A comparison of 5 Countries around the World

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Background

- The GapMinder website has a large collection of statistics about health and economic development for countries around the world. Its founder, Hans Rosling, has developed compelling ways to present statistical data. An R data set is available called Gapminder, and the I will use what I have learned about data manipulation and graphing to explore that dataset.

I want to examine the quality of life in 5 countries in which I have been in.

Scenario

A Comparison of 5 Countries

USA: My home.

Bulgaria: Where my parents came from.

Italy: Where I was conceived.

Denmark: Where I was born.

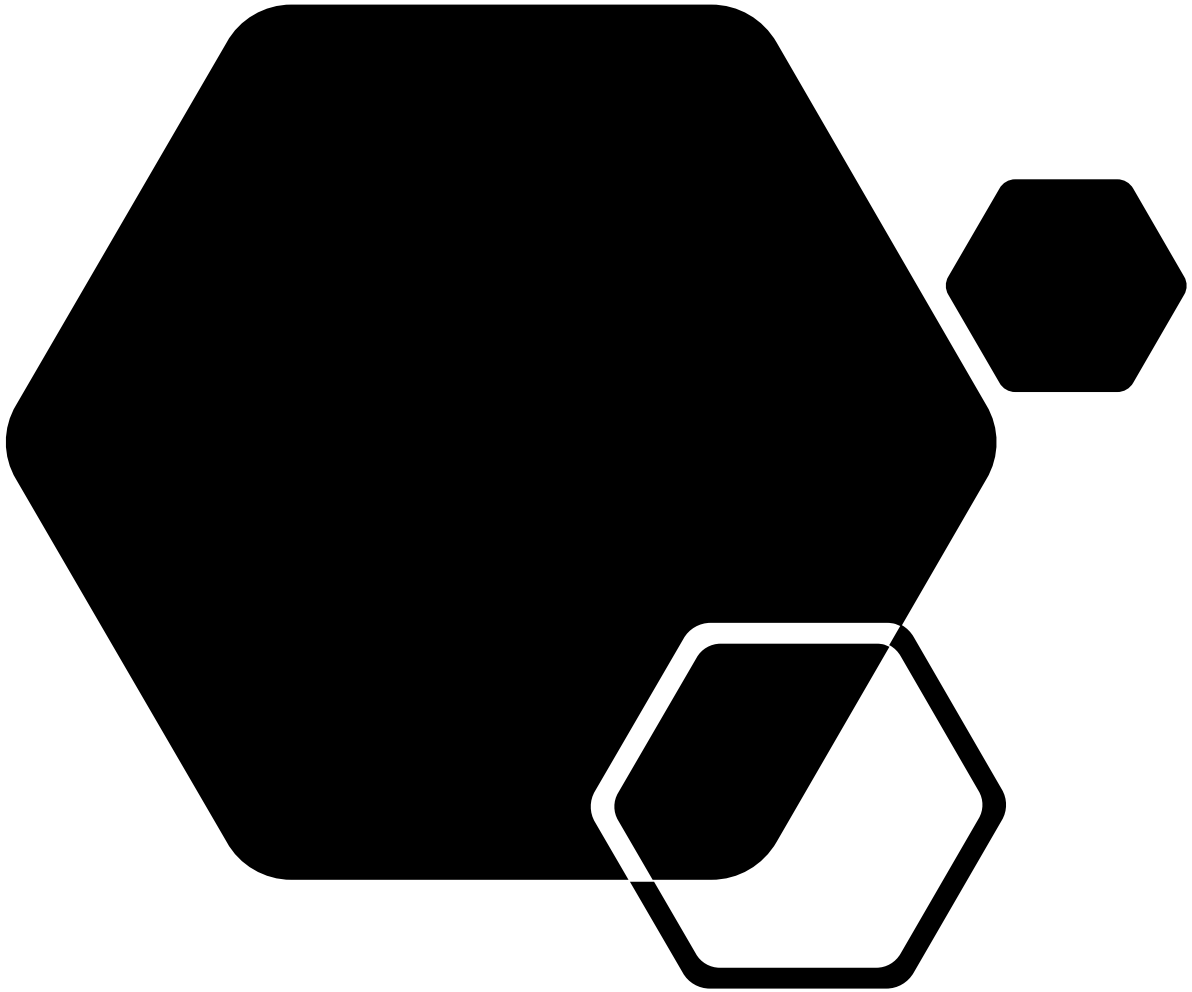
Venezuela: Where my parents immigrated before coming to the U.S.A.

Tasks

1. Which country of the five you chose has the lowest GDP Per Capita in 1952? In 2007?
2. Which has the highest GDP Per Capita in 1952? In 2007?
3. Create a line plot with year on the horizontal axis and lifeExp on the vertical axis for the five countries; give each country a different color line. Describe the variations in life expectancy between the countries.
4. Compute the median of lifeExp as a function of year for all the countries in the gapminder data frame. For what years is the life expectancy of each of the countries you selected above the median life expectancy for all countries?

A Comparison of GDP Per Capita

Part 1



A Comparison of GDP Per Capita

Code to generate these two tibbles:

```
My5Revised <- gapminder %>%
  filter(country %in% c("United States", "Bulgaria", "Venezuela", "Denmark", "Italy")) %>%
  select(country, year, gdpPercap)
View(My5Revised)
filter(My5Revised, year == 1952) %>% arrange(desc(gdpPercap))
filter(My5Revised, year == 2007) %>% arrange(desc(gdpPercap))
```

```
# A tibble: 5 x 3
  country        year gdpPercap
  <fct>         <int>     <dbl>
1 United States  2007    42952.
2 Denmark        2007    35278.
3 Italy          2007    28570.
4 Venezuela      2007    11416.
5 Bulgaria       2007    10681.
```

```
# A tibble: 5 x 3
  country        year gdpPercap
  <fct>         <int>     <dbl>
1 United States  1952    13990.
2 Denmark        1952     9692.
3 Venezuela      1952     7690.
4 Italy          1952     4931.
5 Bulgaria       1952     2444.
```

Analysis

- World median GDP Per Capita in 1952: 1969.
- World median GDP Per Capita in 2007: 6124.
- All 5 country's GDP Per Capita exceeds the world median in 1952 & 2007.

```
# A tibble: 5 x 3
  country       year gdpPercap
  <fct>        <int>     <dbl>
1 United States  2007    42952.
2 Denmark        2007    35278.
3 Italy          2007    28570.
4 Venezuela      2007    11416.
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1 United States  1952    13990.
2 Denmark        1952     9692.
3 Venezuela      1952     7690.
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5 Bulgaria       1952     2444.
```

A Comparison of GDP Per Capita

In 1952 and 2007, respectively, Bulgaria has the lowest GDP Per Capita.

	Country	Year	GDP Per Capita
1	United States	1952	13990.482
	United States	2007	42951.65
2	Denmark	1952	9692.385
	Denmark	2007	35278.42
3	Italy	1952	7689.800
	Italy	2007	28569.72
4	Venezuela	1952	4931.404
	Venezuela	2007	11415.81
5	Bulgaria	1952	2444.287
	Bulgaria	2007	10680.79

Analysis

- Of these countries, only Bulgaria was communist.
- Venezuela was and remains socialist, not communist.
- Because the economies of Bulgaria and Venezuela have not been heavily profit-based, the countries also experienced a lower GDP per capita.

	Country	Year	GDP Per Capita
1	United States	1952	13990.482
	United States	2007	42951.65
2	Denmark	1952	9692.385
	Denmark	2007	35278.42
3	Italy	1952	7689.800
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	Venezuela	2007	11415.81
5	Bulgaria	1952	2444.287
	Bulgaria	2007	10680.79

A Comparison of GDP Per Capita

- 1952 and 2007, respectively, the United States has the highest GDP Per Capita.

	Country	Year	GDP Per Capita
1	United States	1952	13990.482
	United States	2007	42951.65
2	Denmark	1952	9692.385
	Denmark	2007	35278.42
3	Italy	1952	7689.800
	Italy	2007	28569.72
4	Venezuela	1952	4931.404
	Venezuela	2007	11415.81
5	Bulgaria	1952	2444.287
	Bulgaria	2007	10680.79

Analysis

- During the 1950s, the United States experienced a significant increase in their GDP per capita.
- This growth is attributed to a post-WW2 economic 'boom' and government spending: construction of interstate highways and schools, the distribution of veterans' benefits, and increased military spending.

	Country	Year	GDP Per Capita
1	United States	1952	13990.482
	United States	2007	42951.65
2	Denmark	1952	9692.385
	Denmark	2007	35278.42
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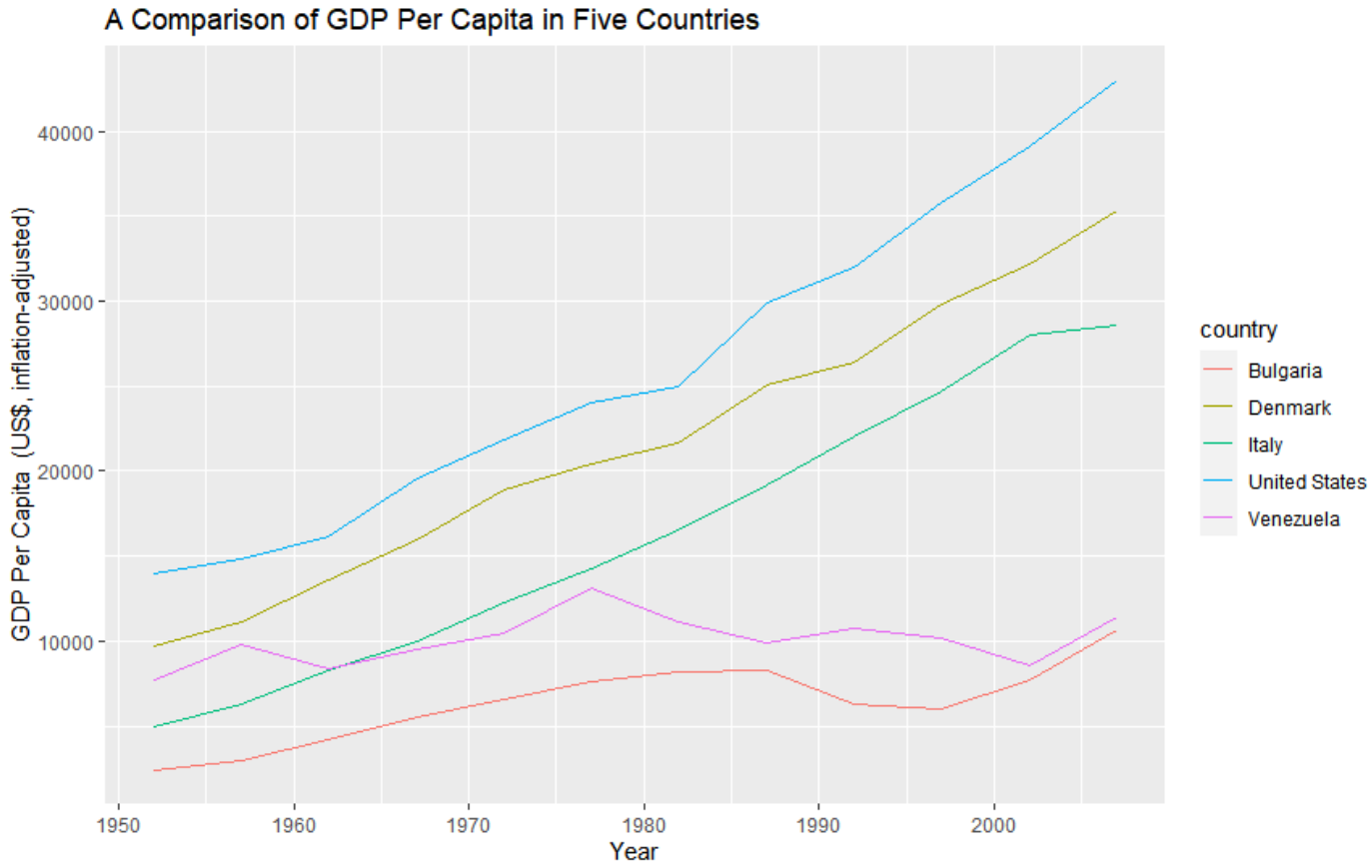
	Venezuela	2007	11415.81
5	Bulgaria	1952	2444.287
	Bulgaria	2007	10680.79

A Comparison of GDP Per Capita

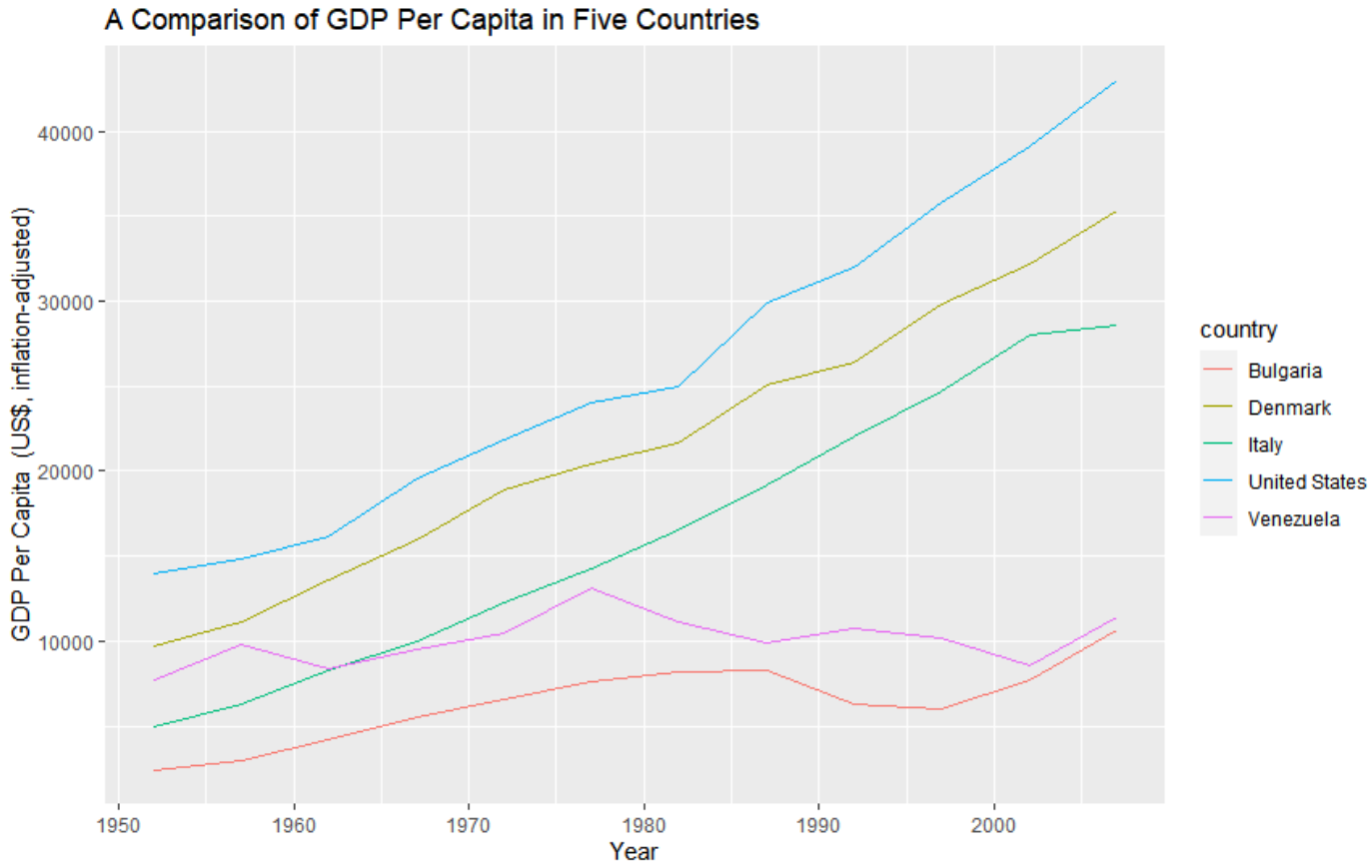
Code to create this line plot:

```
ggplot(My5) + geom_line(aes(x = year, y = gdpPercap, color = country)) +
  xlab("Year") + ylab("GDP Per Capita (US$, inflation-adjusted)") +
  ggtitle("A Comparison of GDP Per Capita in Five Countries")
```



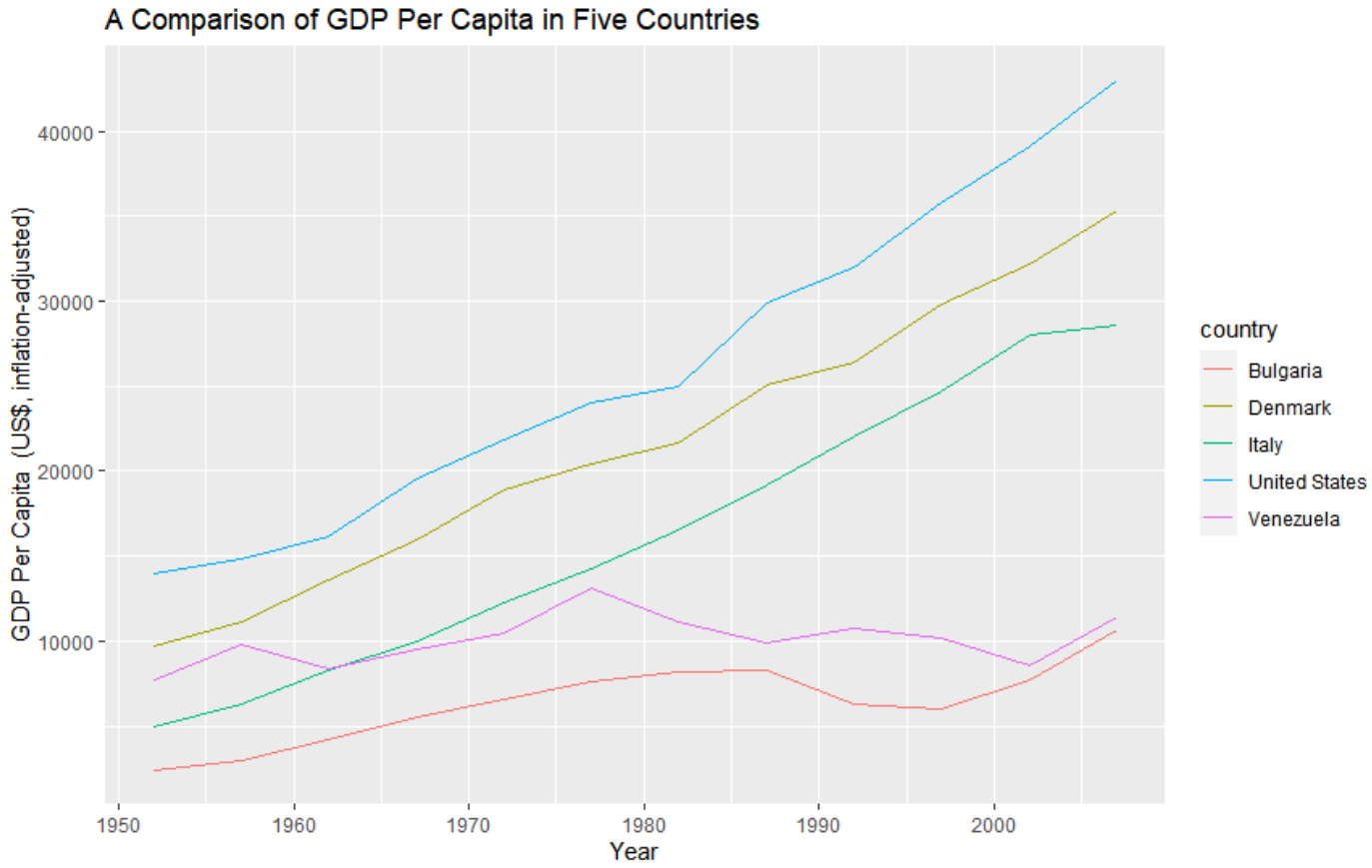
A Comparison of GDP Per Capita

- During 1952 – 2007, the United States, Denmark, and Italy have experienced approximately linear growth in their GDP Per Capita. However, Italy's growth slowed from 2002 – 2007.
- On the other hand, Bulgaria and Venezuela both experienced limited and fluctuating economic growth. The declines in GDP per capita of both countries coincides with periods of political and economic unrest.



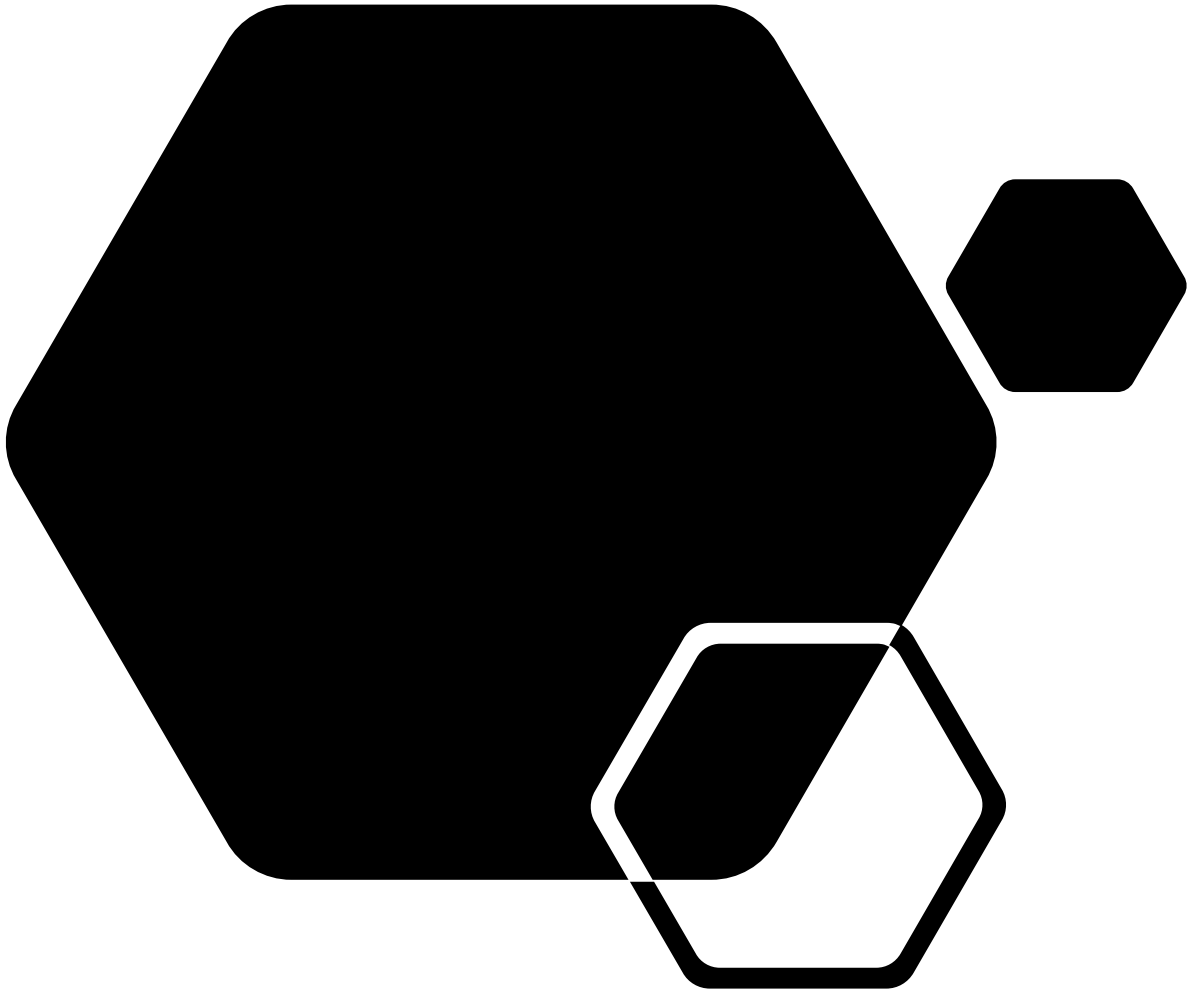
Analysis

- Between 2001 – 2006, Italy experienced a significant change in political leadership. This can partly explain a slowing of Italy's economic growth during this period.
- On the other hand, Bulgaria experienced a decline in economic growth shortly before and after the fall of communism.
- Venezuelan economic growth fluctuates based on the political leadership in the country.



A Comparison of Life Expectancies

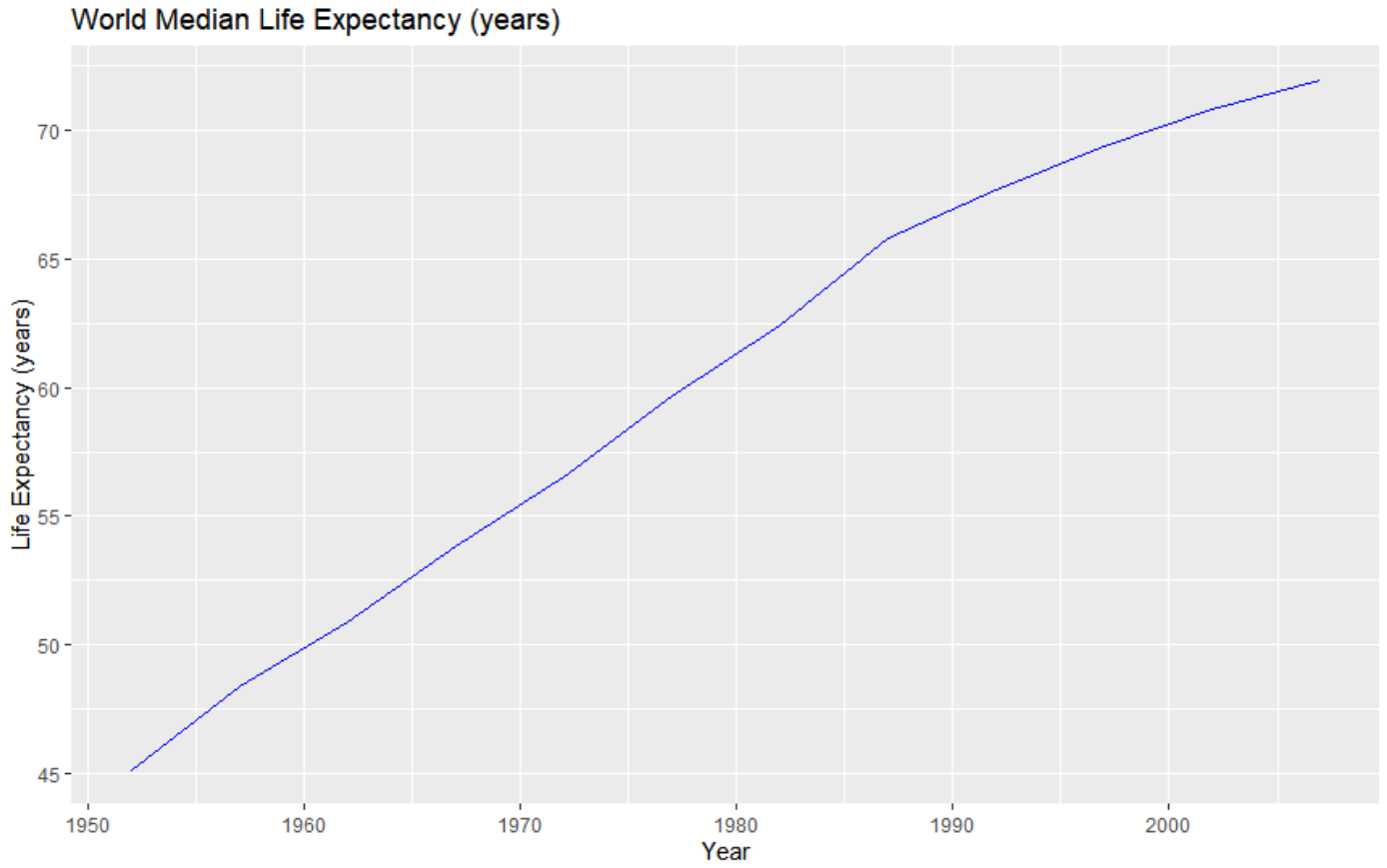
Part 2

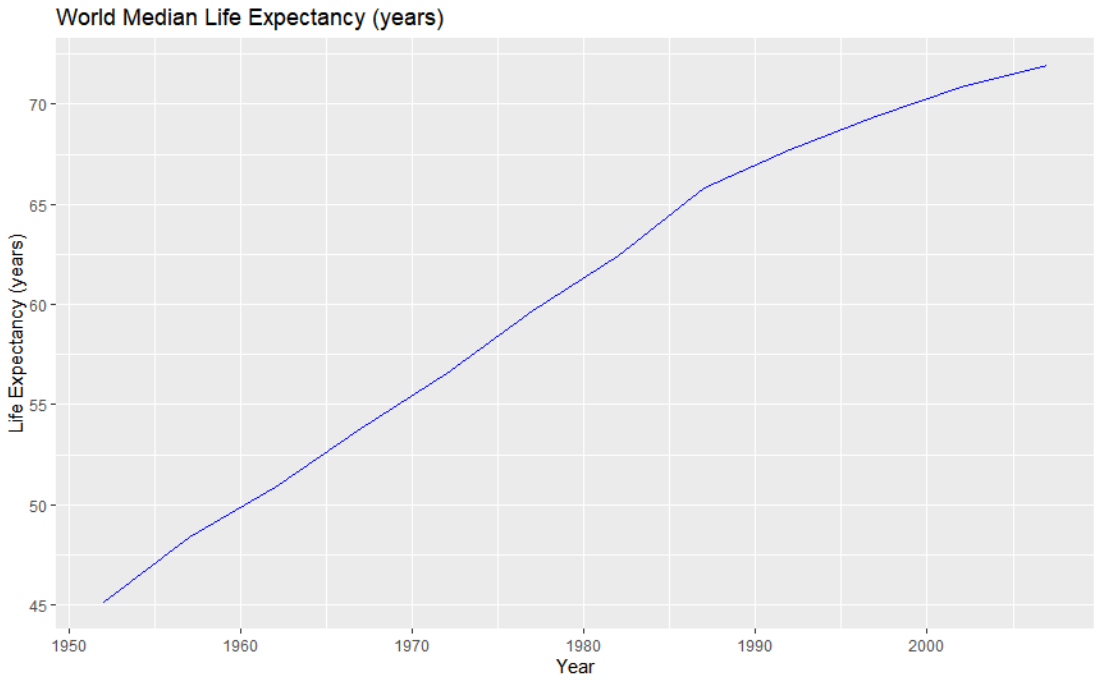


World Median Life Expectancy

Code to create this line plot:

```
ggplot(World) + geom_line(aes(x = year, y = life_med), color = "blue1") +
  xlab("Year") + ylab("Life Expectancy (years)") +
  ggtitle("World Median Life Expectancy (years)")
```





	Year	Median life Expectancy (years)
1	1952	45.1355
2	1957	48.3605
3	1962	50.8810
4	1967	53.8250
5	1972	56.5300
6	1977	59.6720
7	1982	62.4415
8	1987	65.8340
9	1992	67.7030
10	1997	69.3940
11	2002	70.8255
12	2007	71.9355

World Median Life Expectancy

- Over time, the world median life expectancy has been undergoing approximately logistic growth.

Analysis

- Reasons for increased world median life expectancy:
  - Advances in healthcare
  - Advances in education
  - Advances in technology
  - Trade
  - Exchange of technological developments
  - Economic growth leading to improved access to resources

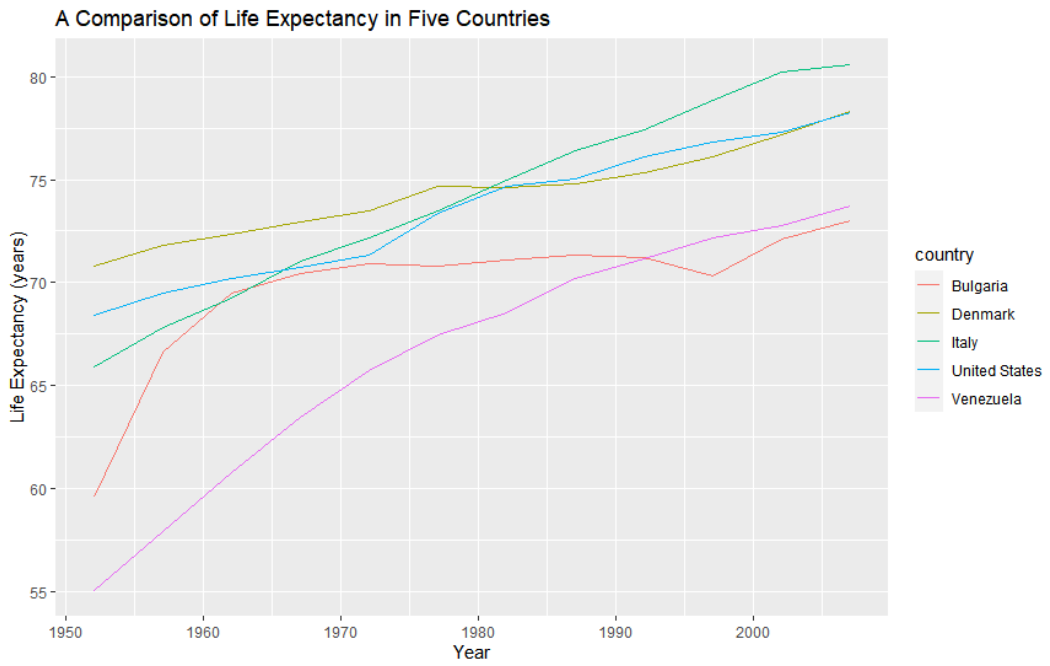
A Comparison of Life Expectancies

- For what years is the life expectancy of each of the countries you selected above the median life expectancy for all countries?
  - USA: 1952 – 2007
  - Bulgaria: 1952 – 2007
  - Italy: 1952 – 2007
  - Denmark: 1952 – 2007
  - Venezuela: 1952 – 2007

Year	World	USA	Bulgaria	Italy	Denmark	Venezuela
1952	45.1355	68.44	59.6	65.94	70.78	55.088
1957	48.3605	69.49	66.61	67.81	71.81	57.907
1962	50.881	70.21	69.51	69.24	72.35	60.77
1967	53.825	70.76	70.42	71.06	72.96	63.479
1972	56.53	71.34	70.9	72.19	73.47	65.712
1977	59.672	73.38	70.81	73.48	74.69	67.456
1982	62.4415	74.65	71.08	74.98	74.63	68.557
1987	65.834	75.02	71.34	76.42	74.8	70.19
1992	67.703	76.09	71.19	77.44	75.33	71.15
1997	69.394	76.81	70.32	78.82	76.11	72.146
2002	70.8255	77.31	72.14	80.24	77.18	72.766
2007	71.9355	78.242	73.005	80.546	78.332	73.747

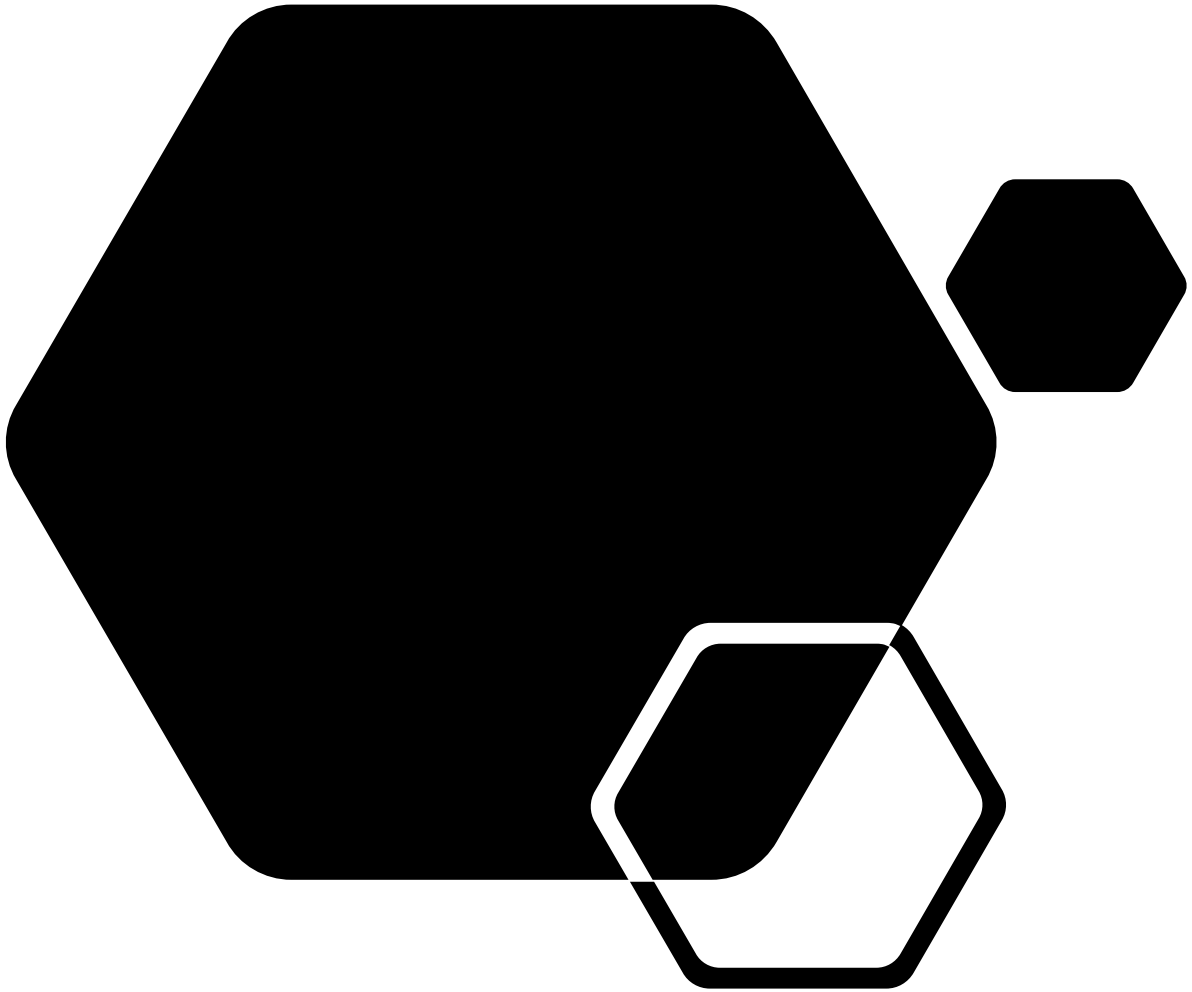
Analysis

- Among these 5 countries, life expectancies have been increasing over time.
- During 1952 – 2007, the life expectancies in the United States, Denmark, and Italy have been seeing an approximately linear increase. Between 1975 and 1985, Denmark experienced a minor decline in life expectancy .
- During 1952 – 2007, Venezuela & Bulgaria have been experiencing approximately logistic growth in life expectancies. However, Bulgaria experienced a temporary and significant decline in life expectancy in the 1990s which coincided with the end of communism in the country.



Relationship between GDP Per Capita and Life Expectancy

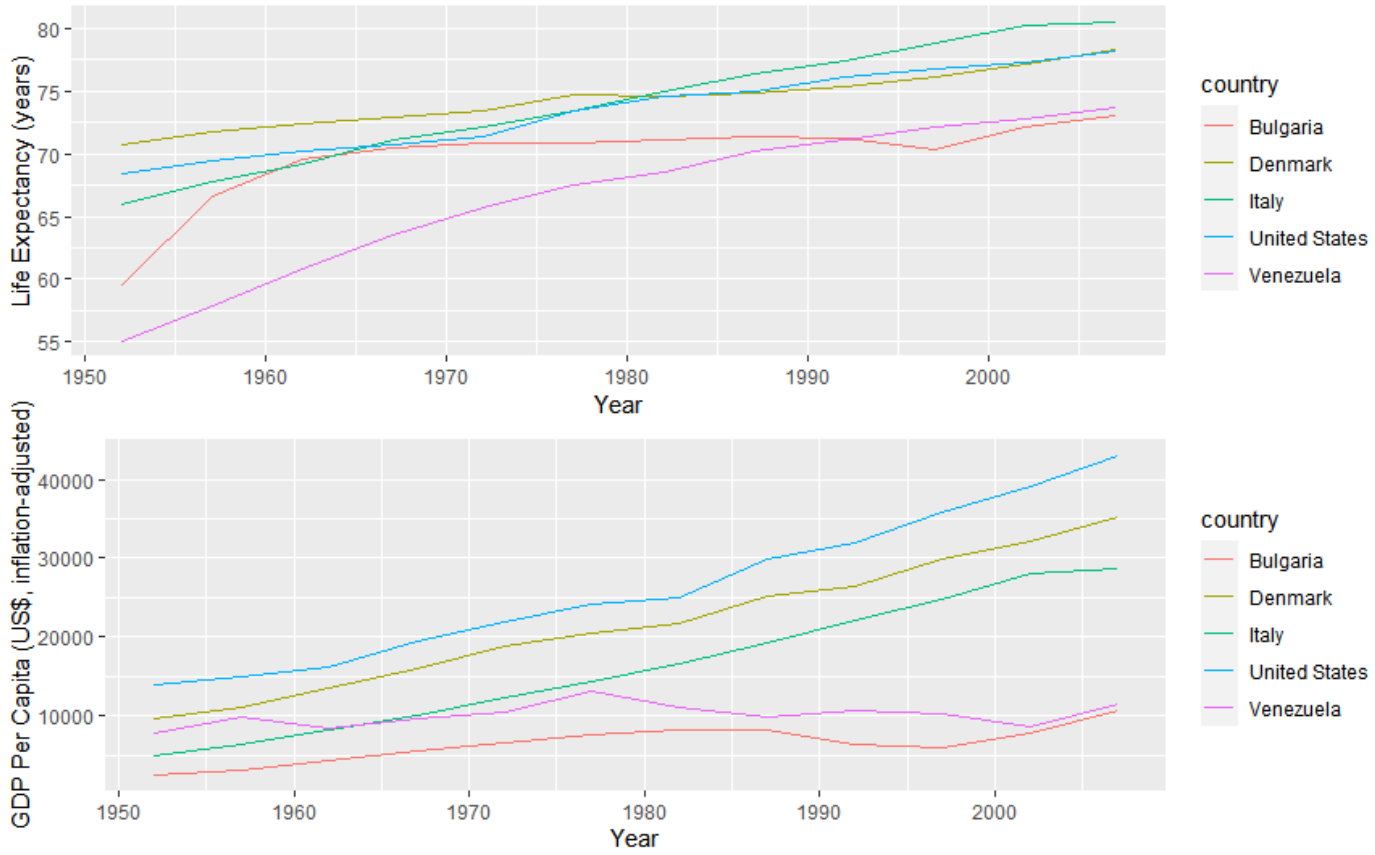
Part 3



Relationship between GDP Per Capita & Life Expectancy

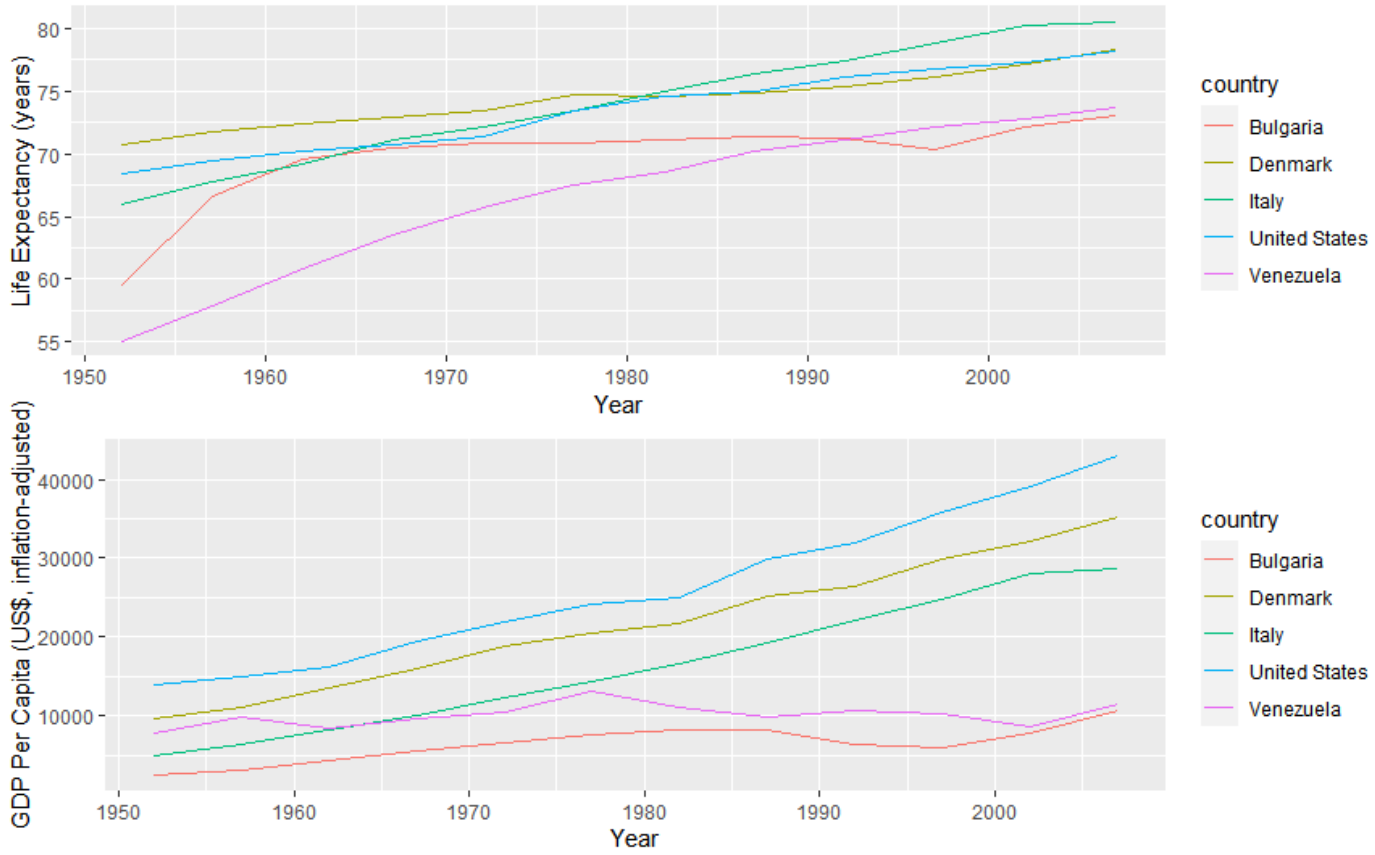
Code to create this line plot:

```
life_exp <- ggplot(My5) +
geom_line(aes(x = year, y = lifeExp,
color = country)) +

  xlab("Year") + ylab("Life Expectancy
(years)")

GDP <- ggplot(My5) +
geom_line(aes(x = year, y =
gdpPercap, color = country)) +

  xlab("Year") + ylab("GDP Per Capita
(US$, inflation-adjusted)")

grid.arrange(life_exp, GDP, ncol = 1)
```



Analysis

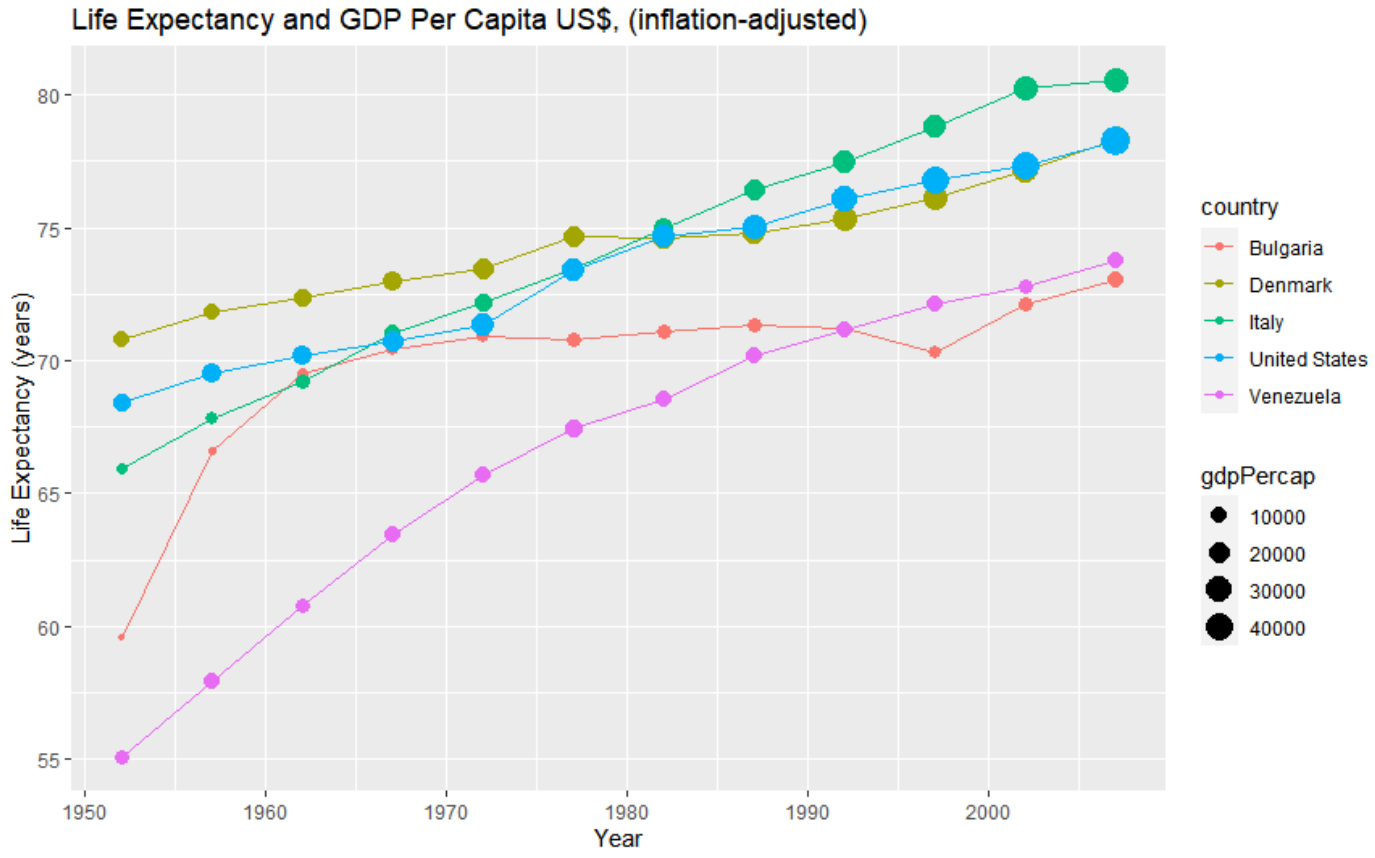
- Of these 5 countries, both GDP per capita and life expectancy tend to increase over time.
- This does not necessarily mean that growth in GDP per capita correlates with growth in life expectancy.
- However, there is are strong reasons to believe that growth in GDP per capita can correlate with a growth in life expectancy.



Relationship between GDP Per Capita and Life Expectancy

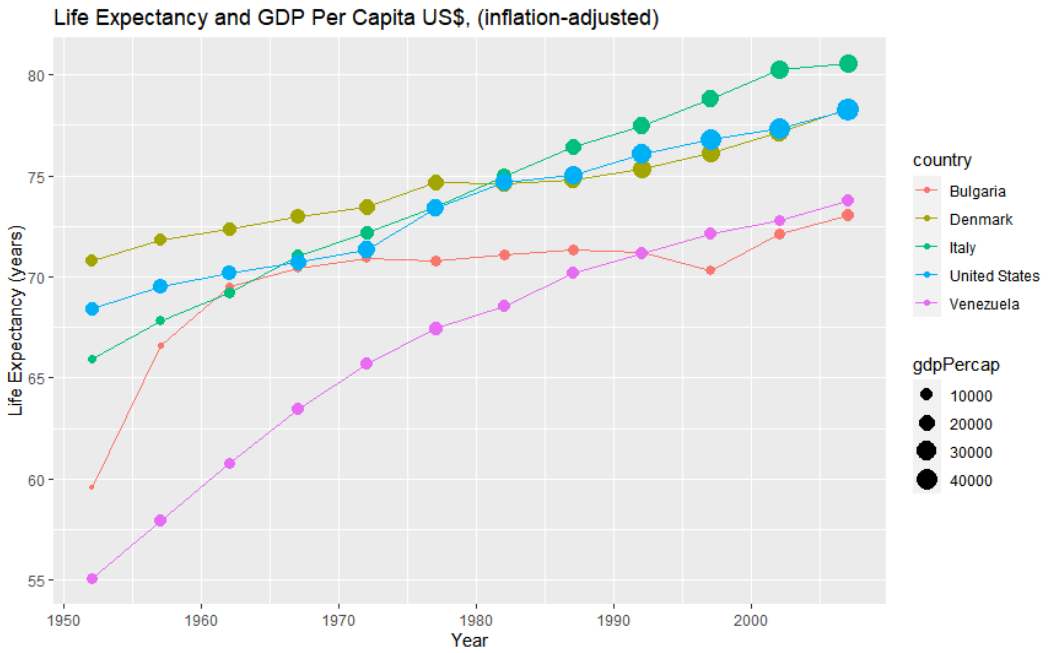
Code to create this line plot:

```
ggplot(My5, aes(x = year, y = lifeExp, color = country)) +
  geom_line() + geom_point(aes(size = gdpPercap)) +
  xlab("Year") +
  ylab("Life Expectancy (years)") +
  ggtitle("Life Expectancy and GDP Per Capita US$, (inflation-adjusted)")
```



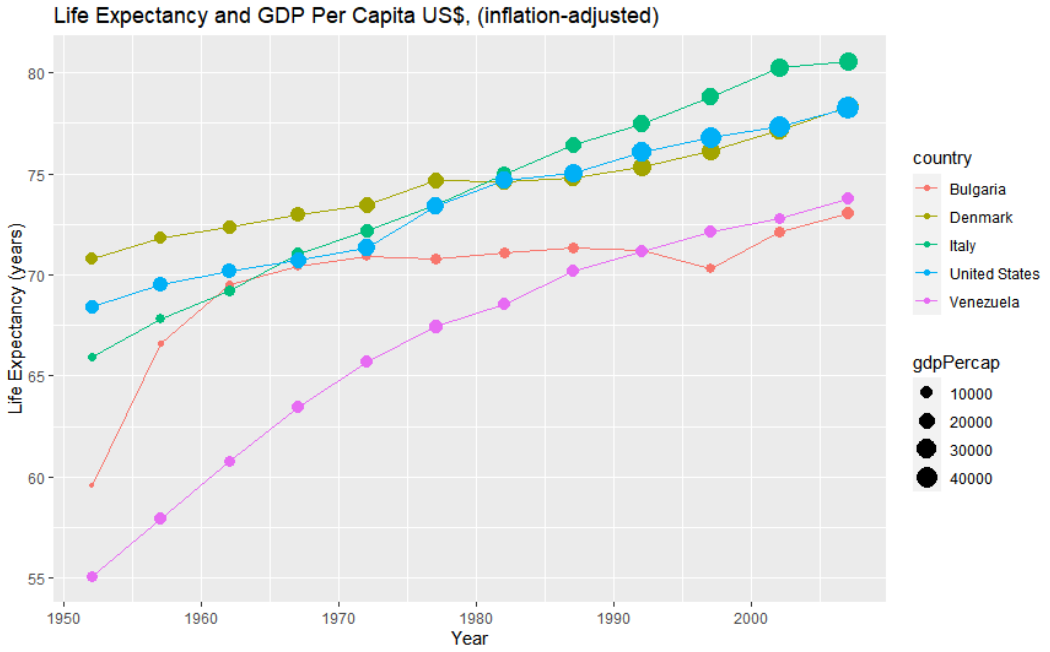
Analysis

- Countries with higher GDPs tend to have higher life expectancies. The reverse is also true- those with lower GDPs tend to have lover life expectancy.
- After 1982, the life expectancy in Italy surpasses that of the U.S.A. This could be due to lifestyle rather than improved economic circumstances. For example, people in Italy tend to walk a lot more and shop only for the 1-3 days ahead.



Analysis

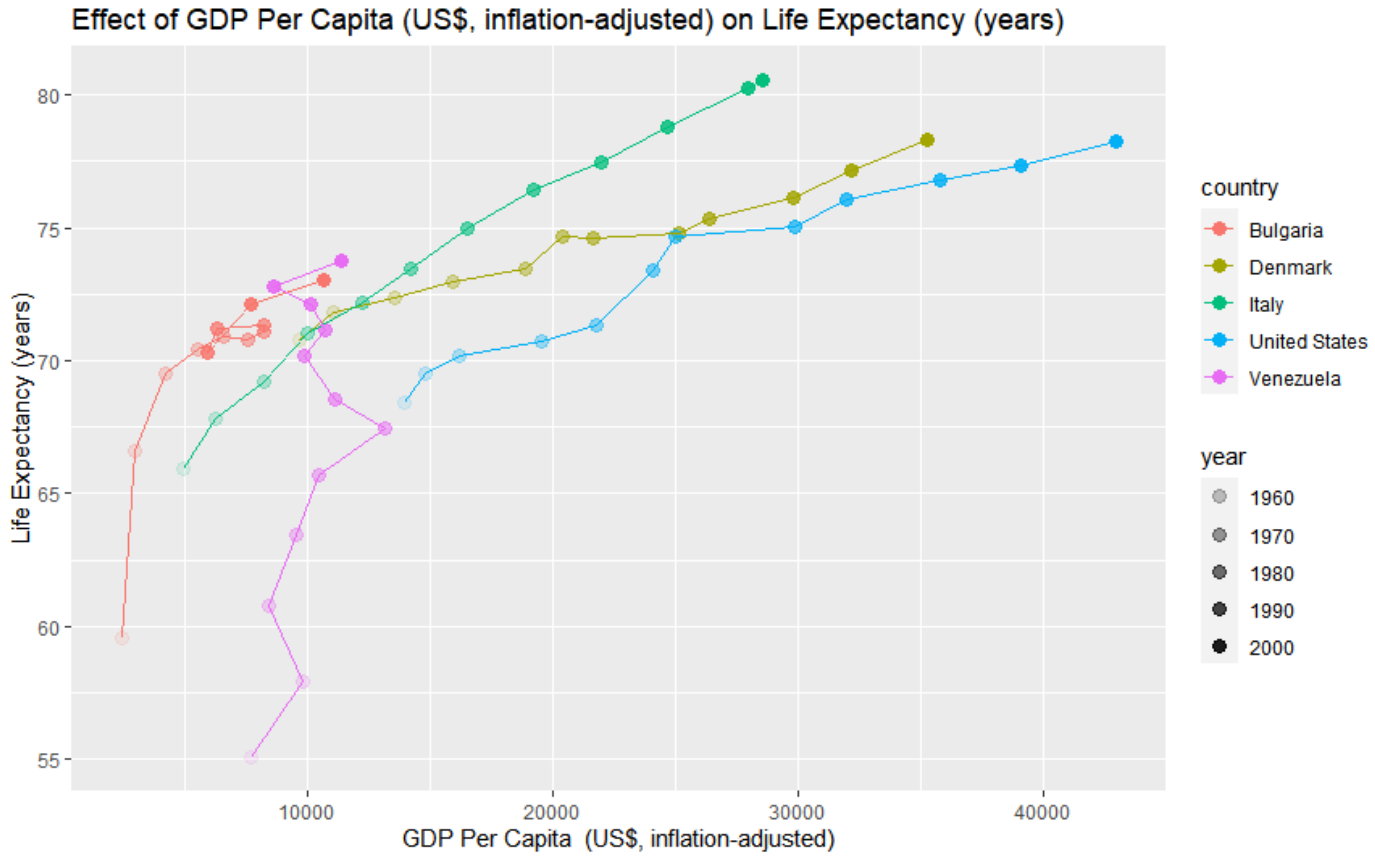
- Despite having a higher GDP per capita than Bulgaria, Venezuela has a generally experienced a lower life expectancy until 1992.
- In 1992, Venezuela's median life expectancy surpassed that of Bulgaria. In 1986, the Chernobyl disaster occurred, and the contamination spread to across Europe, including Bulgaria.
- Throughout the 1990's Bulgaria experienced radiation contamination due to its own nuclear power plant, the Kozloduy. This is considered one of the most dangerous nuclear power plants in the world, and the units with the greatest leakage have been decommissioned.



Effect of GDP Per Capita on Life Expectancy

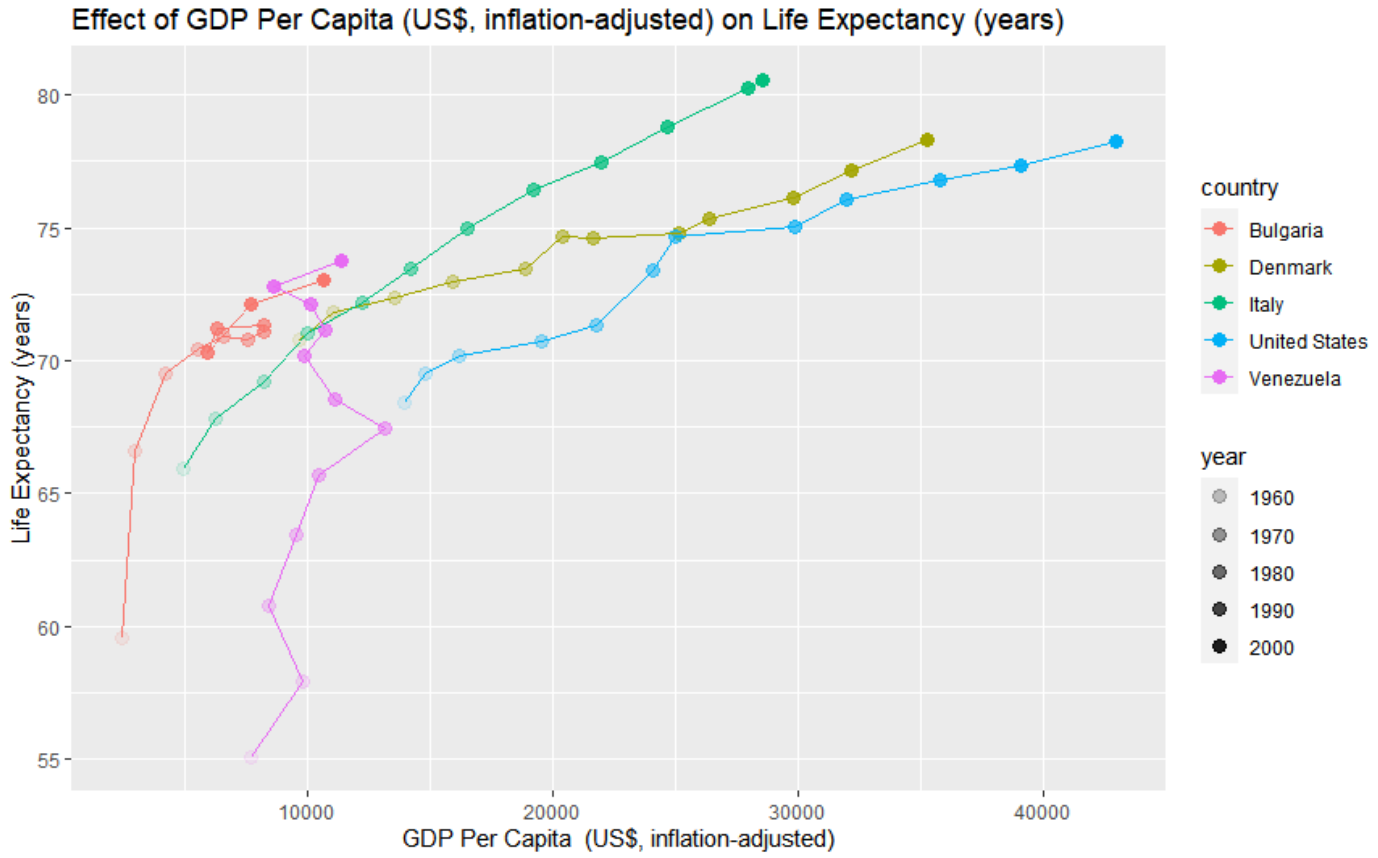
Code to create this point plot:

```
ggplot(My5, aes(x = gdpPercap, y = lifeExp, color = country)) +
  geom_point(aes(alpha = year), size = 3) + geom_path() +
  xlab("GDP Per Capita  (US$, inflation-adjusted)") +
  ylab("Life Expectancy (years)") +
  ggtitle("Effect of GDP Per Capita (US$, inflation-adjusted) on Life Expectancy (years)")
  scale_alpha(range = c(0.3, 1.0))
```



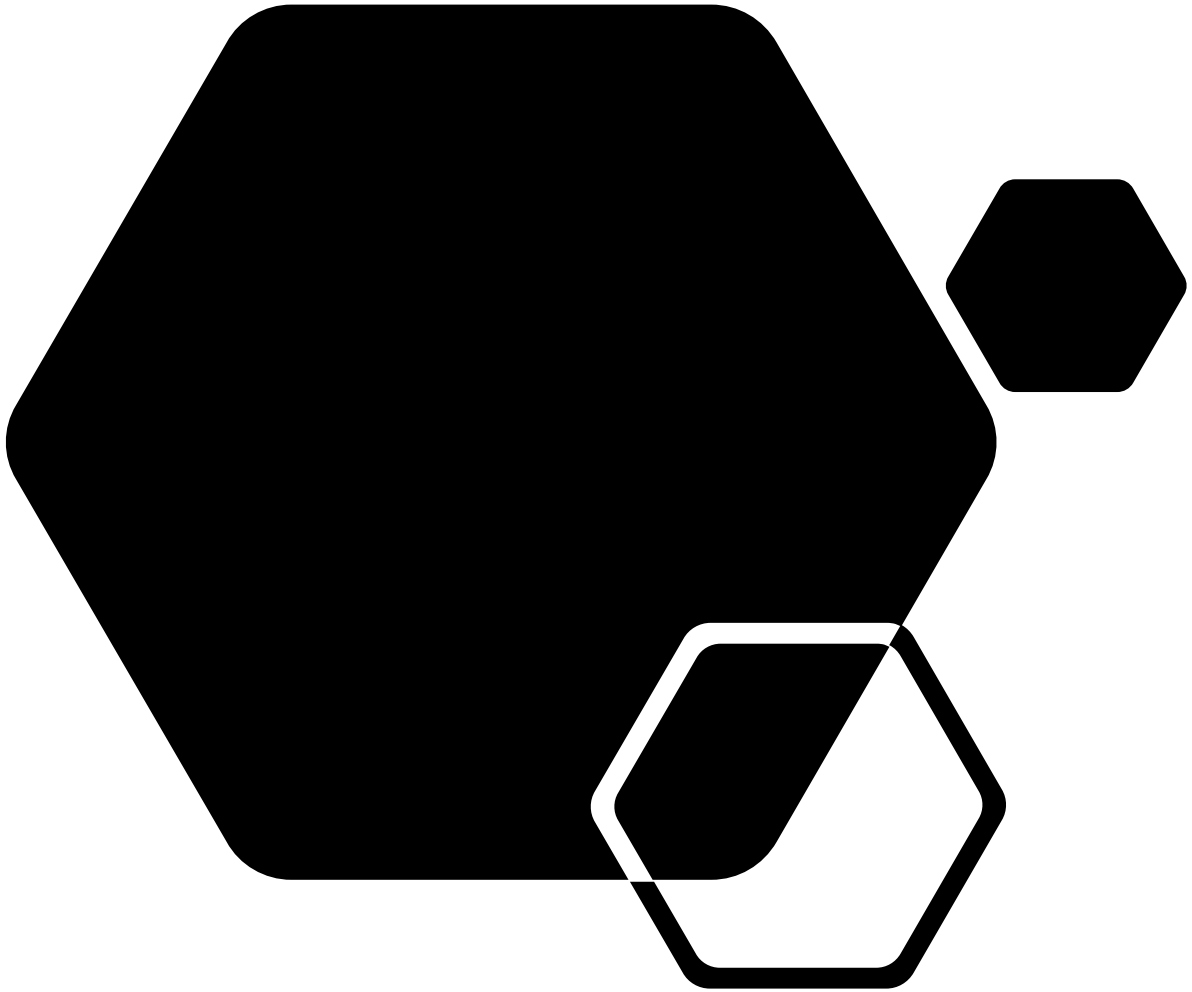
Analysis

- As GDP per capita increases, life expectancy also increases. Conversely, if GDP per capita decrease, life expectancy also tends to decrease.
- When GDP per capita increases, people's standard of living improves with greater access to:
  - Healthcare
  - Education
  - Professional development
  - Technology
  - Improved public infrastructure
- All the above factors in turn further help the economy due to feedback.



Relationship between GDP Per Capita and Life Expectancy

Part 3



Conclusion

As GDP per capita increases, life expectancy also increases. Conversely, if GDP per capita decrease, life expectancy also tends to decrease.

When GDP per capita increases, people's standard of living improves.

During 1952 – 2007, all 5 countries have higher median life expectancies than that of the world median life expectancies. Declines in life expectancy coincide with social, political, and economic unrest.

In 1952 & 2007, all 5 countries have a higher GDP per capita than the world's median. Declines in GDP per capita coincide with social, political, and economic unrest.

Given the trajectory of the world median life expectancy, the world's standard of living is improving, and more people are gaining access to the resources that they need in order to live well.