



WORLD HEALTH AND ECONOMY DATA VISUALIZATION

A WEB SCRAPING PROJECT

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NYC Data Science Academy
July 8, 2019

AGENDA

- 01 Introduction
- 02 Web Scraping
- 03 Topic 1: People and Health
- 04 Topic 2: Education, Communication and Economy
- 05 Conclusion and Wrap Up

AGENDA

01

Introduction

02

Web Scraping

03

Topic 1: People and Health

04

Topic 2: Education, Communication and Economy

05

Conclusion and Wrap Up

INTRODUCTION

Geography

Transportation

Military and Security

Energy

People and Society

Communication

Economy

Government

Education

.....

The screenshot shows the Central Intelligence Agency (CIA) website's Library section. At the top, the CIA logo and name are displayed alongside the tagline "THE WORK OF A NATION. THE CENTER OF INTELLIGENCE." and a search bar. The navigation menu includes "HOME", "ABOUT CIA", "CAREERS & INTERNSHIPS", "OFFICES OF CIA", "NEWS & INFORMATION", "LIBRARY", and "KIDS' ZONE". The "Library" section is active, showing a breadcrumb trail: "Home > Library > Publications > The World Factbook". The main content area features the title "THE WORLD FACTBOOK" and a dropdown menu for selecting a country. Below this are tabs for "ABOUT", "REFERENCE", "APPENDICES", "FAQs", and "CONTACT". A "WELCOME TO THE WORLD FACTBOOK" banner is followed by a world map and a "SELECT A REGION OR CONTINENT" dropdown. The main text describes the factbook's content, including history, people, society, government, economy, energy, geography, communications, transportation, military, and transnational issues. A "WHAT'S NEW" section highlights updates from July 03, 2019, regarding electricity access data. A sidebar on the left lists various resources like "World Leaders", "CIA Maps", "Center for the Study of Intelligence", "Freedom of Information Act", "Electronic Reading Room", "Kent Center Occasional Papers", "Intelligence Literature", "Reports", "Related Links", and "Video Center".

INTRODUCTION

Geography

Transportation

Military and Security

Energy

People and Society

Communication

Economy

Government

Education

.....

The screenshot shows the Central Intelligence Agency (CIA) website's Library section. At the top, there is the CIA logo and the text "CENTRAL INTELLIGENCE AGENCY" and "THE WORK OF A NATION. THE CENTER OF INTELLIGENCE." To the right, there are links for "Report Information" and "Contact", a search bar with "Search CIA.gov..." and a "SEARCH" button, and language options: "عربي", "中文", "Français", "Русский", "Español", and "More ▶".

The main navigation bar includes: HOME, ABOUT CIA, CAREERS & INTERNSHIPS, OFFICES OF CIA, NEWS & INFORMATION, LIBRARY, and KIDS' ZONE. The "LIBRARY" section is active, showing a breadcrumb trail: Home > Library > Publications > The World Factbook.

The "Library" sidebar lists various resources: Publications, * The World Factbook, World Leaders, CIA Maps, Center for the Study of Intelligence, Freedom of Information Act, Electronic Reading Room, Kent Center Occasional Papers, Intelligence Literature, Reports, Related Links, and Video Center.

The main content area is titled "THE WORLD FACTBOOK" and features a dropdown menu for "Please select a country to view". Below this are tabs for "ABOUT", "REFERENCE", "APPENDIX", "FAQs", and "CONTACT". A section titled "THE WORLD FACTBOOK ARCHIVE" includes a "WELCOME TO THE WORLD FACTBOOK" message and a "SELECT A REGION OR CONTINENT" dropdown. A world map is displayed with color-coded regions. Below the map, there is a "WHAT'S NEW" section for "Today is: Monday, July 8" with a date "July 03, 2019" and a paragraph of text: "While the availability of electricity has expanded rapidly over many parts of the world in the past few decades, there are still over 1 billion people worldwide that do not have access to electricity. The World Factbook recently updated all of its 'Electricity access' entries with the latest available data from 2016 and 2017." Below this, there is a date "July 26, 2019".

At the bottom of the sidebar, there are three featured links: "REGIONAL AND WORLD MAPS", "FLAGS OF THE WORLD", and "GUIDE TO COUNTRY COMPARISONS".

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WEB SCRAPING

came from Paraguay and Bolivia.

Age structure:

0-14 years: 24.44% (male 5,629,345 /female 5,293,680)

15-24 years: 15.2% (male 3,476,344 /female 3,317,151)

25-54 years: 39.46% (male 8,808,591 /female 8,826,379)

55-64 years: 9.12% (male 1,977,421 /female 2,096,665)

65 years and over: 11.79% (male 2,216,487 /female 3,052,135) (2018 est.)

population pyramid: 

Dependency ratios:

total dependency ratio: 56.5 (2015 est.)

youth dependency ratio: 39.4 (2015 est.)

elderly dependency ratio: 17.1 (2015 est.)

potential support ratio: 5.8 (2015 est.)

Median age:

total: 31.9 years

male: 30.7 years

female: 33.1 years (2018 est.)

country comparison to the world: [107](#)

Population growth rate:

0.89% (2018 est.)

country comparison to the world: [121](#)

Birth rate:

16.5 births/1,000 population (2018 est.)

country comparison to the world: [109](#)

Death rate:

7.5 deaths/1,000 population (2018 est.)

country comparison to the world: [108](#)

Net migration rate:

-0.1 migrant(s)/1,000 population (2018 est.)

country comparison to the world: [101](#)

Population distribution:

one-third of the population lives in Buenos Aires; pockets of agglomeration occur throughout the northern and central parts of the country; Patagonia to the south remains sparsely populated

Urbanization:

urban population: 91.9% of total population (2018)

rate of urbanization: 1.07% annual rate of change (2015-20 est.)

Major urban areas - population:

14.967 million BUENOS AIRES (capital), 1.548 million Cordoba, 1.488 million Rosario, 1.133 million Mendoza, 956,000 San Miguel de Tucuman, 864,000 La Plata (2018)

Sex ratio:

at birth: 1.07 male(s)/female

0-14 years: 1.06 male(s)/female

Library

Library

Publications

* The World Factbook

World Leaders

CIA Maps

Center for the Study of Intelligence

Freedom of Information Act Electronic Reading Room

Kent Center Occasional Papers

Intelligence Literature

Reports

Related Links

Video Center

Home » Library » Publications » The World Factbook

THE WORLD FACTBOOK

Please select a country to view

[ABOUT](#) [REFERENC](#) [APPENDIC](#) [FAQs](#) [CONTACT](#)

THE WORLD FACTBOOK ARCHIVE

SOUTH AMERICA :: ARGENTINA

PAGE LAST UPDATED ON JULY 01, 2019



ONE-PAGE SUMMARY

Jump to topic

Introduction :: ARGENTINA

Geography :: ARGENTINA

People and Society :: ARGENTINA

Government :: ARGENTINA

Economy :: ARGENTINA

Energy :: ARGENTINA

Communications :: ARGENTINA

Transportation :: ARGENTINA

Military and Security :: ARGENTINA

Terrorism :: ARGENTINA

Transnational Issues :: ARGENTINA

Open All | Close All

WEB SCRAPING



python™



BeautifulSoup



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Country	Continent	Area	Population	Median ag	Population	Birth rate	Death rate	Net migrat	Maternal i	Infant mor	Life expec	Total ferti	Health exq	HIV/AIDS -	HIV/AIDS - HIV
2	United States	north-america	9,833,517.00	329,256,465	38.2	0.8	12.4	8.2	3.8	14	5.7	80.1	1.87	17.1		
3	Marshall Islands	australia-oceania	181	75,684	23.1	1.5	23.8	4.2	-4.6		18.7	73.6	2.98	17.1		
4	Tuvalu	australia-oceania	26	11,147	26	0.86	23.7	8.4	-6.6		28.2	67.2	2.93	16.5		
5	Maldives	south-asia	298	392,473	28.6	-0.06	16.1	4	-12.7	68	21.3	76	1.72	13.7		
6	Micronesia, Federated States of	australia-oceania	702	103,643	25.5	-0.55	19.6	4.2	-20.9	100	19.1	73.4	2.37	13.7		
7	Sweden	europa	450,295.00	10,040,995	41.1	0.8	12.1	9.4	5.3	4	2.6	82.2	1.87	11.9	0.2	11,000
8	Switzerland	europa	41,277.00	8,292,809	42.5	0.68	10.5	8.4	4.6	5	3.6	82.7	1.56	11.7		
9	France	europa	643,801.00	67,364,357	41.5	0.37	12.1	9.4	1.1	8	3.2	82	2.06	11.5	0.5	200,000
10	Malawi	africa	118,484.00	19,842,560	16.6	3.31	40.7	7.7	0	634	42.1	62.2	5.43	11.4	9.6	1,000,000
11	Germany	europa	357,022.00	80,457,737	47.4	-0.17	8.6	11.8	1.5	6	3.4	80.9	1.46	11.3	0.2	91,000
12	Austria	europa	83,871.00	8,793,370	44.2	0.42	9.5	9.7	4.4	4	3.4	81.7	1.48	11.2	0.1	7,400
13	Cuba	central-america	110,860.00	11,116,396	41.8	-0.27	10.6	8.9	-4.5	39	4.4	78.9	1.71	11.1	0.4	30,000
14	Sierra Leone	africa	71,740.00	6,312,212	19.1	2.4	36	10.2	-1.8	1,360	66.7	59	4.69	11.1	1.4	61,000
15	New Zealand	australia-oceania	268,838.00	4,545,627	38.1	0.77	13.1	7.6	2.2	11	4.4	81.4	2.01	11	0.1	3,700
16	Netherlands	europa	41,543.00	17,151,228	42.7	0.38	10.9	9	1.9	7	3.5	81.5	1.78	10.9	0.2	23,000
17	Denmark	europa	43,094.00	5,809,502	41.9	0.59	10.9	9.3	4.3	6	3.2	81	1.78	10.8	0.1	6,400
18	Djibouti	africa	23,200.00	884,017	24.2	2.13	23.3	7.5	5.5	229	44.3	64	2.27	10.6	1.3	9,100
19	Lesotho	africa	30,355.00	1,962,461	24.4	2.24	24.2	15.1	-6.6	487	44.6	53	2.59	10.6	23.8	320,000
20	Belgium	europa	30,528.00	11,570,762	41.5	0.67	11.3	9.7	5.2	7	3.4	81.2	1.78	10.6		
21	Serbia	europa	77,474.00	7,078,110	42.8	-0.47	8.9	13.6	0	17	5.7	75.9	1.44	10.4		2,700
22	Canada	north-america	9,984,670.00	35,881,659	42.4	0.72	10.2	8.8	5.7	7	4.5	82	1.6	10.4		
23	Moldova	europa	33,851.00	3,437,720	37	-1.06	11.2	12.6	-9.3	23	11.7	71.3	1.57	10.3	0.6	15,000
24	Japan	east-asia-southeast-asia	377,915.00	126,168,156	47.7	-0.24	7.5	9.9	0	5	2	85.5	1.42	10.2		28,000
25	Kiribati	australia-oceania	811	109,367	25	1.12	21	7	-2.8	90	31.1	66.9	2.34	10.2		
26	Liberia	africa	111,369.00	4,809,768	17.8	2.59	37.9	7.4	-4.7	725	50.6	63.8	5	10	1.4	40,000
27	Paraguay	south-america	406,752.00	7,025,763	28.7	1.17	16.6	4.8	-0.1	132	18.1	77.6	1.9	9.8	0.5	20,000
28	Malta	europa	316	449,043	41.8	0.99	10	7.9	7.8	9	4.7	82.7	1.48	9.7	0.1	
29	Norway	europa	323,802.00	5,372,191	39.3	0.94	12.2	8	5.3	5	2.5	82	1.85	9.7	0.1	5,100
30	Finland	europa	338,145.00	5,537,364	42.6	0.33	10.7	10.1	2.8	3	2.5	81.1	1.75	9.7		
31	Bosnia and Herzegovina	europa	51,197.00	3,849,891	42.5	-0.17	8.7	10.1	-0.4	11	5.4	77.1	1.31	9.6		
32	Portugal	europa	92,090.00	10,355,493	43.7	-0.27	8.2	10.6	-0.2	10	2.6	80.9	1.39	9.5	0.6	40,000
33	Australia	australia-oceania	7,741,220.00	23,470,145	38.8	1.01	12	7.3	5.4	6	4.2	82.4	1.77	9.4	0.1	26,000
34	Costa Rica	central-america	51,100.00	4,987,142	31.7	1.13	15.3	4.8	0.8	25	7.8	78.9	1.89	9.3	0.4	13,000

258 countries, 78 attributes

DATA VISUALIZATION



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PEOPLE AND HEALTH

01

Mortality

- Maternal mortality rate
- Infant mortality rate

03

Health expenditure

- Health expenditure by \$
- Health expenditure by % of GDP

02

Life expectancy and aging

- Life expectancy at birth
- Median age
- Population growth rate
- Total fertility rate

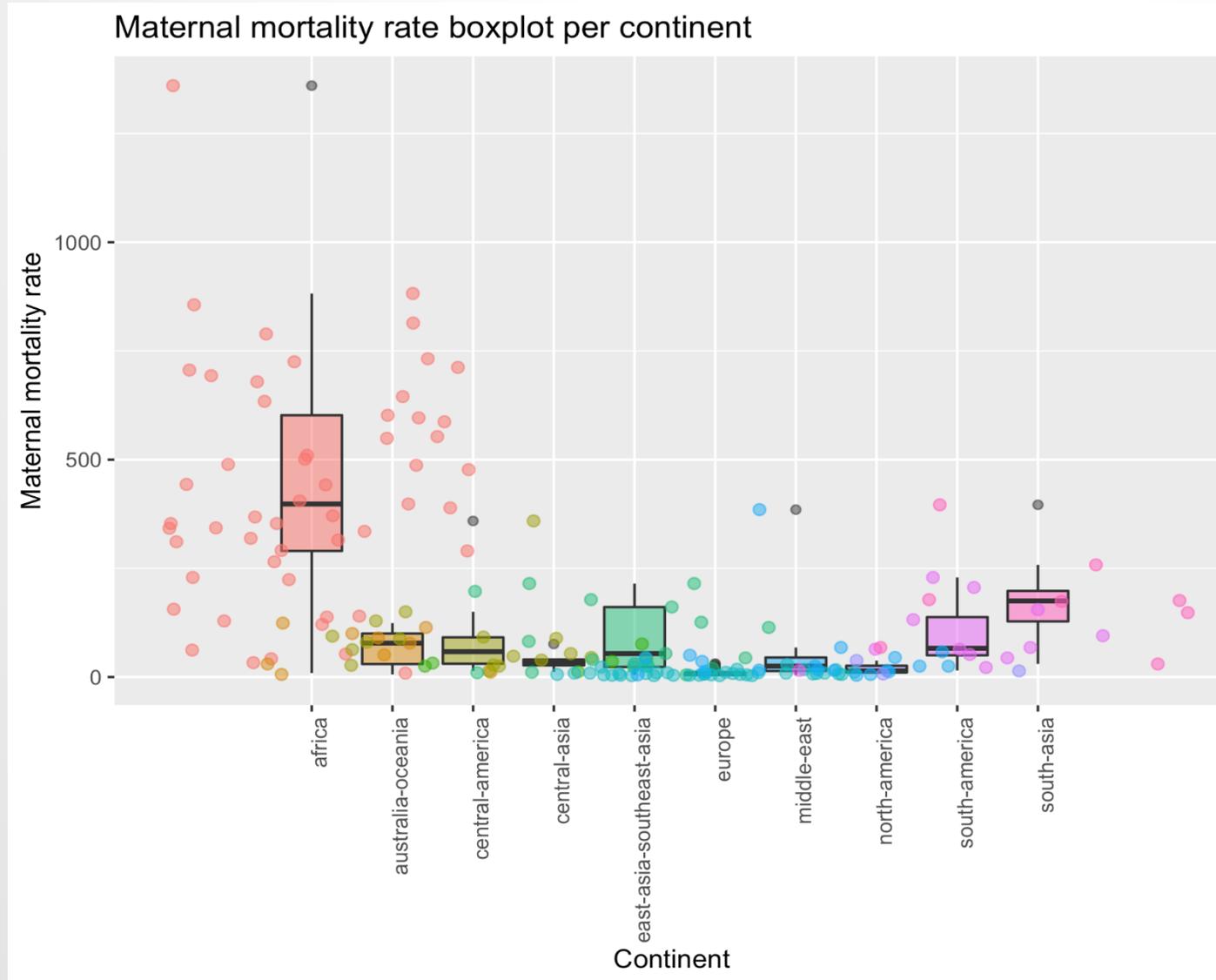
04

The question: Does higher health expenditure necessarily help solving these 8 areas of health concerns/problems?

- 1) Maternal mortality
- 2) Infant mortality
- 3) Life expectancy at birth
- 4) Median age
- 5) Total fertility rate
- 6) HIV/AIDS adult prevalence rate
- 7) Obesity - adult prevalence rate
- 8) Children under the age of 5 years underweight

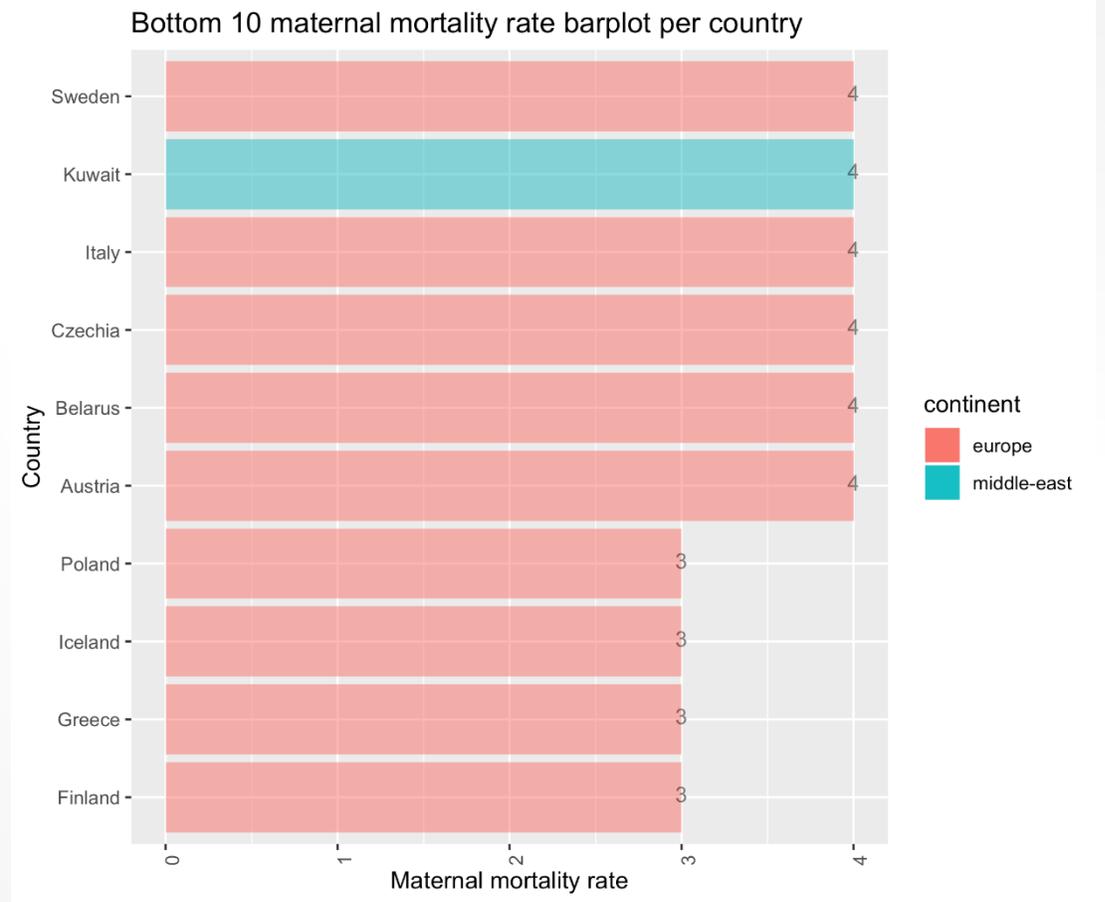
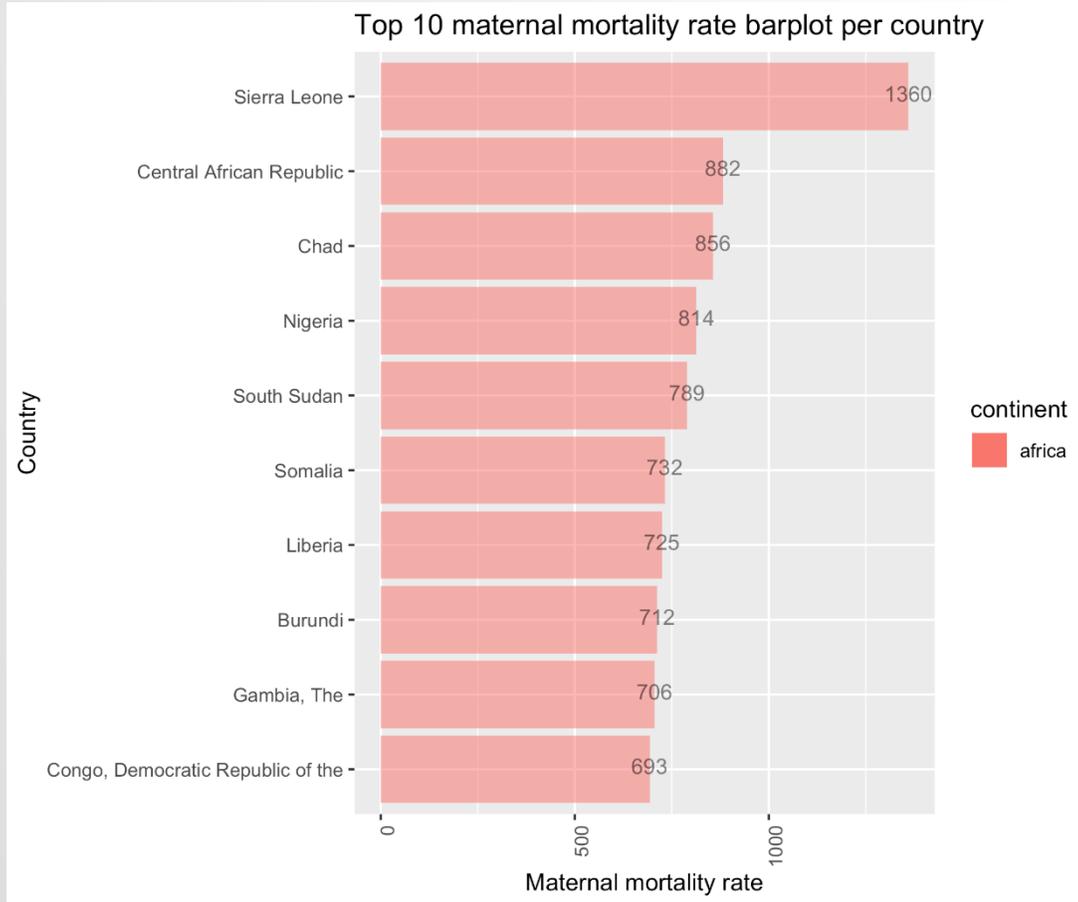
Maternal mortality

MMR is the annual number of female deaths per 100,000 live births from any cause related to or aggravated by pregnancy or its management (excluding accidental or incidental causes).



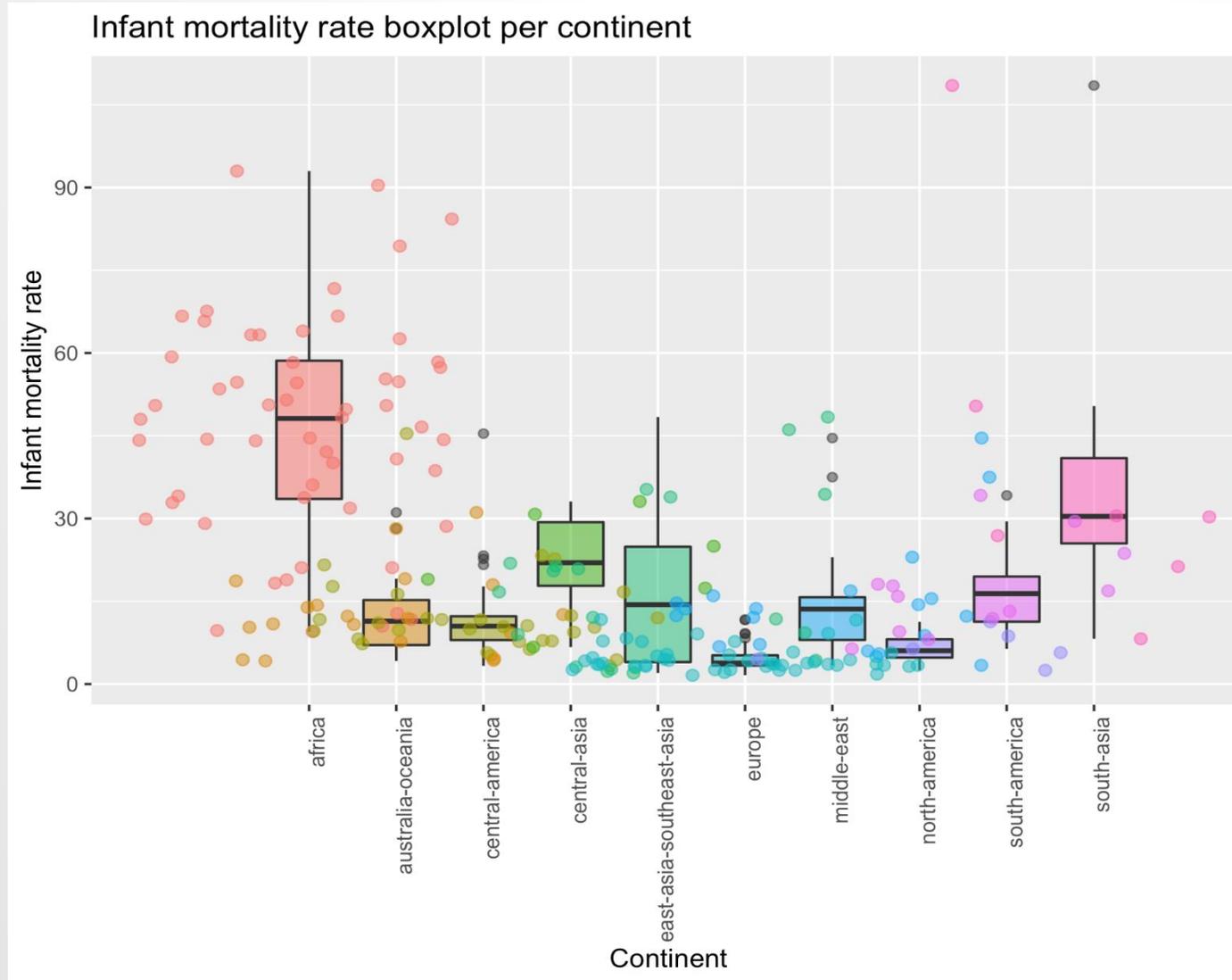
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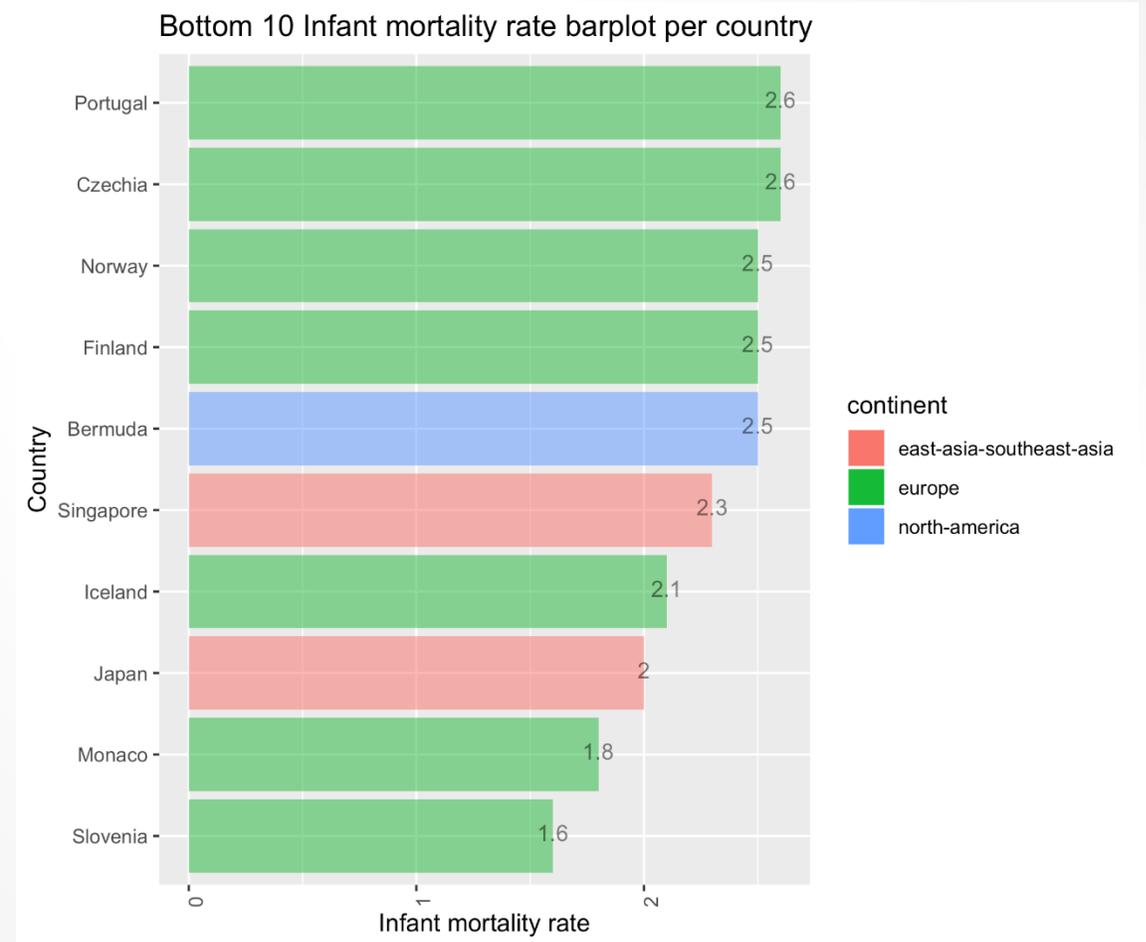
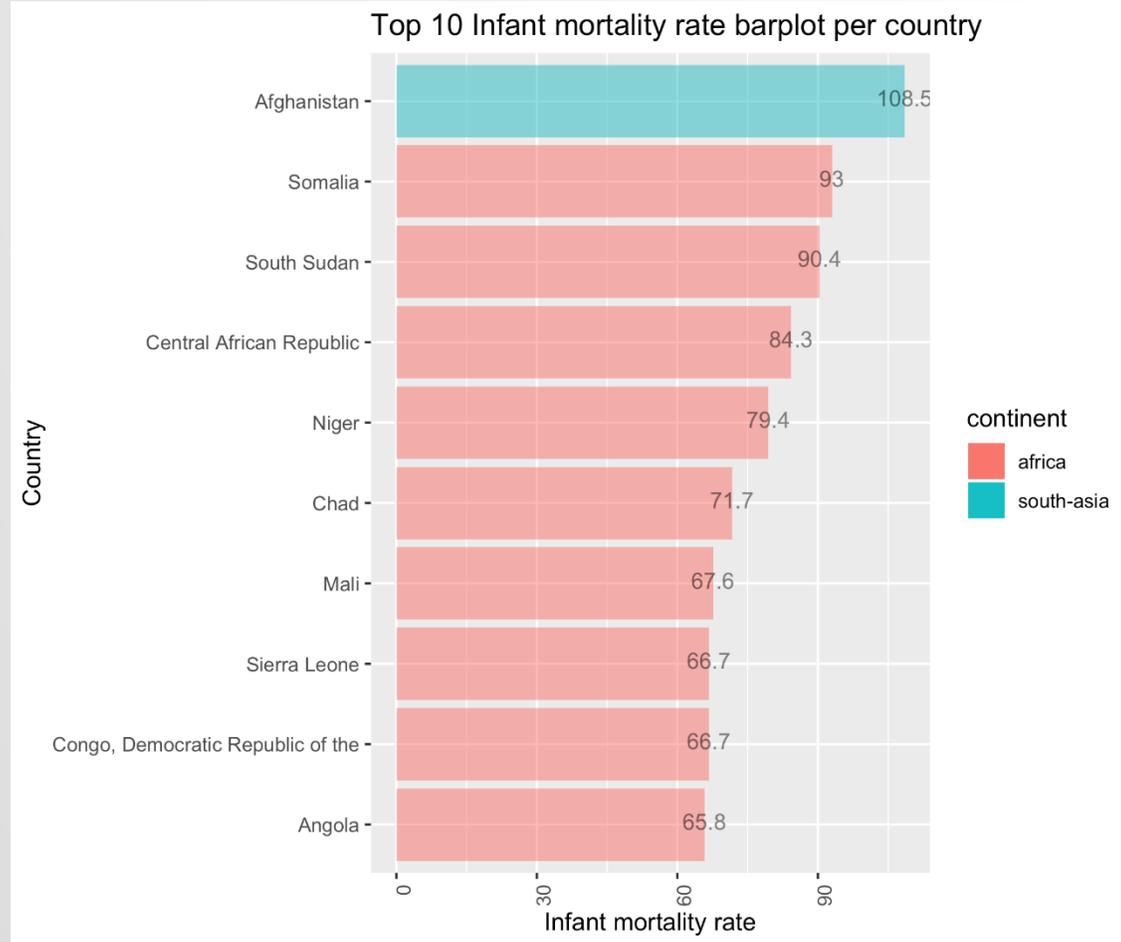
Infant mortality

Infant mortality rate compares the number of deaths of infants under one year old in a given year per 1,000 live births in the same year. This rate is often used as an indicator of the level of health in a country.



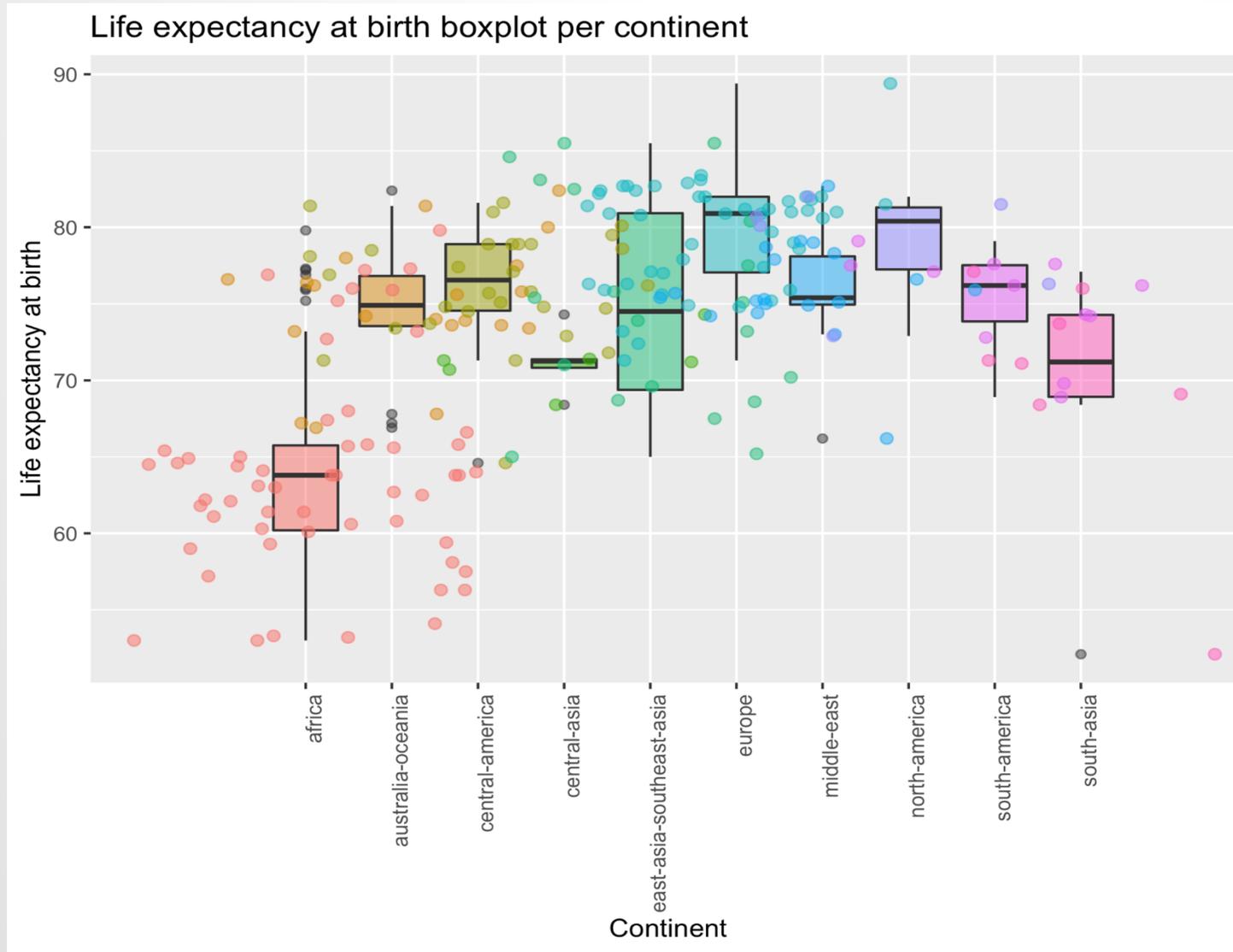
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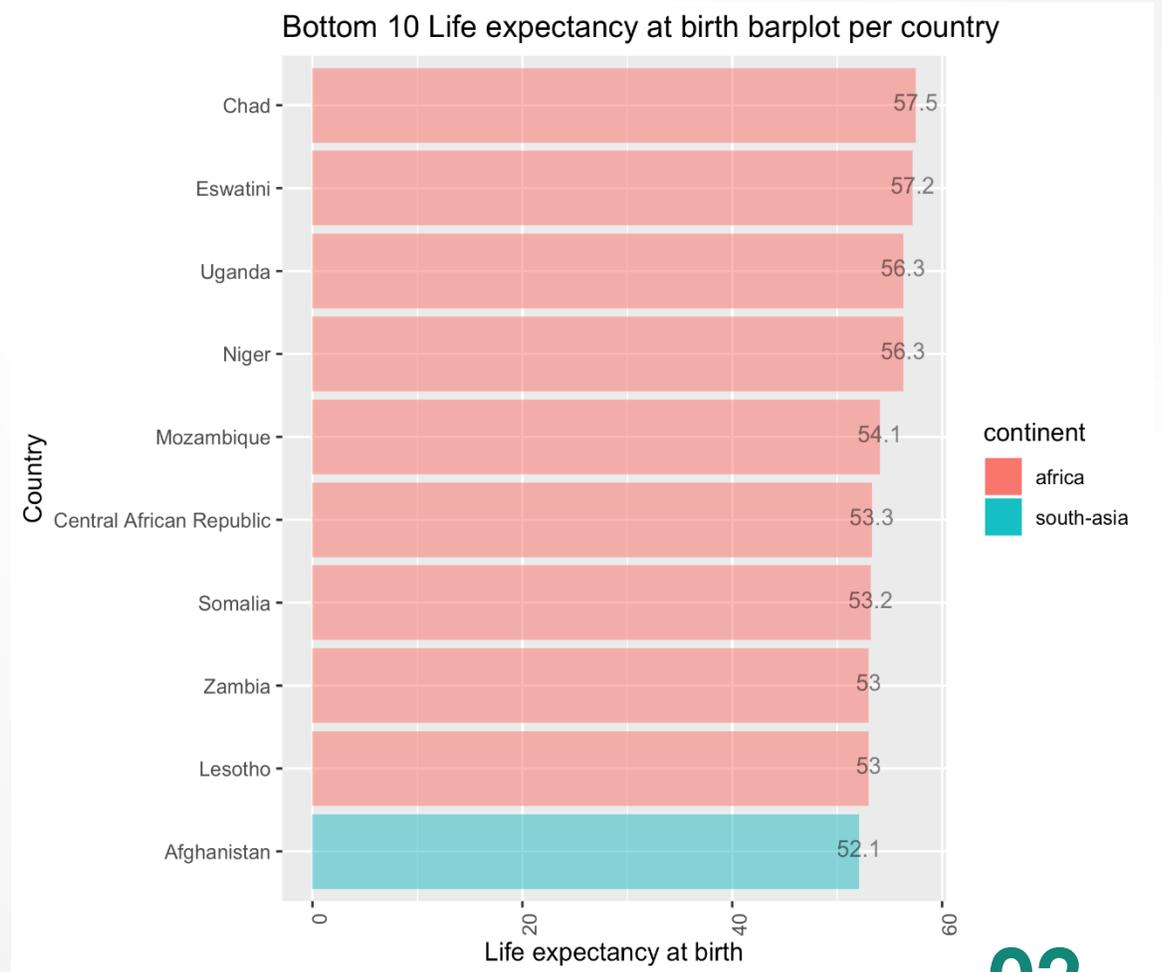
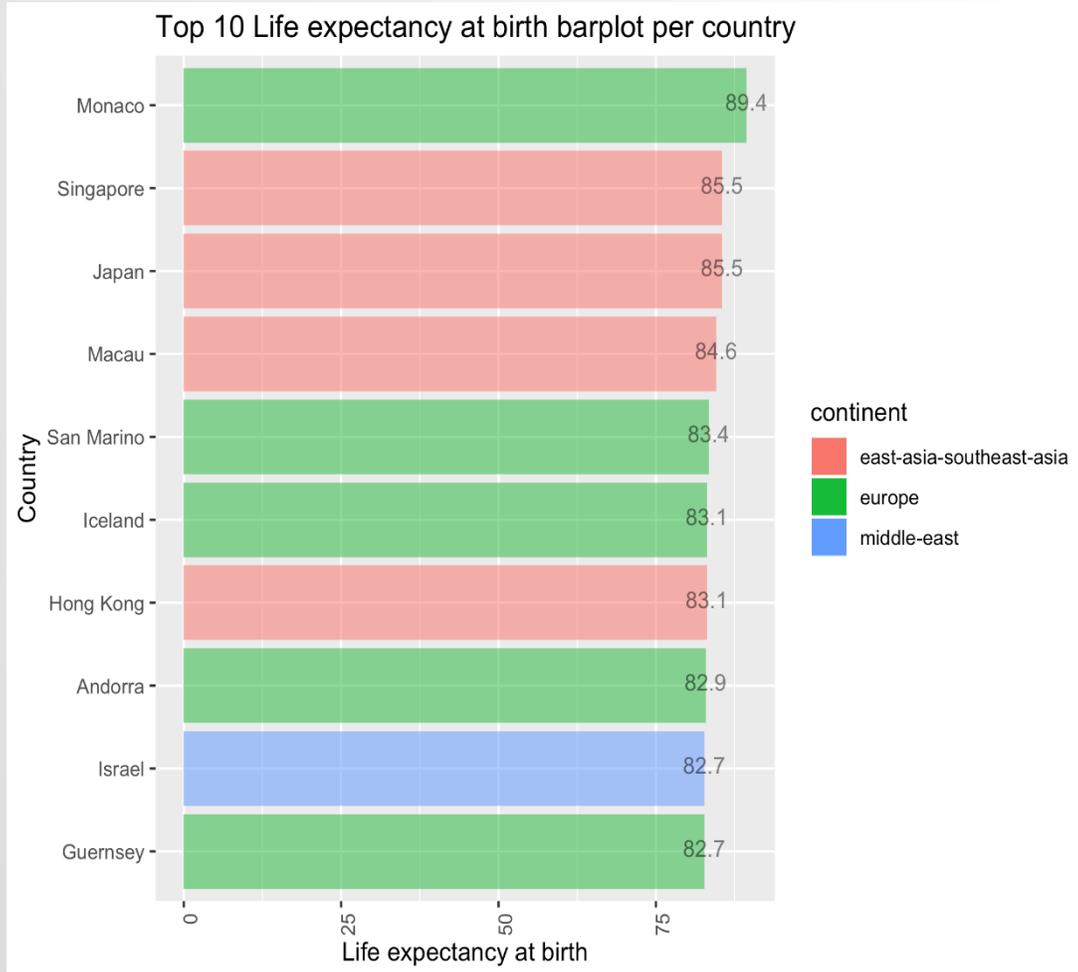
Life expectancy

Life expectancy at birth compares the average number of years to be lived by a group of people born in the same year, if mortality at each age remains constant in the future. Life expectancy at birth is also a measure of overall quality of life in a country and summarizes the mortality at all ages.

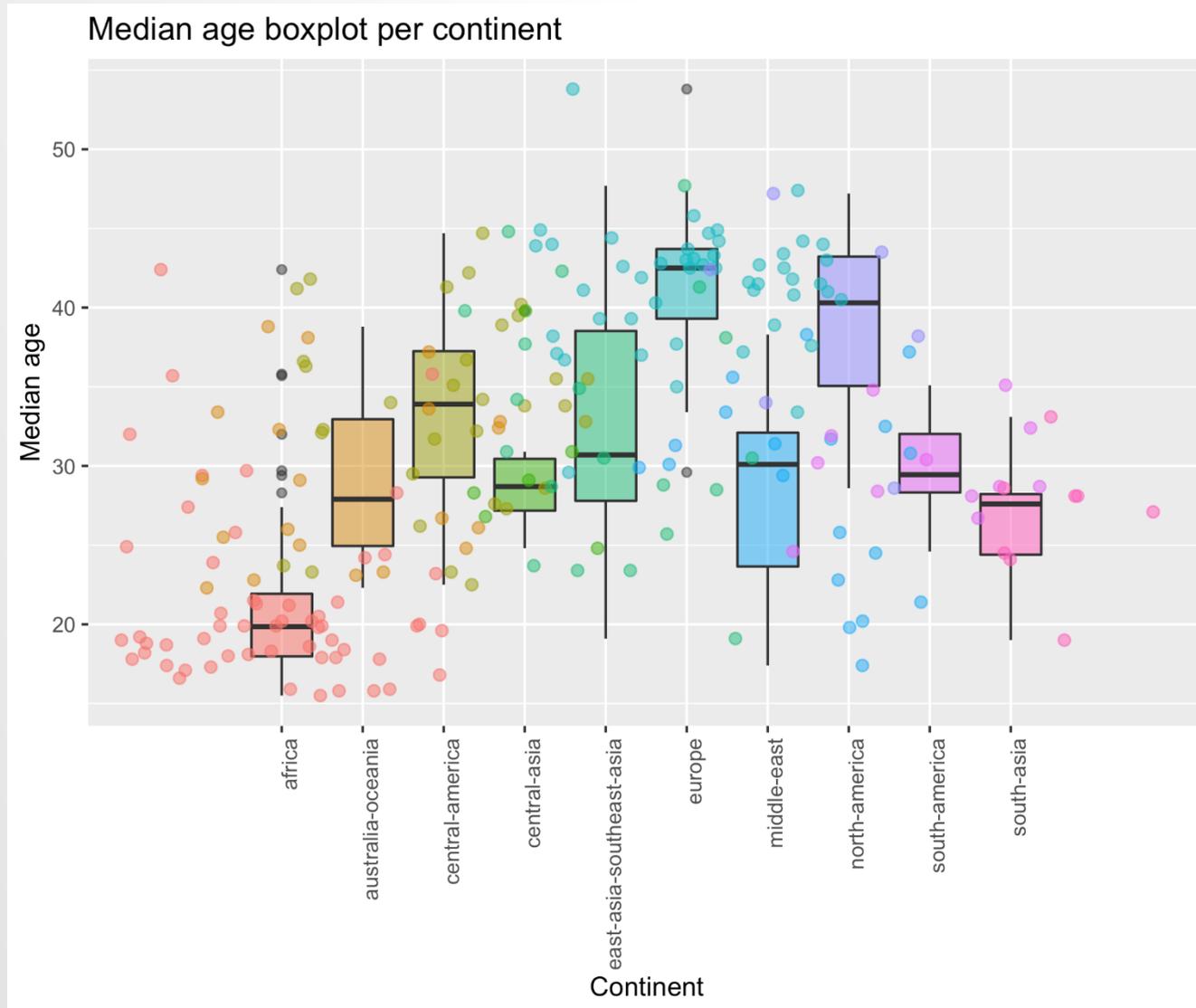


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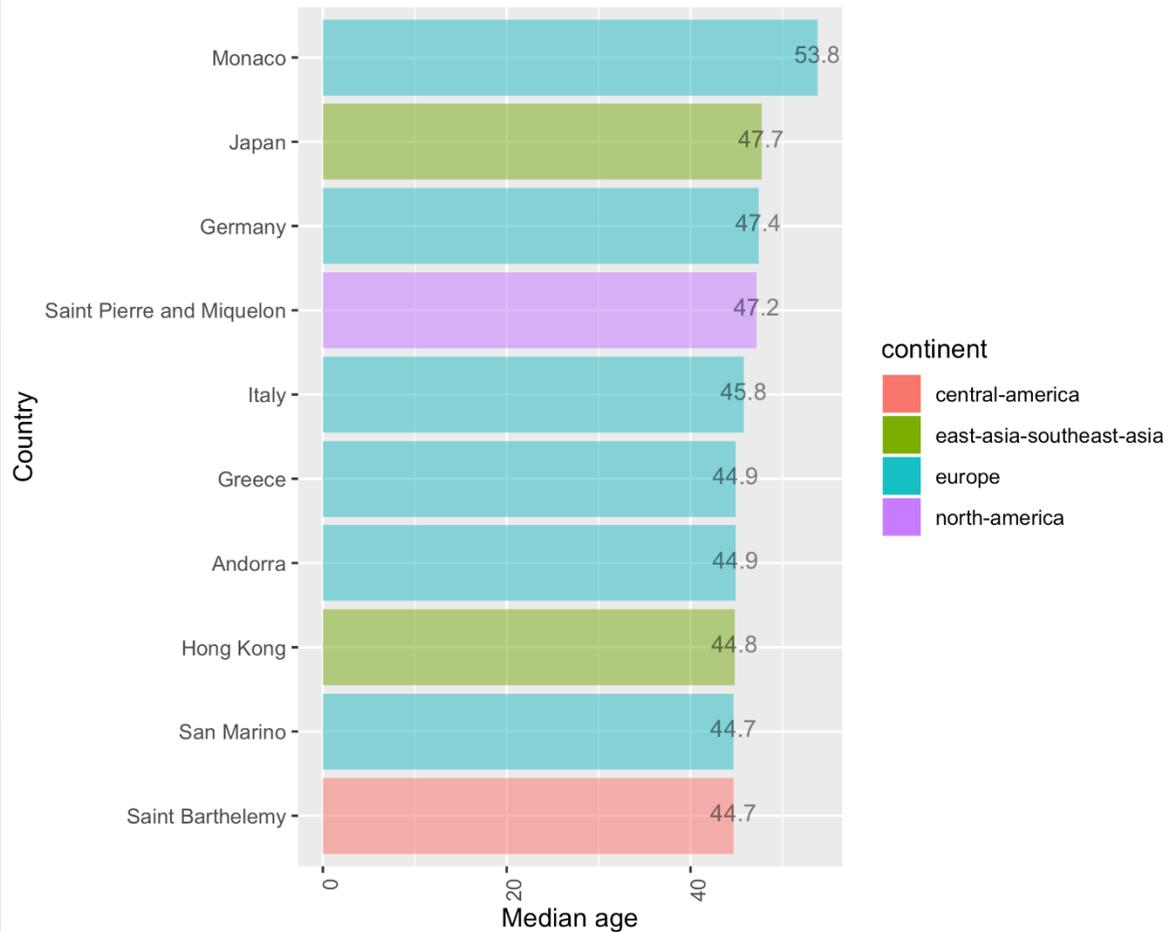


Median age

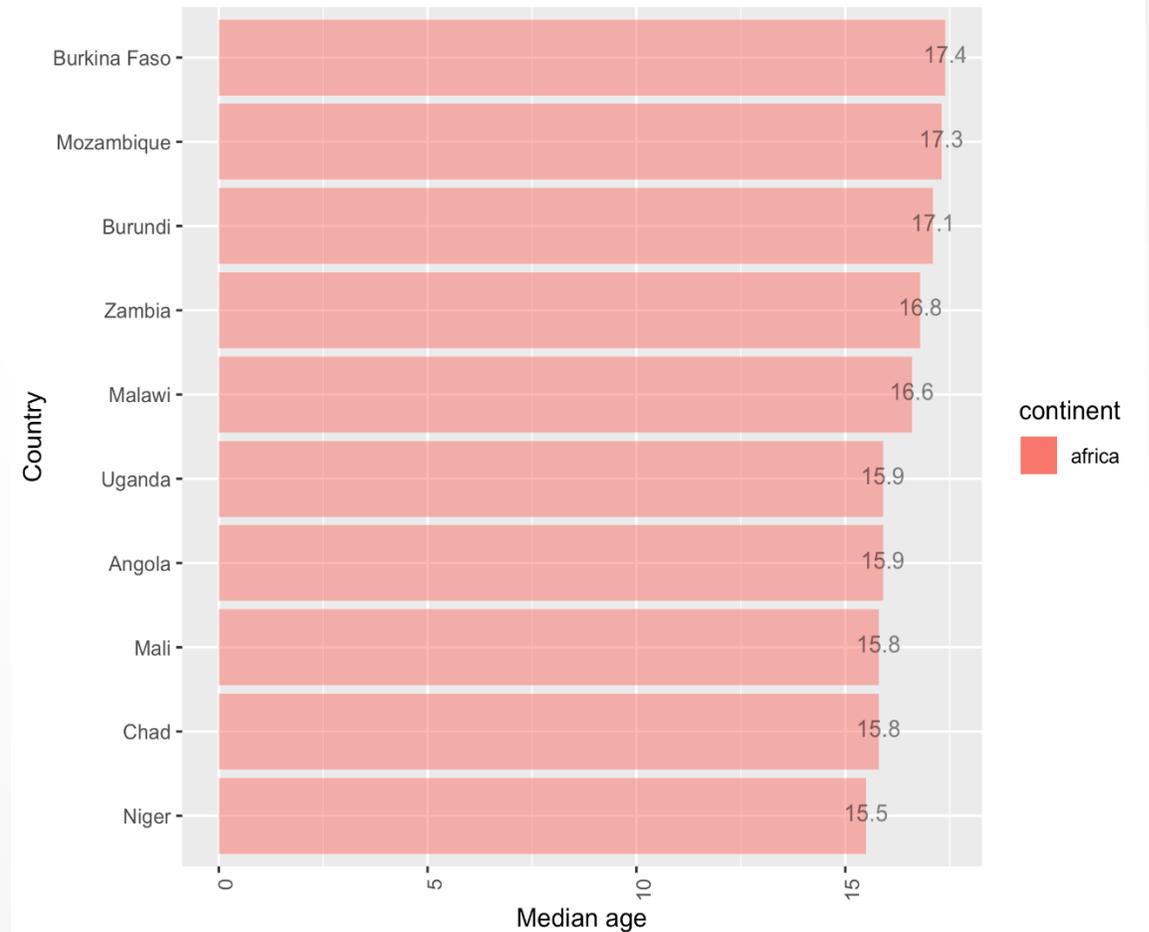


Median age

Top 10 median age barplot per country

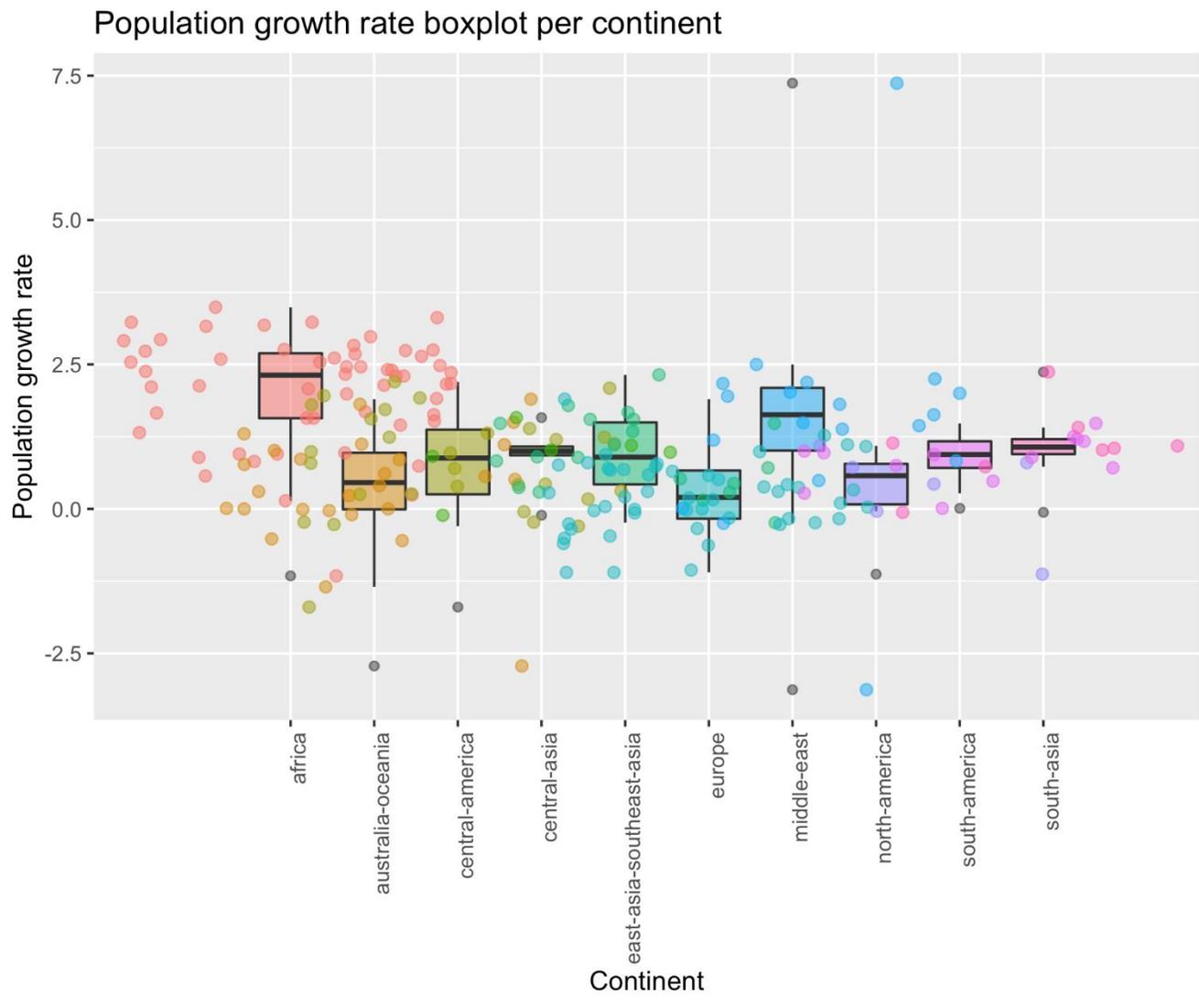


Bottom 10 median age barplot per country



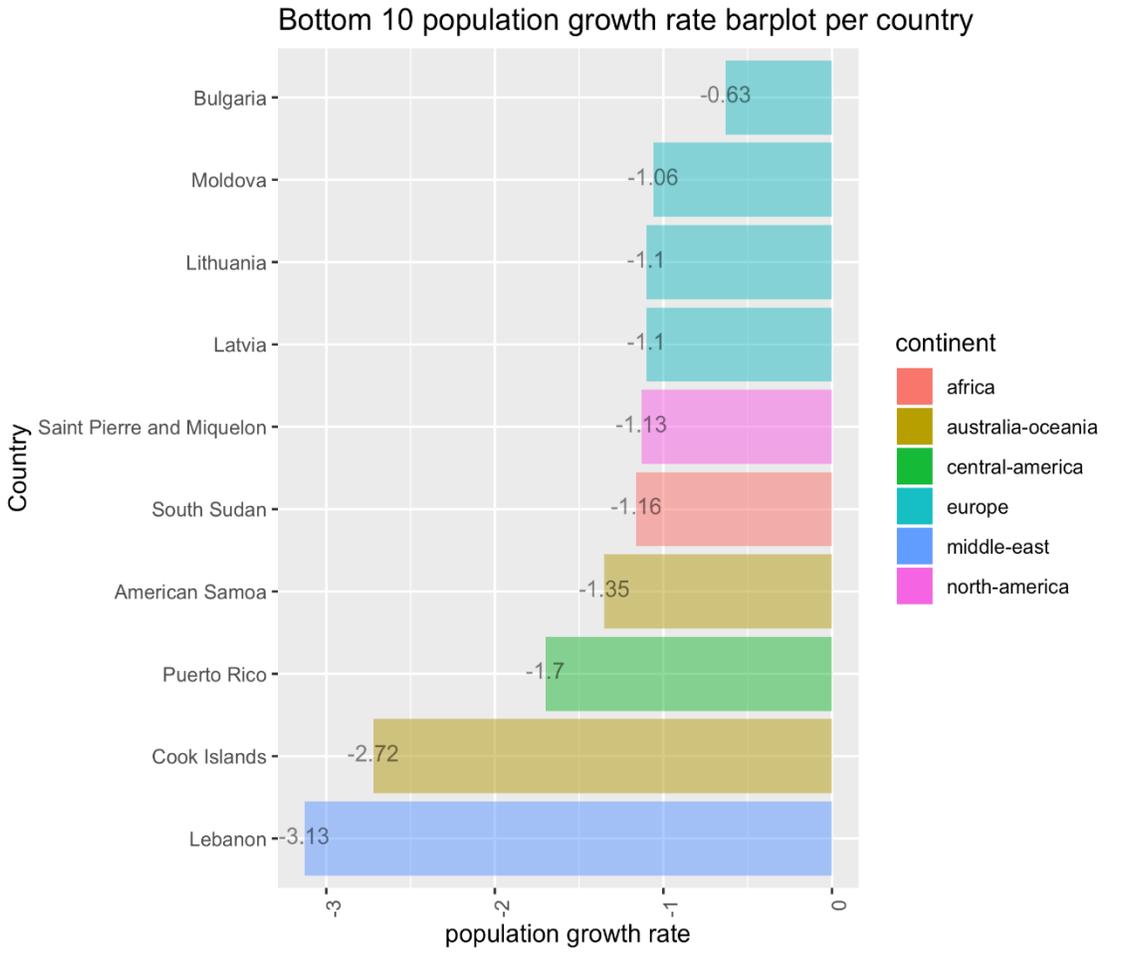
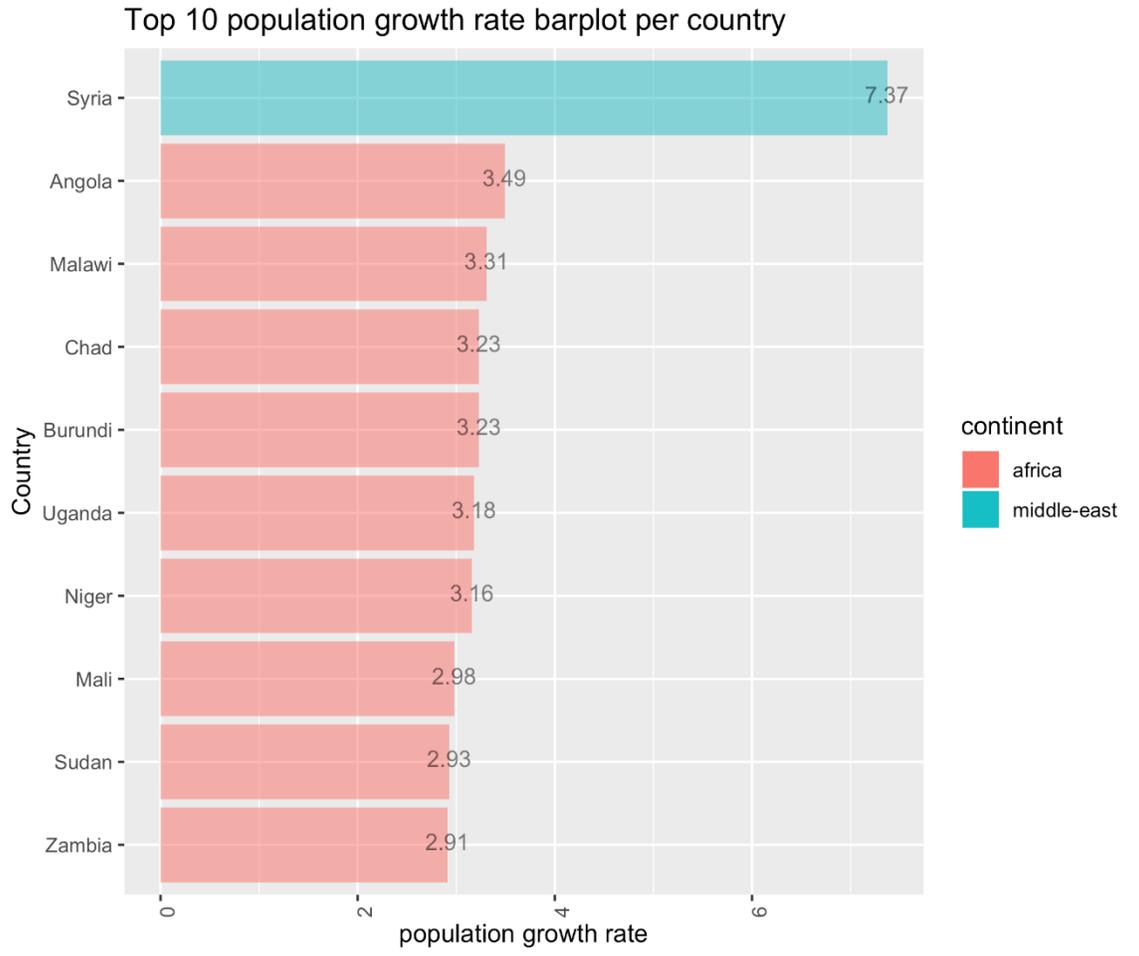
Population growth rate

Population growth rate compares the average annual percent change in populations, resulting from a surplus (or deficit) of births over deaths and the balance of migrants entering and leaving a country. The rate may be positive or negative.



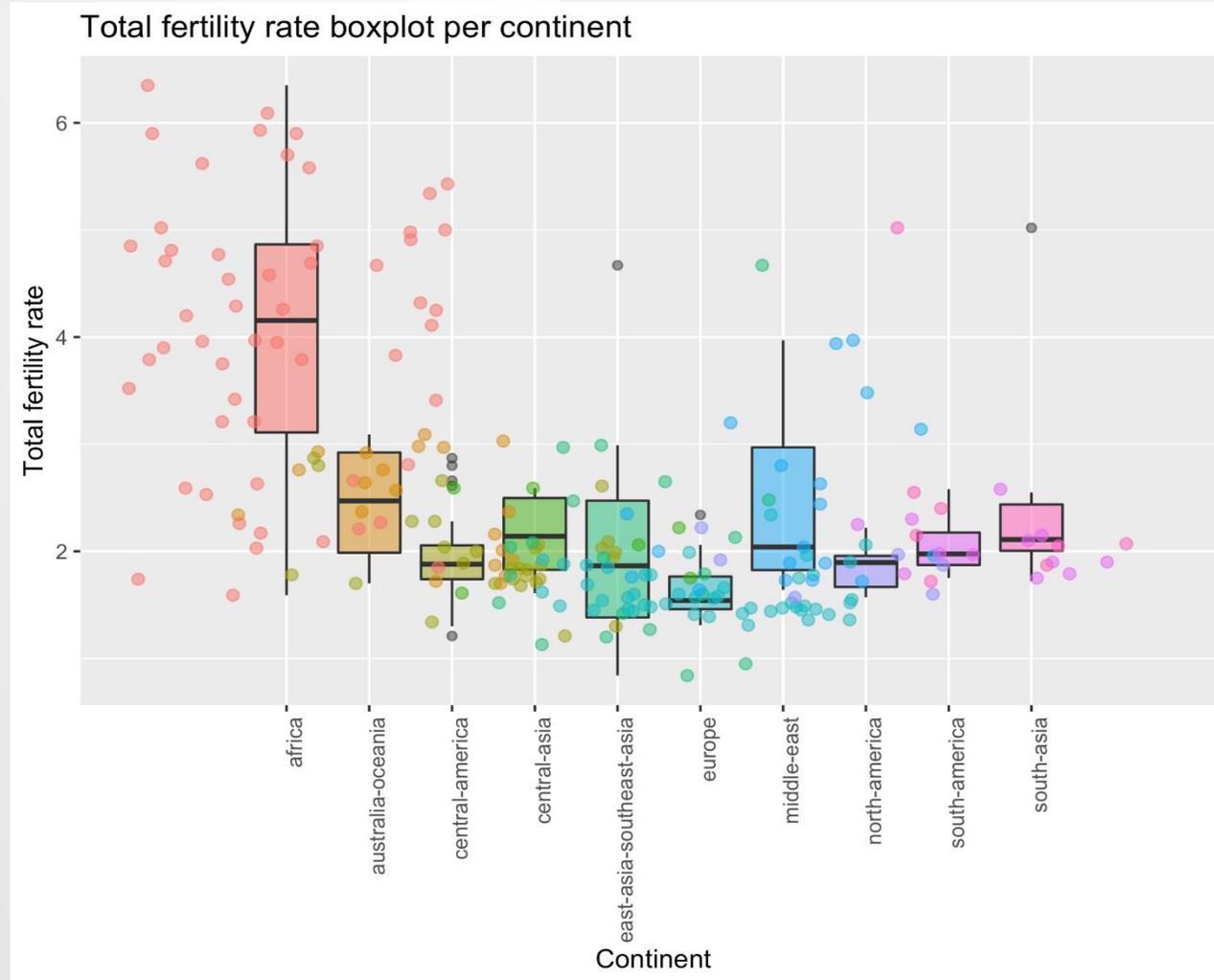
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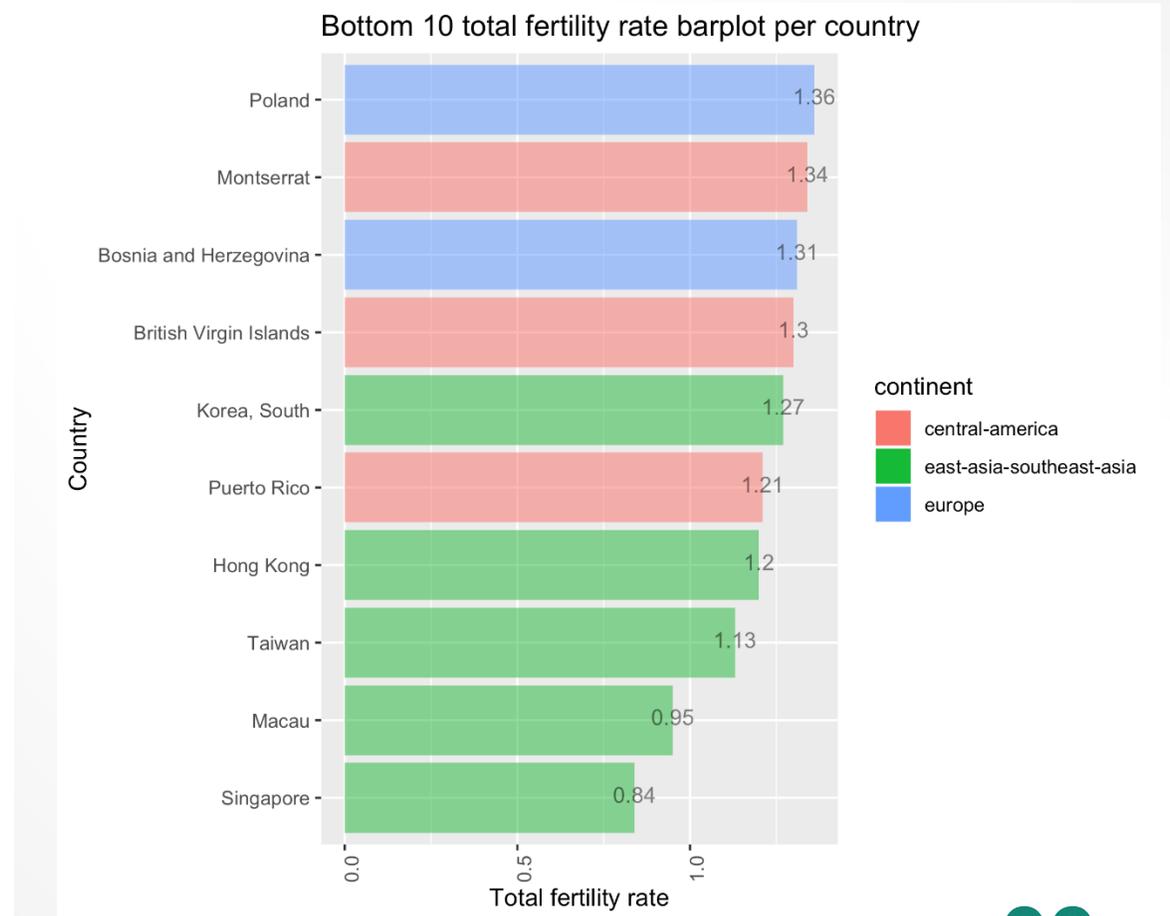
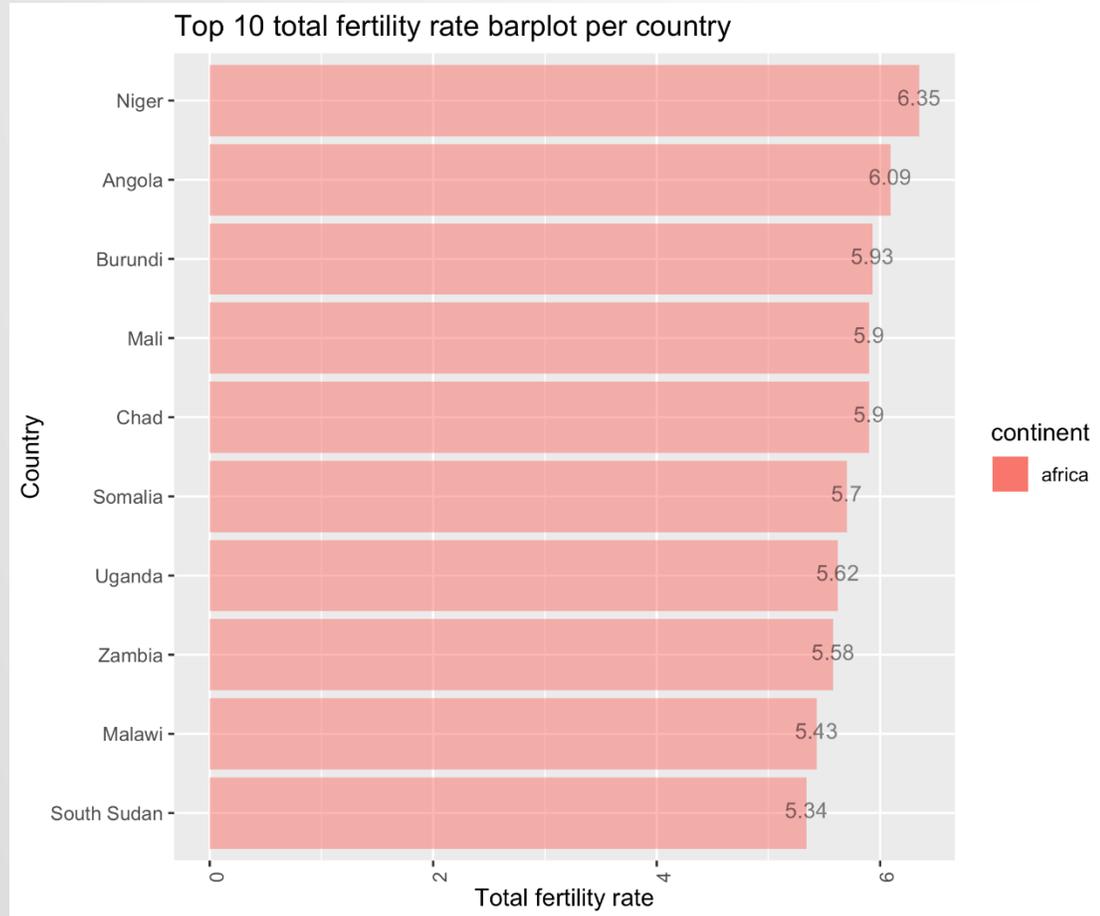
Total fertility rate

TFR compares figures for the average number of children that would be born per woman if all women lived to the end of their childbearing years and bore children according to a given fertility rate at each age. TFR is a more direct measure of the level of fertility than the crude birth rate, since it refers to births per woman.



Total fertility rate

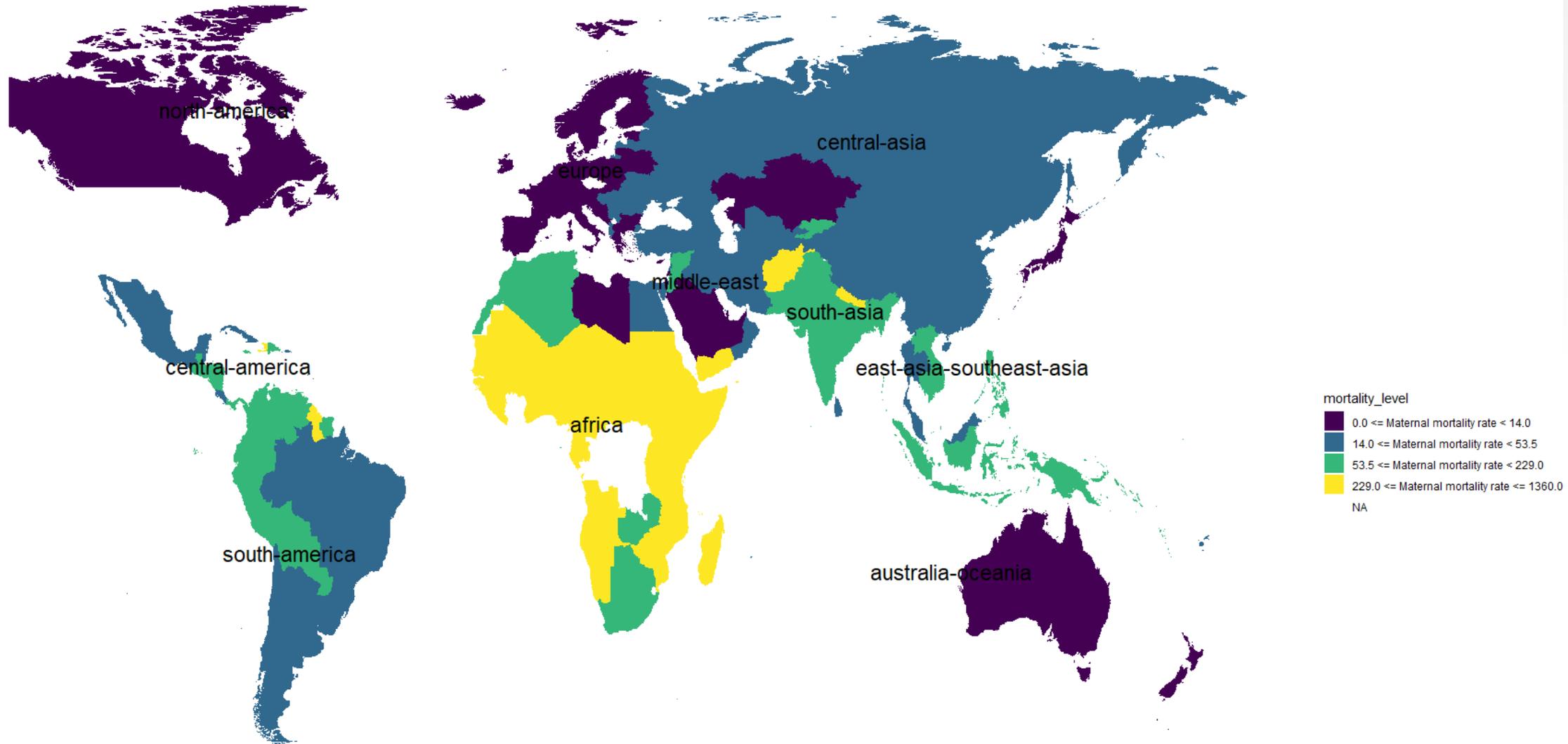
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Mortality world heatmap

01
Mortality

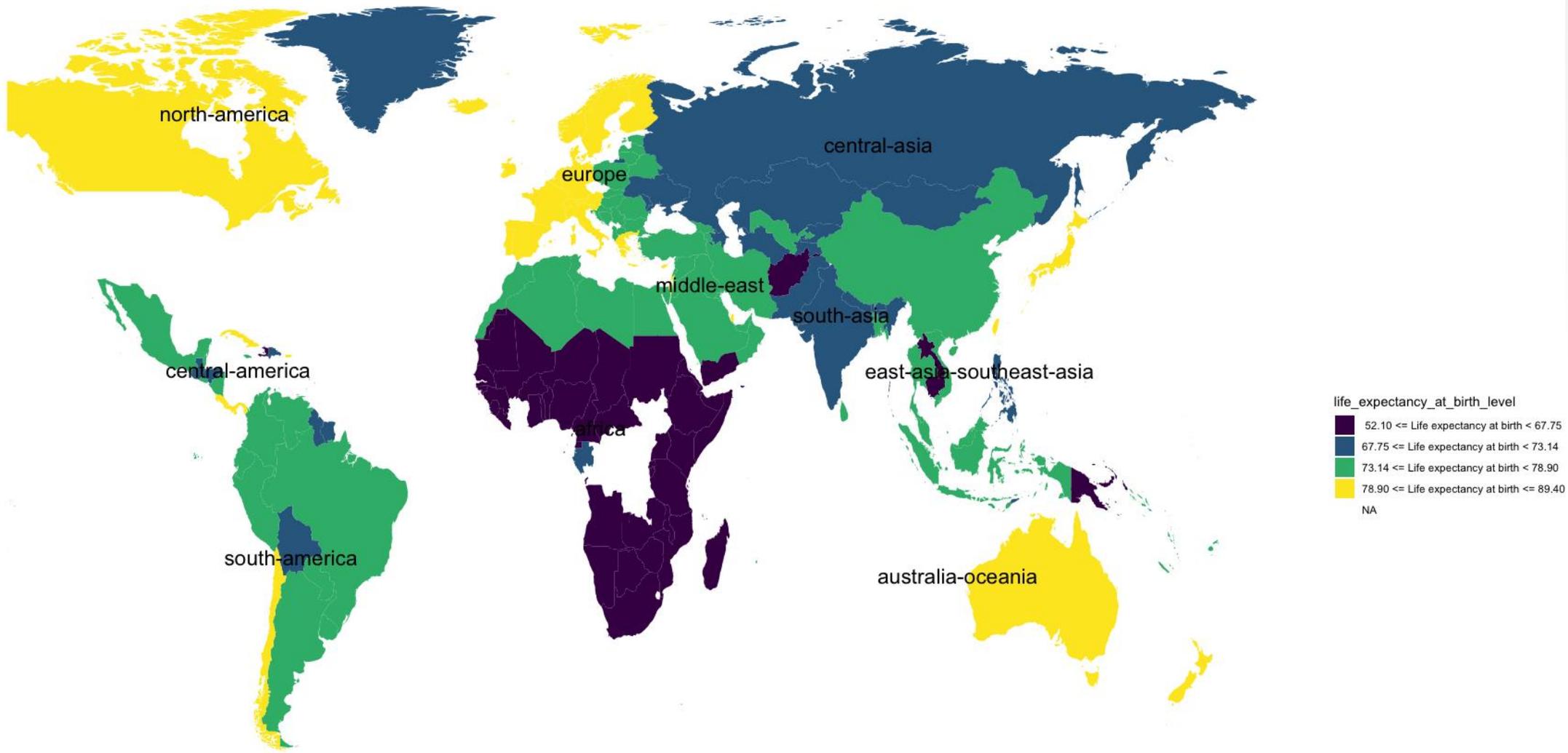
02
Life & aging



Life expectancy world heatmap

01
Mortality

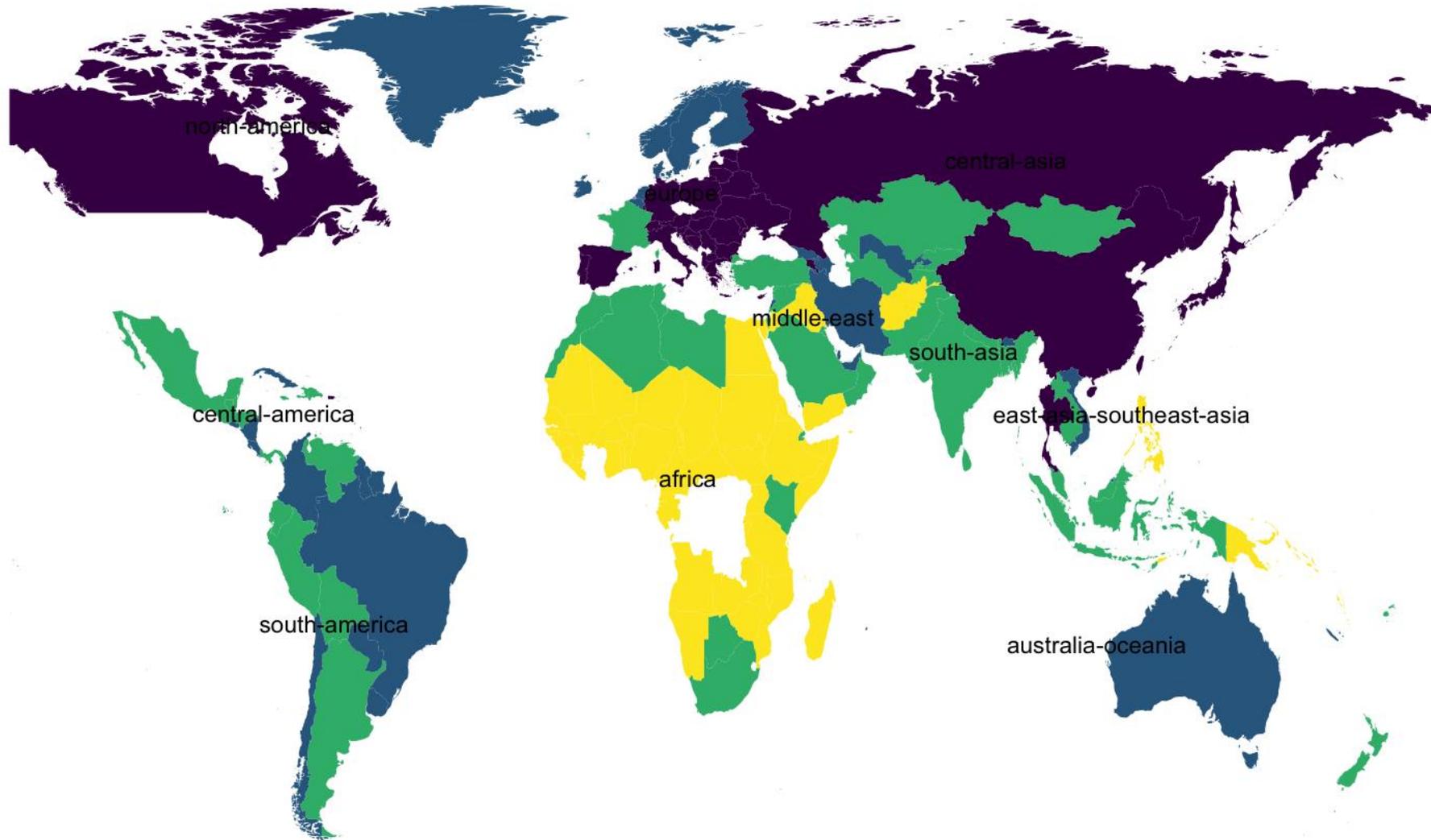
02
Life & aging



Total fertility rate world heatmap

01
Mortality

02
Life & aging

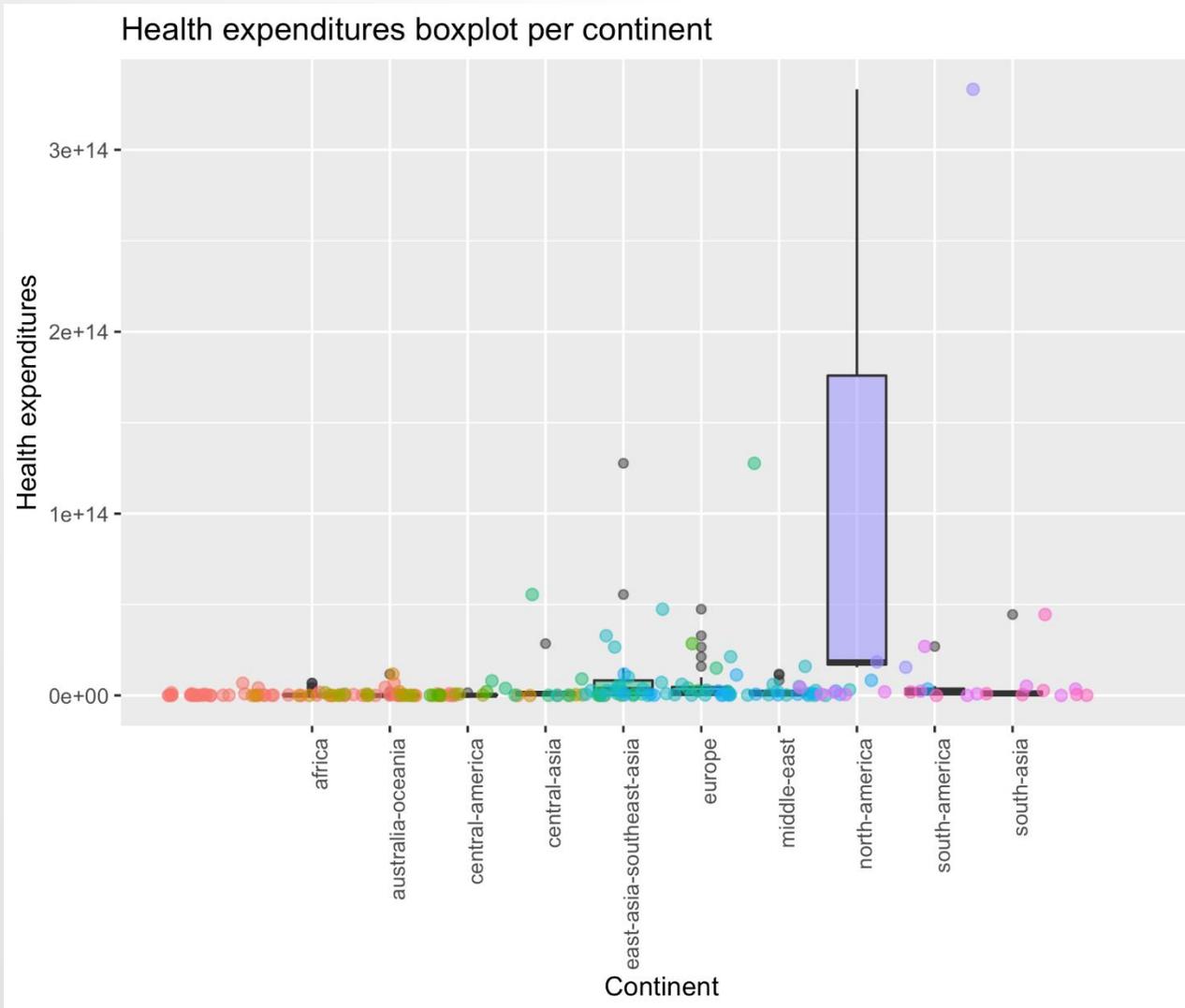


total_fertility_rate_level

- 0.840 <= Total fertility rate < 1.698
- 1.698 <= Total fertility rate < 2.000
- 2.000 <= Total fertility rate < 2.895
- 2.895 <= Total fertility rate <= 6.350
- NA

Health expenditure (by \$)

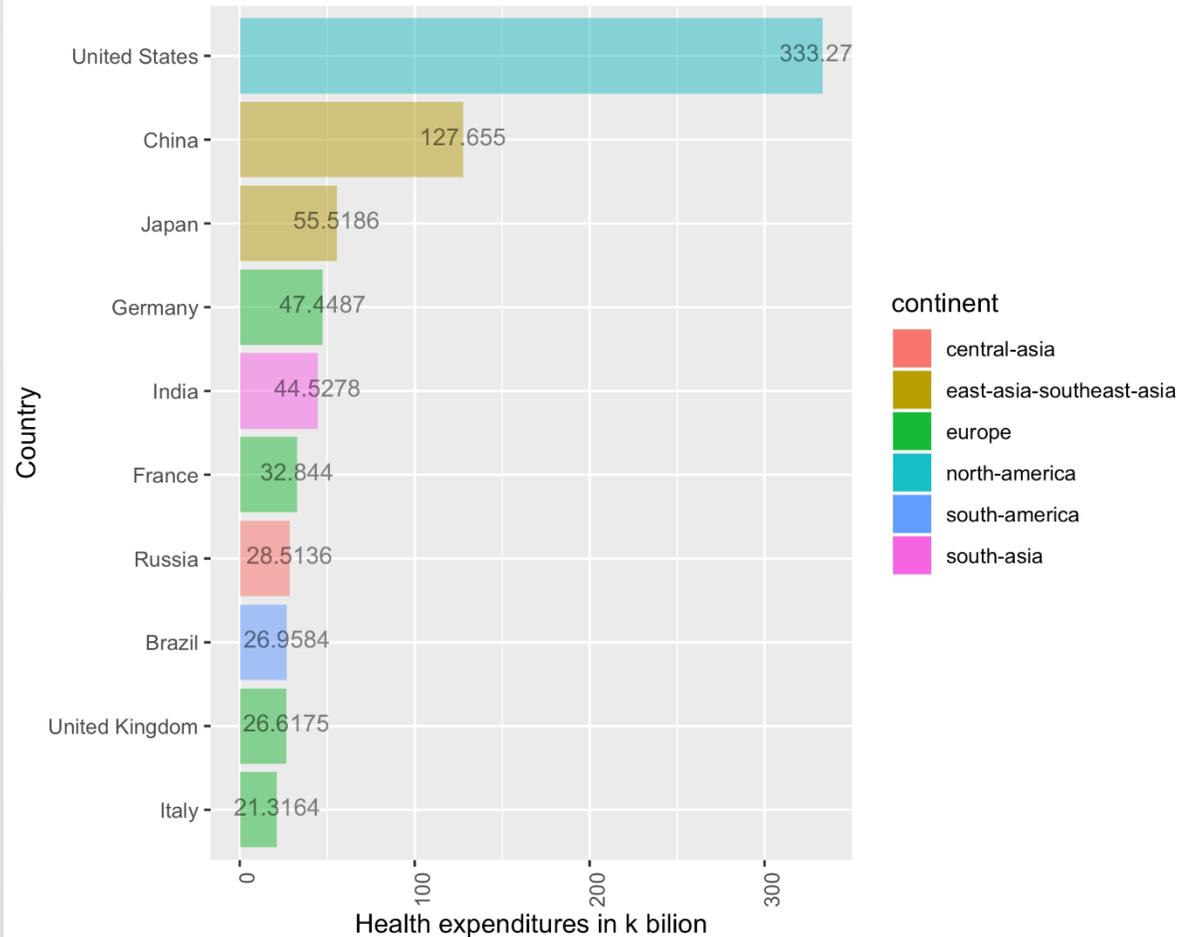
Health expenditures provides the total expenditure on health. Health expenditures are broadly defined as activities performed either by institutions or individuals through the application of medical, paramedical, and/or nursing knowledge and technology, the primary purpose of which is to promote, restore, or maintain health.



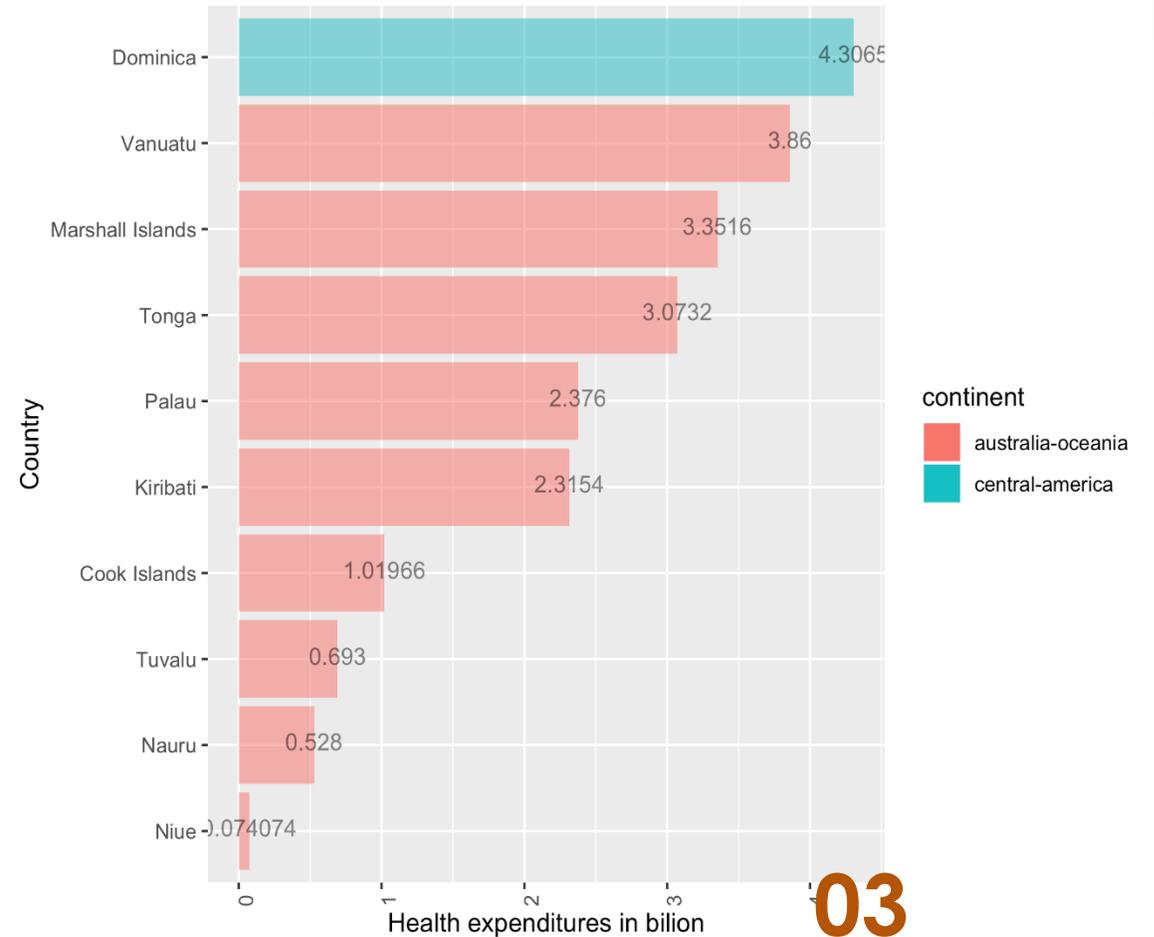
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Top 10 Health expenditures barplot per country



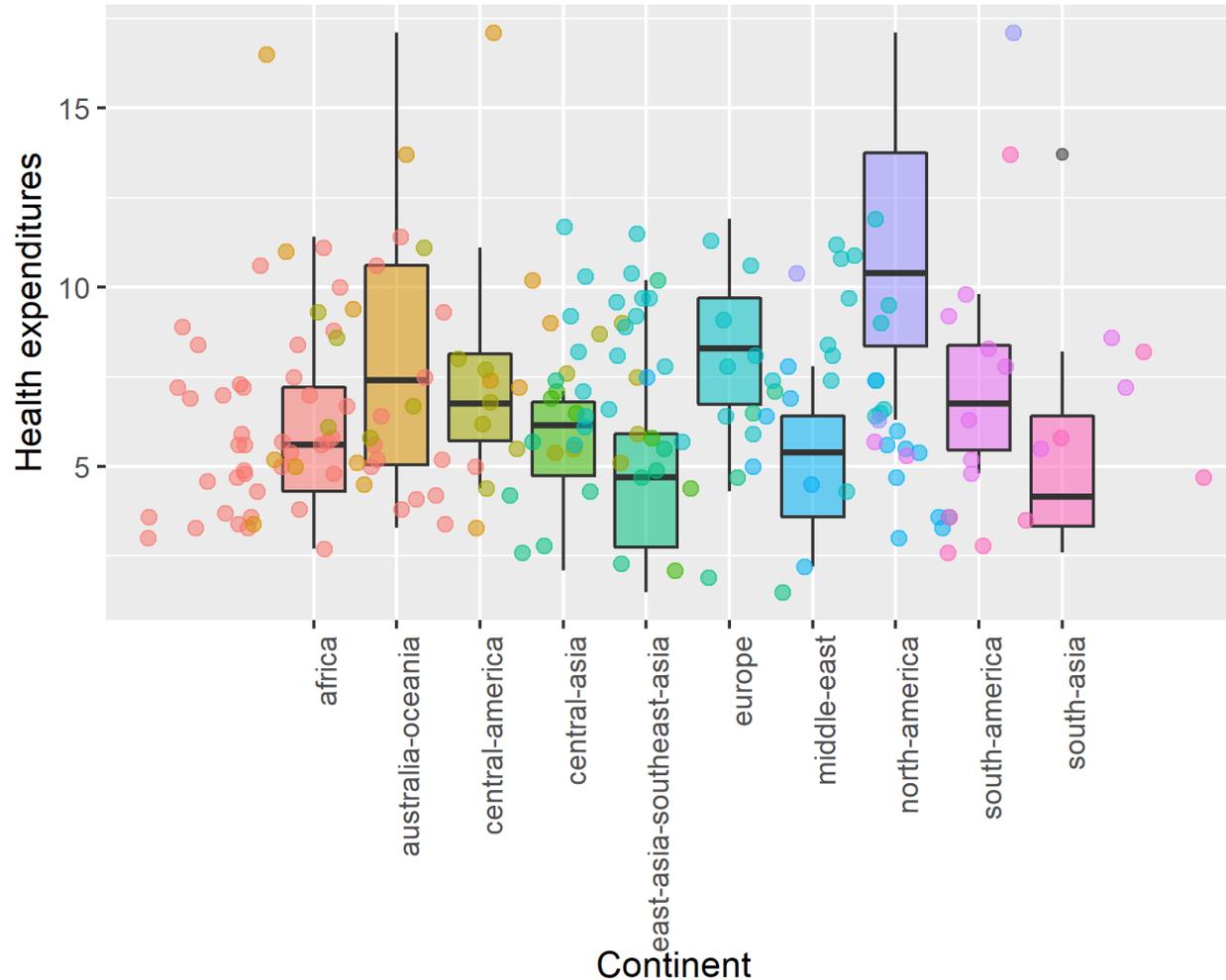
Bottom 10 Health expenditures barplot per country



Health expenditure (by % of GDP)

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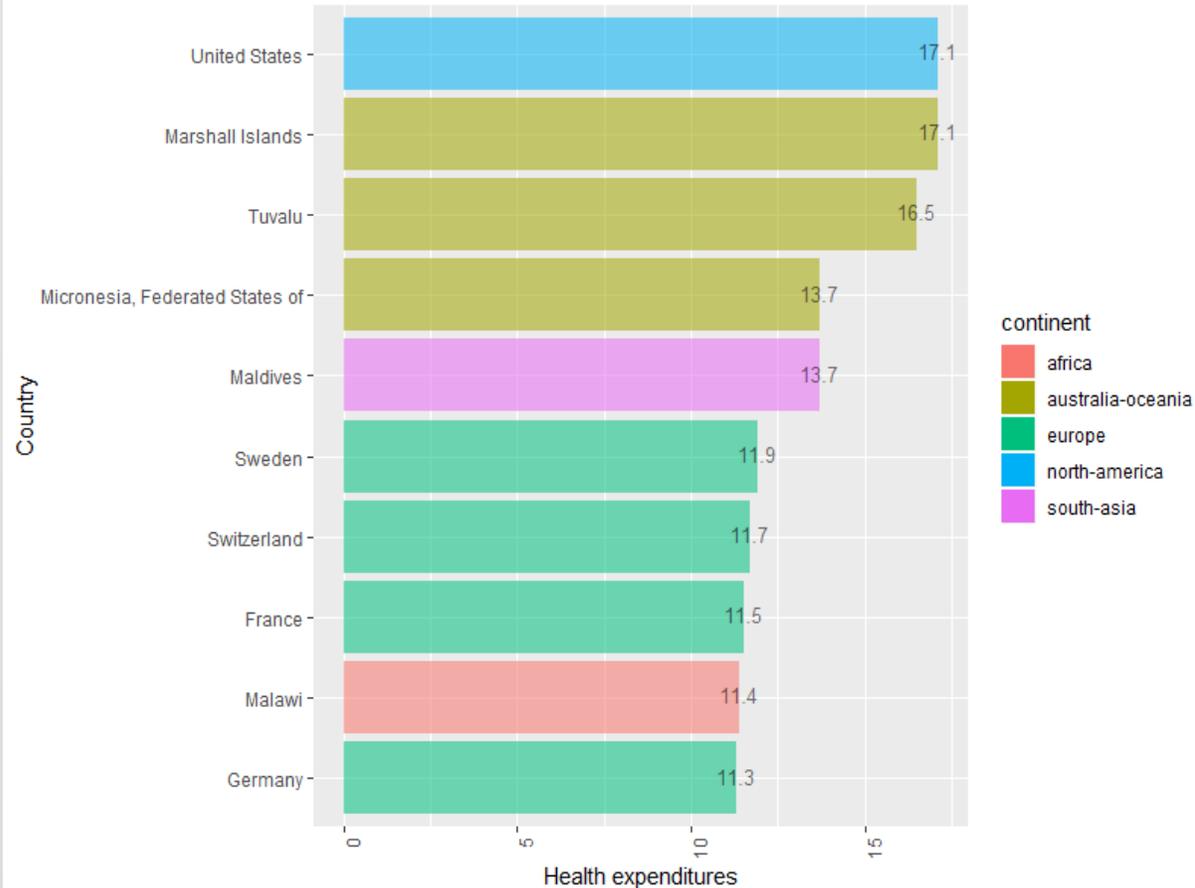
Health expenditures boxplot per continent



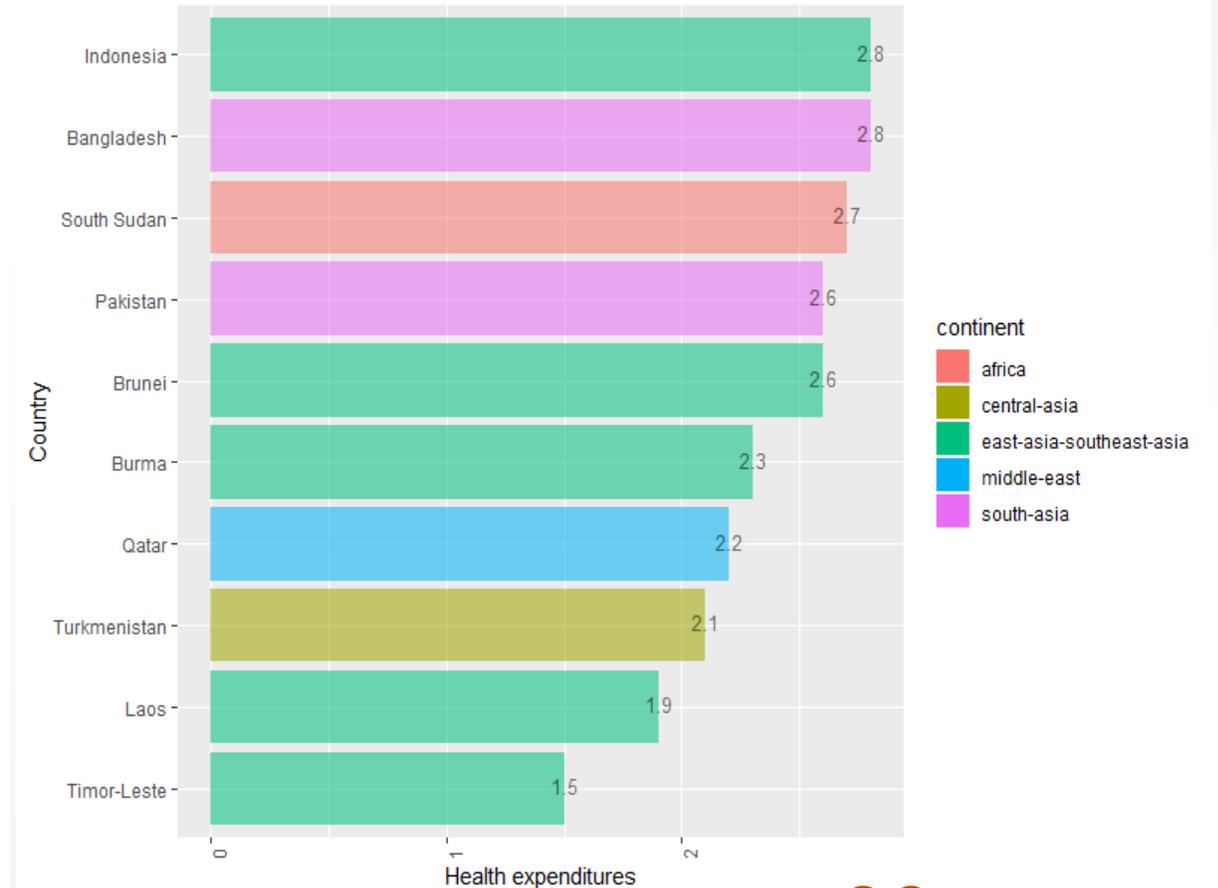
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Top 10 Health expenditures barplot per country



Bottom 10 Health expenditures barplot per country



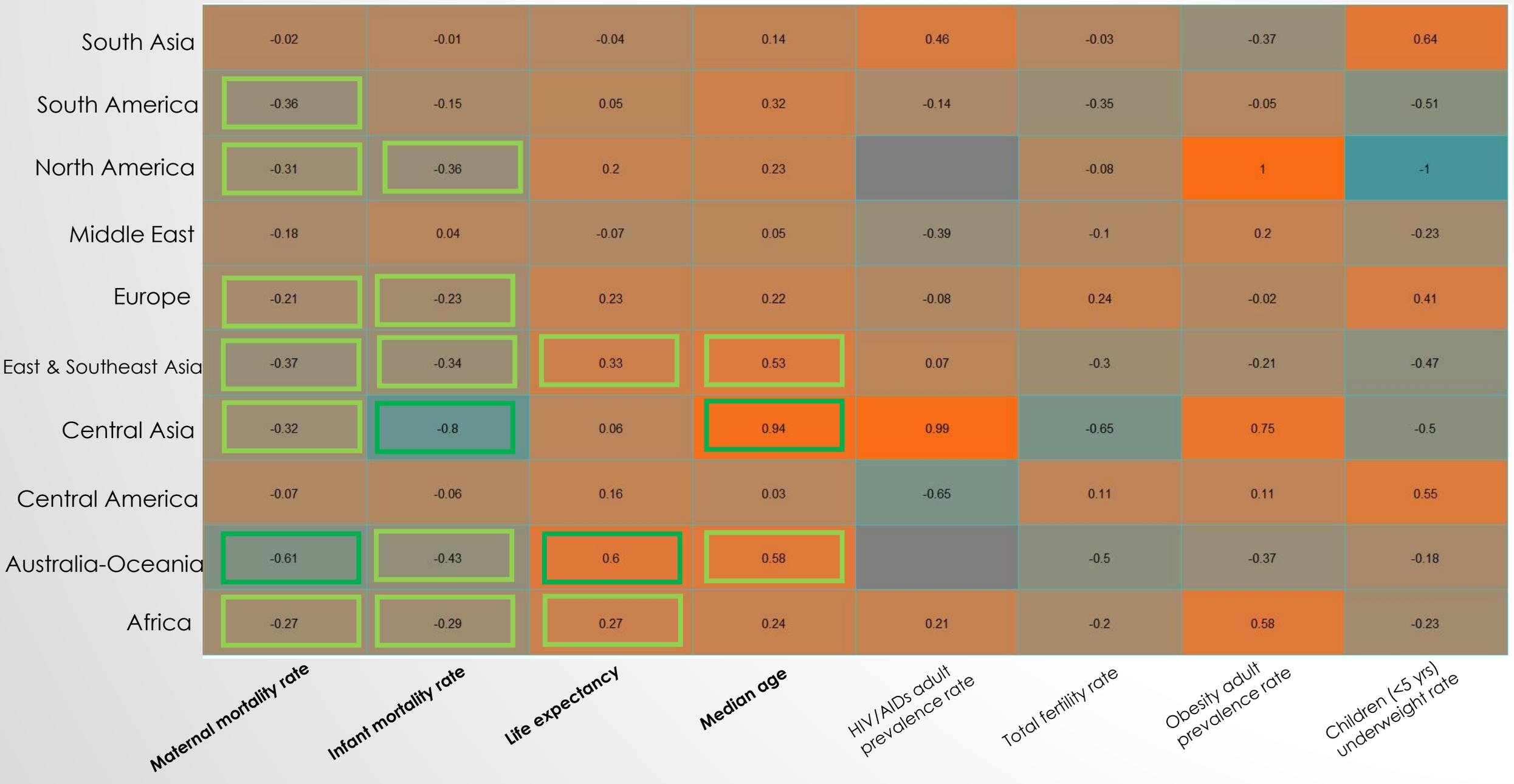
Are health expenditures really working?

THE QUESTION: Do higher health expenditures really lead to better results in terms of alleviating/solving these 8 prominent areas of global health concerns?

- 1) Maternal mortality
- 2) Infant mortality
- 3) Life expectancy at birth
- 4) Median age
- 5) Total fertility rate
- 6) HIV/AIDS adult prevalence rate
- 7) Obesity - adult prevalence rate
- 8) Children under the age of 5 years underweight

Next Step: Find the correlation between health expenditure (\$) and measurements in those 8 areas of concern, for each continent.

South Asia	-0.02	-0.01	-0.04	0.14	0.46	-0.03	-0.37	0.64
South America	-0.36	-0.15	0.05	0.32	-0.14	-0.35	-0.05	-0.51
North America	-0.31	-0.36	0.2	0.23		-0.08	1	-1
Middle East	-0.18	0.04	-0.07	0.05	-0.39	-0.1	0.2	-0.23
Europe	-0.21	-0.23	0.23	0.22	-0.08	0.24	-0.02	0.41
East & Southeast Asia	-0.37	-0.34	0.33	0.53	0.07	-0.3	-0.21	-0.47
Central Asia	-0.32	-0.8	0.06	0.94	0.99	-0.65	0.75	-0.5
Central America	-0.07	-0.06	0.16	0.03	-0.65	0.11	0.11	0.55
Australia-Oceania	-0.61	-0.43	0.6	0.58		-0.5	-0.37	-0.18
Africa	-0.27	-0.29	0.27	0.24	0.21	-0.2	0.58	-0.23
	Maternal mortality rate	Infant mortality rate	Life expectancy	Median age	HIV/AIDs adult prevalence rate	Total fertility rate	Obesity adult prevalence rate	Children (<5 yrs) underweight rate



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Maternal mortality rate

Infant mortality rate

Life expectancy

Median age

HIV/AIDs adult prevalence rate

Total fertility rate

Obesity adult prevalence rate

Children (<5 yrs) underweight rate

AGENDA

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- 04 **Topic 2: Education, Communication and Economy**
- 05 Conclusion and Wrap Up

EDUCATION, COMMUNICATION AND ECONOMY

05

Size of economy

- GDP
- GDP real growth rate

06

Okun's Law

– Does it apply to all countries?

Unemployment rate vs. GDP per capita

07

Internet usage

GDP per capita vs. internet users

08

Education expenditure

- Education expenditure by \$
- Education expenditure by % of GDP
- GDP per capita vs. education expenditure

09

Health expenditure problem revisited

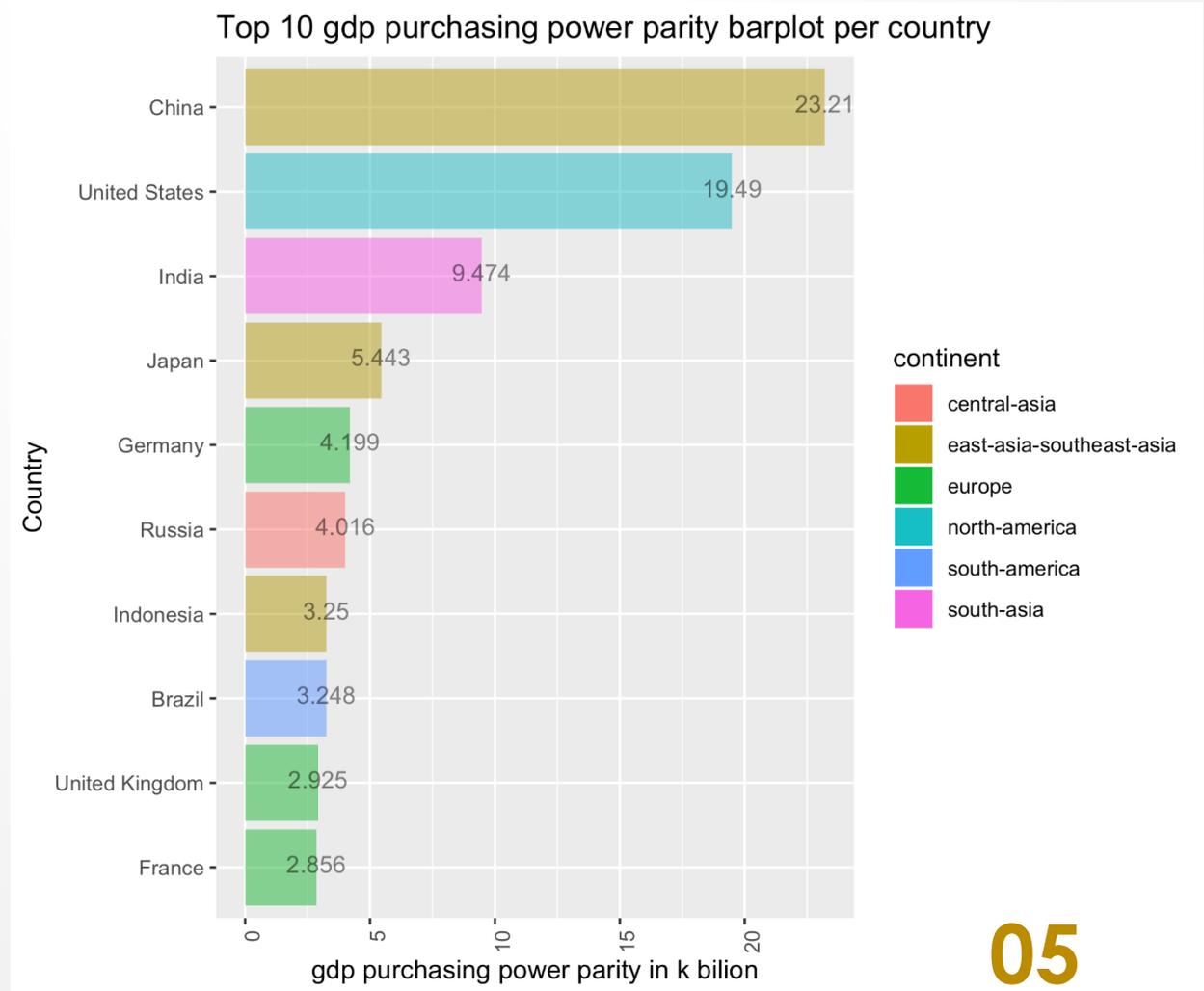
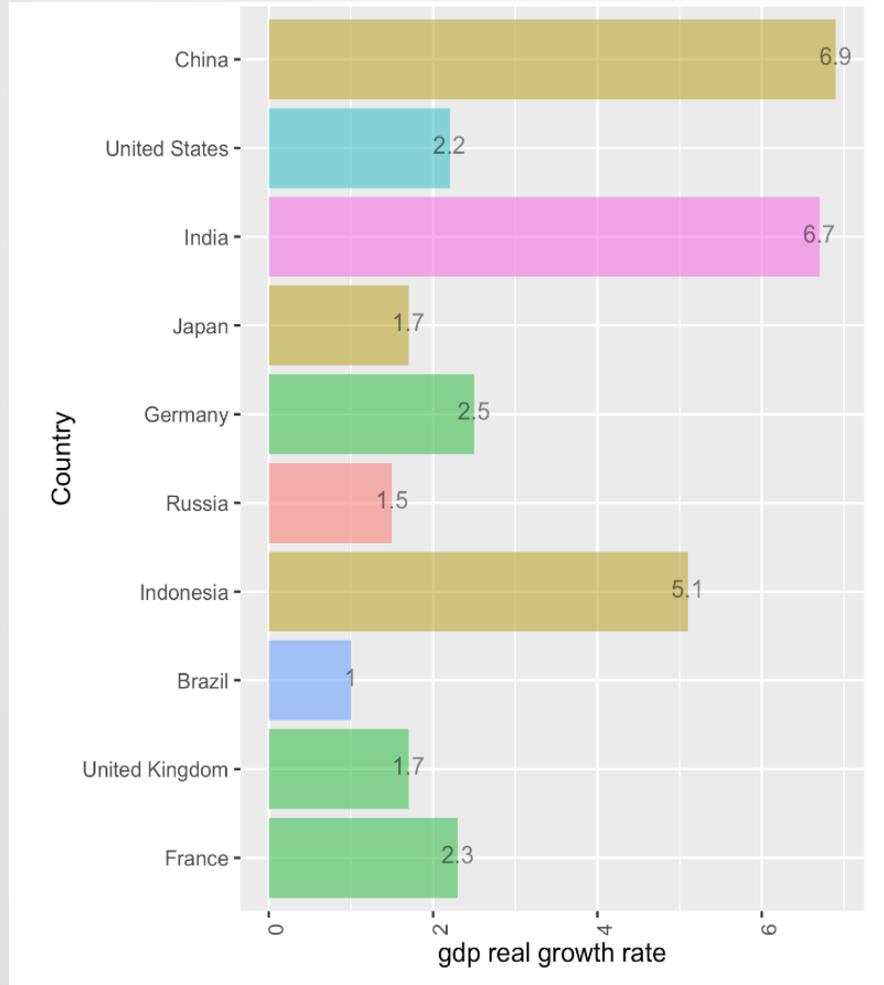
What if we group countries into 3 GDP brackets:

- 1) Low GDP countries
- 2) Middle GDP countries
- 3) High GDP countries

Would correlation matrix look different?

GDP

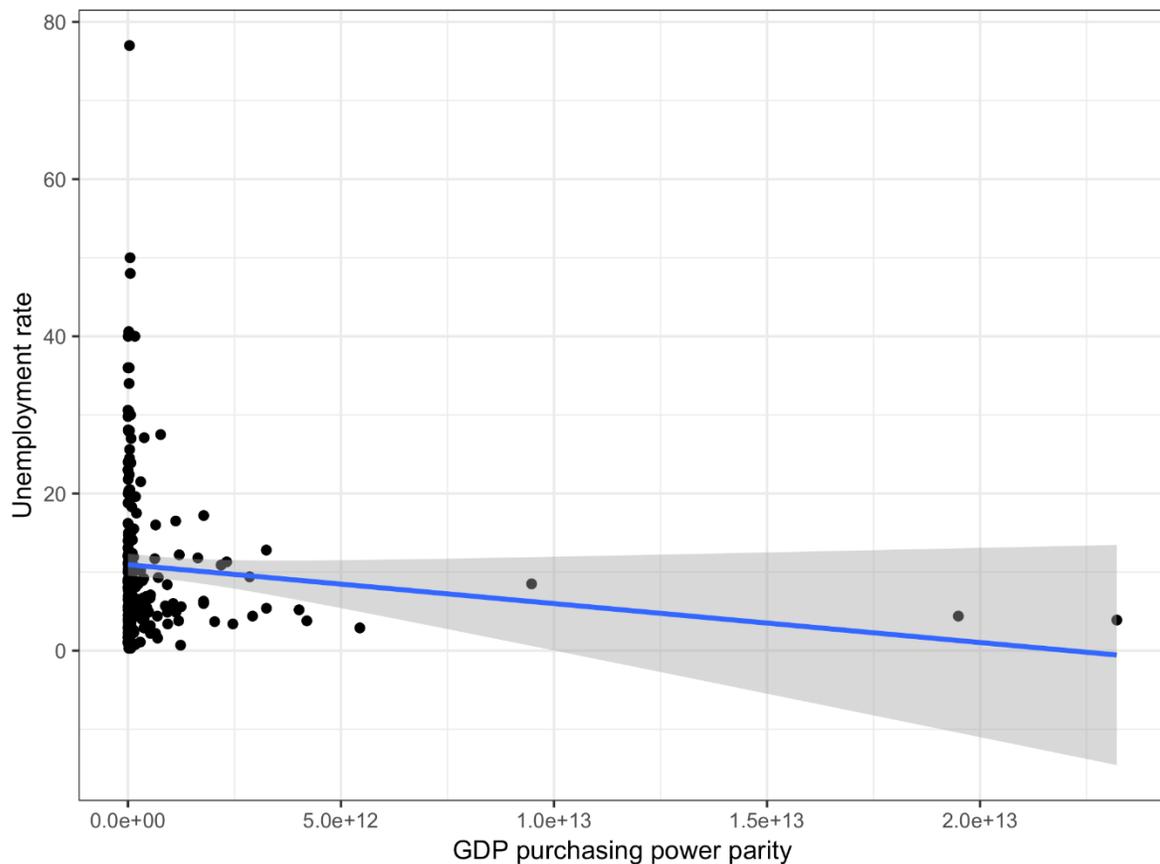
GDP (purchasing power parity) compares the gross domestic product (GDP) or value of all final goods and services produced within a nation in a given year. A nation's GDP at purchasing power parity (PPP) exchange rates is the sum value of all goods and services produced in the country valued at prices prevailing in the United States.



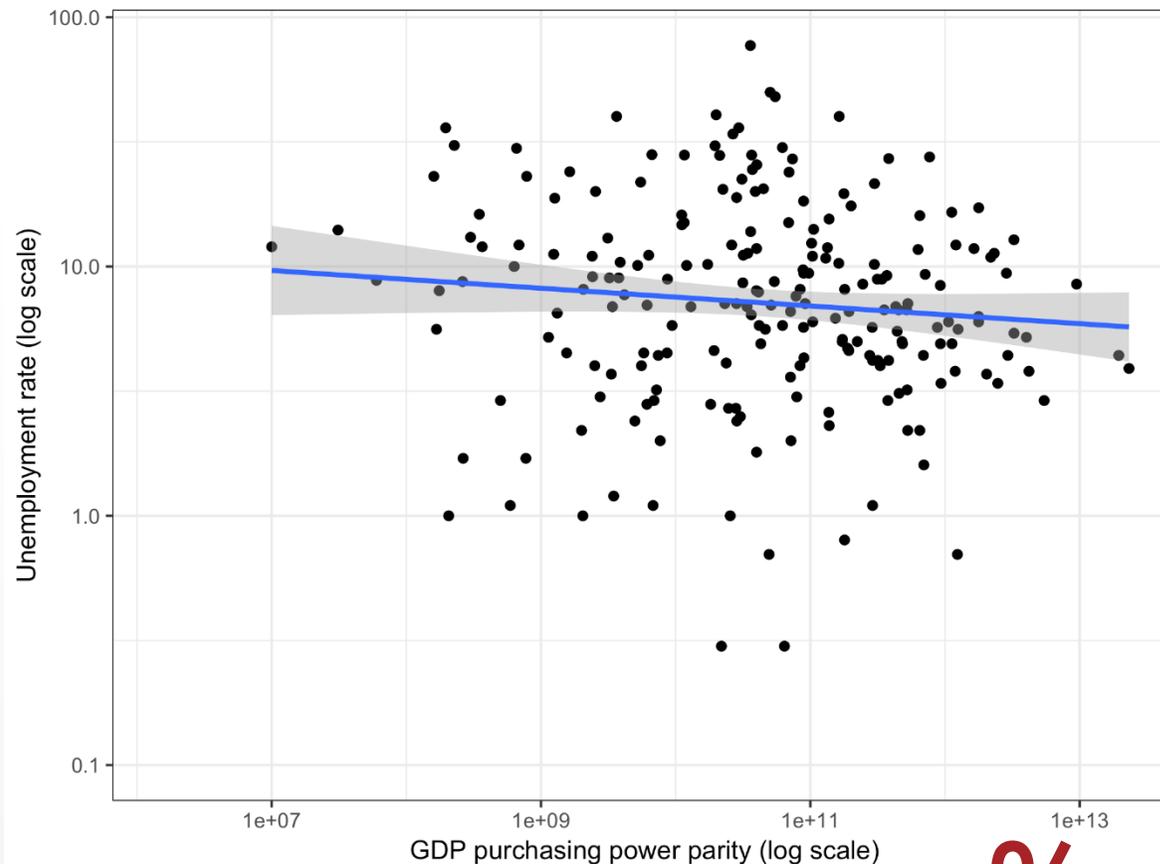
Okun's Law

In economics, Okun's law is an empirically observed relationship between unemployment and losses in a country's production. The "gap version" states that for every 1% increase in the unemployment rate, a country's GDP will be roughly an additional 2% lower than its potential GDP. (i.e. unemployment : GDP \approx - 0.5:1)

All countries GDP vs
Unemployment rate,
correlation is -0.1077.



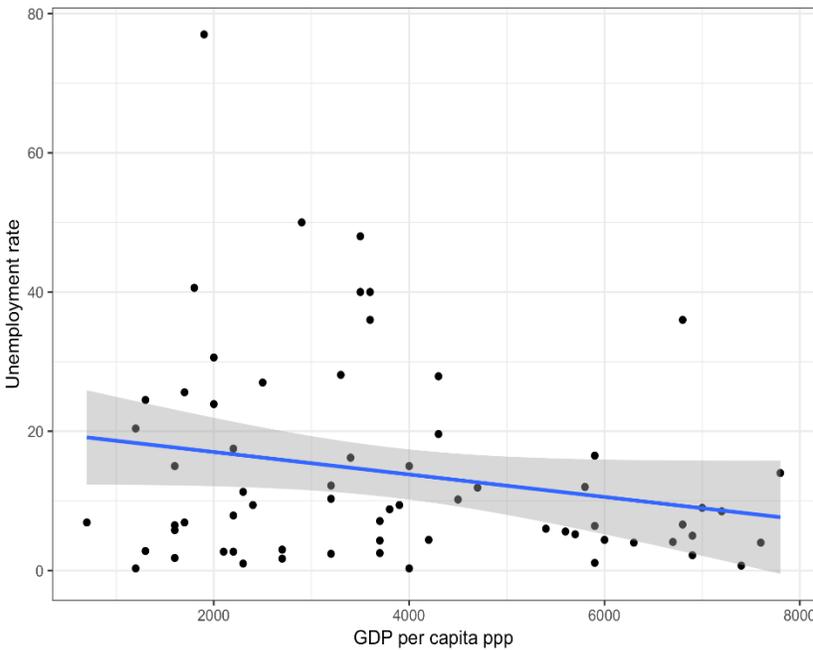
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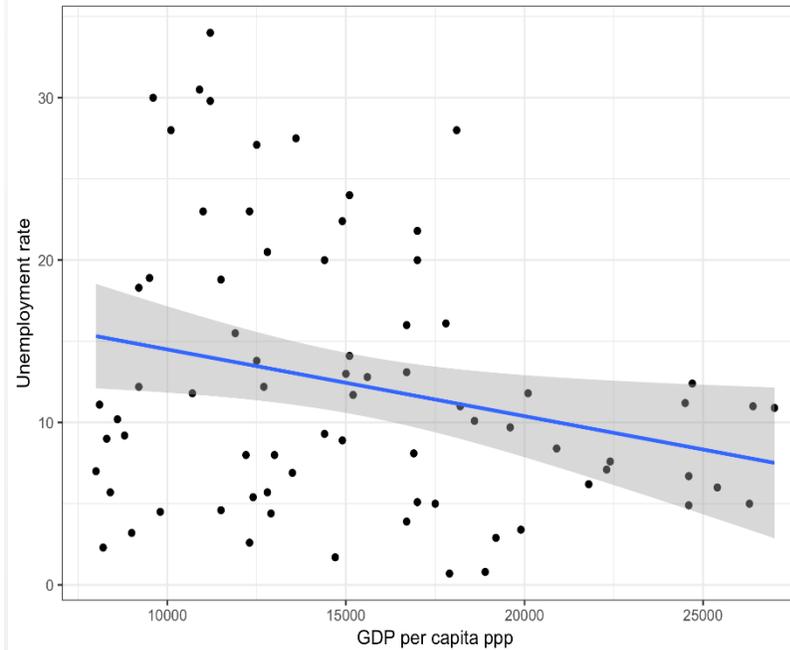
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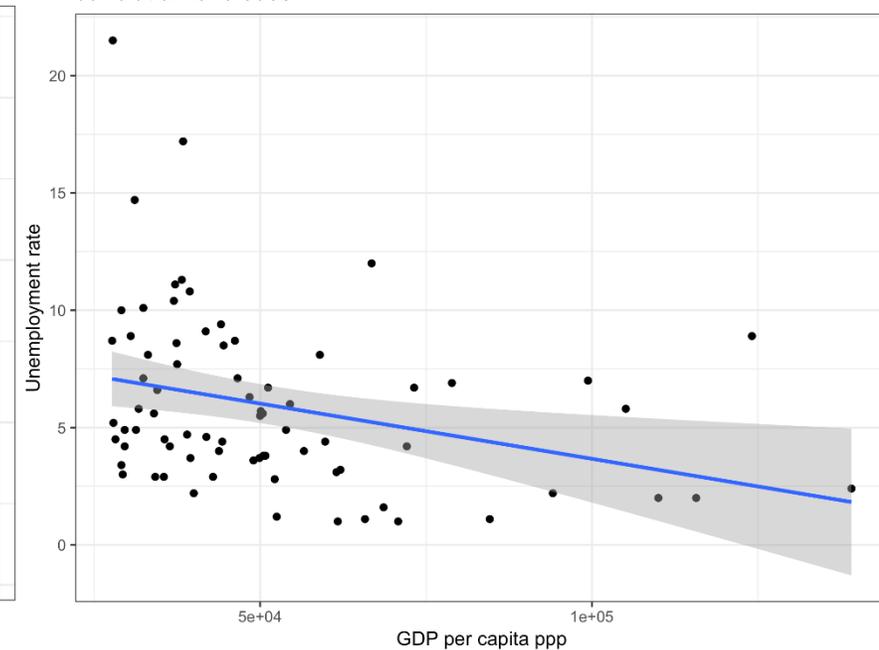
Low GDP countries GDP vs Unemployment rate, correlation is -0.2145.



Middle GDP countries GDP vs Unemployment rate, correlation is -0.2556.



Large GDP countries GDP vs Unemployment rate, correlation is -0.3038.



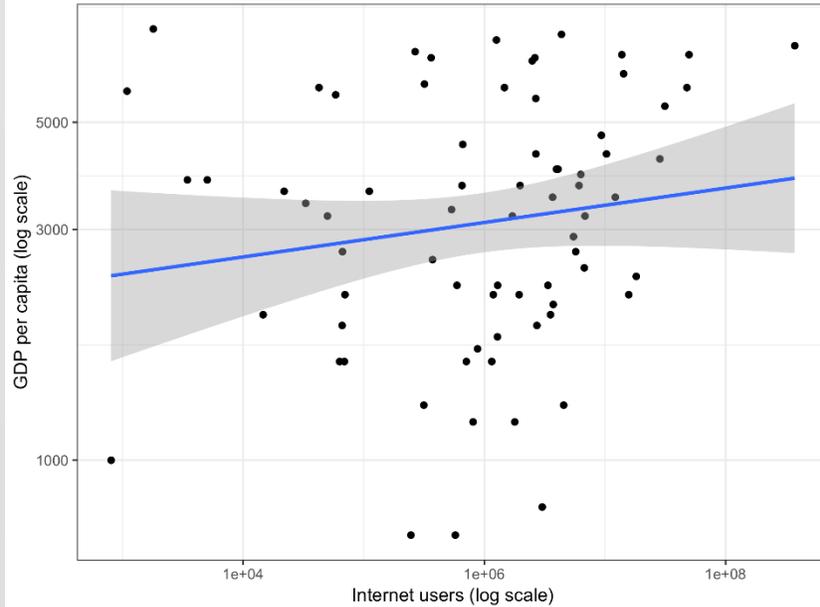
Group countries into 3 GDP brackets:

- 1) Low GDP countries
- 2) Middle GDP countries
- 3) High GDP countries

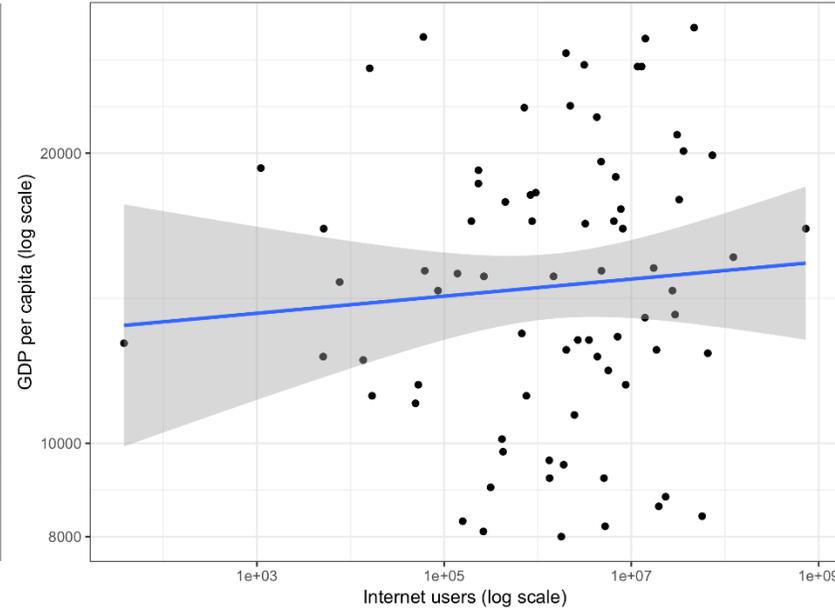
GDP PER CAPITA VS. INTERNET USERS

Internet users compares the number of users within a country that access the Internet. Statistics vary from country to country and may include users who access the Internet at least several times a week to those who access it only once within a period of several months.

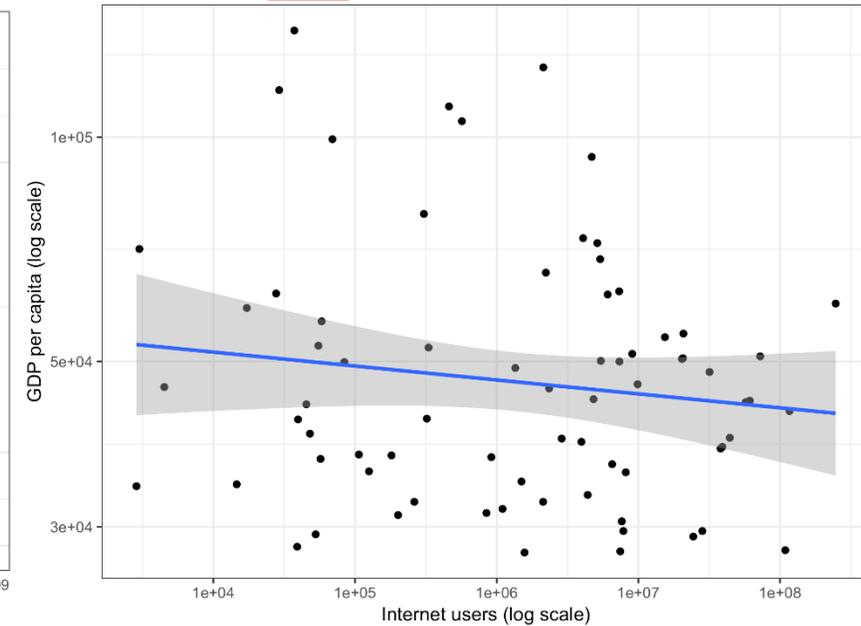
Low GDP countries
internet users vs. GDP,
log correlation is 0.1534.



Middle GDP countries
internet users vs. GDP,
log correlation is 0.0779.



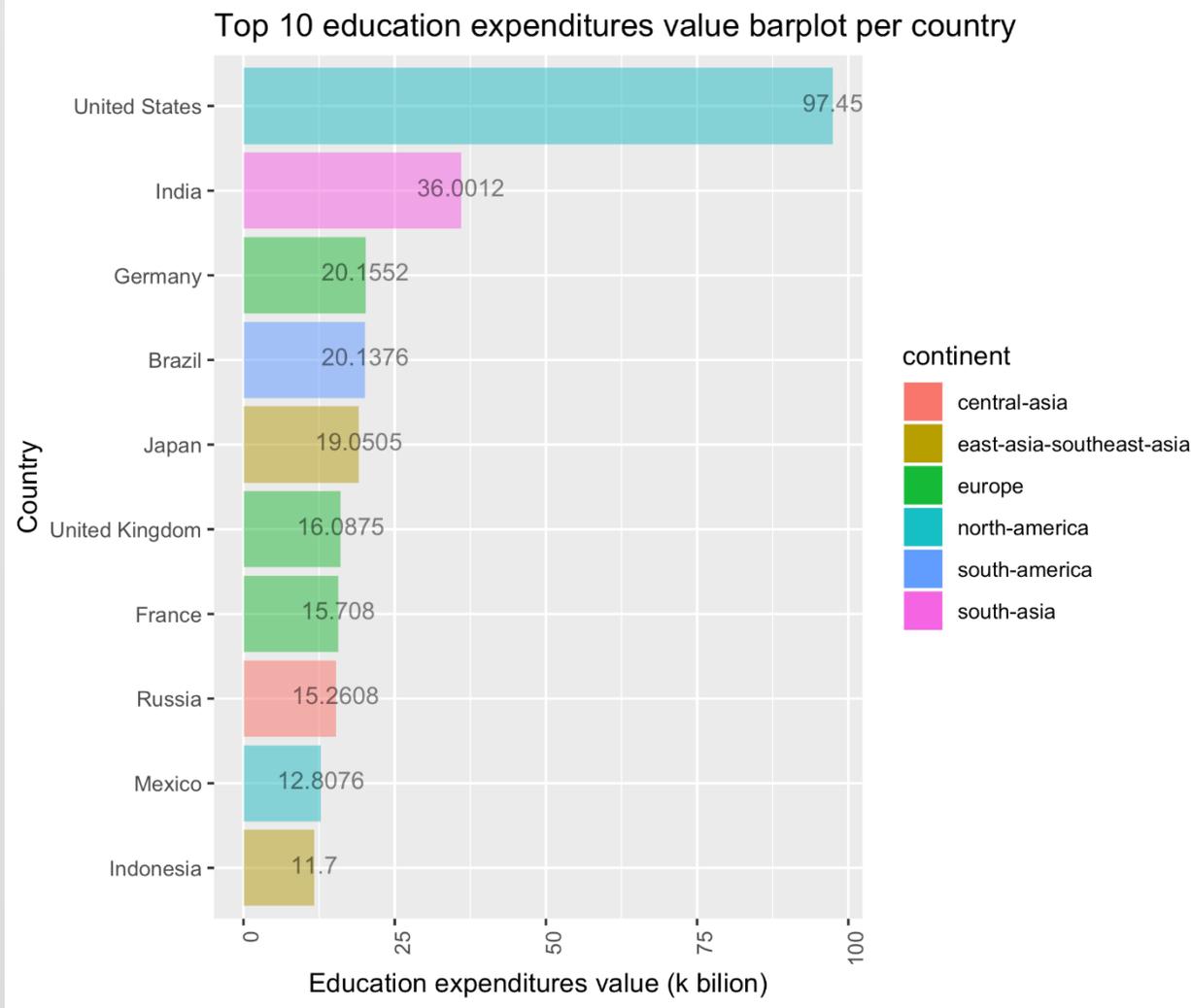
Large GDP countries
internet users vs. GDP,
log correlation is -0.1352.



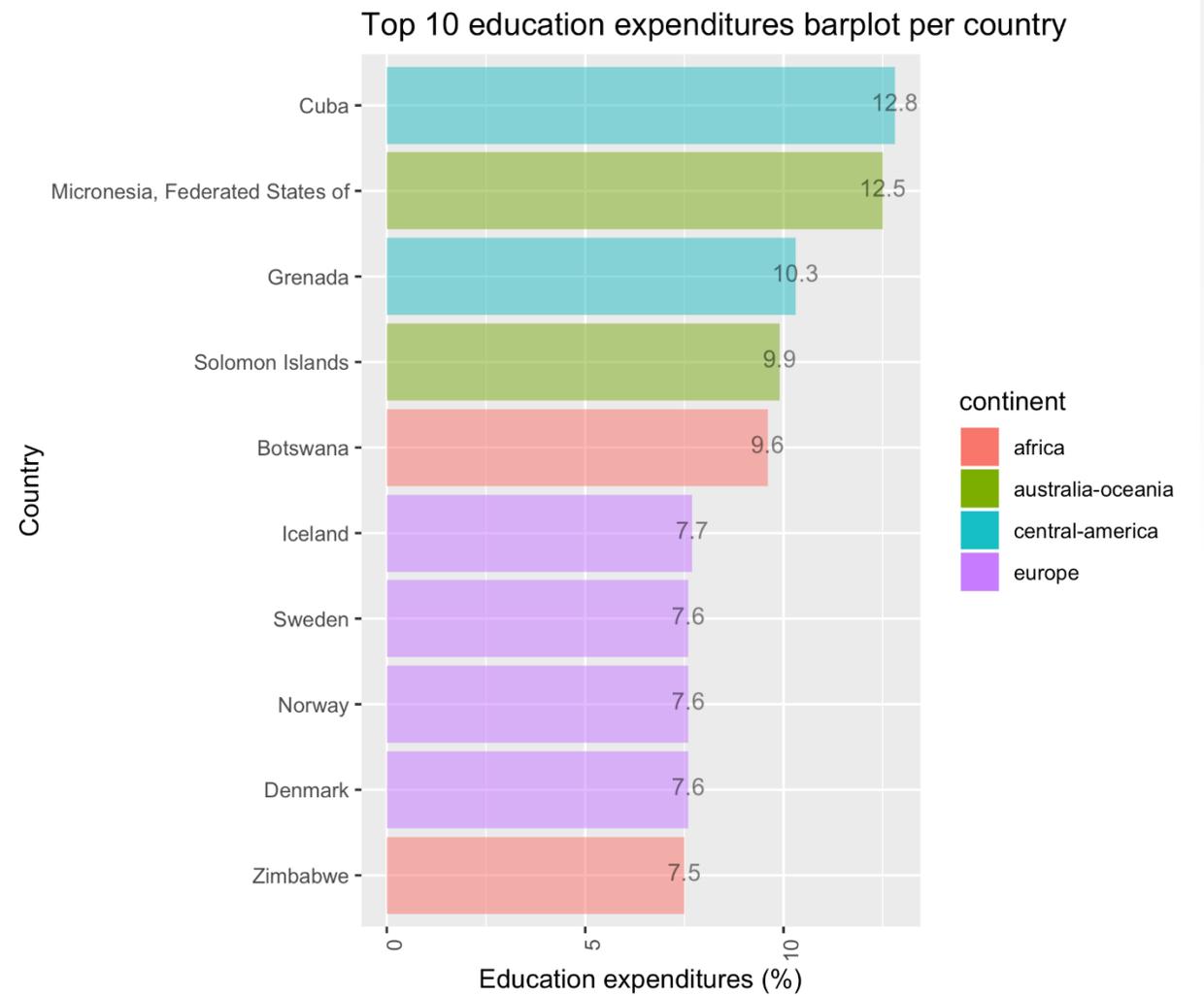
Group countries into 3 GDP brackets:

- 1) Low GDP countries
- 2) Middle GDP countries
- 3) High GDP countries

Education expenditure (\$)

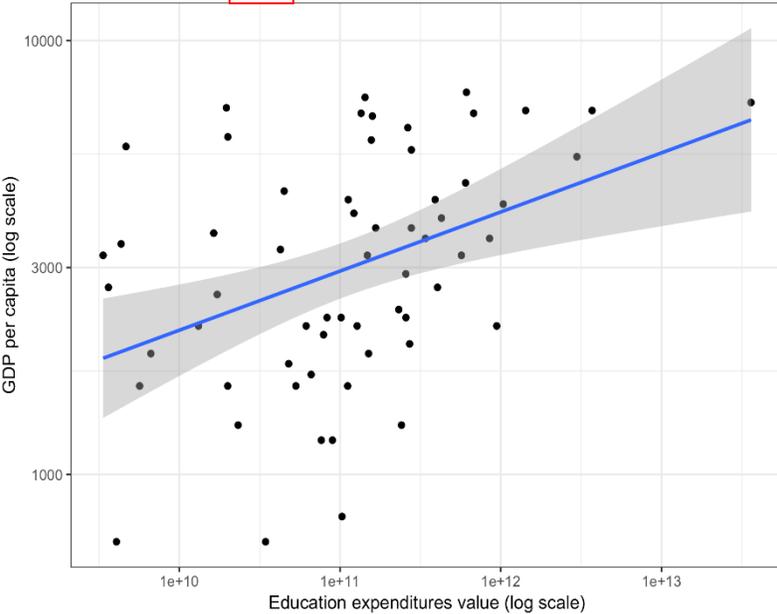


Education expenditure (% of GDP)

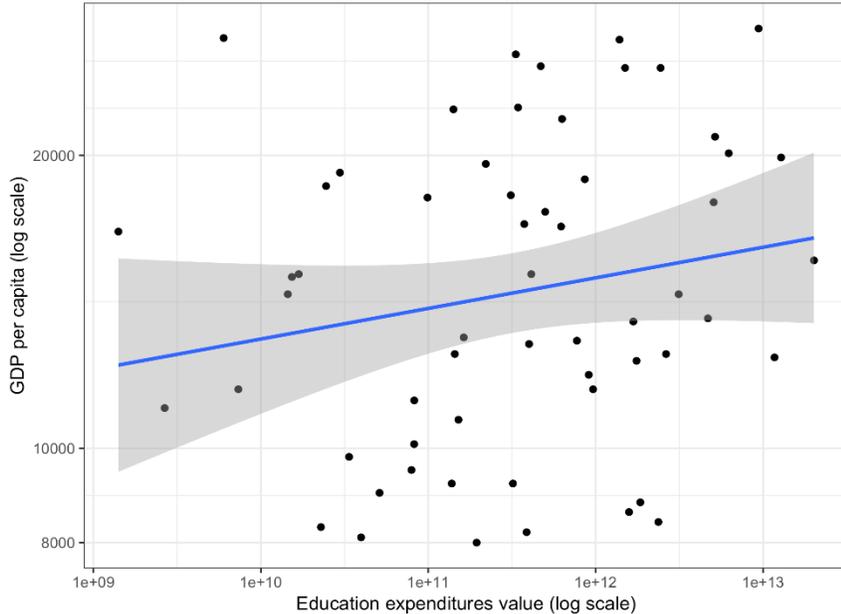


Education expenditure vs. GDP per capita

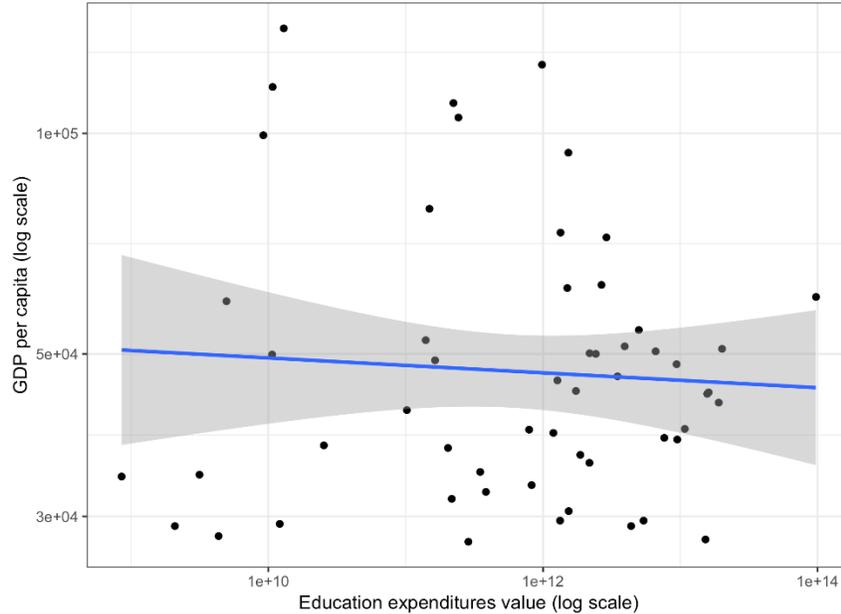
Low GDP countries
education expenditures value vs. GDP,
log correlation is 0.4047.



Middle GDP countries
education expenditures value vs. GDP,
log correlation is 0.1917.



Large GDP countries
education expenditures value vs. GDP,
log correlation is -0.0664.



09 Health expenditure problem revisited

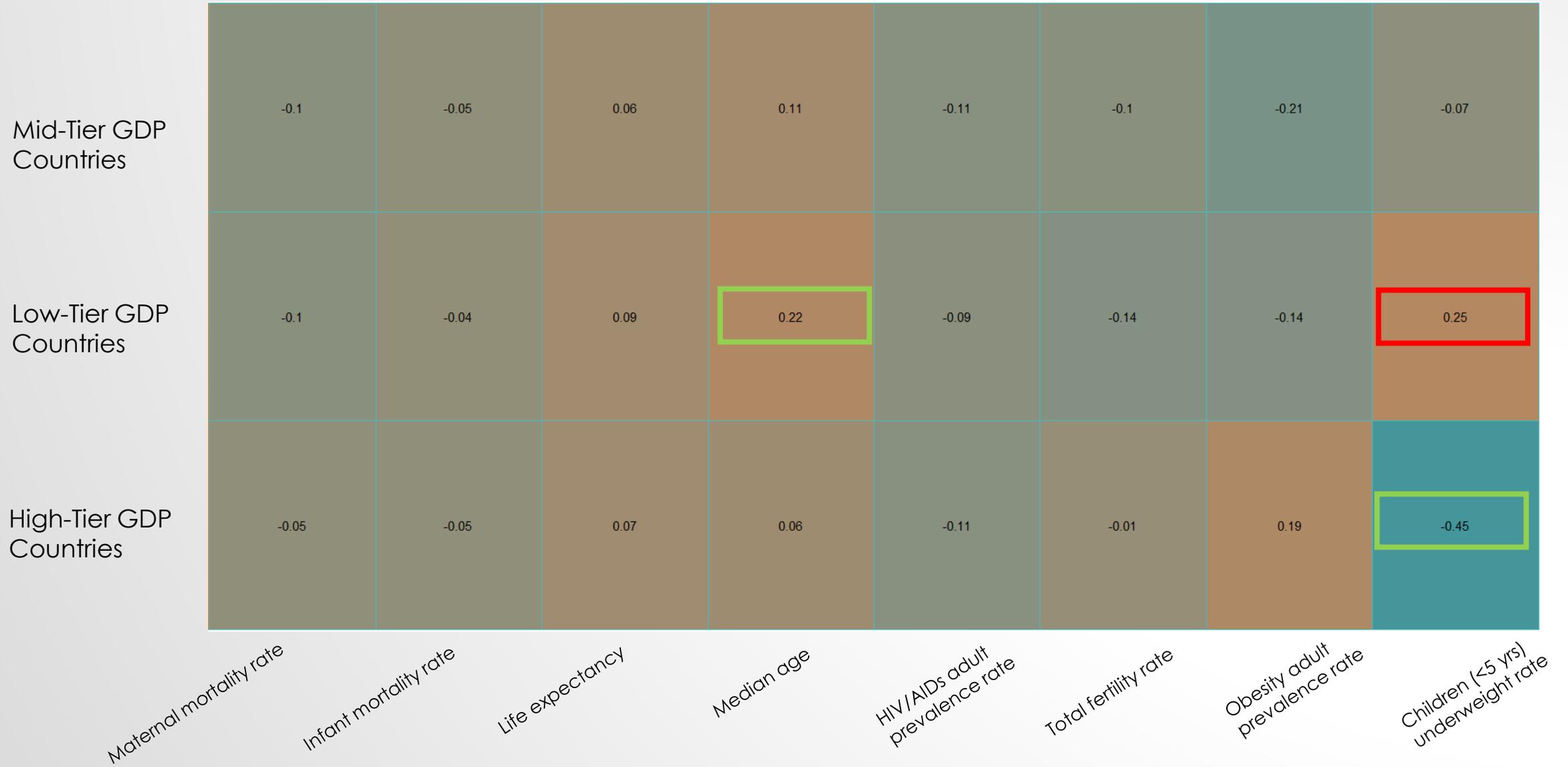
What if we group countries into 3 GDP brackets:

- 1) Low GDP countries
- 2) Middle GDP countries
- 3) High GDP countries

Would correlation matrix look different?

09

Health expenditure problem revisited



AGENDA

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Conclusion

People & Health:

- Countries in Africa faces prominent issues with health care and life quality.
- Countries in Europe and Asia the problem of population aging.
- Larger health expenditures do not necessarily alleviate specific global health concerns.
- Data visualization helps us to see that global health is a topic that is relevant to all of us.

Education, Communication and Economy

- The inverse relationship between GDP and unemployment (Okun's law) holds for our data set. Stronger correlation could be found if we group countries into 3 GDP brackets.
- There is a positive relationship between GDP per capital vs. number of internet users for mid to lower GDP countries. This relationship is negative for high GDP countries.
- There is a positive relationship between GDP per capital vs. education expenditures for mid to lower GDP countries. This relationship is negative for high GDP countries.

THANK YOU!