

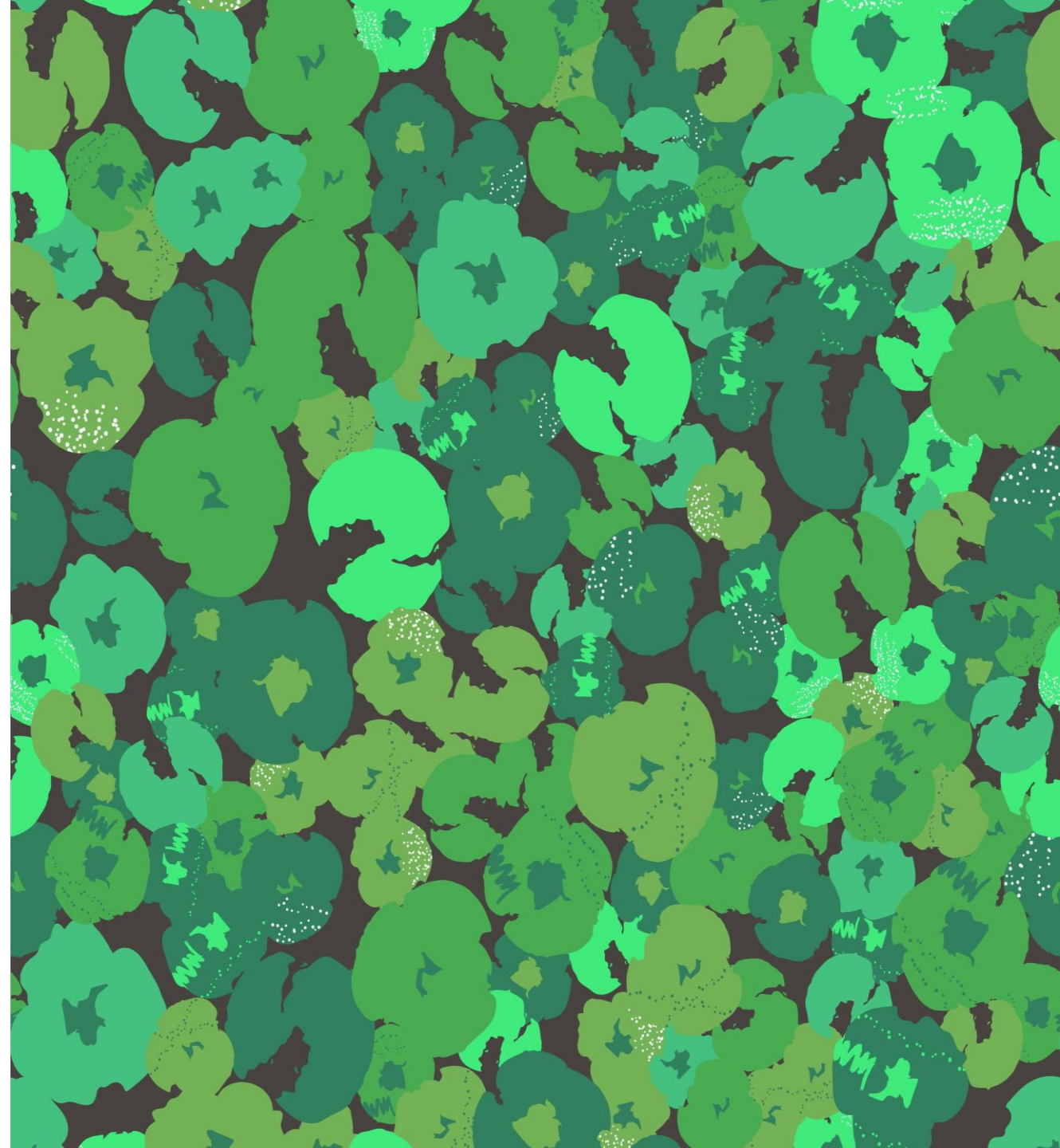


Unveiling the Correlation:

Does Having Many Healthcare Providers Really Extend Life Expectancy?

Group 22

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Content

1 Introduction

Research motivation + RQs

2 Dataset overview + processing

3 Results

4 Conclusion + Challenges faced

1. Introduction - Background

Have you ever wondered: pharmacists/doctors hold the secret to a longer life?

- Especially populations continue to age and face complex health challenges, the role of healthcare professionals becomes increasingly significant.
- In practice, the biggest headache question: Will increasing the number of medical doctors/pharmacists can help to increase life expectancy?



1. Introduction - Background

National Institutes of Health (NIH):



10 additional doctors*



51.5 days increase in life expectancy

1. Introduction - Aim & RQs

1. To have an **overview of life expectancy by gender, by continent in year 2000, 2010, 2015**

- Do females or males tend to have higher life expectancy?
- Which continent/country by continent has the highest/lowest life expectancy?

2. To investigate the potential **relationship between medical professional density and life expectancy**

- Is there any correlation between these 2 variables?


```
In [37]: medDoc.head()
```

```
Out[37]:
```

	Location	Period	Indicator	First Tooltip
0	Afghanistan	2016	Medical doctors (per 10,000)	2.78
1	Afghanistan	2015	Medical doctors (per 10,000)	2.85
2	Afghanistan	2014	Medical doctors (per 10,000)	2.98
3	Afghanistan	2013	Medical doctors (per 10,000)	2.85
4	Afghanistan	2012	Medical doctors (per 10,000)	2.41

```
In [38]: pharm.head()
```

```
Out[38]:
```

	Location	Period	Indicator	First Tooltip
0	Afghanistan	2016	Pharmacists (per 10,000)	0.47
1	Afghanistan	2015	Pharmacists (per 10,000)	0.50
2	Afghanistan	2014	Pharmacists (per 10,000)	0.51
3	Afghanistan	2012	Pharmacists (per 10,000)	0.27
4	Afghanistan	2011	Pharmacists (per 10,000)	0.28

```
In [39]: lifeExp.head()
```

```
Out[39]:
```

	Location	Period	Indicator	Dim1	First Tooltip
0	Afghanistan	2019	Healthy life expectancy (HALE) at birth (years)	Both sexes	53.95
1	Afghanistan	2019	Healthy life expectancy (HALE) at birth (years)	Male	54.73
2	Afghanistan	2019	Healthy life expectancy (HALE) at birth (years)	Female	53.15
3	Afghanistan	2015	Healthy life expectancy (HALE) at birth (years)	Both sexes	52.60
4	Afghanistan	2015	Healthy life expectancy (HALE) at birth (years)	Male	52.78

Base dataset: **Life Expectancy Dataset** (``HALElifeExpectancyAtBirth.csv``)

- Location: 6 unique regional aggregations with data entries ranging from 2000 to 2019.
- Period: **Every 5 years (2000, 2010, 2015, 2019)**
- Indicator: Consistent across all entries, indicating "Healthy life expectancy (HALE) at birth (years)"
- Dim1: Both sexes, male, female

Additional dataset(s): **Medical Doctors Dataset** (``medicalDoctors.csv``) & **Pharmacists Dataset** (``pharmacists.csv``)

- Location: 180+ unique locations with data entries ranging from 1990 to 2018.
- Period: Years of recorded data, with a mean year of 2006.72
- Indicator: Consistent across all entries, indicating "Medical Doctors/Pharmacists (per 10,000)".
- First Tooltip: Numeric values representing the number of medical doctors/pharmacists per 10,000 population
 - Doctors: ranging from 0.13 to 84.22, with a mean of 20.685.
 - Pharmacists: ranging from 0.002 to 26.3, with a mean of 4.124

2. Dataset overview + processing

Step 1: Merge 2 additional datasets based on location and period

- Total density = Doctors density + Pharmacists density

Step 2: Merge the base dataset with additional datasets (inner join)

- After merged, the final dataset only **includes 3 years: 2000, 2010, 2015**

Step 3: Create "Continent" column

Step 4.5.6...

	Location	Period	Pharmacists Density	Doctors Density	Total Density	Sex	Years	Continent
0	Afghanistan	2015	2.85	0.500	3.350	Both sexes	52.60	Asia
1	Afghanistan	2015	2.85	0.500	3.350	Male	52.78	Asia
2	Afghanistan	2015	2.85	0.500	3.350	Female	52.44	Asia
3	Afghanistan	2010	2.37	0.280	2.650	Both sexes	51.13	Asia
4	Afghanistan	2010	2.37	0.280	2.650	Male	51.51	Asia
...
658	Zimbabwe	2015	1.82	0.100	1.920	Male	49.62	Africa
659	Zimbabwe	2015	1.82	0.100	1.920	Female	52.59	Africa
660	Zimbabwe	2010	1.27	0.043	1.313	Both sexes	45.22	Africa
661	Zimbabwe	2010	1.27	0.043	1.313	Male	44.25	Africa
662	Zimbabwe	2010	1.27	0.043	1.313	Female	46.12	Africa

663 rows × 8 columns

3. Results



3.1. Life Expectancy overview - by continent

- Europe tends to have the highest average life expectancy
- Africa consistently exhibits the lowest average life expectancy among the five continents.
- All continents have experienced an overall increase in life expectancy over the years.
- However, Africa - a slight decrease in life expectancy in 2010 compared to other years.

What happened in Africa from 2001 to 2010? HIV/AIDS Epidemic, Darfur Conflict (Sudan) → might lead to a decrease in life expectancy of Africa



Note: Data of Oceania in 2000 is missing from the original dataset.

3.1. Life Expectancy overview - by country

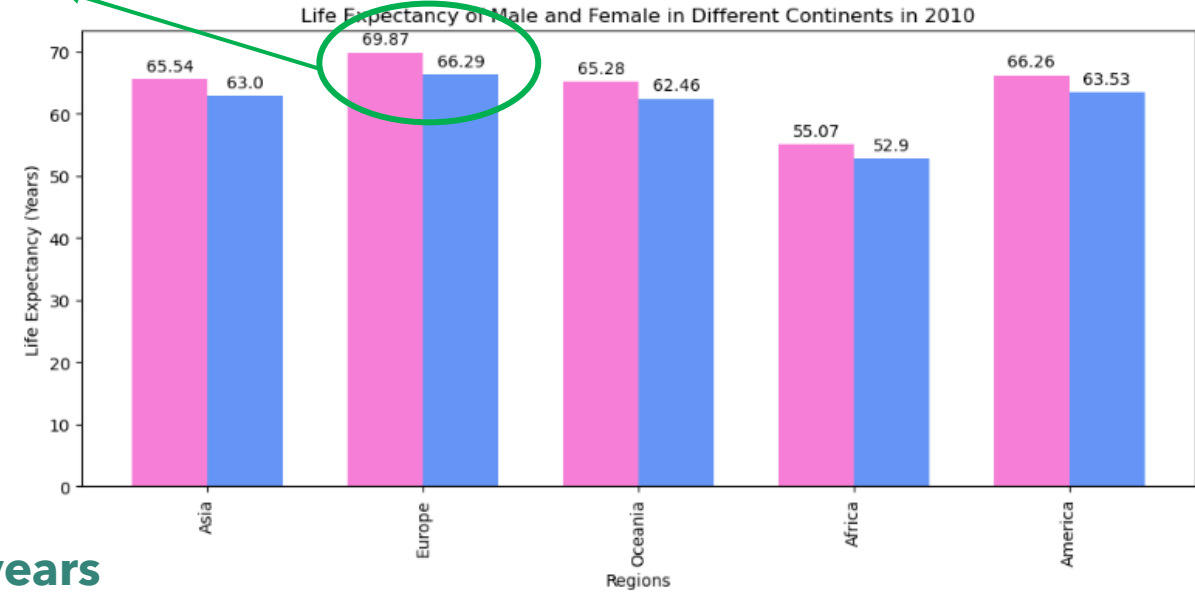
- Many big bubbles cluster around **EU** (.g. Italy, France, Estonia,..)
→ high life expectancy
- **Africa** seems to not have any big bubble
→ low life expectancy



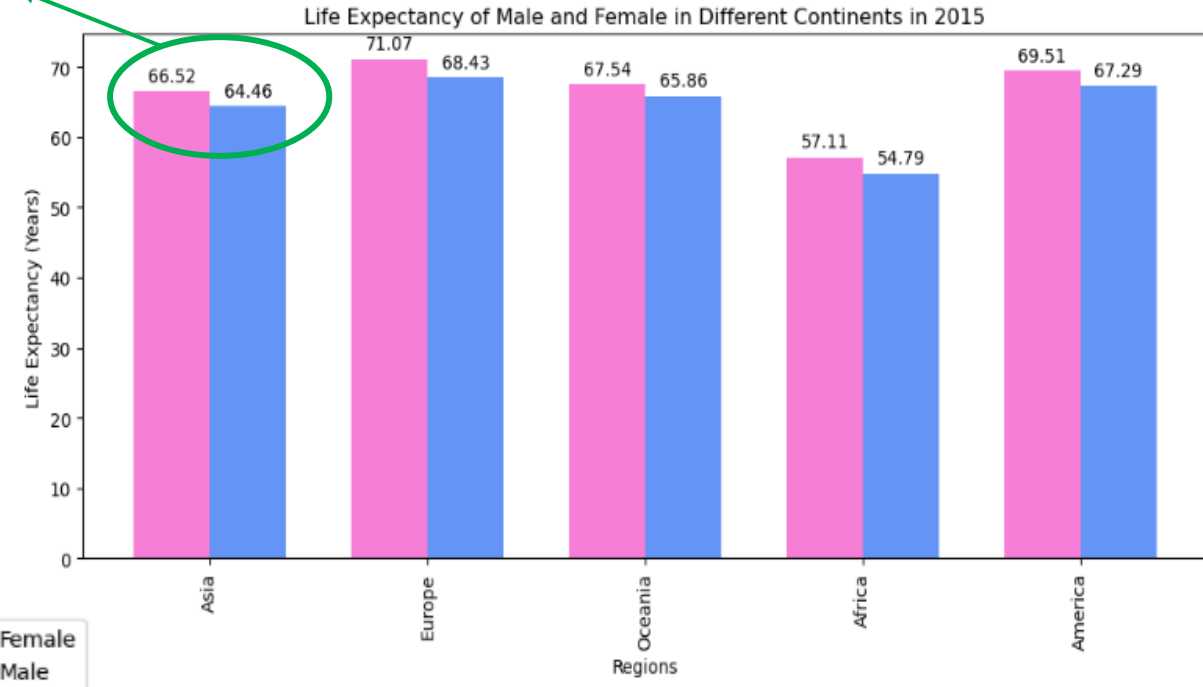
3.2. Life Expectancy by Gender

- In general, females tend to have a higher average life expectancy than males across all continents.
- Europe has the highest difference between the average life expectancy of females and males, ranging from approximately **3 to 4.8 years**, whereas for other continents, the difference typically falls within the range of 1 to 2.7 years

3.58 years



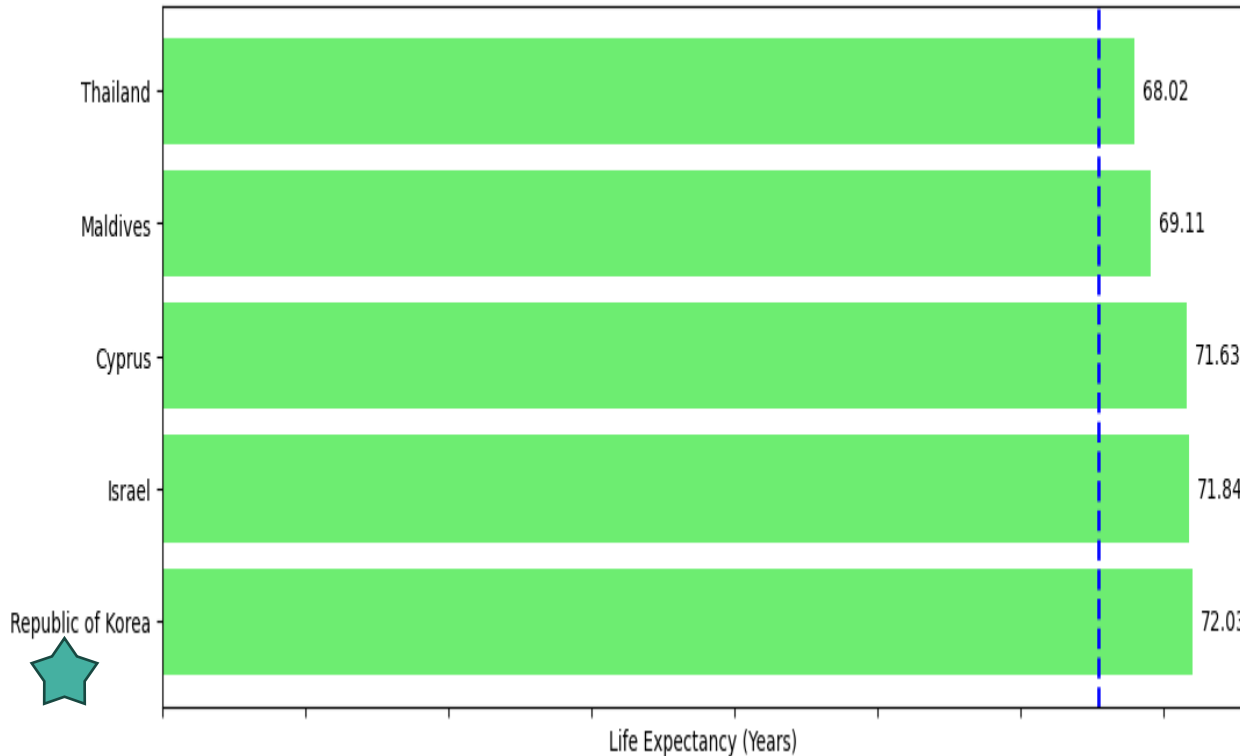
2.06 years



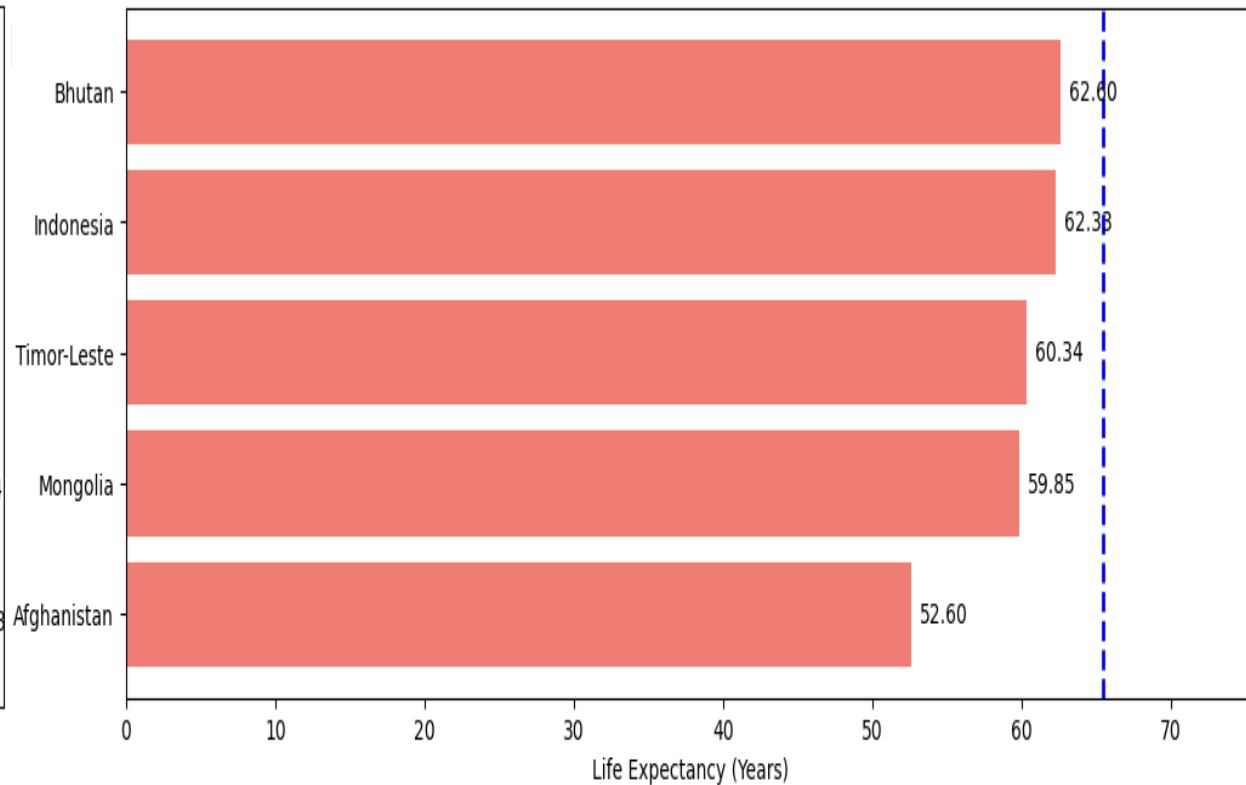
3.3. Countries with Highest/Lowest life expectancy - Asia

— Average: 65.49

Countries with Highest Life Expectancy in Asia (year 2015, both sexes)



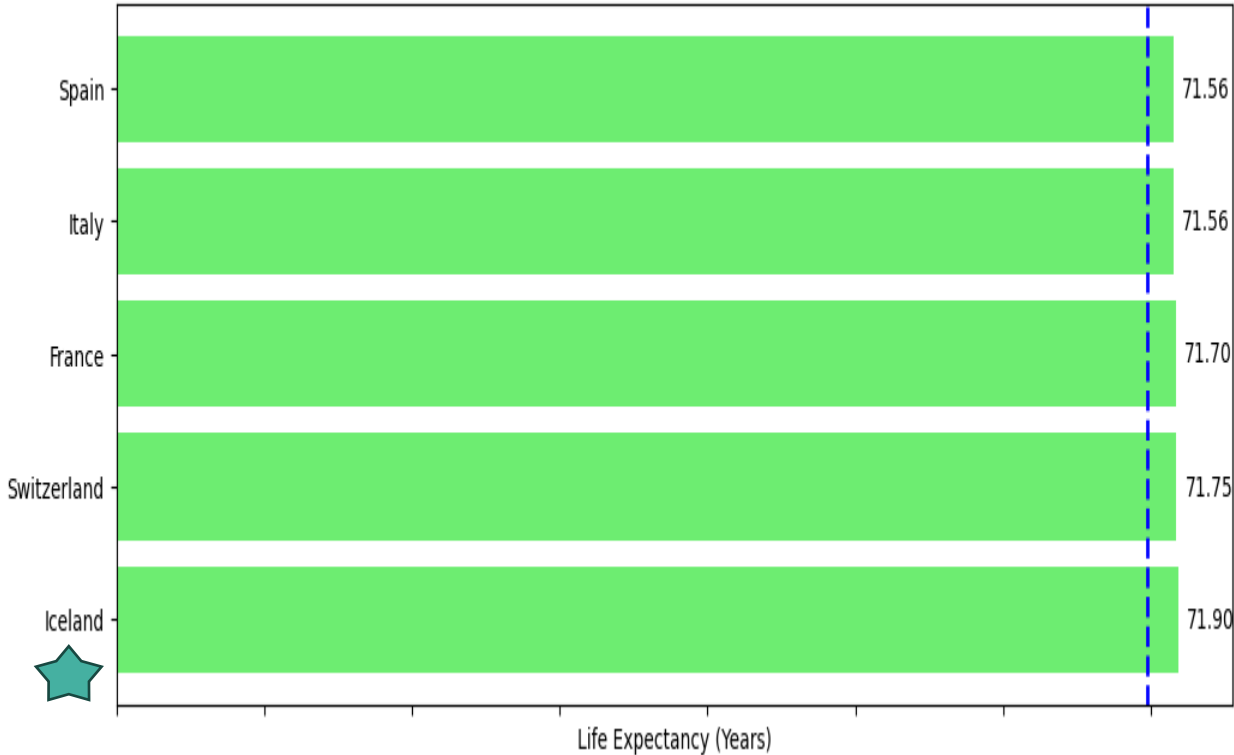
Countries with Lowest Life Expectancy in Asia (year 2015, both sexes)



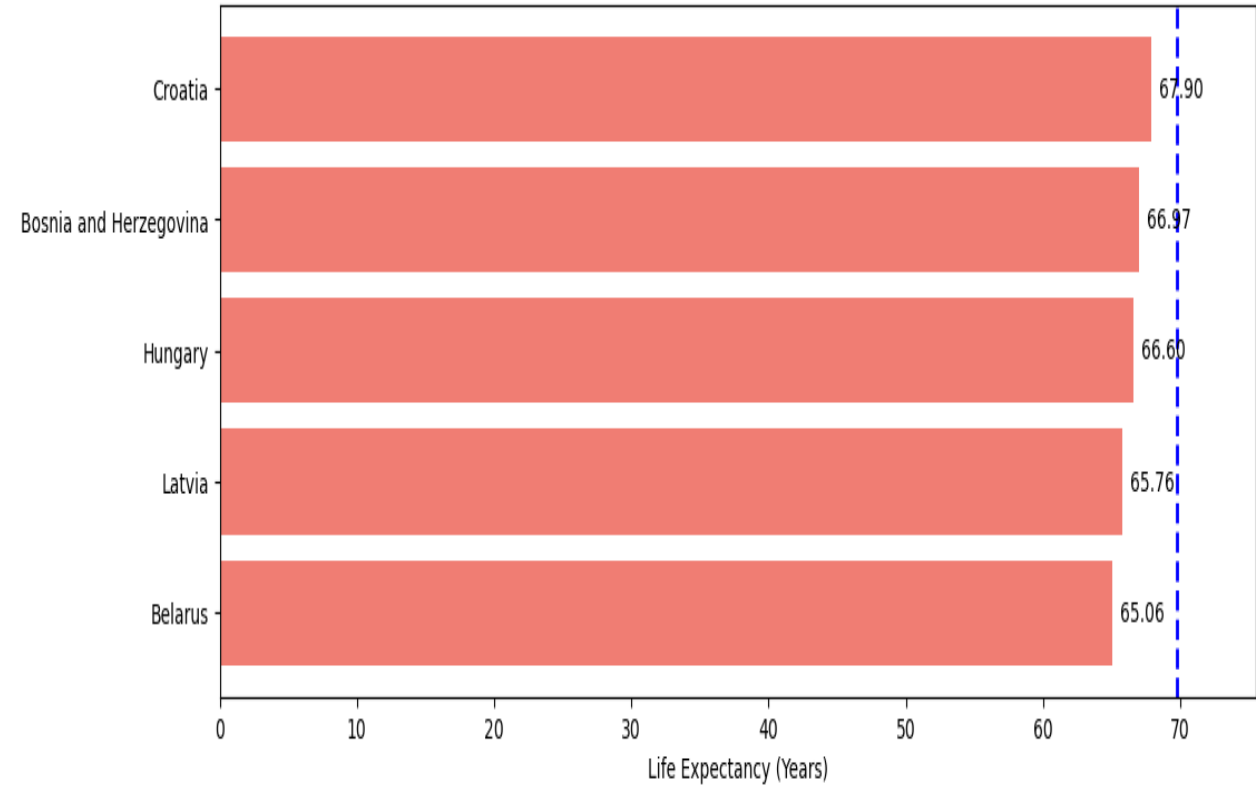
3.3. Countries with Highest/Lowest life expectancy - Europe

— Average: 69.79

Countries with Highest Life Expectancy in Europe (year 2015, both sexes)



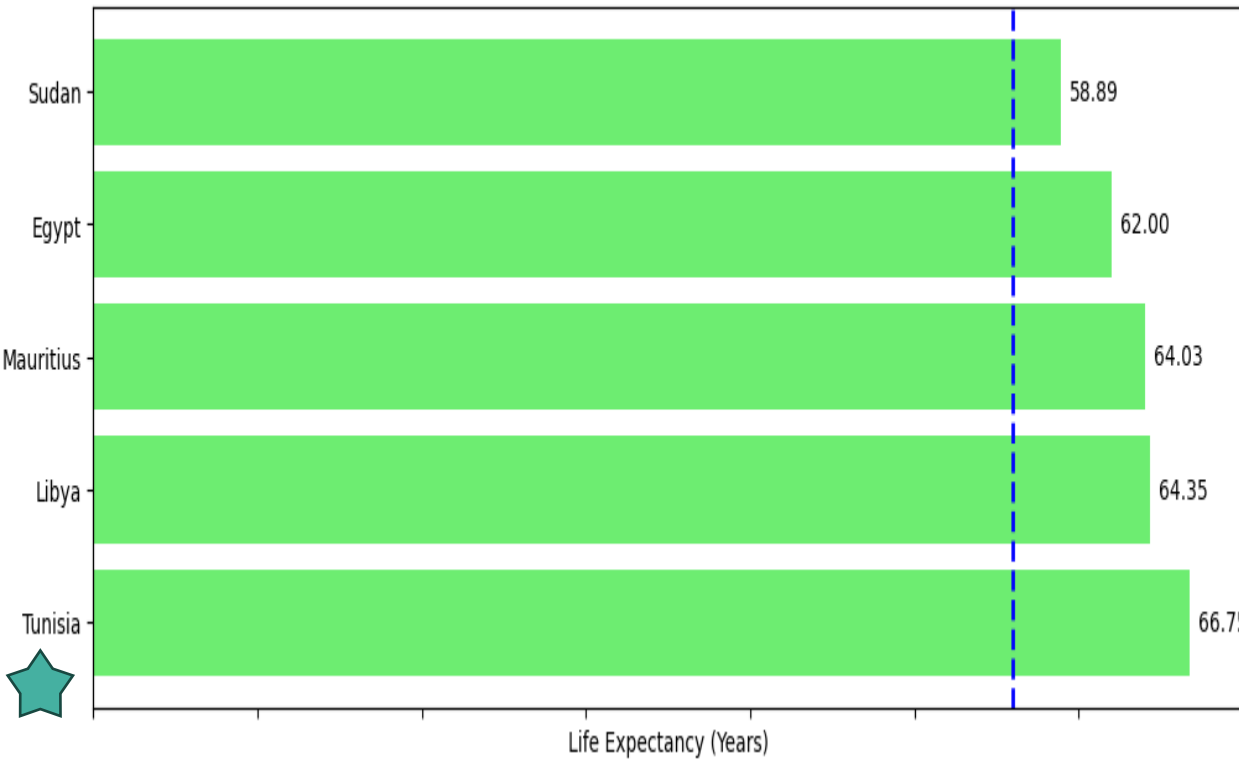
Countries with Lowest Life Expectancy in Europe (year 2015, both sexes)



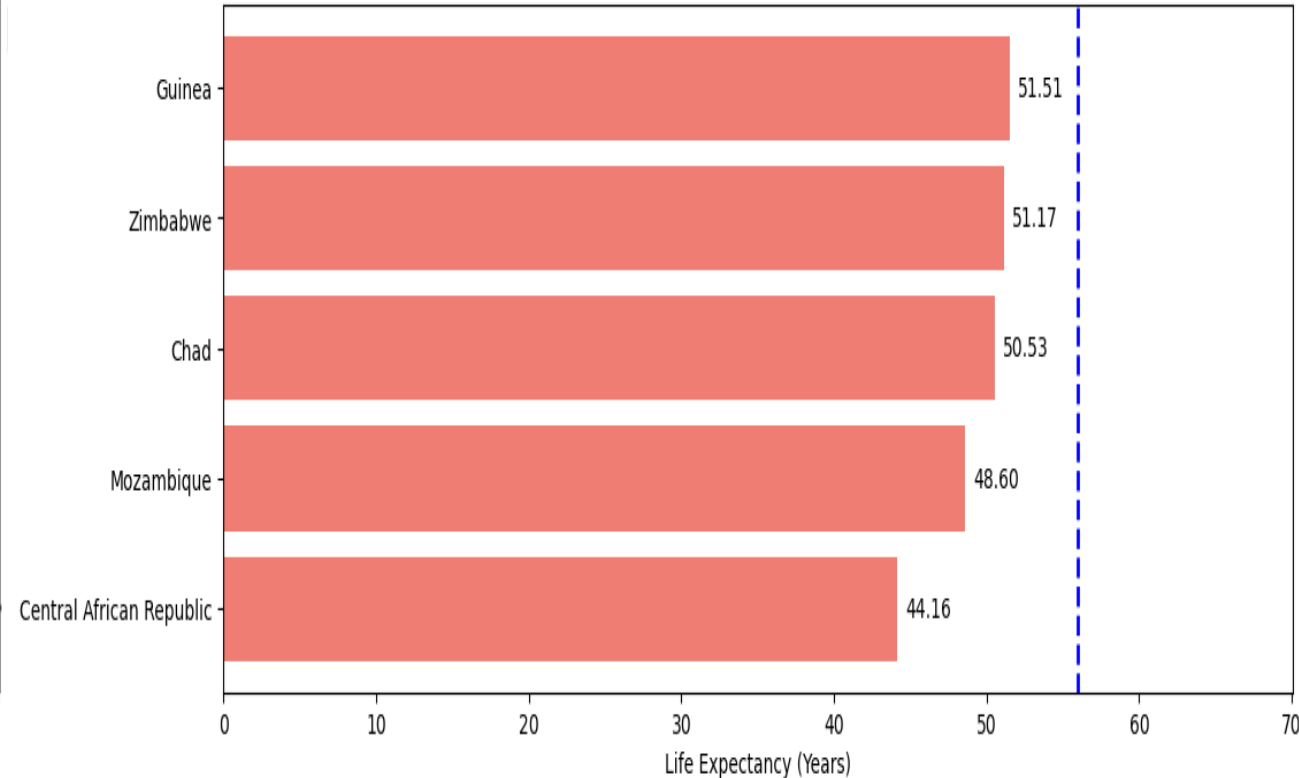
3.3. Countries with Highest/Lowest life expectancy - Africa

— Average: 55.94

Countries with Highest Life Expectancy in Africa (year 2015, both sexes)

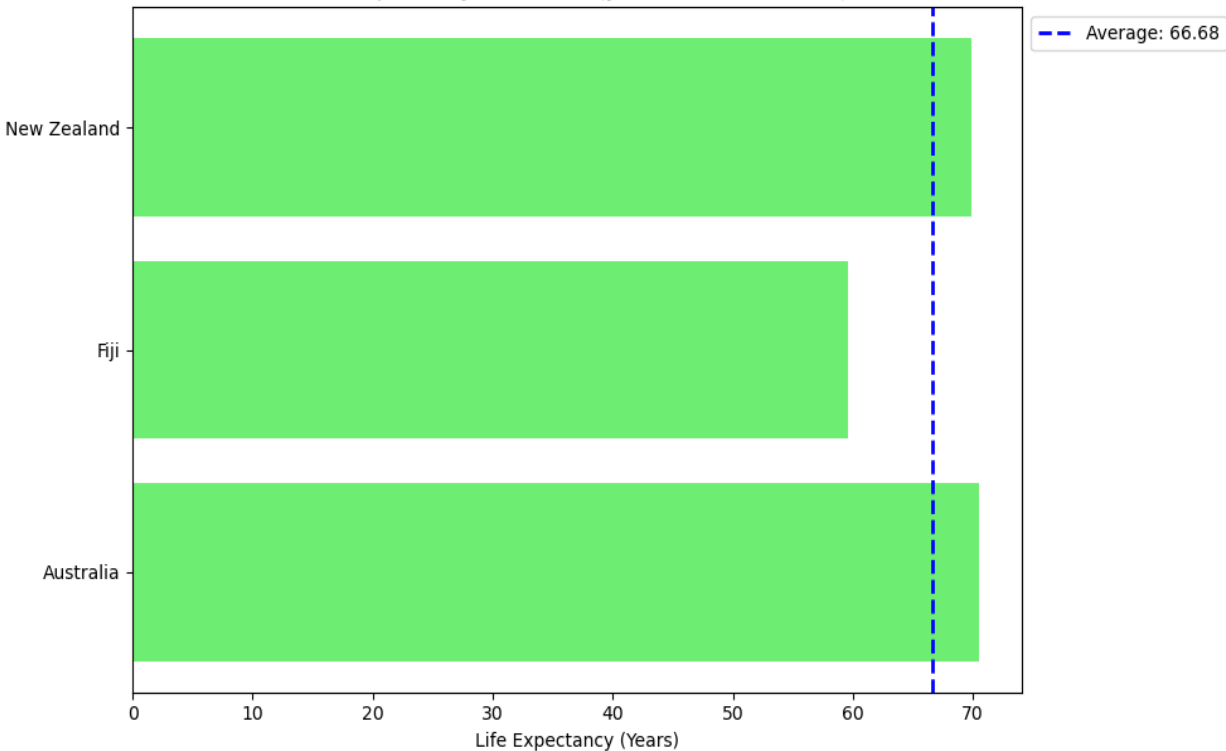


Countries with Lowest Life Expectancy in Africa (year 2015, both sexes)

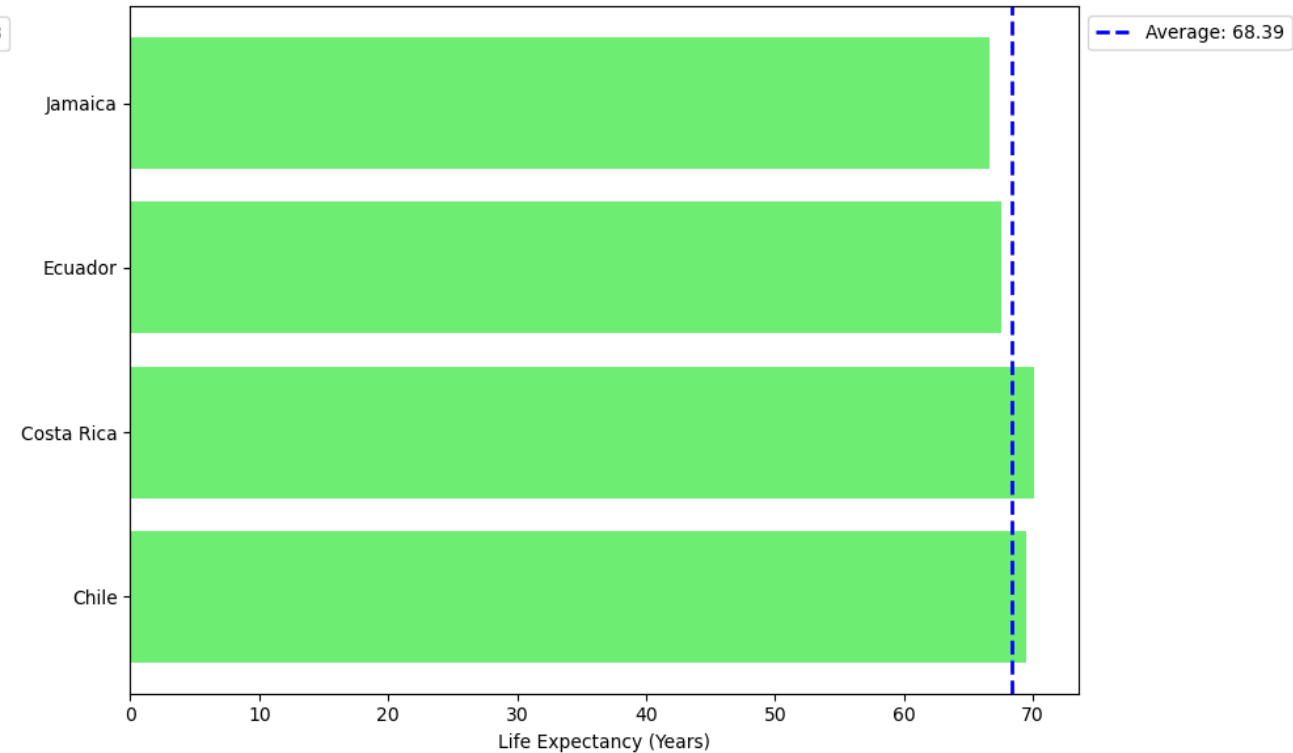


3.3. Countries with life expectancy – Oceania & America

Life Expectancy in Oceania (year 2015, both sexes)

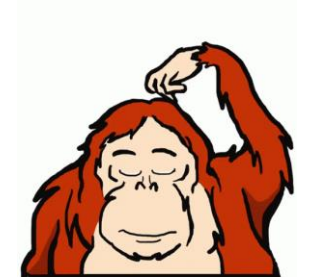


Life Expectancy in America (year 2015, both sexes)



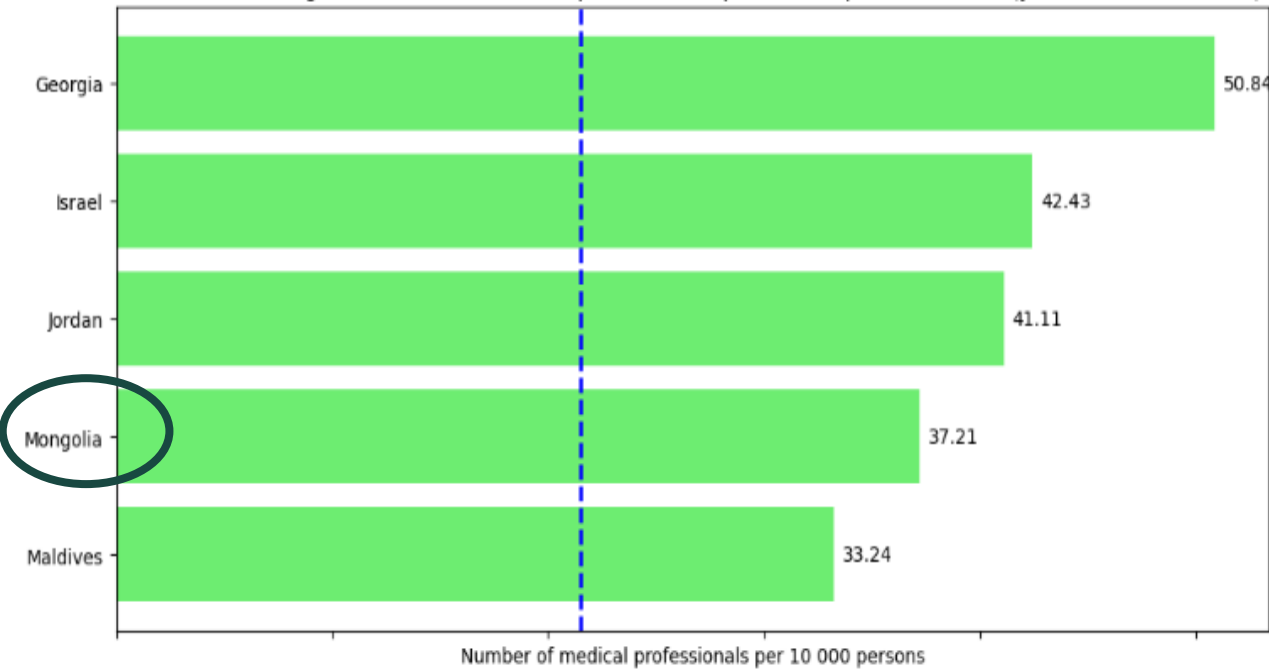
Note: Because Oceania and America only have few countries, we plot all countries, instead of identifying top/bottom countries.

3.4 Relationship between Life Expectancy vs Medical Professional density

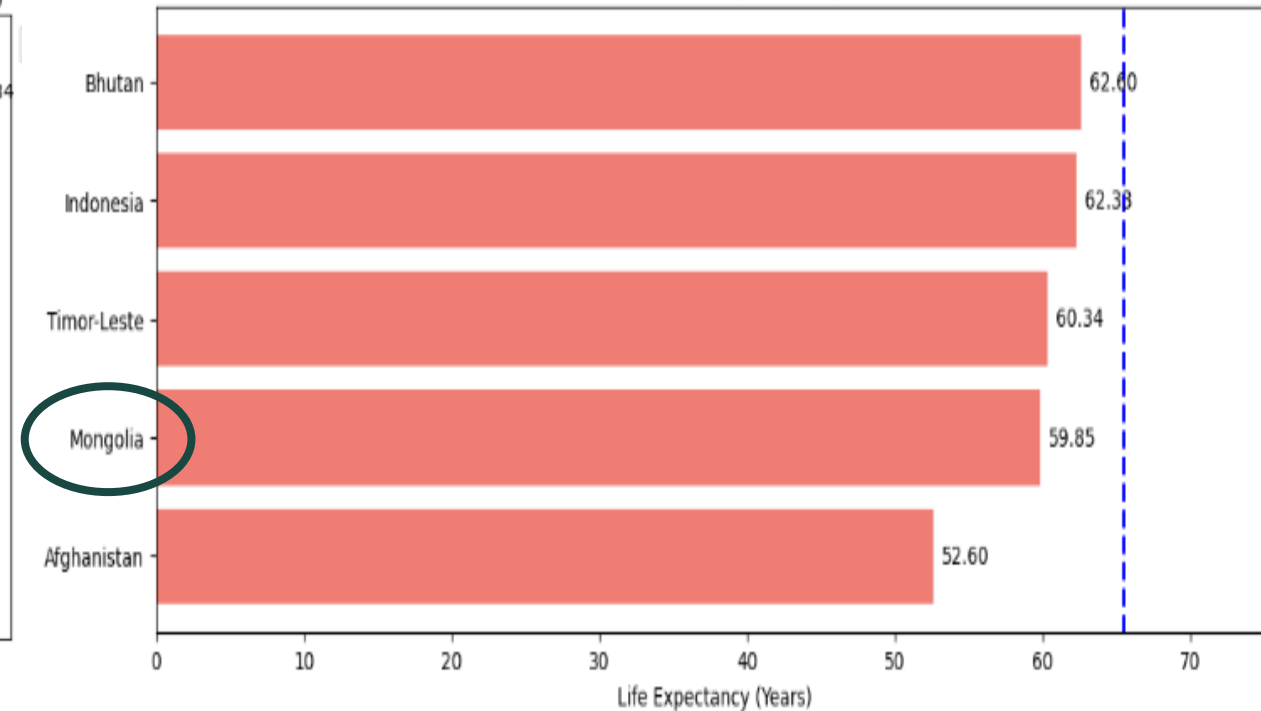


Interesting observation: Mongolia

Countries with Highest Number of medical professionals per 10 000 persons in Asia (year 2015, both sexes)



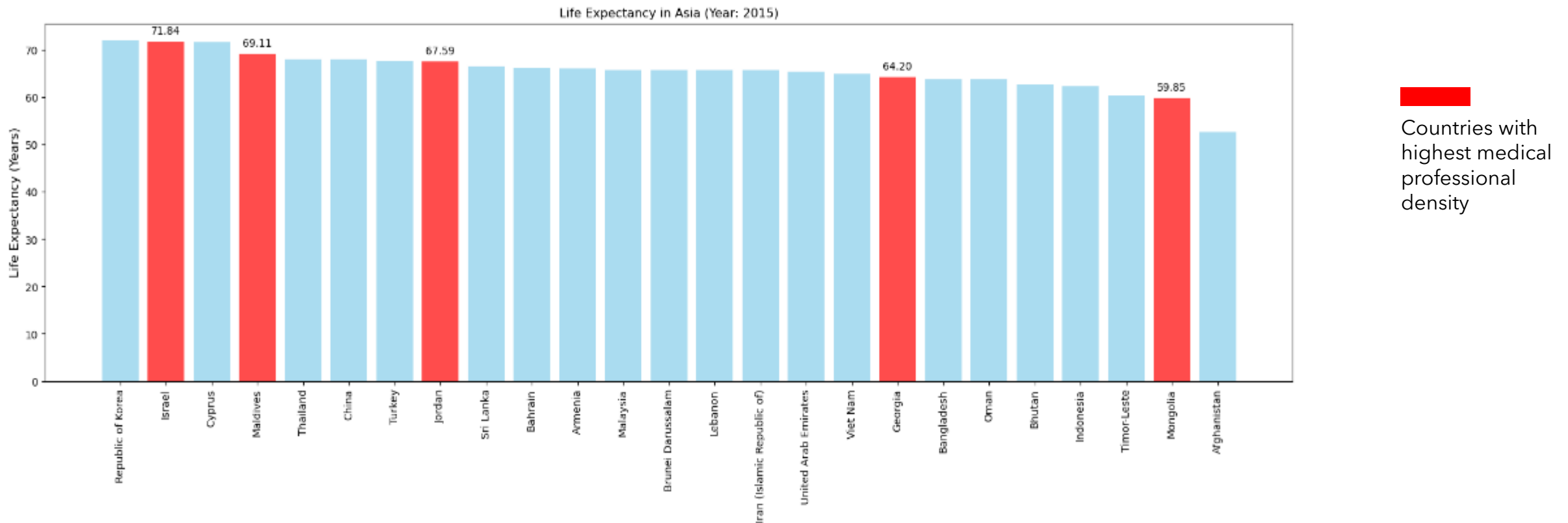
Countries with Lowest Life Expectancy in Asia (year 2015, both sexes)



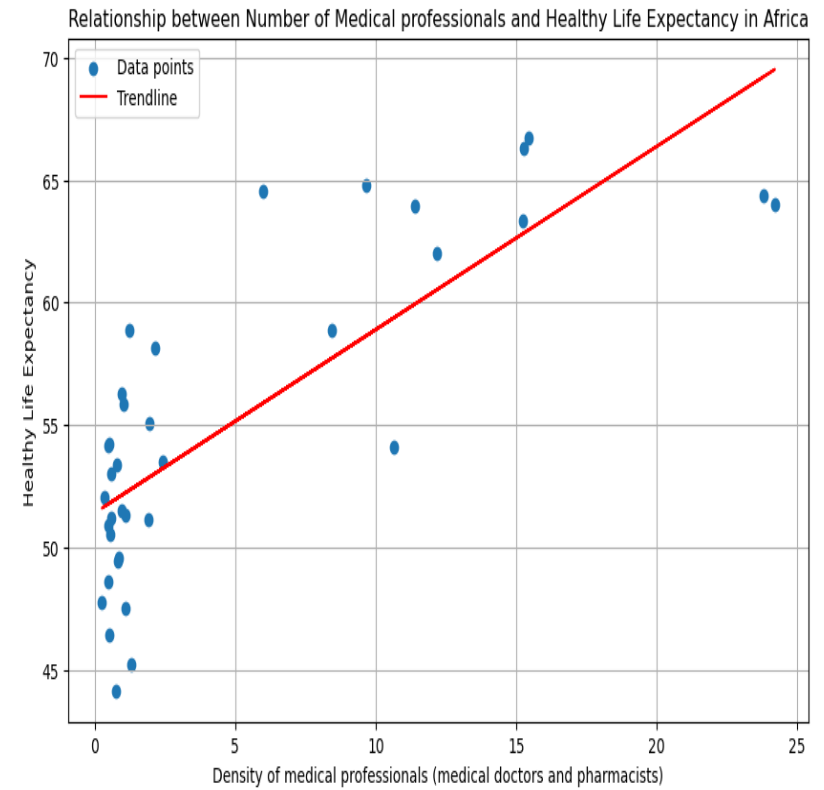
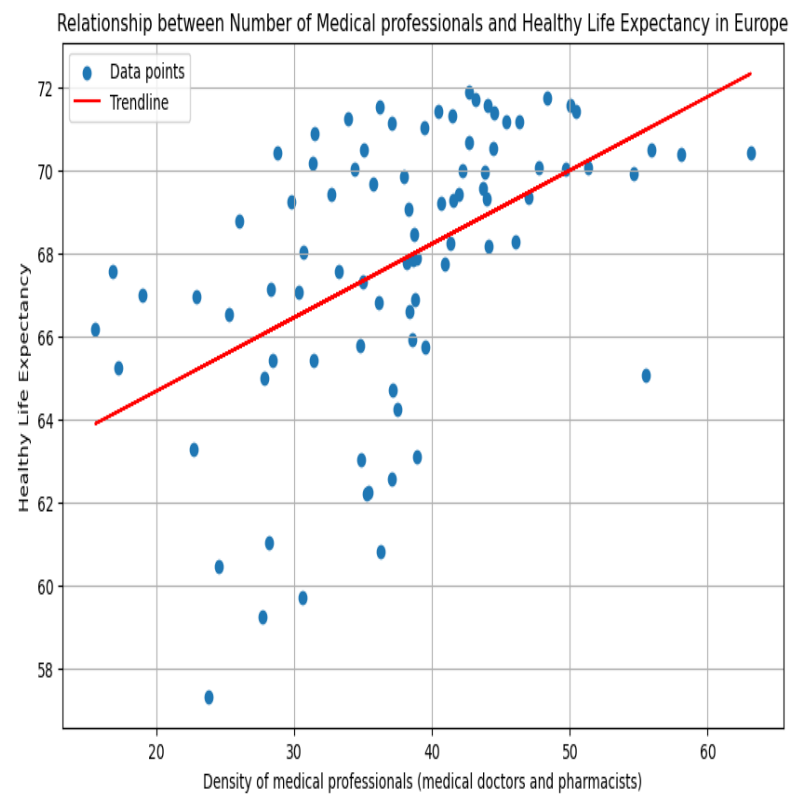
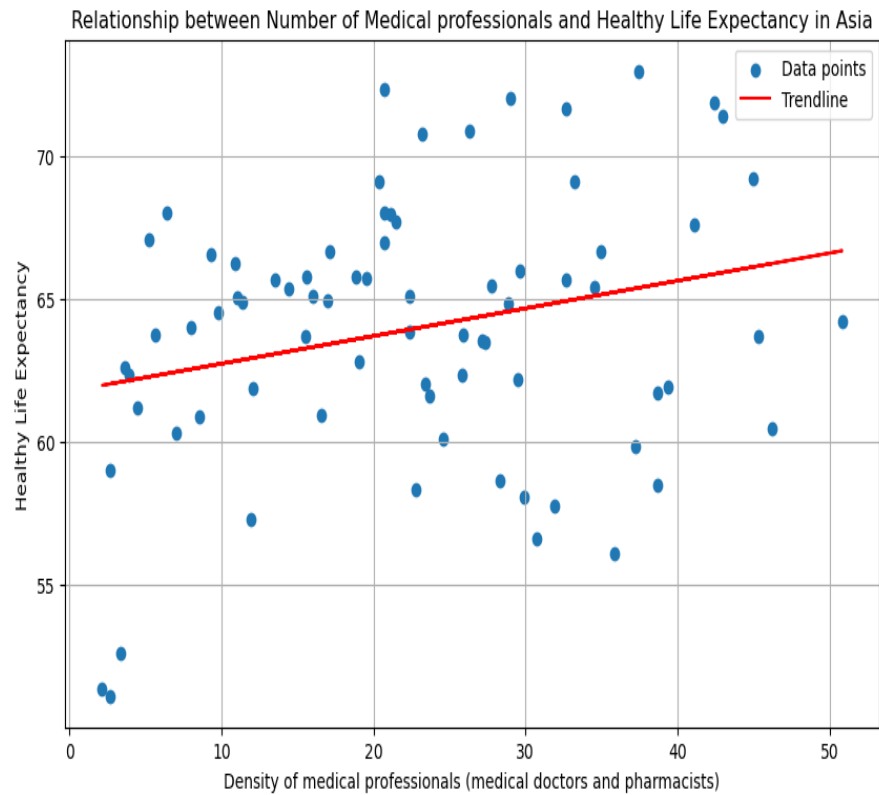
3.4 Relationship between Life Expectancy vs Medical Professional density

ASIA

Top countries with highest number of medical professionals- where are we?



3.4 Relationship between Life Expectancy vs Medical Professional density



4. Conclusion

- ✓ Top countries with the highest medical professional density do not necessarily have the highest life expectancy.
- ✓ In Europe, we observe a somewhat clearer positive correlation between medical professional density and life expectancy,
- ✓ In general, the **relationship between these factors appears nuanced** across all continents.

This discrepancy suggests that while access to healthcare providers is undoubtedly crucial, **other determinants are also important:**

- quality of healthcare systems
- healthcare infrastructure, socioeconomic factors (income, education, employment opportunities, and social support networks)
- lifestyle choices (nutrition, diet, etc.)
- environmental conditions (air and water quality)

4. Conclusion

RQs REVISITED

1. To have an **overview of life expectancy by gender, by continent in year 2000, 2015, 2019**

- Do females or males tend to have higher life expectancy?

→ **Female**

- Which continent/country by continent has the highest/lowest life expectancy?

→ **Previous slides**

2. To investigate the **potential relationship between medical professional density and life expectancy**

- Is there any correlation between these 2 variables?

→ **Nuanced**

4. Conclusion

Challenges faced

- After merging datasets, only data of 3 years remained.
- Encountered null values when converting to continents

(in some countries i.e. "Bolivia (Plurinational State of)", "Iran (Islamic Republic of", "Republic of Korea", etc.)

→ **solution:** use country_converter library

Before:



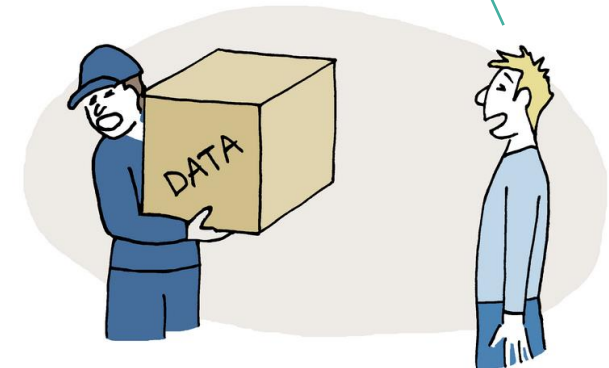
Data "cleaner" team
Ta Tinh
Tran Quan

I HEARD YOU HAVE SOME
DIRTY DATA TO CLEANSE.

Data visualization team

Nguyen Le Nguyen Khang
Nguyen Ngoc
Tran Dung

After:



THAT'S THE BIGGEST I COULD FIND



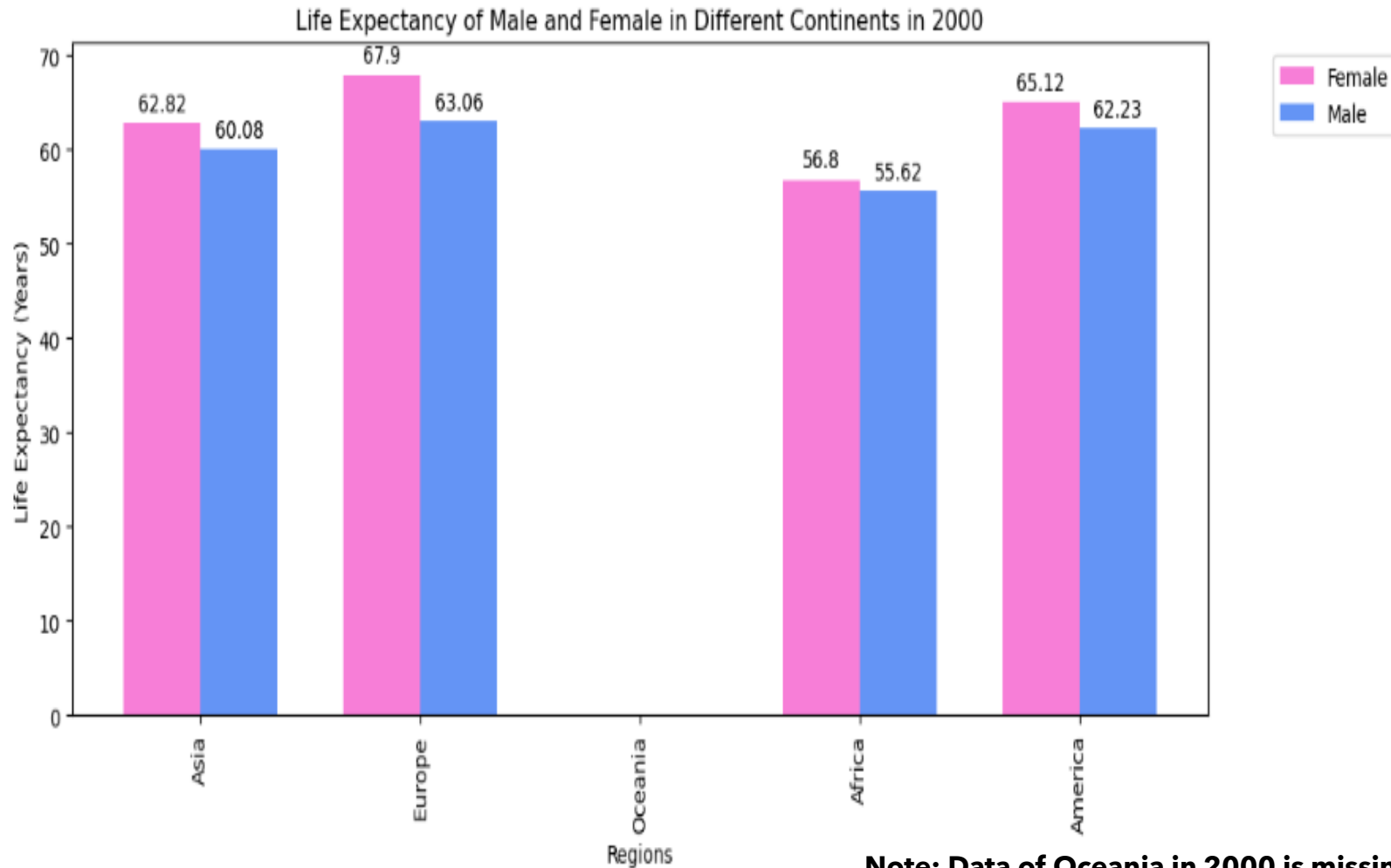
Thank you!



Appendix

A1. Life Expectancy by Gender

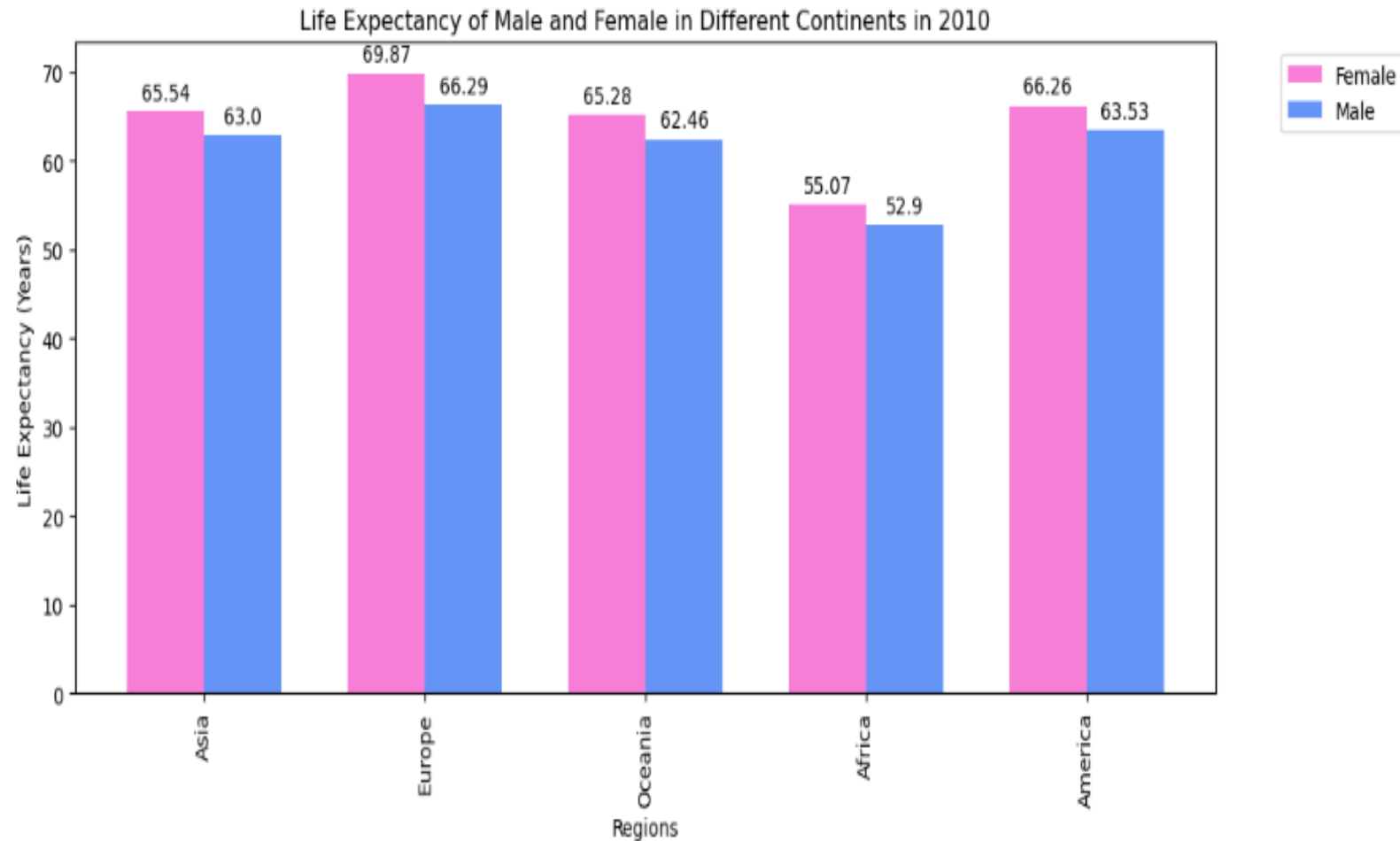
year 2000



Note: Data of Oceania in 2000 is missing from the original dataset.

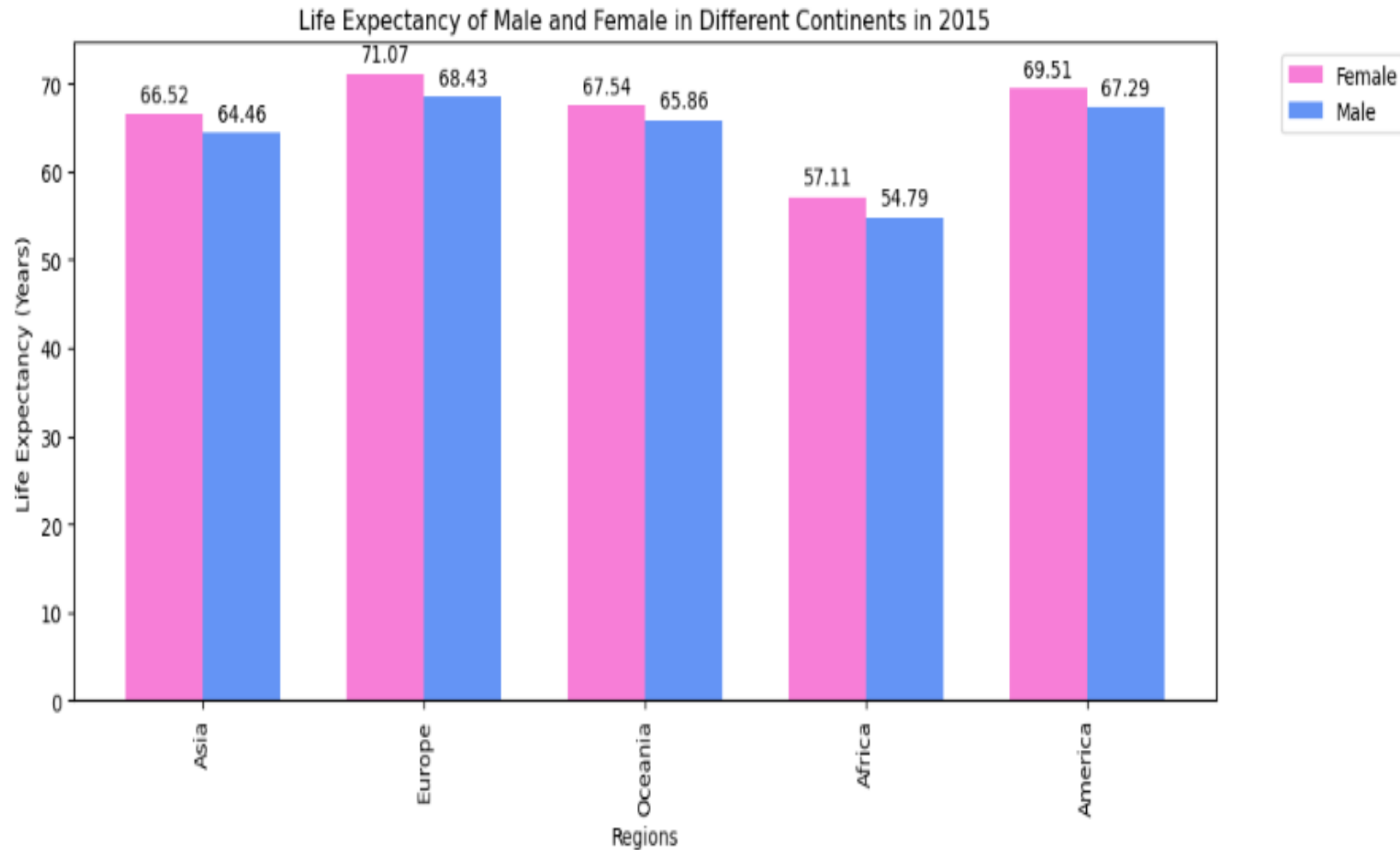
A2. Life Expectancy by Gender

year 2010

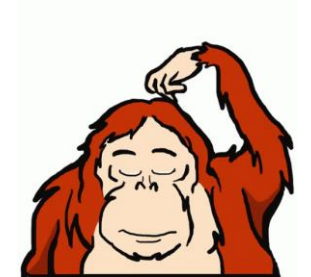


A3. Life Expectancy by Gender

year 2015

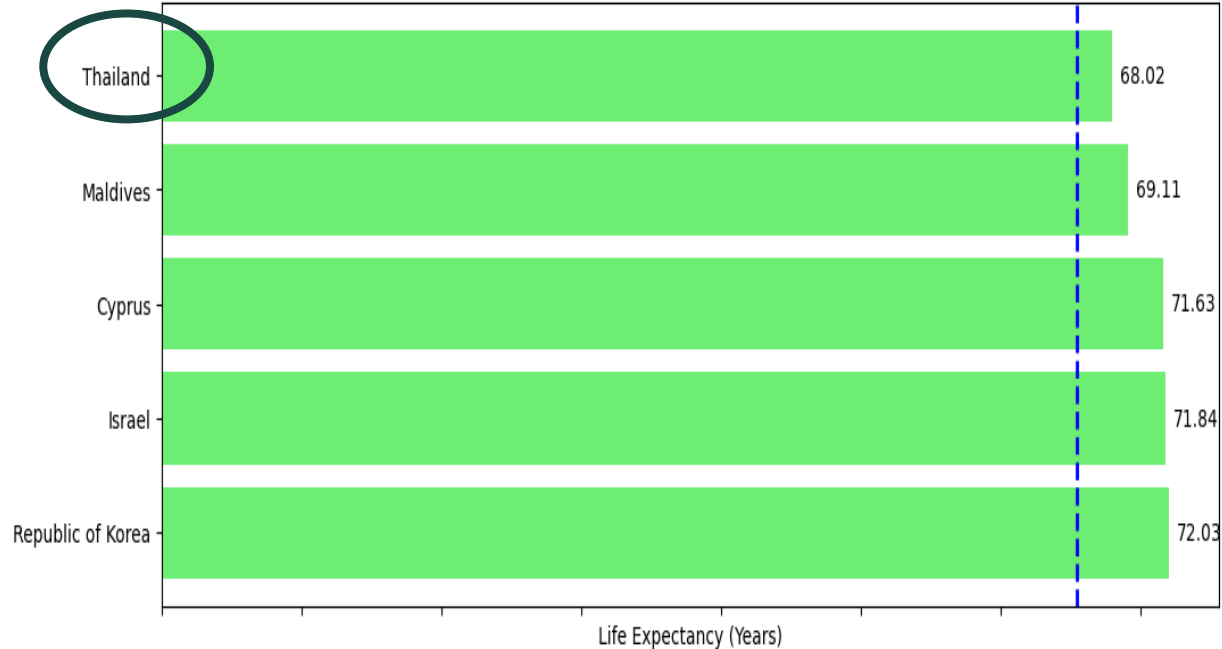


A4. Relationship between Life Expectancy vs Medical Professional density

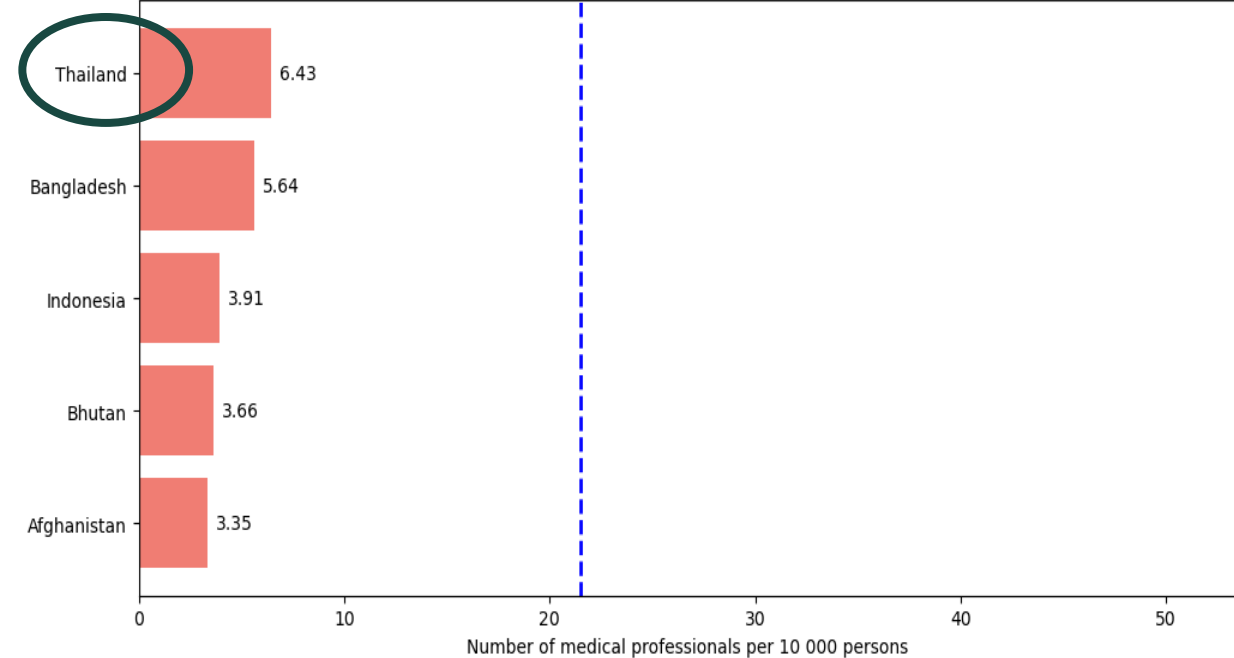


Another Interesting observation: Thailand

Countries with Highest Life Expectancy in Asia (year 2015, both sexes)



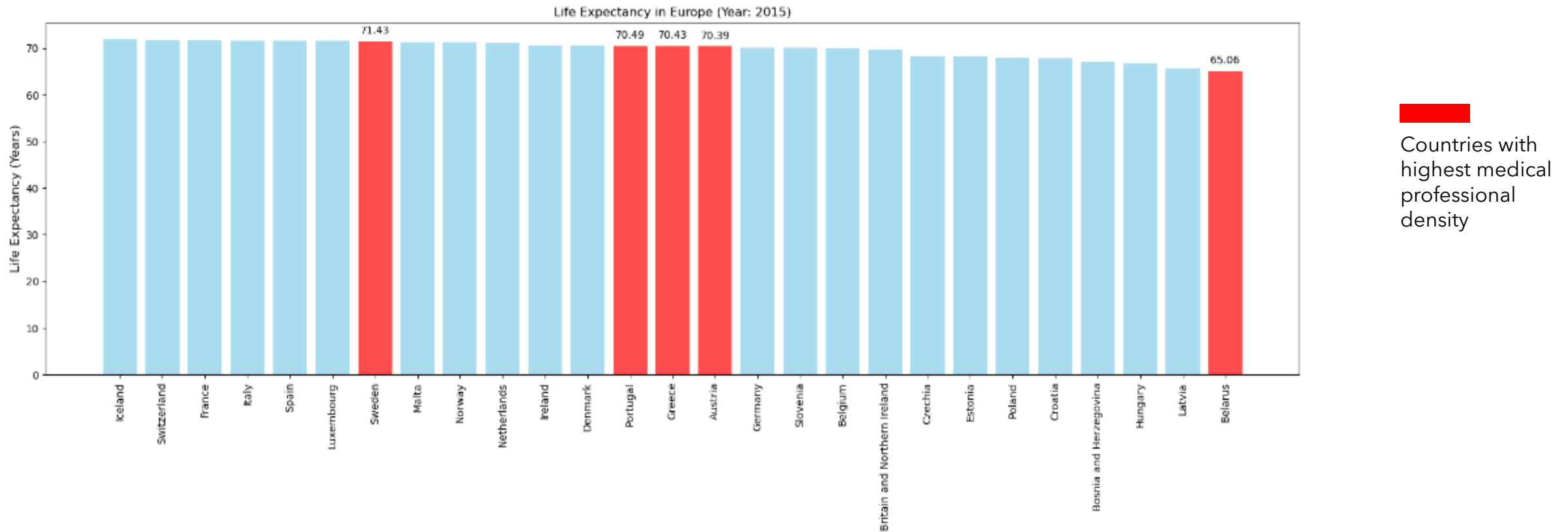
Countries with Lowest Number of medical professionals per 10 000 persons in Asia (year 2015, both sexes)



A5. Relationship between Life Expectancy vs Medical Professional density

EUROPE

Top countries with highest number of medical professionals- where are we?



A6. Relationship between Life Expectancy vs Medical Professional density

AFRICA

Top countries with highest number of medical professionals- where are we?

