HULT
INTERNATIONAL
BUSINESS SCHOOL

Group 11

Tuba Ali
Sophie Briques
Juan Duran
Tien Nguyen
Xiaowen Wang

Hult International Business School
Data Science: Python 19-20

Sub-Saharan Africa

Agenda

1. *Overview*

2. *Methodology - Anomaly Treatment*

3. *Sub Saharan Region vs World*

   a. *Our region*

   b. *World comparison*

4. *Islands Vs Continent*

5. *Warfare Vs Peace Countries*

6. *Conclusion*

7. *References and Appendix*

Overview - Sub-Saharan Africa

Overview - Sub-Saharan Africa

Angola
Benin
Burkina Faso
Central African Republic
Cote d'Ivoire
Cameroon
Congo Democratic Republic
Comoros
Cape Verde
Gabon
Ghana

The Gambia
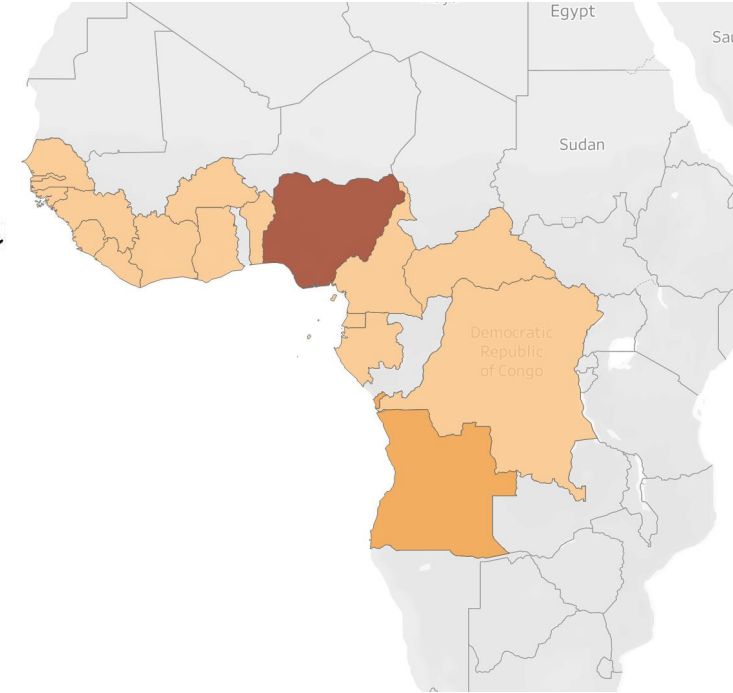Guinea - Bissau
Equatorial Guinea
Liberia
Mauritius
Nigeria
Senegal
Sierra Leone
Sao Tome & Principe
Seychelles

Indicators

Health

- Adolescent fertility rate
- Age dependency ratio
- Fertility rate, total
- Birth rate
- Births attended by skilled health staff (% of total)
- Death rate, crude (per 1,000 people)
- Life expectancy at birth, total (years)
- Prevalence of HIV, total (% of population ages 15-49)
- Prevalence of undernourishment (% of population)
- Prevalence of underweight (% of children under 5)

Education

- Literacy rate
- Educational attainment
- Government expenditure on education

Economy

- Employment in agriculture & Industry & Services (seperated)
- GDP (current US$)
- GDP growth (annual %)
- Industry (including construction), value added (% of GDP)
- Agriculture, forestry, and fishing, value added (% of GDP)
- Services, value added (% of GDP)
- Merchandise trade (% of GDP)
- Military expenditure (% of GDP)
- Armed forces personnel (% of total labor force)
- Tax revenue (% of GDP)

Population

- Population ages 0-14, 15-64, 65 and above (% of total population)
- Population density
- Population growth
- Population in the largest city & slums
- Rural population (% of total population)
- Population, female
- Population, male
- Population, total

Poverty

- GINI index
- Income share
- Poverty headcount ratio at $1.90 a day (% of population)
- Poverty headcount ratio at $3.20 a day (% of population)
- Poverty headcount ratio at national poverty lines (% of population)
- Number of people pushed below the $3.10 ($ 2011 PPP) poverty line by out-of-pocket health care expenditure

Infrastructure

- Surface area (sq. km)
- Urban population (% of total population) & population growth
- Access to electricity
- Mobile cellular subscriptions (per 100 people)

Anomaly Detection And Treatment-Sub-Saharan Africa

Anomaly Detection And Treatment- Sub-Saharan Africa

1. *Education*

2. *Health*

3. *Poverty*

4. *Infrastructure*

Missing Values Treatment

Educational Attainment

- **Different years of education and curriculum**

- **Equivalent Diploma**

Government Expenditure

- **Definition and Method differ between the countries.**

Literacy Rate

- **Difficult to measure**
  - *Requires census or survey measurements under controlled conditions*
- **Many countries report self-reported data**
  - *Some use educational attainment data as a proxy.*
- **Unesco using GALP model to predict data**

Missing Values - Exception
Education in Senegal

Education and Training Quality, Equity and Transparency Improvement Program (PAQUET-EF)

- Program established for the **period 2013-2025** and revised to be aligned with the international agenda.

2012 Unesco Project

- Senegal & Unesco launching a project to improve the quality of higher education in Senegal.
- Project **financed by UNESCO** and the aim is to technically support to establish quality assurance mechanisms **for higher education.**

Case des Tout-Petits

- Since 2002, focus on **early childhood care.**

Missing Values Treatment

Birth attendant by skilled health staff

- **Nigeria**
  - Health care system is poorly developed.
  - No adequate and functional surveillance systems.
- **Senegal**
- **Inputted data years close to 2017**

Sub Sahara Country	Year	Births attended by skilled health staff (% of total)
Liberia	2013	61.1
Mauritius	2015	99.8
Nigeria	2017	40.3
Sao Tome & Principe	2014	92.5
Senegal	2017	68.4
Seychelles	2013	99
Sierra Leone	2013	59.7
World	2014	80.1

Prevalence underweight

- Hard to measure.
  - Other Regions also do not contain data.
- No complete information in World Bank.

Sub Sahara Country	Year	Underweight (% of children under 5)
Angola	2016	19
Benin	2014	18
Burkina Faso	2016	19.2
Cameroon	2014	14.8
Cape Verde	1994	11.8
<Other countries>		

Missing Values Treatment

Poverty headcount ratio

- ($1.90/day) & ($3.20/day)
- **Challenging Calculation**
Many indicators for each nation such as income levels, inflation,

Tax Revenue

- Budgetary central government System

Income Share & Gini Index

- World Bank Data (Latest Data from 2008)
- 10 years because; generation, economy etc.

Missing Values Treatment

Largest Cities

- **Missing Values for Islands Nation countries**
*Did not affect our analysis*

Access to Electricity in Rural Areas

- **Missing Values for Angola and Congo Democratic Republic**
Countries in War and recent Warfare, displacement of population and infrastructure destruction

Military Expenditure

- **Missing Values in Countries without Recent Warfare**

- **Majority countries' military** *expenditure are adopted budget, not necessarily the actual expenditure*

- **Inflation affects**

- **Outliers: Mining military operations and peace operations**

Military Expenditure (% of GDP) in Recent or Ongoing Warfare Countries (without NA)
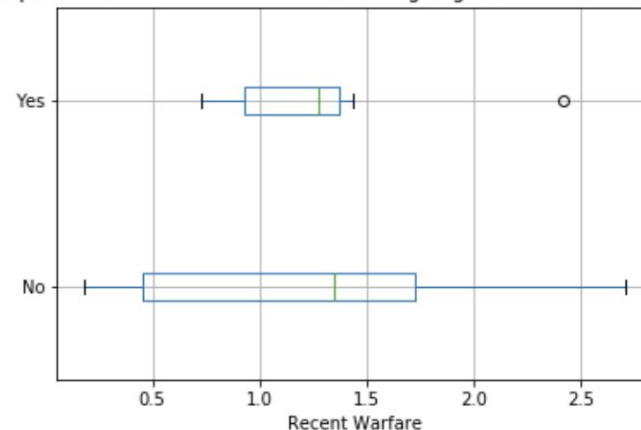
Military Expenditure (% of GDP) in Recent or Ongoing Warfare Countries
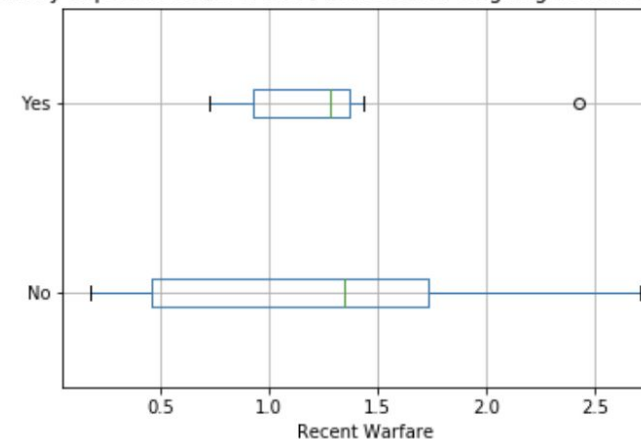
The Sub-Saharan African Region & The World

The SubSaharan African Region & The World

1. *Economy*

2. *Agriculture Sector and Income*

3. *Agriculture Sector and Poverty*

4. *Factors Affecting Poverty*

5. *Service Sector*

6. *Industry Sector*

7. *Health*

Sub-Saharan Africa & The World

Economy and GDP

- Sub-Saharan Africa has the **2nd smallest GDP**

- **Slower-than-expected overall growth** reflects ongoing global uncertainty. (Mohammed, 2019)

- **Angola**, the region's third-biggest economy, remained stuck in recession. (Mohammed, 2019)

- **High inflation** and heavy debt loads discouraged investors in economies such as Zambia and Liberia. (Mohammed, 2019)

**Second lowest GDP in the world, grouped by region**

Hult Region	GDP (current US$) Billions
Carribean Islands & Parts of Latin America	19.8
-> Sub-Saharan Africa	35.3
East/South Africa	38.6
Northern Sub-Saharan Africa	75.2

Fig. 1. From Sub-Saharan economic growth recovery to take longer: World Bank by Omar Mohammed. Retrieved November 5, 2019

The Sub-Saharan African Region

Agricultural Sector and Income

Half of the countries focus their workforce on agriculture and they are all low income and lower middle income countries.

Country Name	Income Group	Highest Value
Central African Rep.	Low income	73.051003
Congo, Dem. Rep.	Low income	68.795998
Guinea-Bissau	Low income	68.190002
Guinea	Low income	66.970001
Sierra Leone	Low income	59.243999
Comoros	Lower middle income	57.115002
Angola	Lower middle income	49.266998
Cote d'Ivoire	Lower middle income	48.421001
Cameroon	Lower middle income	46.575001
Liberia	Low income	46.426998
Benin	Low income	41.782001

Added Value to GDP by agriculture jobs (in $) per capita
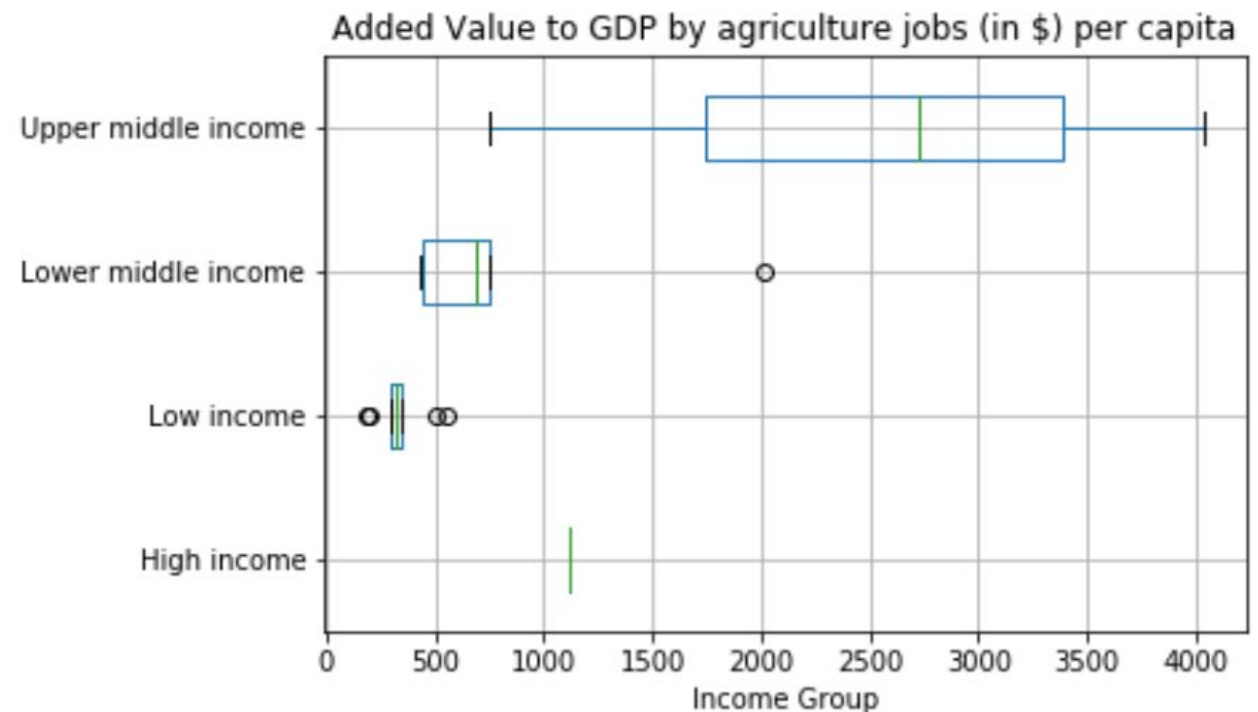
The Sub-Saharan African Region

Agricultural Sector and Poverty

> *Agriculture analysis shows strong association between economic sector development and poverty*
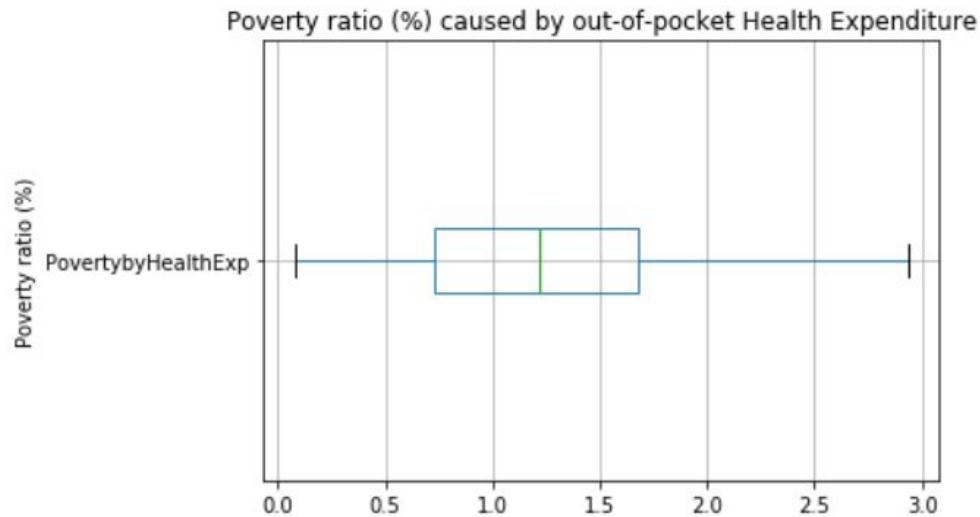
Poverty headcount ratio at national poverty lines (% of population)
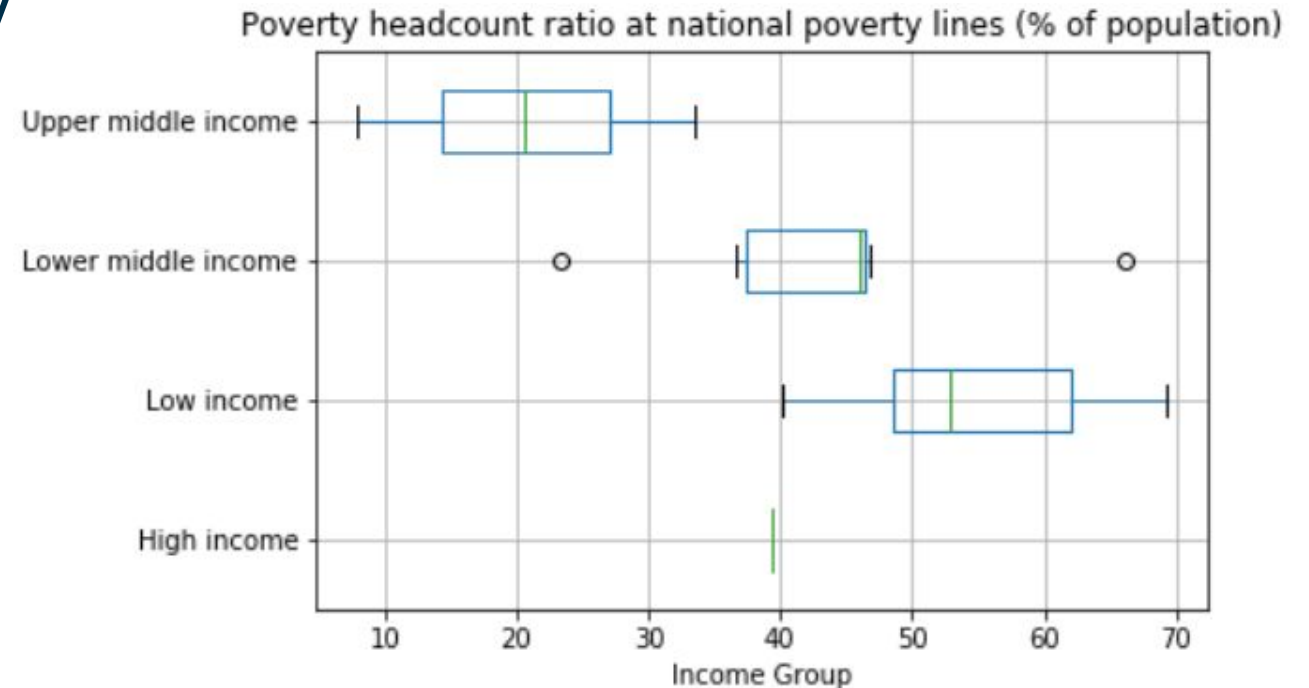
Employment in agriculture (% of total employment) (modeled ILO estimate)	
Poverty headcount ratio at $1.90 a day (2011 PPP) (% of population)	0.720889
Poverty headcount ratio at $3.20 a day (2011 PPP) (% of population)	0.686667
Poverty headcount ratio at national poverty lines (% of population)	0.579772

The Sub-Saharan African Region

Factors Affecting Poverty Headcount Ratio At National Poverty Line

Disease, food shortages and healthcare expenditure are some factors affecting Poverty Headcount.
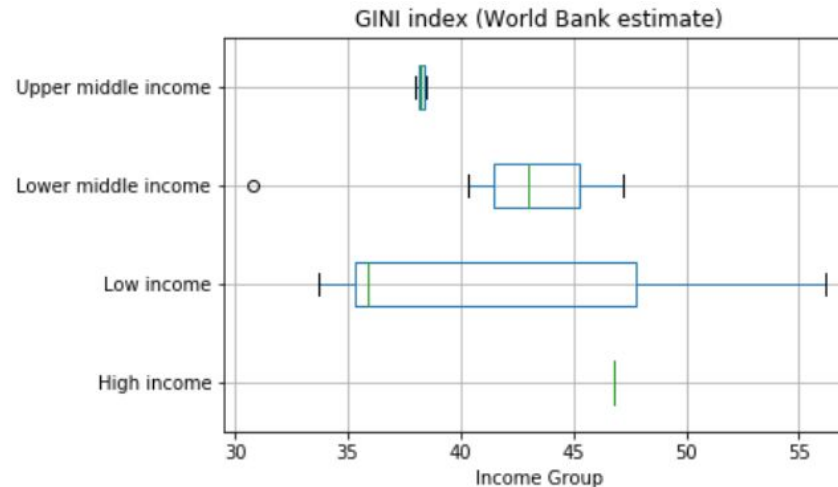

Poverty ratio (%) caused by out-of-pocket Health Expenditure

Sao Tome & Principe

Disease and food shortages —> in 1997 an estimated 90% of the country's food needs are met through **imports.**

The Sub-Saharan African Region

## Factors Affecting Poverty Headcount Ratio At National Poverty Line

GINI index (World Bank estimate)

Country Name	Poverty headcount ratio at national poverty lines (% of population)	Income Group	Income share held by highest 20%
Guinea-Bissau	69.3	Low income	56.7
Sao Tome & Principe	66.2	Lower middle income	39.5
Congo, Dem. Rep.	63.9	Low income	48.4

| Country Name	Poverty headcount ratio at national poverty lines (% of population)	Income Group	Income share held by highest 20%
Seychelles	39.3	High income	53.0

The Sub-Saharan African Region

Services Productivity

*Services jobs comprise the most of all island countries' employment pool..*
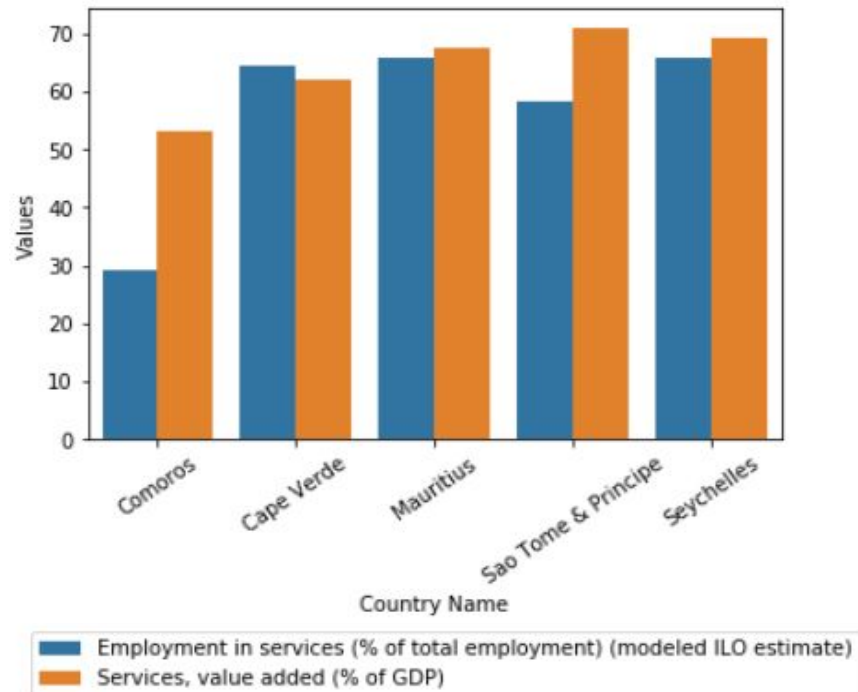
Country Name	Income Group	Highest Value
Mauritius	Upper middle income	65.627998
Seychelles	High income	65.627998
Cape Verde	Lower middle income	64.478996
Sao Tome & Principe	Lower middle income	58.327999
Gambia, The	Low income	54.297001

Added Value to GDP by services jobs (in $) per capita
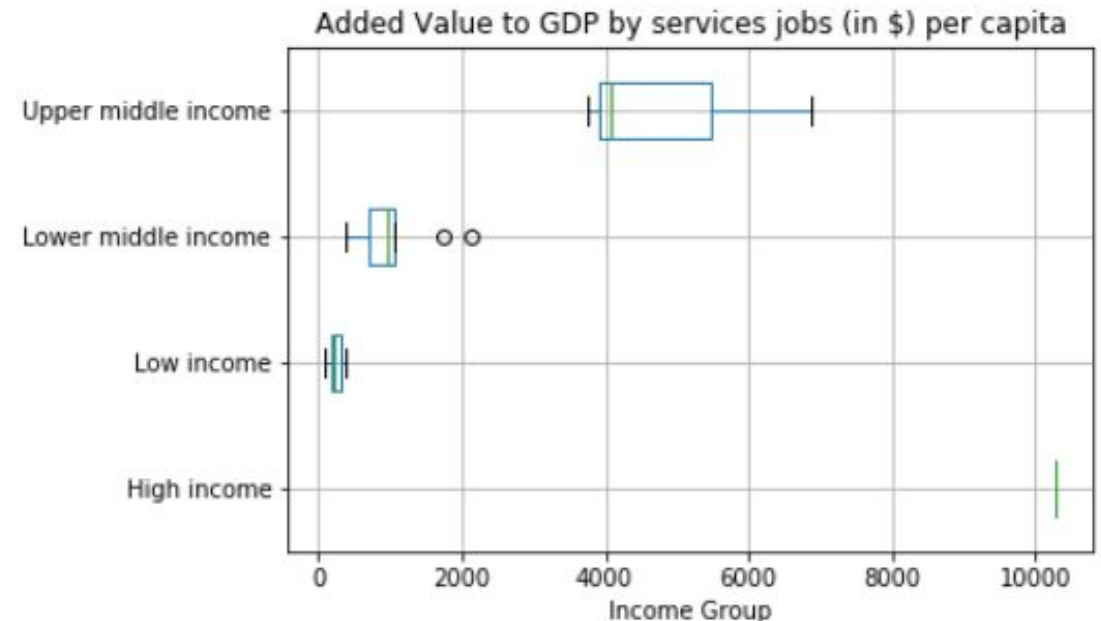
The Sub-Saharan African Region

Industry Productivity

Industry jobs comprise the least of all countries' employment pool.

Added Value to GDP by industry jobs (in $) per capita
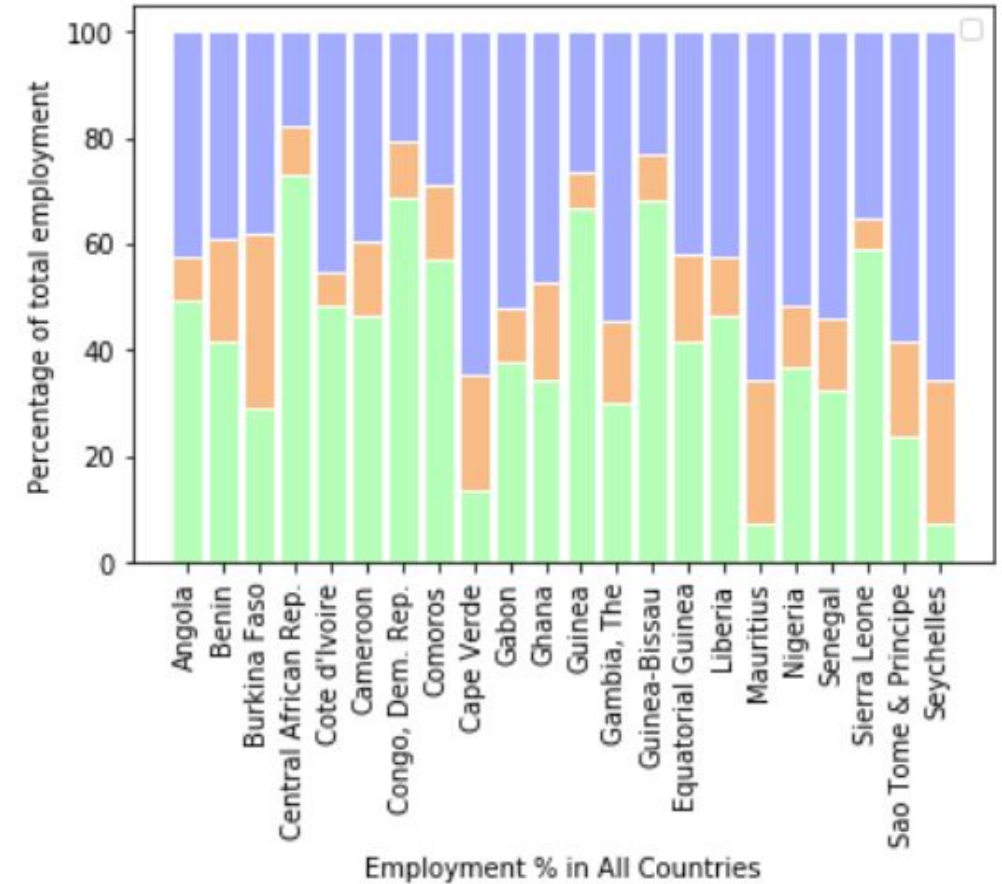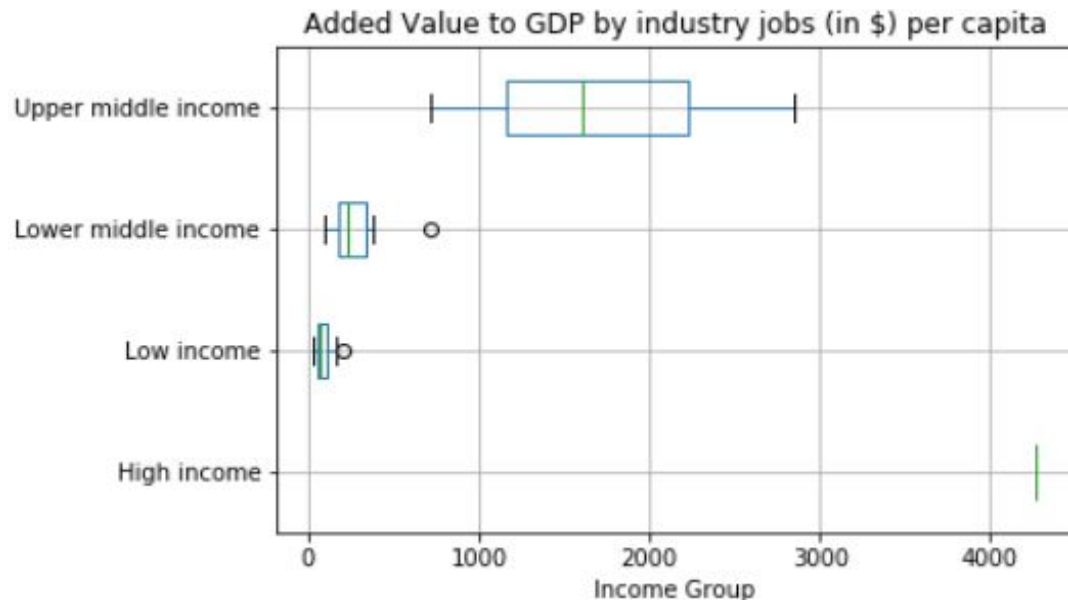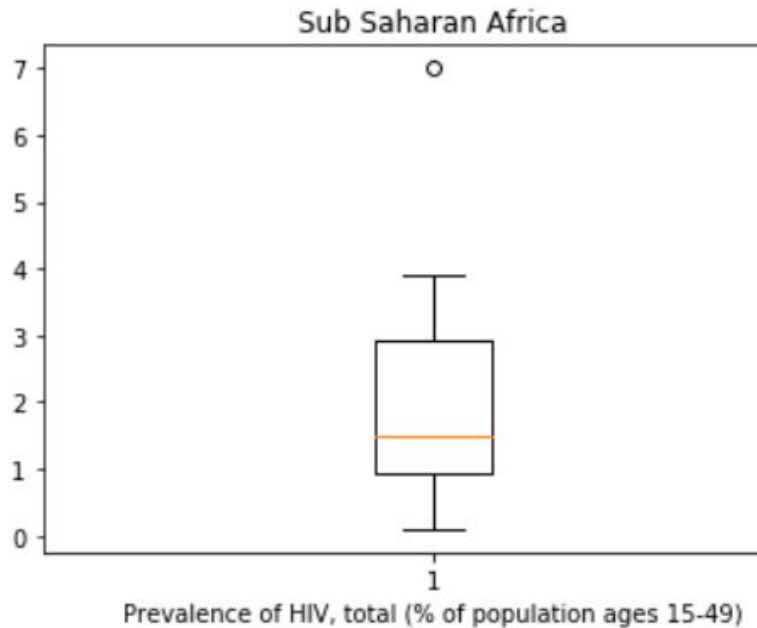
Sub-Saharan Africa & The World

Prevalence of HIV & Undernourishment

Sub Saharan African Countries have the second largest average on both HIV prevalence and Undernourishment.

Hult Region

Region	Avg. Prevalence of HIV, total (% of population ages 15-49)	Avg. Prevalence of undernourishment (% of population)
East/South Africa	8.548	29.36
Sub-Saharan Africa	2.067	18.11
Carribean Islands & Parts ..	1.417	11.33
World	0.800	10.80
South America	0.618	8.36
North America & Part of L..	0.613	8.50
Northern Sub-Saharan Afr..	0.390	11.88
Australia & Oceania	0.333	4.61
Central Asia	0.330	9.75
East/Southeast Asia	0.313	12.38
Middle East & Russia	0.291	7.38
Western Europe	0.245	2.50
Eastern Europe	0.185	2.97
Arabian Peninsula	0.129	11.00

Sub-Saharan Africa & The World

Prevalence of HIV & Undernourishment

Sub Saharan Africa

Prevalence of HIV, total (% of population ages 15-49)

Outlier Treatment:
Avg: World = 0.8 %
Avg: Sub Sahara = 2.05 %
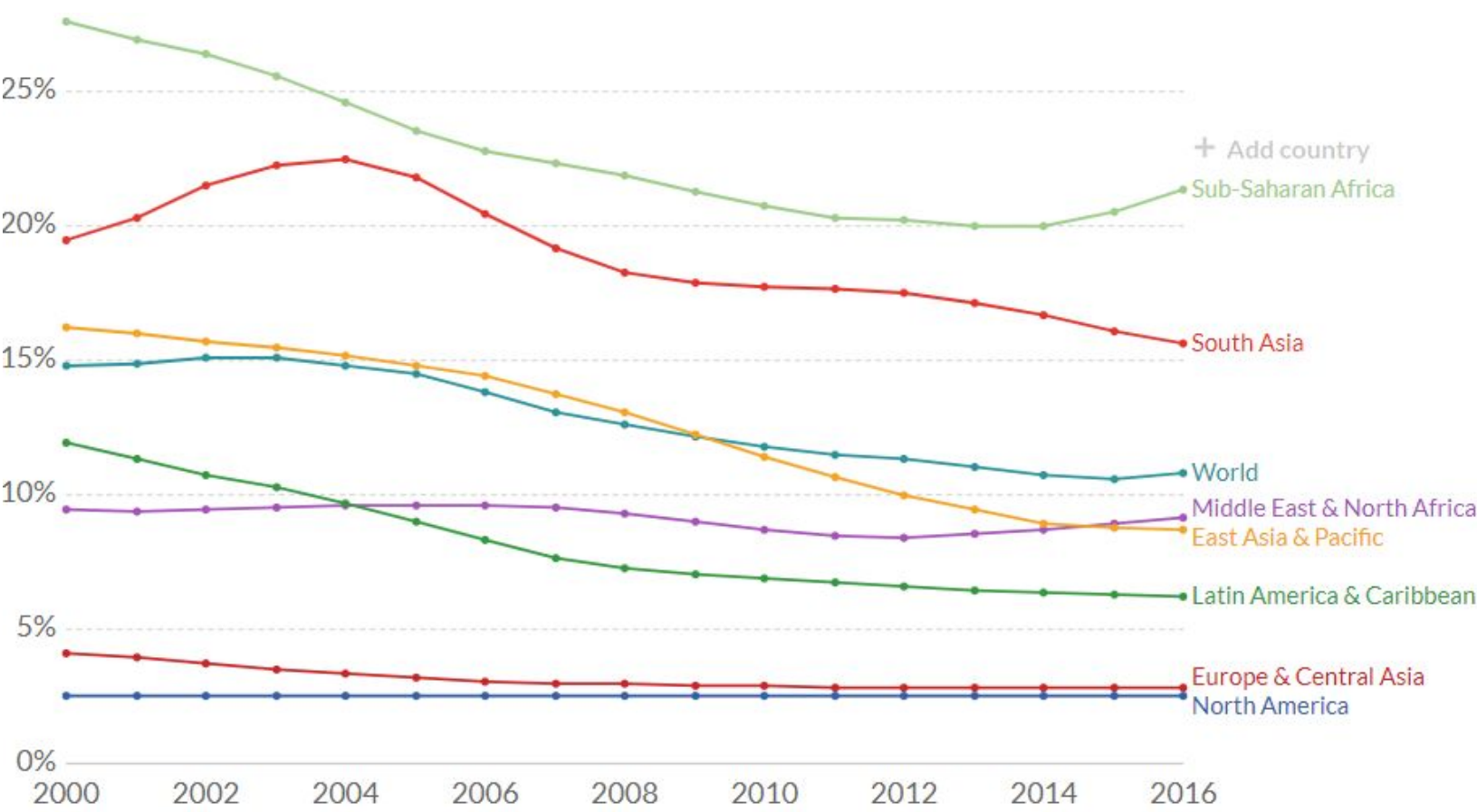**Remove outlier: Equatorial Guinea**
New Avg: Sub Sahara = 1.79 %

Ebola Outbreak in 2015:
Indirect Impact in general Health Care
"Healthcare services were reduced by 50% in three of the most affected countries (CDC, 2019)."

Sub-Saharan Africa & The World

Share of the population that is undernourished **(Roser and Ritchie, 2019)**

Hult Region	Life Expectancy
Sub-Saharan Africa	62.32
East/South Africa	62.71
Northern Sub-Saharan Africa	67.63
Middle East & Russia	71.96

High % of population below poverty line

Hult Region	Poverty
Northern Sub-Saharan Africa	0.27
North America & Part of Latin America	0.30
Sub-Saharan Africa	0.30

The Sub-Saharan African Region – Nation Islands & Continent

Island & Continent

Continent Countries

Angola
Republic of Benin
Burkina Faso
Central African Republic
Côte d'Ivoire
Republic of Cameroon
Democratic Republic of Congo
Gabonese Republic
Ghana
Guinea
The Gambia
Guinea-Bissau
Equatorial Guinea
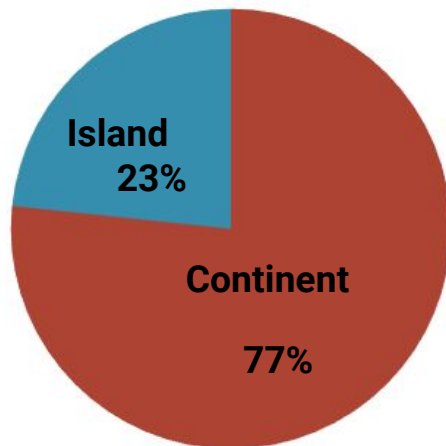Republic Liberia
Nigeria
Senegal
Sierra Leone

Island Nations

Seychelles
Cape Verde
Mauritius
Comoros
Sao Tome & Principe

Nation Islands & Continent

HIV in the Sub-Saharan Region

HIV affects Sub-Saharan Africa disproportionally. Reasons are embedded in several factors such as social and behavioral components (Ramjeel, 2019).
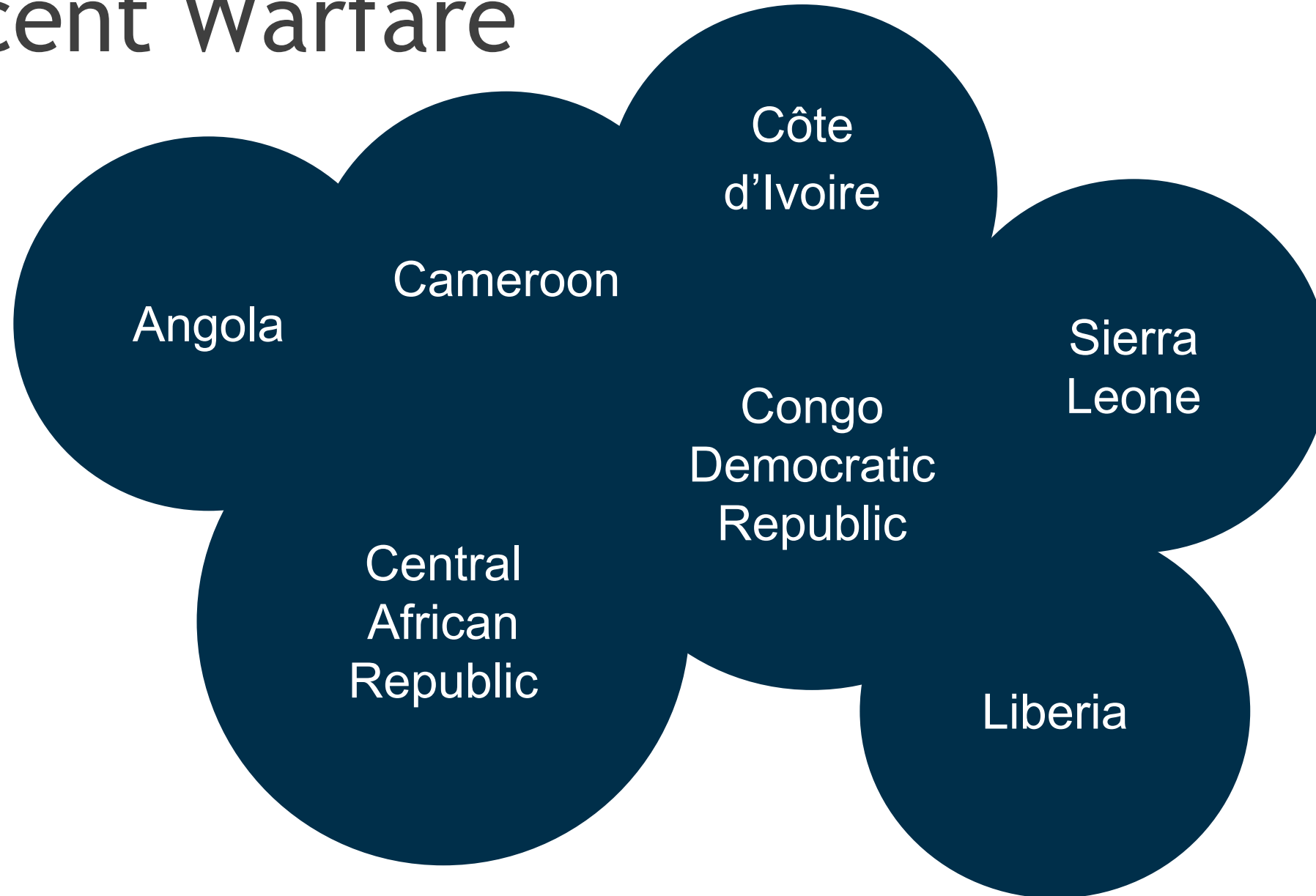
Category	Prevalence of HIV % population ages 15-49
Island	0.7%
Continental	2.3%

Prevalence of HIV % of population ages 15-49

The Sub-Saharan African Region - Recent Warfare

Recent Warfare

Côte d'Ivoire

Cameroon

Angola

Sierra Leone

Congo Democratic Republic

Central African Republic

Liberia
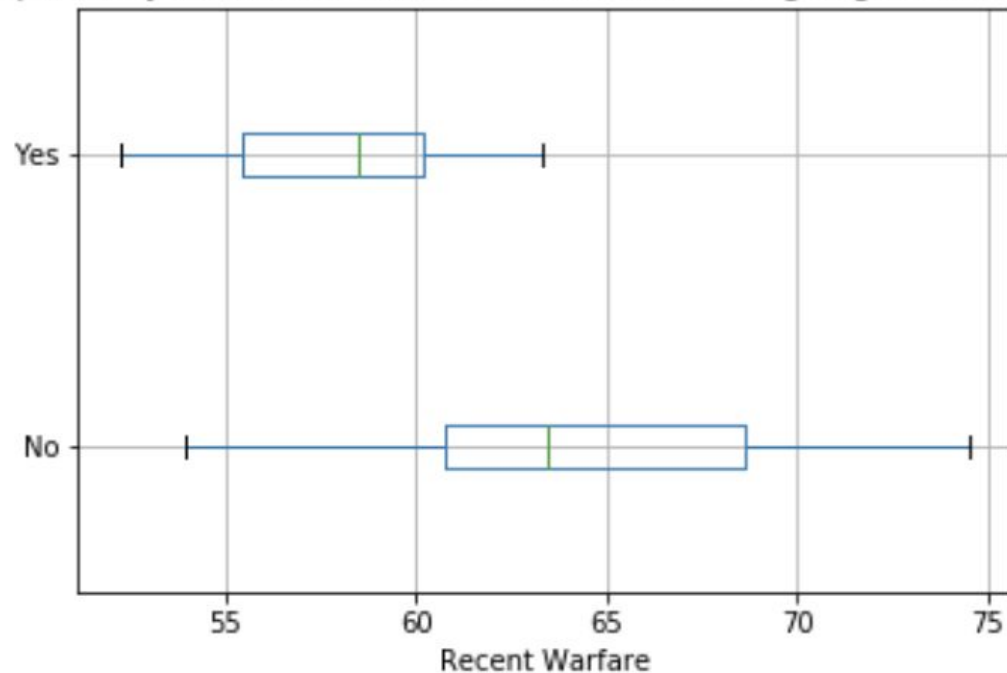
The Sub-Saharan African Recent Warfare

Warfare Side Effects on Population

Life Expectancy at Birth (total, Years) in Recent or Ongoing Warfare Countries

Countries with recent warfare are lacking basic **infrastructure**, water, sanitation and **health care** (Human Rights Watch, 2003).

Recent warfare was not prevalent in Island Nation countries, which showed to have more **stable infrastructure** and better **government resources**.
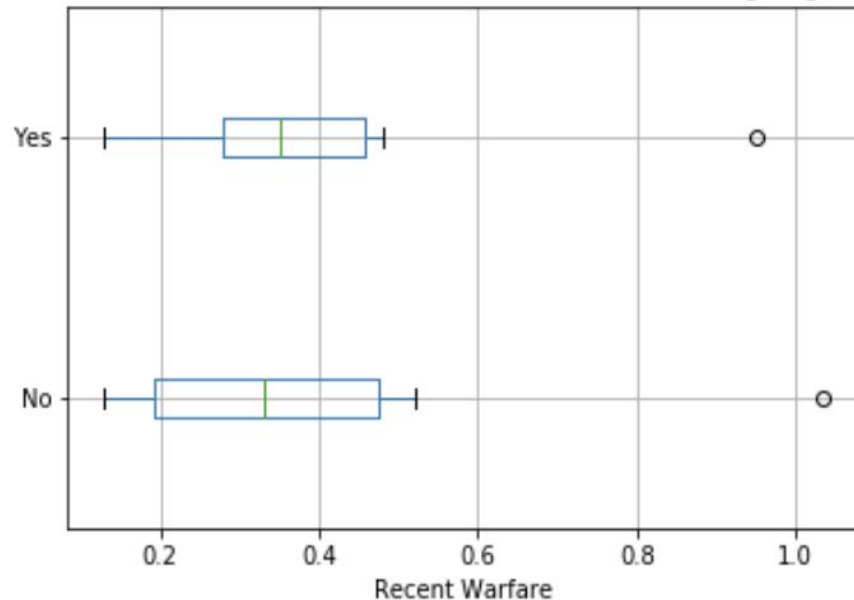
The Sub-Saharan African Recent Warfare
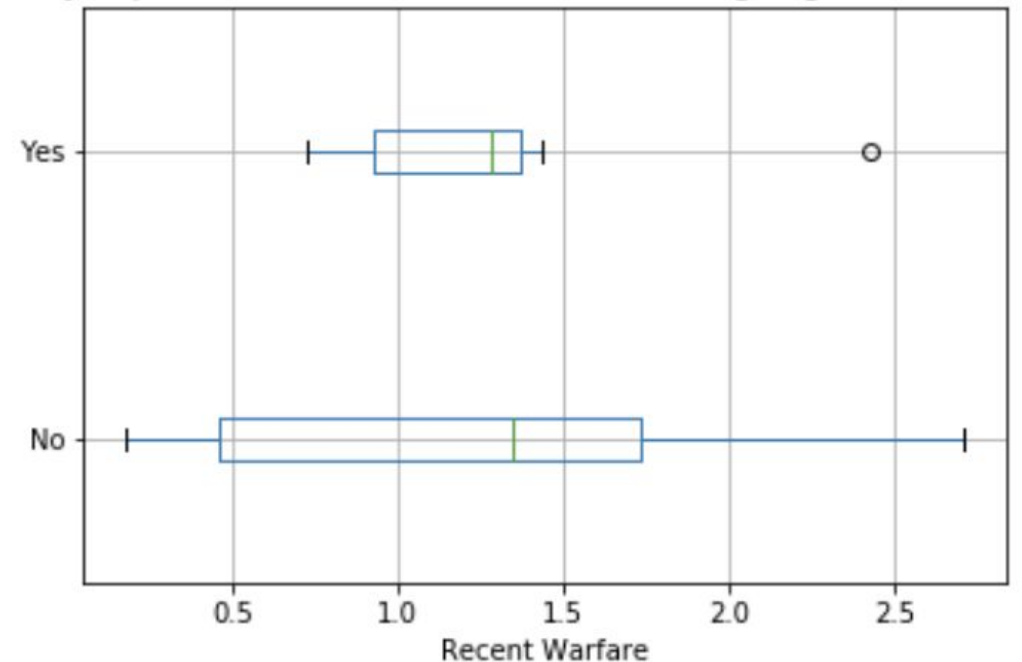
Warfare Side Effects on Population

Armed force personnel in stable and unstable countries is **similar** due to peacekeeping activities.
Military expenditure spans across a **wider range** of % GDP in peace countries.

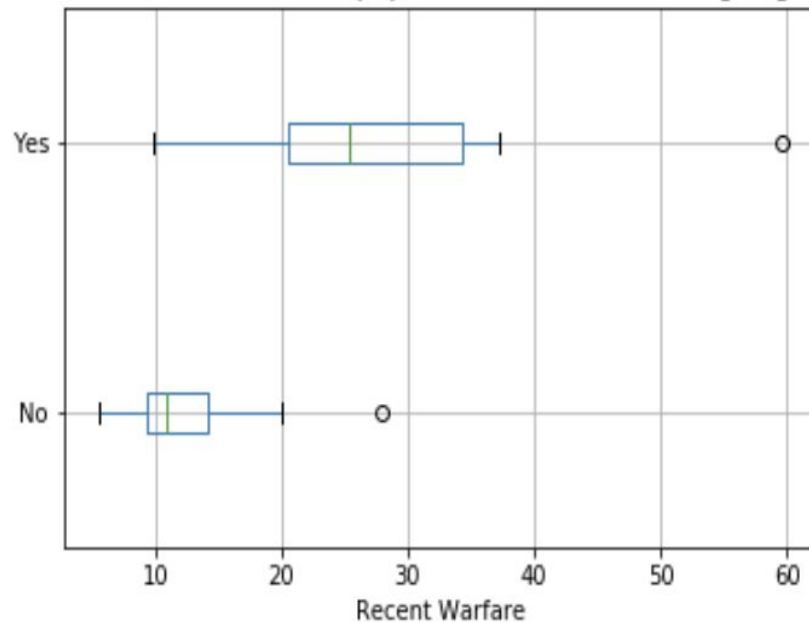Armed Forces Personnel (% of Total Labor Force) in Recent or Ongoing Warfare Countries

Military Expenditure (% of GDP) in Recent or Ongoing Warfare Countries

The Sub-Saharan African Region

Warfare Side Effects on Undernourishment

Prevelance of Undernourishment (% of population) in Recent or Ongoing Warfare Countries

Internal displaced people affect families ability to plant crops and earn a stable living (UN Agency, 2015).

Central African Republic:
- War in 2004 and 2012
- 1.5 million children require humanitarian assistance. *UNICEF report (July, 2018)*
- "More children die from malnutrition than bullets." *UN Agency (April, 2015)*

Conclusion

Economy

Financial support for Agriculture
Technologies advances for Industry
Opportunities for services jobs for continental countries

Education

Understand important of Literacy Rate & Educational Attainment Data
Support Projects & Government Institutions

Health

Population health in overall.
Highest rates of HIV
High levels of undernourishment and underweight of children.

Poverty

Prevalent for most of the countries while some degree of income inequality suggest economic growth

Infrastructure

Warfare affects infrastructure, by displacing people and decreasing population access to basic needs. Increased military expenditure is not significantly associated to stability.

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About the author(s) Lutz Goedde is a senior partner in McKinsey's Denver office; Amandla Ooko-Ombaka is a consultant in the Nairobi office. (n.d.). Winning in Africa's agricultural

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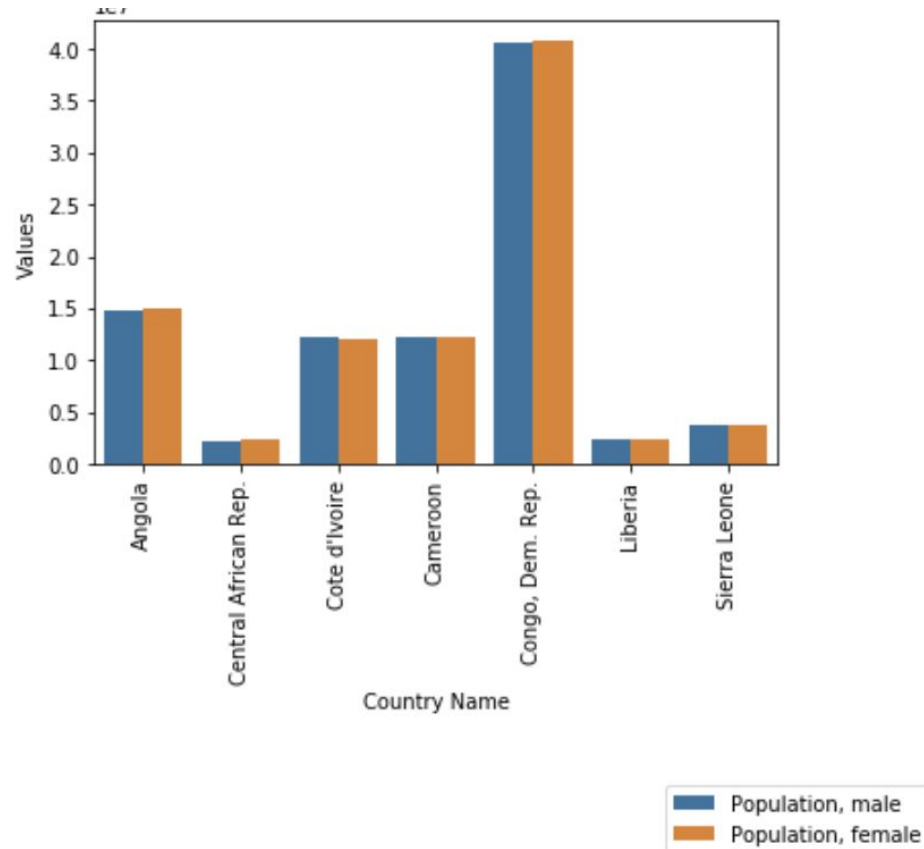
November 5, 2019, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3249694/.

Appendix

Appendix
Warfare Side Effects on Population

Population Distribution in Countries with Recent Warfare

Expected decrease in Male population due to Warfare, but well distributed in each country.

Suggests that civilians (including male, female and children) were directly affected by conflict.
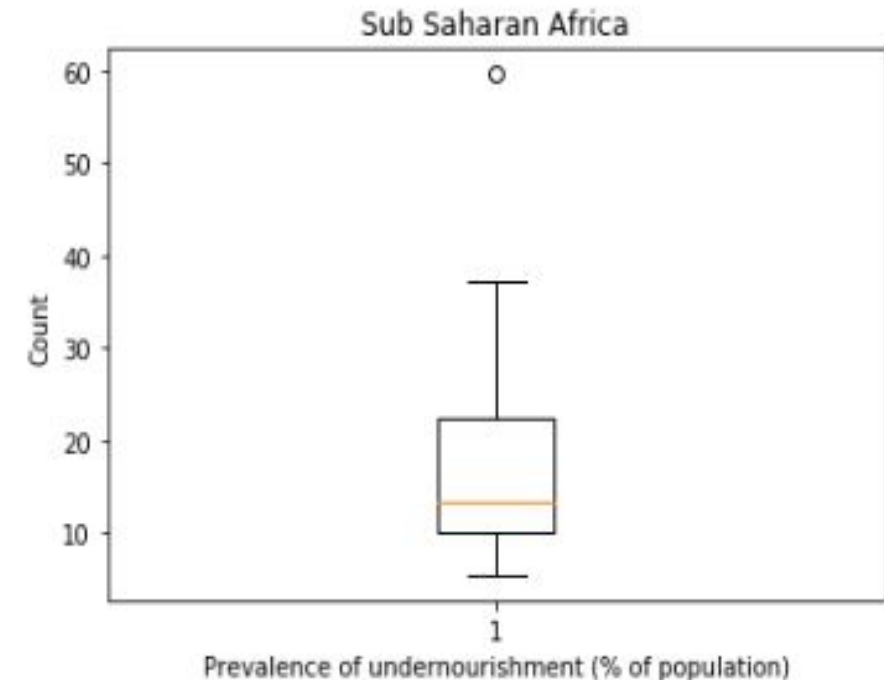
Appendix
Prevalence of Undernourishment

Hult Region	(% of population)
East/South Africa	29.4 %
Sub-Saharan Africa	18.1 %
World	10.8 %
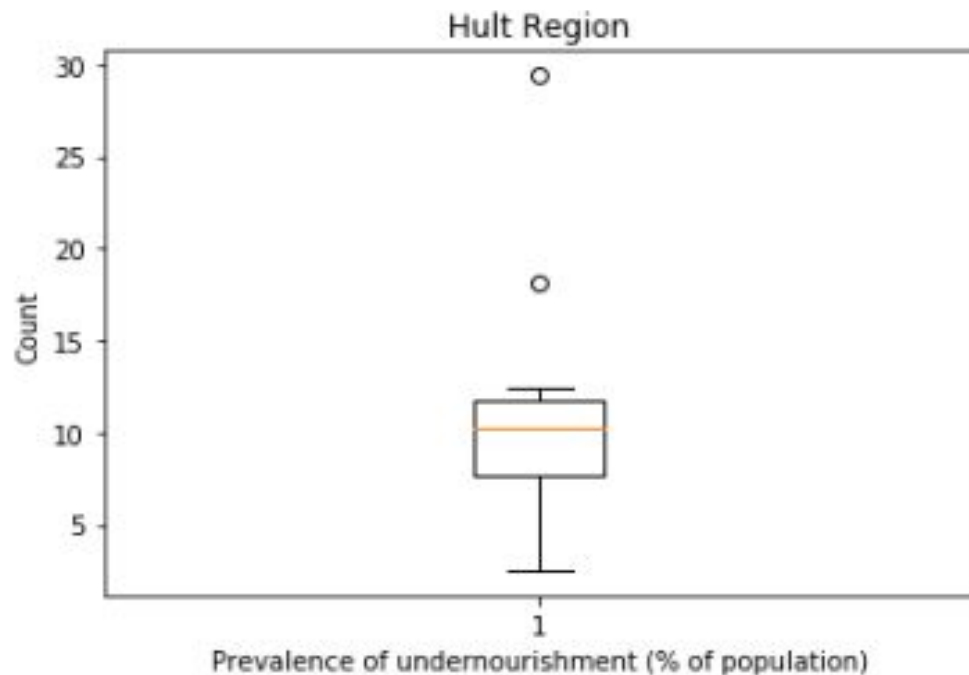
Sub Saharan Country	(% of population)
Central African Rep.	59.6 %
Liberia	37.2 %

Hult Region

Sub Saharan Africa

Nation Islands vs Continent

Sub-Sahara by country sample

Hult Region	%below the $3.10	Continent/Island
Cape Verde	0.63	Island
Angola	0.61	Continent
Mauritius	0.53	Island
Senegal	0.47	Continent
Sierra Leone	0.45	Continent
Gambia, The	0.42	Continent

Sector	%Bellow $3.10 (Mean)
Continent	0.27
Island	0.40

After removing outliers

Sector	%Bellow $3.10 (Mean)
Continent	0.29
Island	0.40

Histogram showing 4 countries that claim no poverty.

Sub Saharan Africa

Sub Saharan Africa

No Apparent Outliers