Do Europe and Asia experience similar trends in Life Expectancy and Life Satisfaction?

Often Imitated, never depulicated

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```
library(tidyverse)
```

```
Warning: package 'tidyverse' was built under R version 4.4.3
```

```
Warning: package 'tidyr' was built under R version 4.4.3
```

```
Warning: package 'readr' was built under R version 4.4.3
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```
Warning: package 'purrr' was built under R version 4.4.3
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```
Warning: package 'stringr' was built under R version 4.4.3
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Warning: package 'forcats' was built under R version 4.4.3
```

```
Warning: package 'lubridate' was built under R version 4.4.3

-- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
v dplyr     1.1.4     v readr     2.1.5
v forcats   1.0.0     v stringr   1.5.1
v ggplot2   3.5.2     v tibble    3.2.1
v lubridate 1.9.4     v tidyr     1.3.1
v purrr     1.0.4
-- Conflicts ------------------------------------------ tidyverse_conflicts() --
x dplyr::filter() masks stats::filter()
x dplyr::lag()    masks stats::lag()
i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to becor
```

```
library(ggplot2)
library(dplyr)
library(scales)
```

```
Attaching package: 'scales'

The following object is masked from 'package:purrr':

    discard

The following object is masked from 'package:readr':

    col_factor
```

```
library(knitr)
```

```
Warning: package 'knitr' was built under R version 4.4.3
```

1 Executive Summary

This report investigates trends in life expectancy and life satisfaction in Europe and Asia from 2011 to 2023. Europe consistently outperformed Asia in the two indicators, and the differences among countries were smaller. However, there have been significant fluctuations and differences in Asian countries. Some countries lag behind in both indicators, while in others, although life expectancy has risen, the happiness index of life lags behind. The research results emphasize the importance of the all-round development that balances longevity and overall health.

2 Introduction

With advancements in global medicine, public health, and living standards, life expectancy has continued to reach new heights. It is often regarded as a key indicator of people's well-being. However, the relationship between life expectancy and life satisfaction may vary across countries and regions, influenced by differences in cultural values, economic development, and societal expectations.This report explores the question: Do Europe and Asia experience similar trends in life expectancy and life satisfaction? To address this question, we analyze publicly available data from Our World in Data, which includes standardized country-level measures of life expectancy and self-reported life satisfaction. Our analysis focuses on Europe and Asia. By cleaning and analyzing data, we discuss the visualization results and key findings.

3 Methodology

```
raw_data <- read_csv("life-satisfaction-vs-life-expectancy.csv")
```

```
Rows: 59752 Columns: 7
-- Column specification --------------------------------------------------------
Delimiter: ","
chr (3): Entity, Code, World regions according to OWID
dbl (4): Year, Life expectancy - Sex: all - Age: 0 - Variant: estimates, Can...

i Use `spec()` to retrieve the full column specification for this data.
i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
region_map <- raw_data %>%
  filter(!is.na(`World regions according to OWID`)) %>%
  distinct(Entity, `World regions according to OWID`) %>%
  deframe()

filled_region <- raw_data %>%
  mutate(`World regions according to OWID` =
           coalesce(`World regions according to OWID`,
                    region_map[Entity]))


cleaned <- filled_region %>%
  mutate(`Life expectancy (years)` = `Life expectancy - Sex: all - Age: 0 - Variant: estimate
  select(-`Life expectancy - Sex: all - Age: 0 - Variant: estimates`) %>%
```

```
  filter(!is.na(`Life expectancy (years)`), !is.na(`Cantril ladder score`))

cleaned %>%
  filter(`World regions according to OWID` %in% c("Europe", "Asia")) %>%
  write_csv("europe_asia.csv")

europe_asia <- read_csv("europe_asia.csv")
```

```
Rows: 999 Columns: 7
-- Column specification --------------------------------------------------------
Delimiter: ","
chr (3): Entity, Code, World regions according to OWID
dbl (4): Year, Cantril ladder score, Population (historical), Life expectanc...

i Use `spec()` to retrieve the full column specification for this data.
i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

Our data was sourced from the online data repository, Our World in Data (OWID). Specifically, we used the Life satisfaction vs. life expectancy dataset. This dataset tracks two main variables for countries and geographic regions, those being life expectancy (measured in years) and life satisfaction (measured on a 1-10 scale using the Cantril Ladder score). These variables are tracked on a yearly basis, alongside population statistics where appropriate.

This dataset suffers from a degree of sparsity, particularly regarding the Cantril Ladder score, as several observations for many countries were missing. The data was filtered such that only observations containing both metrics were present. From there, Europe and Asia stood out as regions of interest for further analysis. Further filtering the dataset for observations containing only the Europe or Asia region variable resulted in the final dataset used for analysis. An example of which can be seen in Figure 1.

```
kable(head(europe_asia[, c("Entity", "Code", "Year", "Cantril ladder score", "Life expectancy
```

Initial inspection of the data was performed using a distribution curve and a density map of both variables in 2023. Figure 2 displays an immediate disparity between Europe and Asia for both life satisfaction and life expectancy. For both variables, Europe displays more countries with preferable results when compared to Asia. This is not to say that Asia does not contain comparable countries Figure 3 shows that while European nations are clustered closer together in a region of high life satisfaction and life expectancy, there are Asian countries present in *the same region*. The density map merely shows that while there are comparable Asian countries, the tighter clustering of European countries in this region is indicative of greater consistency between nations.

Entity	Code	Year	Cantril ladder score	Life expectancy (years)
Afghanistan	AFG	2011	4.258	61.250
Afghanistan	AFG	2012	4.040	61.735
Afghanistan	AFG	2014	3.575	62.260
Afghanistan	AFG	2015	3.360	62.270
Afghanistan	AFG	2016	3.794	62.646
Afghanistan	AFG	2017	3.632	62.406

Figure 1: Europe and Asia filtered dataset

```
long_data <- europe_asia %>%
  filter(Year == 2023) %>%
  select(`World regions according to OWID`,
         `Life expectancy (years)`,
         `Cantril ladder score`) %>%
pivot_longer(
  cols = c(`Life expectancy (years)`, `Cantril ladder score`),
  names_to = "Variable",
  values_to = "Value")

ggplot(long_data, aes(x = Value, fill = `World regions according to OWID`)) +
  geom_density(alpha = 0.5) +
  facet_wrap(~ Variable, ncol = 1, scales = "free") +
  labs(title = "Distribution of Life Expectancy and Life Satisfaction (2023)",
    fill = "Region",
    x = NULL,
    y = "Density") +
    theme_minimal()
```

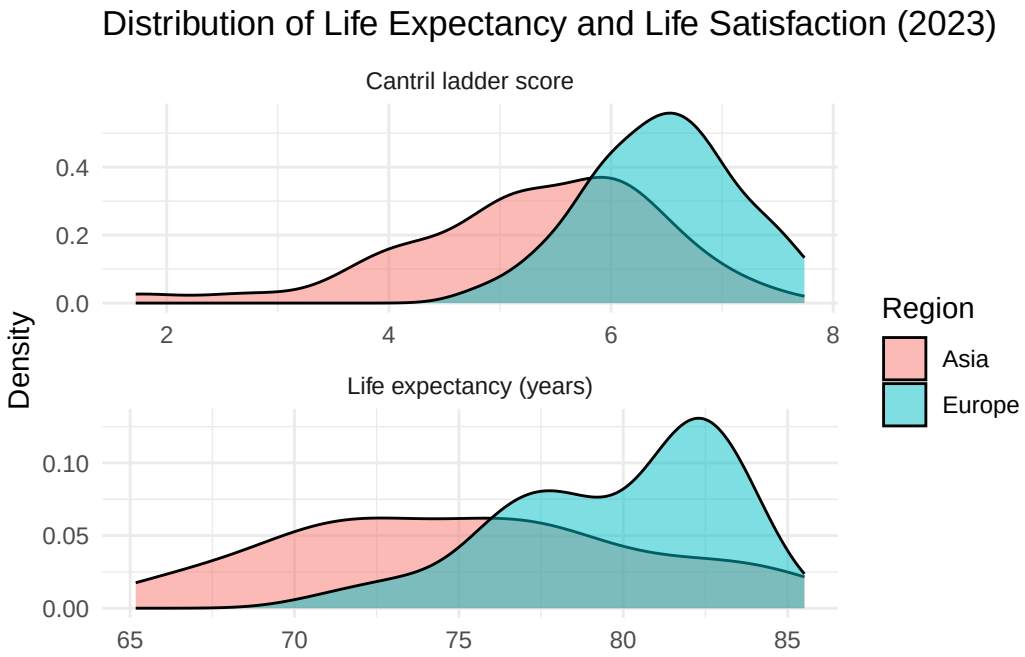

Figure 2: Country-Level Distribution Curves of Life Satisfaction and Life Expectancy in Asia and Europe (2023)

```
ggplot(europe_asia %>% filter(Year == 2023),
       aes(x = `Cantril ladder score`,
           y = `Life expectancy (years)`)) +
  geom_point(aes(color = `World regions according to OWID`), size = 2) +
  stat_density_2d(aes(fill = `World regions according to OWID`),
                  geom = "polygon", alpha = 0.2, color = NA, show.legend = FALSE) +
  labs(title = "Density Map for Europe and Asia (2023)",
       x = "Life Satisfaction",
       y = "Life Expectancy") +
  theme_minimal()
```

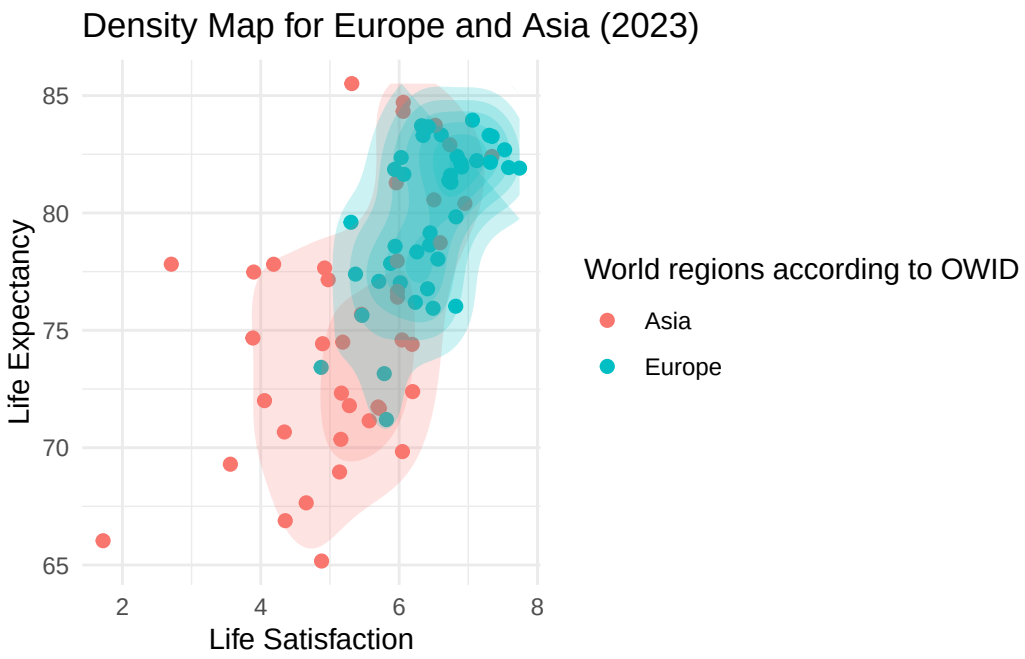

Figure 3: Country-Level Density Map of Life Satisfaction and Life Expectancy in Asia and Europe (2023)

4 Results

Figure 4 presents population-weighted yearly averages of life satisfaction and life expectancy in Asia and Europe from 2011 to 2023. This approach gives more weight to countries with larger populations and offers a clearer view of how the average individual in each region experiences changes in health and well-being.

Europe consistently reported higher values for both indicators. Life expectancy followed a steady upward trend until 2020, with a slight drop afterward, while life satisfaction remained relatively stable. In contrast, Asia showed more fluctuation, with a notable shift in 2019 where both indicators changed direction. Interestingly, the life satisfaction trends for Asia and Europe were almost opposite before 2019, even though they showed similar patterns in 2010 and 2012. However, in terms of life expectancy, they shared similar patterns, including the decline seen in 2021. By 2023, both regions had reached their highest life expectancy levels.

1. Calculate population-weighted regional averages

```
# Load filtered dataset that includes only Europe and Asia
europe_asia <- read_csv("europe_asia.csv")
```

```
Rows: 999 Columns: 7
-- Column specification --------------------------------------------------------
Delimiter: ","
chr (3): Entity, Code, World regions according to OWID
dbl (4): Year, Cantril ladder score, Population (historical), Life expectanc...

i Use `spec()` to retrieve the full column specification for this data.
i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```r
# Compute population-weighted yearly averages for each region
region_avg <- europe_asia %>%

  # Remove any missing values in key variables
  filter(
    !is.na(`Life expectancy (years)`),
    !is.na(`Cantril ladder score`),
    !is.na(`Population (historical)`),
    !is.na(Year)
  ) %>%
  group_by(`World regions according to OWID`, Year) %>%
  summarise(

    # Weighted mean life expectancy using historical population
    `Life expectancy (years)` = weighted.mean(
      `Life expectancy (years)`, `Population (historical)`, na.rm = TRUE),

    # Weighted mean life satisfaction using same population weights
    `Cantril ladder score` = weighted.mean(
      `Cantril ladder score`, `Population (historical)`, na.rm = TRUE),
    .groups = "drop"
  )
```

2. Plot trends and label final-year positions

```r
# Identify the most recent year (2023) for each region to use as label position
label_data <- region_avg %>%
  group_by(`World regions according to OWID`) %>%
  filter(Year == max(Year)) %>%
  ungroup()

# Create line plot showing trend of weighted averages for Asia and Europe
ggplot(region_avg, aes(
```

```
  x = `Cantril ladder score`,
  y = `Life expectancy (years)`,
  group = `World regions according to OWID`,
  color = Year
)) +
  geom_path(linewidth = 1.2) +   # Line to show trajectory
  geom_point(size = 2) +         # Dots for each year
  scale_color_viridis_c() +      # Color gradient for year
  geom_text(
    data = label_data,           # Add region labels at final year
    aes(label = `World regions according to OWID`),
    color = "black",
    vjust = -1
  ) +

  # Add padding on x-axis and y-axis
  scale_x_continuous(expand = expansion(mult = c(0.05, 0.1))) +
  scale_y_continuous(expand = expansion(mult = c(0.05, 0.1))) +
  labs(
    title = "Yearly Averages: Life Satisfaction vs Life Expectancy",
    x = "Life Satisfaction (Cantril ladder score)",
    y = "Life Expectancy (years)",
    color = "Year"
  ) +
  scale_color_viridis_c(
  breaks = c(2011, 2014, 2017, 2020, 2023)  # Customize colorbar ticks
) +
  theme_minimal()
```

```
Scale for colour is already present.
Adding another scale for colour, which will replace the existing scale.
```

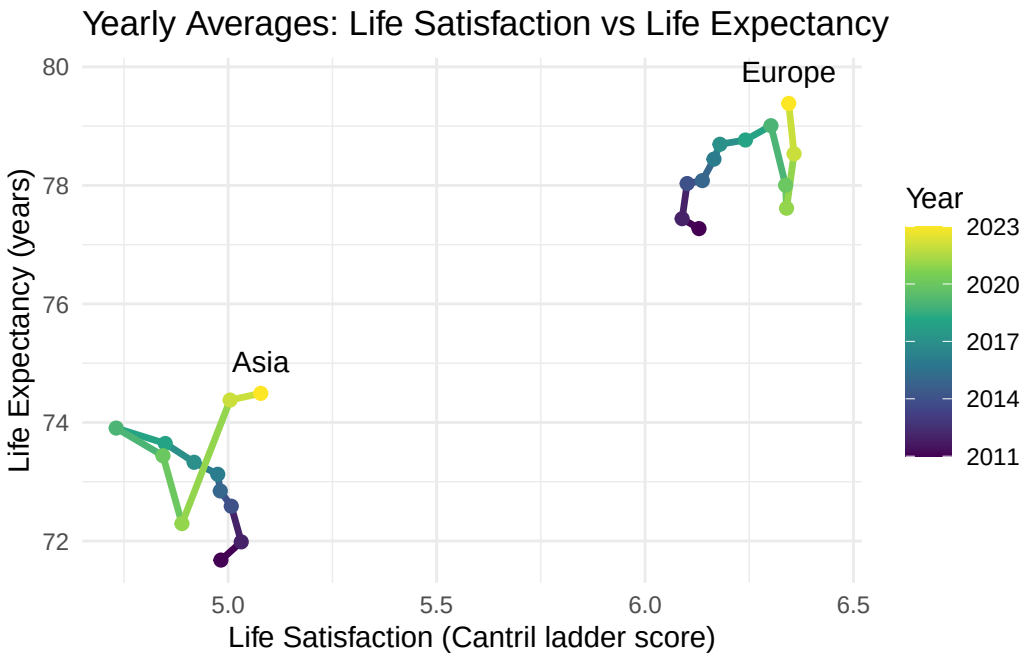

Figure 4: Trajectory of Population-Weighted Life Satisfaction and Life Expectancy in Asia and Europe (2011–2023)

5 Discussion, Conclusion and Recommendations

The central question in this report is whether there are similar trends in life expectancy and life satisfaction between Europe and Asia. By analyzing the population-weighted data from 2011 to 2023, we found that the overall quality of life in both regions has improved over time. However, Europe countries have made consistent progress in terms of health and subjective well-being. They are closely clustered together, indicating relatively uniform regional development. In contrast, Asian countries showed greater differences and extreme values observed. Some of these countries performed well in both indicators, while others lagged significantly behind. These phenomena indicate that the differences in medical insurance policies, economic conditions and social support systems behind different regions may affect well-being outcomes. There are mostly high-welfare countries in Europe, which ensures its relatively stable life expectancy and high level of satisfaction. However, in Asia, the levels in various aspects vary greatly and there is certain room for improvement.

Recommendations:

- Some governments in Asian countries should consider using the people's happiness index as an indicator for policy decisions to ensure that life expectancy and quality of life can be further improved.

- Future research can expand its scope to include other regions around the world and introduce more differences to explore causal relationships.
- consider adding other variables such as occupational inequality, income inequality and educational level to help further explain the differences and propose more specific improvement measures.

6 References

- United Nations. (2024). *World Population Prospects* [Dataset]. Processed by Our World in Data. Available at: https://ourworldindata.org/grapher/life-satisfaction-vs-life-expectancy