

Chad

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

## # A tibble: 18 x 3
##   aggr.age `1993` `2009`
## *   <dbl>   <dbl>   <dbl>
## 1      0 562409. 1101503.
## 2      5 500500.  931991.
## 3     10 401707.  711849.
## 4     15 317016.  562362.
## 5     20 269428.  489393.
## 6     25 239247.  421552.
## 7     30 199817.  341396.
## 8     35 162208.  267779.
## 9     40 132464.  207156.
## 10    45 104416.  156552.
## 11    50  82104.  117108.
## 12    55  63802.   85960.
## 13    60  52006.   67598.
## 14    65  39956.   52302.
## 15    70  38176.   38355.
## 16    75  37582.   26391.
## 17    80      NA   16551.
## 18    85      NA   19565.
```

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

## # A tibble: 18 x 3
##   aggr.age `1993` `2009`
## *   <dbl>   <dbl>   <dbl>
## 1      0 567470. 1130761.
## 2      5 510473.  964574.
## 3     10 408514.  729538.
## 4     15 298617.  522475.
## 5     20 225577.  397175.
## 6     25 191518.  325200.
## 7     30 166186.  279434.
## 8     35 139564.  244519.
## 9     40 114484.  209622.
## 10    45  91839.  173042.
## 11    50  73183.  136213.
## 12    55  58250.  102671.
## 13    60  48631.   79671.
## 14    65  38604.   61274.
## 15    70  37058.   46124.
## 16    75  41378.   32356.
## 17    80      NA   20802.
## 18    85      NA   25930.
```

Thiele log-Normal Hump RW

```
## Warning in fit_tmb(input.thiele.loghump.oag.vec.RW, inner_verbose = FALSE, : convergence error: false c
```

```
##      user  system elapsed
##      5.21    0.10    5.30
## [1] "false convergence (8)"
```

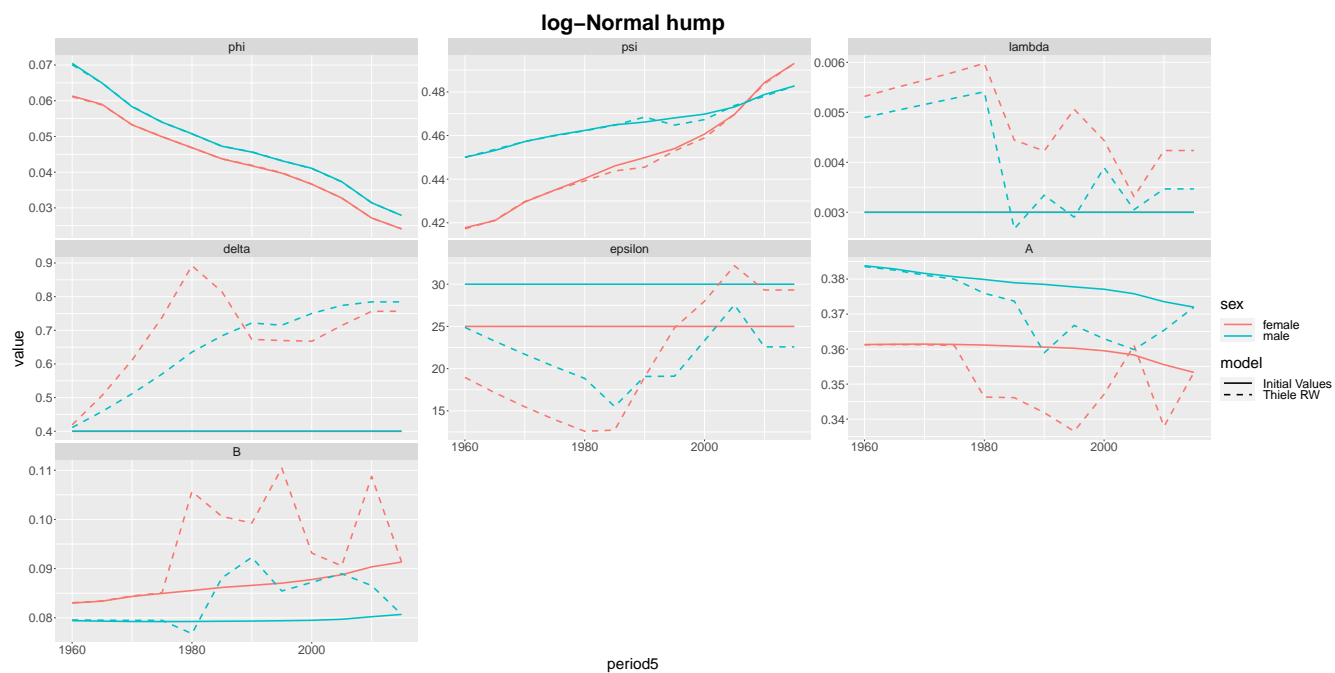


Figure 1: Estimated parameters



Figure 2: Estimated $45q_{15}$

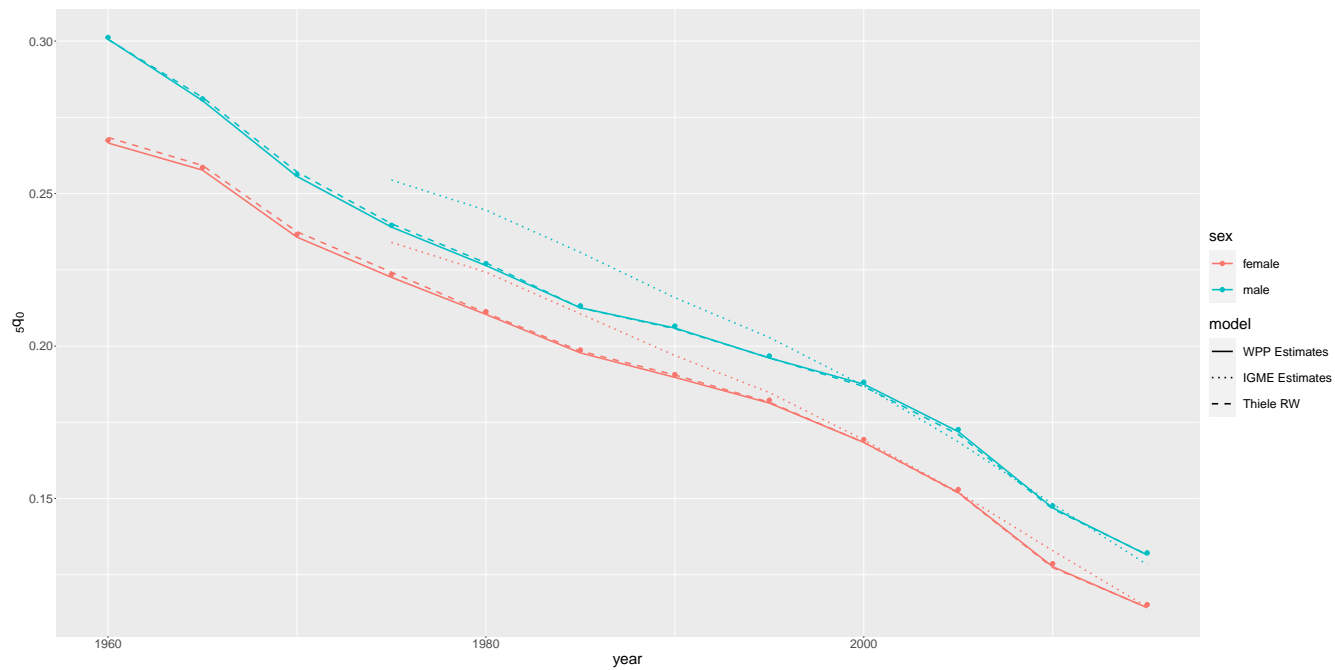


Figure 3: Estimated $5q_0$

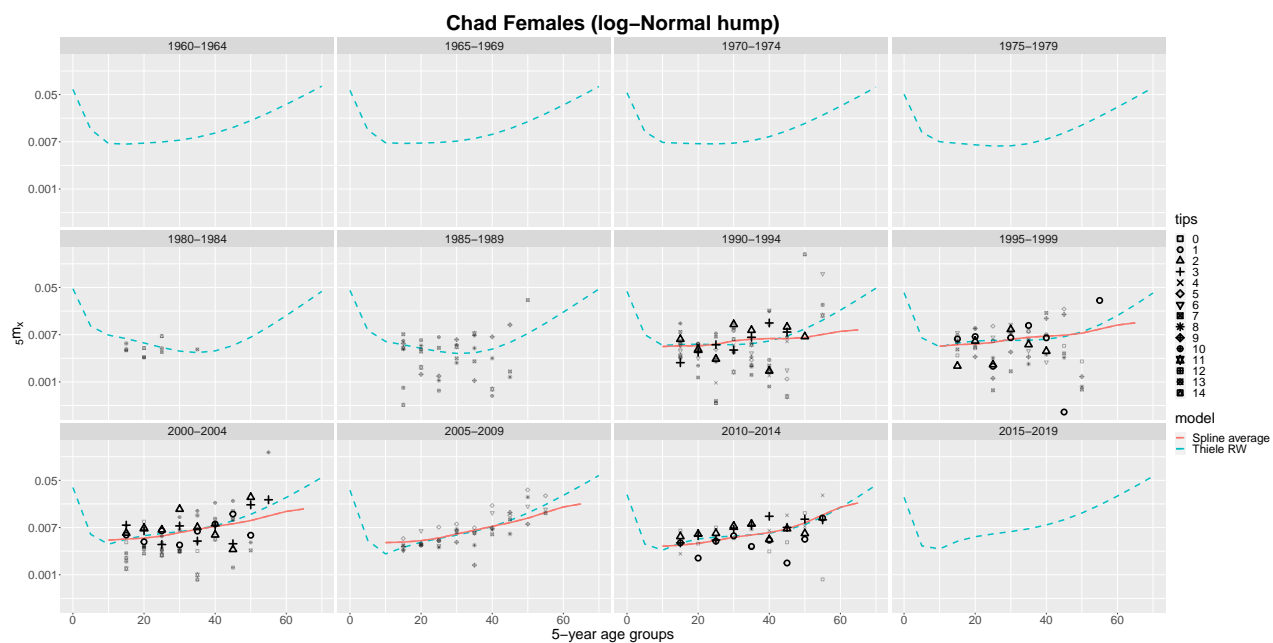


Figure 4: Mortality Schedules

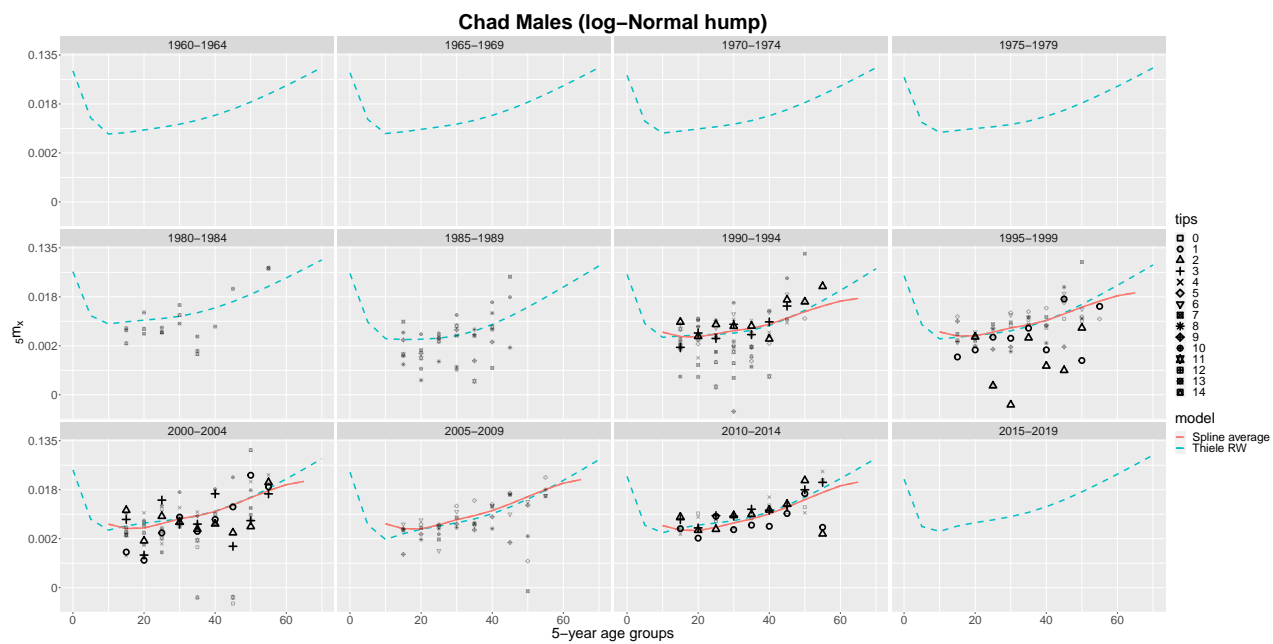


Figure 5: Mortality Schedules

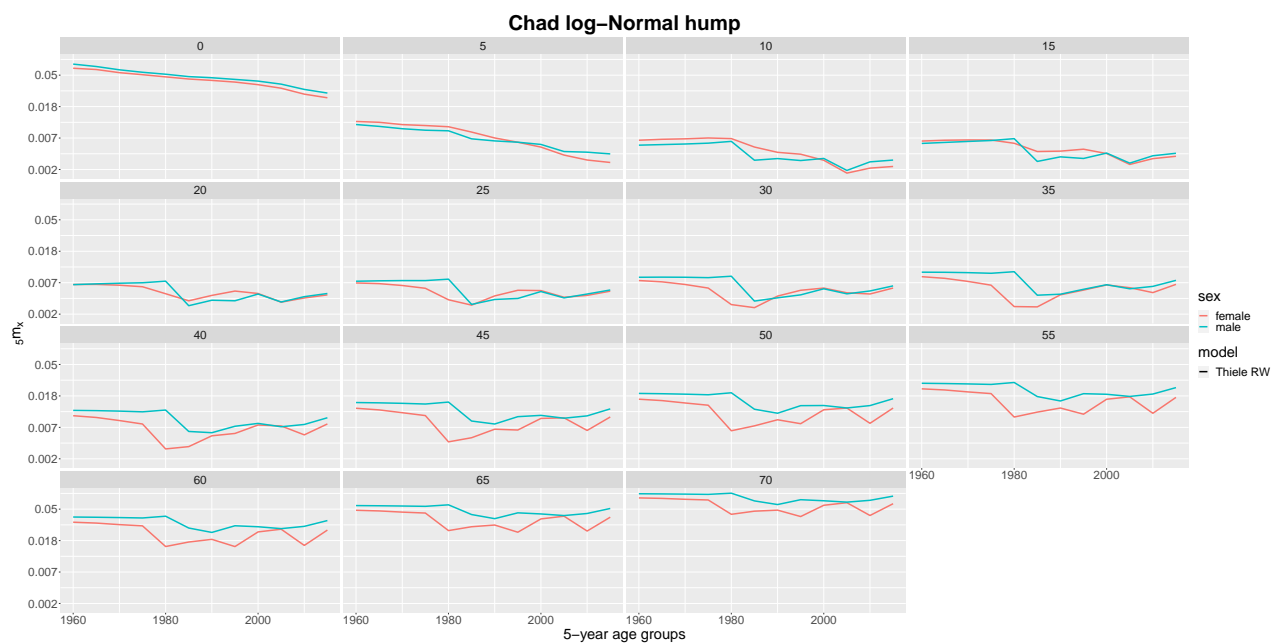


Figure 6: Mortality Schedules

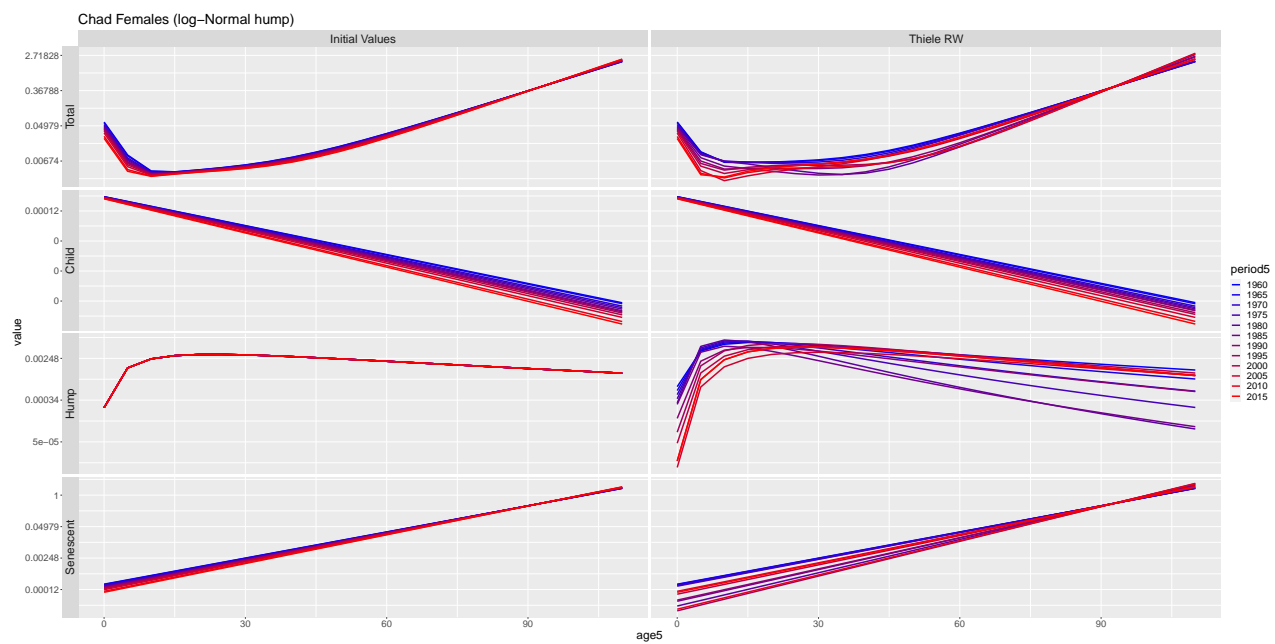


Figure 7: Thiele Decomposed

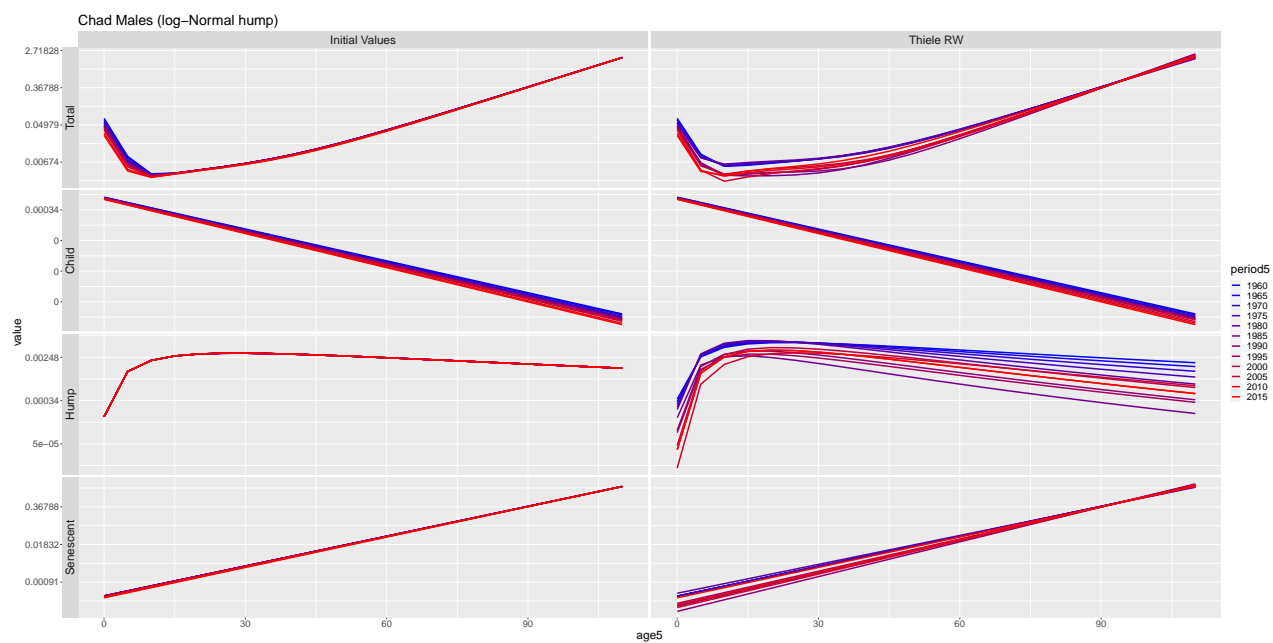


Figure 8: Thiele Decomposed

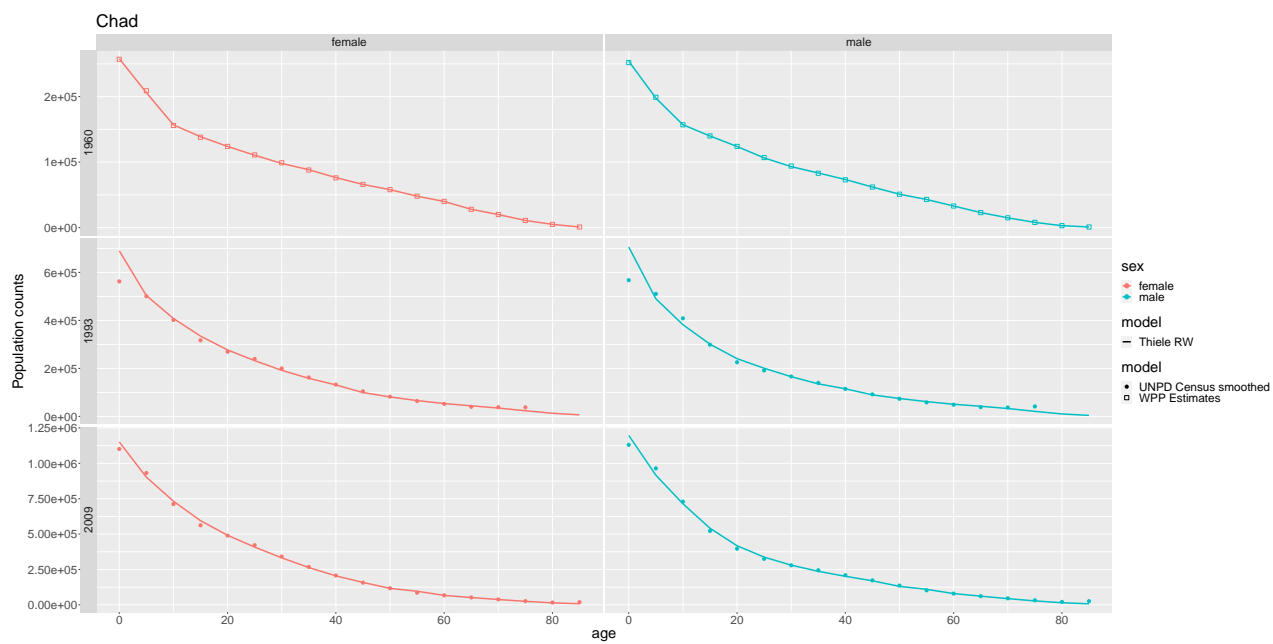


Figure 9: Population

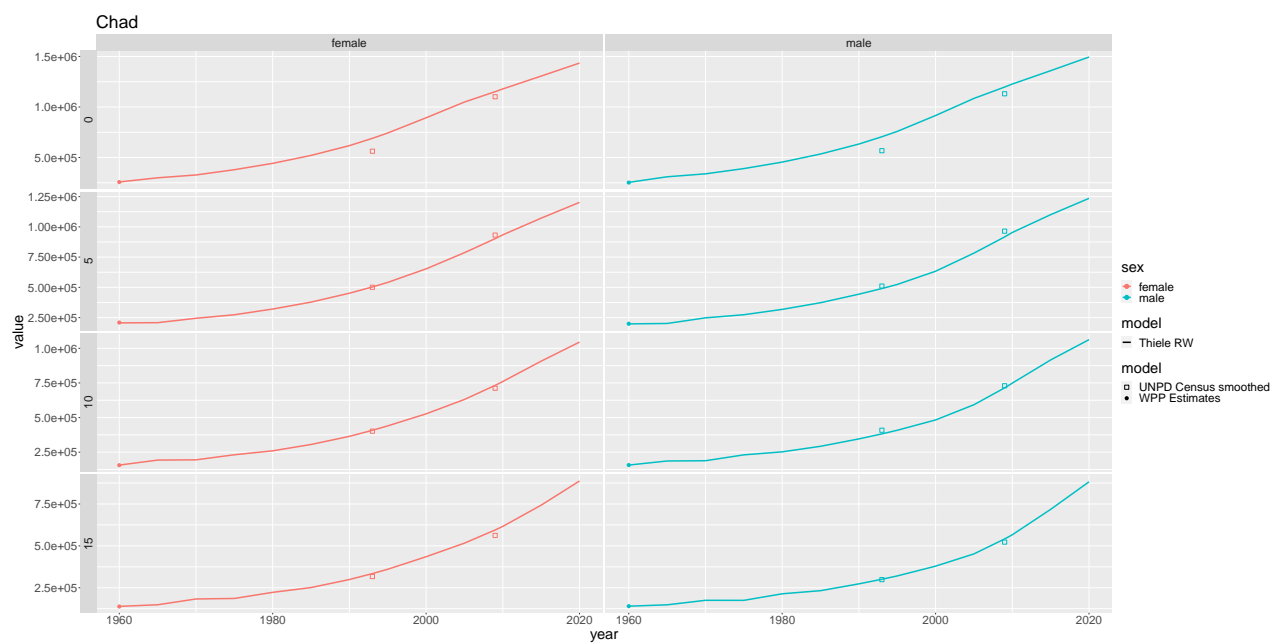


Figure 10: Population

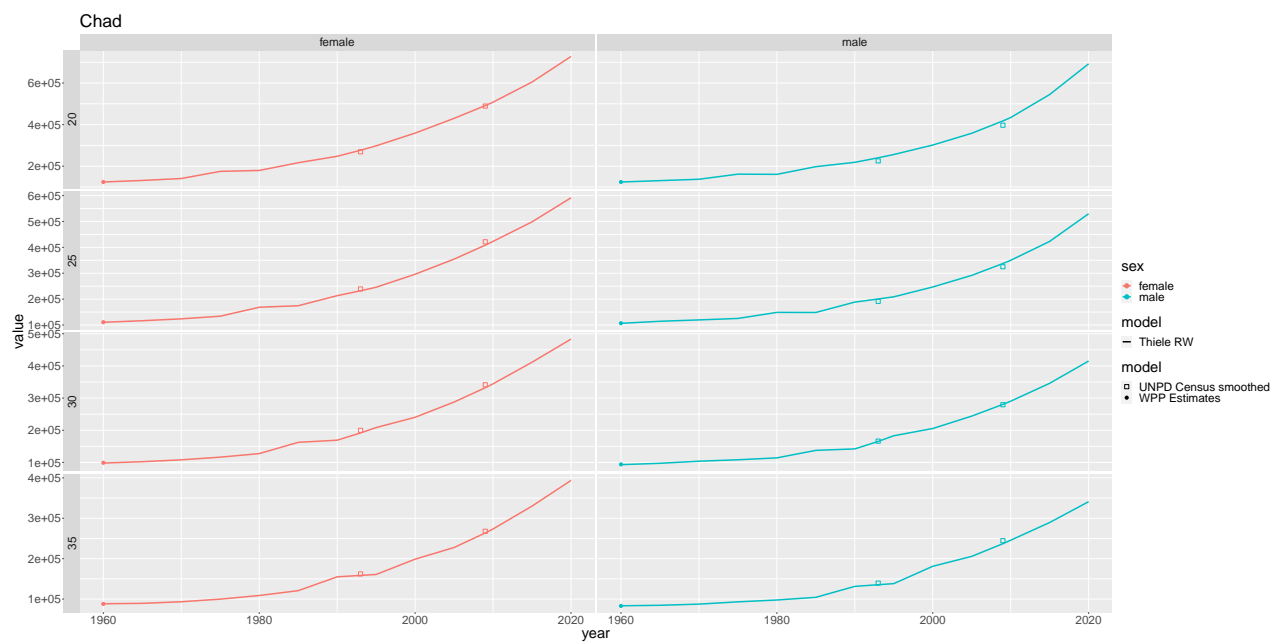


Figure 11: Population

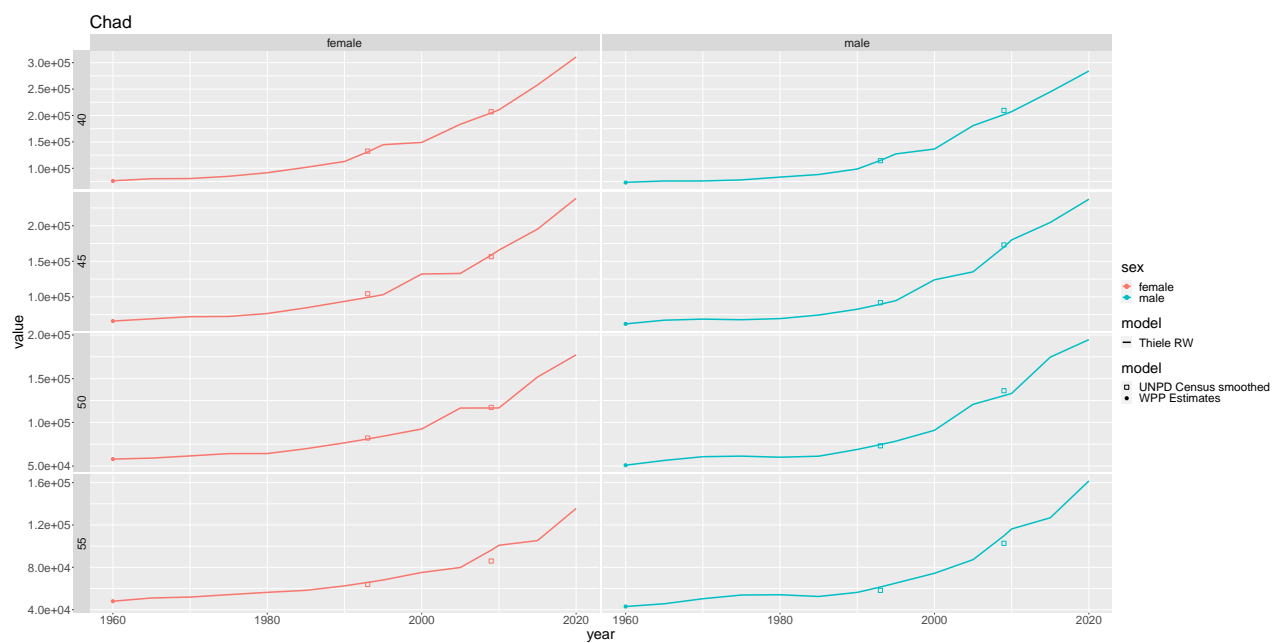


Figure 12: Population

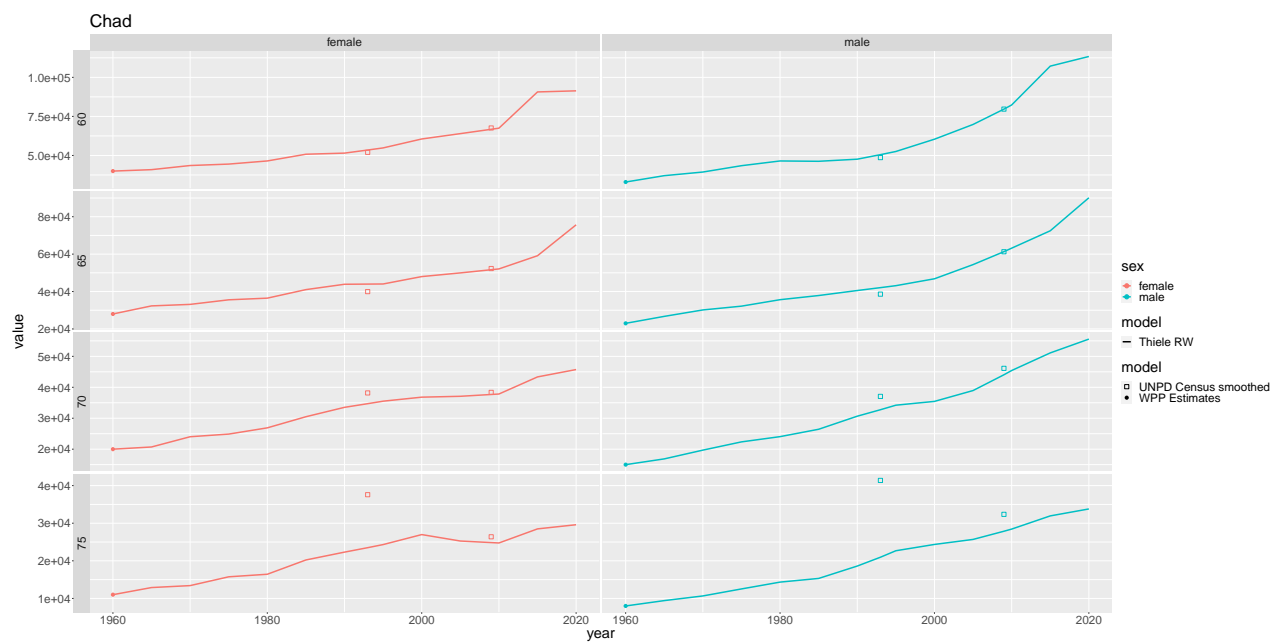


Figure 13: Population

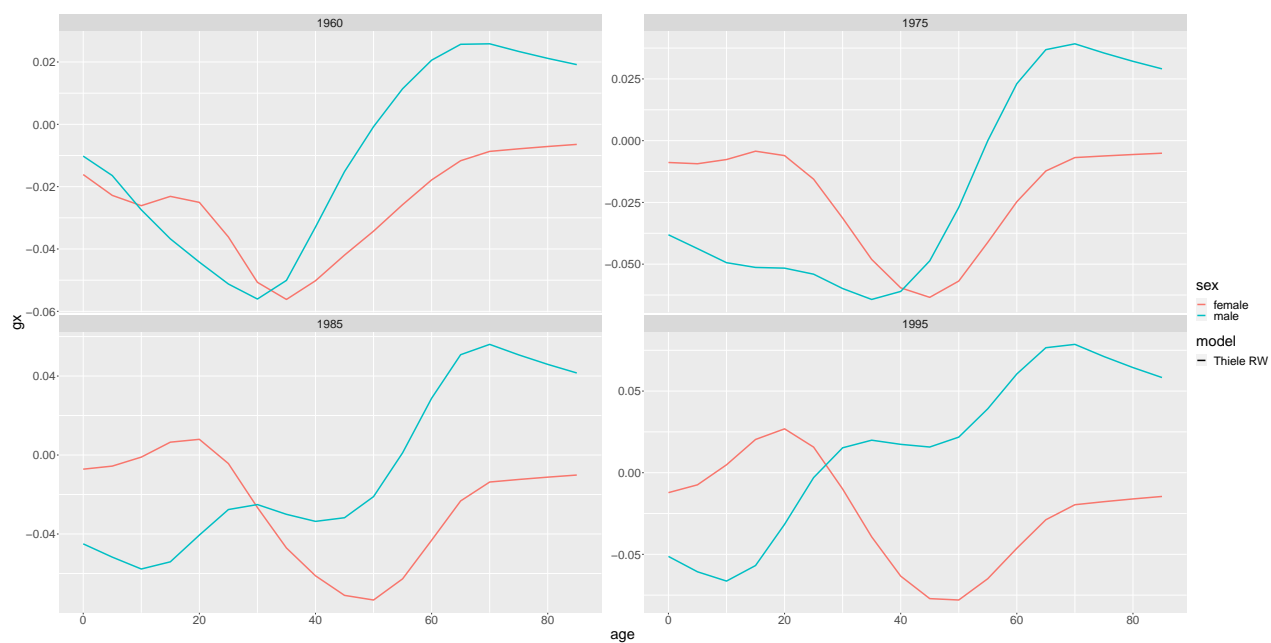


Figure 14: Migration

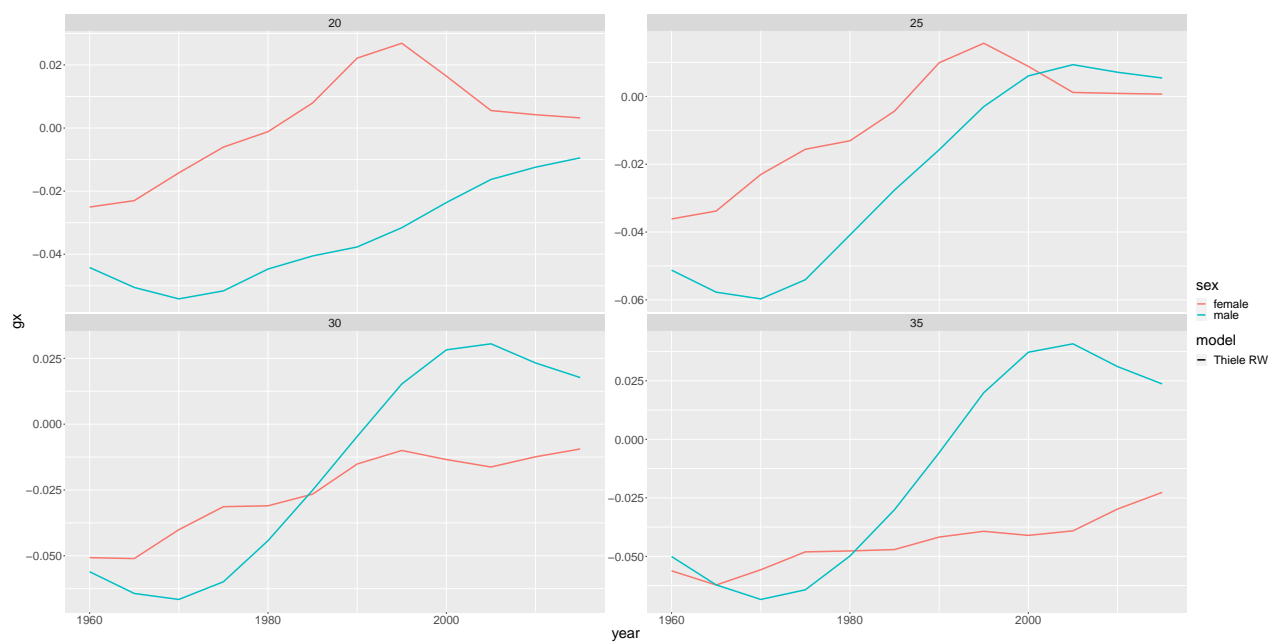


Figure 15: Migration

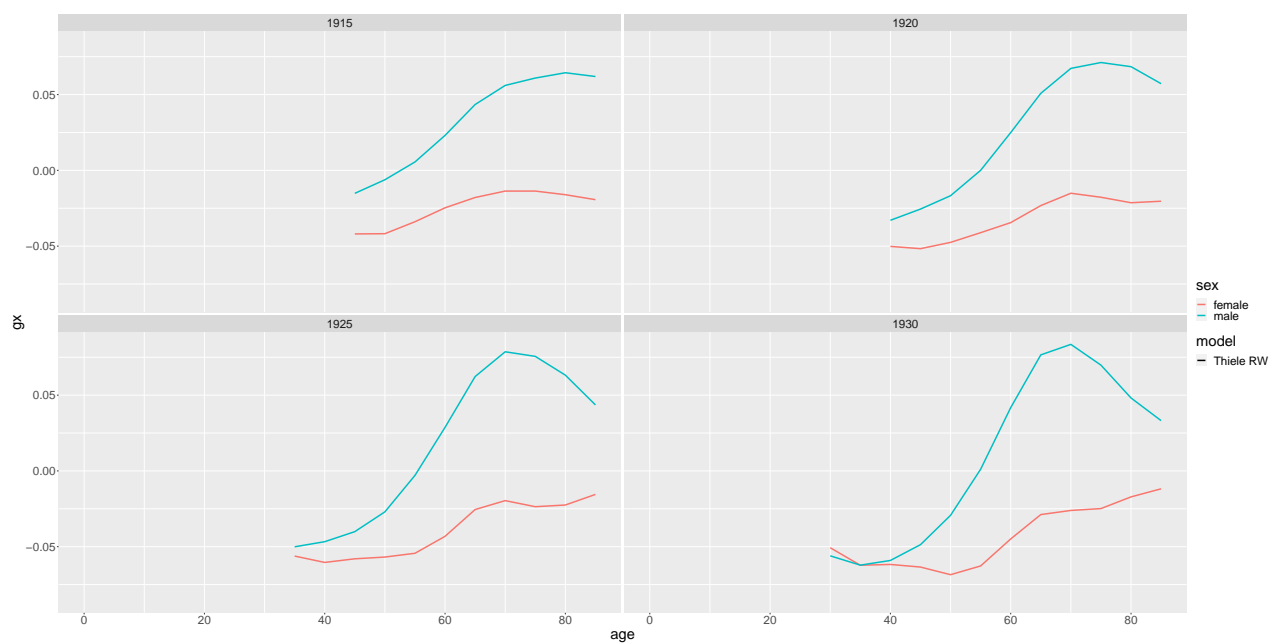


Figure 16: Migration

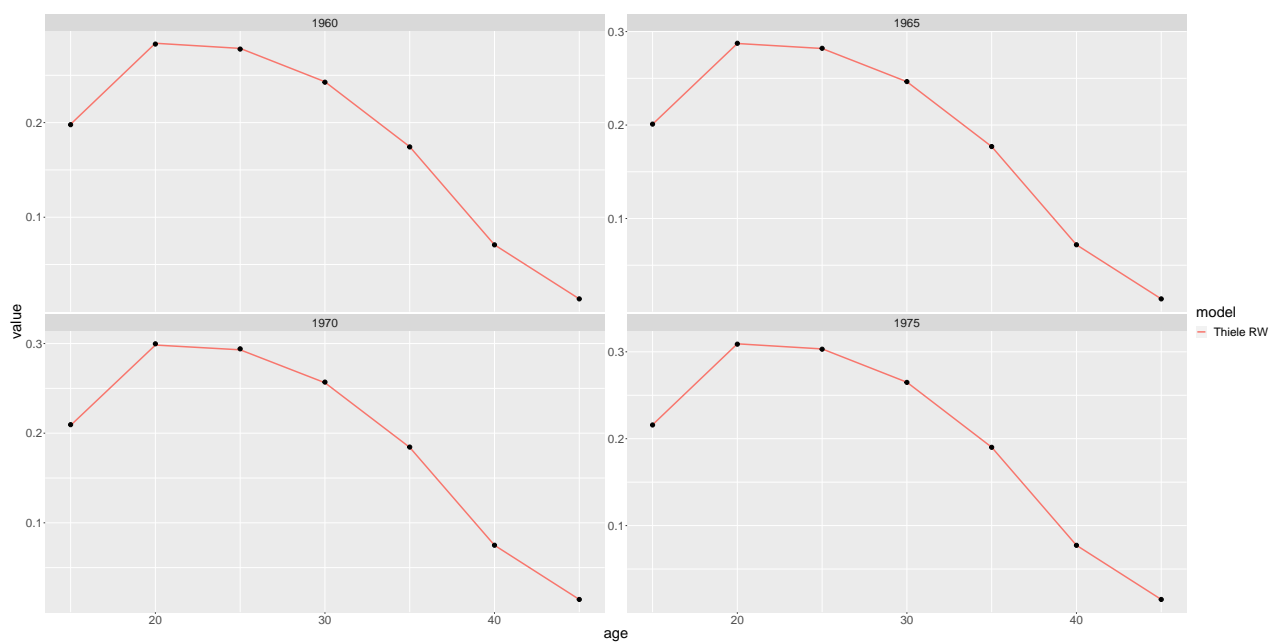


Figure 17: Fertility

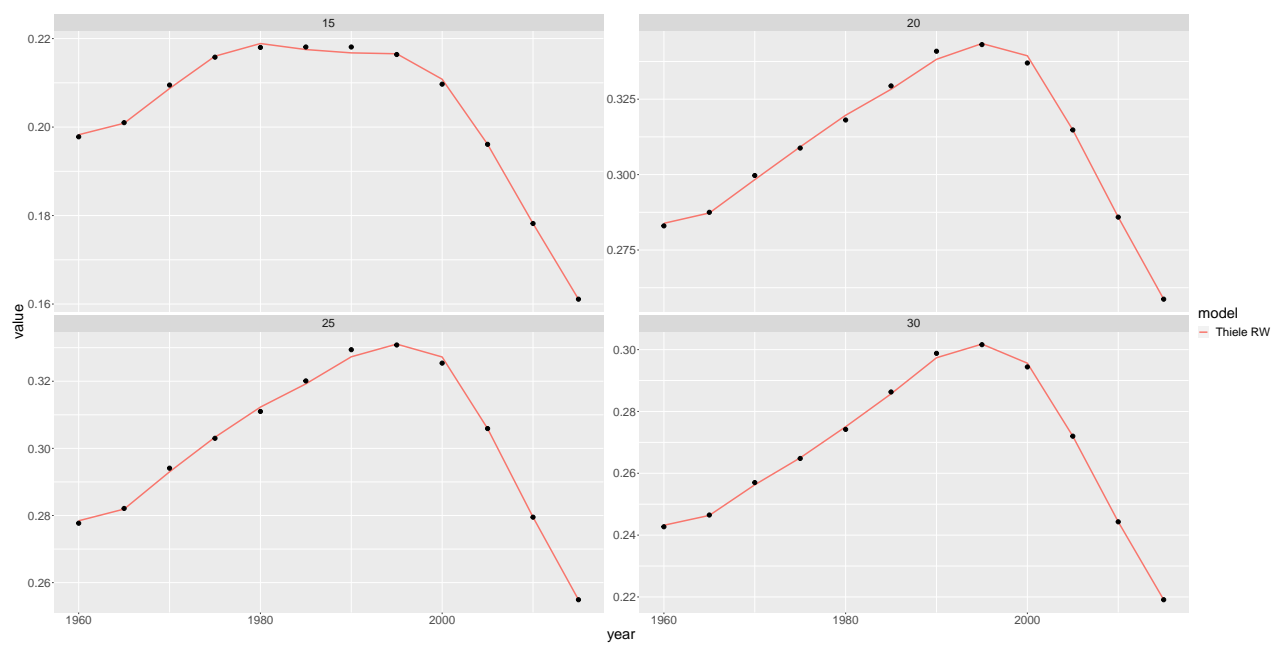


Figure 18: Fertility