

# SubnationalCRVS Demo

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## 1 Set up

```
#library(devtools)
#install_github("jroth-unfpa/SubnationalCRVS")
library(SubnationalCRVS)
library(dplyr)
my_plots_dir <- "Plots/"
dir.create(my_plots_dir)
knitr::opts_chunk$set(echo = TRUE)
```

## 2 View the first few rows of the data

```
head(ecuador_age_tabulation)
```

```
##   province_name province_name_short sex age pop1 pop2      date1      date2
## 1      Azuay              Azu    m   0 6086 6750 2001-11-25 2010-11-28
## 2      Azuay              Azu    m   1 6555 6984 2001-11-25 2010-11-28
## 3      Azuay              Azu    m   2 7232 7090 2001-11-25 2010-11-28
## 4      Azuay              Azu    m   3 7101 7095 2001-11-25 2010-11-28
## 5      Azuay              Azu    m   4 7083 6961 2001-11-25 2010-11-28
## 6      Azuay              Azu    m   5 6583 6895 2001-11-25 2010-11-28
```

```
head(example_data_ecuador)
```

```
## province_name province_name_short sex age pop1 pop2 deaths date1
## 1 Azuay Azu m 0 34101 34886 772 2001-11-25
## 2 Azuay Azu m 10 34946 38125 223 2001-11-25
## 3 Azuay Azu m 15 32387 37611 416 2001-11-25
## 4 Azuay Azu m 20 25634 33665 480 2001-11-25
## 5 Azuay Azu m 25 18606 28376 475 2001-11-25
## 6 Azuay Azu m 30 16193 22026 456 2001-11-25
## date2
## 1 2010-11-28
## 2 2010-11-28
## 3 2010-11-28
## 4 2010-11-28
## 5 2010-11-28
## 6 2010-11-28
```

## 3 Conduct DDQA

### 3.1 Sex ratio

```
s <- PlotSexRatios(data=example_data_ecuador,
                    name.disaggregations="province_name",
                    name.males="m",
                    name.females="f",
                    name.age="age",
                    name.sex="sex",
                    name.date1="date1",
                    name.date2="date2",
                    name.population.year1="pop1",
                    name.population.year2="pop2",
                    line.size.overall=0.6,
                    print.disaggregated=FALSE,
                    print.overall=FALSE,
                    plots.dir="Plots/")
```

#### 3.1.1 View sex ratios in table

```
s %>% select(province_name, age, pop1, pop2, sex_ratio_1, sex_ratio_2) %>%
head()
```

```
## province_name age pop1 pop2 sex_ratio_1 sex_ratio_2
## 1 Azuay 0 33491 33876 101.82138 102.98146
## 2 Azuay 10 34975 37366 99.91708 102.03126
## 3 Azuay 15 34181 37215 94.75147 101.06409
## 4 Azuay 20 31000 35753 82.69032 94.15993
## 5 Azuay 25 23844 32054 78.03221 88.52561
## 6 Azuay 30 21317 26520 75.96285 83.05430
```

### 3.1.2 View sex ratios in combined plot

```
knitr::include_graphics(path=paste0(my_plots_dir,  
  "sex_ratios_combined_province_name_",  
  Sys.Date(),  
  ".pdf"))
```

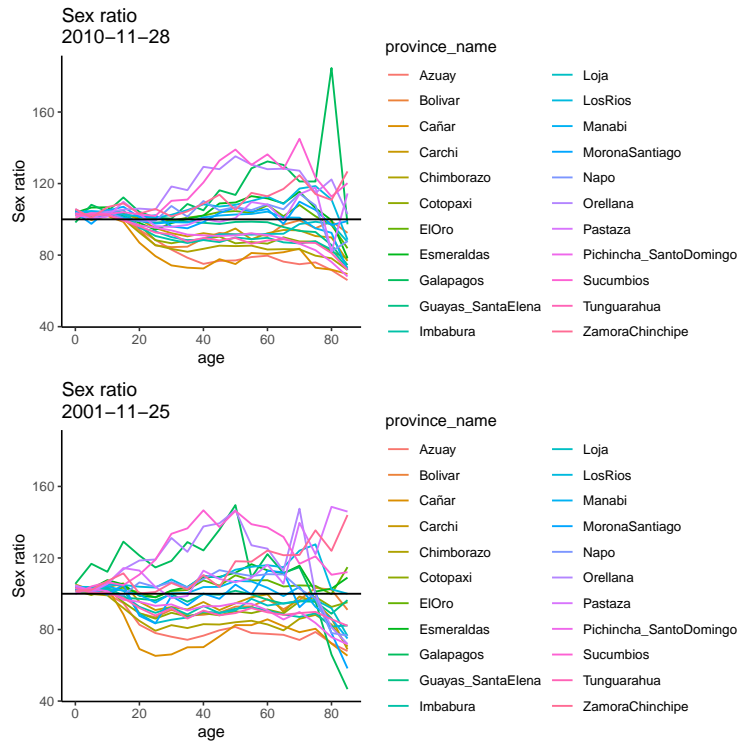


Figure 1: Sex ratios in Ecuador by province, combined plot

### 3.1.3 View sex ratios in disaggregated plots

```
knitr::include_graphics(path=paste0(my_plots_dir,  
  "sex_ratios_by_province_name_",  
  Sys.Date(),  
  ".pdf"))
```

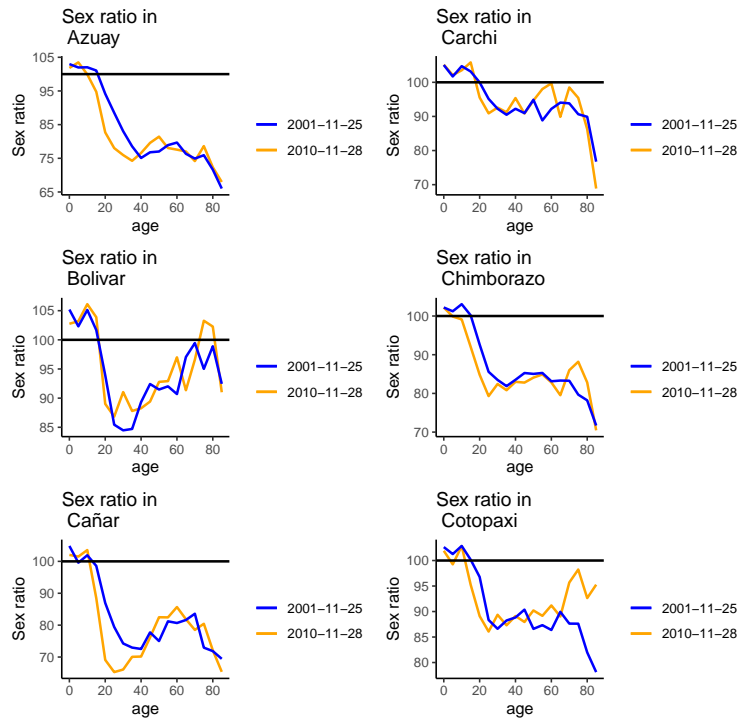


Figure 2: Sex ratios in Ecuador by province, disaggregated plots

## 3.2 Age ratios

```
a <- PlotAgeRatios(data=example_data_ecuador,
  name.disaggregations="province_name",
  name.males="m",
  name.females="f",
  name.age="age",
  name.sex="sex",
  name.date1="date1",
  name.date2="date2",
  name.population.year1="pop1",
  name.population.year2="pop2",
  line.size.overall=0.6,
  print.disaggregated=FALSE,
  print.overall=FALSE,
  plots.dir="Plots/")
```

### 3.2.1 View age ratios in table

```
a %>% select(province_name, age, pop1, pop2, age_ratio_1, age_ratio_2) %>%
  head()
```

```
##   province_name age  pop1  pop2 age_ratio_1 age_ratio_2
## 1      Azuay    0 33491 33876          NA          NA
## 2      Azuay    5 33817 35701    98.78480    100.2246
```

```
## 3      Azuay  10 34975 37366   102.87067   102.4905
## 4      Azuay  15 34181 37215   103.61804   101.7930
## 5      Azuay  20 31000 35753   106.85050   103.2294
## 6      Azuay  25 23844 32054    91.15202   102.9467
```

### 3.2.2 View age ratios in combined plot

```
knitr::include_graphics(path=paste0(my_plots_dir,
                                     "age_ratios_combined_province_name_",
                                     Sys.Date(),
                                     ".pdf"))
```

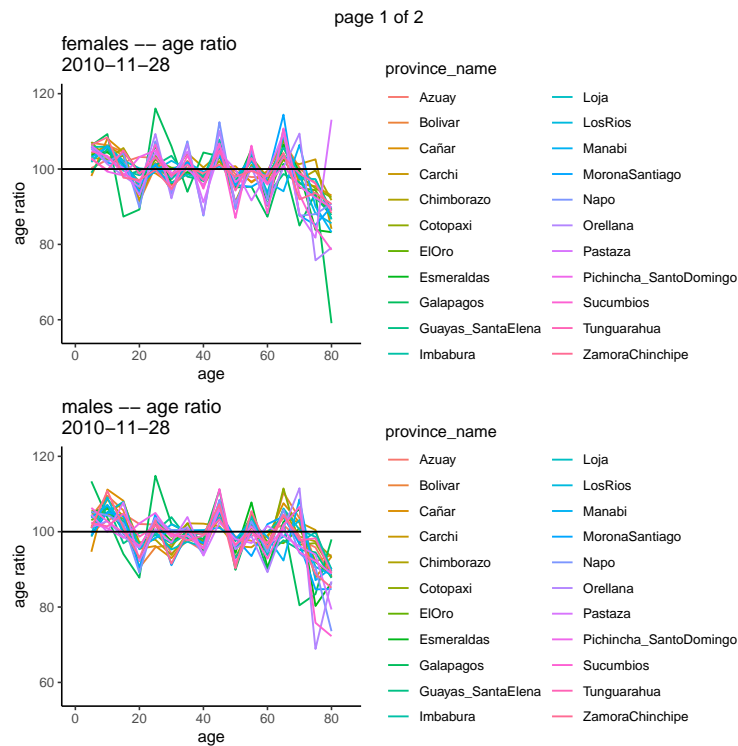


Figure 3: Age ratios in Ecuador by province, combined plot

### 3.2.3 View age ratios in disaggregated plots

```
knitr::include_graphics(path=paste0(my_plots_dir,
                                     "age_ratios_by_province_name_",
                                     Sys.Date(),
                                     ".pdf"))
```

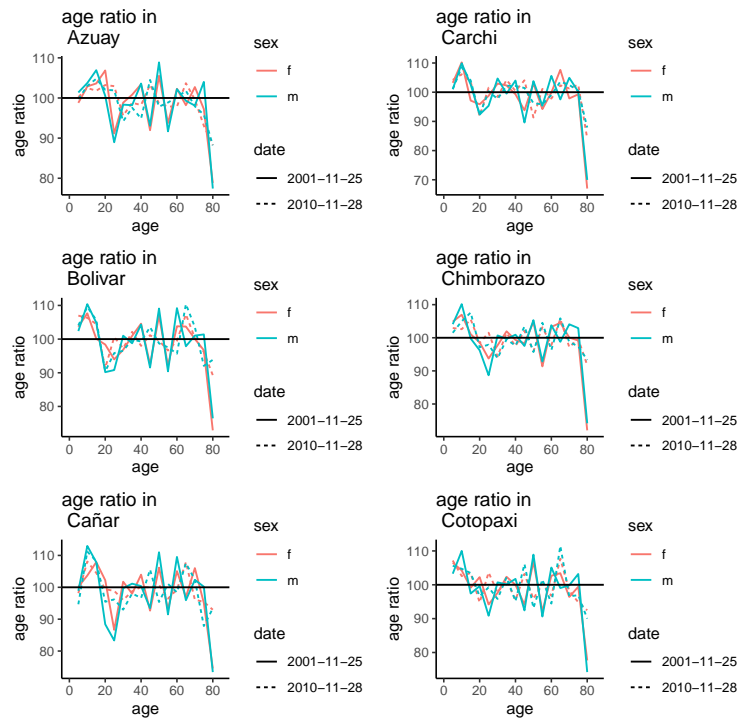


Figure 4: Age ratios in Ecuador by province, disaggregated plots

### 3.3 Potential age heaping

```
PlotPotentialAgeHeaping(data=ecuador_age_tabulation,
  name.disaggregations="province_name",
  name.males="m",
  name.females="f",
  name.age="age",
  name.sex="sex",
  name.date1="date1",
  name.date2="date2",
  name.population.year1="pop1",
  name.population.year2="pop2",
  print.disaggregated=FALSE,
  print.overall=FALSE,
  plots.dir="Plots/")
```

#### 3.3.1 View potential age heaping in combined plot

```
knitr::include_graphics(path=paste0(my_plots_dir,
  "potential_age_heaping_combined_province_name_",
  Sys.Date(),
  ".pdf"))
```

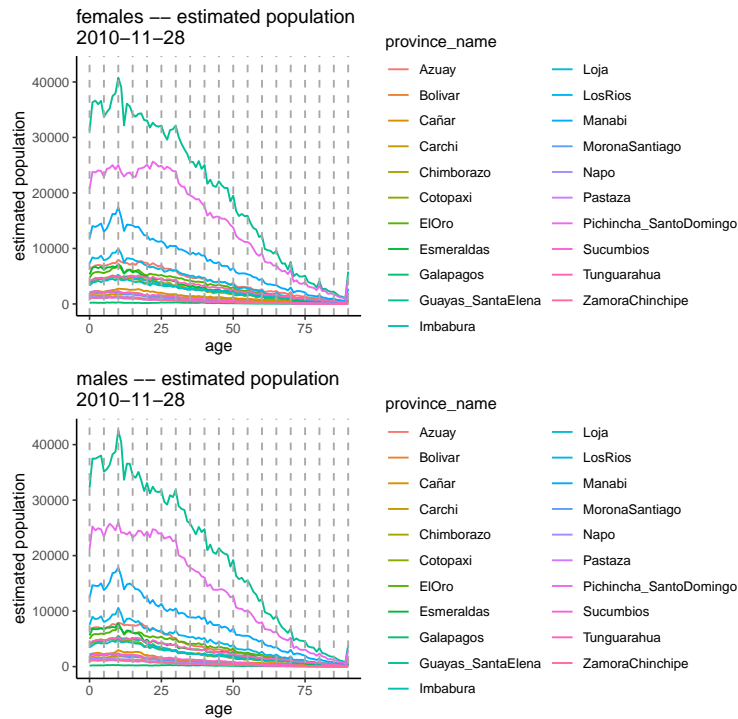


Figure 5: Population counts in Ecuador by single-year age, combined plot

### 3.3.2 View potential age heaping in disaggregated plots

```
knitr::include_graphics(path=paste0(my_plots_dir,
                                     "potential_age_heaping_by_province_name_",
                                     Sys.Date(),
                                     ".pdf"))
```

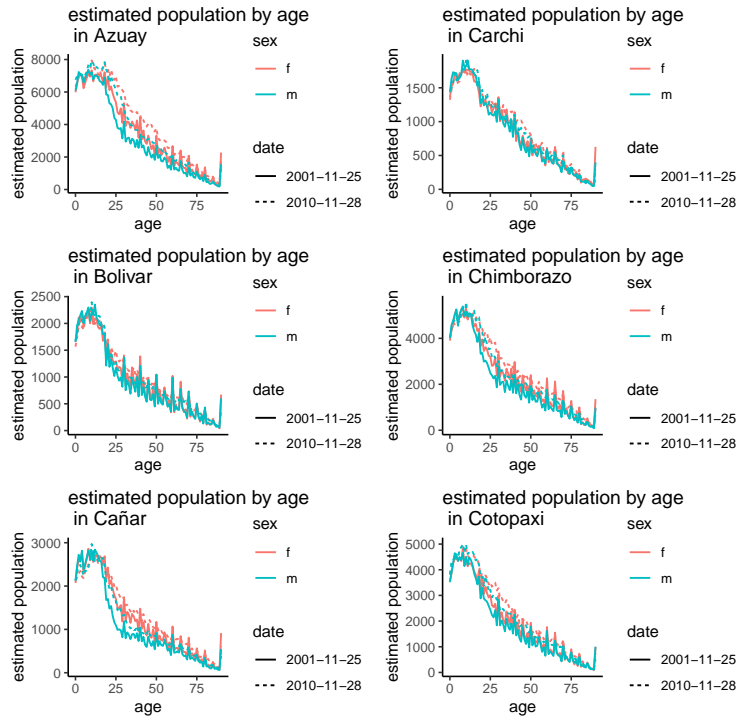


Figure 6: Population counts in Ecuador by single-year age, disaggregated plots

### 3.4 Age heaping indices

```
ageheaping <- PlotAgeHeapingScores(data=ecuador_age_tabulation,
                                   name.disaggregations="province_name_short",
                                   name.males="m",
                                   name.females="f",
                                   name.age="age",
                                   name.sex="sex",
                                   name.date1="date1",
                                   name.date2="date2",
                                   name.population.year1="pop1",
                                   name.population.year2="pop2",
                                   label.subnational.levels="Province",
                                   print.plots=FALSE,
                                   plots.dir="Plots/")
```

#### 3.4.1 View age heaping indices in table

```
head(ageheaping)
```

##	province_name_short	date	sex	roughness	Whipple	Myers
## 1	Azu	2001-11-25	f	0.41	1.18	4.21
## 2	Bol	2001-11-25	f	0.91	1.37	7.39
## 3	Cañ	2001-11-25	f	0.69	1.22	4.89
## 4	Car	2001-11-25	f	0.38	1.18	3.75



##	5	Chi	2001-11-25	f	0.34	1.25	5.44
##	6	Cot	2001-11-25	f	0.34	1.27	5.99

### 3.4.2 View age heaping indices in plots

```
knitr::include_graphics(path=paste0(my_plots_dir,
                                     "age_heaping_scores_combined_province_name_short_",
                                     Sys.Date(),
                                     ".pdf"))
```

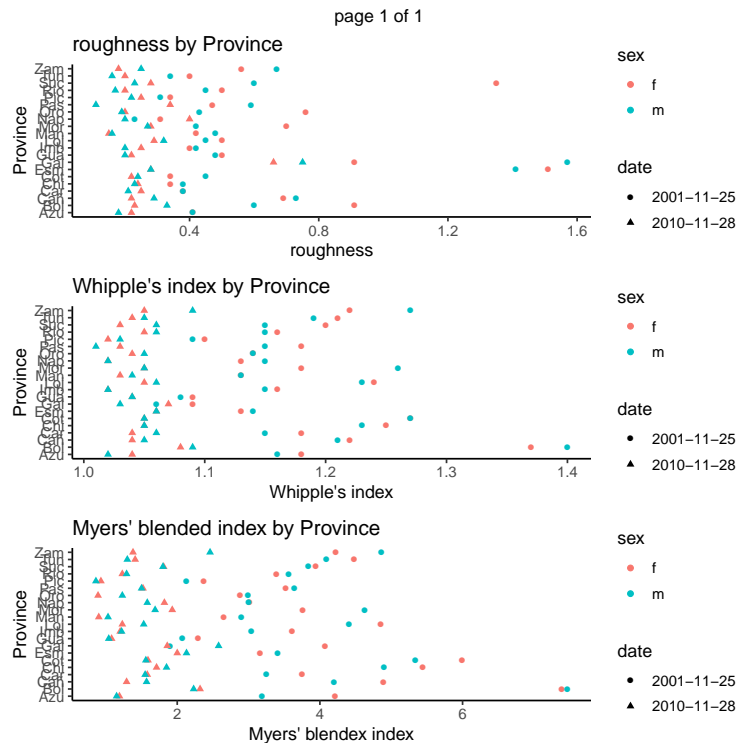


Figure 7: Age heaping indices in Ecuador by province

## 4 DDM estimation

#### 4.1 Compute DDM estimates

```
dgm_results <- EstimateDDM(data=example_data_ecuador,
  name.disaggregations="province_name",
  name.age="age",
  name.sex="sex",
  name.males="m",
  name.females="f",
  name.date1="date1",
  name.date2="date2",
  name.population.year1="pop1",
  name.population.year2="pop2",
```

```

name.deaths="deaths",
deaths.summed=TRUE,
min.age.in.search=15,
max.age.in.search=75,
min.number.of.ages=8)

```

```
## [1] "performing DDM estimation within each of 21 possible age ranges..."
```

#### 4.1.1 View DDM point estimates in table

```
head(ddm_results$ddm_estimates)
```

```
##      cod      sex ggbseg   ggb   seg lower_age_range upper_age_range total_pop1
## 1  Azuay Females  0.669 0.987 0.806             15             50      599313
## 2  Azuay  Males  0.727 1.069 0.917             15             50      599313
## 3 Bolivar Females 0.713 0.988 0.720             20             60      170696
## 4 Bolivar  Males 0.743 0.955 0.796             25             60      170696
## 5  Cañar Females 0.619 0.998 0.575             20             55      206346
## 6  Cañar  Males 0.709 0.953 0.792             15             50      206346
##      total_pop2
## 1          710766
## 2          710766
## 3         183742
## 4         183742
## 5         224433
## 6         224433
```

#### 4.1.2 View age-range sensitivity of DDM point estimates in table

```
head(ddm_results$sensitivity_ddm_estimates)
```

```
##      cod      sex ggbseg   ggb   seg lower_age_range upper_age_range total_pop1
## 1 Azuay Females  0.610 0.987 0.811             15             50      599313
## 2 Azuay Females  0.639 0.874 0.809             15             55      599313
## 3 Azuay Females  0.629 0.857 0.806             20             55      599313
## 4 Azuay Females  0.669 0.829 0.806             15             60      599313
## 5 Azuay Females  0.661 0.815 0.803             20             60      599313
## 6 Azuay Females  0.651 0.784 0.801             25             60      599313
##      total_pop2
## 1          710766
## 2          710766
## 3          710766
## 4          710766
## 5          710766
## 6          710766
```

## 4.2 Plot DDM estimates

```

PlotDDM(ddm_results=ddm_results,
        label.completeness="Estimated Completeness (%)",

```

```
label.subnational.levels="Province",
plots.dir="Plots/")
```

#### 4.2.1 View DDM point estimates in plot

```
knitr::include_graphics(path=paste0(my_plots_dir,
  "ddm_point_estimates_combined_province_name_",
  Sys.Date(),
  ".pdf"))
```

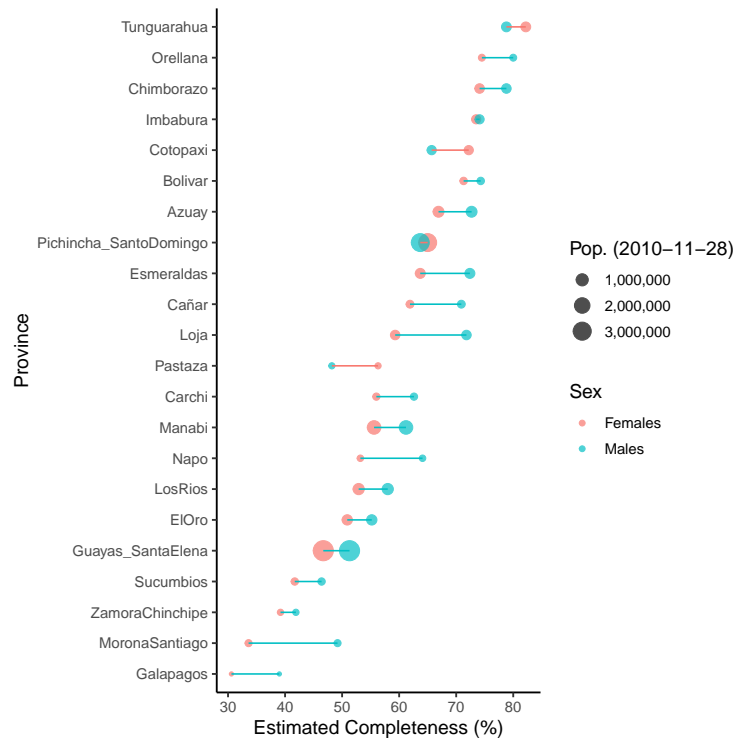


Figure 8: Point estimates of death registration completeness in Ecuador from 2001-2010, using the GGB-SEG method

#### 4.2.2 View sensitivity of DDM point estimates in plot

```
knitr::include_graphics(path=paste0(my_plots_dir,
  "ddm_sensitivity_province_name_",
  Sys.Date(),
  ".pdf"))
```

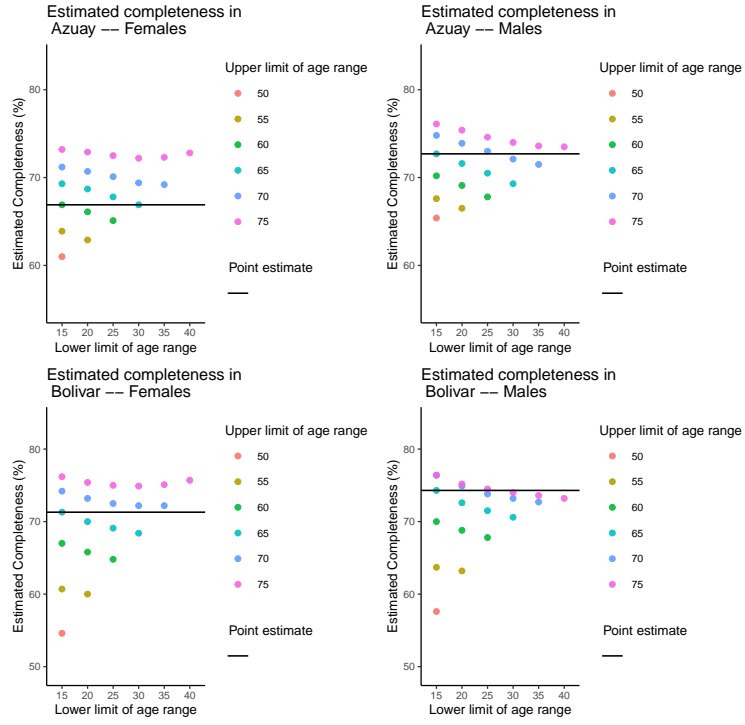


Figure 9: Sensitivity of point estimates of death registration completeness in Ecuador from 2001-2010 to choice of age-range parameter in the GGB-SEG method