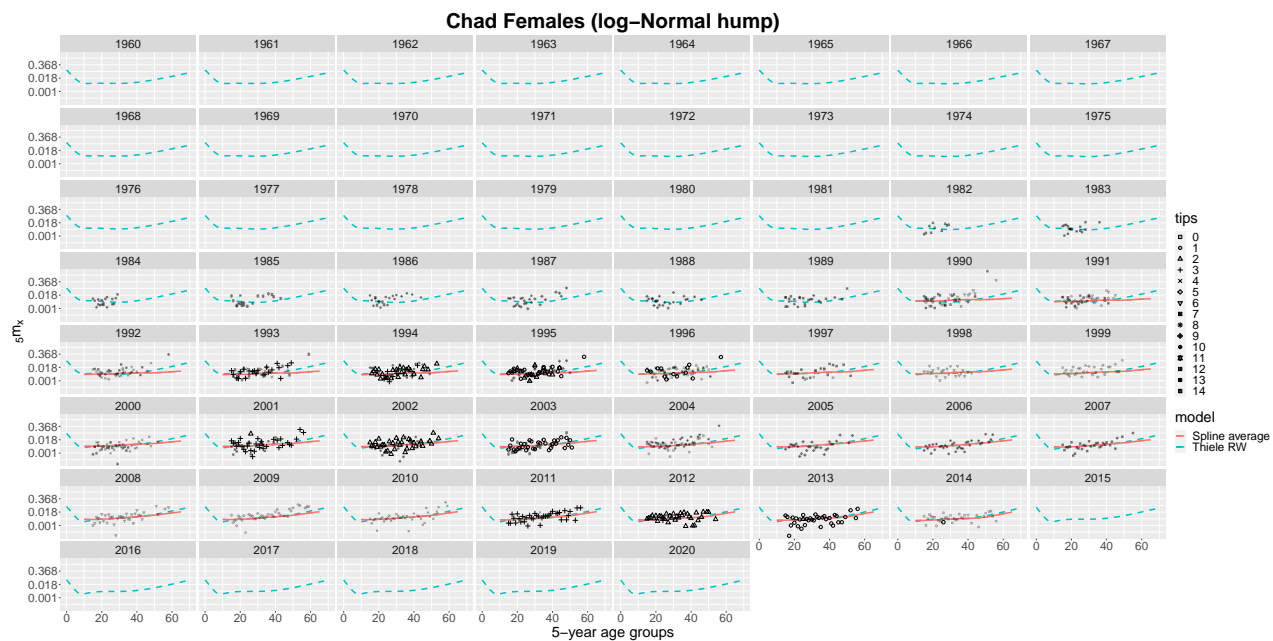
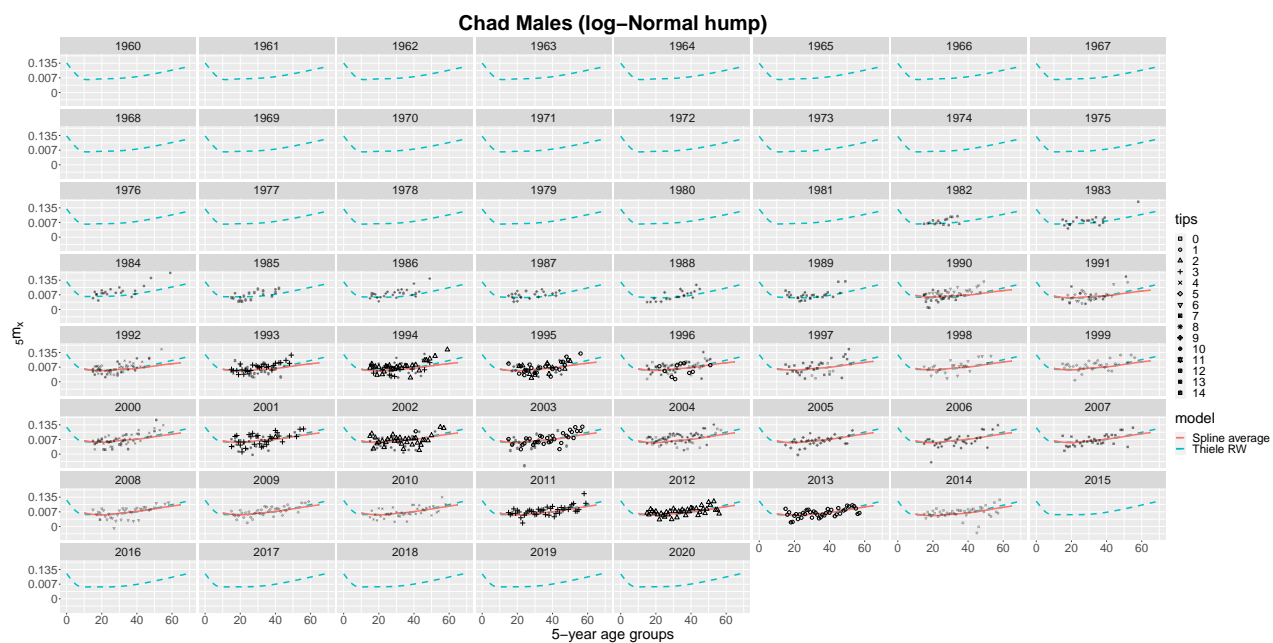Figure 3: Estimated $_5q_0$

Figure 4: Mortality Schedules
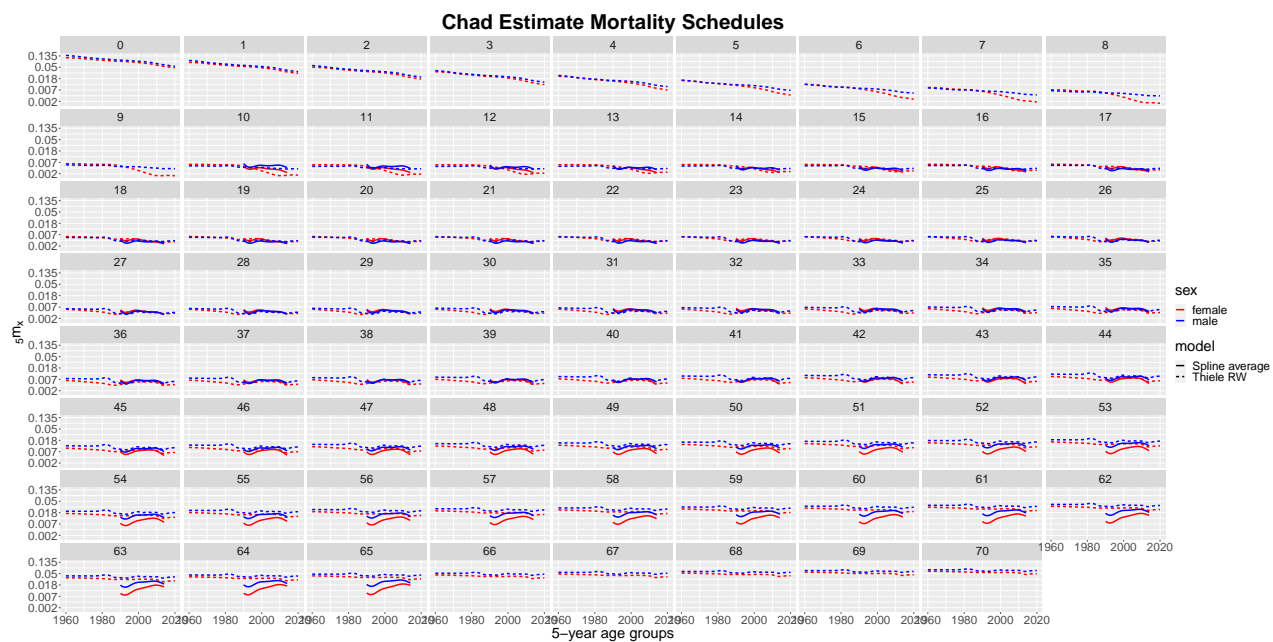
4

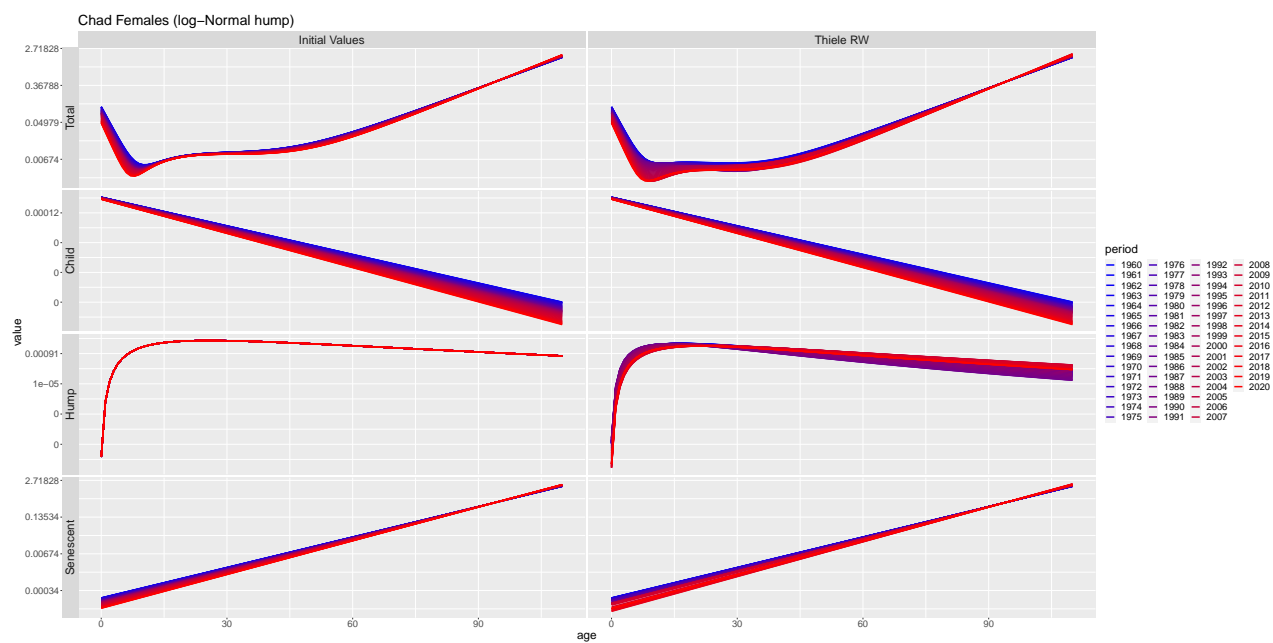Figure 5: Mortality Schedules

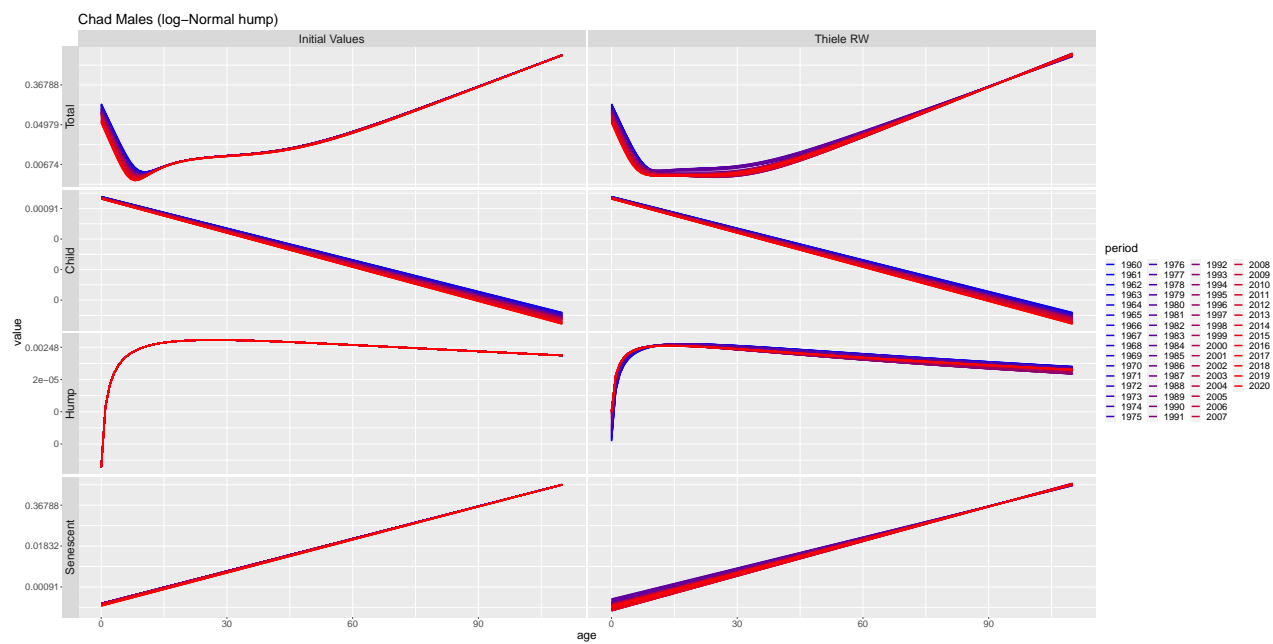Figure 6: Mortality Schedules

5

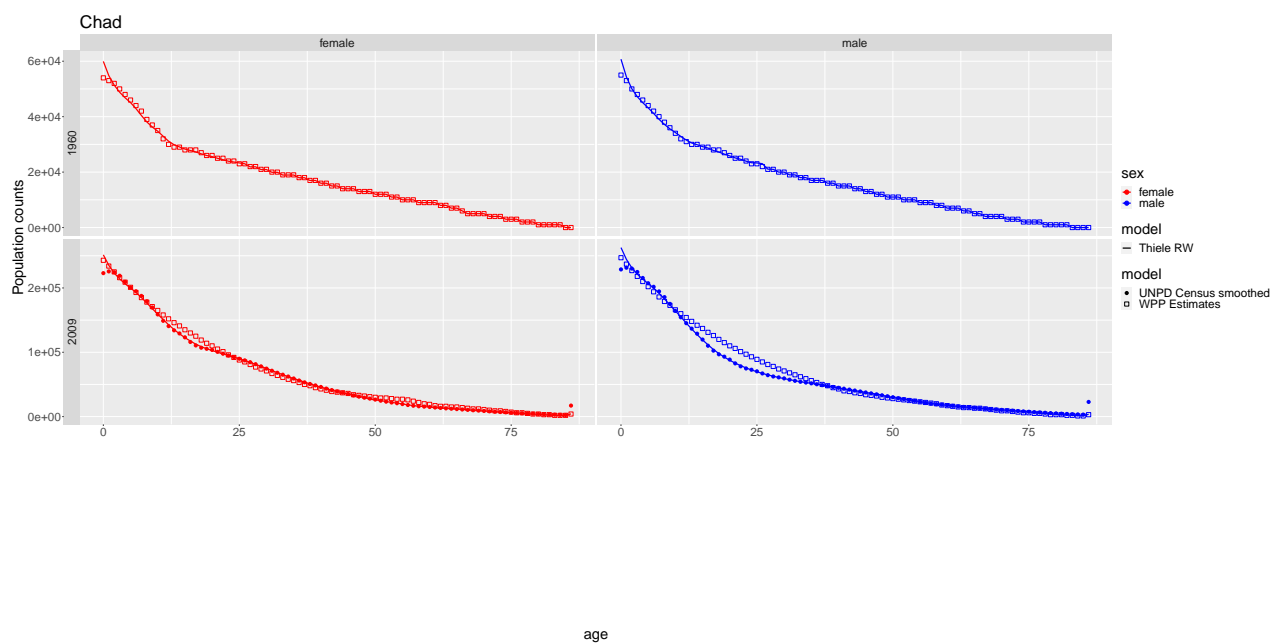Figure 7: Thiele Decomposed
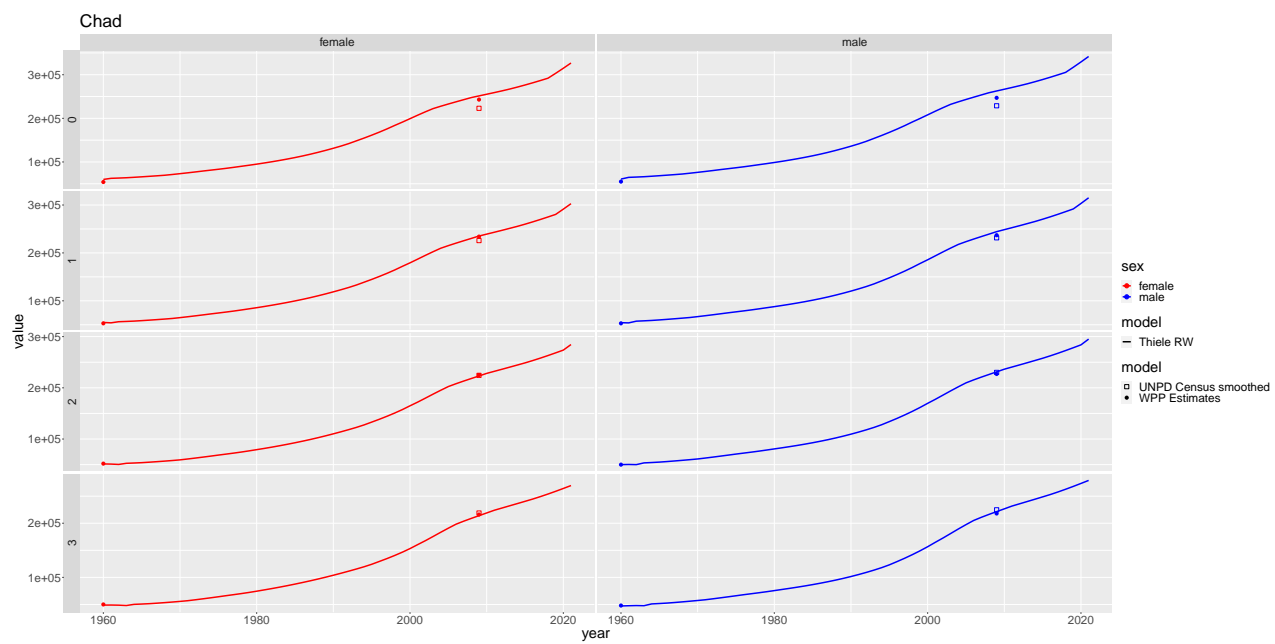

Figure 8: Thiele Decomposed

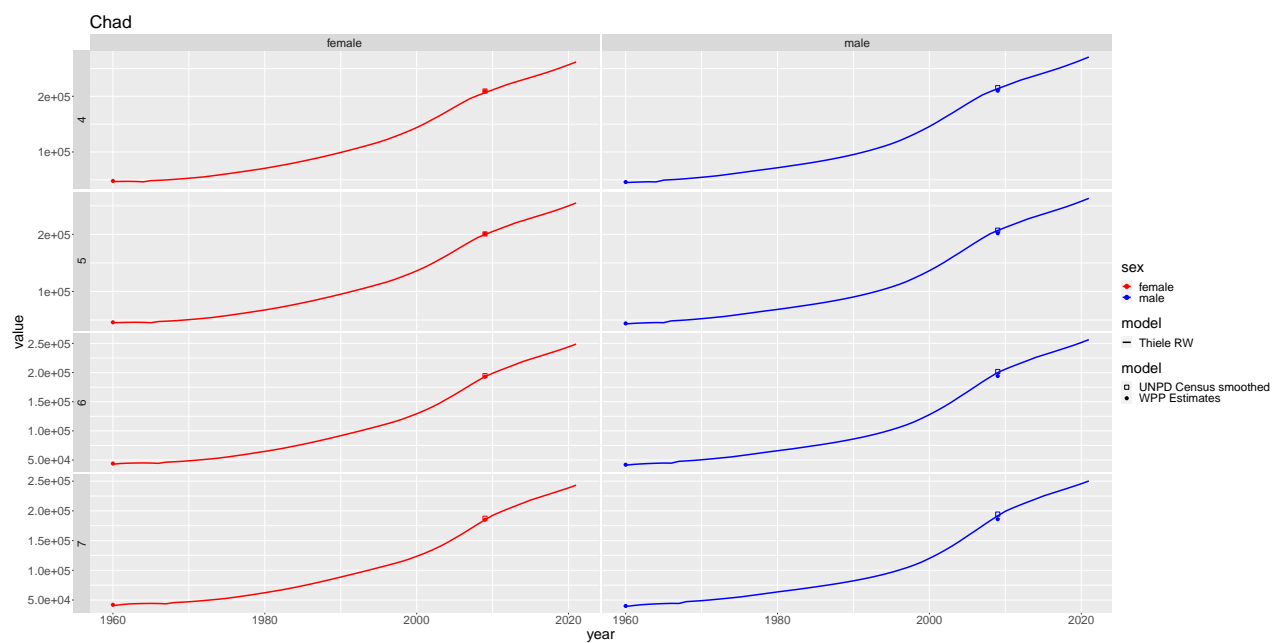Figure 9: Population

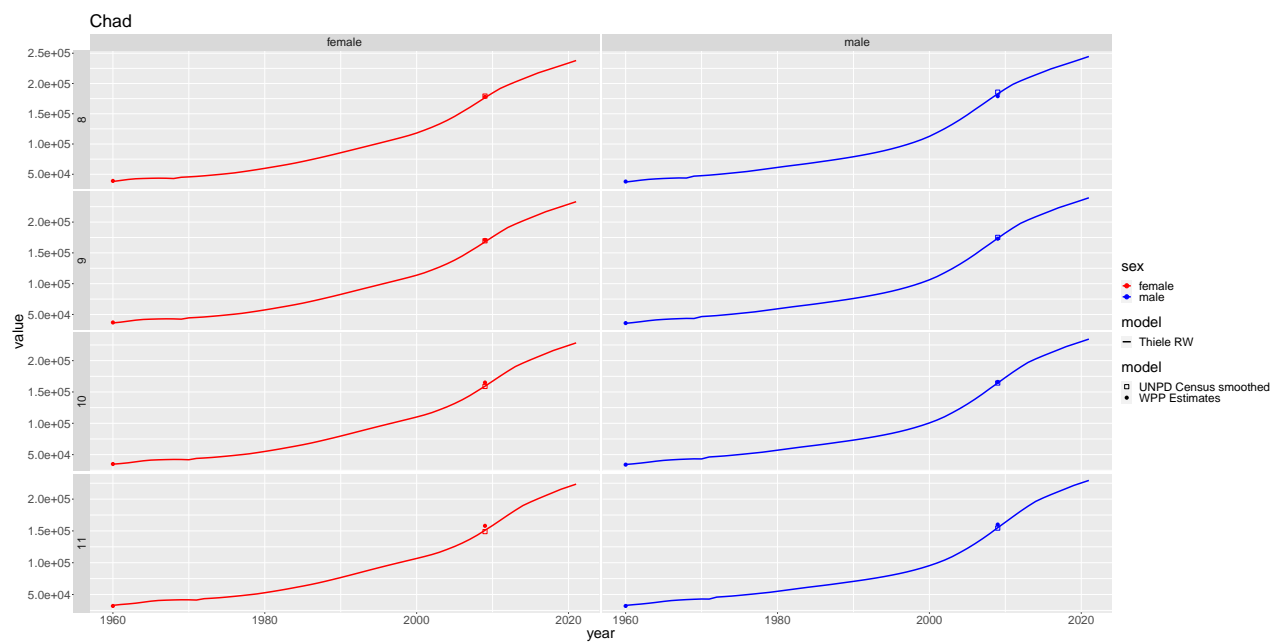

Figure 10: Population
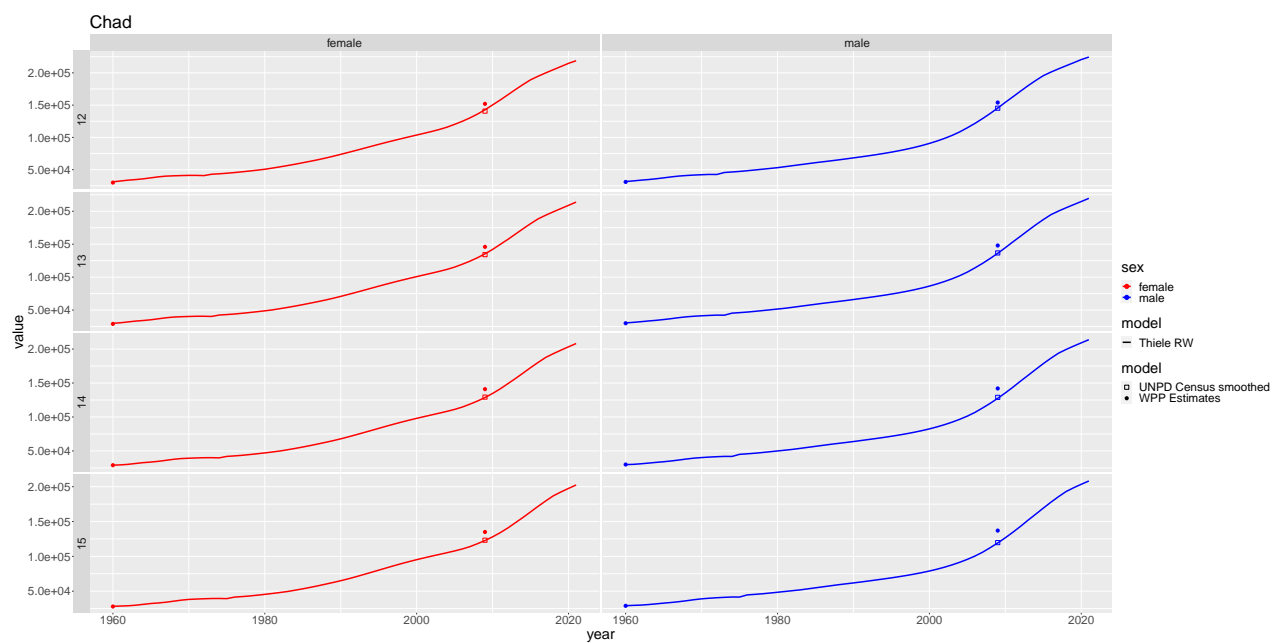
7

Figure 11: Population

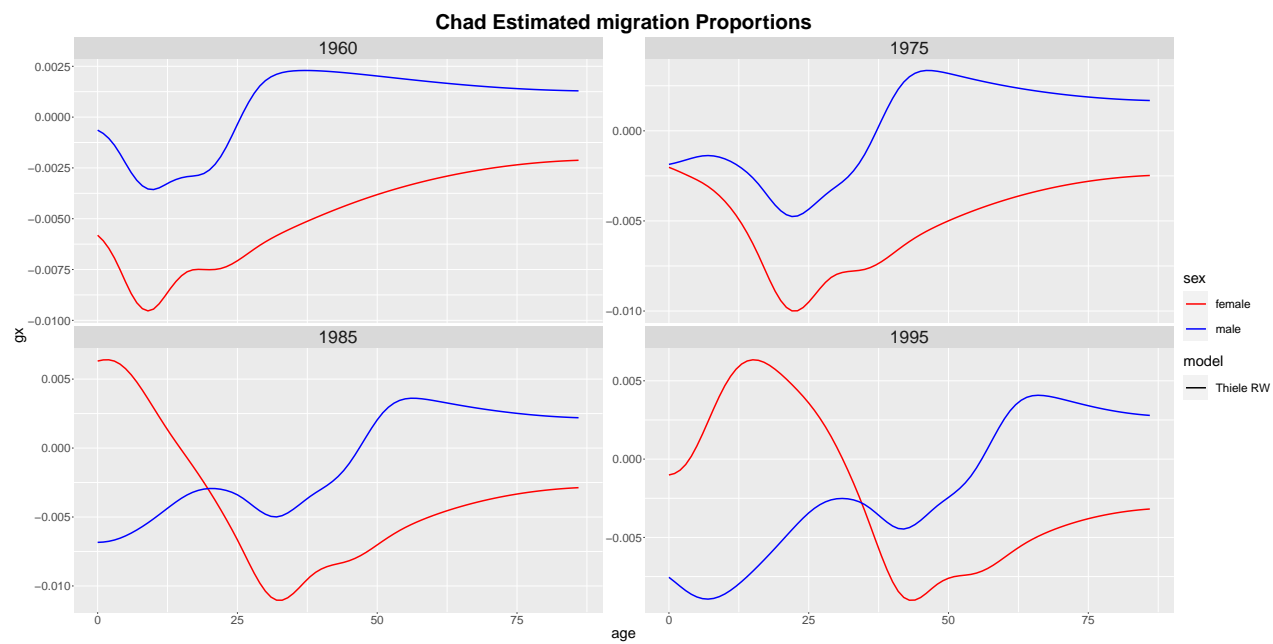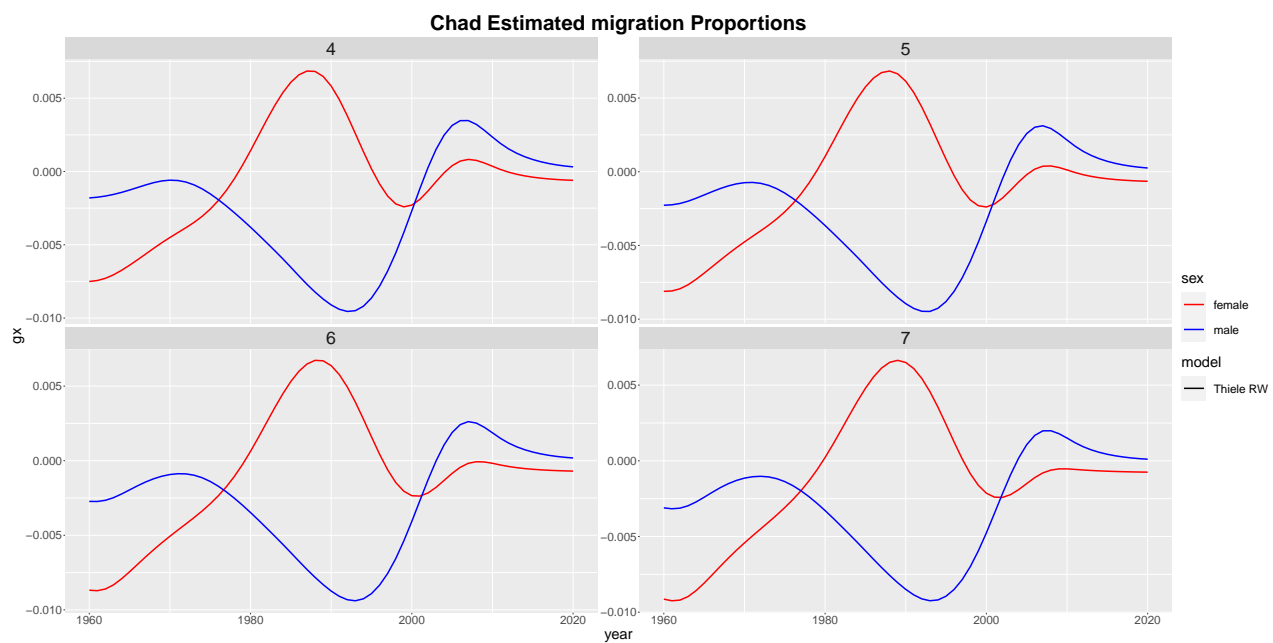Figure 12: Population

Figure 13: Population

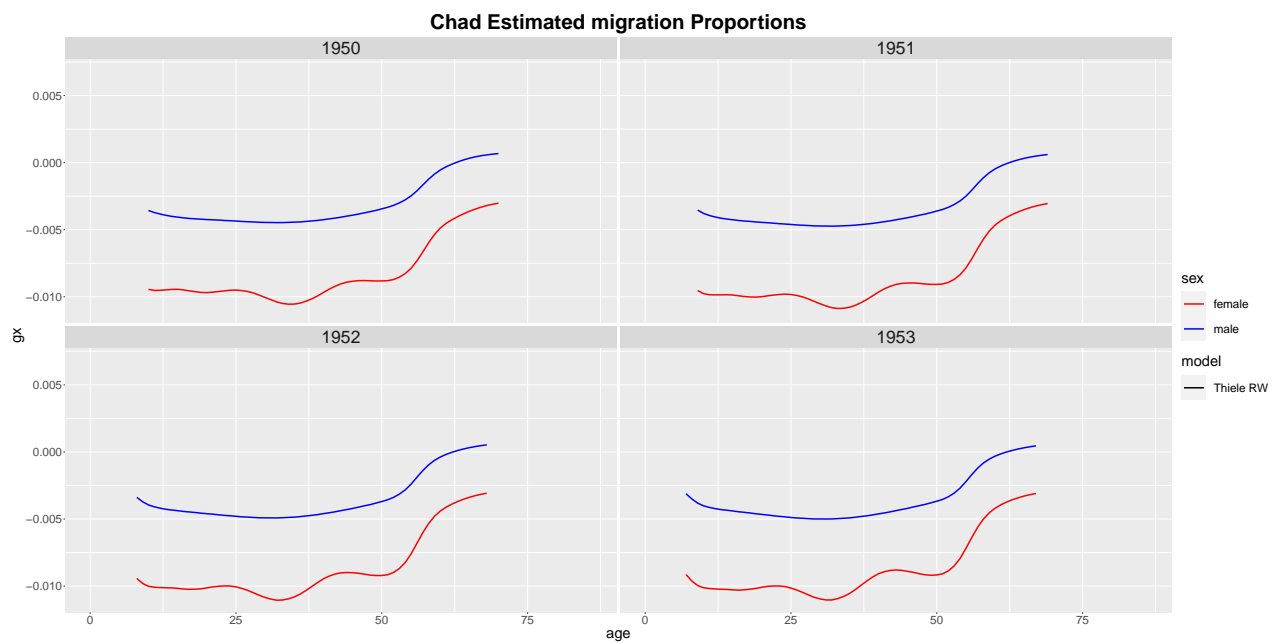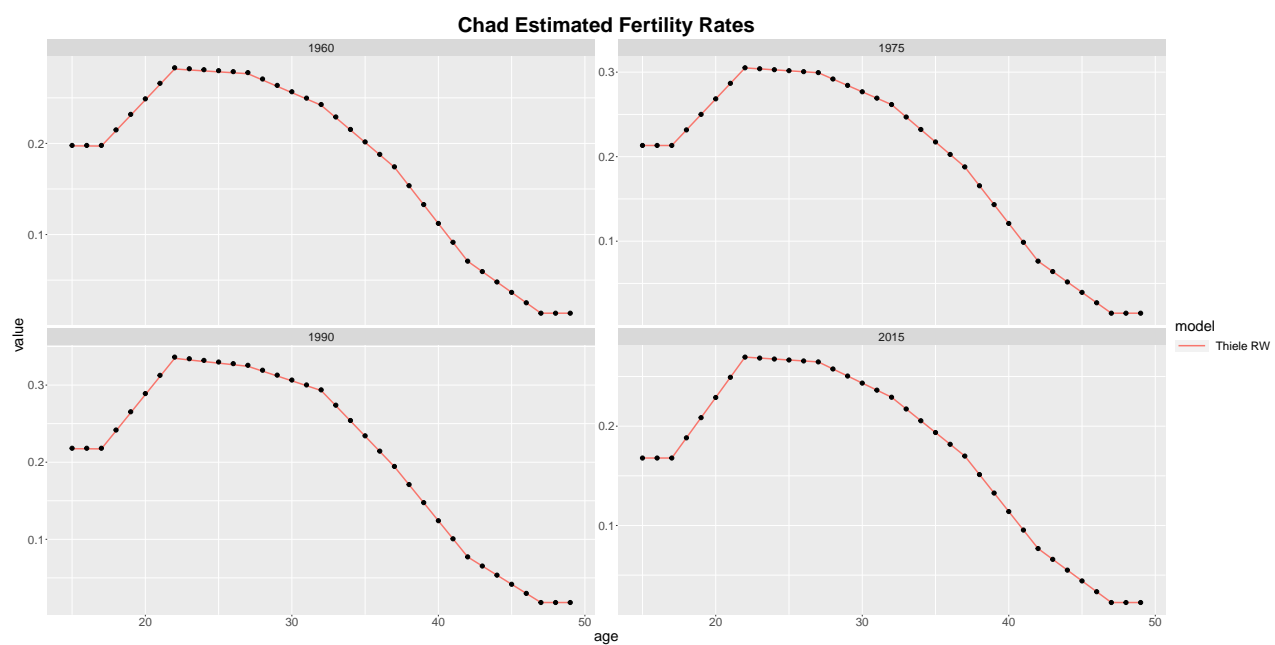Figure 14: Migration
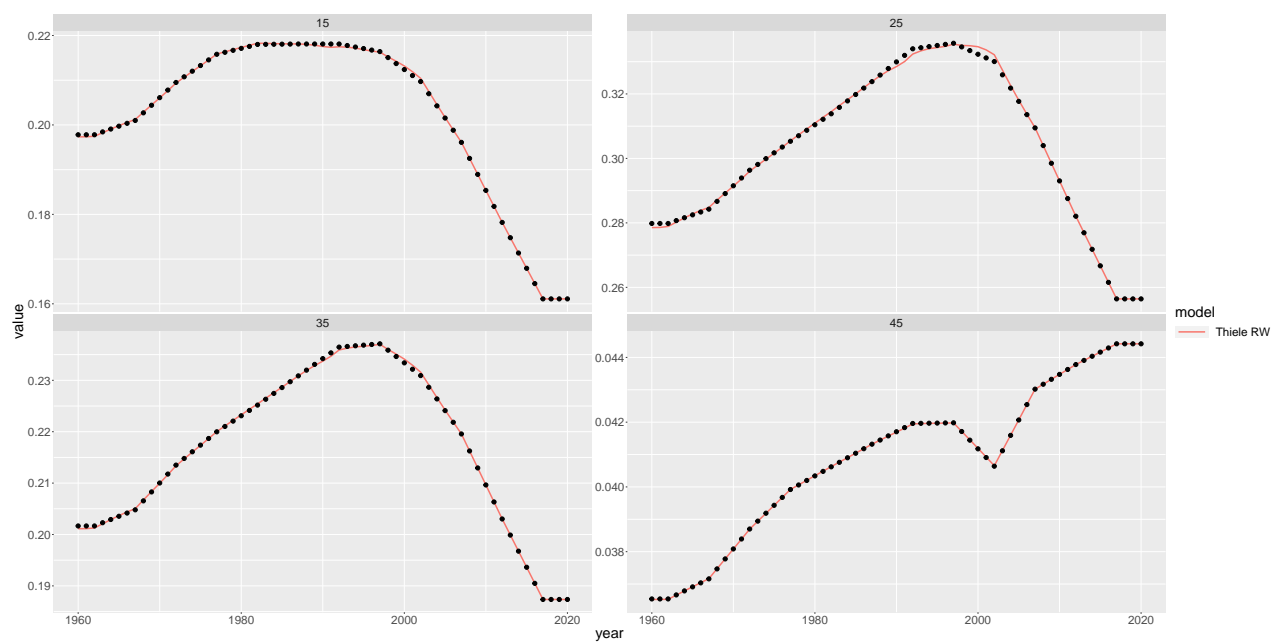
9

Figure 15: Migration

Figure 16: Migration

Chad Estimated Fertility Rates
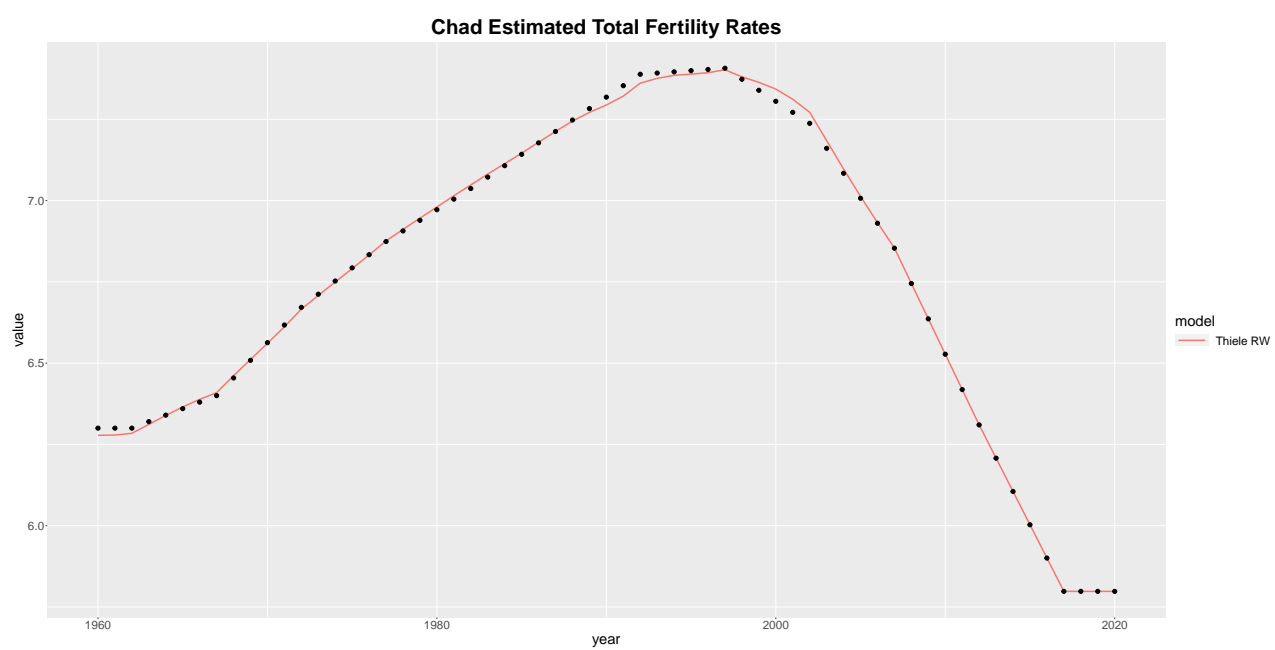

Figure 17: Fertility

Figure 18: Fertility

Chad Estimated Total Fertility Rates

Figure 19: Total Fertility