

Title*

Subtitle

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Abstract

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1 Introduction

Alberta, a province known for its vibrant culture and dynamic economy, faces ongoing challenges in public health, with mortality rates reflecting a complex interplay of socioeconomic, environmental, and healthcare factors. This paper aims to delve into the intricacies of mortality rates in Alberta, exploring the trends, causes, and determinants that shape the province's public health landscape. By leveraging data on causes of death, including chronic diseases,

*Code and data are available at: https://github.com/iJustinn/Alberta_Mortality_Rate.git

accidents, and emerging health threats, we provide a detailed analysis of mortality patterns and their implications for Alberta's healthcare system and policy-making.

This paper utilize data from open.alberta.ca as bases.

2 Data

Data used in this paper was cleaned and processed with the programming language R (R Core Team 2022). Also with support of additional packages in R: `tidyverse` (Wickham et al. 2019), `ggplot2` (Wickham 2016), `janitor` (Firke 2023), `dplyr` (Wickham et al. 2023), `readr` (Wickham, Hester, and Bryan 2023), `knitr` (Xie 2014), 'kableExtra' (`citeKableExtra?`), 'reshape2' (`citeReshape2?`).

2.1 Source

2.2 Method

2.3 Attibutes

3 Results

```
SAMPLING FOR MODEL 'count' NOW (CHAIN 1).
```

```
Chain 1:
```

```
Chain 1: Gradient evaluation took 2.6e-05 seconds
```

```
Chain 1: 1000 transitions using 10 leapfrog steps per transition would take 0.26 seconds.
```

```
Chain 1: Adjust your expectations accordingly!
```

```
Chain 1:
```

```
Chain 1:
```

```
Chain 1: Iteration:    1 / 2000 [  0%] (Warmup)
```

```
Chain 1: Iteration:  200 / 2000 [ 10%] (Warmup)
```

```
Chain 1: Iteration:  400 / 2000 [ 20%] (Warmup)
```

```
Chain 1: Iteration:  600 / 2000 [ 30%] (Warmup)
```

```
Chain 1: Iteration:  800 / 2000 [ 40%] (Warmup)
```

```
Chain 1: Iteration: 1000 / 2000 [ 50%] (Warmup)
```

```
Chain 1: Iteration: 1001 / 2000 [ 50%] (Sampling)
```

```
Chain 1: Iteration: 1200 / 2000 [ 60%] (Sampling)
```

```
Chain 1: Iteration: 1400 / 2000 [ 70%] (Sampling)
```

```
Chain 1: Iteration: 1600 / 2000 [ 80%] (Sampling)
```

```
Chain 1: Iteration: 1800 / 2000 [ 90%] (Sampling)
```

Chain 1: Iteration: 2000 / 2000 [100%] (Sampling)
Chain 1:
Chain 1: Elapsed Time: 0.05 seconds (Warm-up)
Chain 1: 0.047 seconds (Sampling)
Chain 1: 0.097 seconds (Total)
Chain 1:

SAMPLING FOR MODEL 'count' NOW (CHAIN 2).

Chain 2:
Chain 2: Gradient evaluation took 1.5e-05 seconds
Chain 2: 1000 transitions using 10 leapfrog steps per transition would take 0.15 seconds.
Chain 2: Adjust your expectations accordingly!
Chain 2:
Chain 2:
Chain 2: Iteration: 1 / 2000 [0%] (Warmup)
Chain 2: Iteration: 200 / 2000 [10%] (Warmup)
Chain 2: Iteration: 400 / 2000 [20%] (Warmup)
Chain 2: Iteration: 600 / 2000 [30%] (Warmup)
Chain 2: Iteration: 800 / 2000 [40%] (Warmup)
Chain 2: Iteration: 1000 / 2000 [50%] (Warmup)
Chain 2: Iteration: 1001 / 2000 [50%] (Sampling)
Chain 2: Iteration: 1200 / 2000 [60%] (Sampling)
Chain 2: Iteration: 1400 / 2000 [70%] (Sampling)
Chain 2: Iteration: 1600 / 2000 [80%] (Sampling)
Chain 2: Iteration: 1800 / 2000 [90%] (Sampling)
Chain 2: Iteration: 2000 / 2000 [100%] (Sampling)
Chain 2:
Chain 2: Elapsed Time: 0.045 seconds (Warm-up)
Chain 2: 0.051 seconds (Sampling)
Chain 2: 0.096 seconds (Total)
Chain 2:

SAMPLING FOR MODEL 'count' NOW (CHAIN 3).

Chain 3:
Chain 3: Gradient evaluation took 8e-06 seconds
Chain 3: 1000 transitions using 10 leapfrog steps per transition would take 0.08 seconds.
Chain 3: Adjust your expectations accordingly!
Chain 3:
Chain 3:
Chain 3: Iteration: 1 / 2000 [0%] (Warmup)
Chain 3: Iteration: 200 / 2000 [10%] (Warmup)
Chain 3: Iteration: 400 / 2000 [20%] (Warmup)
Chain 3: Iteration: 600 / 2000 [30%] (Warmup)

Chain 3: Iteration: 800 / 2000 [40%] (Warmup)
Chain 3: Iteration: 1000 / 2000 [50%] (Warmup)
Chain 3: Iteration: 1001 / 2000 [50%] (Sampling)
Chain 3: Iteration: 1200 / 2000 [60%] (Sampling)
Chain 3: Iteration: 1400 / 2000 [70%] (Sampling)
Chain 3: Iteration: 1600 / 2000 [80%] (Sampling)
Chain 3: Iteration: 1800 / 2000 [90%] (Sampling)
Chain 3: Iteration: 2000 / 2000 [100%] (Sampling)

Chain 3:

Chain 3: Elapsed Time: 0.048 seconds (Warm-up)

Chain 3: 0.098 seconds (Sampling)

Chain 3: 0.146 seconds (Total)

Chain 3:

SAMPLING FOR MODEL 'count' NOW (CHAIN 4).

Chain 4:

Chain 4: Gradient evaluation took 9e-06 seconds

Chain 4: 1000 transitions using 10 leapfrog steps per transition would take 0.09 seconds.

Chain 4: Adjust your expectations accordingly!

Chain 4:

Chain 4:

Chain 4: Iteration: 1 / 2000 [0%] (Warmup)
Chain 4: Iteration: 200 / 2000 [10%] (Warmup)
Chain 4: Iteration: 400 / 2000 [20%] (Warmup)
Chain 4: Iteration: 600 / 2000 [30%] (Warmup)
Chain 4: Iteration: 800 / 2000 [40%] (Warmup)
Chain 4: Iteration: 1000 / 2000 [50%] (Warmup)
Chain 4: Iteration: 1001 / 2000 [50%] (Sampling)
Chain 4: Iteration: 1200 / 2000 [60%] (Sampling)
Chain 4: Iteration: 1400 / 2000 [70%] (Sampling)
Chain 4: Iteration: 1600 / 2000 [80%] (Sampling)
Chain 4: Iteration: 1800 / 2000 [90%] (Sampling)
Chain 4: Iteration: 2000 / 2000 [100%] (Sampling)

Chain 4:

Chain 4: Elapsed Time: 0.052 seconds (Warm-up)

Chain 4: 0.055 seconds (Sampling)

Chain 4: 0.107 seconds (Total)

Chain 4:

SAMPLING FOR MODEL 'count' NOW (CHAIN 1).

Chain 1:

```

Chain 1: Gradient evaluation took 2.7e-05 seconds
Chain 1: 1000 transitions using 10 leapfrog steps per transition would take 0.27 seconds.
Chain 1: Adjust your expectations accordingly!
Chain 1:
Chain 1:
Chain 1: Iteration:    1 / 2000 [  0%] (Warmup)
Chain 1: Iteration:   200 / 2000 [ 10%] (Warmup)
Chain 1: Iteration:   400 / 2000 [ 20%] (Warmup)
Chain 1: Iteration:   600 / 2000 [ 30%] (Warmup)
Chain 1: Iteration:   800 / 2000 [ 40%] (Warmup)
Chain 1: Iteration:  1000 / 2000 [ 50%] (Warmup)
Chain 1: Iteration:  1001 / 2000 [ 50%] (Sampling)
Chain 1: Iteration:  1200 / 2000 [ 60%] (Sampling)
Chain 1: Iteration:  1400 / 2000 [ 70%] (Sampling)
Chain 1: Iteration:  1600 / 2000 [ 80%] (Sampling)
Chain 1: Iteration:  1800 / 2000 [ 90%] (Sampling)
Chain 1: Iteration:  2000 / 2000 [100%] (Sampling)
Chain 1:
Chain 1: Elapsed Time: 0.075 seconds (Warm-up)
Chain 1:                  0.083 seconds (Sampling)
Chain 1:                  0.158 seconds (Total)
Chain 1:

```

SAMPLING FOR MODEL 'count' NOW (CHAIN 2).

```

Chain 2:
Chain 2: Gradient evaluation took 1.5e-05 seconds
Chain 2: 1000 transitions using 10 leapfrog steps per transition would take 0.15 seconds.
Chain 2: Adjust your expectations accordingly!
Chain 2:
Chain 2:
Chain 2: Iteration:    1 / 2000 [  0%] (Warmup)
Chain 2: Iteration:   200 / 2000 [ 10%] (Warmup)
Chain 2: Iteration:   400 / 2000 [ 20%] (Warmup)
Chain 2: Iteration:   600 / 2000 [ 30%] (Warmup)
Chain 2: Iteration:   800 / 2000 [ 40%] (Warmup)
Chain 2: Iteration:  1000 / 2000 [ 50%] (Warmup)
Chain 2: Iteration:  1001 / 2000 [ 50%] (Sampling)
Chain 2: Iteration:  1200 / 2000 [ 60%] (Sampling)
Chain 2: Iteration:  1400 / 2000 [ 70%] (Sampling)
Chain 2: Iteration:  1600 / 2000 [ 80%] (Sampling)
Chain 2: Iteration:  1800 / 2000 [ 90%] (Sampling)
Chain 2: Iteration:  2000 / 2000 [100%] (Sampling)
Chain 2:

```

Chain 2: Elapsed Time: 0.078 seconds (Warm-up)
Chain 2: 0.079 seconds (Sampling)
Chain 2: 0.157 seconds (Total)
Chain 2:

SAMPLING FOR MODEL 'count' NOW (CHAIN 3).

Chain 3:
Chain 3: Gradient evaluation took 1e-05 seconds
Chain 3: 1000 transitions using 10 leapfrog steps per transition would take 0.1 seconds.
Chain 3: Adjust your expectations accordingly!
Chain 3:
Chain 3:
Chain 3: Iteration: 1 / 2000 [0%] (Warmup)
Chain 3: Iteration: 200 / 2000 [10%] (Warmup)
Chain 3: Iteration: 400 / 2000 [20%] (Warmup)
Chain 3: Iteration: 600 / 2000 [30%] (Warmup)
Chain 3: Iteration: 800 / 2000 [40%] (Warmup)
Chain 3: Iteration: 1000 / 2000 [50%] (Warmup)
Chain 3: Iteration: 1001 / 2000 [50%] (Sampling)
Chain 3: Iteration: 1200 / 2000 [60%] (Sampling)
Chain 3: Iteration: 1400 / 2000 [70%] (Sampling)
Chain 3: Iteration: 1600 / 2000 [80%] (Sampling)
Chain 3: Iteration: 1800 / 2000 [90%] (Sampling)
Chain 3: Iteration: 2000 / 2000 [100%] (Sampling)
Chain 3:
Chain 3: Elapsed Time: 0.078 seconds (Warm-up)
Chain 3: 0.092 seconds (Sampling)
Chain 3: 0.17 seconds (Total)
Chain 3:

SAMPLING FOR MODEL 'count' NOW (CHAIN 4).

Chain 4:
Chain 4: Gradient evaluation took 1.1e-05 seconds
Chain 4: 1000 transitions using 10 leapfrog steps per transition would take 0.11 seconds.
Chain 4: Adjust your expectations accordingly!
Chain 4:
Chain 4:
Chain 4: Iteration: 1 / 2000 [0%] (Warmup)
Chain 4: Iteration: 200 / 2000 [10%] (Warmup)
Chain 4: Iteration: 400 / 2000 [20%] (Warmup)
Chain 4: Iteration: 600 / 2000 [30%] (Warmup)
Chain 4: Iteration: 800 / 2000 [40%] (Warmup)
Chain 4: Iteration: 1000 / 2000 [50%] (Warmup)

```

Chain 4: Iteration: 1001 / 2000 [ 50%] (Sampling)
Chain 4: Iteration: 1200 / 2000 [ 60%] (Sampling)
Chain 4: Iteration: 1400 / 2000 [ 70%] (Sampling)
Chain 4: Iteration: 1600 / 2000 [ 80%] (Sampling)
Chain 4: Iteration: 1800 / 2000 [ 90%] (Sampling)
Chain 4: Iteration: 2000 / 2000 [100%] (Sampling)
Chain 4:
Chain 4: Elapsed Time: 0.074 seconds (Warm-up)
Chain 4:           0.082 seconds (Sampling)
Chain 4:           0.156 seconds (Total)
Chain 4:

```

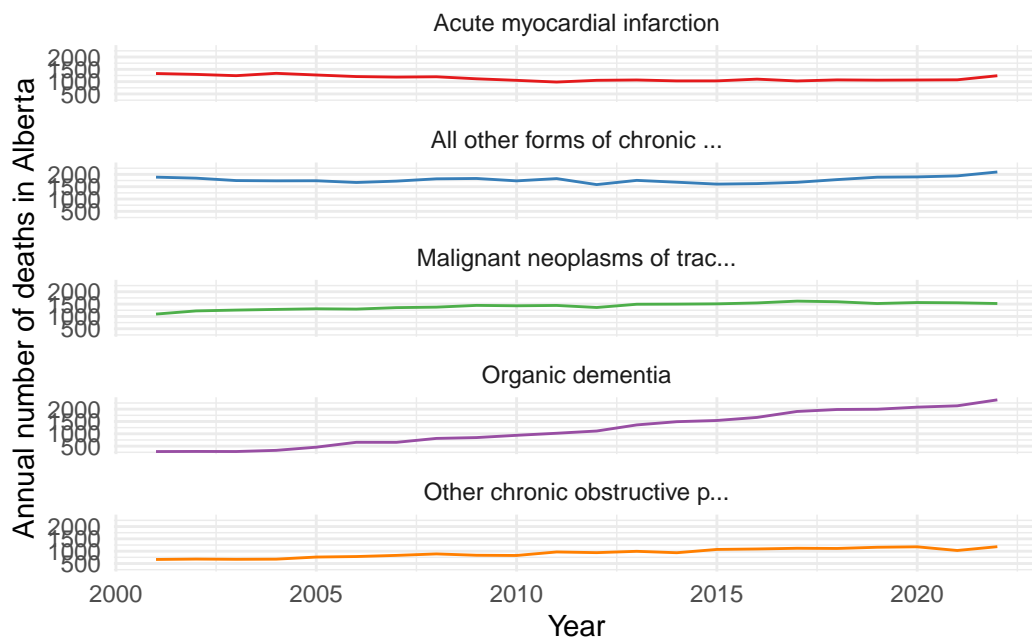


Figure 1: result for poisson model

4 Discussion

5 Conclusion

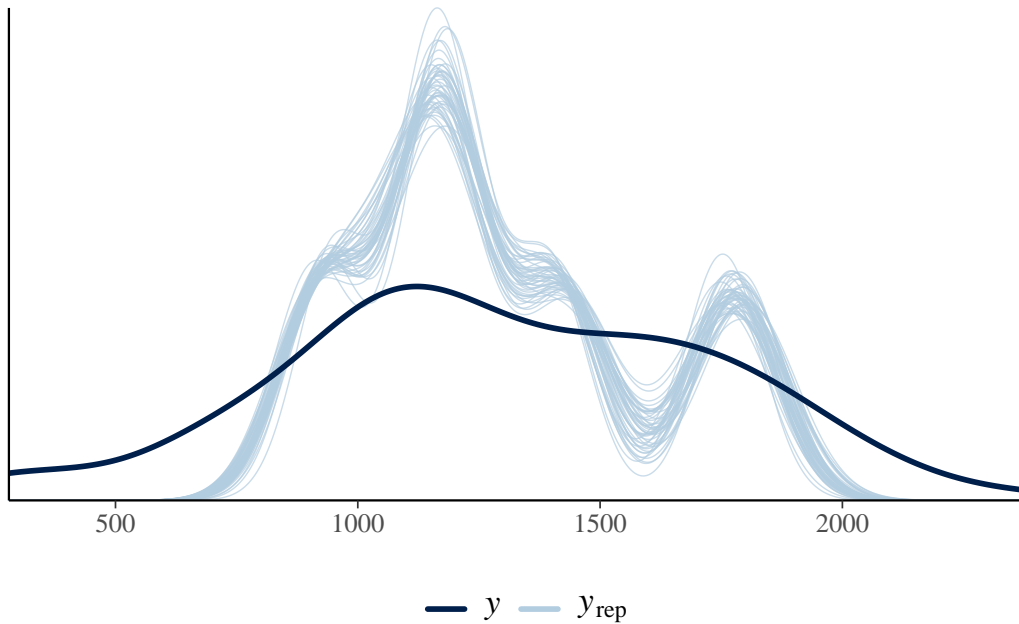


Figure 2: result for poisson model

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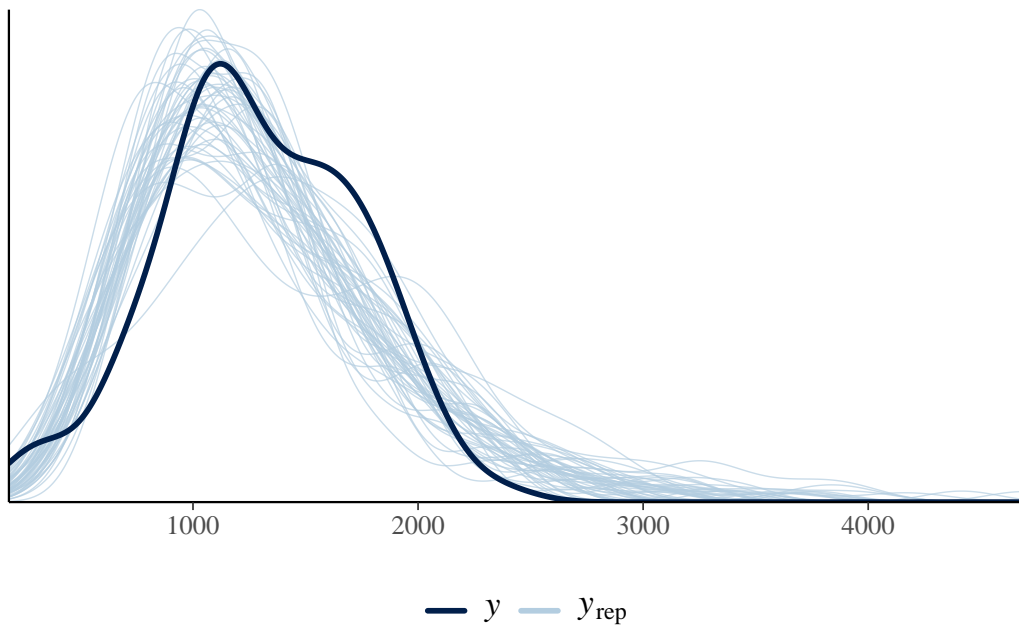


Figure 3: result for poisson model

Table 1: summary of modeling

	Poisson	Negative binomial
other chronic	0.447	0.449 (0.102)
neoplasms	0.223	0.226 (0.100)
dementia	0.046	0.048 (0.101)
obstructive pulmonary	−0.205	−0.203 (0.104)
Num.Obs.	110	110
Log.Lik.	−5718.182	−810.934
ELPD	−5926.8	−815.4
ELPD s.e.	1216.0	10.6
LOOIC	11 853.7	1630.8
LOOIC s.e.	2432.0	21.2
WAIC	11 954.1	1630.8
RMSE	325.38	325.39