Investigating the autism and ADHD prevalence in Chile through Bayesian prevalence analysis and clinical record data linkage

Student 5526

2023-07-04

This dissertation is submitted for the degree of Master of Philosophy. The dissertation does not exceed the word limit for the respective Degree Committee. Word count: xxx TODO

1   Abstract

TODO

2   Declaration

This dissertation is the result of my own work and includes nothing which is the outcome of work done in collaboration except where specifically indicated in the text.

USN: xxxxx July, 2022

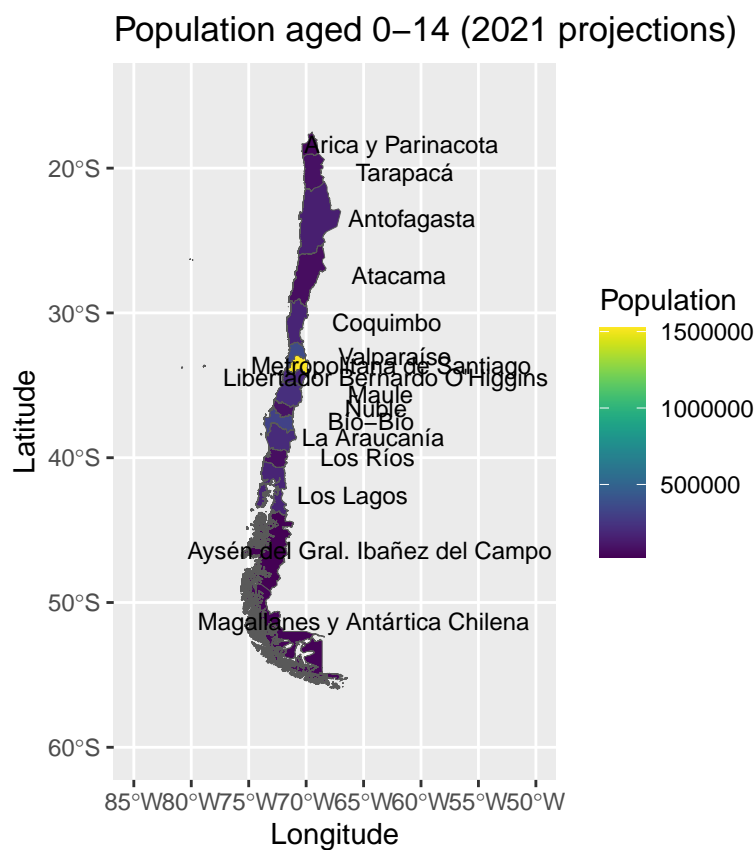TODO - is this section needed?

3   Introduction

Figure 1: Population of 0-14 year olds in Chile in 2021 by region, from 2017 census projections.

4   Methods

5   Results

5.1   School data

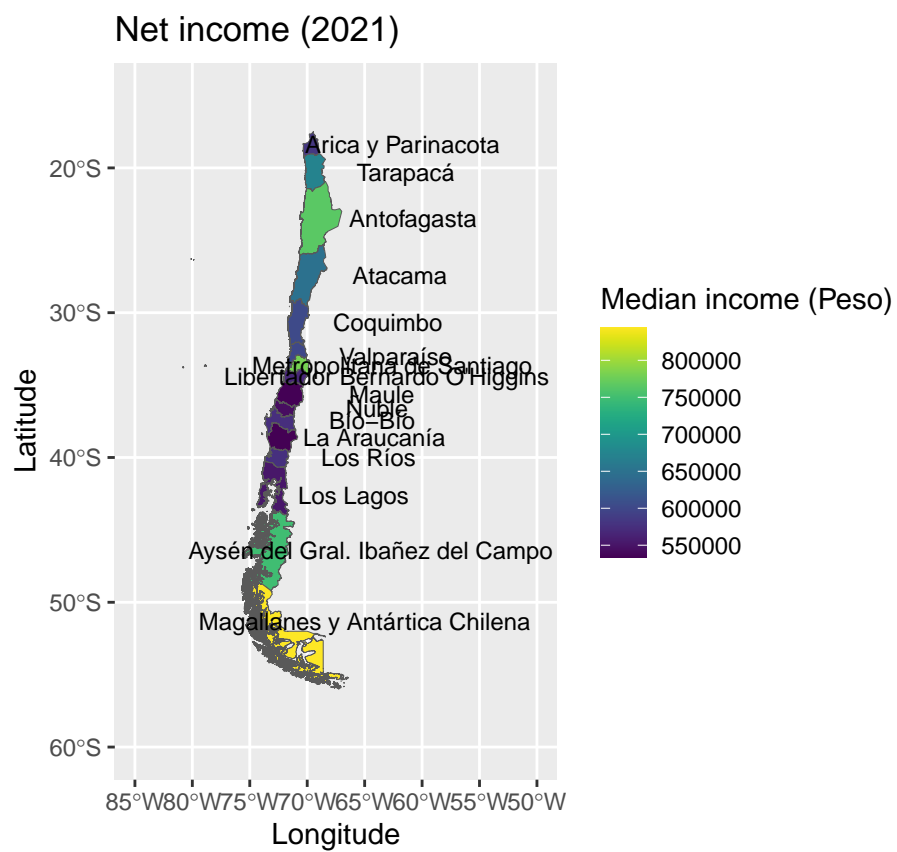TODO - table summarising data content

Figure 2: Net income from main job in Chile in 2021 by region, from the INE's Supplementary Income Survey.
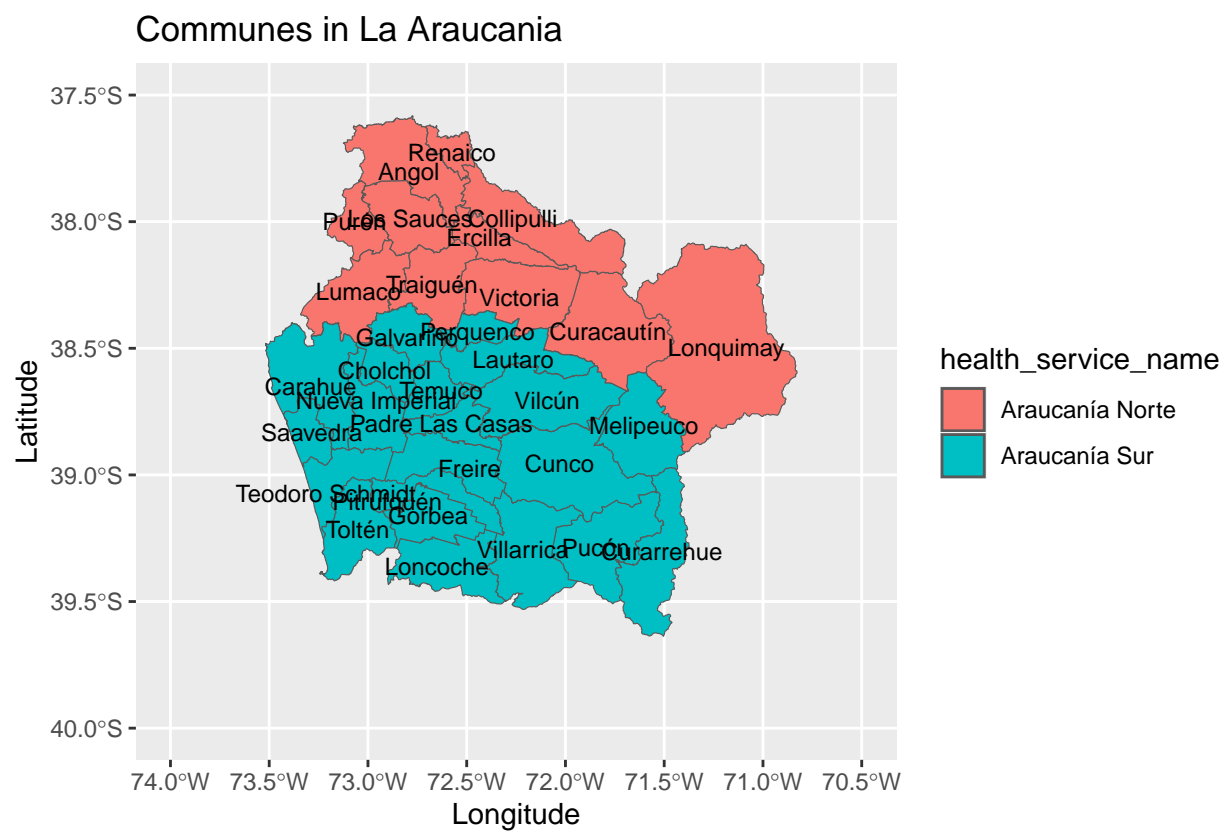
Communes in La Araucania

Figure 3: Communes in the Araucanía region, coloured red for the Araucanía Norte (north Araucanía) health services and blue for the Araucanía Sur (south Araucanía) health service.

In the school data, 4078 (0.13%) students were missing commune of residence. These missing values were imputed with their school's commune as most students are likely to go to school near their place of residence.

5.2 Frequentist prevalence estimation

```
## # A tibble: 1 x 6
##   crude_ci_lower crude_rate crude_ci_upper adjusted_ci_lower adjusted_~1 adjus~2
##            <dbl>      <dbl>          <dbl>             <dbl>       <dbl>   <dbl>
## 1        0.00468    0.00476        0.00484           0.00457     0.00465 0.00473
## # ... with abbreviated variable names 1: adjusted_rate, 2: adjusted_ci_upper

## # A tibble: 1 x 6
##   crude_ci_lower crude_rate crude_ci_upper adjusted_ci_lower adjusted_~1 adjus~2
##            <dbl>      <dbl>          <dbl>             <dbl>       <dbl>   <dbl>
## 1         0.0150     0.0151         0.0153            0.0148      0.0150  0.0151
## # ... with abbreviated variable names 1: adjusted_rate, 2: adjusted_ci_upper

## # A tibble: 2 x 7
##   sex_desc crude_ci_lower crude_rate crude_ci_upper adjusted_c~1 adjus~2 adjus~3
##   <chr>             <dbl>      <dbl>          <dbl>         <dbl>   <dbl>   <dbl>
## 1 Male            0.00787    0.00801        0.00815       0.00773 0.00787 0.00801
## 2 Female          0.00127    0.00133        0.00139       0.00125 0.00131 0.00138
## # ... with abbreviated variable names 1: adjusted_ci_lower, 2: adjusted_rate,
## #   3: adjusted_ci_upper

## # A tibble: 2 x 7
##   sex_desc crude_ci_lower crude_rate crude_ci_upper adjusted_c~1 adjus~2 adjus~3
##   <chr>             <dbl>      <dbl>          <dbl>         <dbl>   <dbl>   <dbl>
## 1 Male             0.0196     0.0198         0.0201        0.0194  0.0197  0.0199
## 2 Female          0.00998     0.0101         0.0103       0.00997  0.0101  0.0103
## # ... with abbreviated variable names 1: adjusted_ci_lower, 2: adjusted_rate,
## #   3: adjusted_ci_upper

##          health_service_name crude_ci_lower crude_rate crude_ci_upper
## 1                  Aconcagua        0.00378    0.00438        0.00497
## 2                      Aisén        0.00629    0.00749        0.00869
## 3                 Antofagasta        0.00791    0.00842        0.00893
## 4             Araucanía Norte        0.00244    0.00300        0.00356
## 5               Araucanía Sur        0.00336    0.00369        0.00402
## 6                      Arauco        0.00637    0.00731        0.00826
## 7                       Arica        0.00540    0.00612        0.00684
## 8                     Atacama        0.00262    0.00306        0.00351
## 9                      Biobío        0.00383    0.00431        0.00479
## 10                     Chiloé        0.00375    0.00450        0.00524
## 11                 Concepción        0.00732    0.00784        0.00837
## 12                   Coquimbo        0.00378    0.00412        0.00445
## 13        Libertador B.O'Higgins        0.00402    0.00434        0.00467
## 14                      Maule        0.00280    0.00305        0.00331
## 15                   Reloncaví        0.00379    0.00424        0.00469
## 16                    Iquique        0.00381    0.00431        0.00481
## 17                 Magallanes        0.00725    0.00831        0.00938
## 18       Metropolitano Central        0.00385    0.00421        0.00457
## 19         Metropolitano Norte        0.00269    0.00294        0.00318
## 20     Metropolitano Occidente        0.00336    0.00358        0.00381
## 21       Metropolitano Oriente        0.00279    0.00304        0.00329
## 22          Metropolitano Sur        0.00385    0.00413        0.00442
```
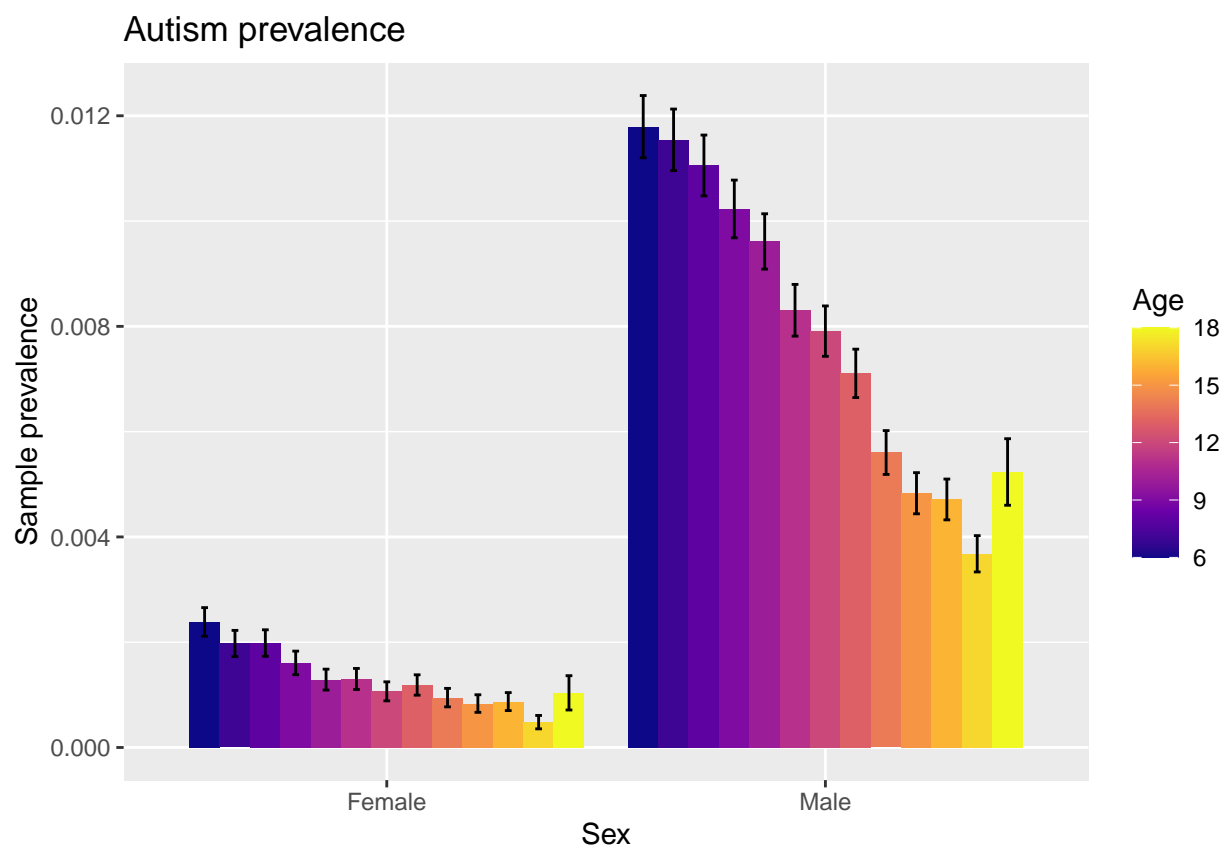
Figure 4: Sample prevalence of autism by age and sex. Bars show 95% confidence intervals.
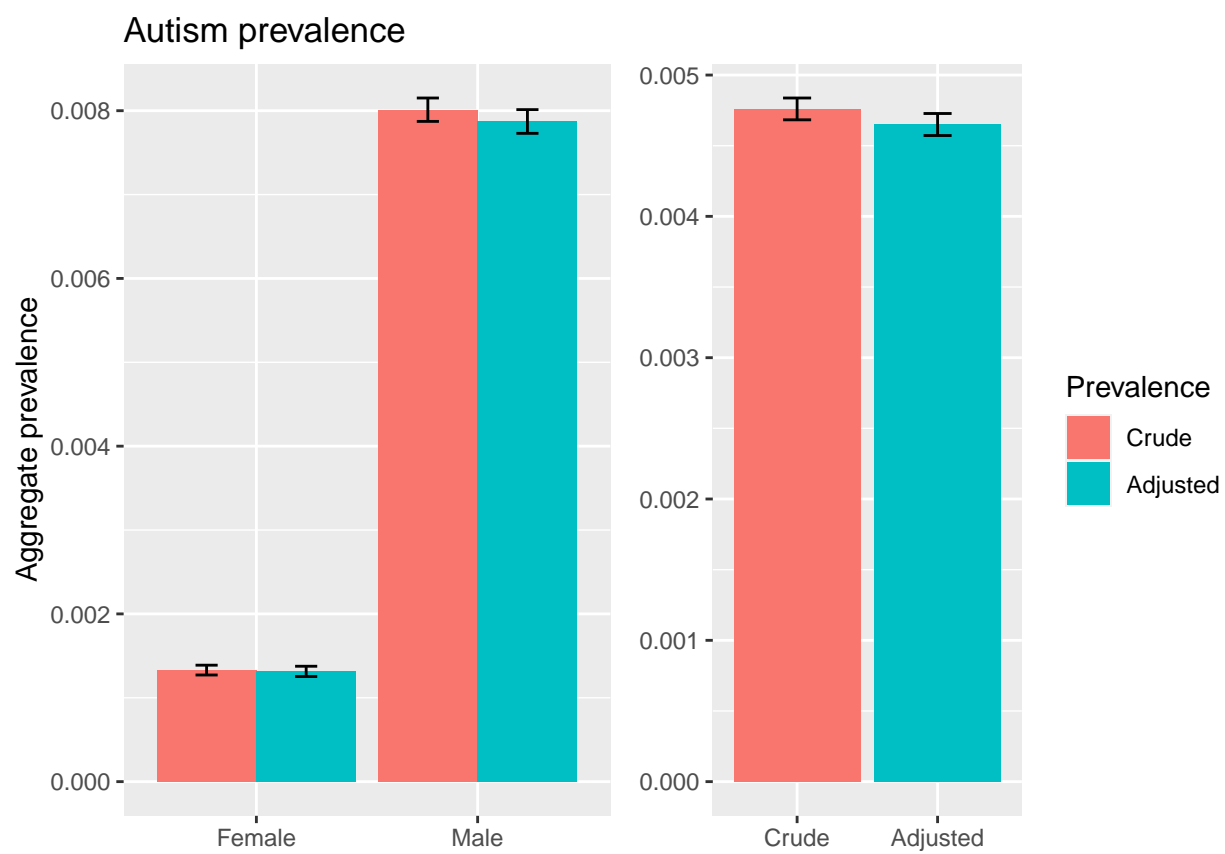
Figure 5: Crude and age- and sex-adjusted sample prevalences of autism, by sex and in aggregate. Bars show 95% confidence intervals.

Figure 6: Sample prevalence of ADHD by age and sex. Bars show 95% confidence intervals.

Figure 7: Crude and age- and sex-adjusted sample prevalences of ADHD, by sex and in aggregate. Bars show 95% confidence intervals.
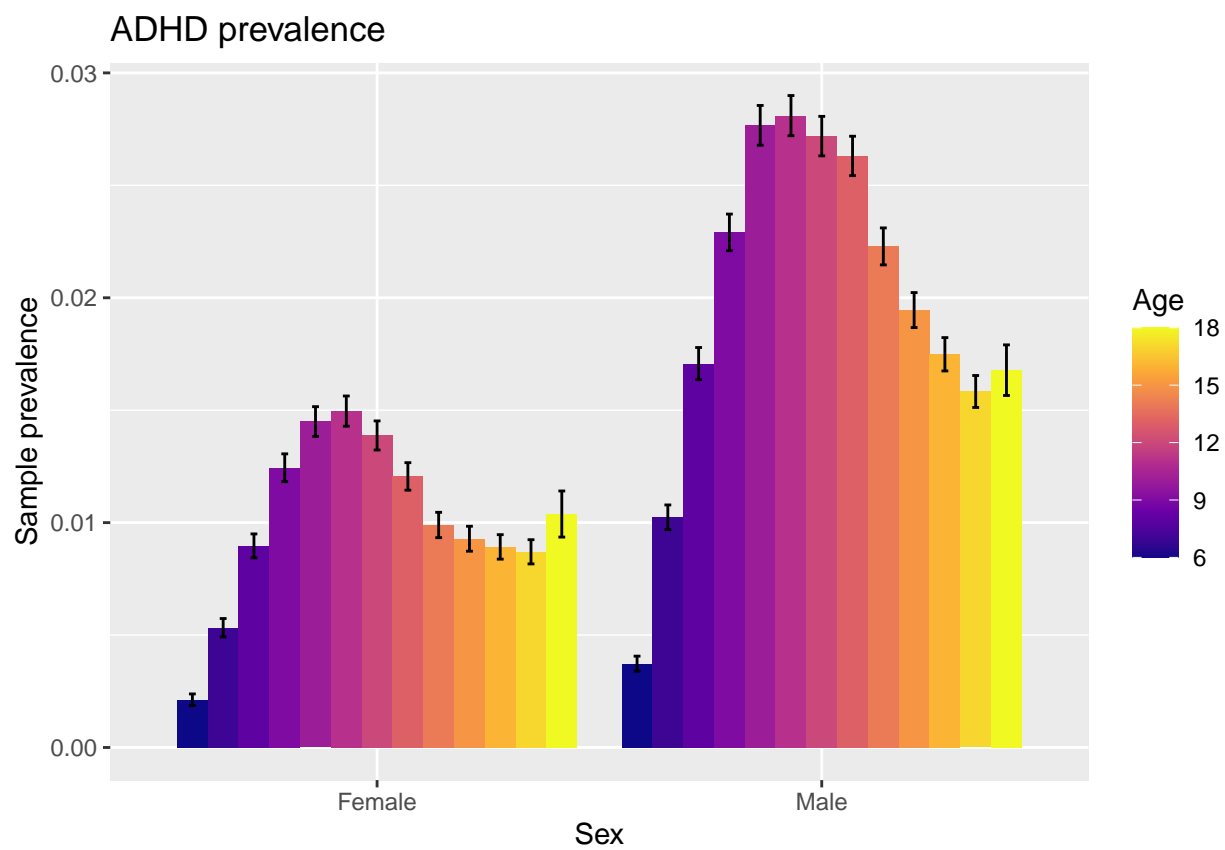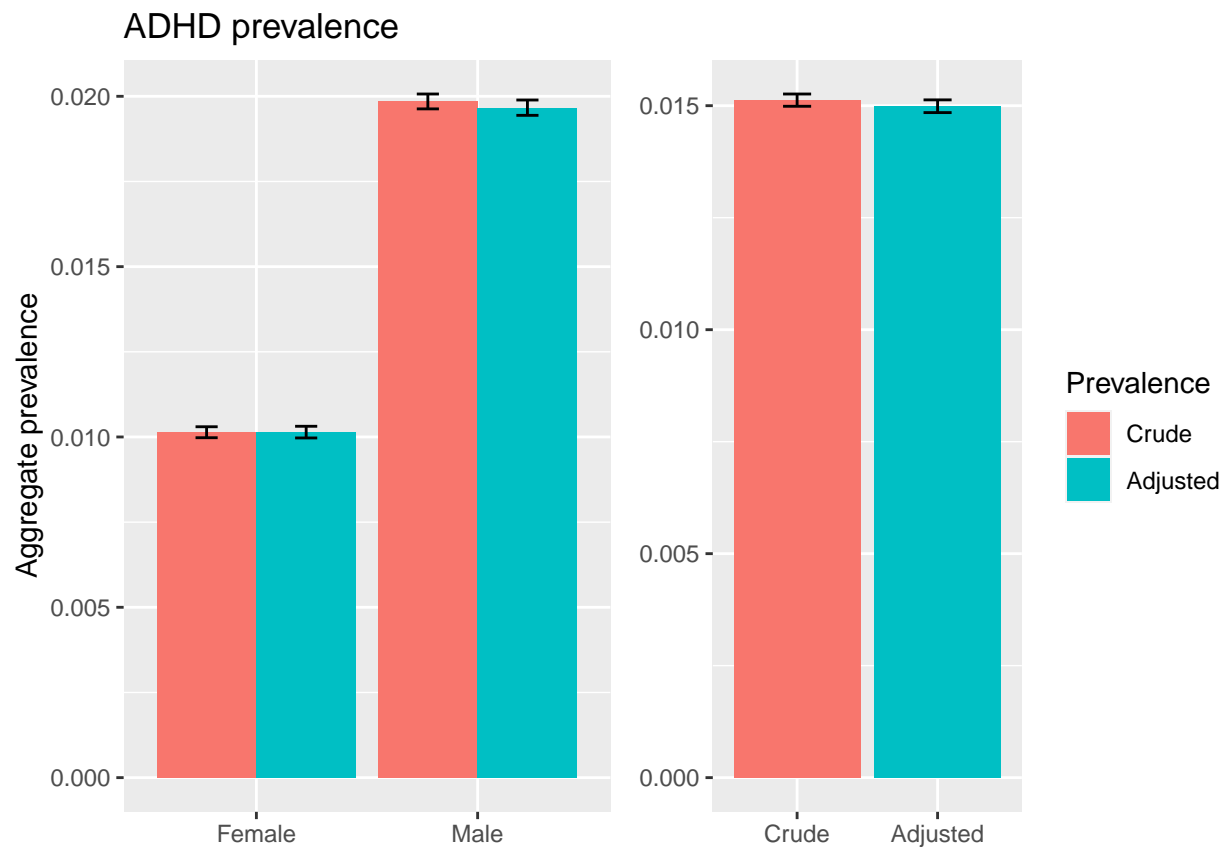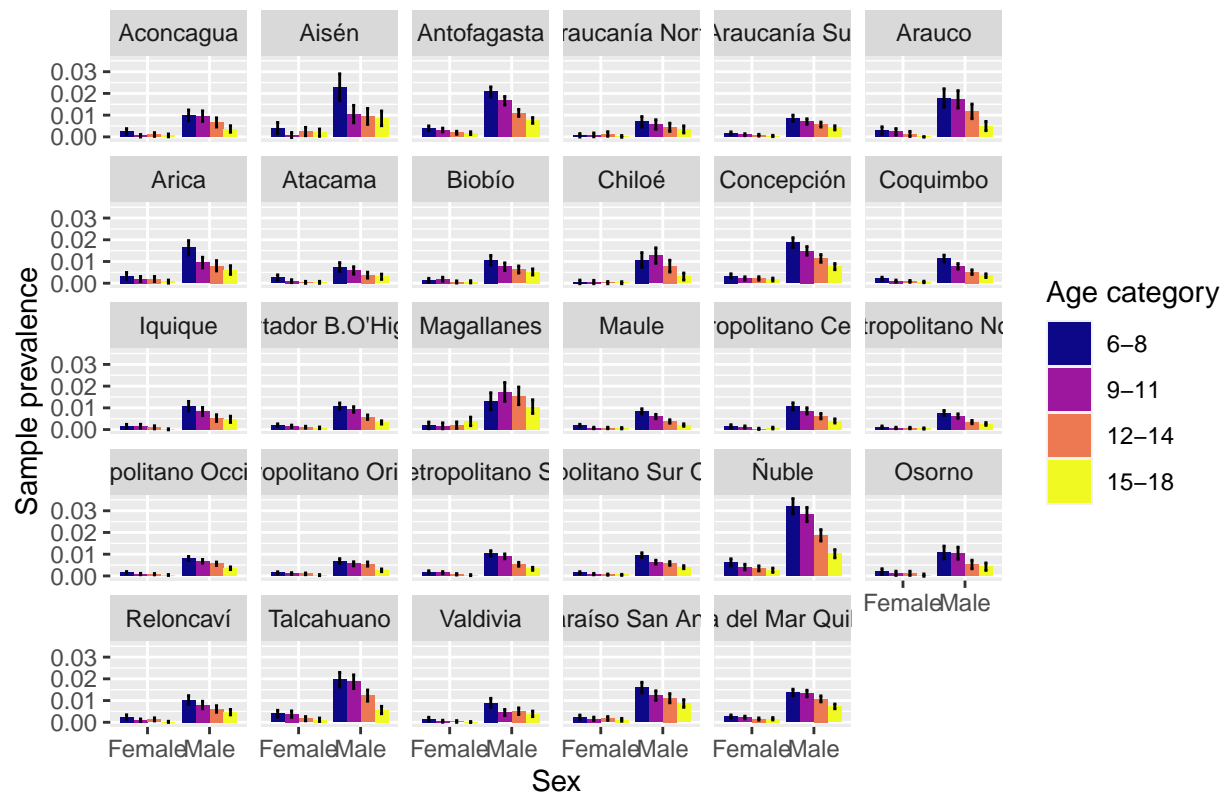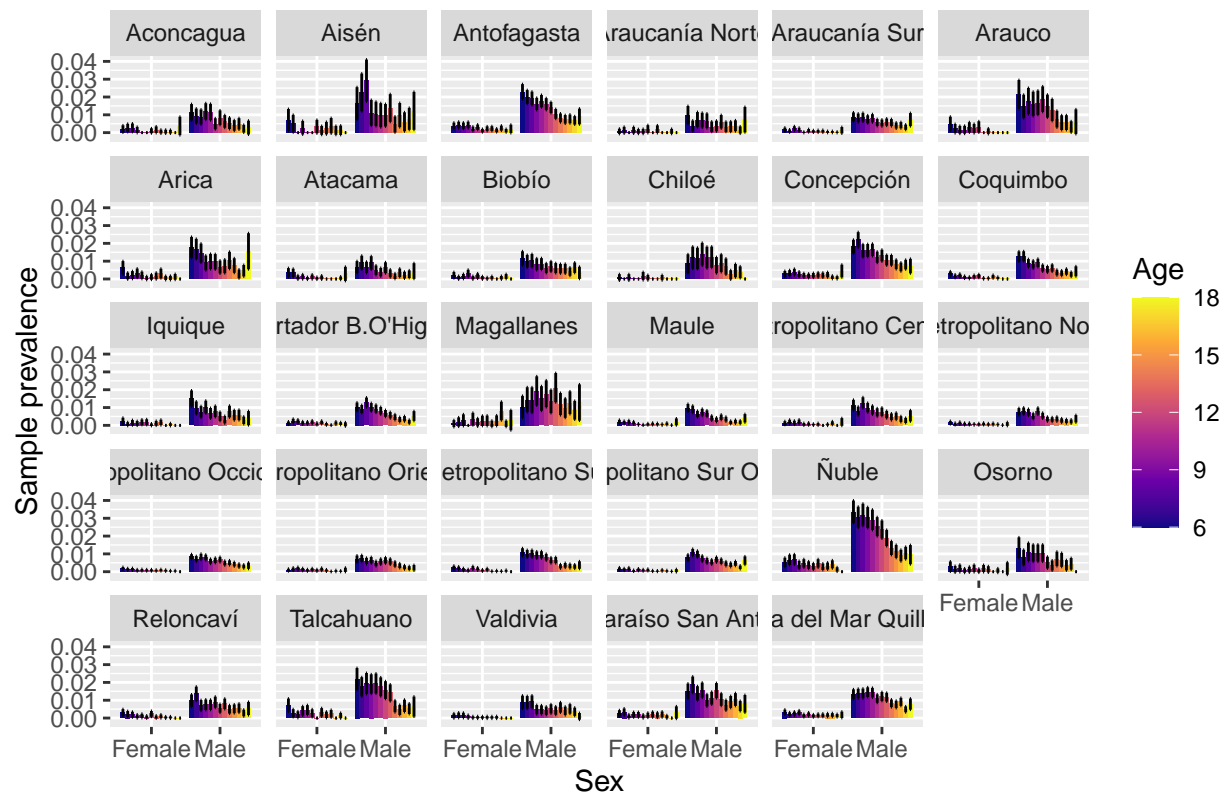
```
## 23 Metropolitano Sur Oriente        0.00342    0.00367    0.00391
## 24                       Osorno       0.00380    0.00445    0.00510
## 25                    Talcahuano      0.00763    0.00839    0.00916
## 26                     Valdivia       0.00269    0.00311    0.00354
## 27      Valparaíso San Antonio        0.00635    0.00694    0.00752
## 28      Viña del Mar Quillota         0.00632    0.00670    0.00709
## 29                       Ñuble        0.01238    0.01317    0.01396
##    adjusted_ci_lower adjusted_rate adjusted_ci_upper
## 1            0.00369       0.00427           0.00499
## 2            0.00634       0.00752           0.00895
## 3            0.00774       0.00825           0.00881
## 4            0.00245       0.00300           0.00376
## 5            0.00338       0.00372           0.00410
## 6            0.00624       0.00715           0.00825
## 7            0.00539       0.00614           0.00704
## 8            0.00266       0.00312           0.00368
## 9            0.00373       0.00420           0.00475
## 10           0.00364       0.00433           0.00518
## 11           0.00718       0.00771           0.00828
## 12           0.00364       0.00396           0.00433
## 13           0.00393       0.00425           0.00460
## 14           0.00277       0.00303           0.00332
## 15           0.00373       0.00417           0.00467
## 16           0.00363       0.00410           0.00466
## 17           0.00724       0.00831           0.00958
## 18           0.00380       0.00416           0.00456
## 19           0.00262       0.00287           0.00314
## 20           0.00316       0.00338           0.00361
## 21           0.00274       0.00298           0.00325
## 22           0.00371       0.00398           0.00427
## 23           0.00339       0.00364           0.00390
## 24           0.00371       0.00433           0.00507
## 25           0.00739       0.00813           0.00898
## 26           0.00260       0.00300           0.00349
## 27           0.00625       0.00683           0.00749
## 28           0.00620       0.00658           0.00699
## 29           0.01208       0.01286           0.01371
```

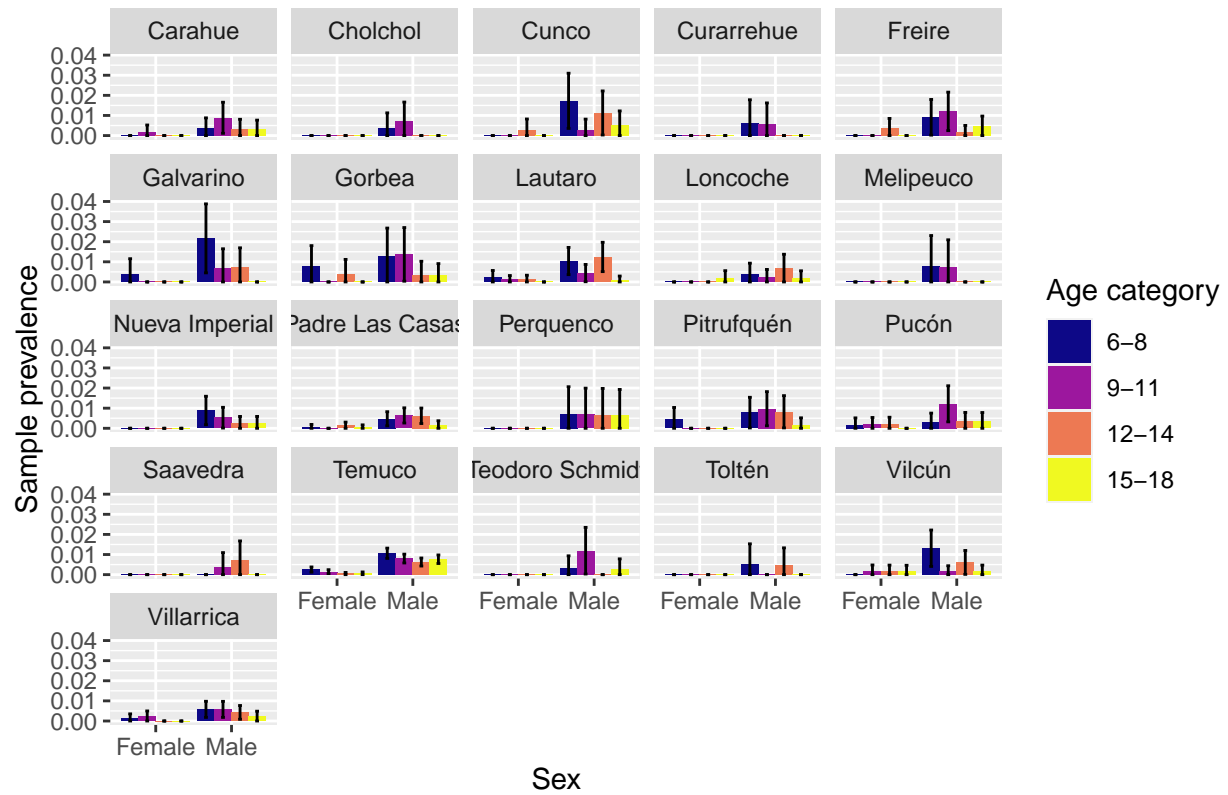## Autism prevalence by health service

Autism prevalence by health service

Autism prevalence by health service

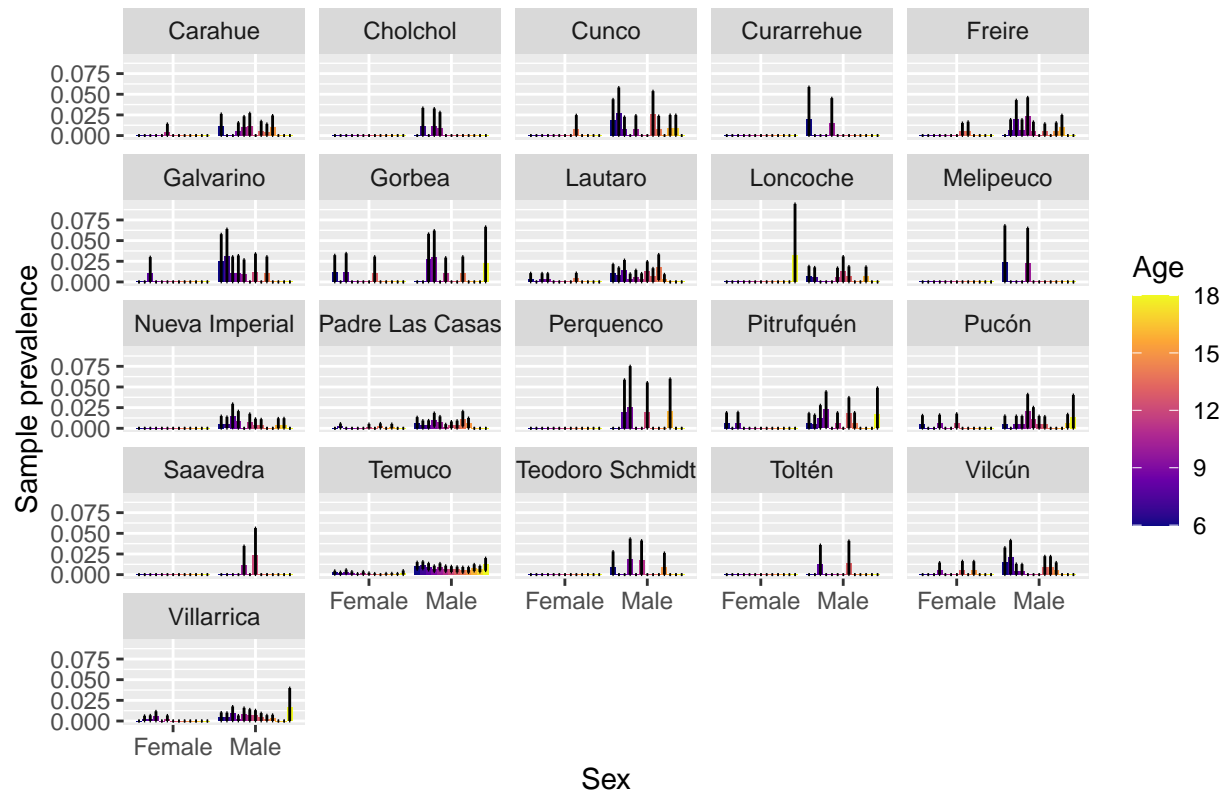

```
## # A tibble: 21 x 7
##    commune_name crude_ci_lower crude_rate crude_ci_upper adjus~1 adjus~2 adjus~3
##    <chr>                 <dbl>      <dbl>          <dbl>   <dbl>   <dbl>   <dbl>
##  1 Carahue             0.00116    0.00266        0.00416 0.00129 0.0025  0.00588
##  2 Cholchol            0          0.00138        0.00295 0.00026 0.00128 0.00816
##  3 Cunco               0.00229    0.0048         0.00732 0.00258 0.00472 0.0100
##  4 Curarrehue          0          0.00147        0.00351 0.00017 0.00142 0.00804
##  5 Freire              0.00195    0.00381        0.00567 0.0021  0.00369 0.00672
##  6 Galvarino           0.00196    0.00478        0.0076  0.0023  0.00463 0.0101
##  7 Gorbea              0.00235    0.0054         0.00844 0.00258 0.0052  0.0118
##  8 Lautaro             0.00255    0.00401        0.00546 0.00259 0.00387 0.00647
##  9 Loncoche            0.00062    0.00202        0.00341 0.0009  0.00295 0.00845
## 10 Melipeuco           0          0.00187        0.00445 0.00022 0.00183 0.0144
## # ... with 11 more rows, and abbreviated variable names 1: adjusted_ci_lower,
## #   2: adjusted_rate, 3: adjusted_ci_upper
```
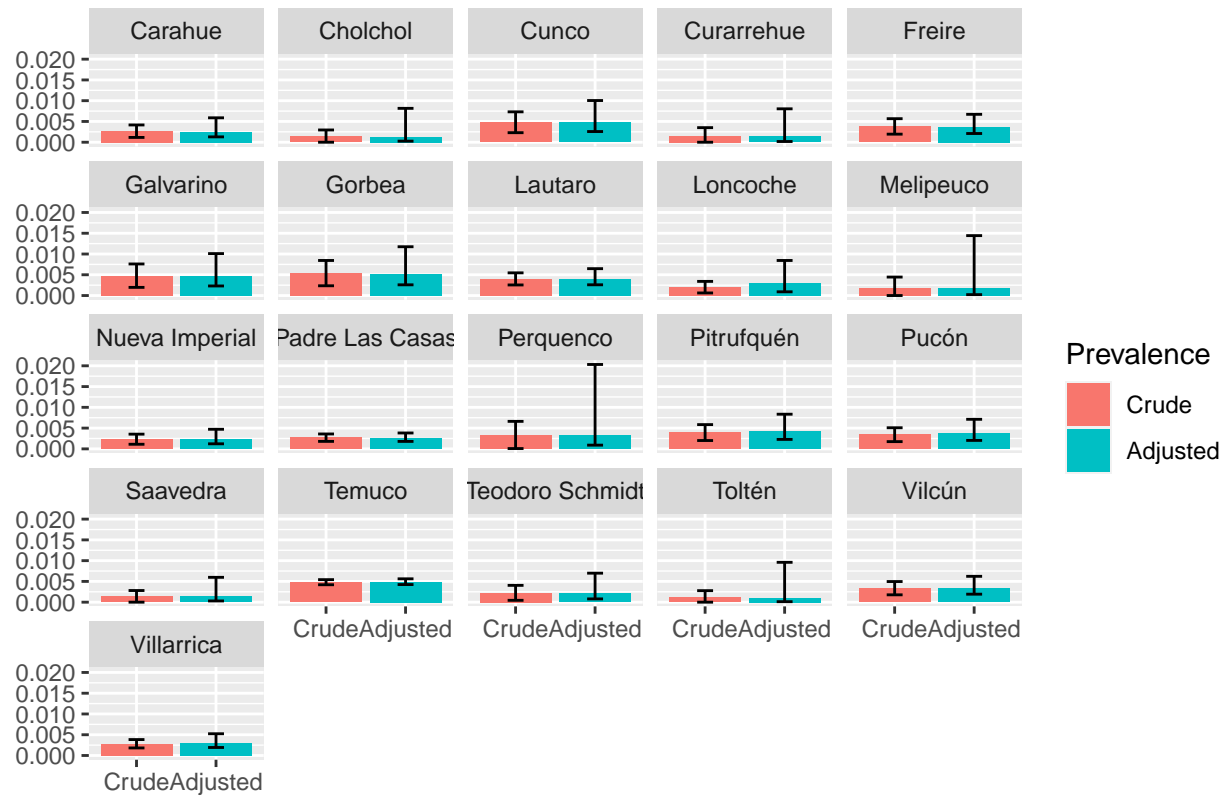
Autism prevalence by commune in Araucanía Sur

Autism prevalence by commune in Araucanía Sur

Autism prevalence by commune in Araucanía Sur

Also:

- SES status
- Ethnicity
- Rurality

5.3 Bayesian prevalence estimation