Top Mortality causes in young adults and middle age adults in Switzerland*

Analyzing data from the WHO database

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This study employs Bayesian analysis to investigate mortality causes among young adults (aged 20 to below 40) and middle-aged adults (aged 40 to below 60) in Switzerland. Analyzing mortality data from national registries and healthcare databases, significant disparities in mortality causes between the two age groups are identified. The findings underscore the importance of targeted interventions and policy measures to address the distinct health needs of young and middle-aged adults. This research contributes to advancing understanding of mortality dynamics in Switzerland and informs evidence-based public health strategies.

1 Introduction

In recent years, understanding the mortality causes among different age groups has become increasingly crucial for public health research and policy-making. Mortality patterns can vary significantly across age cohorts, reflecting not only the natural aging process but also the diverse lifestyle factors, socioeconomic conditions, and healthcare accessibility experienced by different demographic groups. In Switzerland, a country renowned for its high-quality healthcare system and favorable living standards, investigating mortality causes among young and middle-aged adults presents a compelling avenue for exploring the health dynamics within these cohorts.

This research aims to delve into the mortality causes prevalent among young adults (aged 20 to below 40) and middle-aged adults (aged 40 to below 60) in Switzerland, employing a Bayesian analytical approach. While numerous studies have investigated mortality trends in broader age categories or specific disease cohorts, there remains a paucity of research focusing

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*Code and data are available at: https://github.com/thu2912/Top-mortality-causes-of-age-groups-in-Switzerland.git

explicitly on these two distinct age groups. By utilizing Bayesian methods, this study offers a novel perspective on mortality analysis, allowing for the incorporation of prior knowledge, uncertainty quantification, and robust inference in modeling mortality causes.

The findings of this research shed light on the stark differences in the top mortality causes between young and middle-aged adults in Switzerland. By examining comprehensive mortality data from national registries and healthcare databases, this study identifies and analyzes the leading causes of death within each age cohort, elucidating the underlying factors contributing to these disparities. Moreover, the Bayesian framework enables the exploration of uncertainty and variability in mortality patterns, providing valuable insights for policymakers, healthcare practitioners, and researchers in developing targeted interventions and preventive strategies tailored to the specific needs of each age group.

Through this research, we seek to contribute to the broader understanding of mortality dynamics in Switzerland and advance the discourse on public health initiatives aimed at reducing premature deaths and improving overall population health. By uncovering the distinct mortality landscapes among young and middle-aged adults, we aim to inform evidence-based policymaking and resource allocation strategies that address the unique health challenges faced by these demographic cohorts.

2 Data

2.1 Raw Data

2.2 Clean Data

Table 1: Top 10 Mortality Causes in Switzerland for young adults in 2010

Year	Causes	Population	Deaths	Death rate	Age
2010	Self-harm	1507608	202	13.3987084	below 40
2010	Drug use disorders	1507608	95	6.3013728	below 40
2010	Road injury	1507608	85	5.6380704	below 40
2010	Breast cancer	1507608	33	2.1888979	below 40
2010	Ischaemic heart disease	1507608	31	2.0562374	below 40
2010	Brain and nervous system cancers	1507608	27	1.7909165	below 40
2010	Falls	1507608	25	1.6582560	below 40
2010	Congenital anomalies	1507608	20	1.3266048	below 40
2010	Colon and rectum cancers	1507608	19	1.2602746	below 40
2010	Stroke	1507608	15	0.9949536	below 40

Table 3: **?(caption)**

Cause	Deaths
Self-harm	595
Drug use disorders	260
Road injury	181
Brain and nervous system cancers	79
Falls	73

Common Mortality Causes for young adults in 2010,1015,and 2019

Table 5: **?(caption)**

Cause	Deaths
Ischaemic heart disease	1656
Trachea, bronchus, lung cancers	1548
Self-harm	1285
Breast cancer	825
Cirrhosis of the liver	618

Common Mortality Causes for middle age adults in 2010,1015,and 2019

Table 2: Top 10 Mortality Causes in Switzerland for middle ages in 2010

Year	Causes	Population	Deaths	Death rate	Age
2010	Ischaemic heart disease	1840659	623	33.846573	above 40
2010	Trachea, bronchus, lung cancers	1840659	572	31.075827	above 40
2010	Self-harm	1840659	427	23.198213	above 40
2010	Breast cancer	1840659	300	16.298510	above 40
2010	Cirrhosis of the liver	1840659	236	12.821495	above 40
2010	Colon and rectum cancers	1840659	213	11.571942	above 40
2010	Pancreas cancer	1840659	172	9.344479	above 40
2010	Stroke	1840659	141	7.660300	above 40
2010	Brain and nervous system cancers	1840659	134	7.280001	above 40
2010	Mouth and oropharynx cancers	1840659	117	6.356419	above 40

```
# #| label: fig-abc
# #| fig-cap: abc
#| echo: false
#| warning: false
#| message: false

datasummary(
  Deaths ~ Min + Mean + Max + SD + Var + N,
  fmt = 0,
  data = clean_data_below40
)


# #| label: fig-abc
# #| fig-cap: abc
```

	Min	Mean	Max	SD	Var	N
Deaths	14	50	204	55	3077	30

|	Min	Mean	Max	SD	Var	N
Deaths	103	272	623	162	26 240	30

```
#| echo: false
#| warning: false
#| message: false

datasummary(
  Deaths ~ Min + Mean + Max + SD + Var + N,
  fmt = 0,
  data = clean_data_above40
)
```

```
# #| label: fig-abc
# #| fig-cap: abc
#| echo: false
#| warning: false
#| message: false

clean_data_below40%>%
  filter(Cause %in% common_causes_below40_table$Cause) %>%
  ggplot(aes(x = Year.x, y = Deaths, color = Cause)) +
  geom_line() +
  theme_minimal() +
  scale_color_brewer(palette = "Set1") +
  labs(x = "Year", y = "Number of deaths")+
  scale_x_continuous(breaks = c(2010, 2015, 2019))+
  ylim(0,250)# Adjust the limits as needed
```
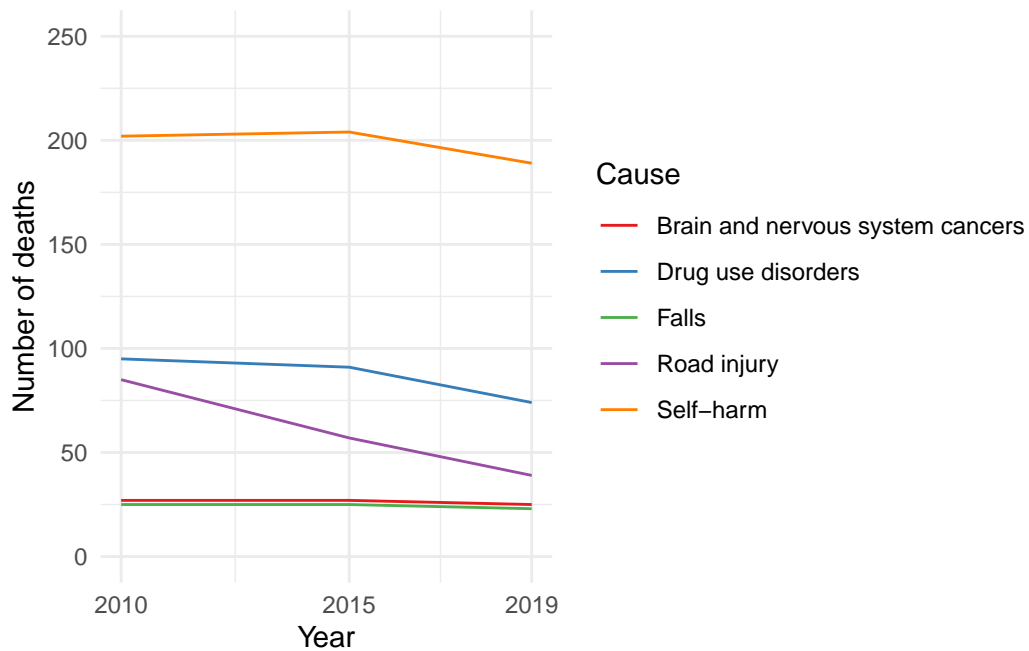
```
# #| label: fig-abc
# #| fig-cap: abc
#| echo: false
#| warning: false
#| message: false

clean_data_above40%>%
  filter(Cause %in% common_causes_above40_table$Cause) %>%
  ggplot(aes(x = Year.x, y = Deaths, color = Cause)) +
  geom_line() +
  theme_minimal() +
  scale_color_brewer(palette = "Set1") +
  labs(x = "Year", y = "Number of deaths")+
  scale_x_continuous(breaks = c(2010, 2015, 2019))+
  ylim(100,650)# Adjust the limits as needed
```
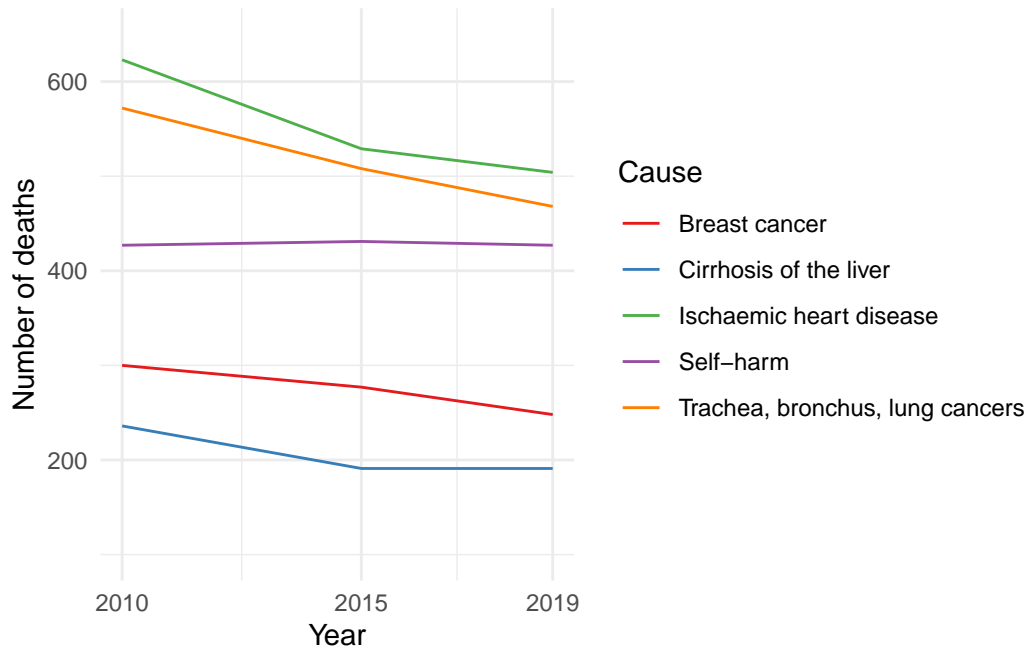
3 Model

3.1 Model set-up

$$y_i | \mu_i, \sigma \sim \text{Normal}(\mu_i, \sigma) \tag{1}$$
$$\mu_i = \alpha + \beta_i + \gamma_i \tag{2}$$
$$\alpha \sim \text{Normal}(0, 2.5) \tag{3}$$
$$\beta \sim \text{Normal}(0, 2.5) \tag{4}$$
$$\gamma \sim \text{Normal}(0, 2.5) \tag{5}$$
$$\sigma \sim \text{Exponential}(1) \tag{6}$$

3.1.1 Model justification

4 Results

Our results are summarized in Table 7.

```
Warning:
`modelsummary` uses the `performance` package to extract goodness-of-fit
```

Table 7: **?(caption)**

(a)

	Below 40
(Intercept)	3.283
	(0.285)
CauseDrug use disorders	1.192
	(0.389)
CauseFalls	−0.090
	(0.405)
CauseRoad injury	0.832
	(0.392)
CauseSelf-harm	2.019
	(0.404)
Num.Obs.	15
Log.Lik.	−66.433
ELPD	−68.6
ELPD s.e.	3.2
LOOIC	137.2
LOOIC s.e.	6.3
WAIC	136.9
RMSE	9.95

```
statistics from models of this class. You can specify the statistics you wish
to compute by supplying a `metrics` argument to `modelsummary`, which will then
push it forward to `performance`. Acceptable values are: "all", "common",
"none", or a character vector of metrics names. For example: `modelsummary(mod,
metrics = c("RMSE", "R2")` Note that some metrics are computationally
expensive. See `?performance::performance` for details.
 This warning appears once per session.
```

" '

5 Discussion

5.1 First discussion point

If my paper were 10 pages, then should be be at least 2.5 pages. The discussion is a chance to show off what you know and what you learnt from all this.

Table 8: **?(caption)**

(a)

	Above 40
(Intercept)	5.634
	(0.244)
CauseCirrhosis of the liver	−0.277
	(0.345)
CauseIschaemic heart disease	0.694
	(0.357)
CauseSelf-harm	0.445
	(0.337)
CauseTrachea, bronchus, lung cancers	0.629
	(0.339)
Num.Obs.	15
Log.Lik.	−92.059
ELPD	−93.9
ELPD s.e.	1.6
LOOIC	187.7
LOOIC s.e.	3.1
WAIC	187.6
RMSE	33.54

5.2 Second discussion point

5.3 Third discussion point

5.4 Weaknesses and next steps

Weaknesses and next steps should also be included.

Appendix

A Additional data details

B Model details

B.1 Posterior predictive check

In **?@fig-ppcheckandposteriorvsprior-1** we implement a posterior predictive check. This shows...

In **?@fig-ppcheckandposteriorvsprior-2** we compare the posterior with the prior. This shows...

C References