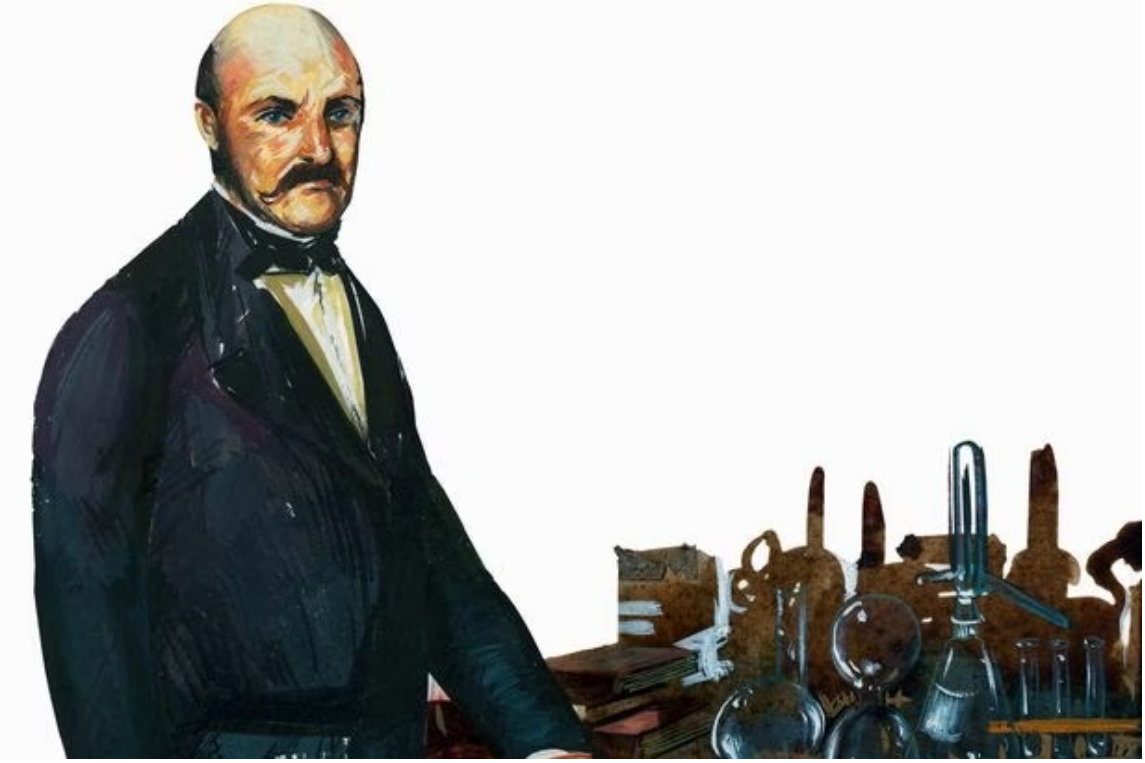
The Discovery of Handwashing

Ignaz Philipp Semmelweis was a Hungarian physician and scientist who was described as the saviour of mothers and the early pioneer of antiseptic procedures. He proposed the practise of handwashing with chlorinated lime solutions in 1847 while working in Vienna General Hospital as a means to reduce childbed fever. We will be exploring the impact this method had on the birth and death rate in data provided.



In [15]:
```
library(dplyr)

library(readr)

library(ggplot2); theme_set(theme_minimal())
```

Loading the dataset

clinic_data <- read_csv("clinic_data.csv")

hospital_data <- read_csv("hospital_data.csv")

Checking the structure of the data

glimpse(clinic_data)

glimpse(hospital_data)

Creating a calculated death ratio column (deaths/births)

In [16]:
```
# death ratio

clinic_data <- clinic_data %>%
  group_by(clinic) %>%
  mutate(death_ratio = deaths/births)

hospital_data <- hospital_data %>%
  group_by(hospital) %>%
  mutate(death_ratio = deaths/births)
```

Clinic data

In [17]:
```
head(clinic_data, 3)
```

year	births	deaths	clinic	death_ratio
1833	3737	197	clinic_1	0.05271608
1834	2657	205	clinic_1	0.07715469
1835	2573	143	clinic_1	0.05557715

hospital data

In [18]:
```
head(hospital_data, 3)
```

year	births	deaths	hospital	death_ratio
1784	1261	11	Dublin	0.008723236
1785	1292	8	Dublin	0.006191950
1786	1351	8	Dublin	0.005921540

Investigating deaths before handwashing was introduced in 1847

In [19]:
```
clinic_deaths_prehandwashing <- clinic_data %>%
  filter(year < 1847) %>%
  group_by(clinic) %>%
  summarise(avg_deaths = mean(death_ratio)) #clinic deaths prehandwashing

clinic_deaths_all_years <- clinic_data %>%
  group_by(clinic) %>%
  summarise(avg_deaths = mean(death_ratio)) #clinic deaths for all the years
```

In [20]:
```
clinic_deaths_prehandwashing

clinic_deaths_all_years
```

clinic	avg_deaths
clinic_1	0.07993925
clinic_2	0.04787381

clinic	avg_deaths
clinic_1	0.05938787
clinic_2	0.04021851

The average death was higher prehandwashing

Doctors began performing pathological autopsies at Vienna hospital in 1823

We compare the average death for Vienna Hospital where autopsies are performed with Dublin and Rotunda Hospital where it was not.

In [21]:
```
hospital_autopsy_introduced <- hospital_data %>%
  filter(hospital == "Vienna") %>% # Filter for only vienna hospital
  mutate(autopsy_introduced = year > 1823) %>%
  group_by(autopsy_introduced) %>%
  summarise(avg_deaths = mean(death_ratio))

hospital_autopsy_introduced
```

autopsy_introduced	avg_deaths
FALSE	0.01323155
TRUE	0.05815028

For hospitals in Vienna, the average death was higher in hospital that perform autopsy as compared to those that don't.

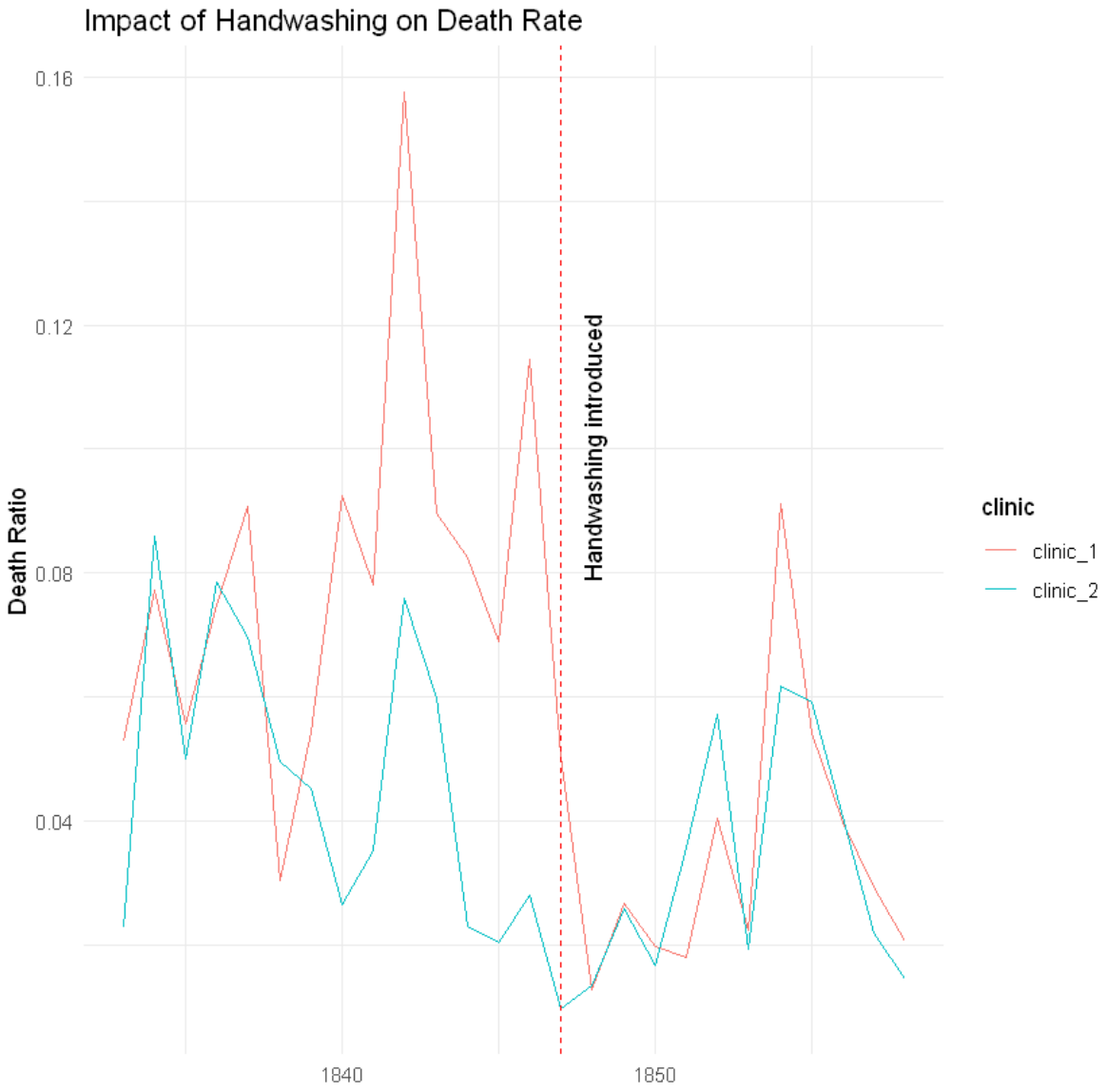
In [22]:
```
all_hospital_autopsy_introduced
```

autopsies_introduced	avg_rate
FALSE	0.01125877
TRUE	0.03660768

The average death across all hospitals that perform autopsy shows a higher value than the ones that don't

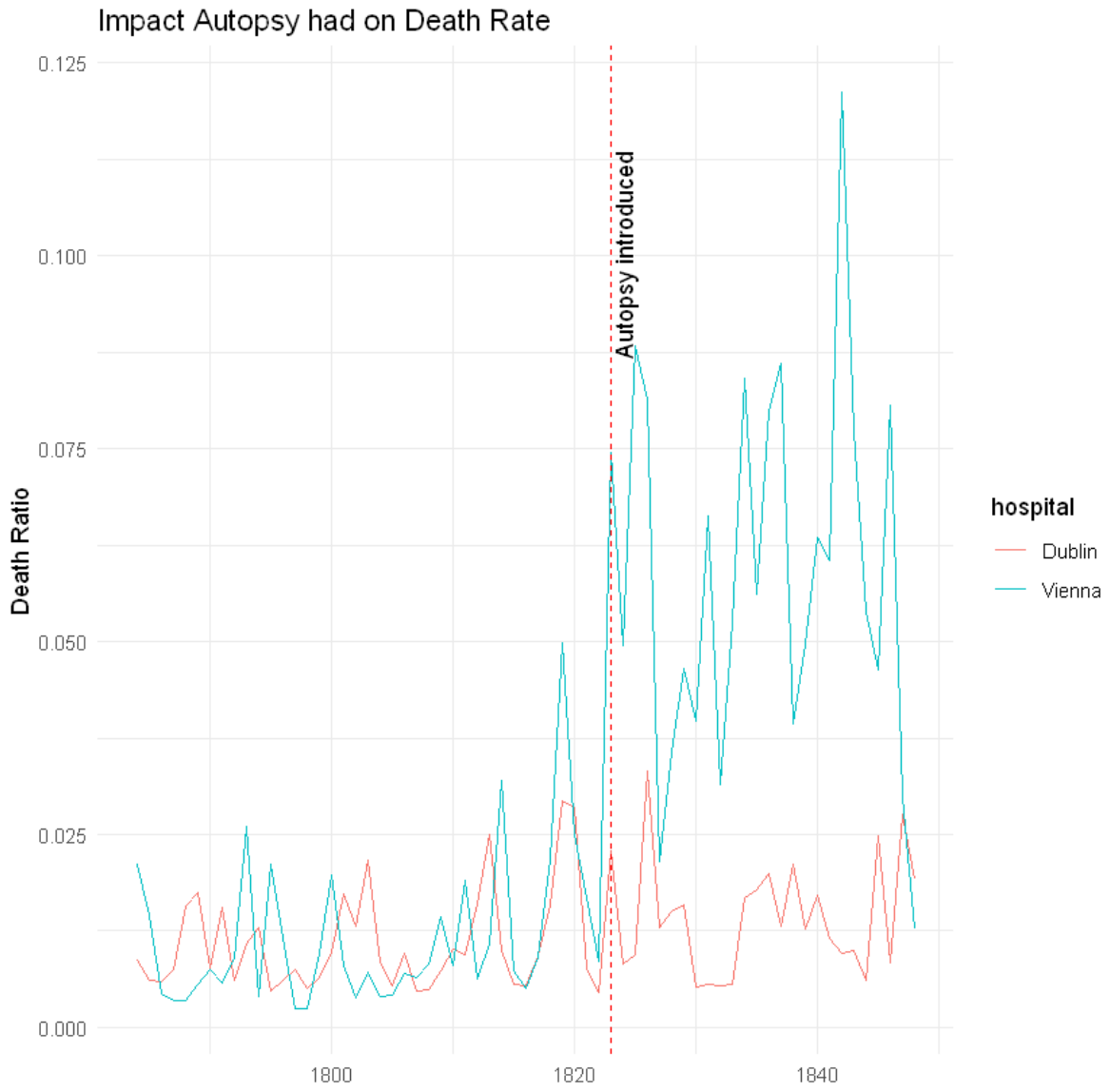
Making Sense of Everything With Visualisation

In [23]:
```
handwashing_introduced <- 1847 # handwashing was introduced

clinic_data %>%
  ggplot(aes(year, death_ratio, colour = clinic)) +
  geom_line() +
  geom_vline(xintercept = handwashing_introduced, linetype = "dashed",
             colour = "red") +
  annotate("text", x = 1848, y = 0.1, label = "Handwashing introduced",
           angle = 90) +
  labs(title = "Impact of Handwashing on Death Rate", x = "",
       y = "Death Ratio")
```



The death rate drastically reduced afeter handwashing was reduced. This validate that handwashing using antiseptic before entering delivery rooms is a good practise.

In [24]:
```
autopsy_introduced <- 1823 #Autopsy was introduced

hospital_data %>%
  ggplot(aes(year, death_ratio, colour = hospital)) +
  geom_line() +
  geom_vline(xintercept = autopsy_introduced, linetype = "dashed",
             colour = "red") +
  annotate("text", x = 1824, y = 0.1, label = "Autopsy introduced",
           angle = 90) +
  # annotate("text", x = 1848, y = 0.1, label = "Handwashing introduced",
           # angle = 90)
  labs(title = "Impact Autopsy had on Death Rate", x = "",
       y = "Death Ratio")
```



For feedback please email me write.ethereal@gmail.com 🚀 Thanks