Data Science & Analytics

Louisville, Kentucky 2022-2023 #603893

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Introduction and Data Overview

Predicting Heart Disease Risk Drivers Using Machine Learning Algorithms and Global Insights on Cardiovascular Mortalities

Cardiovascular diseases (CVDs) have consistently been the leading cause of death across the globe. An estimated 18 million people die from CVDs every year, representing 32% of all global deaths. 85% of these CVD deaths are due to heart attacks and strokes. It is important to note that 38% of all premature deaths (under the age of 70 years), which were about 17 million in 2019, were due to CVDs (Hannah Ritchie et. al., 2019). The medical community believes that most cardiovascular diseases can be prevented by addressing behavioral risk factors such as tobacco use, unhealthy diet and obesity, physical inactivity, and harmful use of alcohol. It is important to detect early signals (or drivers) of cardiovascular disease to prevent deaths through effective management with counseling and medicines.

Cardiovascular diseases (CVD) refer to a group of diseases that involves the **heart or blood vessels**. CVD includes coronary artery diseases (CAD) such as angina and myocardial infarction (commonly known as a heart attack). Other CVDs include stroke, heart failure, hypertensive heart disease, rheumatic heart disease, cardiomyopathy, abnormal heart rhythms, congenital heart disease, valvular heart disease, carditis, aortic aneurysms, peripheral artery disease, thromboembolic disease, and venous thrombosis.

In a study done by Harvard professors, there are multiple categories to account for when estimating the cost of cardiovascular diseases, starting from screening primary prevention to acute hospital care and loss of productivity. Overall, the cost of treating CVDs could be as high as **US \$20 trillion** from 2010 to 2030. It is estimated that 55% of this cost is attributable to healthcare, and the remaining 45% is primarily due to productivity loss from disability or premature death (Bloom et. al., 2011; RTI News Article, 2017).

Data Dictionary

Metadata for the dataset used to build ML models:

heart statlog cleveland hungary final (heart disease dataset): This dataset consists of 1190 records of patients from the US, UK, Switzerland, and Hungary. It has 11 features and 1 target variable (Manu Siddhartha, IEEE Dataport, 2020).

Attribute Name	Description	Datatype
Age	Patient's Age in years	Numeric
Sex	Patient's Gender - Male as 1 Female as 0	Binary
Chest Pain Type	Type of chest pain categorized into 1-typical, 2-typical	Numeric
	angina, 3-non-anginal pain, 4-asymptomatic	
Resting BP	Level of blood pressure at resting mode in mm/HG	Numeric
Cholesterol	Serum cholesterol in mg/dl	Numeric
Fasting Blood	Blood sugar levels on fasting > 120 mg/dl represent 1 in case	Binary
Sugar	of true and 0 as false	
Resting ECG	Result of an electrocardiogram while at rest – 0: Normal; 1:	Numeric
	Abnormality in ST-T wave; 2: Left ventricular hypertrophy	
Max Heart Rate	Maximum heart rate achieved	Numeric
Exercise Angina	Angina induced by exercise - 0 depicts NO; 1 depicts Yes	Binary
Oldpeak	Exercise-induced ST-depression* in comparison with the	Numeric
	state of rest	
ST Slope	ST segment* measured in terms of the slope during peak	Numeric
	exercise - 0: Normal; 1: Upsloping; 2: Flat; 3: Down-sloping	
Target	Heart Risk - 1 indicates heart disease; 0 indicates normal	Binary

^{*}ST-segment is the line between the "S" and the "T" on the readout of an EKG. If a person is in good health, the line appears at or close to the baseline level. A depressed or elevated ST segment indicates the presence of an underlying health condition.

Datasets from the UN and WHO were used for Global level insights at a country level:

Dataset	Key Attributes
Cardiovascular-disease-deaths-by-age	Cardiovascular Deaths
	Literacy Rates - share of the population older than 14
Cross-country-literacy-rates	years that can read and write.
	Human Development Index: a long and healthy life, a good
Human-development-index	education, and a decent standard of living.
Population-since-1800	Percent WRT Population
	Share of population living in extreme poverty - Extreme
	poverty is defined as living below the International
Poverty-explorer	Poverty Line of \$2.15 per day.
	Consumption of alcohol is measured in liters of pure
Share-of-adults-Alcohol	alcohol per person aged 15 or older
Share-of-adults-overweight	Share of adults that are overweight or obese
	The share of men and women aged 15 and older who
Share-of-adults-who-smoke	smoke any tobacco product on a daily or non-daily basis.
Share-population-female	Share of the female population

Purpose

The main objective of this study is to examine the global distribution of cardiovascular deaths and its relationship with behavioral and socio-economic factors and build machine learning models to predict CVD deaths and understand its drivers. Country-level data on CVDs and behavioral and socio-economic factors were extracted from various sites for this study. The key insights from this analysis can help WHO (World Health Organization) and national and state-level governments to develop data-driven plans to identify risk factors and proactively manage this disease to reduce deaths and its economic impact on society. The findings from this study will help develop cost-effective strategies to build preventive plans to reduce global deaths by focusing on the education and preventive healthcare of the top 20 nations that account for 70% of all CVD deaths.

Methods

A Machine Learning model has been created using a curated dataset that consists of 1190 patients from the United States, United Kingdom, Switzerland, and Hungary. The Global level insights have been created using United Nations and WHO data through datasets available in "Our World in Data"; the links to all the data files are in the References section. Data used for the global analysis consists of three decades, ranging from 1996 to 2019.

Exploratory Data Analysis

All the data files were extracted as .csv files, and analysis was done using Excel and Microsoft SQL Server. The first step was performing EDA on each dataset to understand the data in detail.

The analysis, performed in Excel, was done to understand the relationship between socioeconomic, demographic, and behavioral attributes with cardiovascular deaths.

Data Transformation

The "Final" dataset was created in SQL by combining key attributes from the above-mentioned datasets (from United Nations and World Health Organization) at a <u>country level</u> and yearly trend, ranging from 1990 to 2019.

Machine Learning Model to Predict Heart Risk

Multiple ML techniques were used to predict heart risk using the heart disease (mentioned in the Data Dictionary) dataset. Classification models - Decision Tree, Naïve Bayes, and Neural Network - were created using Visual Studio. The Decision Tree model was chosen due to its accuracy and explanatory power to explain the drivers of the model.

Results

Global Analysis & Insights on Cardiovascular Deaths

Data on CVD deaths were merged with socioeconomic attributes of individual countries, such as the percentage of the population with respect to the global population, the percentage of the population above 65 years old, the percentage of the population in extreme poverty, GDP per capita, percentage of the population that consumes Alcohol, percentage of the population that consumes Tobacco, Cardiovascular death, and Human Development Index. A derived variable - CVD Deaths percentage with respect to the population of that country was created.

CVD continues to be the leading cause of death worldwide, increasing from 28% in 1990 to 34% in 2019 (Figure 1). Deaths due to Cancer exhibited the second highest deaths and relative increase during this period. Alzheimer's and Diabetes showed significant positive relative change during this period while Diarrheal, Neonatal disorders, and Tuberculosis have seen a significant decline over this period.

Relative Change in the Distribution of Top Diseases in the Last 3 Decades (1990-2019)

Deaths by top Diseases	1990	2019	Relative Change
Cardiovascular Diseases	28%	34%	23.1%
Neoplasms (Cancer)	13%	19%	40.2%
Lower respiratory infections	8%	5%	-39.9%
Chronic respiratory diseases	7%	7%	2.8%
Neonatal disorders	7%	3%	-49.9%
Diarrheal diseases	7%	3%	-57.6%
Digestive diseases	4%	5%	10.4%
Tuberculosis	4%	2%	-46.9%
Diabetes mellitus	2%	3%	87.6%
Alzheimer	1%	3%	131.7%

Figure 1

Relative Change Over the Last 3 Decades

(Data Range: 1990-2019)

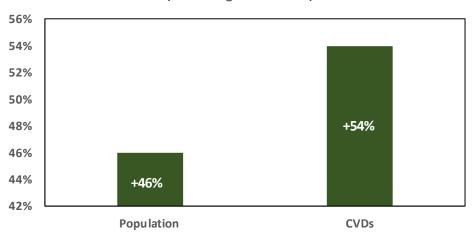


Figure 2

Figure 2 shows the relative change in global population (GP) [(GP2019-GP1990)/GP1990] and Cardiovascular Deaths (CVD) [(CVD2019-CVD1990)/CVD1990] over three decades from 1990 to 2019. The global population grew by 46% during this period while CVD deaths grew by 54%, outpacing population growth in the same period.

Distribution of CVDs by Age Groups in the last 3 Decades (1990-2019)

Distribution by Age Groups	% WRT All	Change
Distribution by Age Groups	CVD Deaths	(2019-1990)
<5Yrs	0.1%	-0.5%
5-14Yrs	0.1%	-0.1%
15-49Yrs	6.7%	-1.5%
50-69Yrs	27.5%	-4.3%
>=70Yrs	65.6%	6.5%

Figure 3

Figure 3 shows the global distribution of CVD deaths by age group and its relative change over three decades [(2019-1990)/1990]. A significant increase in the percentage of deaths from older age groups is seen at the expense of a decline in other age groups.

Global Distribution of Change in CVDs WRT Population in the Last 3 Decades (1990-2019)

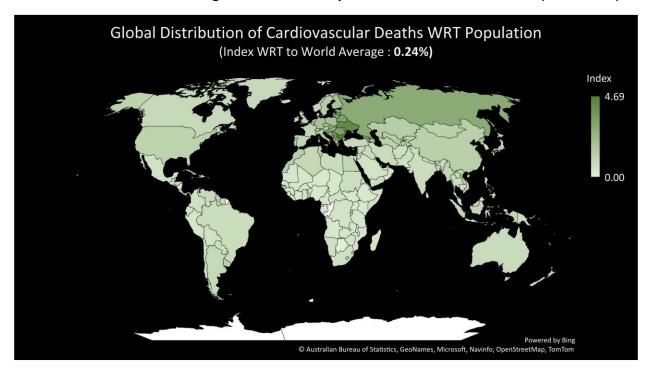


Figure 4

Figure 4 is indexed with the global average (total CVD Deaths WRT Global Population) to show which part of the globe is over-represented in CVD deaths. This chart indicates a higher index (higher CVD deaths WRT population) for the Siberia part of Russia, Eastern Europe, and Central Asia. The majority of the African continent, Australia, and South American countries indicate a lower index for CVD deaths.

Predicting Heart Risk Using Machine Learning Model & Understanding its Drivers

This section uses patient-level data on heart failure risk curated from five different data sets on a common set of 11 attributes from 4 different countries. These attributes cover demographic information about the patient and key risk attributes ranging from blood pressure to heart rate performance during exercise. This data was divided into training and testing data sets (70% training and 30% Testing). The training dataset was fed into Machine Learning Classification algorithms using Microsoft SQL Server 2020 and Visual Studio 2019. Multiple Machine Learning models were created to predict heart risk. All models showed relatively close classification accuracy and precision. Finally, the Decision Tree ML model was selected based on its explanatory power. Figure 5 below describes the methodology used for this work.

Methodology Used for Training and Testing ML Model to Predict Heart Failure Risk

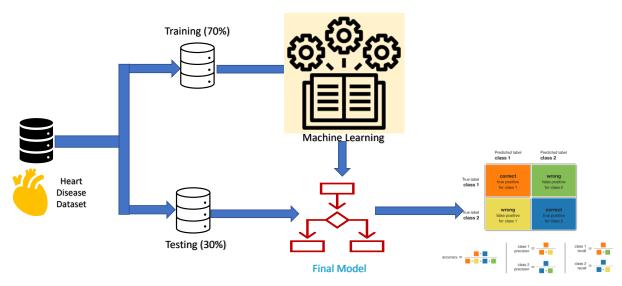


Figure 5

The classification accuracy of this decision tree model on the training data set is shown below in Figure 6. Overall, the accuracy of the model is 80%, which is reasonably good accuracy. The precision and Recall for predicting Heart Risk is also in the range of lower than 80%. These numbers exhibit the relative stability of the model.

Model Strength and Stability: Accuracy, Precision, and Recall of ML Model

Decision Tree ML Model	True Class			
Predicted	0 (Actual) 1 (Actual)			
0	130	36		
1	34	157		

Precision for Target 1	Accuracy	Recall for Target 1
82%	80%	81%

Figure 6

Figure 7 below shows the dependency network of the decision tree model. This helps in understanding the importance of input attributes in predicting heart risk. ST Slope stands out as the most important attribute in predicting heart risk, followed by Chest Pain Type, Sex, and Max Heart Rate.

Dependency Network: Importance of Attributes

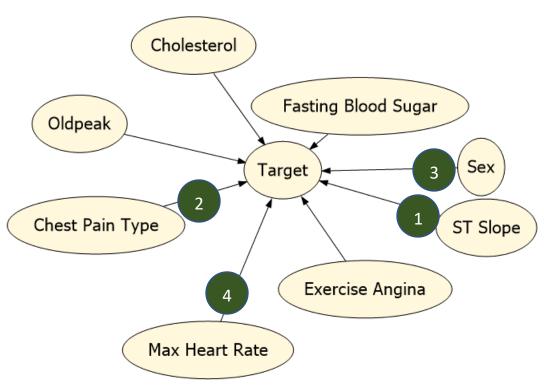


Figure 7

Attribute Definition and its Importance

Attribute Importance from Strongest to Least link				
ST Slope	Slope refers to the slope of each patient's stress test			
Chest Pain Type	This refers to the Angina or Ischemic chest pain			
Sex	Sex refers to the assigned sex of the patient at birth			
	This refers to the maximum heart rate reached during a stress test.			
Max Heart Rate	This is a hard variable because younger people have higher heart			
IVIAX HEAIT RALE	rates while older people have lower heart rates but are more likely to			
	have heart problems			
Cholesterol	This refers to cholesterol within the blood			
Exercise Angina	Exercise Angina measures whether or not a patient had Angina			
Exercise Aligina	(severe heart pain) during exercise			
Facting Pland Sugar	Fasting blood sugar measures a person's blood sugar and how it will			
Fasting Blood Sugar	likely change in the long term			
Oldnoak	Oldpeak refers to whether or not the patient			
Oldpeak	showed ST depression induced by exercise during the stress test			

Figure 8

Figure 8 shows the detailed order of attribute importance in predicting heart risk.

Segmenting World Population Using Aggregated Attributes and Machine Learning Clustering Model

The change in Cardiovascular deaths by countries from 1990 to 2019 was examined to explore positive or negative trends in CVD over three decades. Figure 9 below shows the list of the top 15 countries that experienced a significant increase in CVDs in the last three decades. The majority of these countries belong to the eastern European region, where tobacco usage is on the higher side and the health development Index (HDI) is below the world's average. Earlier studies done on Tobacco (Ambuj Roy et.al., 2017, ResearchGate) and Overweight (Imre Csige et.al., 2018) are found to exhibit a significant correlation to CVDs, while a study on alcohol consumption (Jurgen Rehm et.al., 2016) did not establish a conclusive relationship with CVDs.

List of top 15 countries that experienced the highest increase in CVDs in the last three decades (1990-2019)

Top 15 Countries that Experienced Increase in Cardiovascular Deaths (CVD) WRT Population (2019-1990)		HDI	Alcohol	Overweight	Tobacco
Ukraine	0.34%	0.79	61.8	58.4	26.2
Bulgaria	0.33%	0.81	66.0	61.7	39.4
Moldova	0.28%	0.77	66.6	51.8	28.7
Bosnia and Herzegovina	0.25%	0.78	47.9	53.3	35.5
Montenegro	0.25%	0.84	54.0	59.4	31.8
Albania	0.25%	0.81	51.0	57.7	23.0
North Macedonia	0.21%	0.78	53.7	58.1	NA
Belarus	0.21%	0.82	73.6	59.4	30.9
Serbia	0.20%	0.81	60.0	57.1	40.1
Lithuania	0.20%	0.88	79.1	59.6	32.3
North Korea	0.18%	NA	40.3	32.4	17.8
Armenia	0.18%	0.78	26.0	54.4	25.8
Romania	0.17%	0.83	67.2	57.7	28.4
Dominican Republic	0.13%	0.77	43.0	61.2	10.9
Georgia	0.13%	0.81	35.1	54.2	31.7
Average of 15 Countries	0.22%	0.81	55.02	55.76	28.75
Global Average	0.01%	0.73	40.25	48.85	20.70

Figure 9

List of top 15 countries that experienced the highest decline in CVDs in the last three decades (1990-2019)

Top 15 Countries that Experienced decline in Cardiovascular Deaths (CVD) WRT Population (2019-1990)		HDI	Alcohol	Overweight	Tobacco
Portugal	-0.10%	0.87	69.2	57.5	25.3
Australia	-0.10%	0.94	79.4	64.5	14
Iceland	-0.10%	0.96	71.5	59.1	12.6
Switzerland	-0.11%	0.96	81.2	54.3	25.7
Belgium	-0.11%	0.94	76.5	59.5	23.9
Israel	-0.12%	0.92	55	64.3	21.6
Grenada	-0.13%	0.80	49.6	51.4	NA
Germany	-0.13%	0.95	79.4	56.8	22.5
Austria	-0.15%	0.92	78.1	54.3	27.1
Ireland	-0.19%	0.94	81.3	60.6	21.4
Sweden	-0.19%	0.95	73	56.4	24.8
United Kingdom	-0.23%	0.94	73.4	63.7	16.1
Luxembourg	-0.23%	0.93	91.8	58.7	21.6
Denmark	-0.26%	0.95	74.4	55.4	18.1
Norway	-0.26%	0.96	79	58.3	17.1
Average of 15 Countries	-0.16%	0.93	74.19	58.32	20.84
Global Average	0.01%	0.73	40.25	48.85	20.70

Figure 10

Figure 10 shows the list of the top 15 countries that experienced a significant decline in CVDs in the last three decades. The majority of these countries belong to the Western European region, where tobacco usage is on the much lower side and the health development Index is above the world's average.

List of top 10 countries accounting for $2/3^{rd}$ of CVDs worldwide with change in CVDs in the last three decades (1990-2019)

Change in Cardiovascular Deaths (CVD) WRT Population for 10 Countries (2019-1990) Accounts for 63% of all Cardiovascular Deaths in the world		HDI	Alcohol	Overweight	Tobacco
China	0.11%	0.76	55.9	32.3	25.7
India	0.05%	0.65	38.8	19.7	28.1
Russia	0.09%	0.85	58.1	57.1	27.1
United States	-0.07%	0.93	71.7	67.9	23.4
Indonesia	0.09%	0.72	22.7	28.2	37.2
Ukraine	0.34%	0.79	61.8	58.4	26.2
Brazil	0.01%	0.77	40.3	56.5	13.2
Japan	0.07%	0.92	57	27.2	20.5
Germany	-0.13%	0.95	79.4	56.8	22.5
Pakistan	0.003%	0.55	1.2	28.4	20.8
Global Average	0.01%	0.73	40.25	48.85	20.70

Figure 11

Figure 11 shows the list of the top 10 countries which account for 63% of Cardiovascular Deaths worldwide. This chart indicates that 8 out of 10 countries experienced an increase in CVDs in the last three decades while only two countries, USA and Germany, experienced a decline over this period. These countries (USA and Germany) exhibit low tobacco usage compared to the world's average and the health development Index is above the world's average.

Country-specific data on the Human Development Index, Percentage of the Population consuming Alcohol, Percent of the population consuming Tobacco, and Percent of the population overweight are used to further generate segments using the Machine Learning Clustering algorithm using Microsoft SQL Server 2020. The three-segment solution was selected based on the sizes of the segments and homogeneity within segments and heterogeneity across segments.

Methodology Used for Generating Segment Using ML Clustering Model

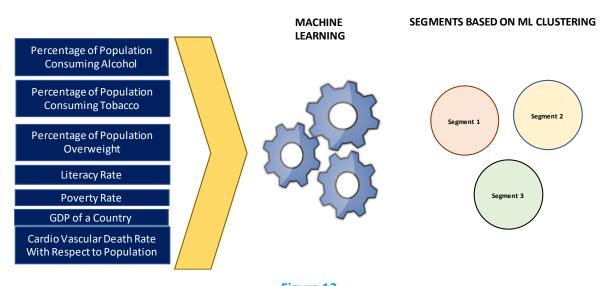


Figure 12

Figure 12 describes the methodology used for clustering country-specific data into meaningful groups.

Top Level Description and Profile of Segments

High Population Density Regions with underindexed HDI and Moderate CVD Burden

- Represents 47% of the world population
- Accounts for ~6M CVD 32% of all CVD worldwide; CVD WRT Population of the Country is close to world average
- Top Countries (accounts for 75% of all CVD of this Cluster): India, Indonesia, Pakistan, Bangladesh, Vietnam, and Philippines
- 20% plus under-indexed on HDI, Alcohol and Tobacco consumption per capita, and percentage of population Overweight with respect to world average

Populous Regions with over-indexed
Overweight population and High CVD Burden

- Represents 37% of the world population
- \bullet Accounts for ~7.6M CVD 41% of all CVD worldwide; CVD WRT Population of the Country is close to the world's average
- Top Countries (accounts for 70% of all CVD of this Cluster): China, Brazil, Japan, Egypt, Turkey, Iran, and Mexico
- HDI and Tobacco consumption per capita is close to world average, Alcohol consumption per capita is 13% under-indexed, and Percentage of population Overweight is about 20% over-indexed with respect to world average

Developed Regions with
Over-indexed Tobacco
and Alcohol
Consumption and High
CVD

- Represents 16% of the world population
- Accounts for ~4.9M CVD 26% of all CVD worldwide; CVD WRT Population of the Country is about 67% over-indexed
- Top Countries (accounts for 80% of all CVD of this Cluster): Russia, United States, Ukraine, Germany, Italy, United Kingdom, and Poland
- HDI and Tobacco consumption per capita is about 23% over-indexed, Alcohol consumption per capita is 74% over-indexed, and Percentage of population Overweight is about 26% over-indexed with respect to world average

Figure 13

Figure 13 summarizes the key characteristics of each segment.

High Population Density Regions with under-indexed HDI and Moderate CVD Burden (Segment 1) are the biggest segment in size representing about 47% of the world population and accounting for 32% of all Cardiovascular Deaths.

- This segment is significantly under-indexed with respect to the world's average on all key dimensions- the percentage of the population consuming alcohol and tobacco, the percentage of the population overweight, and the Human Development Index.
- The top countries part of this segment are key Southeast Asian countries (India, Bangladesh, Pakistan, Indonesia, Vietnam, and the Philippines).
- This segment belongs to a high population density region of the world and is lower on the human development index.
- With economies growing and habit and work cultures changing, these countries pose a significantly higher risk of increasing CVD over the next few years if proper and relevant measures - such as promoting healthy foods and exercise routine, and investment in the healthcare system – are not undertaken by local Governments.

Populous Regions with an over-indexed Overweight population and High CVD Burden (Segment 2) represent about 37% of the world population and account for 41% of all Cardiovascular Deaths.

- This segment is at par with the world's average on Human Development Index and Tobacco consumption, under-indexed on Alcohol consumption, and about 20% overindexed on the percentage of the population overweight.
- China, Brazil, Japan, Egypt, Turkey, Iran, and Mexico are the top countries in this segment and represents 80% of all CVDs in this segment.
- This region has a good opportunity to reduce CVDs by investing more in health infrastructure, preventive health care, and cardio health education.

Developed Regions with Over-indexed Tobacco and Alcohol Consumption and High CVD (Segment 3) represent only 16% of the world population and account for 26% of all Cardiovascular Deaths.

- This segment is about 67% over-indexed for Cardiovascular deaths WRT Population of the country compared to the world's average.
- This segment is 23% over-indexed on Human Development Index (HDI). This segment is also significantly over-indexed on all other key dimensions- the percentage of population consuming alcohol, tobacco, and overweight.
- The top countries part of this segment are Western developed nations or East European countries - Russia, United States, Ukraine, Germany, Italy, United Kingdom, and Poland, and represents 80% of all CVDs of this segment.
- The biggest challenge of this segment is the aged population and significantly higher consumption of Tobacco. Countries belonging to this segment can reduce CVD by focusing on educating their population on reducing tobacco consumption and focusing on eating healthy and exercising.

Conclusions

This study focuses on two key topics: (1) building a model using machine learning techniques to predict heart failure risk and its driver; (2) developing deeper global insights on cardiovascular deaths using 3 decades of data and examining the relationship between socioeconomic and demographic attributes with CVD deaths.

Key learnings from this study are as follows:

- Various ML models were built to predict heart risk. All models were able to predict patients with heart risk with 80%+ classification accuracy. Finally, the decision tree model was selected for this analysis because of its explanatory power. This ML model has a precision of 82% and an 81% recall rate for heart-risk patients. The drivers of the model have been examined and have found that ST Slope, Chest Pain Type, and Max Heart Rate are the top drivers for predicting heart risk among patients.
- Over three decades, it was seen that the increase in CVD globally outpaced world population growth (54% in CVDs vs 46% in the population). The age group of 70+ years population accounts for the majority of CVD and the percentage of total cardiovascular deaths from this group has gone up in the last three decades. Russia, Eastern European, and Central Asian countries are over-indexed on CVD with respect to average CVD worldwide.
- Three decades of CVDs trend indicates that some of the western countries with
 developed economies were able to reverse the CVDs trend while many countries- such
 as India, China, and eastern European countries, saw an increase in CVDs. The trend in
 CVDs poses a significant challenge as major populous countries are showing an
 increase in CVDs over three decades.
- Machine Learning based cluster model using aggregated attributes such as the
 percentage of the population consuming alcohol and tobacco, and the percentage of the
 population overweight, with socioeconomic factors such as the Human Development
 Index, GDP, % of the population still below the poverty line, helped segment the
 world's population into three key distinct segments. These segments are homogeneous
 within and heterogeneous across and offer a great opportunity to develop segment
 base strategies to tackle Cardiovascular health across the globe.
- It was evident from the analysis that the percentage of the population using Tobacco
 was found to be positively correlated with a higher incidence of CVDs in that country,
 while higher HDI (Human Development Index) was found to be associated with
 countries with lower incidence of CVDs and a decline in CVDs over last 3 decades. This
 suggests that improving socio-economic factors could have a positive impact on
 cardiovascular health outcomes.

Next Steps

The insights generated from this study using patient level and aggregated data helped in establishing an underlying relationship between behavioral, and socioeconomic attributes and comorbidities with cardiovascular deaths. This study helps in identifying 3 key distinct segments representing different geographies and a very unique socio-economic profile that can guide WHO and individual countries to build strategies targeted to tackle cardiovascular disease. ML-based predictive modeling helped in identifying key drivers for heart risk. To further improve the accuracy of the ML model to predict heart risk failure with a 95%+ accuracy, efforts should be put in to gather patient-level information from diverse geographical regions on genetic predisposals, lifestyle, and dietary data on a longitudinal basis to enhance richness in attributes that feed into the ML model. Efforts should be made to develop Artificial Intelligence driven wearable devices that could help predict heart risk with very high accuracy well in advance to prevent deaths. This will be very helpful for developed nations (North America and Western Europe with aged populations) to prevent deaths due to cardiovascular episodes among the aged population.

To decrease the incidents of cardiovascular disease (CVD) deaths, it is crucial to implement more preventive measures. One effective measure is to incorporate health education about the hazards of sedentary lifestyles, tobacco and alcohol consumption, and unhealthy diets into the K-12 curriculum. Educating students about the long-term effects of these risk factors on their heart health, can encourage healthy behaviors early on and reduce the prevalence of CVD in the future.

These insights provide a solid foundation, but efforts to build richer and more extensive patient-level data representing a broader set of countries should be continued. Deeper studies on policies, programs, and preventive measurement practices adopted by top contributors to cardiovascular deaths worldwide should be carried out. Developed policies and practices focused on top drivers of heart risk and CVD will help reduce premature deaths because of CVDs and in turn mitigate the huge economic loss society bears due to this disease.

Digital Scientific Poster



Predicting Heart Disease Risk Drivers Using Machine Learning Algorithms and Global Insights on Cardiovascular Mortalities

#603893 Louisville, Kentucky

Cardiovascular diseases (CVD) have consistently been the leading cause of

- Around 18 million people die from CVD yearly, representing 32% of all global
- 85% of these CVD deaths are due to heart attacks and stroke

- tobaccouse
 unhealthy diet and obesity
 physical inactivity
 harmful use of alcohol
 CVD has a heavy economic burden on society. Cost of CVD is estimated in
 multiple categories screening primary prevention, acute hospital care, loss of
 productivity. Cost of CVD could be as high as US\$20 trillion from 2010 to 2030.

The main objective of this study is to examine global distribution of cardiovascular death's and its relationship with behavioral and socio -economic factors and build machine learning models to predict heart disease risk and

The key insights from this analysis can help WHO and national and state —level governments to develop data —driven plans to identify risk factors and proactively manage this disease to reduce deaths and its economic impact on society.

Machine Learning models have been created using a curated dataset consisting of 1190 patients from the United States, United Kingdom, Switzerland, and Hungary. Global level insights have been created using multiple datasets including:

Worldwide Socioeconomic attifute and CVD deaths

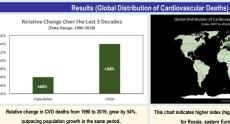
Three decades (1990 to 2019) of country level deaths by cause

Exploratory Data Analysis is the first step performed on each dataset to understand the data in detail. Statistical and ML techniques are used to analyze this data to highlight underlying patterns and bulld models (Decision Tree and Clustering) to develop deeper and actionable insights.

Results (Global Distribution of Cardiovascular Deaths)

Deaths by top Diseases	1990	2019	Relative Change (2019-1990)/1990
Cardiovascular Diseases	28%	34%	23.1%
Neoplasms (Cancer)	13%	19%	40.2%
Lower respiratory infections	8%	5%	-39.9%
Chronic respiratory diseases	7%	7%	2.8%
Neonatal disorders	7%	3%	-49.9%
Diarrheal diseases	7%	3%	-57.6%
Digestive diseases	4%	5%	10.4%
Tuberculosis	4%	2%	-46.9%
Diabetes mellitus	2%	3%	87.6%
Alzheimer	1%	3%	131.7%

CVD continues to be the leading cause of deaths worldwide, increasing from 28% in 1990 to 34% in 2019.



This chart indicates higher index (higher CVD deaths WRT population) for Russia, eastern Europe and Central Asia.

Results (Predicting Heart Risk Using Decision Tree Model & Insights)

Methodology Used for Training and Testing ML Model to predict Heart Failure Risk Classification Accuracy and Precision



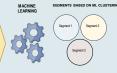
Precision and Recall numbers for predicting Heart Risk exhibit Attribute Importance from Strongest to Least link relative stability of the model. have heart problems
This refers to cholesterol within the blood
Exercise Angina measures whether or not a patient had Angina severe heart pain) during exercise fasting blood sugar measures a person's blood sugar and how it will

ST Slope is most important attribute in predicting heart risk followed by Chest Pain Type. Sex. and Max Heart Rate.

Results (Clustering and Key Segments)

Methodology Used for Generating Segment using ML Clustering Model







Cardiovascular health across the globe.

Key learnings from this study are as follows:

- . ST Slope, Chest Pain Type, and Max Heart Rate are top drivers for predicting heart risk
- CVD globally outpaced world population growth (54% in CVDs vs 46% in population). Age group of 70+ years population accounts for European, and Central Asian countries are over -indexed on CVD.
- Some of the western countries with developed economies were able to reverse CVD trend. Major populous countries show an increase in CVDs, posing a significant
- Three distinct segments identified based on aggregated attributes % of population consuming alcohol and tobacco, % of population overweight, other socioeconomic far allowing for development of segment -based strategies to tackle CVD globally.
- . % of population using Tobacco was found to be positively correlated with a higher
- Higher HDI (Human Development Index) found to be associated with countries with a wer incidence and decline in CVDs.
- Analysis suggests that improving socio-economic factors could have a positive impact on cardiovascular health outcomes.

To improve the accuracy of ML model to 95% + accuracy, efforts should be put in to enhance richness in attributes by gathering patient level information from

- diverse geographical regions on genetic predispos
- lifestyle and dietary data on longitudinal basis

To decrease the incidents of cardiovascular disease (CVD) deaths, it is crucial to implement Social Factors:

- Develop Al driven wearable devices that could help predict heart risk with very high accuracy to prevent deaths. This will be very helpful for developed nations to pr deaths due to CVD amongst aged population.
- Measures to incorporate health education into the K-12 curriculum on hazards of measures to incorporate relative occurrent into the Text controlled in integrals of sectionary lifestlyes, tobacco and alcohol consumption, and unhealthy diets should be undertaken. This can promote students to imbibe healthy behaviors early on and reduce the prevalence of CVD in future.
- Carry out deeper study on policies, programs and prev adopted by the countries that were able to reverse CVI

Economic Factors:

WHO should encourage countries to adopt effective policies and practices focused on reducing burden of heart risk and CVD. This will help reduce premature deaths and in turn mitigate huge economic loss.

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Appendix

Data Analysis on Raw Data using Excel:

Country-Level Population:

Year	Country	Population	Region	Total	Region		%WRT Population
2019	Afghanistan	37769496	Afghanistan	61994	Afghanistan	61994	0.16%
2019	Albania	2873883	Albania	12904	Albania	12904	0.45%
2019	Algeria	42705372	Algeria	97930	Algeria	97930	0.23%
2019	American Samoa	47341	American Samoa	125	American Samoa	125	0.26%
2019	Andorra	76361	Andorra	168	Andorra	168	0.22%
2019	Angola	32353592	Angola	25723	Angola	25723	0.08%
2019	Anguilla	15408	Anguilla		Anguilla		0.00%
2019	Antigua and Barbuda	92127	Antigua and Barbuda	200	Antigua and Barbuda	200	0.22%
2019	Argentina	44745516	Argentina	101725	Argentina	101725	0.23%
2019	Armenia	2820604	Armenia	13507	Armenia	13507	0.48%
2019	Aruba	106458	Australia	51615	Aruba		0.00%
2019	Australia	25357168	Austria	32999	Australia	51615	0.20%
2019	Austria	8879939	Azerbaijan	42138	Austria	32999	0.37%
2019	Azerbaijan	10232761	Bahamas	867	Azerbaijan	42138	0.41%
2019	Bahamas	404563	Bahrain	1272	Bahamas	867	0.21%
2019	Bahrain	1494195	Bangladesh	324765	Bahrain	1272	0.09%
2019	Bangladesh	165516224	Barbados	905	Bangladesh	324765	0.20%
2019	Barbados	280193	Belarus	75338	Barbados	905	0.32%
2019	Belarus	9673971	Belgium	33627	Belarus	75338	0.78%
2019	Belgium	11510569	Belize	464	Belgium	33627	0.29%
2019	Belize	389103	Benin	11418	Belize	464	0.12%
2019	Benin	12290443	Bermuda	209	Benin	11418	0.09%
2019	Bermuda	63833	Bhutan	1208	Bermuda	209	0.33%
2019	Bhutan	767467	Bolivia	15903	Bhutan	1208	0.16%
2019	Bolivia	11777318	Bosnia and Herzegovina	18828	Bolivia	15903	0.14%
2019	Bonaire Sint Eustatius and Saba	25597	Botswana	3519	Bonaire Sint Eustatius and Saba	э	0.00%
2019	Bosnia and Herzegovina	3360718	Brazil	397993	Bosnia and Herzegovina	18828	0.56%
2019	Botswana	2499705	Brunei	508	Botswana	3519	0.14%
2019	Brazil	211782880	Bulgaria	79119	Brazil	397993	0.19%
2019	British Virgin Islands	30631	Burkina Faso	22151	British Virgin Islands		0.00%
2019	Brunei	438058	Burundi	10803	Brunei	508	0.12%
2019	Bulgaria	7052536	Cambodia	30313	Bulgaria	79119	1.12%
2019	Burkina Faso	20951638	Cameroon	26491	Burkina Faso	22151	0.11%
2019	Burundi	11874838	Canada	82644	Burundi	10803	0.09%
2019	Cambodia	16207746	Cape Verde	1073	Cambodia	30313	0.19%
2019	Cameroon	25782342	Central African Republic	7210	Cameroon	26491	0.10%
2019	Canada	37522584	Chad	13838	Canada	82644	0.22%
2019	Cape Verde	577037	Chile	30114	Cape Verde	1073	0.19%
2019	Cayman Islands	66152	China	4584273	Cayman Islands		0.00%
2019	Central African Republic	5209329	Colombia	72629	Central African Republic	7210	0.14%

2019 2019 2019							
	Chad	16126868	Comoros	1143	Chad	13838	0.09%
2019	Chile	19039484	Congo	7096	Chile	30114	0.16%
	China	1421864064	Cook Islands	58	China	4584273	0.32%
2019						72629	
	Colombia	50187404	Costa Rica	6665	Colombia	-	0.14%
2019	Comoros	790993	Cote d'Ivoire	22377	Comoros	1143	0.14%
2019	Congo	5570736	Croatia	24720	Congo	7096	0.13%
2019	Cook Islands	17133	Cuba	39755	Cook Islands	58	0.34%
2019	Costa Rica	5084527	Cyprus	3112	Costa Rica	6665	0.13%
2019	Cote d'Ivoire	26147544	Czechia	51294	Cote d'Ivoire	22377	0.09%
2019	Croatia	4129749	Democratic Republic of Congo	89907	Croatia	24720	0.60%
2019	Cuba	11316699	Denmark	15331	Cuba	39755	0.35%
2019	Curacao	193119	Djibouti	1240	Curacao	03.00	0.00%
2019	Cyprus	1228840	Dominica	242	Cyprus	3112	0.25%
2019	Czechia	10536876	Dominican Republic	27139	Czechia	51294	0.49%
2019	Democratic Republic of Congo	89906896	Ecuador	21464	Democratic Republic of Congo	89907	0.10%
2019	Denmark	5795879	Egypt	263873	Denmark	15331	0.26%
2019	Djibouti	1073999	El Salvador	9694	Djibouti	1240	0.12%
2019	Dominica	71446	England	153285	Dominica	242	0.34%
2019	Dominican Republic	10881886	Equatorial Guinea	960	Dominican Republic	27139	0.25%
2019	Ecuador	17343742	Eritrea	6660	Ecuador	21464	0.12%
2019	Egypt	105618672	Estonia	8201	Egypt	263873	0.25%
2019	El Salvador	6280222	Eswatini	1518	El Salvador	9694	0.15%
2019	Equatorial Guinea	1553037	Ethiopia	76975	Equatorial Guinea	960	0.06%
2019	Eritrea	3498819	Fiji	2641	Eritrea	6660	0.19%
2019	Estonia	1327039	Finland	25384	Estonia	8201	0.62%
2019	Eswatini	1169620	France	166495	Eswatini	1518	0.13%
2019	Ethiopia	114120592	Gabon	2541	Ethiopia	76975	0.07%
2019	Faeroe Islands	51708	Gambia	2602	Faeroe Islands		0.00%
2019	Falkland Islands	3729	Georgia	29709	Falkland Islands		0.00%
2019	Fiji	918472	Germany	364285	Fiji	2641	0.29%
2019	Finland	5521539	Ghana	39650	Finland	25384	0.46%
2019	France	64399760	Greece		France	166495	0.26%
				55921		100493	
2019	French Guiana	284088	Greenland	123	French Guiana		0.00%
2019	French Polynesia	299730	Grenada	263	French Polynesia		0.00%
2019	Gabon	2242788	Guam	474	Gabon	2541	0.11%
2019	Gambia	2508882	Guatemala	15882	Gambia	2602	0.10%
2019	Georgia	3770814	Guinea	14547	Georgia	29709	0.79%
2019	Germany	83148144	Guinea-Bissau	2214	Germany	364285	0.44%
2019	Ghana	31522294	Guyana	2430	Ghana	39650	0.13%
						55050	
2019	Gibraltar	32715	Haiti	26469	Gibraltar		0.00%
2019	Greece	10574026	Honduras	15016	Greece	55921	0.53%
2019	French Guiana	284088	Greenland	123	French Guiana		0.00%
2019		299730	Grenada	263	French Polynesia		0.00%
	French Polynesia						
2019	Gabon	2242788	Guam	474	Gabon	2541	0.11%
2019	Gambia	2508882	Guatemala	15882	Gambia	2602	0.10%
2019	Georgia	3770814	Guinea	14547	Georgia	29709	0.79%
2019	Germany	83148144	Guinea-Bissau	2214	Germany	364285	0.44%
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2019	Ghana	31522294	Guyana	2430	Ghana	39650	0.13%
2019	Gibraltar	32715	Haiti	26469	Gibraltar		0.00%
2019	Greece	10574026	Honduras	15016	Greece	55921	0.53%
2019	Greenland	55955	Hungary	61818	Greenland	123	0.22%
			Iceland	723		263	
2019	Grenada	122737			Grenada		0.21%
2019	Guadeloupe	395487	India	2574408	Guadeloupe	263	0.07%
2019	Guam	168632	Indonesia	651482	Guam	474	0.28%
2019	Guatemala	17106338	Iran	173601	Guatemala	15882	0.09%
2019	Guernsey	62391	Iraq	79953	Guernsey		0.00%
2013						14547	
2010	Guinea	12877537	Ireland	10348	Guinea	14547	0.11%
2019		1970460					
2019 2019	Guinea-Bissau	1370400	Israel	12394	Guinea-Bissau	2214	0.11%
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2019 2019	Guyana	798761	Italy	236507	Guyana	2430	0.30%
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2019 2019 2019 2019 2019 2019 2019 2019	Guyana Haiti Honduras Hong Kong Hungary Iceland India Indonesia Iran Iraq Ireland Isle of Man Israel Italy Jamaica Japan	798761 11160441 9958832 7496121 9771799 360787 1383112064 269582880 86564208 41563524 4896021 83950 8607922 59727936 2813776 125791680	Italy Jamaica Japan Jordan Kazakhstan Kenya Kiribati Kuwait Kyrgyzstan Laos Latvia Lebanon Lesotho Liberia Libya Lithuania	236507 6456 372482 11798 65391 40612 348 4118 17482 13523 15778 16329 4027 4300 12748 21301	Guyana Haiti Honduras Hong Kong Hungary Iceland India Indonesia Iran Iraq Ireland Isle of Man Israel Italy Jamaica Japan	2430 26469 15016 61818 723 2574408 651482 173601 79953 10348 12394 236507 6456	0.30% 0.24% 0.15% 0.00% 0.63% 0.20% 0.19% 0.24% 0.20% 0.19% 0.21% 0.00% 0.14% 0.40% 0.30%

2019	Kiribati	124252	Maldives	522	Kiribati	348	0.28%
2019	Kosovo	1686856	Mali	19520	Kosovo		0.00%
2019	Kuwait	4441105	Malta	1490	Kuwait	4118	0.09%
2019	Kyrgyzstan	6323643	Marshall Islands	156	Kyrgyzstan	17482	0.28%
2019	Laos	7212058	Mauritania	3951	Laos	13523	0.19%
2019	Latvia	1916552	Mauritius	3309	Latvia	15778	0.82%
2019	Lebanon	5781912	Mexico	167536	Lebanon	16329	0.28%
2019	Lesotho	2225710	Moldova	23438	Lesotho	4027	0.18%
2019	Liberia	4985290	Monaco	161	Liberia	4300	0.09%
2019	Libya	6569085	Mongolia	9806	Libya	12748	0.19%
2019	Liechtenstein	38500	Montenegro	3942	Liechtenstein		0.00%
2019	Lithuania	2849083	Morocco	117034	Lithuania	21301	0.75%
2019	Luxembourg	619981	Mozambique	31693	Luxembourg	1332	0.21%
2019	Macao	663660	Myanmar	138139	Macao		0.00%
2019	Madagascar	27533134	Namibia	3748	Madagascar	35396	0.13%
2019	Malawi	18867340	Nauru	23	Malawi	15651	0.08%
2019	Malaysia	32804024	Nepal	46500	Malaysia	58825	0.18%
2019	Maldives	504518	Netherlands	42569	Maldives	522	0.10%
2019	Mali	20567430	New Zealand	11949	Mali	19520	0.09%
2019	Malta	503646	Nicaragua	8202	Malta	1490	0.30%
2019	Marshall Islands	44750	Niger	17201	Marshall Islands	156	0.35%
2019	Martinique	372254	Nigeria	163496	Martinique		0.00%
2019	Mauritania	4383853	Niue	9	Mauritania	3951	0.09%
2019	Mauritius	1296284	North Korea	102586	Mauritius	3309	0.26%
2019	Mayotte	294502	North Macedonia	14023	Mayotte		0.00%
2019	Mexico	125085312	Northern Ireland	5024	Mexico	167536	0.13%
2019	Moldova	3109496	Northern Mariana Islands	115	Moldova	23438	0.75%
2019	Monaco	37059	Norway	12724	Monaco	161	0.43%
2019	Mongolia	3232435	Oman	4998	Mongolia	9806	0.30%
2019	Montenegro	630403	Pakistan	341109	Montenegro	3942	0.63%
2019	Montserrat	4528	Palau	65	Montserrat		0.00%
2019	Morocco	36304408	Palestine	6709	Morocco	117034	0.32%
2019	Mozambique	30285602	Panama	5319	Mozambique	31693	0.10%
2019	Myanmar	53040212	Papua New Guinea	15540	Myanmar	138139	0.26%
2019	Namibia	2446648	Paraguay	9912	Namibia	3748	0.15%
2019	Nauru	12156	Peru	29215	Nauru	23	0.19%
2019	Nepal	28832500	Philippines	204312	Nepal	46500	0.16%

2019	Netherlands	17363260	Poland	174736	Netherlands	42569	0.25%
2019	New Caledonia	285374	Portugal	37354	New Caledonia	42303	0.23%
2019	New Zealand	4959033	Puerto Rico	8823	New Zealand	11949	0.24%
2019	New Zealand	6663919	Qatar	1121	Nicaragua	8202	0.24%
2019	Niger	23443400	Romania	150427	Niger	17201	0.12%
2019	Nigeria	203304496	Russia	1004932	Nigeria	163496	0.07%
2019	Niue	1943	Rwanda	11826	Niue	9	0.46%
2019	North Korea	25755442	Saint Kitts and Nevis	156	North Korea	102586	0.40%
2019	North Macedonia	2114175	Saint Lucia	445	North Macedonia	14023	0.66%
2019	Northern Mariana Islands	49880	Saint Vincent and the Grenadines	355	Northern Mariana Islands	115	0.23%
2019	Norway	5348285	Samoa	537	Norway	12724	0.24%
2019	Oman	4602769	San Marino	98	Oman	4998	0.11%
2019	Pakistan	223293280	Sao Tome and Principe	274	Pakistan	341109	0.11%
2019	Palau	17939	Saudi Arabia	45836	Palau	65	0.36%
2019	Palestine	4909775	Scotland	19285	Palestine	6709	0.14%
2019	Panama	4232538	Senegal	15982	Panama	5319	0.13%
2019	Papua New Guinea	9542492	Serbia	63768	Papua New Guinea	15540	0.16%
2019	Paraguay	6530029	Sevchelles	241	Paraguay	9912	0.15%
2019	Peru	32824864	Sierra Leone	9009	Peru	29215	0.09%
2019	Philippines	110380800	Singapore	6809	Philippines	204312	0.19%
2019	Poland	38493600	Slovakia	26797	Poland	174736	0.45%
2019	Portugal	10289921	Slovenia	7797	Portugal	37354	0.36%
2019	Puerto Rico	3292888	Solomon Islands	2285	Puerto Rico	8823	0.27%
2019	Qatar	2807242	Somalia	18521	Oatar	1121	0.04%
2019	Romania	19524212	South Africa	82660	Romania	150427	0.77%
2019	Russia	145742288	South Korea	77480	Russia	1004932	0.69%
2019	Rwanda	12835029	South Sudan	7114	Rwanda	11826	0.09%
2019	Saint Barthlemy	10504	Spain	131493	Saint Barthlemy		0.00%
2019	Saint Helena	5470	Sri Lanka	46576	Saint Helena		0.00%
2019	Saint Kitts and Nevis	47739	Sudan	74371	Saint Kitts and Nevis	156	0.33%
2019	Saint Lucia	178594	Suriname	1422	Saint Lucia	445	0.25%
2019	Saint Martin (French part)	33150	Sweden	36086	Saint Martin (French part)		0.00%
2019	Saint Pierre and Miguelon	5952	Switzerland	23968	Saint Pierre and Miguelon		0.00%
2019	Saint Vincent and the Grenadines	104940	Syria	45681	Saint Vincent and the Grenadine	355	0.34%
2019	Samoa	211915	Taiwan	41061	Samoa	537	0.25%
2019	San Marino	34203	Tajikistan	21856	San Marino	98	0.29%
2019	Sao Tome and Principe	214612	Tanzania	54489	Sao Tome and Principe	274	0.13%

2019	Saudi Arabia	35827364	Thailand	115830	Saudi Arabia	45836	0.13%
2019	Senegal	16000783	Timor	2460	Senegal	15982	0.10%
2019	Serbia	7401056	Togo	8361	Serbia	63768	0.86%
2019	Seychelles	104386	Tokelau	4	Seychelles	241	0.23%
2019	Sierra Leone	8046830	Tonga	177	Sierra Leone	9009	0.11%
2019	Singapore	5866408	Trinidad and Tobago	4016	Singapore	6809	0.12%
2019	Sint Maarten (Dutch part)	43002	Tunisia	35008	Sint Maarten (Dutch part)	0003	0.00%
2019	Slovakia	5453932	Turkey	176662	Slovakia	26797	0.49%
2019	Slovenia	2112905	Turkmenistan	18323	Slovenia	7797	0.37%
2019	Solomon Islands	675000	Tuvalu	42	Solomon Islands	2285	0.34%
2019	Somalia	15981312	Uganda	28150	Somalia	18521	0.12%
2019	South Africa	58087060	Ukraine	449376	South Africa	82660	0.14%
2019	South Korea	51803832	United Arab Emirates	8622	South Korea	77480	0.15%
2019	South Sudan	10447677	United Kingdom	188112	South Sudan	7114	0.07%
2019	Spain	47131372	United States	957455	Spain	131493	0.28%
2019	Sri Lanka	21649664	United States Virgin Islands	501	Sri Lanka	46576	0.22%
2019	Sudan	43232092	Uruguay	10004	Sudan	74371	0.17%
2019	Suriname	600305	Uzbekistan	107395	Suriname	1422	0.24%
2019	Sweden	10267922	Vanuatu	868	Sweden	36086	0.35%
2019	Switzerland	8575593	Venezuela	61510	Switzerland	23968	0.33%
2019	Syria	20098252	Vietnam	240161	Syria	45681	0.23%
2019	Taiwan	23777742	Wales	10520	Taiwan	41061	0.23%
2019	Tajikistan	9337008	Yemen	55753	Tajikistan	21856	0.17%
2019	Tanzania	59872584	Zambia	18157	Tanzania	54489	0.25%
2019	Thailand	71307768			Thailand		0.09%
2019	Timor	1280442	Zimbabwe	17810	Timor	115830 2460	0.16%
2019				1070000		8361	
2019	Togo Tokelau	8243093 1775		18739989	Togo Tokelau	8361	0.10% 0.23%
2019		104965				177	0.25%
2019	Tonga	1519960			Tonga	4016	0.17%
2019	Trinidad and Tobago Tunisia	12049319			Trinidad and Tobago Tunisia	35008	0.26%
2019	Turkey	83481688			Turkey	176662	0.29%
2019	Turkmenistan	6158424			Turkmenistan	18323	0.21%
2019	Turks and Caicos Islands	43104			Turks and Caicos Islands	16525	0.00%
2019	Tuvalu	10983			Turks and Calcos Islands	42	0.38%
2019	Uganda	42949076			Uganda	28150	0.38%
2019	Ukraine	44211100			Ukraine	449376	1.02%
2015	Oklaine	44211100			OKIAIIIE	445370	1.02/0
2019	United Arab Emirates	9211660			United Arab Emirates	8622	0.09%
2019	United Kingdom	66778660			United Kingdom	188112	0.28%
2019	United States	334319680			United States	957455	0.29%
2019	United States Virgin Islands	100837			United States Virgin Islands	501	0.50%
2019	Uruguay	3428412			Uruguay	10004	0.29%
2019	Uzbekistan	32976946			Uzbekistan	107395	0.33%
2019	Vanuatu	304414			Vanuatu	868	0.29%
2019	Vatican	815			Vatican		0.00%
2019	Venezuela	28971686			Venezuela	61510	0.21%
2019	Vietnam	95776712			Vietnam	240161	0.25%
2019	Wallis and Futuna	11735			Wallis and Futuna		0.00%
2019	Yemen	31546694			Yemen	55753	0.18%
2019	Zambia	18380478			Zambia	18157	0.10%
2019	Zimbabwe	15354606			Zimbabwe	17810	0.10%
2017	LIIIDADWE	15554000			Lillingowe	1/010	0.12/0

Cardio Deaths by County

Entity -2019	Cardio Deaths			WRT Avg Cardio Deaths	Country	Population
Afghanistan	61995	0.16%	0.49%	0.69	Afghanistan	37769496
Albania	12904	0.45%	0.45%	1.88	Albania	2873883
Algeria	97931	0.23%	0.13%	0.96	Algeria	42705372
American Samoa	125	0.26%	0.26%	1.10	American Samoa	47341
Andorra	169	0.22%	0.22%	0.92	Andorra	76361
Angola	25724	0.08%	0.08%	0.33	Angola	32353592
Antigua and Barbuda	200	0.00%	0.22%	0.91	Antigua and Barbuda	92127
	101725	0.22%	0.22%	0.95	Arrigua and Barbuda Argentina	44745516
Argentina		0.2070		2.00		2820604
Armenia	13507	0.48%	0.48%		Armenia	
Australia	51615			0.85	Australia	25357168
Austria	32998	0.37%	0.37%	1.55	Austria	8879939
Azerbaijan	42138	0.41%	0.41%	1.72	Azerbaijan	10232761
Bahamas	869	0.21%	0.21%	0.90	Bahamas	404563
Bahrain	1271	0.09%	0.09%	0.36	Bahrain	1494195
Bangladesh	324764	0.20%	0.20%	0.82	Bangladesh	165516224
Barbados	905	0.32%	0.32%	1.35	Barbados	280193
Belarus	75339	0.78%	0.78%	3.25	Belarus	9673971
Belgium	33627	0.29%	0.29%	1.22	Belgium	11510569
Belize	464	0.12%	0.12%	0.50	Belize	389103
Benin	11418	0.09%	0.09%	0.39	Benin	12290443
Bermuda	209	0.33%	0.33%	1.37	Bermuda	63833
Bhutan	1208	0.16%	0.16%	0.66	Bhutan	767467
Bolivia	15905	0.14%	0.14%	0.56	Bolivia	11777318
Bosnia and Herzegovina	18828	0.56%	0.56%	2.34	Bosnia and Herzegovina	3360718
Botswana	NULL	#VALUE!	#VALUE!	#VALUE!	Botswana	2499705
Brazil	397993	0.19%	0.19%	0.79	Brazil	211782880
Brunei	508	0.12%	0.12%	0.48	Brunei	438058
Bulgaria	79119	1.12%	1.12%	4.69	Bulgaria	7052536
Burkina Faso	22151	0.11%	0.11%	0.44	Burkina Faso	20951638
Burundi	10804	0.09%	0.09%	0.38	Burundi	11874838
Cambodia	30313	0.19%	0.19%	0.78	Cambodia	16207746
Cameroon	26491	0.10%	0.10%	0.43	Cameroon	25782342
Canada	82644	0.22%	0.22%	0.92	Canada	37522584
Cape Verde	1073	0.19%	0.19%	0.78	Cape Verde	577037
Central African Republic	7210	0.14%	0.14%	0.58	Central African Republic	5209329
Chad	13837	0.09%	0.09%	0.36	Chad	16126868
Chile	30115	0.16%	0.16%	0.66	Chile	19039484
China	4584273	0.32%	0.32%	1.35	China	1421864064
Colombia	72629	0.14%	0.14%	0.60	Colombia	50187404
Comoros	1143	0.14%	0.14%	0.60	Comoros	790993
Congo	7096	0.14%	0.14%	0.53	Congo	5570736
Cook Islands	58	0.13%	0.13%	1.41	Cook Islands	17133
Costa Rica	6664	0.13%	0.13%	0.55	Costa Rica	5084527
Cote d'Ivoire	22376	0.09%	0.09%	0.36	Cote d'Ivoire	26147544
Croatia	24721	0.60%	0.60%	2.50	Croatia	
Cidatia						
	20755					4129749
Cuba	39755	0.35%	0.35%	1.47	Cuba	11316699
Cuba Cyprus	3112	0.35% 0.25%	0.35% 0.25%	1.47 1.06	Cuba Cyprus	11316699 1228840
Cuba Cyprus Czechia	3112 51294	0.35% 0.25% 0.49%	0.35% 0.25% 0.49%	1.47 1.06 2.03	Cuba Cyprus Czechia	11316699 1228840 10536876
Cuba Cyprus Czechia Czechoslovakia	3112 51294 NULL	0.35% 0.25% 0.49% #VALUE!	0.35% 0.25% 0.49% #VALUE!	1.47 1.06 2.03 #VALUE!	Cuba Cyprus Czechia Czechoslovakia	11316699 1228840 10536876 NULL
Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo	3112 51294 NULL 89906	0.35% 0.25% 0.49% #VALUE! 0.10%	0.35% 0.25% 0.49% #VALUE! 0.10%	1.47 1.06 2.03 #VALUE! 0.42	Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo	11316699 1228840 10536876 NULL 89906896
Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark	3112 51294 NULL 89906 15330	0.35% 0.25% 0.49% #VALUE! 0.10% 0.26%	0.35% 0.25% 0.49% #VALUE! 0.10% 0.26%	1.47 1.06 2.03 #VALUE! 0.42 1.11	Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark	11316699 1228840 10536876 NULL 89906896 5795879
Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti	3112 51294 NULL 89906 15330	0.35% 0.25% 0.49% #VALUE! 0.10% 0.26% 0.12%	0.35% 0.25% 0.49% #VALUE! 0.10% 0.26% 0.12%	1.47 1.06 2.03 #VALUE! 0.42 1.11	Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti	11316699 1228840 10536876 NULL 89906896 5795879 1073999
Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica	3112 51294 NULL 89906 15330 1240 242	0.35% 0.25% 0.49% #VALUE! 0.10% 0.26% 0.12% 0.34%	0.35% 0.25% 0.49% #VALUE! 0.10% 0.26% 0.12% 0.34%	1.47 1.06 2.03 #VALUE! 0.42 1.11 0.48 1.42	Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Demmark Djibouti Dominica	11316699 1228840 10536876 NULL 89906896 5795879 1073999 71446
Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominican Republic	3112 51294 NULL 89906 15330 1240 242 27140	0.35% 0.25% 0.49% #VALUE! 0.10% 0.26% 0.12% 0.34% 0.25%	0.35% 0.25% 0.49% #VALUE! 0.10% 0.26% 0.12% 0.34% 0.25%	1.47 1.06 2.03 #VALUE! 0.42 1.11 0.48 1.42	Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominican Republic	11316699 1228840 10536876 NULL 89906896 5795879 1073999 71446 10881886
Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Demmark Djibouti Dominica Dominican Republic Ecuador	3112 51294 NULL 89906 15330 1240 242 27140	0.35% 0.25% 0.49% #VALUE! 0.10% 0.26% 0.12% 0.34% 0.25% 0.12%	0.35% 0.25% 0.49% #VALUE! 0.10% 0.26% 0.12% 0.34% 0.25% 0.12%	1.47 1.06 2.03 #VALUE! 0.42 1.11 0.48 1.42 1.04	Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominica Ecuador	11316699 1228840 10536876 NULL 89906896 5795879 1073999 71446 10881886 17343742
Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominica Republic Ecuador Egypt	3112 51294 NULL 89906 15330 1240 242 27140 21464 263873	0.35% 0.25% 0.49% #VALUE! 0.10% 0.26% 0.12% 0.34% 0.25% 0.12% 0.25%	0.35% 0.25% 0.49% #VALUE! 0.10% 0.26% 0.12% 0.34% 0.25% 0.12% 0.25%	1.47 1.06 2.03 #WALUE! 0.42 1.11 0.48 1.42 1.04 0.52	Cuba Cyprus Czechia Czechoslovakia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominica Ecuador Egypt	11316699 1228840 10536876 NULL 89906896 5795879 1073999 71446 10881886 17343742
Cuba Cyprus Cyechia Czechia Czechosiovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominican Republic Ecuador Egypt El Salvador	3112 51294 NULL 89906 15330 1240 242 27140 21464 263873 9695	0.35% 0.25% 0.49% #VALUE! 0.10% 0.26% 0.12% 0.34% 0.25% 0.12% 0.25% 0.15%	0.35% 0.25% 0.49% #VALUE! 0.10% 0.26% 0.12% 0.34% 0.25% 0.12% 0.25% 0.15%	1.47 1.05 2.03 #VALUE! 0.42 1.11 0.48 1.42 1.04 0.52	Cuba Cyprus Czechia Czechoslovakia Demoratic Republic of Congo Demmark Djibouti Dominica Dominican Republic Ecuador Egypt El Salvador	11316699 1228840 10536876 NULL 89906896 5795879 1073999 71446 10881886 17343742 105518672 6280222
Cuba Cyprus Cyprus Czechia Czechoslovakia Democratic Republic of Congo Demmark Djibouti Dominica Dominican Republic Ecuador Egypt El Salvador Equatorial Guinea	3112 51294 NULL 89906 15330 1240 27140 21464 263873 9695	0.35% 0.25% 0.49% #VALUE! 0.10% 0.12% 0.34% 0.25% 0.12% 0.25% 0.15% 0.06%	0.35% 0.25% 0.49% #VALUE! 0.10% 0.26% 0.12% 0.34% 0.25% 0.12% 0.15% 0.06%	1.47 1.06 2.03 #VALUE! 0.42 1.11 0.48 1.42 1.04 0.52 1.04 0.65	Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominican Republic Ecuador Egypt El Salvador Equatorial Guinea	11316699 1228840 10536876 NULL 89906896 5795879 1073999 71446 10881886 17343742 105518672 6280222 1553037
Cuba Cyprus Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominican Republic Ecuador Egypt El Salvador Equatorial Guinea Eritrea	3112 51294 NULL 89906 15330 1240 242 27140 21454 263873 9695 960 6660	0.35% 0.25% 0.49% #VALUE! 0.10% 0.25% 0.12% 0.34% 0.25% 0.12% 0.15% 0.05% 0.05%	0.35% 0.25% 0.49% #VALUE! 0.10% 0.12% 0.25% 0.12% 0.25% 0.12% 0.25% 0.15%	1.47 1.06 2.03 #WALUE! 0.42 1.11 0.48 1.42 1.04 0.52 1.04 0.65 0.65	Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominican Republic Ecuador Egypt El Salvador Equatorial Guinea Eritrea	11316699 1228840 10536876 NULL 89906896 5795879 1073999 71446 10881886 17343742 105618672 6280222 1553037 3498819
Cuba Cyprus Cyprus Czechia Czechosiovakia Democratic Republic of Congo Demmark Djibouti Dominica Dominican Republic Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia	3112 51294 NULL 89906 15330 1240 27140 2164 263873 9695 960 66660 8201	0.35% 0.25% 0.49% #VALUE! 0.10% 0.26% 0.12% 0.34% 0.25% 0.12% 0.25% 0.15% 0.05% 0.15% 0.06% 0.06%	0.35% 0.25% 0.49% #VALUE! 0.10% 0.12% 0.12% 0.25% 0.12% 0.25% 0.12% 0.12% 0.25% 0.12%	1.47 1.06 2.03 #VALUE! 0.42 1.11 0.48 1.42 1.04 0.52 1.04 0.55 0.26 0.80 2.58	Cuba Cyprus Czechia Czechoslovakia Demoratic Republic of Congo Demmark Djibouti Dominica Dominican Republic Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia	11316699 1228840 10556876 NULL 89906896 5795879 1073999 71446 10881886 17343742 105618672 6280222 1553037 3498819
Cuba Cyprus Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominican Republic Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia Estonia	3112 51294 NULL 89906 15330 1240 21454 27140 21464 263873 9695 960 6660 8201 1519	0.35% 0.25% 0.49% #VALUE! 0.10% 0.26% 0.12% 0.25% 0.15% 0.15% 0.06% 0.06% 0.19%	0.35% 0.25% 0.49% #VALUE! 0.10% 0.26% 0.12% 0.34% 0.12% 0.15% 0.15% 0.06% 0.16% 0.16% 0.16%	1.47 1.06 2.03 #MAUEI 0.42 1.11 0.48 1.42 1.04 0.52 1.04 0.52 0.26 0.80 0.80 0.54	Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominica Dominica Republic Ecuador Egypt El Salvador Equotrial Guinea Eritrea Estonia Eswatini	11316699 1228840 10536876 NUL 89906896 5795879 1073999 71446 10881886 17343742 105618672 6280222 1553037 3498819 1327039
Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominica Republic Ecuador Egypt El Salvador Equatorial Guinea Erritrea Estonia Eswatin Ethiopia	3112 51294 NULL 88906 15330 1240 242 27140 21464 263873 9695 9606 6660 8201 1519 76975	0.35% 0.25% 0.49% #VALUE! 0.10% 0.26% 0.12% 0.25% 0.12% 0.25% 0.12% 0.25% 0.16% 0.19% 0.60% 0.19%	0.35% 0.25% 0.49% #VALUEI 0.10% 0.26% 0.12% 0.25% 0.15% 0.15% 0.06% 0.19% 0.06% 0.19% 0.06% 0.19%	1.47 1.06 2.03 #WALUEI 0.42 1.11 0.48 1.42 1.04 0.52 1.04 0.65 0.26 0.80 2.58 0.54 0.28	Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominican Republic Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia Eswatini Ethiopia	11316699 1228840 10536876 NULL 89906896 5795879 1073899 71446 10881886 17343742 105518672 6280222 1550037 3498819 1327039 1169620 114120592
Cuba Cyprus Cyprus Czechia Czechosiovakia Democratic Republic of Congo Demmark Djibouti Dominica Dominican Republic Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia Eswatini Ethiopia Fiji	3112 51294 NULL 88906 15330 1240 242 27140 21464 263873 9695 9695 960 6660 8201 1519 76975 2642	0.35% 0.25% 0.25% 1vVALUE! 0.10% 0.26% 0.12% 0.25% 0.12% 0.25% 0.15% 0.15% 0.16% 0.19% 0.62% 0.13%	0.35% 0.25% 0.25% 0.49% #VALUE! 0.10% 0.26% 0.12% 0.25% 0.12% 0.25% 0.106% 0.19% 0.66% 0.19%	1.47 1.06 2.03 #VALUE! 0.42 1.11 0.48 1.42 1.04 0.52 1.04 0.55 0.26 0.80 2.58 0.54 0.28 1.20	Cuba Cyprus Czechia Czechoslovakia Demoratic Republic of Congo Demmark Djibouti Dominica Dominican Republic Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia Eswatini Ethiopia Fiji	11316699 1228840 10536876 NULL 89906896 5795879 1073999 71446 10881886 17343742 105618672 628022 1553037 3498819 1327039 1169620 114120592 918472
Cuba Cyprus Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominica Dominica Republic Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia Eswatini Ethiopia Fiji Finland	3112 51294 NULL 89906 15330 1240 21446 263873 9695 960 6660 8201 1519 76975 26442 25388	0.35% 0.25% 0.49% #VALUEI 0.10% 0.26% 0.12% 0.34% 0.25% 0.12% 0.15% 0.15% 0.15% 0.15% 0.06% 0.13% 0.07% 0.62% 0.13% 0.07%	0.35% 0.25% 0.49% #VALUE! 0.10% 0.26% 0.12% 0.34% 0.25% 0.12% 0.15% 0.15% 0.15% 0.06% 0.13% 0.07% 0.06% 0.13% 0.07%	1.47 1.06 2.03 #MAUEI 0.42 1.11 0.48 1.42 1.04 0.52 1.04 0.65 0.26 0.80 2.58 0.54 0.28 1.20	Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominican Republic Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia Eswatini Ethiopia Fiji Finland	11316699 1228840 10536876 NUL 89906896 5795879 1073999 71446 10881886 17343742 105518672 6280222 1553037 349819 1327039 1169620 114120592 918472 5521539
Cuba Cyprus Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominica Dominica Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia Eswatini Ethiopia Fiji Fiji Finland France	3112 51294 NULL 88906 15330 1240 242 27140 21464 263873 9695 9606 6660 8201 1519 76975 2642 25383 166496	0.35% 0.25% 0.49% #VALUEI 0.10% 0.26% 0.12% 0.34% 0.25% 0.15% 0.15% 0.15% 0.15% 0.10% 0.06% 0.19% 0.06% 0.19% 0.06% 0.19% 0.06% 0.19%	0.35% 0.25% 0.49% #VALUE! 0.10% 0.26% 0.12% 0.25% 0.15% 0.06% 0.15% 0.06% 0.19% 0.06% 0.19% 0.06% 0.19%	1.47 1.06 2.03 #NAUEI 0.42 1.11 0.48 1.42 1.04 0.52 1.04 0.65 0.26 0.80 2.58 0.54 0.28 1.20 1.92 1.08	Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominican Republic Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia Eswatini Ethiopia Fiji Finland France	11316699 1228840 10536876 NULL 89906896 5795879 1073999 71446 10881886 17343742 105518672 628022 1553037 3498819 1327039 1169620 114120592 918472 5521539
Cuba Cyprus Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominican Republic Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia Eswatini Ethiopia Fjij Finland France Gabon	3112 51294 NULL 88906 15330 1240 21464 263873 9695 960 6660 8201 1519 76975 2642 25383 166496 2541	0.35% 0.25% 0.49% #VALUEI 0.10% 0.26% 0.12% 0.34% 0.25% 0.15% 0.15% 0.15% 0.15% 0.16% 0.19% 0.62% 0.13% 0.29% 0.46% 0.19%	0.35% 0.25% 0.49% #VALUE! 0.10% 0.26% 0.12% 0.34% 0.25% 0.15% 0.15% 0.15% 0.15% 0.06% 0.19% 0.62% 0.13% 0.29% 0.46% 0.46% 0.26% 0.11%	1.47 1.06 2.03 #MAUE! 0.42 1.11 0.48 1.42 1.04 0.52 1.04 0.65 0.26 0.80 0.80 0.54 0.28 1.20 1.92	Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominican Republic Ecuador Egypt El Salvador Eustroial Guinea Eritrea Estonia Eswatini Ethiopia Fiji Finland France Gabon	11316699 122840 10536876 NUL 89906896 5795879 1073999 71446 10881886 17343742 105618672 6280222 1553037 3498819 1327039 1169620 114120592 918472 5521539 64399760 2242788
Cuba Cyprus Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominica Dominica Republic Ecuador Egypt El Salvador Equatorial Guinea Erritrea Estonia Eswatini Ethiopia Fjij Fjinland France Gabon Gambia	3112 51294 NULL 88906 15330 1240 2144 21464 263873 9695 9606 8201 15119 76975 2642 25388 166496	0.35% 0.25% 0.49% #VALUEI 0.10% 0.12% 0.12% 0.12% 0.25% 0.12% 0.15% 0.06% 0.19% 0.06% 0.19% 0.62% 0.35% 0.15% 0.62% 0.13% 0.07% 0.62% 0.13% 0.07%	0.35% 0.25% 0.49% #VALUEI 0.10% 0.12% 0.12% 0.12% 0.12% 0.12% 0.15% 0.06% 0.10% 0.06% 0.10% 0.06% 0.10% 0.06% 0.10% 0.06% 0.10% 0.06% 0.10% 0.06% 0.10% 0.06% 0.10% 0.06% 0.10% 0.06% 0.10% 0.06% 0.10% 0.06% 0.10%	1.47 1.06 2.03 #WALUE! 0.42 1.11 0.48 1.42 1.04 0.52 1.04 0.65 0.80 0.26 0.80 2.58 1.20 1.28 1.20 1.08 0.47	Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominican Republic Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia Eswatini Ethiopia Fiji Finland France Gabon Gambia	11316699 1228840 10536876 NULL 89906896 5795879 1073999 71446 10881886 17343742 105618672 6280222 1553037 3498819 1327039 1169620 114120592 918472 5521539 64399760 2242788
Cuba Cyprus Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominican Republic Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia Eswatini Ethiopia Fjij Finland France Gabon	3112 51294 NULL 88906 15330 1240 244 27140 21464 263873 9695 960 6660 8201 1519 76975 2642 25383 166496 2541 2603 29709	0.35% 0.25% 0.49% #VALUEI 0.10% 0.12% 0.12% 0.12% 0.15% 0.15% 0.15% 0.15% 0.06% 0.13% 0.079% 0.46% 0.11% 0.10% 0.10%	0.35% 0.25% 0.25% 0.49% #VALUEI 0.10% 0.26% 0.26% 0.12% 0.34% 0.25% 0.15% 0.15% 0.15% 0.19% 0.62% 0.19% 0.06% 0.19% 0.01% 0.01% 0.06%	1.47 1.06 2.03 #WAUE! 0.42 1.11 0.48 1.42 1.04 0.52 1.04 0.65 0.26 0.80 2.58 0.54 0.28 1.20 1.92 1.08 0.47 0.43	Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominican Republic Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia Eswatini Ethiopia Fiji Finland France Gabbon Gambia	11316699 1228840 10536876 NULL 89906896 5795879 1073999 71446 10881886 17343742 105518672 628022 1553037 3498819 1327039 1169620 114120592 918472 521539 64399760 2242788 2508882 3770814
Cuba Cyprus Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominica Dominica Republic Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia Eswatini Ethiopia Fjij Finland France Gabon Gambia Georgia Georgia	3112 51294 NULL 89906 15330 1240 21464 263873 9695 960 6660 8201 1519 76975 2642 25383 166496 2541 2603 29709 364285	0.35% 0.25% 0.49% #VALUEI 0.10% 0.12% 0.34% 0.25% 0.12% 0.12% 0.13% 0.06% 0.11% 0.06% 0.13% 0.07% 0.46% 0.10% 0.10% 0.10% 0.10% 0.10%	0.35% 0.25% 0.49% #VALUEI 0.10% 0.12% 0.12% 0.12% 0.12% 0.13% 0.06% 0.13% 0.06% 0.13% 0.07% 0.26% 0.13% 0.07% 0.26% 0.10% 0.26% 0.10% 0.10% 0.10%	1.47 1.06 2.03 #/ALUE! 0.42 1.11 0.48 1.42 1.04 0.52 1.04 0.55 0.26 0.80 2.58 0.80 2.58 0.28 1.20 1.92 1.08 0.47 0.43 3.29 1.83	Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominica Dominica Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia Eswatini Ethiopia Fjij Finland France Gabbon Gambia Georgia	11316699 122840 10536876 NUL 89906896 5795879 1073999 71446 10881886 17343742 105618672 6280222 11553037 3498819 1327039 1169620 114120592 918472 5521539 64399760 2242728 2508882 3770814
Cuba Cyprus Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominica Dominica Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia Eswatini Ethiopia Fiji Finland France Gabon Gambia Georgia	3112 51294 NULL 88906 15330 1240 244 27140 21464 263873 9695 960 6660 8201 1519 76975 2642 25383 166496 2541 2603 29709	0.35% 0.25% 0.49% #VALUEI 0.10% 0.12% 0.12% 0.12% 0.15% 0.15% 0.15% 0.15% 0.06% 0.13% 0.079% 0.46% 0.11% 0.10% 0.10%	0.35% 0.25% 0.25% 0.49% #VALUEI 0.10% 0.26% 0.26% 0.12% 0.34% 0.25% 0.15% 0.15% 0.15% 0.19% 0.62% 0.19% 0.06% 0.19% 0.01% 0.01% 0.06%	1.47 1.06 2.03 #WAUE! 0.42 1.11 0.48 1.42 1.04 0.52 1.04 0.65 0.26 0.80 2.58 0.54 0.28 1.20 1.92 1.08 0.47 0.43	Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominican Republic Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia Eswatini Ethiopia Fiji Finland France Gabbon Gambia	11316699 1228840 10536876 NULL 89906896 5795879 1073999 71446 10881886 17343742 105518672 628022 1553037 3498819 1327039 1169620 114120592 918472 521539 64399760 2242788 2508882 3770814
Cuba Cyprus Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominica Dominica Republic Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia Eswatini Ethiopia Fiji Finland France Gabon Gambia Georgia Germany	3112 51294 NULL 89906 15330 1240 21464 263873 9695 960 6660 8201 1519 76975 2642 25383 166496 2541 2603 29709 364285	0.35% 0.25% 0.49% #VALUEI 0.10% 0.12% 0.34% 0.25% 0.12% 0.12% 0.13% 0.06% 0.11% 0.06% 0.13% 0.07% 0.46% 0.10% 0.10% 0.10% 0.10% 0.10%	0.35% 0.25% 0.49% #VALUEI 0.10% 0.12% 0.12% 0.12% 0.12% 0.13% 0.06% 0.13% 0.06% 0.13% 0.07% 0.26% 0.13% 0.07% 0.26% 0.10% 0.26% 0.10% 0.10% 0.10%	1.47 1.06 2.03 #MAUE! 0.42 1.11 0.48 1.42 1.04 0.52 1.04 0.65 0.26 0.80 2.58 0.54 0.28 1.20 1.92 1.08 0.47 0.43 3.29 1.83 0.53	Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominica Dominica Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia Eswatini Ethiopia Fjij Finland France Gabbon Gambia Georgia	11316699 122840 10536876 NUL 89906896 5795879 1073999 71446 10881886 17343742 105618672 6280222 11553037 3498819 1327039 1169620 114120592 918472 5521539 64399760 2242728 2508882 3770814
Cuba Cyprus Cyprus Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominican Republic Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia Eswatini Ethiopia Fiji Finland France Gabon Gambia Georgia Georgia Germany Ghana	3112 51294 NULL 88906 15330 1240 242 27140 21464 263873 9655 9600 8201 1519 76975 2642 25383 166496 2541 2639 29709 364285	0.35% 0.25% 0.49% 14VALUEI 0.10% 0.26% 0.12% 0.25% 0.15% 0.15% 0.15% 0.15% 0.10% 0.62% 0.10% 0.10% 0.10% 0.13% 0.13% 0.13% 0.13% 0.13% 0.13% 0.13% 0.13%	0.35% 0.25% 0.49% #VALUE! 0.10% 0.12% 0.12% 0.25% 0.15% 0.15% 0.06% 0.06% 0.10% 0.07% 0.07% 0.07% 0.10%	1.47 1.06 2.03 #MAUEI 0.42 1.11 0.48 1.42 1.04 0.52 1.04 0.65 0.26 0.80 2.58 1.20 1.92 1.08 0.47 0.43 3.29 1.83 0.53 2.21	Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominican Dominican Republic Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia Eswatini Ethiopia Fiji Finland France Gabon Gambia Georgia Germany	11316699 1228840 10536876 NUL 89906896 5795879 1073999 71446 10881886 17343742 105518672 6280222 1553037 3498819 1327039 114120592 918472 5521539 64399760 2242728 250882 3770814 33148144 31522294
Cuba Cyprus Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominican Republic Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia Eswatini Ethiopia Fjij Finland France Gabon Gambia Georgia Germany Ghana	3112 51294 NULL 88906 15330 1240 242 27140 21464 2163873 9695 9600 8201 15199 76975 2642 25383 166496 2541 2630 29709 364285 396650	0.35% 0.25% 0.49% #VALUE! 0.10% 0.26% 0.12% 0.25% 0.15% 0.15% 0.15% 0.15% 0.10% 0.62% 0.13% 0.079% 0.46% 0.10% 0.1	0.35% 0.25% 0.49% #VALUE! 0.10% 0.12% 0.12% 0.12% 0.15% 0.15% 0.15% 0.15% 0.15% 0.15% 0.15% 0.16% 0.11% 0.46% 0.11% 0.10% 0.46% 0.11% 0.10	1.47 1.06 2.03 #NAUEI 0.42 1.11 0.48 1.42 1.04 0.52 1.04 0.65 0.26 0.80 2.58 0.54 0.28 1.20 1.92 1.08 0.47 0.43 3.29 1.83 0.53 2.21 0.92	Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominican Republic Ecuador Egypt El Salvador Eustroial Guinea Eritrea Estonia Eswatini Ethiopia Fiji Finland France Gabon Gambia Georgia Germany Ghana Greece	11316699 122840 10536876 NUL 89906896 5795879 1073999 71446 10881886 17343742 105618672 6280222 11553037 3498819 1327039 1169620 114120592 918472 5521539 64399760 2242788 2508882 3770814 83148144 31522294
Cuba Cyprus Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominica Dominica Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia Eswatini Ethiopia Fiji Finland France Gabon Gambia Georgia Geermany Ghana Greece	3112 51294 NULL 88906 15330 1240 242 27140 21464 263873 9695 9600 6660 8201 15191 76975 2642 25333 166496 25411 2603 29709 364285 39650 39650	0.35% 0.25% 0.49% 14VALUEI 0.10% 0.26% 0.12% 0.25% 0.15% 0.15% 0.15% 0.15% 0.10% 0.62% 0.10% 0.10% 0.10% 0.13% 0.13% 0.13% 0.13% 0.13% 0.13% 0.13% 0.13%	0.35% 0.25% 0.49% #VALUE! 0.10% 0.12% 0.12% 0.25% 0.15% 0.15% 0.06% 0.06% 0.10% 0.07% 0.07% 0.07% 0.10%	1.47 1.06 2.03 #MAUEI 0.42 1.11 0.48 1.42 1.04 0.52 1.04 0.65 0.26 0.80 2.58 1.20 1.92 1.08 0.47 0.43 3.29 1.83 0.53 2.21	Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominican Republic Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia Eswatini Ethiopia Fiji Finland France Gabon Gambia Georgia Germany Ghana Greece	11316699 1228840 10536876 NUL 89906896 5795879 1073999 71446 10881886 17343742 105518672 6280222 1553037 3498819 1327039 114120592 918472 5521539 64399760 2242728 250882 3770814 33148144 31522294
Cuba Cyprus Cyprus Czechia Czechoslovakia Democratic Republic of Congo Demmark Djibouti Dominica Dominican Republic Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia Eswatini Ethiopia Fiji Fiji Finland France Gabon Gambia Georgia Germany Ghana Greece Greenland Greenada	3112 51294 NULL 88906 15330 1240 242 27140 21464 2163873 9695 9600 8201 15199 76975 2642 25383 166496 2541 2630 29709 364285 396650	0.35% 0.25% 0.49% #VALUEI 0.10% 0.12% 0.12% 0.12% 0.12% 0.15% 0.05% 0.15% 0.06% 0.19% 0.62% 0.19% 0.07% 0.29% 0.46% 0.10% 0.79% 0.46% 0.10% 0.79% 0.46% 0.10% 0.79% 0.25% 0.15% 0.25% 0.25% 0.15% 0.05% 0.25% 0.15% 0.05	0.35% 0.25% 0.49% #VALUE! 0.10% 0.12% 0.12% 0.25% 0.15% 0.15% 0.06% 0.15% 0.06% 0.10% 0.07% 0.29% 0.24% 0.25% 0.15% 0.05% 0.15% 0.05% 0.15% 0.05% 0.15% 0.05% 0.15% 0.05% 0.15% 0.05% 0.15% 0.05% 0.25% 0.15% 0.25% 0.15% 0.25% 0.25% 0.15% 0.25%	1.47 1.06 2.03 #NAUEI 0.42 1.11 0.48 1.42 1.04 0.52 1.04 0.65 0.26 0.80 2.58 0.54 0.28 1.20 1.92 1.08 0.47 0.43 3.29 1.83 0.53 2.21 0.92	Cuba Cyprus Czechia Czechoslovakia Democratic Republic of Congo Denmark Djibouti Dominica Dominican Republic Ecuador Egypt El Salvador Equatorial Guinea Eritrea Estonia Eswatini Ethiopia Fjij Finland France Gabon Gambia Georgia Germany Ghana Greece Greenland	11316699 1228840 10536876 NULL 89906896 5795879 1073899 71446 10881886 17343742 105518672 6280222 1553037 3498819 1327039 1169620 114120592 918472 5521539 64399760 2242788 2508882 3770814 83148144 831482294 10574026 55955
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	40047	0.040/	0.040/	0.00	The second second	4005004
Ireland Israel	10347 12393	0.21% 0.14%	0.21% 0.14%	0.88	Ireland Israel	4896021 8607922
Italy	236507	0.14%	0.14%	1.65	Italy	59727936
Jamaica	6457	0.40%	0.40%	0.96	Jamaica	2813776
Japan	372483	0.23%	0.23%	1.24	Japan	125791680
Jordan	11798	0.30%	0.11%	0.46	Jordan	10698682
Kazakhstan	65391	0.35%	0.35%	1.46	Kazakhstan	18754260
Kenya	40611	0.08%	0.08%	0.33	Kenya	50951452
Kiribati	349	0.08%	0.28%	1.17	Kiribati	124252
Kosovo	NULL	#VALUE!	#VALUE!	#VALUE!	Kosovo	1686856
Kuwait	4119	0.09%	0.09%	0.39	Kuwait	4441105
Kyrgyzstan	17482	0.03%	0.28%	1.16	Kyrgyzstan	6323643
Laos	13523	0.19%	0.19%	0.78	Laos	7212058
Latvia	15779	0.13%	0.13%	3.44	Latvia	1916552
Lebanon	16329	0.82%	0.82%	1.18	Lebanon	5781912
Lesotho	4028	0.18%	0.18%	0.76	Lesotho	2225710
	4299	0.18%	0.18%	0.36	Liberia	
Liberia	12747	0.19%	0.19%	0.81	Libya	4985290 6569085
Libya Lithuania	21301	0.75%	0.75%	3.12	Lithuania	2849083
Luxembourg	1332	0.73%	0.73%	0.90		619981
	35397	0.21%			Luxembourg	
Madagascar			0.13%	0.54	Madagascar	27533134
Malawi	15650	0.08%	0.08%	0.35	Malawi	18867340
Malaysia	58824	0.18%	0.18%	0.75	Malaysia	32804024
Maldives	522	0.10%	0.10%	0.43	Maldives	504518
Mali	19519	0.09%	0.09%	0.40	Mali	20567430
Malta	1491	0.30%	0.30%	1.24	Malta	503646
Marshall Islands	156	0.35%	0.35%	1.46	Marshall Islands	44750
Mauritania	3952	0.09%	0.09%	0.38	Mauritania	4383853
Mauritius	3309	0.26%	0.26%	1.07	Mauritius	1296284
Mexico	167535	0.13%	0.13%	0.56	Mexico	125085312
Micronesia (country)	331	#DIV/0!	#DIV/0!	#DIV/0!	Micronesia (country)	2402.22
Moldova	23438	0.75%	0.75%	3.15	Moldova	3109496
Monaco	161	0.43%	0.43%	1.82	Monaco	37059
Mongolia	9806	0.30%	0.30%	1.27	Mongolia	3232435
Montenegro	3943	0.63%	0.63%	2.61	Montenegro	630403
Morocco	117034	0.32%	0.32%	1.35	Morocco	36304408
Mozambique	31692	0.10%	0.10%	0.44	Mozambique	30285602
Myanmar	138139	0.26%	0.26%	1.09	Myanmar	53040212
Namibia	3747	0.15%	0.15%	0.64	Namibia	2446648
Nauru	23	0.19%	0.19%	0.79	Nauru	12156
Nepal	46501	0.16%	0.16%	0.67	Nepal	28832500
Netherlands	42569	0.25%	0.25%	1.02	Netherlands	17363260
New Zealand	11948	0.24%	0.24%	1.01	New Zealand	4959033
Nicaragua	8202	0.12%	0.12%	0.51	Nicaragua	6663919
Nigor	17201	0.079/	0.07%	0.21	Nigor	22442400
Niger Nigeria	163496	0.07%	0.07%	0.31 0.34	Niger	23443400 203304496
Niue	103490	0.08%	0.08%	1.72	Nigeria Niue	1943
			0.41%			
North Korea	102586	0.40%		1.66	North Korea	25755442
North Macedonia	14023	0.66%	0.66%	2.77	North Macedonia	2114175
Northern Mariana Islands	116	0.23%	0.23%	0.97	Northern Mariana Islands	49880
Norway	12724	0.24%	0.24%	0.99	Norway	5348285
Oman	4998	0.11%	0.11%	0.45	Oman	4602769
Pakistan	341108	0.15%	0.15%	0.64	Pakistan	223293280
Palau	65	0.36%	0.36%	1.51	Palau	17939
Palestine	6710	0.14%	0.14%	0.57	Palestine	
Panama	5318	0.13%	0.13%	0.53		4909775
Papua New Guinea	15540	0.16%			Panama	4232538
Paraguay			0.16%	0.68	Papua New Guinea	4232538 9542492
	9912	0.15%	0.15%	0.63	Papua New Guinea Paraguay	4232538 9542492 6530029
Peru	29215	0.15% 0.09%	0.15% 0.09%	0.63 0.37	Papua New Guinea Paraguay Peru	4232538 9542492 6530029 32824864
Philippines	29215 204311	0.15% 0.09% 0.19%	0.15% 0.09% 0.19%	0.63 0.37 0.77	Papua New Guinea Paraguay Peru Philippines	4232538 9542492 6530029 32824864 110380800
Philippines Poland	29215 204311 174736	0.15% 0.09% 0.19% 0.45%	0.15% 0.09% 0.19% 0.45%	0.63 0.37 0.77 1.90	Papua New Guinea Paraguay Peru Philippines Poland	4232538 9542492 6530029 32824864 110380800 38493600
Philippines Poland Portugal	29215 204311 174736 37353	0.15% 0.09% 0.19% 0.45% 0.36%	0.15% 0.09% 0.19% 0.45% 0.36%	0.63 0.37 0.77 1.90 1.52	Papua New Guinea Paraguay Peru Philippines Poland Portugal	4232538 9542492 6530029 32824864 110380800 38493600 10289921
Philippines Poland Portugal Puerto Rico	29215 204311 174736 37353 8823	0.15% 0.09% 0.19% 0.45% 0.36% 0.27%	0.15% 0.09% 0.19% 0.45% 0.36% 0.27%	0.63 0.37 0.77 1.90 1.52 1.12	Papua New Guinea Paraguay Peru Philippines Poland Portugal Puerto Rico	4232538 9542492 6530029 32824864 110380800 38493600 10289921 3292888
Philippines Poland Portugal Puerto Rico Qatar	29215 204311 174736 37353 8823 1121	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04%	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04%	0.63 0.37 0.77 1.90 1.52 1.12 0.17	Papua New Guinea Paraguay Peru Philippines Poland Portugal Puerto Rico Qatar	4232538 9542492 6530029 32824864 110380800 38493600 10289921 3292888 2807242
Philippines Poland Portugal Puerto Rico Qatar Romania	29215 204311 174736 37353 8823 1121 150427	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.77%	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.77%	0.63 0.37 0.77 1.90 1.52 1.12 0.17 3.22	Papua New Guinea Paraguay Peru Philippines Poland Portugal Puerto Rico Qatar Romania	4232538 9542492 6530029 32824864 110380800 38493600 10289921 3292888 2807242 19524212
Philippines Poland Portugal Puerto Rico Qatar Romania Russia	29215 204311 174736 37353 8823 1121 150427 1004931	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.77% 0.69%	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.77% 0.69%	0.63 0.37 0.77 1.90 1.52 1.12 0.17 3.22 2.88	Papua New Guinea Paraguay Peru Philippines Poland Portugal Puerto Rico Qatar Romania Russia	4232538 9542492 6530029 32824864 110380800 38493600 10289921 3292888 2807242 19524212
Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda	29215 204311 174736 37353 8823 1121 150427 1004931 11826	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.77% 0.69%	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.77% 0.69% 0.09%	0.63 0.37 0.77 1.90 1.52 1.12 0.17 3.22 2.88 0.39	Papua New Guinea Paraguay Peru Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda	4232538 9542492 6530029 32824864 110380800 38493600 10289921 3292888 2807242 19524212 145742288 12835029
Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwsnda	29215 204311 174736 37353 8823 1121 150427 1004931 11826 157	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.77% 0.69% 0.09%	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.77% 0.69% 0.09%	0.63 0.37 0.77 1.90 1.52 1.12 0.17 3.22 2.88 0.39	Papua New Guinea Paraguay Peru Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis	4232538 9542492 6530029 32824864 110380800 38493600 10289921 3292888 2807242 19524212 145742288 12835029 47739
Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia	29215 204311 174736 37353 8823 1121 150427 1004931 11826 157 446	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.77% 0.69% 0.09% 0.33% 0.25%	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.77% 0.69% 0.09% 0.33% 0.25%	0.63 0.37 0.77 1.90 1.52 1.12 0.17 3.22 2.88 0.39 1.37	Papua New Guinea Paraguay Peru Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia	4232538 9542492 6530029 32824864 110380800 38493600 10289921 3292888 2807242 19524212 145742288 12835029 47739 178594
Philippines Poland Portugal Puerto Rico Qatar Romania Russia Russia Saint Kitts and Nevis Saint Lucia Saint Vincent and the Grenadines	29215 204311 174736 37353 8823 1121 150427 1004931 11826 157 446	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.77% 0.69% 0.09% 0.33% 0.25% 0.34%	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.77% 0.69% 0.09% 0.33% 0.25% 0.34%	0.63 0.37 0.77 1.90 1.52 1.12 0.17 3.22 2.88 0.39 1.37 1.04	Papua New Guinea Paraguay Peru Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Uncient and the Grenadines	4232538 9542492 6530029 32824864 110380800 10289921 3292888 2807242 19524212 145742288 12835029 47739 178594 104940
Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Vincent and the Grenadines Samoa	29215 204311 174736 37353 8823 1121 150427 1004931 11826 157 446 355 539	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.77% 0.69% 0.09% 0.33% 0.25% 0.34% 0.25%	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.77% 0.69% 0.09% 0.33% 0.25% 0.34% 0.25%	0.63 0.37 0.77 1.90 1.52 1.12 0.17 3.22 2.88 0.39 1.37 1.04	Papua New Guinea Paraguay Peru Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Unicent and the Grenadines	4232588 9542492 6530029 32824864 110380800 38493600 10289921 3292888 807242 145742288 12885029 47739 178594 104940 211915
Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Vincent and the Grenadines Samoa Samoa	29215 204311 174736 37353 8823 1121 150427 1004931 11826 157 446 355 539 98	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.77% 0.69% 0.09% 0.33% 0.25% 0.25% 0.25%	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.77% 0.69% 0.09% 0.33% 0.25% 0.34% 0.25% 0.25%	0.63 0.37 0.77 1.90 1.52 1.12 0.17 3.22 2.88 0.39 1.37 1.04 1.41	Papua New Guinea Paraguay Peru Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Vincent and the Grenadines Samoa San Marino	4232538 9542492 6530029 32824864 110380800 38495600 10289921 3292888 2807242 19524212 145742288 12835029 47739 178594 104940 211915 34203
Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Vincent and the Grenadines Samoa San Marino Sao Tome and Principe	29215 204311 174736 37353 8823 1121 150427 1004931 11826 157 446 355 539 98 8	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.77% 0.69% 0.33% 0.25% 0.34% 0.25% 0.34%	0.15% 0.09% 0.19% 0.45% 0.27% 0.04% 0.77% 0.69% 0.33% 0.25% 0.34% 0.25% 0.34% 0.25%	0.63 0.37 0.77 1.90 1.52 1.12 0.17 3.22 2.88 0.39 1.37 1.04 1.41 1.06 1.20 0.53	Papua New Guinea Paraguay Peru Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Vincent and the Grenadines Samoa San Marino Sao Tome and Principe	4232538 9542492 6530029 32824864 110380800 38495600 10289921 3292888 2807242 19524212 145742288 12835029 47739 178594 104940 211915 34203 244612
Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Vincent and the Grenadines Samoa San Marino Sao Tome and Principe Saudi Arabia	29215 204311 174736 37553 8823 1121 150427 1004931 11826 157 446 3555 539 98 273 45837	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.77% 0.69% 0.33% 0.25% 0.34% 0.25% 0.25% 0.29%	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.69% 0.09% 0.33% 0.25% 0.34% 0.25% 0.25% 0.25%	0.63 0.37 0.77 1.90 1.52 1.12 0.17 3.22 2.88 0.39 1.37 1.04 1.41 1.06 1.20 0.53 0.53	Papua New Guinea Paraguay Peru Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Vincent and the Grenadines Samoa San Marino Sao Tome and Principe Saudi Arabia	4232588 9542492 6530029 32824864 110380800 38493600 10289921 3292888 2807242 19524212 145742288 12835029 47739 178594 104940 211915 34203 224612 35827364
Philippines Poland Portugal Puerto Rico Qatar Romania Russia Russia Saint Kitts and Nevis Saint Lucia Saint Vincent and the Grenadines Samo Samo Marino Sao Tome and Principe Saudi Arabia Senegal	29215 204311 174736 37553 8823 1121 150427 1004931 11826 157 4446 9555 539 98 273 45837	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.69% 0.09% 0.33% 0.25% 0.25% 0.25% 0.25% 0.25%	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.69% 0.09% 0.33% 0.25% 0.25% 0.25% 0.25% 0.29%	0.63 0.37 0.77 1.90 1.52 1.12 0.17 3.22 2.88 0.39 1.37 1.04 1.41 1.06 1.20 0.53 0.53	Papua New Guinea Paraguay Peru Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Vincent and the Grenadines Samoa San Marino Sao Tome and Principe Saudi Arabia Sengal	4232538 9542492 6530029 32824864 110380800 38495600 10289921 3292888 2807242 19524212 145742288 12835029 47739 178594 10440 211915 34203 214612 35827364 16000783
Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Vincent and the Grenadines Samoa San Marino Sao Tome and Principe Saudi Arabia Senegal Serbia	29215 204311 174736 37353 8823 1121 150427 1004931 11826 157 446 355 539 98 8 273 45837 15981 63769	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.69% 0.04% 0.77% 0.69% 0.03% 0.25% 0.34% 0.25% 0.25% 0.25% 0.29% 0.13% 0.13%	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.69% 0.04% 0.77% 0.69% 0.03% 0.25% 0.34% 0.25% 0.25% 0.13% 0.13% 0.13%	0.63 0.37 0.77 1.90 1.52 1.12 0.17 3.22 2.88 0.39 1.37 1.04 1.41 1.06 1.20 0.53 0.53 0.42 3.60	Papua New Guinea Paraguay Peru Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Vincent and the Grenadines Samoa San Marino Sao Tome and Principe Saudi Arabia Senegal Serbia	4232588 9542492 6530029 32824864 110380800 38493600 10289921 3292888 807242 145742288 12835029 47739 178594 104940 211915 34203 214612 35827364 16000783 7401056
Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rawanda Saint Kitts and Nevis Saint Lucia Saint Vincent and the Grenadines Samoa San Marino San Marino Sao Tome and Principe Saudi Arabia Senegal Serbia Serbia	29215 204311 174736 37553 8823 1121 150427 100431 11826 157 446 355 539 98 273 45837 15981 15981 63769	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.69% 0.09% 0.33% 0.25% 0.25% 0.25% 0.13% 0.13% 0.13% 0.13%	0.15% 0.09% 0.19% 0.45% 0.35% 0.04% 0.77% 0.69% 0.33% 0.25% 0.25% 0.29% 0.33% 0.25% 0.25% 0.25% 0.25%	0.63 0.37 0.77 1.90 1.52 1.12 0.17 3.22 2.88 0.39 1.37 1.04 1.41 1.06 1.20 0.53 0.53 0.42 3.60 0.97	Papua New Guinea Paraguay Peru Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Ucia San Marino Sao Tome and Principe Saoul Arabia Senegal Serbia Seychelles	4232538 9542492 6530029 32824864 110380800 38495600 10289921 3292888 2807242 19524212 145742288 12835029 47739 178594 104940 211915 34203 214612 35827364 16000783 7401056 104386
Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Vincent and the Grenadines Samoa San Marino Sao Tome and Principe Saudi Arabia Senegal Serbia	29215 204311 174736 37353 8823 1121 150427 1004931 11826 157 446 355 539 98 273 45837 15981 63769 242 9009	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.69% 0.77% 0.69% 0.33% 0.25% 0.25% 0.25% 0.13% 0.13% 0.10% 0.86% 0.13%	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.69% 0.04% 0.77% 0.69% 0.33% 0.25% 0.25% 0.29% 0.13% 0.10% 0.10% 0.86%	0.63 0.37 0.77 1.90 1.52 1.12 0.17 3.22 2.88 0.39 1.37 1.04 1.41 1.06 1.20 0.53 0.53 0.42 3.60 0.97	Papua New Guinea Paraguay Peru Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Vincent and the Grenadines Samoa San Marino Sao Tome and Principe Saudi Arabia Senegal Serbia	4232538 9542492 6530029 32824864 110380800 38495600 10289921 19524212 19524212 145742288 12835029 47739 178594 104940 211915 34203 214612 35827364 16000783 7401056 8046830
Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Vincent and the Grenadines Samoa San Marino Sao Tome and Principe Saudi Arabia Seengal Serbia Seychelles Sierra Leone Singapore	29215 204311 1147/36 37553 8823 1121 150427 1004931 11826 157 446 3555 539 98 273 45837 15981 65769 242 9009 6610	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.77% 0.09% 0.33% 0.25% 0.25% 0.25% 0.25% 0.34% 0.25%	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.07% 0.09% 0.09% 0.33% 0.25% 0.25% 0.34% 0.25% 0.13% 0.13% 0.13% 0.10% 0.86% 0.29% 0.13%	0.63 0.37 0.77 1.90 1.52 1.12 0.17 3.22 2.88 0.39 1.37 1.04 1.41 1.06 1.20 0.53 0.53 0.42 3.60 0.97 0.47	Papua New Guinea Paraguay Peru Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Saint Horia Sanda Sandarino San Marino Sao Tome and Principe Saudi Arabia Sevchelles Seychelles Sierra Leone Singapore	4232588 9542492 6530029 32824864 110380800 38493600 10289921 3292888 2807242 19524212 145742288 12835029 47739 178594 104940 211915 34203 214612 35827364 16000783 7401056 104386 8046830 5866408
Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Vincent and the Grenadines Samo Marino San Ome and Principe Saudi Arabia Serbia Serbia Seychelles Sierra Leone Singapore	29215 204311 174736 37353 8823 1121 150427 1004931 11826 157 446 355 539 98 273 45837 15981 63769 242 9009	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.77% 0.69% 0.33% 0.25% 0.25% 0.29% 0.25%	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.69% 0.04% 0.77% 0.69% 0.33% 0.25% 0.25% 0.29% 0.13% 0.10% 0.10% 0.86%	0.63 0.37 0.77 1.90 1.52 1.12 0.17 3.22 2.88 0.39 1.37 1.04 1.41 1.06 1.20 0.53 0.53 0.42 3.60 0.97	Papua New Guinea Paraguay Peru Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Ucia Saint Orinent and the Grenadines Samoa San Marino Sao Tome and Principe Saudi Arabia Senegal Serbia Seychelles Sierra Leone	4232538 9542492 6530029 32824864 110380800 38495600 10289921 19524212 19524212 145742288 12835029 47739 178594 104940 211915 34203 214612 35827364 16000783 7401056 8046830
Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Vincent and the Grenadines Samoa San Marino Sao Tome and Principe Saudi Arabia Senegal Serbia Seychelles Sierra Leone Singapore Silovakia	29215 204311 174736 37353 8823 1121 150427 1004931 11826 157 446 355 539 98 273 45837 15981 63769 242 9009 6810 26796 7797	0.15% 0.09% 0.45% 0.36% 0.27% 0.04% 0.77% 0.09% 0.09% 0.25% 0.34% 0.25% 0.13% 0.13% 0.13% 0.13% 0.10%	0.15% 0.09% 0.45% 0.36% 0.27% 0.04% 0.07% 0.09% 0.09% 0.34% 0.25% 0.34% 0.13% 0.13% 0.13% 0.10% 0.86% 0.25% 0.13% 0.13% 0.10% 0.	0.63 0.37 0.77 1.90 1.52 1.12 0.17 3.22 2.88 0.39 1.37 1.04 1.41 1.06 1.20 0.53 0.53 0.53 0.42 3.60 0.97 0.47 0.49 2.05	Papua New Guinea Paraguay Peru Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Lucia Saint Saint Lucia Saint	4232538 9542492 6530029 32824864 110380800 38493600 10289921 3292888 2807242 145742288 12835029 47739 178594 104940 211915 34203 214612 35827364 16000783 7401056 104386 8046830 5865408 5453932 2112905
Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Vincent and the Grenadines Samoa San Marino Sao Tome and Principe Saudi Arabia Senegal Serbia Seychelles Sierra Leone Singapore Silovakia	29215 204311 114736 37553 8823 1121 150427 1104931 11826 157 446 3555 539 98 273 45837 15981 63769 242 9009 6810 26796	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.77% 0.69% 0.33% 0.25% 0.25% 0.29% 0.25%	0.15% 0.09% 0.45% 0.36% 0.27% 0.04% 0.07% 0.69% 0.09% 0.33% 0.25% 0.25% 0.25% 0.25% 0.13% 0.10% 0.10% 0.10% 0.10% 0.10% 0.10% 0.10% 0.10% 0.10% 0.10% 0.10% 0.21% 0.21% 0.25% 0.	0.63 0.37 0.77 1.90 1.52 1.12 0.17 3.22 2.88 0.39 1.37 1.04 1.41 1.06 1.20 0.53 0.53 0.42 3.60 0.97 0.47 0.49 2.05	Papua New Guinea Paraguay Peru Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Occasional San Marino San Marino Sao Tome and Principe Saudi Arabia Serejal Seyhelles Sierra Leone Singapore Slovakia	4232538 9542492 6530029 32824864 110380800 38495600 10289921 3292888 2807242 19524212 19524212 145742288 12835029 47739 178594 104940 211915 34203 214612 35827364 16000783 7401056 104386 8046830 8046830 5866408 5459932
Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Vincent and the Grenadines Samoa San Marino Sao Tome and Principe Saudi Arabia Senegal Serbia Seychelles Sierra Leone Singapore Slovakia Slovenia Solomon Islands	29215 204311 174736 37353 8823 1121 150427 1004931 11826 157 446 355 539 98 273 45837 15981 63769 242 9009 6810 26796 7797	0.15% 0.09% 0.45% 0.36% 0.27% 0.04% 0.77% 0.09% 0.09% 0.25% 0.34% 0.25% 0.13% 0.13% 0.13% 0.13% 0.10%	0.15% 0.09% 0.45% 0.36% 0.27% 0.04% 0.07% 0.09% 0.09% 0.34% 0.25% 0.34% 0.13% 0.13% 0.13% 0.10% 0.86% 0.25% 0.13% 0.13% 0.10% 0.	0.63 0.37 0.77 1.90 1.52 1.12 0.17 3.22 2.88 0.39 1.37 1.04 1.41 1.06 1.20 0.53 0.53 0.53 0.42 3.60 0.97 0.47 0.49 2.05	Papua New Guinea Paraguay Peru Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Lucia Saint Saint Lucia Saint	4232588 9542492 6530029 32824864 110380800 38493600 10289921 3292888 807242 145742288 12835029 47739 178594 104940 211915 34203 214612 35827364 16000783 7401056 104386 8048830 5866408 5453932 2112905
Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Lucia Saint Vincent and the Grenadines Samoa San Marino Sao Tome and Principe Saudi Arabila Serbia Serbia Serbia Seychelles Sierra Leone Singapore Slovakia Slovenia Solomon Islands Somalia	29215 204311 174736 37553 8823 1121 150427 1004931 11826 1577 446 3555 539 98 273 45837 15981 63769 242 9009 6810 26796 7797 2285	0.15% 0.09% 0.45% 0.45% 0.27% 0.04% 0.09% 0.09% 0.09% 0.25% 0.	0.15% 0.09% 0.45% 0.36% 0.27% 0.04% 0.09% 0.09% 0.25% 0.	0.63 0.37 0.77 1.90 1.52 1.12 0.17 3.22 2.88 0.39 1.37 1.04 1.41 1.06 1.20 0.53 0.53 0.42 3.60 0.97 0.47 0.49 2.05	Papua New Guinea Paraguay Peru Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Ucia Saint Samoa San Marino Sao Tome and Principe Saudi Arabia Senegal Serbia Seychelles Sierra Leone Singapore Slovakia Slovakia Slovakia	4232538 9542492 6530029 32824864 110380800 38493600 10289921 19524212 19524212 145742288 12835029 47739 178594 104940 211915 34203 214612 35827364 16000783 7401055 104386 8046830 5453932 211905 675000
Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Saint Unionation of the Common of	29215 204311 174736 37553 8823 1121 150427 1004931 11826 157 4446 3555 539 98 273 45837 15981 63769 242 9009 6810 26796 7797 2285	0.15% 0.09% 0.19% 0.45% 0.27% 0.04% 0.27% 0.69% 0.09% 0.25% 0.25% 0.25% 0.13% 0.10% 0.10% 0.13% 0.10% 0.13% 0.10% 0.23% 0.13% 0.10% 0.23% 0.13%	0.15% 0.09% 0.45% 0.45% 0.27% 0.69% 0.27% 0.69% 0.33% 0.25% 0.33% 0.25% 0.33% 0.25% 0.34% 0.25% 0.13% 0.10% 0.86% 0.23% 0.11% 0.12% 0.49% 0.33% 0.23% 0.13% 0.12%	0.63 0.37 0.77 1.90 1.52 1.12 0.17 3.22 2.88 0.39 1.37 1.04 1.41 1.06 1.20 0.53 0.53 0.53 0.42 3.60 0.97 0.47 0.49 2.05 1.54 1.41 0.48	Papua New Guinea Paraguay Peru Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Ucia Saint Openation of the Common of the Com	4232538 9542492 6530029 32824864 110380800 38495600 10289921 3292888 2807242 19524212 145742288 12835029 47739 178594 104940 211915 34203 214612 35827364 16000783 7401056 104386 8046830 8
Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Kints and Nevis Saint Vincent and the Grenadines Samoa San Marino Sao Tome and Principe Saudi Arabia Sevchelles Sierra Leone Singapore Silovakia Slovenia Solomalia Solomalia Soomalia Soomalia	29215 204311 114736 37353 8823 1121 150427 1004931 11826 1157 446 3555 539 98 273 45837 15981 63769 242 9009 6810 26796 67797 2285	0.15% 0.09% 0.19% 0.45% 0.27% 0.045% 0.27% 0.69% 0.09% 0.09% 0.25% 0.25% 0.25% 0.29% 0.29% 0.13% 0.13% 0.13% 0.12% 0.12% 0.49% 0.49% 0.23% 0.12% 0.49% 0.49% 0.23% 0.12% 0.49%	0.15% 0.09% 0.45% 0.45% 0.36% 0.27% 0.69% 0.69% 0.09% 0.25% 0.25% 0.25% 0.25% 0.25% 0.25% 0.13% 0.13% 0.12% 0.13% 0.12% 0.49% 0.34% 0.13% 0.12% 0.49% 0.34%	0.63 0.37 0.77 1.90 1.52 1.12 0.17 3.22 2.88 0.39 1.37 1.04 1.41 1.06 1.20 0.53 0.53 0.42 3.60 0.97 0.47 0.49 2.05 1.54 1.41 0.48 0.59	Papua New Guinea Paraguay Peru Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Vincent and the Grenadines Samoa San Marino Sao Tome and Principe Saudi Arabia Serbia Seychelles Sierra Leone Singapore Slovakia Slovenia Solomon Islands Somalia South Africa	4232588 9542492 6530029 32824864 110380800 38493600 10289921 3292888 2807242 145742288 12835029 47739 178594 104940 211915 34203 214612 35827364 16000783 7401056 104386 8046830 5866408 5453932 2112905 675000 15981312 58087060
Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Vincent and the Grenadines Samoa San Marino Sao Tome and Principe Saudi Arabia Senegal Serbia Seychelles Silerra Leone Silovakia Slovenia Solomon Islands Somba	29215 204311 174736 37533 8823 1121 150427 1004931 11826 157 4446 355 539 98 273 45837 15981 63769 242 9009 6810 26796 7797 2285 182661 77481	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.07% 0.69% 0.09% 0.25% 0.25% 0.25% 0.29% 0.13% 0.13% 0.10% 0.13% 0.13% 0.13% 0.13% 0.13% 0.13% 0.13% 0.14% 0.14%	0.15% 0.09% 0.45% 0.45% 0.27% 0.06% 0.27% 0.09% 0.09% 0.09% 0.09% 0.09% 0.25% 0.25% 0.25% 0.25% 0.25% 0.25% 0.25% 0.25% 0.25% 0.25% 0.25% 0.25% 0.25% 0.34% 0.15% 0.10% 0.86% 0.12% 0.49% 0.13% 0.15% 0.15% 0.15% 0.15%	0.63 0.37 0.77 1.90 1.52 1.12 0.17 3.22 2.88 0.39 1.37 1.04 1.41 1.06 1.20 0.53 0.53 0.42 3.60 0.97 0.47 0.49 2.05 1.54 1.41 0.48 0.59 0.63	Papua New Guinea Paraguay Peru Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Ucia Saint	4232538 9542492 6530029 32824864 110380800 38495600 10289921 3292888 2807242 19524212 145742288 12835029 47739 178594 104940 211915 34203 214612 35827364 16000783 7401056 104386 8046830 8866408 846830 8566408 5459932 2112905 67500 15881312 58087060 51803832 10447677
Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Vincent and the Grenadines Samoa San Marino Sao Tome and Principe Saudi Arabia Serbia Serbia Serbia Serbia Serbia Seychelles Sierra Leone Singapore Slovakia Slovenia Solomon Islands South Africa South Krorea South Sudan	29215 204311 174736 37553 8823 1121 150427 1004931 11826 157 446 355 539 98 273 45837 15981 63769 242 9009 6810 26796 7797 2285 18521 82661 77481	0.15% 0.09% 0.45% 0.45% 0.27% 0.06% 0.27% 0.69% 0.25%	0.15% 0.09% 0.19% 0.45% 0.36% 0.27% 0.04% 0.05% 0.09% 0.09% 0.09% 0.33% 0.25% 0.29% 0.33% 0.13% 0.10% 0.25% 0.29% 0.33% 0.13% 0.10% 0.85% 0.23% 0.11% 0.15% 0.23% 0.11% 0.12% 0.49% 0.37% 0.14% 0.12%	0.63 0.37 0.77 1.90 1.52 1.12 0.17 3.22 2.88 0.39 1.37 1.04 1.41 1.06 1.20 0.53 0.53 0.42 3.60 0.97 0.47 0.49 2.05 1.54 1.41 0.48 0.59 0.63 0.59	Papua New Guinea Paraguay Peru Philippines Poland Portugal Puerto Rico Qatar Romania Russia Rwanda Saint Kitts and Nevis Saint Lucia Saint Uncent and the Grenadines Samoa San Marino Sao Tome and Principe Saudi Arabia Seregal Serbia Seychelles Sierra Leone Singapore Slovakia Slovenia Solomon Islands Somalia South Africa South Krica South Krica South Krica South Korea South Sudan	4232538 9542492 6530029 32824864 110380800 38493600 10289921 19524212 19524212 19524212 145742288 12835029 47739 178594 104940 211915 34203 214612 35827364 16000783 7401056 104386 8046830 5453932 2112905 675000 15981312 58087060 51803882

Sudan	74371	0.17%	0.17%	0.72	Sudan	43232092
Suriname	1423	0.24%	0.24%	0.99	Suriname	600305
Sweden	36087	0.35%	0.35%	1.47	Sweden	10267922
Switzerland	23969	0.28%	0.28%	1.17	Switzerland	8575593
Syria	45682	0.23%	0.23%	0.95	Syria	20098252
Taiwan	41061	0.17%	0.17%	0.72	Taiwan	23777742
Tajikistan	21856	0.23%	0.23%	0.98	Tajikistan	9337008
Tanzania	54489	0.09%	0.09%	0.38	Tanzania	59872584
Thailand	115830	0.16%	0.16%	0.68	Thailand	71307768
Timor	2459	0.19%	0.19%	0.80	Timor	1280442
Togo	8361	0.10%	0.10%	0.42	Togo	8243093
Tokelau	4	0.23%	0.23%	0.94	Tokelau	1775
Tonga	178	0.17%	0.17%	0.71	Tonga	104965
Trinidad and Tobago	4016	0.26%	0.26%	1.10	Trinidad and Tobago	1519960
Tunisia	35007	0.29%	0.29%	1.21	Tunisia	12049319
Turkey	176663	0.21%	0.21%	0.88	Turkey	83481688
Turkmenistan	18323	0.30%	0.30%	1.24	Turkmenistan	6158424
Tuvalu	42	0.38%	0.38%	1.60	Tuvalu	10983
Uganda	28149	0.07%	0.07%	0.27	Uganda	42949076
Ukraine	449376	1.02%	1.02%	4.25	Ukraine	44211100
United Arab Emirates	8621	0.09%	0.09%	0.39	United Arab Emirates	9211660
United Kingdom	188113	0.28%	0.28%	1.18	United Kingdom	66778660
United States	957455	0.29%	0.29%	1.20	United States	334319680
United States Virgin Islands	501	0.50%	0.50%	2.08	United States Virgin Islands	100837
Uruguay	10003	0.29%	0.29%	1.22	Uruguay	3428412
Uzbekistan	107394	0.33%	0.33%	1.36	Uzbekistan	32976946
Vanuatu	869	0.29%	0.29%	1.19	Vanuatu	304414
Venezuela	61510	0.21%	0.21%	0.89	Venezuela	28971686
Vietnam	240161	0.25%	0.25%	1.05	Vietnam	95776712
Yemen	55752	0.18%	0.18%	0.74	Yemen	31546694
Zambia	18157	0.10%	0.10%	0.41	Zambia	18380478
Zimbabwe	17810	0.12%	0.12%	0.48	Zimbabwe	15354606

SQL Queries:

```
*/Selecting all rows from Heart Disease table*/
SELECT [ID]
     ,[age]
     ,[sex]
     ,[chest_pain_type]
     ,[resting_bp_s]
     ,[cholesterol]
     ,[fasting_blood_sugar]
     ,[resting_ecg]
     ,[max_heart_rate]
     ,[exercise_angina]
     ,[oldpeak]
     ,[ST_slope]
     ,[target]
  FROM [UN].[dbo].[heart_statlog_cleveland_hungary_final]
*/Altering the "Final Data" table*/
alter table [dbo].[Final_Data]
add Human_Development_Index float null,
Alcohol float null,
Overweight float null,
Tobacco_Use float null,
```

```
Percentage_of_female float null,
 Literacy rates nvarchar(50) null,
GDP float null,
Poverty float null
______
*/Updating the "Final Data" table to add defined attributes from the raw table*/
update [dbo].[Final Data]
set [Tobacco Use] = a.[Tobacco Use]
from [dbo].[Final Data] as b inner join [dbo].[WID share-of-adults-who-smoke] as a on
a.Entity = b.Region where a.[Year] = 2019
update [dbo].[Final Data]
set [Overweight] = a.[Overweight]
from [dbo].[Final Data] as b inner join [dbo].[WID share-of-adults-overweight] as a on
a.Entity = b.Region where a.[Year] = 2016
update [dbo].[Final Data]
set [Alcohol] = a.[Alcohol]
from [dbo].[Final_Data] as b inner join [dbo].[WID_share-of-adults-Alcohol] as a on
a.Entity = b.Region where a.[Year] = 2016
update [dbo].[Final Data]
set [Percentage of female] = a.[Percentage of female]
from [dbo].[Final_Data] as b inner join [dbo].[WID_share-population-female] as a on
a.Entity = b.Region where a.[Year] = 2019
update [dbo].[Final Data]
set [Literacy_rates] = a.[Literacy_rates]
from [dbo].[Final_Data] as b inner join [dbo].[WID_cross-country-literacy-rates] as a on
a.Entity = b.Region where a.[Year] = 2015
update [dbo].[Final Data]
set [GDP] = a.[Value]
from [dbo].[Final_Data] as b inner join [dbo].[GDP] as a on a.[Region_Country_Area] =
b.[Region] where a.[Year] = 2019 and a.[Series] = 'GDP per capita (US dollars)'
update [dbo].[Final Data]
set [Poverty] = a.[Share_of_population_below_2_15_a_day]
from [dbo].[Final_Data] as b inner join [dbo].[WID_poverty-explorer] as a on a.[Entity]
= b.[Region] where a.[Year] = 2019
update [dbo].[Final Data]
set [Percent WRT Population] = a.[Percent WRT Population]
from [dbo].[Final Data] as b inner join [dbo].[Final Data 2] as a on a.[Region] =
b.[Region]
```

/Below few steps are related to extraction of data from "Final Data" table to perform analysis on Excel and build an input data for ML modeling/

```
SELECT [Region]
      ,[CardioVascular Deaths]
      ,[Percent WRT Population]
      ,[Human_Development_Index]
     ,[Alcohol]
     ,[Overweight]
      ,[Tobacco Use]
      ,[Percentage of female]
      ,[Literacy_rates]
      ,[GDP]
     ,[Poverty]
  FROM [UN].[dbo].[Final Data]
  order by [Region]
  Select
Min([Human Development Index]),Max([Percent WRT Population]),avG([Percent WRT Population]
  from [UN].[dbo].[Final_Data]
  Where [Region] IS NOT NULL
  Select
avg([Human_Development_Index]),avg([Alcohol]),avg([Overweight]),avg([Tobacco_Use]),avg([P
ercentage_of_female]),avg([GDP]),avg([Poverty]),count(*)
  from [UN].[dbo].[Final Data]
  where [Percent WRT Population] <= 0.15 and [Region] IS NOT NULL
  Select
avg([Human_Development_Index]),avg([Alcohol]),avg([Overweight]),avg([Tobacco_Use]),avg([P
ercentage_of_female]),avg([GDP]),avg([Poverty]),count(*)
  from [UN].[dbo].[Final Data]
  where [Percent_WRT_Population] > 0.15 and [Percent_WRT_Population] <= 0.22 and [Region]
IS NOT NULL
  Select
avg([Human_Development_Index]),avg([Alcohol]),avg([Overweight]),avg([Tobacco_Use]),avg([P
ercentage_of_female]),avg([GDP]),avg([Poverty]),count(*)
  from [UN].[dbo].[Final Data]
  where [Percent_WRT_Population] > 0.22 and [Percent_WRT_Population] <= 0.55 and [Region]
IS NOT NULL
  Select
avg([Human_Development_Index]),avg([Alcohol]),avg([Overweight]),avg([Tobacco_Use]),avg([P
ercentage of female]),avg([GDP]),avg([Poverty]),count(*)
  from [UN].[dbo].[Final_Data]
  where [Percent_WRT_Population] > 0.55 and [Region] IS NOT NULL
  Select
avg([Human Development Index]),avg([Alcohol]),avg([Overweight]),avg([Tobacco Use]),avg([P
ercentage_of_female]),avg([GDP]),avg([Poverty]),count(*)
  from [UN].[dbo].[Final_Data]
  where [Percent WRT Population] <= 0.2 and [Region] IS NOT NULL
  Select
avg([Human_Development_Index]),avg([Alcohol]),avg([Overweight]),avg([Tobacco_Use]),avg([P
ercentage_of_female]),avg([GDP]),avg([Poverty]),count(*)
  from [UN].[dbo].[Final_Data]
```

```
where [Percent_WRT_Population] > 0.2 and [Region] IS NOT NULL
   Select [Region]
  from [UN].[dbo].[Final Data]
  where [Percent WRT Population] <= 0.2 and [Region] IS NOT NULL
  Select [Region]
  from [UN].[dbo].[Final Data]
  where [Percent WRT Population] > 0.2 and [Region] IS NOT NULL
Select [Entity],[Population_historical_estimates]
from [dbo].[WID population-since-1800]
where [Year] =2009 and [Entity] NOT IN (
'Anguilla','Aruba','Bonaire Sint Eustatius and Saba','British Virgin Islands','Cayman
Islands',
'Curacao', 'Faeroe Islands', 'Falkland Islands', 'French Guiana', 'French
Polynesia', 'Gibraltar', 'Guadeloupe',
'Guernsey', 'Hong Kong', 'Isle of
Man', 'Jersey', 'Liechtenstein', 'Macao', 'Martinique', 'Mayotte', 'Montserrat', 'New
Caledonia',
'Saint Barthlemy', 'Saint Helena', 'Saint Martin (French part)', 'Saint Pierre and
Miquelon', 'Sint Maarten (Dutch part)',
'Turks and Caicos Islands', 'Vatican', 'Wallis and
Futuna', 'Africa', 'Asia', 'Europe', 'European Union (27)', 'High-income countries',
'Lower-middle-income countries', 'Low-income countries', 'Netherlands Antilles', 'North
America', 'Oceania', 'Reunion',
'South America', 'Svalbard and Jan Mayen', 'Upper-middle-income countries', 'Western
Sahara','World')
Order by [Entity] ASC
Select [Entity],[Population historical estimates]
from [dbo].[WID population-since-1800]
where [Year] =1990 and [Entity] IN ('Lower-middle-income countries', 'Low-income
countries','Upper-middle-income countries','High-income countries','World')
Order by [Entity] ASC
Select [Entity],[Population_historical estimates]
from [dbo].[WID population-since-1800]
where [Year] =2019 and [Entity] IN ('Lower-middle-income countries', 'Low-income
countries','Upper-middle-income countries','High-income countries','World')
Order by [Entity] ASC
Select
[Entity],[Deaths_Cardiovascular_diseases_Sex_Both_Age_Under_5_Number],[Deaths_Cardiovascu
lar diseases_Sex_Both_Age_5_14_years_Number],
[Deaths Cardiovascular diseases Sex Both Age 15 49 years Number], [Deaths Cardiovascular d
iseases Sex Both Age 50 69 years Number],[Deaths Cardiovascular diseases Sex Both Age 70
vears Number]
from [dbo].[WID_cardiovascular-disease-deaths-by-age]
where [Year] =1990 and [Entity] Like '%World%'
Order by [Entity] ASC
```

```
Select
[Entity], [Deaths Cardiovascular diseases Sex Both Age Under 5 Number], [Deaths Cardiovascu
lar diseases Sex Both Age 5 14 years Number],
[Deaths_Cardiovascular_diseases_Sex_Both_Age_15_49_years_Number], [Deaths_Cardiovascular_d
iseases_Sex_Both_Age_50_69_years_Number],[Deaths_Cardiovascular_diseases_Sex_Both_Age_70_
years Number]
from [dbo].[WID cardiovascular-disease-deaths-by-age]
where [Year] =2019 and [Entity] Like '%World%'
Order by [Entity] ASC
Delete from [dbo].[Final Data] where [Region] is NULL
Select * from [dbo].[Final Data]
Alter table [dbo].[Final_Data]
Add Cardio_Deaths_Percent float Null
Alter table [dbo].[Final Data]
Add CD Bucket Varchar(256) Null
Update [dbo].[Final Data]
set Cardio_Deaths_Percent = ([CardioVascular_Deaths]/18552134.0)
Update [dbo].[Final_Data]
set CD Bucket =
CASE
WHEN Cardio_Deaths_Percent <= 0.0008 Then 'Very Low'
WHEN Cardio_Deaths_Percent > 0.0008 and Cardio_Deaths_Percent <= 0.002 Then 'Low'
WHEN Cardio_Deaths_Percent > 0.002 and Cardio_Deaths_Percent <= 0.004 Then 'Average'
WHEN Cardio Deaths Percent > 0.004 and Cardio Deaths Percent <= 0.009 Then 'High'
WHEN Cardio Deaths Percent > 0.009 Then ' Very High'
```

Student Copyright Checklist

Type Student: Answer question 1 below. 1) Does your solution to the competitive event integrate any type of music and/or sound? ☐ YES ■ NO If NO, go to question 2. If YES, is the music and/or sound copyrighted? ☐ YES ■ NO If YES, move to question 1A. If NO, move to question 1B. 1A) Have you asked for author permission to use the music and/or sound in your solution and included that permiss your documentation? If YES, move to question 2. If NO, ask for permission and if permission is granted, include to documentation. 1B) Is the music/sound royalty free, or did you create the music/sound yourself? If YES, cite the royalty free music/somusic/sound properly in your documentation. CHAPTER ADVISOR: Sign below regarding your student's answer(s) to the use of music/sound in his/her competitive event student answers "NO" to question 1, please sign below noting that you have evaluated the competitive event solution and the question(s) accurately. Lori Zebrack-Smith (chapter advisor), have checked my student's solution and confirm that any done so with proper permission and is cited correctly in the student's documentation and/or the solution has been for sound included. STUDENT: Answer question 2 below. 2) Does your solution to the competitive event integrate any graphics/videos? ■ YES ■ NO If NO, go to question 3. If YES, islare) the graphics/videos copyrighted, registered and/or trademarked? ■ YES ■ NO If YES, move to question 2A. If NO, move to question 2B. 2A) Have you asked for author permission to use the graphics and/or videos in your solution and included a permission is documentation for graphic/video used? If YES, move to question 3. If NO, ask for permission and if permission is	ne permission in your und OR your original ent solution. Even if you d the student answere use of music/sound is
If NO, go to question 2. If YES, is the music and/or sound copyrighted? YES NO If YES, move to question 1A. If NO, move to question 1B. 1A) Have you asked for author permission to use the music and/or sound in your solution and included that permiss your documentation? If YES, move to question 2. If NO, ask for permission and if permission is granted, include the documentation. 1B) Is the music/sound royalty free, or did you create the music/sound yourself? If YES, cite the royalty free music/some music/sound properly in your documentation. CHAPTER ADVISOR: Sign below regarding your student's answer(s) to the use of music/sound in his/her competitive events tudent answers "NO" to question 1, please sign below noting that you have evaluated the competitive event solution and the question(s) accurately. I. Lori Zebrack-Smith (chapter advisor), have checked my student's solution and confirm that any done so with proper permission and is cited correctly in the student's documentation and/or the solution has been for sound included. STUDENT: Answer question 2 below. 2) Does your solution to the competitive event integrate any graphics/videos? YES NO If NO, go to question 3. If YES, isfare) the graphics/videos copyrighted, registered and/or trademarked? YES NO If YES, move to question 2A. If NO, move to question 2B. 2A) Have you asked for author permission to use the graphics and/or videos in your solution and included a permission to use the graphics and/or videos in your solution and included a permission to use the graphics and/or videos in your solution and included a permission to use the graphics and/or videos in your solution and included a permission to use the graphics and/or videos in your solution and included a permission to use the graphics and/or videos in your solution and included a permission to the control of the	ne permission in your und OR your original ent solution. Even if you d the student answere use of music/sound is
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If YES, move to question 1A. If NO, move to question 1B. 1A) Have you asked for author permission to use the music and/or sound in your solution and included that permiss your documentation? If YES, move to question 2. If NO, ask for permission and if permission is granted, include to documentation? If YES, move to question 2. If NO, ask for permission and if permission is granted, include to documentation. 1B) Is the music/sound royalty free, or did you create the music/sound yourself? If YES, cite the royalty free music/sommusic/sound properly in your documentation. CHAPTER ADVISOR: Sign below regarding your student's answer(s) to the use of music/sound in his/her competitive eventsudent answers "NO" to question 1, please sign below noting that you have evaluated the competitive event solution and the question(s) accurately. Lori Zebrack-Smith (chapter advisor), have checked my student's solution and confirm that any done so with proper permission and is cited correctly in the student's documentation and/or the solution has been for sound included. STUDENT: Answer question 2 below. 2) Does your solution to the competitive event integrate any graphics/videos? PYES NO If NO, go to question 3. If YES, is(are) the graphics/videos copyrighted, registered and/or trademarked? YES NO If YES, move to question 2A If NO, move to question 2B. 2A) Have you asked for author permission to use the graphics and/or videos in your solution and included a permission to use the graphics and/or videos in your solution and included a permission.	ne permission in your und OR your original ent solution. Even if you d the student answere use of music/sound is
your documentation? If YES, move to question 2. If NO, ask for permission and if permission is granted, include t documentation. 18) Is the music/sound royalty free, or did you create the music/sound yourself? If YES, cite the royalty free music/sound properly in your documentation. CHAPTER ADVISOR: Sign below regarding your student's answer(s) to the use of music/sound in his/her competitive event student answers "NO" to question 1, please sign below noting that you have evaluated the competitive event solution and the question(s) accurately. Lori Zebrack-Smith (chapter advisor), have checked my student's solution and confirm that any done so with proper permission and is cited correctly in the student's documentation and/or the solution has been for sound included. STUDENT: Answer question 2 below. 2) Does your solution to the competitive event integrate any graphics/videos? YES NO If YES, isfare) the graphics/videos copyrighted, registered and/or trademarked? YES NO If YES, move to question 2A. If NO, move to question 2B. 2A) Have you asked for author permission to use the graphics and/or videos in your solution and included a permission and included and included a permission and	ne permission in your und OR your original ent solution. Even if you d the student answere use of music/sound is
IB) Is the music/sound royalty free, or did you create the music/sound yourself? If YES, cite the royalty free music/sound properly in your documentation. CHAPTER ADVISOR: Sign below regarding your student's answer(s) to the use of music/sound in his/her competitive event solution and the question(s) accurately. I, Lori Zebrack-Smith (chapter advisor), have checked my student's solution and confirm that any done so with proper permission and is cited correctly in the student's documentation and/or the solution has been fo sound included. STUDENT: Answer question 2 below. 2) Does your solution to the competitive event integrate any graphics/videos? ● YES ■ NO If NO, go to question 3. If YES, is(are) the graphics/videos copyrighted, registered and/or trademarked? ■ YES ■ NO If YES, move to question 2A. If NO, move to question 2B. 2A) Have you asked for author permission to use the graphics and/or videos in your solution and included a permission.	ent solution. Even if you d the student answere use of music/sound is
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permission in your documentation.	
2B) Is(are) the graphics/videos royalty free, or did you create your own graphic? If YES, cite the royalty free graphics/original graphics/videos properly in your documentation.	videos OR your own
CHAPTER ADVISOR: Sign below regarding your student's answer(s) to the use of graphics/videos in his/her competitive if your student answers "NO" to question 2, please sign below noting that you have evaluated the competitive event solutions answered the question(s) accurately.	
Lori Zebrack-Smith (chapter advisor), have checked my student's solution and confirm that the	use of graphics/videos
with proper permission and is cited correctly in the student's documentation and/or the solution has been found to be included.	
STUDENT: Answer question 3 below.	
3) Does your solution to the competitive event use another's thoughts or research? YES NO	
If NO, this is the end of the checklist. If YES, have you properly cited other's thoughts or research in your documentation? YES NO	
CHAPTER ADVISOR: Sign below regarding your student's answer(s) to having integrated any thoughts/research of o	thers in his/her
competitive event solution. Even if your student answers "NO" to question 3, please sign below noting that you have competitive event solution and the student answered the question(s) accurately.	
I. Lori Zebrack - Smith (chapter advisor), have checked my student's solution and confirm that the research of others is done so with proper permission and is cited correctly in the student's documentation and/or the to have all original thought with no use of other's thoughts/research.	
Rishika Gautam	
Student Name:	