**ITBW21 - VISUAL ANALYTICS Project**

Project Proposal Document

AY2022 Y1 S2

Smells Like Team Spirit

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## **The Team**

|  |  |  |
| --- | --- | --- |
| **Module Group:** |  | ITBW21-03 |
| **Team Name:** |  | Smells Like Team Spirit |
| **Team Members:** |  | 1. Damian (224106Y) \*  2. Amber (222809U)  3. Javerine (220429P)  4. Natelie (224308W) |

\*Denotes the Team Leader

## **Our Hypothesis**

Our proposed hypothesis is as shown below, which will serve as the basis of our analysis and solution.

***“Singapore is a good place to live in”***

## **Gathering User Requirements**

This section covers the methods we used to gather information of our target user to identify the pain points and requirements to get a well-rounded understanding of our target users.

### 1. Target user

Our primary focus would be on ***Young Adults*** living in Singapore, this covers areas such as Junior College, Polytechnic, University students and young working adults. Some of the possible use cases of our analysis/solution:

* Identify factors young adults will have to consider in the future.
* Analysis can be used for young adults from all over the world.
* To make better decisions about studying in Singapore
* To better understand Singapore.
* Provides support and resources for planning their future.

### 2. Factors & Problem statements

We decided on four factors to take a deep dive into and provide an optimal analysis/solution. Below are the factors along with the problem statements, and the member in charge of each.

|  |  |  |  |
| --- | --- | --- | --- |
| S/N | Factor | Problem statement | Team member |
| *1* | **Healthcare** | *Singapore has the best* ***Healthcare*** | Amber |
| *2* | **Housing** | *Singapore has the best* ***Housing*** | Javerine |
| *3* | **Education** | *Singapore has the best* ***Education system*** | Natelie |
| *4* | **Safety** | *Singapore is the* ***Safest*** *country* | Damian |

The ***reasoning*** of why we chose these factors,

* Singapore is known for its **rigorous** education system and despite many success stories, some are overworked and stressed from school.
* Singapore is known for its **world-renowned healthcare**, but people still think that there are still areas of improvements.
* Despite Singapore’s small size, it has been able **to make full use of all land** available, while catering to the different people’s needs. Furthermore, the **prices of housing** is also on a rise.
* Singapore has earned the title of "**Safest country in the world**“, with one of the lowest crime rates in the world. Does our **strict laws and regulations** help to maintain law and order?

Our project will analyse these factors to support our hypothesis, with the limited time and resources, we are only covering 4 factors. Since different people have different opinions, our report may not include what they feel is an influencing factor or areas where they would like to know more about.

### 3. Interviews Questions

We constructed 13 interview questions with mixture of open and close-ended questions to elicit relevant information and confirm/clarify information of our interviewees.

|  |  |  |  |
| --- | --- | --- | --- |
| **List of Interview Questions** | | | |
| **S/N** | **Question** | **User** | **Type of Question** |
| 1. | If you could create a country, what kind of country would you want it to be. | Young Adults | Open-ended |
| 2. | What has been your experience with the education system in Singapore? | Young Adults | Open-ended |
| 3. | Do you feel that the school environment is comfortable enough for you to do well in school? Why/Why not? | Young Adults | Close-ended + Open-ended |
| 4. | Do you think Singapore’s education system needs improvement? Why/Why not? | Young Adults | Close-ended + Open-ended |
| 5. | Describe your last experience at the hospital. For example, your waiting time and experience with doctors. | Young Adults | Open-ended |
| 6. | Do you think Singapore’s healthcare is affordable? Why/Why not? | Young Adults | Close-ended + Open-ended |
| 7. | Do you trust the healthcare system  in Singapore? Why/Why not? | Young Adults | Close-ended + Open-ended |
| 8. | In the future, when you decide to get a house, what type of housing will you get and why? | Young Adults | Open-ended |
| 9. | What are some factors you will consider when getting a house? Why? | Young Adults | Open-ended |
| 10. | Do you feel that the housing prices in Singapore are affordable? Why/Why not? | Young Adults | Open-ended |
| 11. | How do you think the police in Singapore address safety concerns in the community? | Young Adults | Open-ended |
| 12. | In your opinion, what are the main safety concerns in Singapore? | Young Adults | Open-ended |
| 13. | In your opinion, what more could be done to enhance safety in Singapore? | Young Adults | Open-ended |

### 4. Proof of Interviews & Personas

The following is a list of the sources of our interviews, which were captured in video and audio formats.

|  |  |
| --- | --- |
| Description | Link |
| Interview clips | <https://drive.google.com/drive/folders/1dv72pbAsqJIHCdNuHFZ2IZBfehRPbstF?usp=share_link> |
| Personas | <https://www.figma.com/file/qKjKN02h3l8TaAg2XFUtvo/INTERVIEW-VAP?node-id=0%3A1&t=DSAbZGbslH89WRWt-1> |

Here are the screen captures of the persona of each interviewees.

|  |  |
| --- | --- |
| Interview 1 | Diagram  Description automatically generated with medium confidence |
| Interview 2 | A picture containing table  Description automatically generated |
| Interview 3 | A picture containing text  Description automatically generated |
| Interview 4 | Text  Description automatically generated with low confidence |
| Interview 5 | Graphical user interface, application  Description automatically generated |
| Interview 6 | Text  Description automatically generated with medium confidence |
| Interview 7 | Graphical user interface, text, application  Description automatically generated |
| Interview 8 | Graphical user interface, application  Description automatically generated |

### 5. Survey

In addition to the interviews, we conducted a survey with a total of 14 close-ended questions to gain additional insight into our target users, in which we,

* Received a total of **59 responses**.
* Performed **data cleaning** on our data and remove unnecessary data.
* Focused on age group of **16-25 years old**; the rest were separated.

Link to the data sheet and the survey form are below. We will be performing further analysis in the later section of this document.

|  |  |
| --- | --- |
| Description | Link |
| Data sheet (.xlsx) | <https://onedrive.live.com/edit.aspx?resid=A07BA9526755530F!1492&ithint=file%2cxlsx&authkey=!AEovLWZQl8yYiQI> |
| Survey Form | <https://docs.google.com/forms/d/1QovyGXpzKKAnXLlzMjsZUYEHRdDOg2oflyNTq5r_o9k/edit> |

## **Understanding Requirements**

After conducting interviews and surveys, in this section, we will gain a deeper understanding of the users' requirements from the data we have collected.

### 1. Product Backlog

From the interviews conducted, 12 user stories where created that outlined the requirements.

|  |  |  |
| --- | --- | --- |
| **S/N** | **Use Case** | **User Story** |
| 1. | Improved job prospects in the competitive job market. | **As a** student**, I want to** further my studies in university **so that I** have a better chance of finding job opportunities in the future, to succeed in a stressful and competitive environment. |
| 2. | Comfortable, well-equipped learning environment with a positive culture. | **As a** student, **I want to** feel comfortable and supported in my school environment **so that I** can focus on my studies and perform to the best of my ability. |
| 3. | Education is flexible and adaptable to changing societal and job market needs | **As a** student preparing for the workforce, **I want** my education to be flexible and adaptable to the changing needs of society and the job market. |
| 4. | Affordable healthcare | **As a** person who is concerned about the cost of healthcare, **I want to** know more about Medisave and subsidies in Singapore, **so that I** can pay for medical bills at a lower cost. |
| 5. | Decreased waiting times | **As a** young adult who is a permanent resident**, I want to** have a shorter waiting time so my doctor visit can be more efficient |
| 6. | Efficient medicine and test results collection | **As a** patient/visitor at a hospital, **I want to** have shorter waiting time and more efficient processing speed when I collect my medicine and receive test results, **so that I** can spend lesser time waiting during my visit to the hospital. |
| 7. | Pricing of houses | **As a** student in junior college, **I want to** be able to know more about the prices of housing **so that I** can better prepared how much money I need in the future to get my own house. |
| 8. | Grants for housing | **As a** permanent resident, **I want to** be able to know which grants are available and how it will be affected by the type of house **so that** my family and I can consider moving to a bigger home if it is within our budget. |
| 9. | Location and Amenities | **As a** young adult**, I want to** know which location is best place I should stay at based on the amenities in that area **so that** I can see which area fits within my budget. |
| 10. | Crime Statistics | **As a** young adult, **I would** like to see statistics of crime in Singapore such as the types of crime committed, **so that I** am informed and can better understand the overall safety of the country. |
| 11. | Crime Prevention | **As a** young adult, **I would** **like** the government to educate and spread awareness about crimes and how to prevent them, **so that I** will not be a victim of crime. |
| 12. | Road Safety | **As a** young adult**, I want** to be able to see statistics related to traffic conditions and accidents, **so that I** can feel safer when walking around Singapore. |

### 2. Survey Analysis

In this section, we will take deeper dive to analyse the survey data we collected from the public.

|  |  |
| --- | --- |
| **Question + Model** | **Description** |
| Chart, bar chart  Description automatically generated | We manage to get an even number of females and male young adults to response to our survey.  This will help us to get a fair point of view from both genders. |
| Chart, pie chart  Description automatically generated | The different age groups we got through our survey.  We have filtered out responses not from our target audience to analyse their choices. |
| Chart, pie chart  Description automatically generated | **57%** of our respondents feel that the education system in Singapore adequately prepares them for the workforce while **43%** do not feel that way. The results are **quite balanced**. |
| Chart, bar chart  Description automatically generated | Most of the respondents (**21**) feel that Singapore’s education system is **much better** compared to other countries while some of our respondents (**16**) feel that it is **better**, and the minority of our respondents (**7**) feel that the education system is **neutral** compared to other countries. |
| Chart, bar chart  Description automatically generated | On the **scale 5**, most of the respondents (**15**) are **very satisfied** with Singapore’s education system.  On the **scale 3 and 4**, they have the same number of respondents (**13**) each and they are either **neutral** or **satisfied** with Singapore’s education system.  On the **scale 2**, a little of our respondents feel **dissatisfied** with Singapore’s education system.  On the **scale 1**, a minority of our respondents feel **very dissatisfied** with the Singapore’s education system. |
| Chart, pie chart  Description automatically generated | About **1/3 of respondents responded that Singapore’s healthcare is cheap** (level 4-5), while about ¼ of respondents say that its expensive (level 1-2).  There is a **wide range of opinions** about the affordability of the healthcare as the percentage of people who think it’s cheap, expensive, and neutral is **about the same** |
| Chart, pie chart  Description automatically generated | Majority of respondents **(75%)** say that they wait **less than 30 min** for a doctor.  While only **4%** of the respondents say that they must wait **more than 1.5 hours** for doctor. |
| Chart, bar chart, waterfall chart  Description automatically generated | Majority respondents **(95%)** responded that they took **lesser than 20 min** to travel to their nearest healthcare facility.  Only **4.5%** say that it takes **more than 20 min** to reach a healthcare facility which is very low. |
| Chart  Description automatically generated | According to our survey, **majority o**f youth aged 16-25 feels safe in Singapore. |
| Chart, pie chart  Description automatically generated | Our survey found that **29% of Singaporeans aged 16-25** have experienced some form of crime, while the remaining **71% never experienced any form of crime happening to them**. |
| Chart, pie chart  Description automatically generated | Our survey has shown that youths in Singapore aged **16-25 have confidence in the abilities of emergency services** such as the police, ambulance, and fire fighters, to effectively handle emergencies and keep citizens safe. |
| Chart, bar chart  Description automatically generated | Most of the respondents **(21)** say they **stay less than 5 minutes away** from the MRT and only a small number **(4)** of people **stay more than 15 minutes away from MRT.** |
|  | Based on the survey results, I clean the data by sorting them by during location to North, North-East, East, West, South and Central of Singapore.  From **the tree map**, majority of the people choose **North of Singapore as their ideal location** to stay at and **minority of people choose Central** as to stay at. |
| Chart, pie chart  Description automatically generated |  |
| **1 in 3 young adults** choose **HDB** as their preference, and the majority **(41%)** of them choose **HDB 4 room flat** as their ideal house type.  This question helps us to be able to **know which area of housing to focus** more on like HDB rental/selling prices and comparison of different types of HDB prices | |

### 3. Secondary Research & Insights

Additionally, we performed secondary research on other domains to identify any potential knowledge gaps and to gain additional insights which can serve as the basis of further analysis.

|  |  |
| --- | --- |
| **Insights** | **Source** |
| *“An understanding of economics and finance provides a valuable foundation for lifelong learning and can be applied to real-world problems” "The discourse is not just theoretical, but it can lead to better outcomes that can improve the lives of billions of people on earth"* | Goh, Y.H.(2021) Understanding Economics, finance useful for youth, can help tackle real-world problems: DPM Heng, The Straits Times. Available at:  [*https://www.straitstimes.com/singapore/understanding-economics-finance-valuable-for-young-people-can-help-address-real-world*](https://www.straitstimes.com/singapore/understanding-economics-finance-valuable-for-young-people-can-help-address-real-world) |
| *“Boosting lifelong learning and closing learning gaps early in life are among the five key areas of focus needed to ensure Singapore’s education system stays relevant in an increasingly uncertain and challenging world.”* | Teng, A. (2023) *Focus on 5 key areas to keep education system relevant in uncertain world: Chan Chun Sing*, *The Straits Times*. Available at:  <https://www.straitstimes.com/singapore/parenting-education/focus-on-5-key-areas-to-keep-education-system-relevant-in-uncertain-world-chan-chun-sing> |
| *“… whether they can stay ahead of healthcare costs are the top two issues on Singaporeans’ minds amid an ongoing national engagement exercise”* | Goh, Y.H. (2022) *Job security, healthcare costs top two concerns in poll on forward Singapore Topics*, *The Straits Times*. Available at:  <https://www.straitstimes.com/singapore/job-security-healthcare-costs-top-two-concerns-in-poll-on-forward-singapore-topics> |
| *"We will continue to monitor the market closely and adjust our policies as necessary on both housing demand and supply, to ensure that prices move broadly in line with economic fundamentals," said Mr. Desmond Lee.* | Goh, Y.H. (2022) *Singapore committed to affordable public housing, will intervene as needed: Desmond Lee*, *The Straits Times*. Available at:  <https://www.straitstimes.com/singapore/politics/singapore-committed-to-affordable-public-housing-will-intervene-as-needed-desmond-lee> |
| *Rise in scam cases drove overall crime higher in Singapore.*  *From January 2022 to June 2022, an increase in scams to 14,349 cases drove up the total number of reported crimes to 25,593 cases, from 18,725 cases in the same period in 2021* | Bose, P. (2022) *Singapore is the safest country in the world for International Travel*, *Lifestyle Asia India*. Available at:  <https://www.lifestyleasia.com/ind/whats-on/news-whats-on/singapore-is-safest-country-in-the-world-for-international-travel/> |

### 4. Transdisciplinary Thinking

To further develop our ideas, we reached out to other domains and collaborated with a Professor in NTU that is researching on the education system in Singapore. We conducted an interview with him, and the following are his insights:

***Question 1:*** *“What do you think are the main issues in Singapore's education system?”*

|  |
| --- |
| **Mentioned Key Points** |
| High stress levels |
| Competitive nature |
| High regard/emphasis of grades |
| Grades are the most important factor in determining a child’s success |
| Syllabus getting harder each year, making it daunting to keep up |
| Stress is the main issue in Singapore’s education system |

***Question 2:*** *“Do you feel that the school environment is comfortable enough for students to do well in school? Why/Why not?”*

|  |
| --- |
| **Mentioned Key Points** |
| School environment is good compared to other countries |
| Really good environment |
| Good equipment and facilities to facilitate a good school life |
| Students are well taken care of |
| School environment is good compared to other countries |
| Really good environment |

***Question 3:*** *“Do you think Singapore’s education system needs improvement? Why/Why not?”*

|  |
| --- |
| **Mentioned Key Points** |
| Singapore is doing well in keeping up their education system |
| Needs improvement, as stress levels hasn’t been going down |
| Singapore’s effort in reducing stress is not enough, due to the removal of mid-year exams, more emphasis will be put on year-end exams |
| Students feel the need to do much better compared to back in the days |
| Students are aiming for higher qualifications |
| Singapore is doing well in keeping up their education system |

Listen to the full interview here:

|  |  |
| --- | --- |
| Description | Link |
| Interview audio | <https://drive.google.com/file/d/1QLyXOjGFobsy4gDAVxjRPhijZThoD1Oz/view?usp=share_link> |

## **Proposed Workplan**

This section outlines the features we plan to include in our analysis/solution and details the resources we are utilizing/have used, as well as the project schedule.

### 1. Planned Features

Here is the complete description of the features we plan to provide in our analysis/solution.

|  |  |
| --- | --- |
| **Factor** | **Features** |
| **Education (Natelie)** | Focus on **tertiary education** statistics (those studying in school) and **employment** condition statistics (those working) to target our age group.  **School Statistics**   * School Insights such as the number of schools, students, classes, fees etc. * Teacher to Student ratio in different institutions and schools. * With the types of schools in Singapore listed to filter the data * From survey: Rating of the quality of Singapore education system compared to other countries. * From survey: Rating of overall satisfaction with the education system in Singapore.   Analysing the curriculum, teacher qualifications, and resources available in different education systems can help us gain more insight.  Analysing the quality and satisfaction with their education.  **Enrolment Statistics**   * Enrolment Rates by Course, Study Type, Institutions   **Graduate Statistics**   * Graduate Rates by Course, Sex, Study Type, Institutions * Graduate Rates in Singapore and Other Countries (Comparing graduation rates between countries.)   **Employment Statistics**   * Employment Rates by School, Degree etc * Graduate Median Salary by School, Degree etc * From survey: Education system in Singapore adequately prepares you for the workforce.   Analysing the opinions, employability and earning potential of graduates from different education systems.  **Government Expenditure Statistics**   * Government Expenditure on Education Annually   Examining the level of funding allocated to education can help give us more insight on how much the government fund our education system. |
| **Healthcare**  **(Amber)** | **Efficiency Statistics**   * Number of hospital admissions over the years * Number of hospital beds over the years * Number of medical staffs over the years * Number of healthcare facilities over the years * Waiting time at polyclinics   **Quality Statistics**   * Life expectancy of patients in Singapore and other countries (comparison)   **Cost Statistics**   * Costs of medical procedures like heart bypass surgery between different countries * Consumer price index (CPI) * Healthcare subsidies * Healthcare expenditure per person * Hospitals/Clinics in Singapore listed to filter the data |
| **Housing**  **(Javerine)** | **Housing Prices Statistics**   * Overview of HDB Resale Prices * Private residential properties. * Properties overall prices * Graphs showing price range of HDB * Distance of MRT and cost of housing   **Housing Grants Statistics**   * Number of Housing grants and amount   **Comparison statistics compared to the world**   * House Prices in the World * Price Index in the World by city |
| **Safety**  **(Damian)** | **Crime statistics**   * Crime rates over time * Number of crimes by the type of crime * Police to population ratio * Police stations across Singapore to see the distribution * Comparison of safety and crime index across countries   **Emergency services statistics**   * Number of EMS calls overtime * Number of fire occurrences in Singapore over time * Emergency serviceman to population ratio * Fire related injuries and fatalities over time * Fire stations across Singapore to see the distribution   **Traffic statistics**   * Road traffic accident casualties * Number of vehicles involved in fatal accidents * Number of fatal accidents involving drivers, rider, cyclist * Traffic condition overtime * Traffic lights across Singapore and the no. of traffic lights * Number of pedestrian facilities across Singapore |

### 2. Benefits

The ways in which our analysis/solution will benefit our target users and address their concerns.

|  |  |  |
| --- | --- | --- |
| **S/N** | **Factor** | **Benefits** |
| 1 | Education **(Natelie)** | **How/Who will it benefit?**   * For international students to considering coming to Singapore. * Inform decision on expenses & information for future children/parents. * Improved job prospects in the competitive job market. |
| 2 | Healthcare **(Amber)** | **How/Who will it benefit?**   * Informed on costs and subsidies provided by the government. * Compare services provided. * Shows the efficiency of the healthcare system in Singapore. * Shows the accessibility and capacity of the healthcare system. |
| 3 | Housing **(Javerine)** | **How/Who will it benefit?**   * Allows for a better planning of future housing. * Inform on the prices of housing in Singapore. * Informed on government grants. * Show the importance of location e.g., the proximity of amenities. |
| 4 | Safety **(Damian)** | **How/Who will it benefit?**   * Greater awareness about crimes and the prevention methods. * Informed on pedestrian safety in Singapore * Better understanding on emergency response systems. * Consideration when deciding to come to Singapore. |

### 3. Resources

The following is a list of the resources that we have used or will be using develop our analysis/solution.

|  |  |
| --- | --- |
| Activity | Source |
| Interview | Discord Logo PNG Transparent & SVG Vector - Freebie SupplyMeet | Google Blog Icon, bubble chart  Description automatically generated |
| Survey | Why Your Business Should be Using Google Forms | Corkboard Concepts |
| Visualization | Figma Partners with WordPress to Improve Design Collaboration – WP Tavern |
| Data Sources | 1. [data.gov.sg](http://www.data.gov.sg) 2. [statista.com](http://www.statista.com) 3. [singstat.gov.sg](http://www.singstat.gov.sg) 4. [datamall.lta.gov.sg](https://datamall.lta.gov.sg/)  5. Survey & interviews |

### 4. Approach & Schedule

Our proposed plan for executing this project involves separating it into three different phases.

|  |  |
| --- | --- |
| Phases | Activity |
| PHASE 1:  Requirements Gathering | by Jan 2023 | Gathering requirements via interviews and surveys etc. |
| PHASE 2:  Prep & Modeling | by Mid Jan 2023 | Data cleaning/preparation and prototyping for visualization. |
| PHASE 3:  Visualization & Analysis| by Mid Feb 2023 | Creation of analysis dashboard. |

Detailed Project Schedule created with Gantt chart format:

|  |  |
| --- | --- |
| Description | Link |
| Project Schedule | <https://onedrive.live.com/redir?resid=A07BA9526755530F!1486&authkey=!APUwSunSy9Ytx1w&ithint=file%2cxlsx> |

### 5. Datasets

Here is the list of datasets/potential datasets that we are using to perform our analysis.

|  |  |  |  |
| --- | --- | --- | --- |
| **Education (Natelie)** | | | |
| * School Insights * Enrolment Rates * Graduate Rates * Employment Rates * Government Expenditure on Education | | | |
| **S/N** | **Dataset** | | **Description** |
| 1 | **University Graduates (First Degree) by Course Type**  The Government of Singapore. (February 15, 2016). *Graduates From University First Degree Courses by Type Of Course* - Data.gov.sg. Retrieved January 12, 2023, from  <https://data.gov.sg/dataset/graduates-from-university-first-degree-courses-by-type-of-course> | | Evidence for: **Graduation Rates**  University Graduates (First Degree) by number and type of course from July 6, 2015, to February 15, 2016. |
| 2 | **Employment Conditions of Graduates**  The Government of Singapore. (November 2, 2023). *Graduate Employment Survey - NTU, NUS, SIT, SMU, SUSS & SUTD* - Data.gov.sg. Retrieved January 12, 2023, from  <https://data.gov.sg/dataset/graduate-employment-survey-ntu-nus-sit-smu-suss-sutd> | | Evidence for: **Employment Rates**  The Graduate Employment Survey (GES) is conducted annually by NTU, NUS, SMU, SIT, SUTD, and SUSS from January 1, 2013, to December 31, 2021, to survey the employment conditions of graduates six months after graduation. It helps provide data for informed course decisions. |
| 3 | **Polytechnic Graduates by Course**  The Government of Singapore. (January 6, 2023). *Polytechnics - Intake, Enrolment and Graduates by Course* - Data.gov.sg. Retrieved January 12, 2023, from  <https://data.gov.sg/dataset/polytechnics-intake-enrolment-and-graduates-by-course> | | Evidence for: **Enrolment Rates** + **Graduation Rates**  Intake, enrolment, and graduate figures (refer to full-time diploma courses only and exclude students on the Polytechnic Foundation Programme) from January 1, 1993, to December 31, 2014. Direct entry to second year is included. Courses are classified according to content weighting and may change over time. |
| 4 | **Polytechnic Enrolment by Study Type**  The Government of Singapore. (February 22, 2022). *Singapore Polytechnic Enrolment by Type of Study - Annual* -Data.gov.sg. Retrieved January 12, 2023, from  <https://data.gov.sg/dataset/singapore-polytechnic-enrolment-by-type-of-study> | | Evidence for: **Enrolment Rates**  Full-time and Part-time enrolment numbers annually from January 1, 2016, to December 31, 2021. |
| 5 | **Polytechnic Graduate by Study Type**  The Government of Singapore. (February 21, 2022). *Singapore Polytechnic Graduate By Type of Study, Annual* - Data.gov.sg. Retrieved January 12, 2023, from  <https://data.gov.sg/dataset/singapore-polytechnic-graduate-by-type-of-study-annual> | | Evidence for: **Graduation Rates**  Graduates by type of study (Full-time and Part-time courses) numbers annually from January 1, 2016, to December 31, 2021. |
| 6 | **Pre-University Students & Education officers**  The Government of Singapore. ( January 6, 2023). *Students and Teachers in Schools - Pre University* - Data.gov.sg. Retrieved January 12, 2023, from  <https://data.gov.sg/dataset/students-and-teachers-in-schools?resource_id=089779cd-3041-4ec4-8c0a-57f5380fca40> | | Evidence for: **School Insights**  Students and education officers from pre-universities numbers annually from January 1, 1981, to December 31, 2021. |
| 7 | **University Intake, Enrolment, Graduates by Course**  The Government of Singapore. ( January 6, 2023). *Universities - Intake, Enrolment and Graduates by Course* - Data.gov.sg. Retrieved January 12, 2023, from  <https://data.gov.sg/dataset/universities-intake-enrolment-and-graduates-by-course> | | Evidence for: **Enrolment Rates** + **Graduation Rates**  Intake, enrolment, and graduate by course numbers annually from January 1, 2005, to December 31, 2021. |
| 8 | | **Intake, Enrolment, Graduates by Institutions**  The Government of Singapore. ( January 6, 2023). *Intake, Enrolment and Graduates by Institutions* - Data.gov.sg. Retrieved January 12, 2023, from <https://data.gov.sg/dataset/intake-enrolment-and-graduates-by-institutions> | Evidence for: **Enrolment Rates** + **Graduation Rates**  Intake, enrolment, and graduate by institutions numbers annually from January 1, 1982, to December 31, 2021. |
| 9 | | **School Students, Education Officers, Education Partners by Level**  The Government of Singapore. ( January 6, 2023). *Students, Education Officers, and Education Partners in Schools by Level* - Data.gov.sg. Retrieved January 12, 2023, from  <https://data.gov.sg/dataset/students-education-officers-and-education-partners-in-schools-by-level> | Evidence for: **School Insights**  School students, education officers, education partners by level numbers annually from January 1, 2003, to December 31, 2021.  Education Partners include non-teaching staff such as administrators, allied educators, technical support and operations staff in mixed-level primary, secondary, and junior college schools. Staff strength data may include temporary staff movements. |
| 10 | | **Classes & Class Size by Level**  The Government of Singapore. ( January 6, 2023). *Number of Classes and Class Size by Level* - Data.gov.sg. Retrieved January 12, 2023, from  <https://data.gov.sg/dataset/number-of-classes-and-class-size-by-level?view_id=43c598cd-830f-40f0-95a0-3c2720e82213&resource_id=9c44631c-b8cd-499d-b01b-11fa1a5c33c0> | Evidence for: **School Insights**  Classes and class size by level numbers annually from January 1, 1982, to December 31, 2021.  Shows the number of classes and class size by level, where in the class size is the average number of students per class. |
| 11 | | **ITE Intake, Enrolment, Graduates by Course**  The Government of Singapore. ( January 6, 2023). *Number of Classes and Class Size by Level* - Data.gov.sg. Retrieved January 12, 2023, from  <https://data.gov.sg/dataset/ite-intake-enrolment-and-graduates-by-course> | Evidence for: **Enrolment Rates + Graduation Rates**  ITE Intake, enrolment, and graduate by course numbers annually from January 1, 2009, to December 31, 2021.  Institute of Technical Education (ITE) figures include full-time Nitec, Higher Nitec and Diploma programmes but exclude apprentices. Courses are classified by school. |
| 12 | | **Education Expenditure (Government)**  The Government of Singapore. (December 30, 2022). *Government Recurrent Expenditure on Education by Type of Educational Institutions* - Data.gov.sg. Retrieved January 12, 2023, from  <https://data.gov.sg/dataset/government-recurrent-expenditure-on-education> | Evidence for: **Government Expenditure**  The recurrent amount spent by government on education by type and educational institutions annually from January 1, 1981, to December 31, 2021. |
| 13 | | **Polytechnic Diploma Courses Graduates by Course & Sex**  Singapore Department of Statistics. (25 Feb 2022). *(DOS) |* *SingStat TableBuilder* - *Graduates from Polytechnic Diploma Courses By Type Of Course And Sex* – Tablebuilder.singstat.gov.sg. Retrieved January 12, 2023, from  <https://tablebuilder.singstat.gov.sg/table/TS/M850501> | Evidence for: **Graduation Rates**  Graduates From Polytechnic Diploma Courses by Type Of Course And Sex numbers annually from 1993 – 2020. |
| 14 | | **Polytechnic Advanced Diploma Courses Graduates by Course**  Singapore Department of Statistics. (25 Feb 2022). *(DOS) |* *SingStat TableBuilder* - *Graduates From Polytechnic Advanced Diploma Courses By Type Of Course* – Tablebuilder.singstat.gov.sg. Retrieved January 12, 2023, from  <https://tablebuilder.singstat.gov.sg/table/TS/M850541> | Evidence for: **Graduation Rates**  Graduates From Polytechnic Advanced Diploma Courses by Course numbers annually from 1993 – 2020. |
| 15 | | **University First Degree Courses Graduates by Course & Sex**  Singapore Department of Statistics. (25 Feb 2022). *(DOS) |* *SingStat TableBuilder* - *Graduates from University First Degree Courses By Type Of Course And Sex* – Tablebuilder.singstat.gov.sg. Retrieved January 12, 2023, from  <https://tablebuilder.singstat.gov.sg/table/TS/M850511> | Evidence for: **Graduation Rates**  Graduates From University First Degree Courses by Type of Course and Sex numbers annually from 1993 – 2020. |
| 16 | | **Higher Degree Courses Graduates by Course**  Singapore Department of Statistics. (25 Feb 2022). *(DOS) |* *SingStat TableBuilder* - *Graduates from Higher Degree Courses By Type Of Course* - Tablebuilder.singstat.gov.sg. Retrieved January 12, 2023, from  <https://tablebuilder.singstat.gov.sg/table/TS/M850551> | Evidence for: **Graduation Rates**  Graduates From Higher Degree Courses by Type of Course numbers annually from 1993 – 2020. |
| 17 | | **Education Expenditure Per Student (Government)**  Singapore Department of Statistics. (21 Oct 2022). *(DOS) |* *SingStat TableBuilder* - *Government Recurrent Expenditure On Education Per Student* - Tablebuilder.singstat.gov.sg. Retrieved January 12, 2023, from  <https://tablebuilder.singstat.gov.sg/table/TS/M850291> | Evidence for: **Government Expenditure**  The recurrent amount spent by government per student numbers annually from 1986 – 2021. |
| 18 | | **Tertiary Graduation Rates in the World**  OECD (2023), *Tertiary graduation rate* (indicator). doi: 10.1787/15c523d3-en (Accessed on 13 January 2023)  <https://data.oecd.org/students/tertiary-graduation-rate.htm> | Evidence for: **Graduation Rates**  Tertiary Graduation Rates in the world  The data is from 2005 – 2020. |
| 19 | | **Dataset from Politemall/Teacher**  **Graphical user interface, application, Teams  Description automatically generated** | Evidence for: **School Insights**  Dataset consists of level, school type, year, fees.  Data is from 2013 – 2020. |

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| **Healthcare (Amber)** | | |
| * Efficiency * Cost * Quality | | |
| **S/N** | **Dataset** | **Description** |
| 1 | **Hospital admissions**  The Government of Singapore. (2021, March 11). *Hospital Admissions and Public Sector Outpatient Attendances, Annual-Data.gov.sg*. Data.gov.sg. Retrieved January 11, 2023, from  <https://data.gov.sg/dataset/hospital-admissions-and-public-sector-outpatient-attendances-annual> | Evidence for: **Efficiency**  Hospital admissions from 1984-2020 from various hospital/healthcare facilities.  This will be **used in comparison with the amount of hospital beds available**. It will present the data  Only using data **from 2006 onwards** due to empty data. |
| 2 | **Medical staffs**  Singapore Department of Statistics. (2022, June 28). (DOS) | *SingStat Table Builder - Registered Health Personnel (End of Period).* Tablebuilder.singstat.gov.sg. Retrieved January 11, 2023, from <https://tablebuilder.singstat.gov.sg/table/TS/M870011> | Evidence for: **Efficiency**  Number of Medical staffs in Singapore in from 1960-2021, **based on occupational role**.  Will only be using 2014-2021 as **older years have empty values.** And **excluding staff that is not in practice**. |
| 3 | **Hospital capacity**  Ministry of Health. (2023, January 5). *Beds in inpatient facilities and places in non-residential long-term care facilities*. moh.gov.sg. Retrieved January 13, 2023, from  <https://www.moh.gov.sg/resources-statistics/singapore-health-facts/beds-in-inpatient-facilities-and-places-in-non-residential-long-term-care-facilities> | Evidence for: **Efficiency**  Number of beds in Healthcare facilities bed capacity from 2010-2021 categorised **based on type of facility.** |
| 4 | **Life expectancy**  The World Bank. (2022, December 22). *Life expectancy at birth, total (years) | Data*. Data.Worldbank.Org. Retrieved January 13, 2023, from <https://data.worldbank.org/indicator/SP.DYN.LE00.IN> | Evidence for: **Quality**  Life expectancies of **different countries** from 1960-2021  Only using **from 2014 onwards** due to empty data columns |
| 5 | **Cost of heart bypass surgery**    Steward, C. (2021, June 21). *Cost of a heart bypass in various countries 2019*. Statista. Retrieved January 11, 2023, from <https://www.statista.com/statistics/189966/cost-of-a-heart-bypass-in-various-countries/> | Evidence for: **Cost**  Cost of heart bypass surgery at **different countries** |
| 6 | **Number of Healthcare facilities**  Ministry of Health. (2022, October 27). *Health Facilities*. moh.gov.sg. Retrieved January 13, 2023, from <https://www.moh.gov.sg/resources-statistics/singapore-health-facts/health-facilities> | Evidence for: **Efficiency**  Number of healthcare facilities from 2014-2021, **categorised by healthcare type.** |
| 7 | **Consumer price index (CPI)**  Singapore Department of Statistics. (2022, December 23). *(DOS) |* *SingStat TableBuilder - Consumer Price Index (CPI), 2019 As Base Year*. Tablebuilder.singstat.gov.sg. Retrieved January 11, 2023, from  <https://tablebuilder.singstat.gov.sg/table/TS/M212881> | Evidence for: **Cost**  CPI from 1961 to 2022 (Annually)  Consumer price index **shows the inflation rate**.  **Only data on Health is used**. |
| 8 | **Subsidies**  Ministry of Health. (2022, November 1). *MOH | Subsidies for Acute Inpatient Care at Public Healthcare Institutions*. Moh.gov.sg. Retrieved January 11, 2023, from  <https://www.moh.gov.sg/cost-financing/healthcare-schemes-subsidies/subsidies-for-acute-inpatient-care-at-public-healthcare-institutions> | Evidence for: **Cost**  **Amount of subsidy for each circumstance** |
| 9 | **Healthcare expenditure per person**  Singapore Department of Statistics. (2019, July 31). *DOS | SingStat Table Builder - Average Monthly Household Expenditure Per Household Member Among Resident Households*. Tablebuilder.singstat.gov.sg. Retrieved January 13, 2023, from  <https://tablebuilder.singstat.gov.sg/table/CT/16450> | Evidence for: **Cost**  Expenditure per household member **by income quartile**.  **Only using data on health** |
| 10 | **Waiting times at poly clinics**  Ministry of Health. (2022, December 20). *Waiting times for registration and for consultation at Polyclinics*. moh.gov.sg. Retrieved January 11, 2023, from  <https://www.moh.gov.sg/resources-statistics/healthcare-institution-statistics/waiting-times-for-registration-and-for-consultation-at-polyclinics> | Evidence for: **Efficiency**  Wait times for registration and consultation at polyclinics **categorised based on location** for October 2022 |
| 11 | **Different subsidy rate for each ward**  Lim, A. (2022, January 27). *7 healthcare cost statistics in Singapore (2022): How high is it?* Smart Wealth Singapore. Retrieved January 14, 2023, from <https://smartwealth.sg/healthcare-cost-statistics-singapore/> | Evidence for: **Cost**  Different **cost** data for **different illness** and **ward type** |

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| **Housing (Javerine)** | | |
| * Housing Prices * Housing Grants * Comparison compared to the world | | |
| **S/N** | **Dataset:** | **Description:** |
| A | **HDB Resale Prices**  Singapore Government. (n.d.). *Resale Flat Prices*. Retrieved from  <https://data.gov.sg/dataset/resale-flat-prices> | Evidence for: **Housing Prices**  Resale Flat Prices based on registration date from **Jan 2017 to 1 Jan 2023**  I will be using some columns like ; Month, Town, Flat Type, Storey Range, Floor Area Sqm, Flat Model, Remaining lease, Resale Price.  I will use this data set as it is information is the latest, which will help me to better show my validity of my analysis. |
| 2 | **Private residential properties.**  Urban Redevelopment Authority. (n.d.). Retrieved January 1, 2023, from  <https://www.ura.gov.sg/Corporate/Property/Property-Data/Private-Residential-Properties> | Evidence for: **Housing Prices and Grants**  This is for me to have more understanding on housing in Singapore and the price. They provide a wide range of data for different housing types |
| 3 | **Housing grants**  *Housing Grants Awarded, by Type of Housing Grant.* Data.gov.sg,  <https://data.gov.sg/dataset/households-that-benefitted-from-cpf-housing-grant?view_id=0e095168-bf37-4ffd-a760-57bc23edba01&amp;resource_id=a077135a-a0ae-4656-9fd9-8fa61e8170bb>. | Evidence for: **Housing Grants**  I will be able to tell what type of schemes and type of grant under CPF housing grant and how many people are offered or have this suberise offered.  Housing grants include grants awarded under the Central Provident Fund (CPF) housing grant scheme and the Additional CPF Housing Grant (AHG), Special CPF Housing Grant (SHG) and the Proximity Housing Grant (PHG).  Information is from **2010 to 2021** |
| 4 | **Price Range of HDB**  *Price Range of HDB Flats Offered*. (n.d.). Data.gov.sg. Retrieved January 1, 2023, from  <https://data.gov.sg/dataset/price-range-of-hdb-flats-offered?resource_id=d23b9636-5812-4b33-951e-b209de710dd5> | Evidence for: **Housing Prices**  Price range of BTO flats offered in each FY for the following towns (Punggol 21, Jurong West, Choa Chu Kang, Bukit Panjang, Woodlands, Sembawang Seng Kang).  It includes data like minimum selling and maximum selling price and after prices after subsidies  Information is from **27 October 2015 to 27 December 2022** |
| 5 | **Property Price Index**  www.srx.com.sg. (n.d.). *SRX Singapore Property Price Index*. [online] Available at:  <https://www.srx.com.sg/price-index>. | Evidence for: **Housing Prices**  Sales and Rent prices for non-landed, landed and HDB housing in Singapore |
| 6 | **Cost of housing near MRT**  [HDB Flats near MRT Stations in Singapore: Exactly How Much More do they Cost? (2021) (propertyguru.com.sg)](https://www.propertyguru.com.sg/property-guides/hdb-near-mrt-how-much-more-56969) | Evidence for: **Housing Prices**  Average price increase of prices of HDB housing compared to near MRT vs not near MRT |
| 7 | **House Prices in the World**  OECD (2023), *Housing prices* (indicator). doi: 10.1787/63008438-en (Accessed on 13 January 2023)  <https://data.oecd.org/price/housing-prices.htm> | Evidence for: **Comparison Compared to the world**  Housing prices in the world  The data is from **2018 to 2022** |
| 8 | **Data from teacher: HDB BTO** | Evidence for: **Housing Prices**  Datasets consist of distance from amenities, room type, longitude, resale prices  The data is from **2008 to 2017** |
| 9. | **HDB Property Information**  *HDB Property Information*. (n.d.). Data.gov.sg.  <https://data.gov.sg/dataset/hdb-property-information> | Evidence for: **Housing Prices**  Contains the number of flats sold and rented and together with facilities near it  The data is from **January 1, 1937, to December 31, 2022** |
| 10. | **Price Index in the World by city**  *Current Property Prices Index by City*. (n.d.). [www.numbeo.com](http://www.numbeo.com).  <https://www.numbeo.com/property-investment/rankings_current.jsp> | Evidence for: **Comparison Compared to the world**  Comparison of price index in the world for housing and the income  Price Index for 2023 |
| 11 | **Population Living in Public Housing**  Hirschman, R. *Singapore: Population Living in Public Housing 2021* | Statista. *Statista*, Apr. 2022, [www.statista.com/statistics/966747/population-living-in-public-housing-singapore](http://www.statista.com/statistics/966747/population-living-in-public-housing-singapore). | Population of housing people stay in . |
| 12 | **Number of housing and Development board residential units under construction in Singapore**  Hirschman, R. *Number of Housing and Development Board (HDB) residential units under construction in Singapore from 2012/2013 to 2021/2022*| Statista. *Statista*, Nov.2022, <https://www.statista.com/statistics/965640/public-housing-units-under-construction-singapore/> | Data is on houses build over the years.  Data from **2012 to 2022** |
| 13 | **Flats Constructed**  *Flats constructed*. Data.gov.sg. (n.d.). Retrieved January 14, 2023, from <https://data.gov.sg/dataset/flats-constructed?view_id=3ad0e23b-0840-42bf-a079-7a866e624d89&amp;resource_id=4af42bbf-1ac0-46bf-9318-6efa6aa475a7> | Data is the number of flats build in Singapore over the years.  Prior to 1982, include units sold by JTC, but exclude those by HUDC. Include middle housing units completed by URA in 1985 and 1986. In 1992, exclude 96 units due to reclassification.  Data is from **1977 to 2017** |
| 14 | **Number of HDB properties/facilities allocated, by Finical year**  *Sold and Rented HDB Properties and Facilities*. Data.gov.sg, 26 Sept. 2016  <https://data.gov.sg/dataset/number-of-sold-and-rented-hdb-properties-facilities?view_id=cd8d1720-8536-4858-bdb7-5dd13dded033&resource_id=4541dd43-89a8-4e4b-881a-0cf1096489d0>  Accessed 14 Jan. 2023. | Contains Financial Year, Property Type, Category, Flat type and no of units.  Data is from 1977 to 2017 |

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| **Safety (Damian)** | | |
| * Crime Rates * Traffic Incidents * SPF/SCDF facilities * Traffic infrastructure * Fatality rates | | |
| **S/N** | **Dataset** | **Description** |
| 1 | **Recorded Crime Cases**  Singapore Police Force. (2022, October 20). *Crime Cases Recorded,* Retrieve from,  [https://tablebuilder.singstat.gov.sg/table/TS/ M890541](https://tablebuilder.singstat.gov.sg/table/TS/M890541) | Statistics on public safety are compiled by the Singapore Civil Defence Force, Singapore Police Force, Singapore Prison Service, and the Immigration & Checkpoints Authority.  Data from 2011-2021 |
| 2 | **Singapore Police Force Establishments**  Ministry of Home Affairs - Singapore Police Force. (2022, January 17). *Singapore Police Force Establishments*  <https://data.gov.sg/dataset/singapore-police-force-establishments> | Geo location of police stations across Singapore 2022. |
| 3 | **Fire Stations**  Ministry of Home Affairs - Singapore Civil Defence Force. (2017, September 22). *Fire Stations*  <https://data.gov.sg/dataset/fire-stations?resource_id=b31aa42f-607b-4037-8065-d0fbde5c975d> | Geo location of fire stations across Singapore 2019. |
| 4 | **Location of Speed Enforcement Cameras**  Ministry of Home Affairs - Singapore Police Force. (2019, December 16). *Location of Speed Enforcement Cameras*  <https://data.gov.sg/dataset/location-of-speed-enforcement-cameras> | Geo location of speed enforcement camera across Singapore 2019. |
| 5 | **SFP Annual Reports**  Singapore Police Force. *SPF Annual report (2014-2022)*  [*https://www.police.gov.sg/media-room/publications*](https://www.police.gov.sg/media-room/publications) | SPF annual reports needed for the number of active policeman in Singapore. |
| 6 | **Road Traffic Accident Casualties**  Singapore Police Force. (2022, April 07). *Road Traffic Accident Casualties,* Retrieve from,  [https://tablebuilder.singstat.gov.sg/table/](https://tablebuilder.singstat.gov.sg/table/TS/M651281" \l "!)  [TS/M651281#!](https://tablebuilder.singstat.gov.sg/table/TS/M651281" \l "!) | Data shows number of traffic accident casualties in Singapore from 1981 to 2021. |
| 7 | **Vehicles Involved in Fatal and Injury Road Traffic Accidents by Type of Vehicle**  Singapore Police Force. (2022, April 07). *Vehicles Involved in Fatal and Injury Road Traffic Accidents by Type of Vehicle,* Retrieve from,  [https://tablebuilder.singstat.gov.sg/](https://tablebuilder.singstat.gov.sg/table/TS/M650311)  [table/TS/M650311](https://tablebuilder.singstat.gov.sg/table/TS/M650311) | Number of vehicle that are involved in an accident that is fatal or result in an injury. Data from 2015 to 2021. |
| 8 | **Causes Of Accidents by Severity of Injury Sustained**  Singapore Police Force. (2022, September 16). *Causes Of Accidents by Severity Of Injury Sustained,* Retrieve from,  [https://tablebuilder.singstat.gov.sg/](https://tablebuilder.singstat.gov.sg/table/TS/M651361)  [table/TS/M651361](https://tablebuilder.singstat.gov.sg/table/TS/M651361) | Number of fatal accidents of drivers, riders, or cyclists. Range from 2012 to 2021. |
| 9 | **Emergency Medical Services**  Singapore Civil Defence Force. (2022, April 11). *Emergency Medical Services,* Retrieve from,  [https://tablebuilder.singstat.gov.sg/](https://tablebuilder.singstat.gov.sg/table/TS/M890951)  [table/TS/M890951](https://tablebuilder.singstat.gov.sg/table/TS/M890951) | Total number of EMS calls categorised into 'Emergency', 'Non-Emergency', and 'False Alarm'. Data range from 2000 to 2021. |
| 10 | **Fire Occurrences**  Singapore Civil Defence Force. (2022, February 25). *Fire Occurrences,* Retrieve from,  [https://tablebuilder.singstat.gov.sg/](https://tablebuilder.singstat.gov.sg/table/TS/M890181)  [table/TS/M890181](https://tablebuilder.singstat.gov.sg/table/TS/M890181) | Total number of fire occurrences in Singapore from 1968 to 2021. Data exclude fire incidents involving minor fires such as fires involving rubbish bins and rubbish chutes which are of a very low risk relative to other fires. |
| 11 | **Fire Injuries and Fire Fatalities**  Singapore Civil Defence Force. (2022, April 25). *Fire Injuries and Fire Fatalities,* Retrieve from,  [https://tablebuilder.singstat.gov.sg/t](https://tablebuilder.singstat.gov.sg/table/TS/M891341)  [able/TS/M891341](https://tablebuilder.singstat.gov.sg/table/TS/M891341) | Number of injuries cause by fire in Singapore from 2001 to 2021. |
| 12 | **Fatality Rate from Fire Incidents**  Singapore Civil Defence Force. (2022, March 04). *Fatality Rate from Fire Incidents,* Retrieve from,  [https://tablebuilder.singstat.gov.sg/](https://tablebuilder.singstat.gov.sg/table/TS/M891281)  [table/TS/M891281](https://tablebuilder.singstat.gov.sg/table/TS/M891281) | The fatality rate from fire incidents Per 100,000 Population. From 2005 to 2021. |
| 13 | **Traffic Lights Location**  Land Transport Authority. *annual\_traffic\_lights,* Retrieve from,  <https://datamall.lta.gov.sg/> | Geo location of all the traffic lights in Singapore |
| 14 | **Traffic Condition**  Land Transport Authority. *road\_traffic\_condition,* Retrieve from,  <https://datamall.lta.gov.sg/> | The traffic condition which includes the average speed and the traffic volume in Singapore. Data range from 2004 to 2020. |
| 15 | **Pedestrian facilities**  Land Transport Authority. *annual\_pedestrian\_facilities,* Retrieve from,  <https://datamall.lta.gov.sg/> | Number of pedestrian facilities built and maintain in Singapore from 1994 to 2020. |
| 16 | **Safety/Crime Index by Country 2018 - 2023**  Safety/Crime Index by Country. (n.d.). [www.numbeo.com](http://www.numbeo.com).  [https://www.numbeo.com/crime/rankings\_by](https://www.numbeo.com/crime/rankings_by_country.jsp?title=2022&displayColumn=1)  [\_country.jsp?title=2022&displayColumn=1](https://www.numbeo.com/crime/rankings_by_country.jsp?title=2022&displayColumn=1) | Comparison of safety and crime index of countries.  Safety/Crime Index for 2018-2023. |

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