

COS30045

Data Visualisation

ASEAN Health Insights: Birth Rates and Life Expectancy Process Book



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1. Introduction

1.1. Background and Motivation

The presented visualization effectively illustrates the relationship between life expectancy trends and population demographics across all ASEAN member states: Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam. This comprehensive visualization provides detailed insights into how various health indicators correlate with life expectancy and demonstrates the demographic transitions occurring within Southeast Asian populations.

Users who would find value in our visualization include regional health policymakers and ASEAN health ministers, who can utilize the data to inform decision-making regarding healthcare resource allocation and policy development at both national and regional levels. Additionally, public health researchers would benefit from the comparative display of health trends across ASEAN nations to support their academic work and policy recommendations. Furthermore, international organizations such as the WHO and ASEAN Secretariat could use this tool to understand regional health disparities and coordinate healthcare initiatives across member states.

Our visualization has been specifically designed to be accessible to both technical and non-technical audiences, making it valuable for journalists, educators, and citizens interested in understanding their country's health progress compared to other ASEAN members. The interactive features allow users to explore and compare health metrics across different ASEAN nations, providing valuable insights into regional health patterns and disparities. However, as this project is developed within an academic context, it particularly addresses the requirements and expectations of our Data Visualizations course instructor, who will evaluate how effectively we have interpreted and presented the health-related data.

The visualization draws from multiple authoritative sources, including OECD Health Statistics as our primary dataset, complemented by country-level data from Statista, Macrotrends, Country Economy, and The Global Economy. This diverse range of sources enables us to present a comprehensive view of health metrics across all ASEAN member states while ensuring data reliability and accuracy.

The goal of this project is to identify and visualize key patterns in life expectancy and demographic changes within ASEAN countries, which we'll accomplish through interactive

visualization tools that allow users to explore relationships between various health indicators. Our visualization will enable users to examine temporal trends in life expectancy, analyze gender-specific health outcomes, and understand the demographic composition of different ASEAN populations through interactive features that reveal detailed information upon user interaction.

By presenting this comparative data in an accessible and interactive format, we aim to facilitate better understanding of regional health trends, highlight areas for potential collaboration between ASEAN member states, and support evidence-based decision-making in public health policy across Southeast Asia.

1.2. Visualisation Purpose

The benefit of completing this visualization is that it becomes a comprehensive resource for understanding health trends and demographic patterns across all ASEAN member states. This visualization could help the users mentioned above answer the following questions:

1. How does life expectancy vary across different ASEAN countries, and what trends have emerged over time?
2. What are the demographic differences between ASEAN nations, and how do these correlate with health outcomes?
3. How do gender-specific health indicators compare across the ASEAN region?
4. Which ASEAN countries have shown the most significant improvements in life expectancy, and what patterns can be identified?
5. How do population age distributions differ among ASEAN member states, and what implications might this have for healthcare systems?

Anyone interested in understanding regional health disparities, demographic transitions, and life expectancy trends across Southeast Asia will be able to easily access and interpret the data provided through our interactive visualizations. The visualization presents multiple layers of information through intuitive charts and maps, allowing users to explore both broad regional patterns and country-specific details.

Therefore, visualization itself serves as an accessible tool for users to analyze and compare health metrics across ASEAN nations, facilitating evidence-based decision-making and understanding of regional health patterns. Through interactive features and clear visual representations, users can effectively explore and comprehend complex health data relationships across Southeast Asia.

1.3. Project Schedule

The project follows a well-organized schedule with two main types of meetings. Project discussions (every Monday and Thursday around 2 PM) are the primary opportunity for the team to connect, where each member shares their progress, addresses technical challenges, and ensures everyone is contributing consistently. These 20-minute discussions also allow us to resolve any issues, such as delays or imbalances in workload, to keep the project on track. In addition, bi-weekly project review meetings with our tutor (every Friday at 3 PM) offer essential guidance on our sustainability and energy visualization efforts. These hour-long sessions are where we present our latest work, receive feedback on our visualization designs, and confirm that the project is staying true to the core sustainability theme. The tutor's feedback has been instrumental in refining our approach and enhancing how users understand the data.

This is our project schedule that we have set since the project started.

- **Week 7** – collecting necessary data
- **Week 8** – Finalize and validate data again, starting with process book (Introduction and partially data content)
- **Week 9** – start sketching design on collected data, at least chart should be completed, start coding for website.
- **Week 10** – 4 alternative design sketching should be completed and updated process book. 
- **Week 11** – Finalize one design and process book.
- **Week 12** – Prepare for the presentation.

2. Data

Our analysis synthesizes information from authoritative health databases and demographic repositories. The OECD Health Statistics serves as our foundation, complemented by data from national health ministries, international organizations, and specialized research institutions. This diverse range of sources ensures comprehensive coverage of health indicators while maintaining data reliability and accuracy across all ASEAN member states.

The data integration process involved careful collection and standardization of health metrics across multiple sources.

1. Extracting historical life expectancy data for each ASEAN country
2. Collecting gender-specific health indicators
3. Compiling population demographic statistics

4. Gathering age distribution data across the region
5. Documenting health trend data over time

We consolidated these diverse datasets into a unified structure, ensuring consistency and accuracy in our representation of regional health patterns. Each metric was selected specifically to illuminate key aspects of ASEAN's health landscape, maintaining focus on indicators that directly address our analytical objectives. Our methodology emphasized data quality and relevance, incorporating only verified information from reputable sources.

This careful curation process enabled us to create a robust dataset that captures both broad trends and nuanced variations in health outcomes across different populations. We paid particular attention to temporal consistency, ensuring that historical data could be meaningfully compared with current statistics to reveal emerging patterns and long-term trends. The resulting framework provides a solid foundation for analyzing health disparities, demographic shifts, and their implications for healthcare planning across Southeast Asia.

The integrated dataset encompasses multiple dimensions of health and demographic information, including age distribution patterns, gender-specific health outcomes, and various socio-economic factors that influence population health. This comprehensive approach allows for detailed analysis of how different variables interact to shape health outcomes across the region, providing valuable insights for healthcare planning and policy development.

After collecting the data from these various sources, we consolidated and organized it into a structured Excel spreadsheet to ensure consistency and accessibility. The dataset was carefully curated to include relevant metrics that directly address the questions outlined in section 1.2 Visualization Purpose.

All the data in our compiled dataset will be utilized in the visualization, as we specifically collected information that would help users understand and compare health trends and demographic patterns across ASEAN countries. This focused approach ensures that our visualization remains relevant and directly addresses the key questions identified earlier in the booklet.

2.1. Data Source Proposal

For this project, we used several raw datasets that provide valuable information about global trends in life expectancy, population growth, and birth rates. These datasets are important

for understanding how populations grow and change over time, and how those changes impact sustainability. Below, we explain the key datasets we worked with

2.1.1 Life Expectancy Dataset:

This dataset gives information about life expectancy in different countries and regions over time. It shows the average life expectancy at birth for each country, broken down by year. This helps us understand how life expectancy has changed around the world and how it relates to other factors like healthcare, economic conditions, and the environment. Understanding life expectancy is key to understanding sustainability because it reflects the quality of life, healthcare systems, and overall living conditions.

Key Features:

- ASEAN Countries
- Year of data from 2013 - 2022
- Life expectancy of Males, Females and Total
- Link we used for this dataset - <https://asean.org/wp-content/uploads/2023/12/ASEAN-Statistical-Yearbook-2023.pdf>

ASEAN STATISTICAL YEARBOOK 2023										
Table 2.9. Life Expectancy at Birth ¹⁾ in ASEAN by Sex, 2013-2022 (in years)										
Country	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
TOTAL										
Brunei Darussalam	78.0	77.2	77.7	77.8	77.3	78.5	77.7	77.9	77.6	76.4
Cambodia	66.7	67.6	68.3	69.1	69.9	70.6	75.5	72.0	72.7	73.3
Indonesia	70.4	70.6	70.8	70.9	71.1	71.2	71.3	71.5	71.6	71.9
Lao PDR	67.0	68.0	68.0	65.0	65.0	66.0	66.0	67.0	67.0	67.0
Malaysia	74.5	74.5	74.6	74.4	74.4	74.6	74.8	74.7	74.5	73.4
Myanmar	67.8	63.9	64.4	65.0	65.5	66.1	66.5	66.8	66.8	67.1
Philippines	-	-	72.7	-	-	-	-	-	-	-
Singapore	82.4	82.6	82.9	83.0	83.2	83.4	83.7	83.7	83.2	83.0
Thailand	-	-	-	74.8	75.5	75.8	75.7	76.2	-	-
Viet Nam	73.1	73.2	73.3	73.4	73.5	73.5	73.6	73.7	73.6	73.6
MALE										
Brunei Darussalam	77.7	75.8	77.8	76.9	76.4	77.5	76.6	77.1	76.3	74.5
Cambodia	64.8	65.6	66.4	67.1	67.9	68.6	74.3	69.9	70.6	71.2
Indonesia	68.5	68.9	68.9	69.1	69.2	69.3	69.4	69.6	69.7	69.9
Lao PDR	65.0	66.0	65.0	63.0	64.0	64.0	65.0	65.0	65.0	66.0
Malaysia	72.3	72.4	72.5	72.1	72.1	72.3	72.5	72.5	72.3	71.3
Myanmar	65.5	59.3	59.7	60.3	60.8	61.3	62.0	62.0	62.7	62.8
Philippines	-	-	69.6	-	-	-	-	71.3	71.3	71.3
Singapore	80.1	80.3	80.5	80.7	80.9	81.2	81.4	81.3	80.8	80.7
Thailand	-	-	-	71.2	71.8	72.0	71.9	72.4	73.5	73.6
Viet Nam	70.5	70.6	70.7	70.8	70.9	70.9	71.0	71.0	71.1	71.1
FEMALE										
Brunei Darussalam	78.3	78.5	77.5	78.7	78.2	79.4	78.8	78.7	78.9	78.3
Cambodia	68.8	69.6	70.4	71.2	72.0	72.7	76.8	74.2	74.8	75.5
Indonesia	72.4	72.6	72.8	72.8	73.1	73.2	73.3	73.5	73.6	73.8
Lao PDR	69.0	70.0	62.0	67.0	67.0	68.0	68.0	69.0	69.0	69.0
Malaysia	76.9	77.0	77.1	77.0	77.1	77.2	77.4	77.2	77.0	75.8
Myanmar	69.1	68.7	69.3	69.8	70.2	70.9	71.1	71.5	71.1	71.3
Philippines	-	-	75.9	-	-	-	-	77.5	77.5	77.5
Singapore	84.5	84.8	85.1	85.1	85.4	85.5	85.9	85.9	85.5	85.2
Thailand	-	-	-	78.6	79.4	79.6	79.7	80.1	80.5	80.7
Viet Nam	75.8	76.0	76.1	76.1	76.2	76.2	76.3	76.4	76.4	76.4

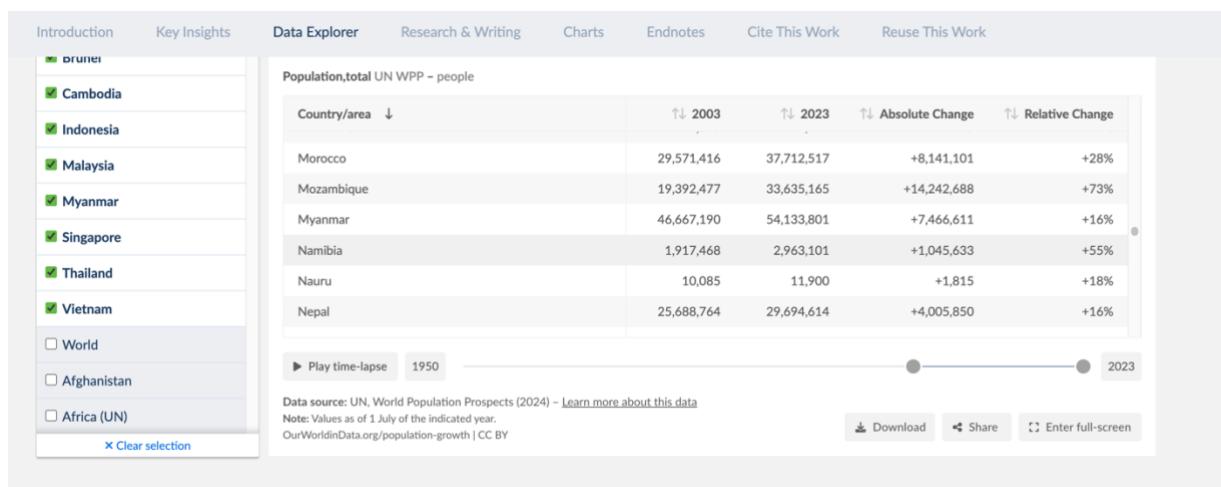
Source: ASEAN Secretariat
Notes:
1) Life expectancy at birth refers to number of years of a new born will live if the prevailing patterns of mortality at the time of the child's birth were to stay the same throughout his or her life
- not available at the time of publication

2.1.2 Population Growth Dataset:

This dataset tracks how the global population has grown over time. It shows the population growth rate for each country, helping us see which countries have rapidly growing populations or shrinking populations. Understanding population growth is essential for sustainability because rapid population growth can put pressure on resources like food, water, housing, and energy, while aging populations may face challenges with healthcare and the economy.

Key Features:

- ASEAN Countries
- Year of data from 2003 - 2023
- Annual population growth rate
- Total population for each country/region
- Link for dataset - <https://ourworldindata.org/population-growth>



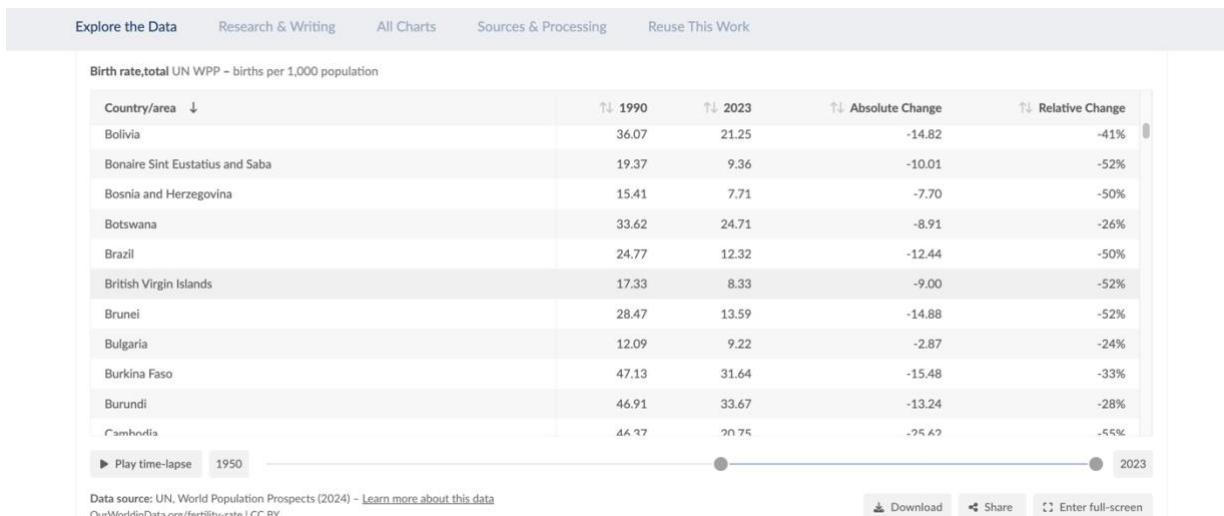
2.1.3 Birth Rate Dataset:

This dataset provides the number of live births per 1,000 people in each country or region. Birth rates give us insight into how fast a population is growing and can show changes in social behaviours, healthcare access, or economic factors. For example, a sudden drop in birth rates might indicate changes in society, such as people having fewer children due to economic challenges or access to birth control. This dataset helps us understand the future population structure and the challenges that come with it.

Key Features:

- ASEAN Countries
- Year of data from 1990 - 2023
- Birth rate per 1,000 people
- Link for Datasets - <https://ourworldindata.org/grapher/crude-birth-rate>

Entity	Code	Year	Birth rate
Afghanista	AFG	1950	49.38
Afghanista	AFG	1951	49.624
Afghanista	AFG	1952	49.784
Afghanista	AFG	1953	49.979
Afghanista	AFG	1954	50.004
Afghanista	AFG	1955	50.156
Afghanista	AFG	1956	50.279
Afghanista	AFG	1957	50.306
Afghanista	AFG	1958	50.424
Afghanista	AFG	1959	50.456
Afghanista	AFG	1960	50.516
Afghanista	AFG	1961	50.566
Afghanista	AFG	1962	50.666
Afghanista	AFG	1963	50.787
Afghanista	AFG	1964	50.852
Afghanista	AFG	1965	50.889
Afghanista	AFG	1966	51.018
Afghanista	AFG	1967	51.106
Afghanista	AFG	1968	51.209
Afghanista	AFG	1969	51.28
Afghanista	AFG	1970	51.207
Afghanista	AFG	1971	51.303
Afghanista	AFG	1972	51.244
Afghanista	AFG	1973	51.278
Afghanista	AFG	1974	51.373



Data Summary

Life Expectancy data set (Males, Females and Total- both)		
Attribute	Description	Type
Country Name	This field contains the name of the country for the subscription data	Categorical (string)
Year(s)	The field represent the range of years from 2013 - 2022	Ordinal numbers
Data sets	Data represents in Years	Ordinal numbers
Population Growth data set		
Country Name	This field contains the name of the country for the subscription data	Categorical (string)
Country Code	A 3-alphabectical unique identifier for each country (eg. Malaysia - MYS)	Categorical (Text)
Year(s)	The field represent the range of years from 2013 - 2022	Ordinal numbers
Data sets	Data sets with total populations in each year (Millions)	Ordinal numbers
Birth Rate		
Country Name	This field contains the name of the country for the subscription data	Categorical (string)
Country Code	A 3-alphabectical unique identifier for each country (eg. Malaysia - MYS)	Categorical (Text)
Year(s)	The field represent the range of years from 1990 - 2023	Ordinal numbers
Data sets	Data sets represents birth rate based on 1000 people for each year	Ordinal numbers

Importance of These Datasets:

By combining data from life expectancy, population growth, and birth rates, our project can give a fuller picture of global demographic trends and how they impact sustainability. These indicators are all interconnected and help us understand how social and economic factors shape population changes, and how those changes affect resource use, environmental impacts, and long-term sustainability.

- **Life expectancy** tells us about the overall health and well-being of populations.
- **Population growth** helps us see where there are challenges, like overcrowding or rapid change, that may need attention.
- **Birth rates** provide clues about future population trends and how society is evolving.

Together, these datasets allow us to explore different scenarios, make predictions about future trends, and offer useful insights to decision-makers. This helps guide sustainable planning in areas like healthcare, urban development, resource management, and policymaking. These datasets also align with global sustainability goals, such as improving health outcomes, ensuring balanced population growth, and planning for a more sustainable future.

2.2. Data Processing Proposal

We gathered raw data on life expectancy, population growth, and birth rates from trustworthy sources. However, before we can analyse and visualize the data, we need to process it properly. This process ensures that the data is clean, well-organized, and ready for our sustainability analysis. Here's a simple outline of the steps involved in processing the data -

The first step is data cleaning. The datasets may have missing, incomplete, or incorrect information, which can happen due to errors during data collection or formatting problems. Our cleaning process will include.

- **Handling missing values:** If any important data is missing (like country name, year, or birth rate), we will either fill in the gaps with default values or remove those records, depending on how important they are.
- **Detecting and fixing outliers:** We will find and correct any extreme values that could distort the results. For example, if we see countries with unusually high population growth or life expectancy that don't make sense (like negative growth rates or life expectancy over 120 years), we will investigate and fix those errors.
- **Standardizing data formats:** We will make sure the data is consistent. This means converting all years to a four-digit format, ensuring birth rates are in decimal form, and properly formatting dates

Data Before Cleaning

1	Entity	Code	Year	Population - Sex: all - Age: all - Variant: estimat	2739	Burundi	BDI	2023	13689455	11710	Myanmar	MMR	1966	24836495
2	Afghanista	AFG	1950	7776182	2740	Cambodia	KHM	1950	4375252	11711	Myanmar	MMR	1967	25406432
3	Afghanista	AFG	1951	7879343	2741	Cambodia	KHM	1951	4475694	11712	Myanmar	MMR	1968	25989668
4	Afghanista	AFG	1952	7987783	2742	Cambodia	KHM	1952	4577965	11713	Myanmar	MMR	1969	26585110
5	Afghanista	AFG	1953	8096703	2743	Cambodia	KHM	1953	4680458	11714	Myanmar	MMR	1970	27193013
6	Afghanista	AFG	1954	8207953	2744	Cambodia	KHM	1954	4783832	11715	Myanmar	MMR	1971	27807214
7	Afghanista	AFG	1955	8326981	2745	Cambodia	KHM	1955	4890376	11716	Myanmar	MMR	1972	28428330
8	Afghanista	AFG	1956	8454302	2746	Cambodia	KHM	1956	4999483	11717	Myanmar	MMR	1973	29026389
9	Afghanista	AFG	1957	8588340	2747	Cambodia	KHM	1957	5110435	11718	Myanmar	MMR	1974	29598164
10	Afghanista	AFG	1958	8723412	2748	Cambodia	KHM	1958	5220838	11719	Myanmar	MMR	1975	30176563
11	Afghanista	AFG	1959	8869271	2749	Cambodia	KHM	1959	5332933	11720	Myanmar	MMR	1976	30758817
12	Afghanista	AFG	1960	9035048	2750	Cambodia	KHM	1960	5449962	11721	Myanmar	MMR	1977	31355968
13	Afghanista	AFG	1961	9214082	2751	Cambodia	KHM	1961	5571175	11722	Myanmar	MMR	1978	31972974
14	Afghanista	AFG	1962	9404411	2752	Cambodia	KHM	1962	5697560	11723	Myanmar	MMR	1979	32596551
15	Afghanista	AFG	1963	9604491	2753	Cambodia	KHM	1963	5823011	11724	Myanmar	MMR	1980	33227203
16	Afghanista	AFG	1964	9814318	2754	Cambodia	KHM	1964	5946186	11725	Myanmar	MMR	1981	33858787
17	Afghanista	AFG	1965	10036003	2755	Cambodia	KHM	1965	6072288	11726	Myanmar	MMR	1982	34482968
18	Afghanista	AFG	1966	10266397	2756	Cambodia	KHM	1966	6201237	11727	Myanmar	MMR	1983	35162716
19	Afghanista	AFG	1967	10505961	2757	Cambodia	KHM	1967	6332946	11728	Myanmar	MMR	1984	35899314
20	Afghanista	AFG	1968	10756924	2758	Cambodia	KHM	1968	6467324	11729	Myanmar	MMR	1985	36622832
21	Afghanista	AFG	1969	11017417	2759	Cambodia	KHM	1969	6604731	11730	Myanmar	MMR	1986	37314881
22	Afghanista	AFG	1970	11290135	2760	Cambodia	KHM	1970	6639187	11731	Myanmar	MMR	1987	37971601
23	Afghanista	AFG	1971	11567672	2761	Cambodia	KHM	1971	6620880	11732	Myanmar	MMR	1988	3800927
24	Afghanista	AFG	1972	11853697	2762	Cambodia	KHM	1972	6673891	11733	Myanmar	MMR	1989	39214624
25	Afghanista	AFG	1973	12158000	2763	Cambodia	KHM	1973	6739737	11734	Myanmar	MMR	1990	39817252
26	Afghanista	AFG	1974	12469127	2764	Cambodia	KHM	1974	6783251	11735	Myanmar	MMR	1991	40394159

Data after Cleaning

3	Population Growth Rate										
4	Country	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
5	Brunei Darussalam	346649	352921	358930	364669	370884	377800	384964	392340	399395	405566
6	Cambodia(KHM)	13050978	13244739	13439204	13639030	13841775	14053479	14276819	14500732	14722587	14945090
7	Indonesia (IDN)	225048004	227926647	230871649	233951650	237062339	240157901	243220024	246305326	249470029	252698526
8	Lao (LAO)	5697945	5781627	5869531	5963199	6056238	6148974	6241649	6334198	6426595	6518981
9	Malaysia(MYS)	24679604	25256771	25836073	26417906	26998384	27570054	28124780	28655771	29162033	29662835
10	Myanmar(MMR)	46667190	47068779	47438362	47785142	48125046	48390791	48660458	49024376	49419824	49837450
11	Phillipines (PHL)	84731838	86394513	88015957	89508993	91075179	92699093	94384256	96337126	98248616	100175512
12	Singapore(SGP)	4138241	4172766	4268361	4407064	4596515	4806742	4968573	5077019	5182242	5293344
13	Thailand(THA)	64868164	65452051	66017415	66567685	67102389	67619834	68121076	68579442	69007211	69436091
14	Vietnam(VNM)	79563778	80338978	81088309	82167900	83633377	85175789	86460023	87455150	88468314	89510357

2.3. Data Transformation

After cleaning the data, we will adjust it so it's easier to analyze and visualize. This includes:

- **Normalization/Scaling:** We might adjust the data to make comparisons between countries with different population sizes or growth rates. For example, we could scale birth rates to show the number of births per 1,000 people or adjust life expectancy based on different regions. This helps make the data easier to understand and compare in charts or graphs.

- Time-based transformations:** Since the data covers several years, we will organize it by specific time periods (like by decade or year) to look at trends over time. For example, we could compare birth rates and population growth at the start and end of the dataset.
- Deriving new variables:** Sometimes, we need to create new pieces of data from the existing information. For example, we might calculate the average life expectancy for each region or track how the population changed over certain years (like 1990-2000 or 2000-2010).

Datasets after cleaning and filtering process

Life Expectancy (Females)

Life Expectancy (Female) - In years		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Country											
Brunei Darussalam		78.3	78.5	77.5	78.7	78.2	79.4	78.8	78.7	78.9	78.3
Cambodia		68.8	69.6	70.4	71.2	72	72.7	76.8	74.2	74.8	75.5
Indonesia		72.4	72.6	72.8	72.8	73.1	73.2	73.3	73.5	73.6	73.8
Lao		69	70	62	67	67	68	68	69	69	69
Malaysia		76.9	77	77.1	77	77.1	77.2	77.4	77.2	77	75.8
Myanmar		69.1	68.7	69.3	69.8	70.2	70.9	71.1	71.5	71.1	71.3
Phillipines		-	-	75.9	-	-	-	-	77.5	77.5	77.5
Singapore		84.5	84.8	85.1	85.1	85.4	85.5	85.9	85.9	85.5	85.2
Thailand		-	-	-	78.6	79.4	79.6	79.7	80.1	80.5	80.7
Vietnam		75.8	76	76.1	76.1	76.2	76.2	76.3	76.4	76.4	76.4

Life Expectancy (Males)

Country	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Brunei Darussalam	77.7	75.8	77.8	76.9	76.4	77.5	76.6	77.1	76.3	74.5
Cambodia	64.8	65.6	66.4	67.1	67.9	68.6	74.2	69.9	70.6	71.2
Indonesia	68.5	68.9	68.9	68.1	69.2	69.3	69.4	69.6	69.7	69.9
Lao	65	66	65	63	65	64	65	65	65	66
Malaysia	72.3	72.4	72.5	72.1	72.1	72.3	72.5	72.5	72.3	71.3
Myanmar	65.5	59.3	59.7	60.3	60.8	61.3	62	62	62.7	62.8
Phillipines	-	-	69.6	-	-	-	-	71.3	71.3	71.3
Singapore	80.1	80.3	80.5	80.7	80.9	81.2	81.4	81.3	80.8	80.7
Thailand	-	-	-	71.2	71.8	72	71.9	72.4	73.5	73.6
Vietnam	70.5	70.6	70.7	70.8	70.9	70.9	71	71	71.1	71.1

Life Expectancy (Total)

Country	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Brunei Darussalam	78	77.2	77.7	77.8	77.3	78.5	77.7	77.9	77.6	76.4
Cambodia	66.7	67.6	68.3	69.1	69.9	70.6	75.7	72	72.7	73.3
Indonesia	70.4	70.6	70.8	71.1	71.1	71.2	71.3	71.6	71.6	71.9
Lao	67	68	68	65	65	66	66	67	67	67
Malaysia	74.5	74.5	74.6	74.4	74.4	74.6	74.8	74.5	74.5	73.4
Myanmar	67.8	63.9	64.4	65	65.5	66.1	66.5	66.8	66.8	67.1
Phillipines	NA	NA	72.7	NA						
Singapore	82.4	82.6	82.9	83	83.2	83.4	83.7	83.7	83.2	83
Thailand	NA	NA	NA	74.8	75.5	75.8	75.7	76.2	NA	NA
Vietnam	73.1	73.2	73.3	73.4	73.5	73.5	73.6	73.7	73.6	73.6

Population Growth (2003 – 2023)

Country	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brunei Darussalam	346649	352921	358930	364669	370884	377800	384964	392340	399395	405566	411206
Cambodia(KHM)	13050978	13244739	13439204	13639030	13841775	14053479	14276819	14500732	14722587	14945090	15170212
Indonesia (IDN)	225048004	227926647	230871649	233951650	237062339	240157901	243220024	246305326	249470029	252698526	25585246
Lao (LAO)	5697945	5781627	5869531	5963199	6056238	6148974	6241649	6334198	6426595	6518981	6611385
Malaysia(MYS)	24679604	25256771	25836073	26417906	26998384	27570054	28124780	28655771	29162033	29662835	30174269
Myanmar(MMR)	46667190	47068779	47438362	47785142	48125046	48390791	48660458	49024376	49419824	49837450	50262658
Phillipines (PHL)	84731838	86394513	88015957	89508993	91075179	92699093	94384256	96337126	98248616	100175512	102076337
Singapore(SGP)	4138241	4172766	4268361	4407064	4596515	4806742	4968573	5077019	5182242	5293344	5385589
Thailand(THA)	64868164	65452051	66017415	66567685	67102389	67619834	68121076	68579442	69007211	69436091	69845115
Vietnam(VNM)	79563778	80338978	81088309	82167900	83633377	85175789	86460023	87455150	88468314	89510357	90573104

Birth Rate (1990 – 2023)

Country Code	Year	Birth Rate
BRN	1990	28.468
BRN	1991	27.709
BRN	1992	26.674
BRN	1993	25.572
BRN	1994	24.479
BRN	1995	23.37
BRN	1996	22.375
BRN	1997	21.611
BRN	1998	20.999
BRN	1999	20.351
BRN	2000	19.803
BRN	2001	19.298
BRN	2002	18.685
BRN	2003	18.036

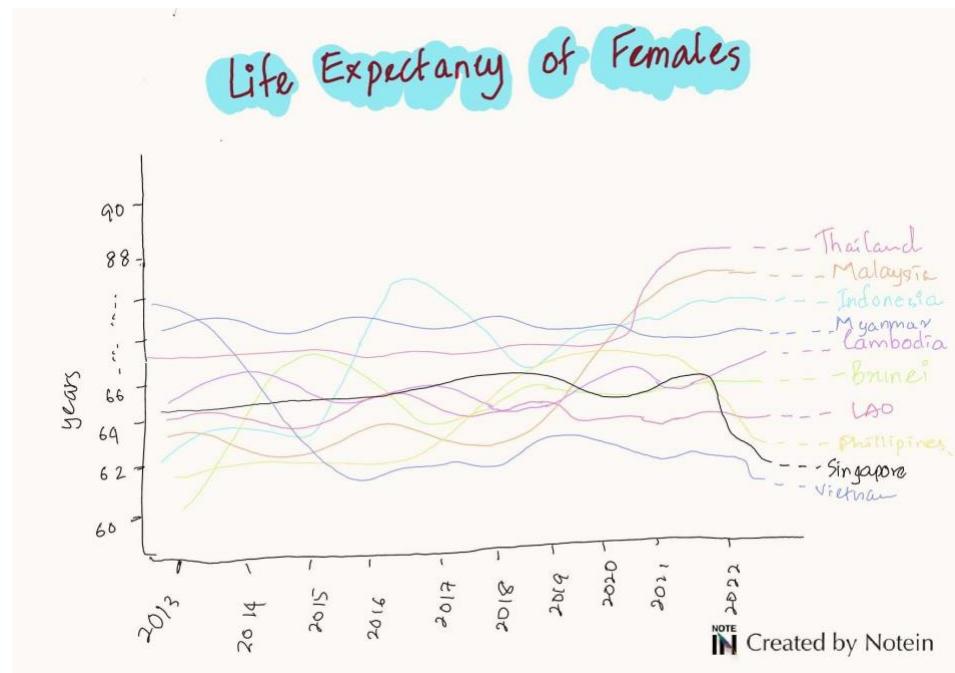
3. Chart

To make the data easy to understand, we are using interactive charts to highlight key trends over time. For life expectancy, we'll create a multi-line chart that shows changes over a 10-year period. Each line will represent a different country, making comparisons simple. Tooltips will be included so users can see more information by hovering over the data points. This will help viewers quickly grasp how life expectancy varies across countries and over time.

3.1. Chart Proposal

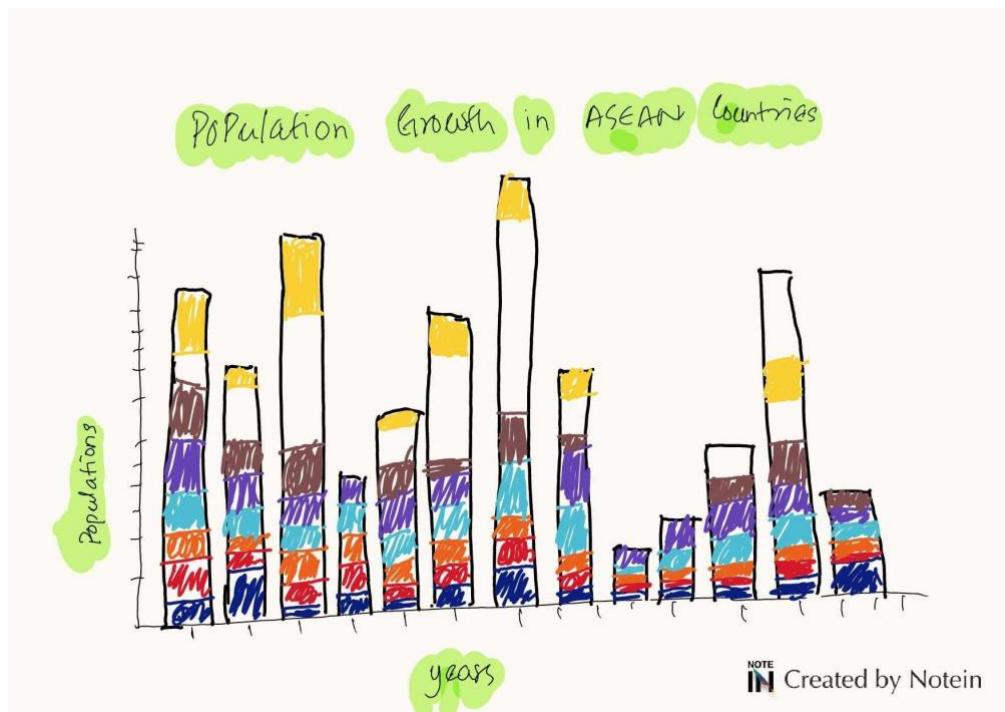
3.1.1 Sample Chart Sketching for Life Expectancy

Since the data set is for 10 years, we decided to have a multiple line chart with the tooltip. In that way, viewers can see the differences between the years for each country.

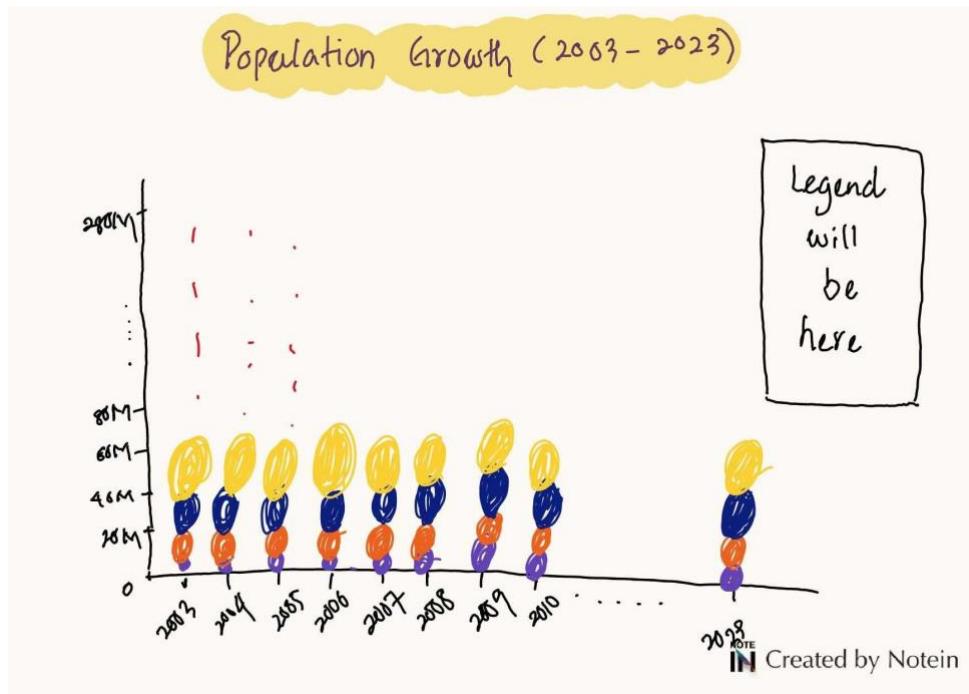


3.1.2 Sample sketching for Population Growth

For the Population Growth data, stacked bar chart will be more suitable and we can make to show to the data of a specific country.



Updated sketch for stacked bubble chart (Population Growth dataset)



3.2. Must-Have Features (Proposal)

To make the data clear, engaging, and easy to explore, the following essential features are included in the visualizations for life expectancy, population growth, and birth rates:

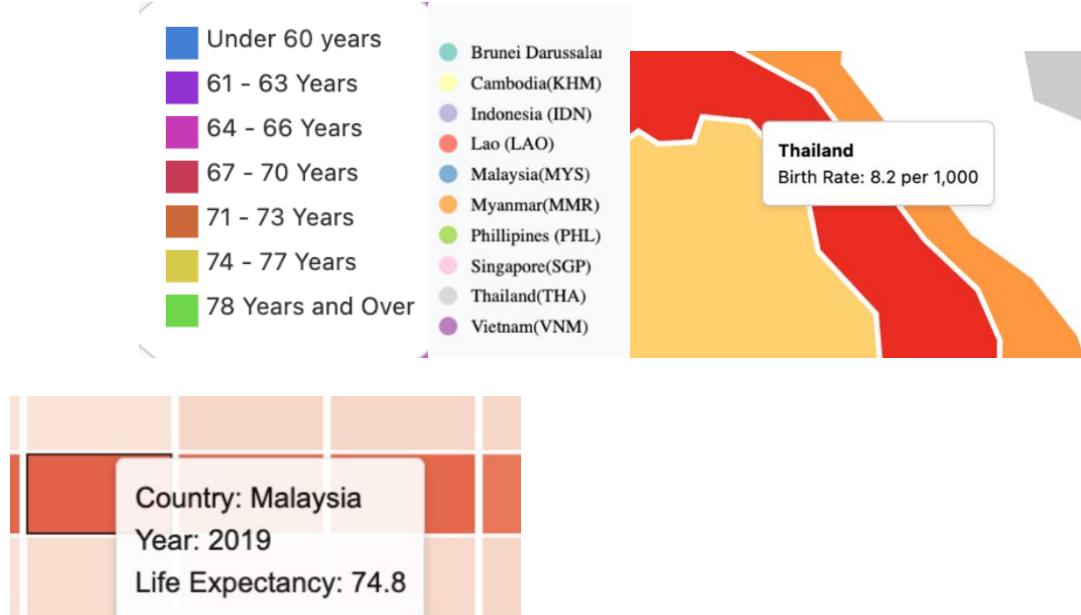
3.2.1. Interactive Features

Interactive elements make it easier for users to engage with the data and uncover insights.

- **Hover Effects:**
 - **Heat Map:** When users hover over different points on the Heat Map, they'll see detailed information for each country. This includes explanations of the correspondence rectangle labels, helping users understand what each of them represents (e.g., life expectancy in Malaysia, Year 2021).
 - **Radial Chart:** Hovering over the stacked Radial Chart highlights specific pathways (such as the all the year data are stacked in one tile for each country) and provides detailed data and information upon hovering it.
 - **Choropleth Map:** In the choropleth map for birth rate datasets, year slider will be included as one of interactive features. So that the viewers can see the yearly data by sliding the year slider option. Also, the colour intensity on the map will change according to the data in that particular year.

3.2.2. Additional Information

- **Adding Labels and tool tips:** We have put all the data labels in every chart for easier to understanding the data.



3.3. Optional Features (Proposal)

In addition to the main features, there are a few extra options that could make the user experience better and give more ways to explore the data. These features aren't required, but they can make it more fun and helpful for users who want to dive deeper.

1. **Interactive Filters** - Let users filter the data by things like region, income level, or specific years. This helps users look at the parts of the data that interest them the most.
2. **Data Comparison Tool** - Add a tool that lets users choose multiple countries and compare them side by side in a chart. This would allow users to compare things like life expectancy, population growth, and birth rates between countries.
3. **Trend Analysis and Predictions** - Include trend lines or predictions based on past data, showing possible future changes in life expectancy or population growth.
4. **Zoom and Pan Functionality** - Let users zoom in on certain areas of a chart or move around to view different sections.

4. Visualisation Design

4.1. Chart

4.1.1. Visualization Design (Proposal)

First of all, after we got sketching for the chart designs that we want for, we started visualizing it with JavaScript codes. The goal is to make the data easy to understand and use. The chart will clearly show key trends and insights from the dataset. Different chart types like line charts, bar chart, heap map, radial chart or choropleth map will be used, depending on the data.

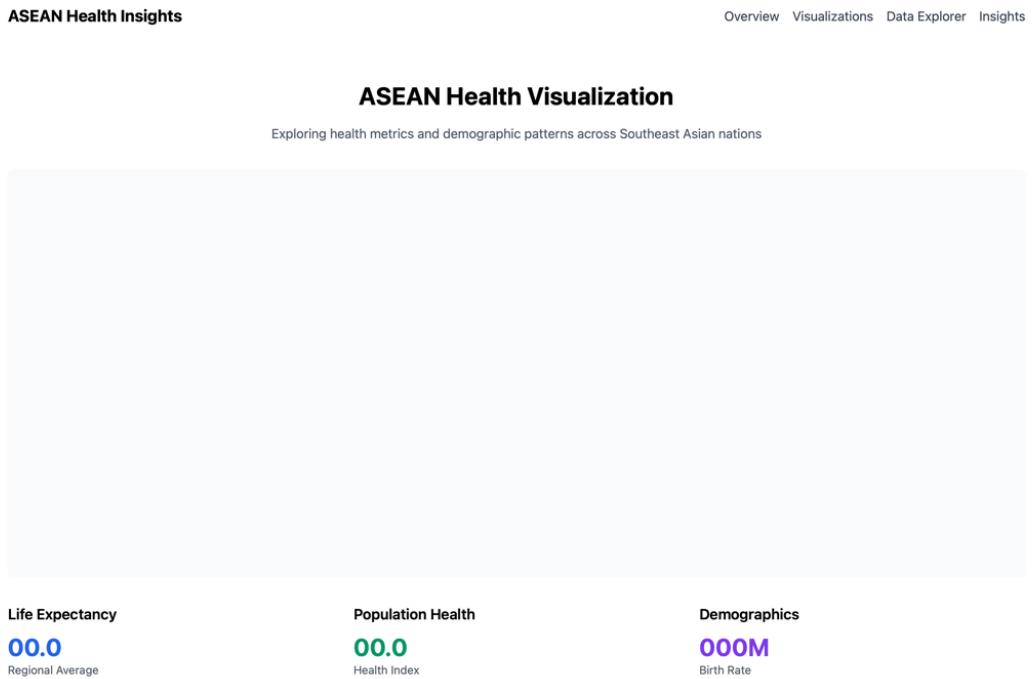
The chart will focus on important metrics such as life expectancy, population growth, and birth rates over a 20-year period. To make the chart more interactive, tooltips will be added. When users hover over a data point, extra information like the country name, population, or year will be displayed.

Clear labels and legends will help users better understand the data. The design will also be accessible, using high-contrast colours to accommodate people with colour blindness. The initial focus is on creating a simple, functional design that can be further improved

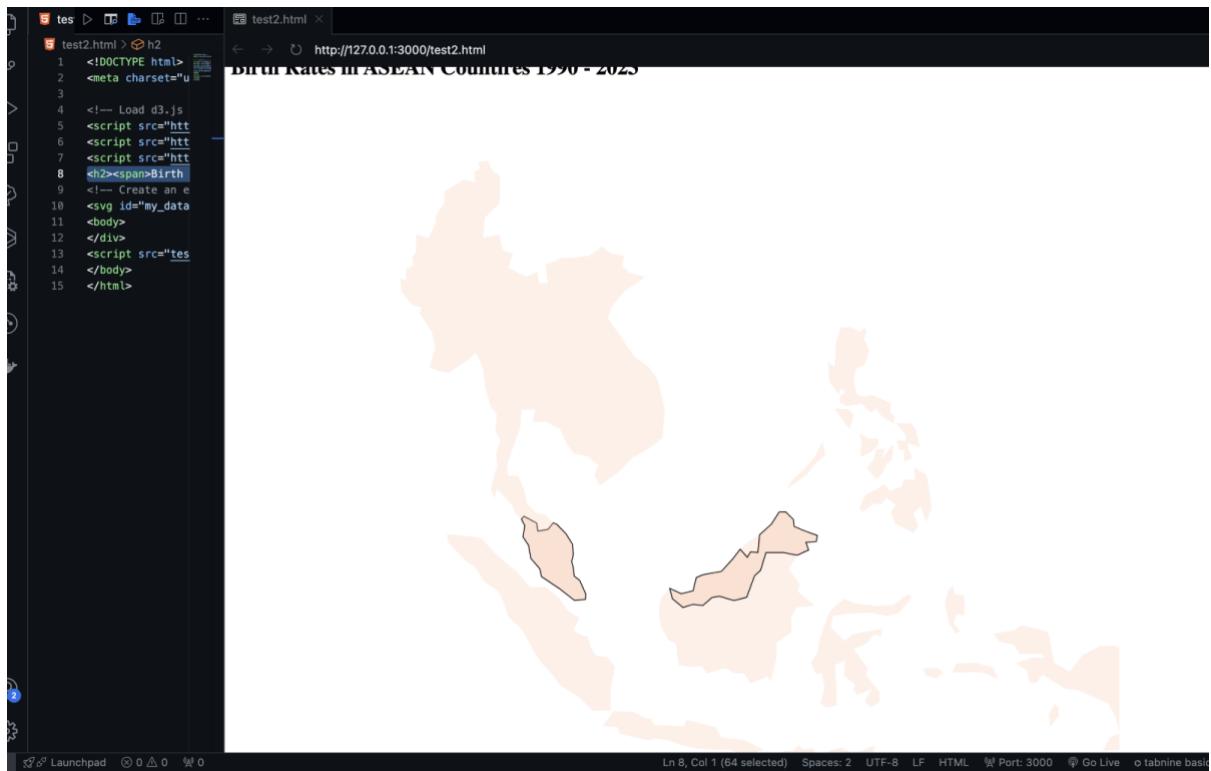
4.1.2. Visualization Design (Progress)

In this stage, we will begin refining the chart based on feedback and testing. This includes adjusting the layout, trying different chart styles to different datasets and adding features to improve the chart's functionality. For example, we may add filters to let users select specific countries or regions, so they can focus on the trends that interest them the most. We might also include a "drill-down" feature, which allows users to click on a country or data point to see more details, like yearly breakdowns.

We will test how the chart works on different devices and screen sizes to make sure it's easy to use. We'll also test interactive features, like zooming in or hovering over data points, to ensure the chart works well for everyone. Any problems found during testing will be fixed to improve the user experience.



This is the progressing Geo Json map. We have worked several Json files for this. But Json file at this stage, we felt like it is too simple to have it on our map. So, we changed another Json file to come out with the map more goodlooking style.

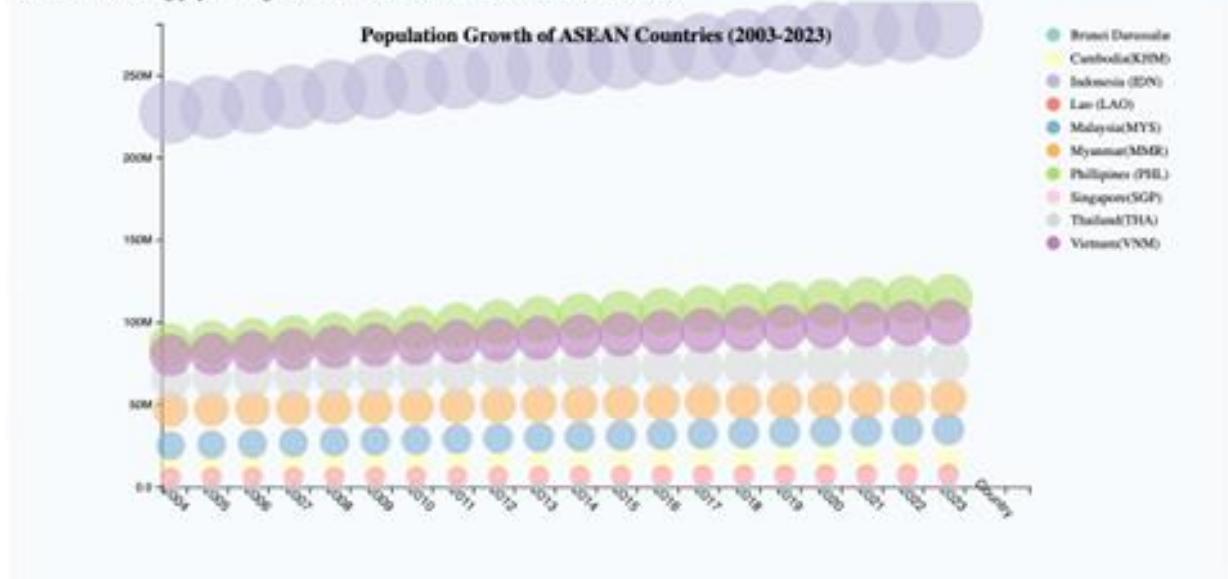


The Bubble chart for Population growth dataset is not still finalized for this stage. Since we are working with different chart styles and have not finalized which one we should take. So, most of the chart styles are not formatting well as we want to see how it will be with this chart style.

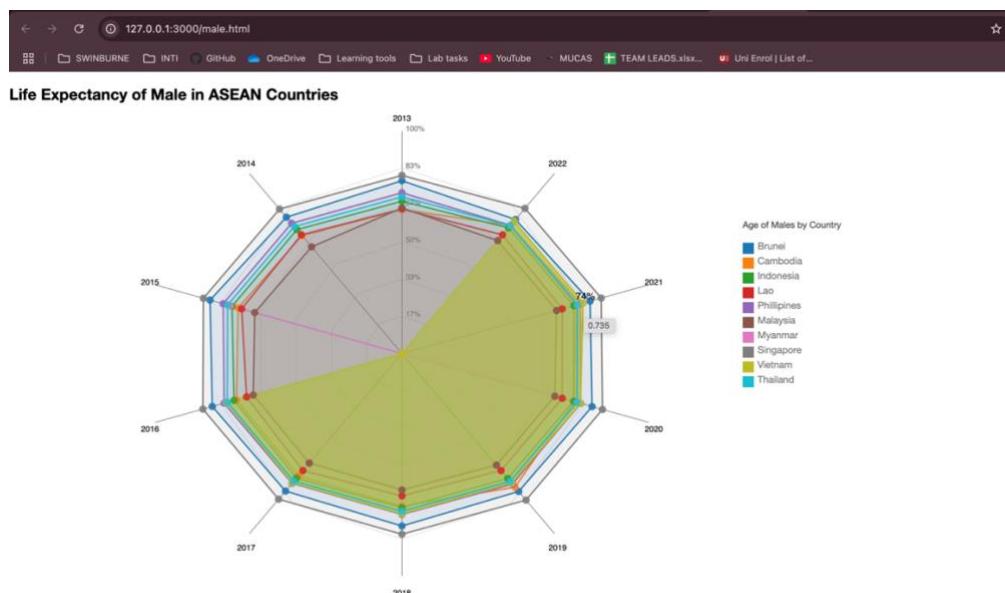
Population Growth of ASEAN Countries (2003-2023)

Explore the population growth trends across ASEAN countries from 2003 to 2023 with this interactive bubble chart.

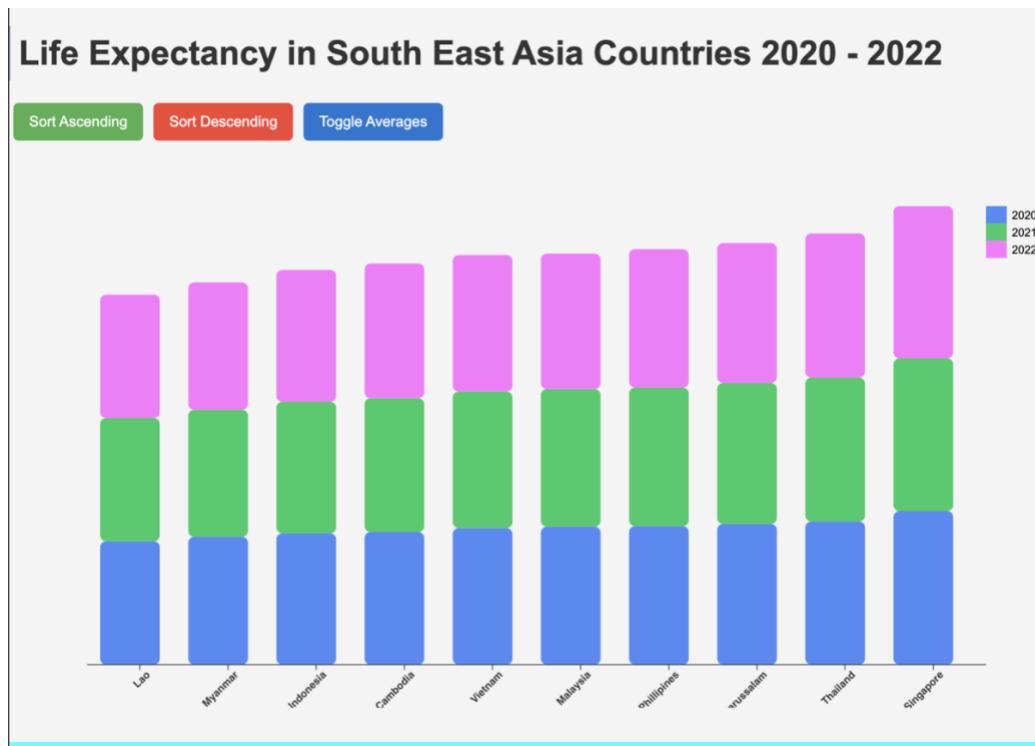
Bubble chart showing population growth trends for ASEAN countries from 2003 to 2023



This is the radar chart style of life expectancy of male's dataset previously. But after we have discussed, the dataset is not getting well radar chart style. So, we chose to go with another chart style, stacked radial chart in the final stage.



This is one of the worked stacked bar chart styles, but this one is with only 3 years dataset (2020 – 2022). After we have visualized with this chart, we realized that the dataset is too narrow to come out with a better visualizing design.



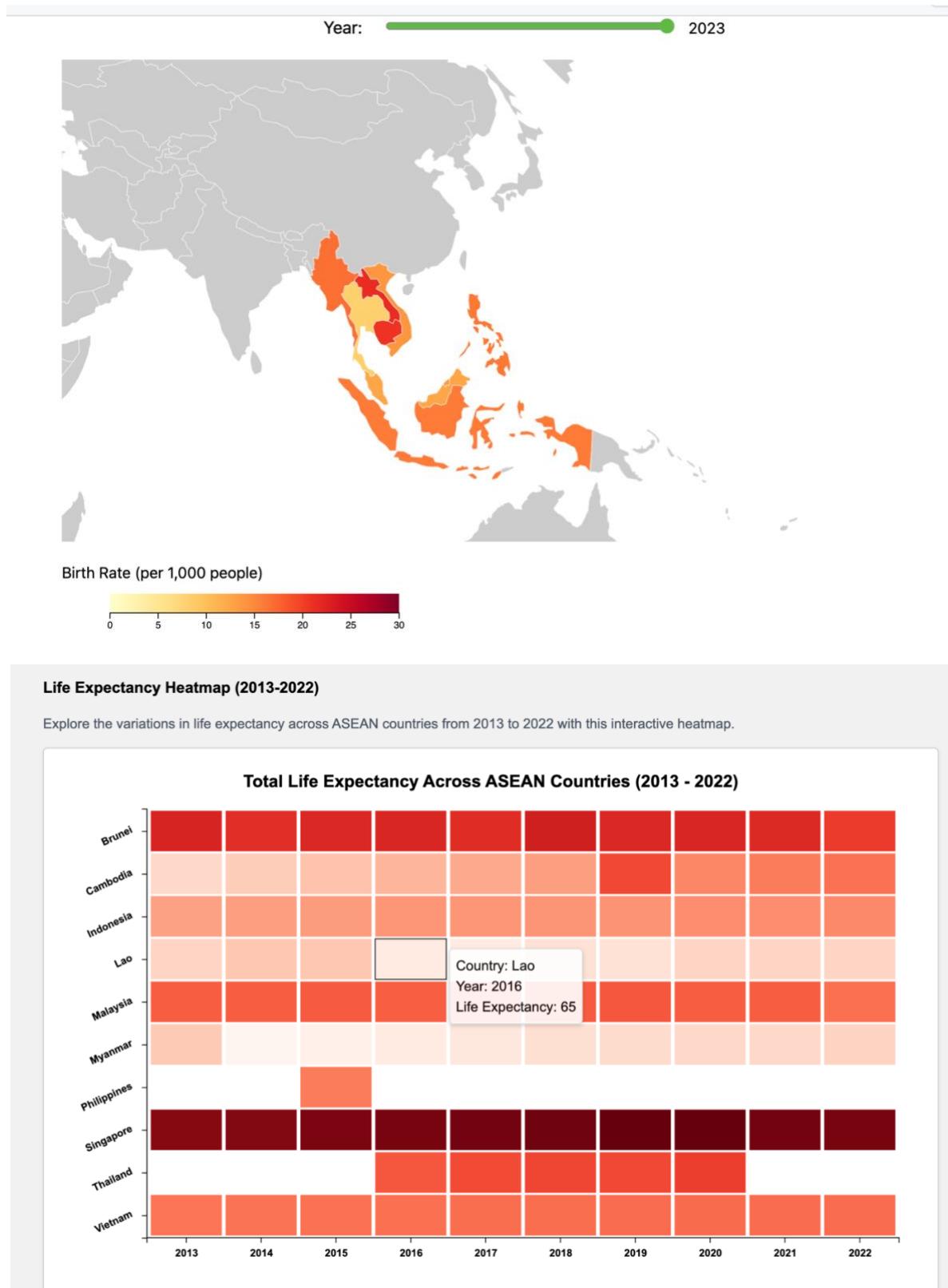
4.1.3. Visualization Design (Final)

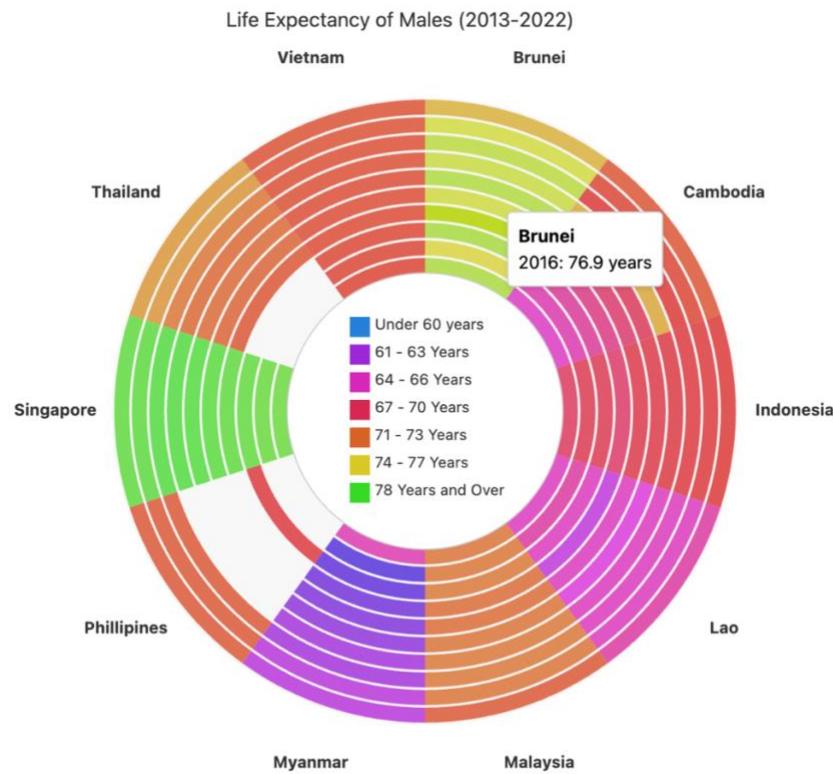
The final design will be based on the improvements made during the previous stages. At this point, the chart will be fully interactive, with features like tooltips and drill-down options working smoothly. The design will be clean and organized, making it easy for users to understand the data at a glance without feeling overwhelmed.

We will finalize the colour choices to make sure they are clear and easy to follow. Different colors will be used to represent different countries or regions, making it simple to compare them. Labels and legends will be concise and clear, helping users quickly interpret the data.

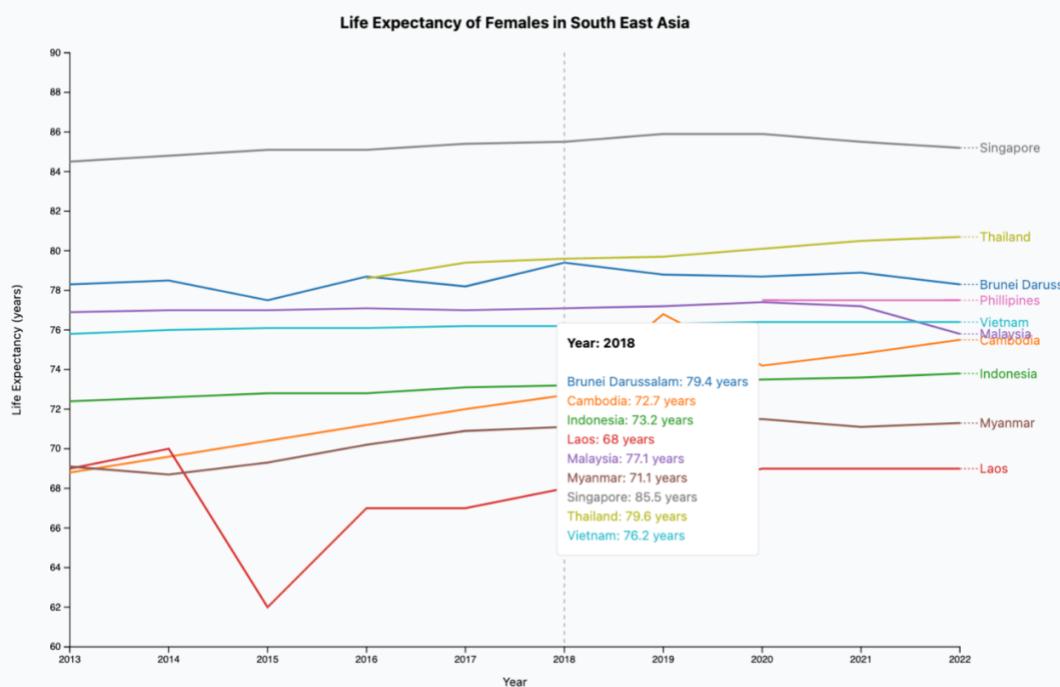
The final version will also ensure the chart is accessible to everyone. This means making sure it works with screen readers, has good color contrast for people with visual impairments, and includes alternative text descriptions for important data points. The chart will also be responsive, meaning it will work well on devices of all sizes, like phones and tablets.

Finally, we will test the chart on different browsers and platforms to ensure it performs well and is easy for users to access. Once everything is finalized, the chart will be ready for use, providing a user-friendly way to explore and understand the data.





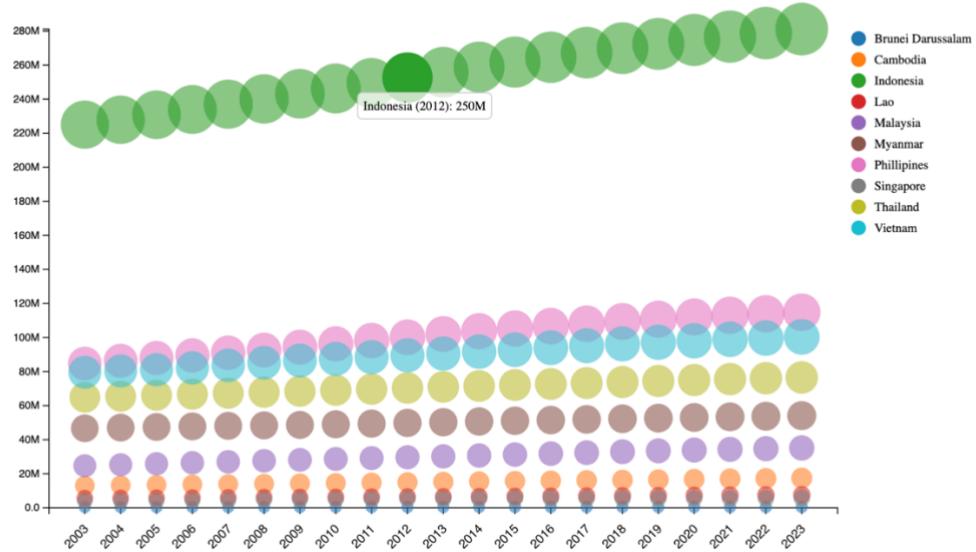
Life Expectancy of Females in South East Asia Countries 2020 - 2022



Population Growth of ASEAN Countries (2003-2023)

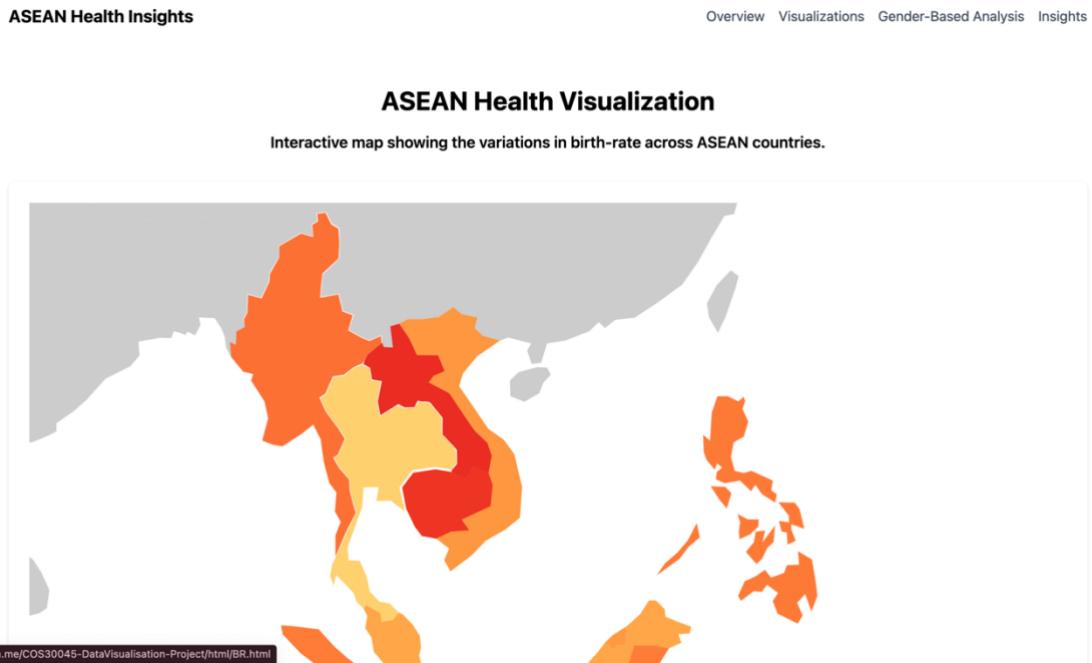
Explore the population growth trends across ASEAN countries from 2003 to 2023 with this interactive bubble chart.

Bubble chart showing population growth trends for ASEAN countries from 2003 to 2023

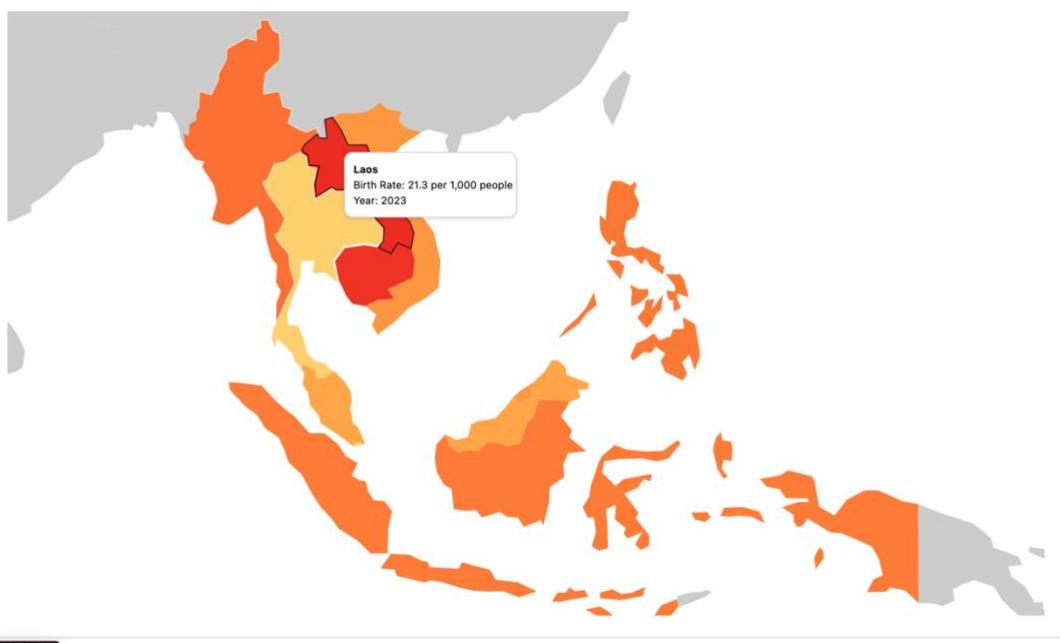


5. Web Visualisation Design

This is the first page we can see when we enter when we enter the link of our web.

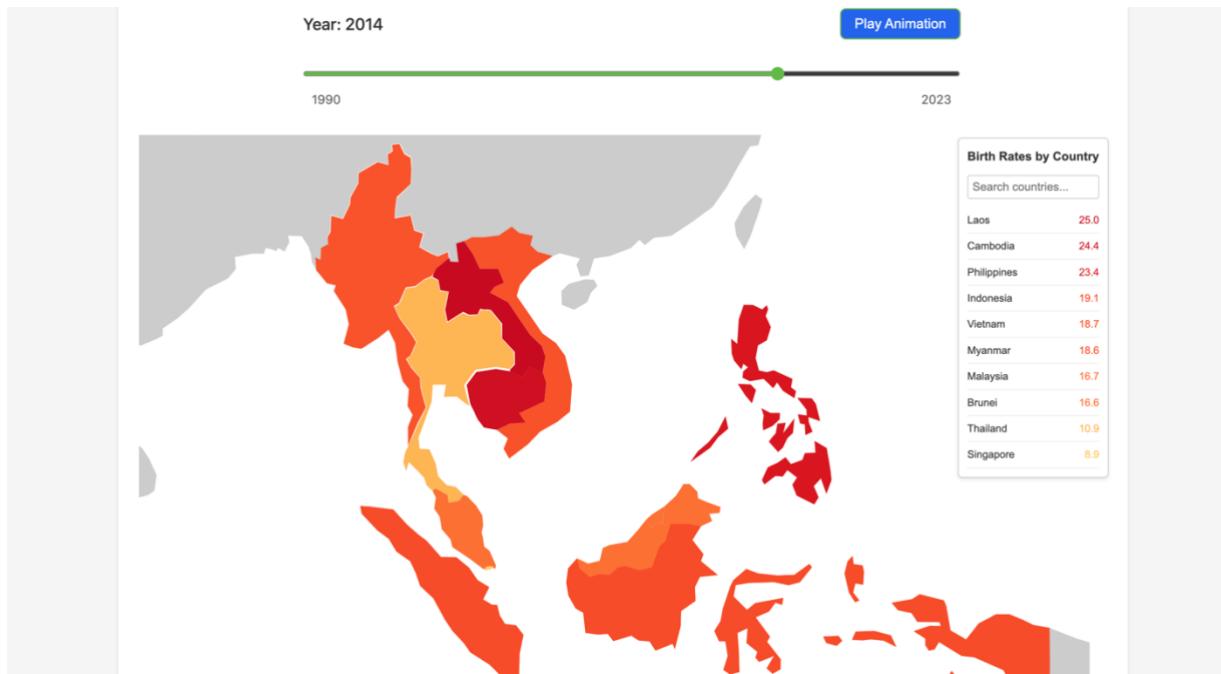


We may see the interactive map first. There are still two options whether we can view the data by hovering upon each country in the main page or click the map and we can see more data interactive with animation button playing from dataset 1990 to 2023.



127.0.0.1:5500/html/BR.html



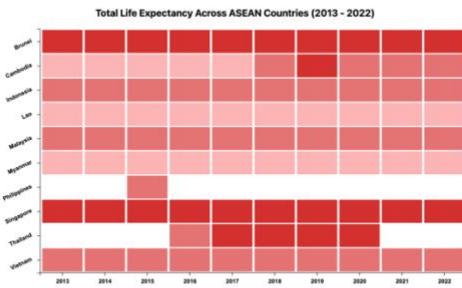


When we scrolled down a bit, we will see these two charts. Heat Map for Life expectancy (total – both female and male) and floating bubble chart for population growth in ASEAN countries (2003 – 2023). Every chart will contain tooltips upon hovering the chart. And under each chart window, there will be legends for color range and key observation for each dataset and chart.

INTERACTIVE VISUALIZATIONS

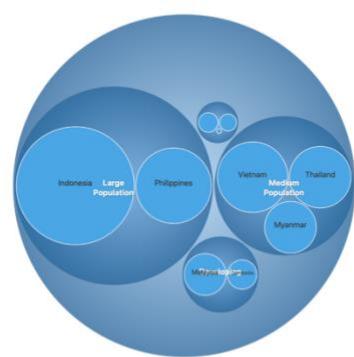
Life Expectancy Heatmap (2013-2022)

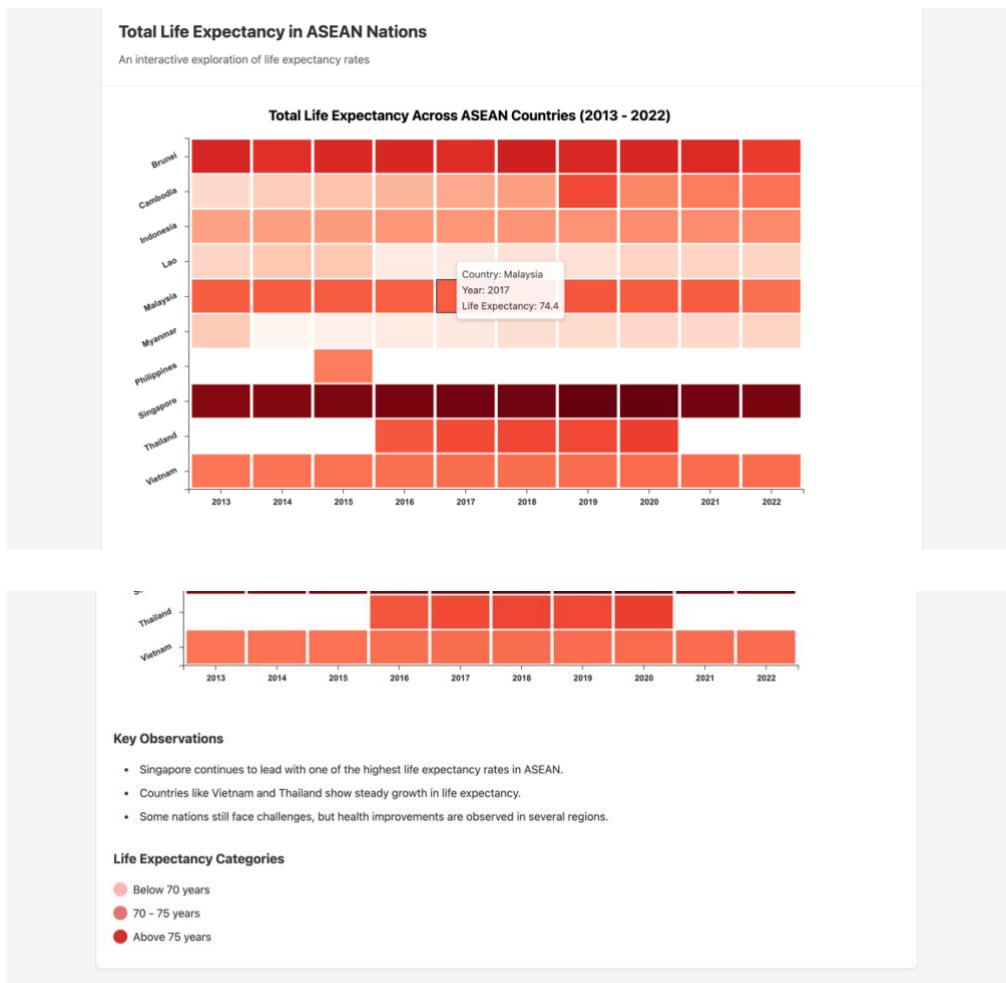
Explore the variations in life expectancy across ASEAN countries from 2013 to 2022 with this interactive heatmap.



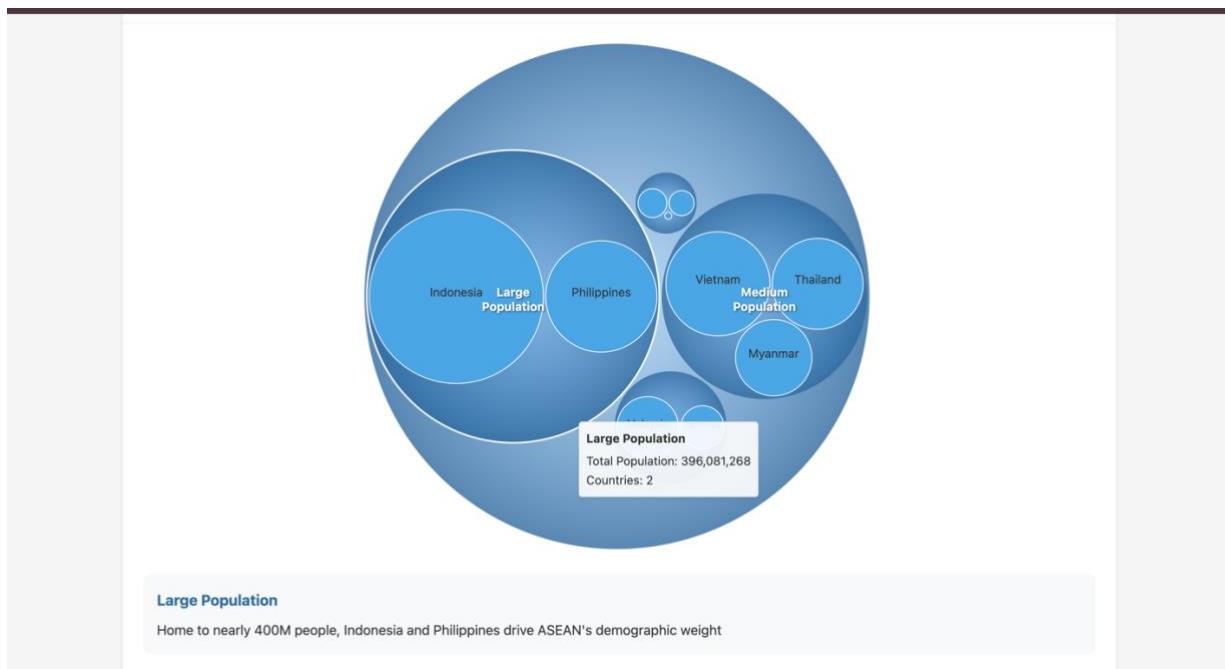
Population Growth in ASEAN Nations (2003-2023)

Explore the population growth trends across ASEAN countries from 2003 to 2023 with this interactive bubble chart.

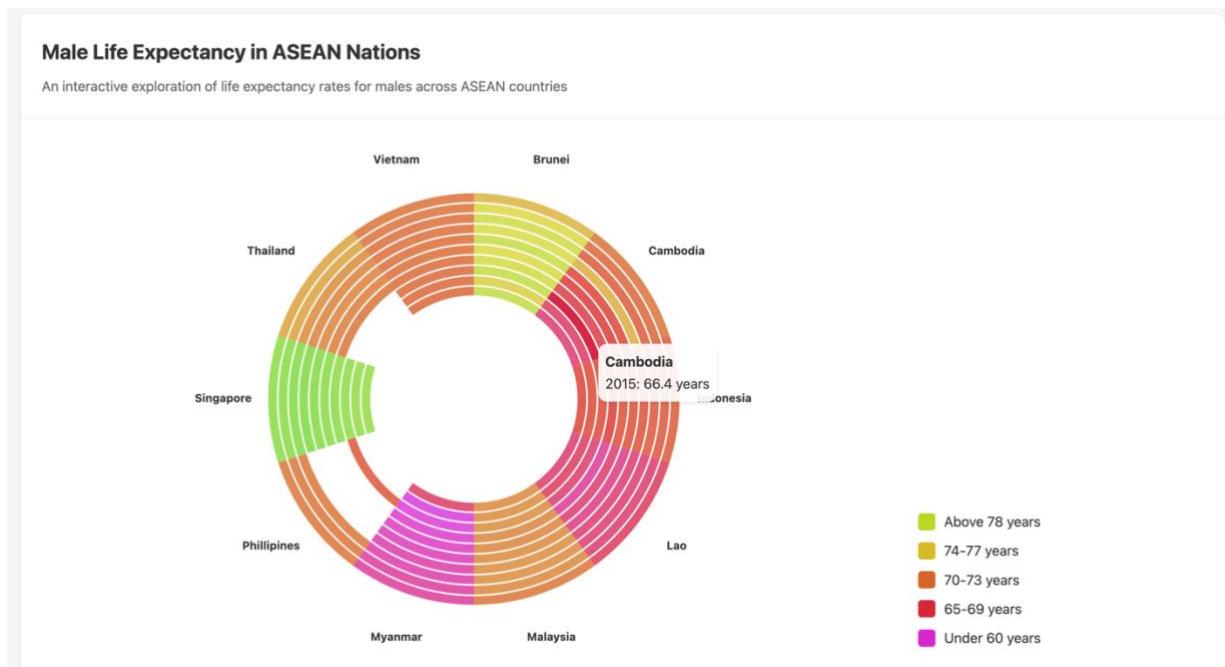


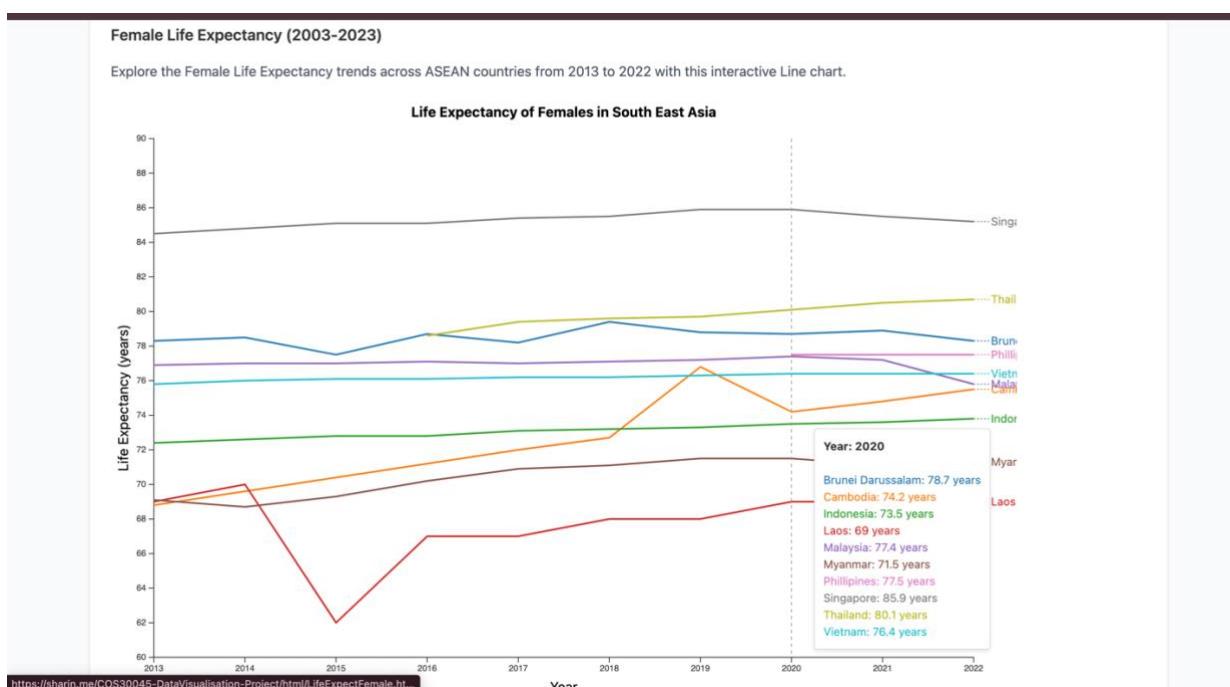
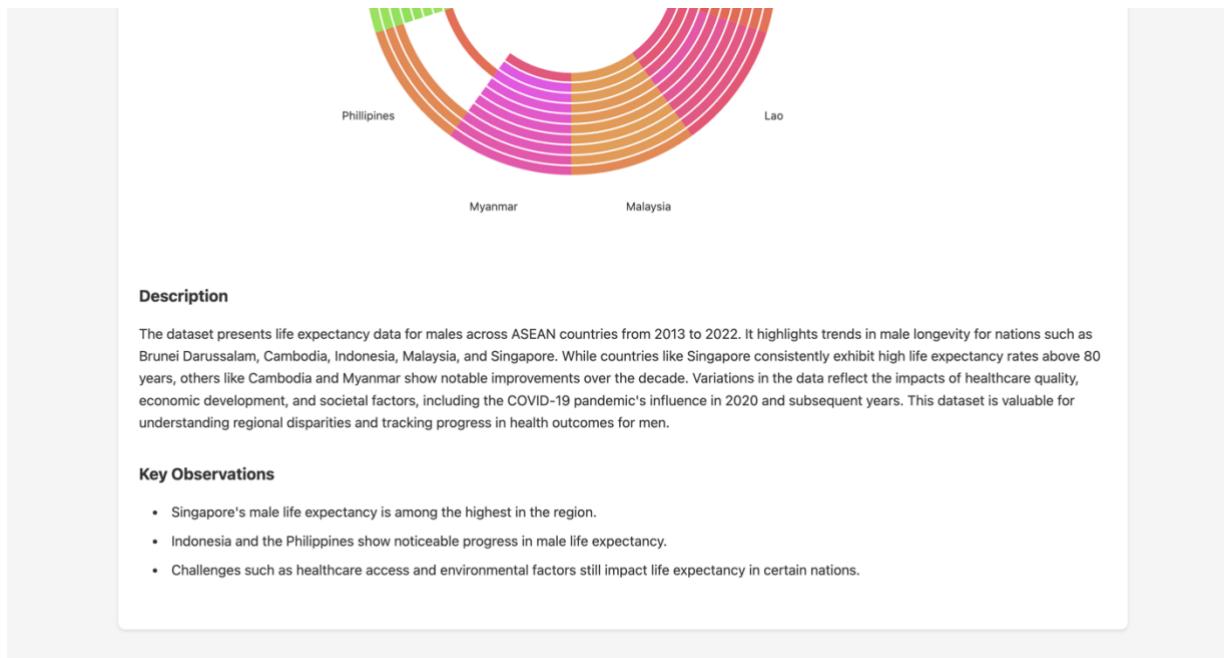


The floating bubble chart for the population growth will be including 3 main groups where large, medium and small. Upon hovering each bubble, it will be showing specific information for each bubble and name of the countries under that bubble.



Scrolling down a bit, Gender based Analysis separate charts for male and female life expectancy which ranged from 2013 to 2022.





The lowest part of the website is about our key insights of our data sets and future expectation of the health trends in ASEAN countries by 2035.

Key Insights

Regional Patterns in ASEAN Health Data

Over the past three decades (1990–2023), ASEAN nations have witnessed diverse health trends. While Singapore consistently excels in healthcare quality, countries like Myanmar still face barriers like limited infrastructure and accessibility.

Key progress has been seen in Malaysia and Thailand, where targeted policies have improved life expectancy for women, showcasing the importance of gender-focused health strategies. However, challenges persist in balancing birth rates with available resources in rural regions.

Key Finding: Regional disparities highlight the need for scalable healthcare models tailored to diverse economic and social contexts.

Future Implications of Health Trends

By 2035, an aging population will redefine healthcare priorities across Southeast Asia. Nations like Thailand and Vietnam are projected to see over 25% of their populations aged 60 or older, emphasizing the urgent need for geriatric care infrastructure.

Urbanization and technological advancements present opportunities to integrate telemedicine, AI-driven diagnostics, and preventive care, ensuring accessible healthcare for both urban and rural communities.

Key Finding: Proactive investments in healthcare innovation and sustainability will be critical to navigating these demographic shifts.

© COS30045 Data Visualisation - ASEAN Health Visualization Project
Shin Thant Thi Ri ~ Yadanar Theint

6. Validation Website

To check how well our website works, we asked a few of my friends to fill out a short survey using a Google Form. The goal was to get their opinions on the design, how easy it was to use, and if they could understand the information. We wanted to know if the website was simple to navigate, if the charts were clear, and if the overall look made sense. Their feedback helped us find any problems and areas that needed improvement before sharing the site with more people.

The answers from the survey gave us useful ideas about how to make the website better. We asked people to rate things like how easy the website was to use, how clear the data was, and how satisfied they were overall. Based on what they told us, we made some changes to improve the website and make it easier for everyone to use. This process helped us make sure the website works well and gives the right information to its users.

In Survey Questionnaire

Website survey for Data Visualization

Website survey for Data Visualization

Website Link Here - <http://sharin.me/COS30045-DataVisualisation-Project/>

Is it easy to navigate the website?

Very Easy
 Slightly easy
 A bit Complex
 No

How comfortable are you with interpreting data from chart?

Very Easy
 Slightly easy
 A bit Complex
 No

Do the colors and fonts make the content easy to read?

Very Easy
 Slightly easy
 A bit Complex
 No

Was the design consistent throughout the website?

Yes
 No

Did you find the information you were looking for quickly?

Yes
 No

Were there any technical issues while using the website?

Yes
 No

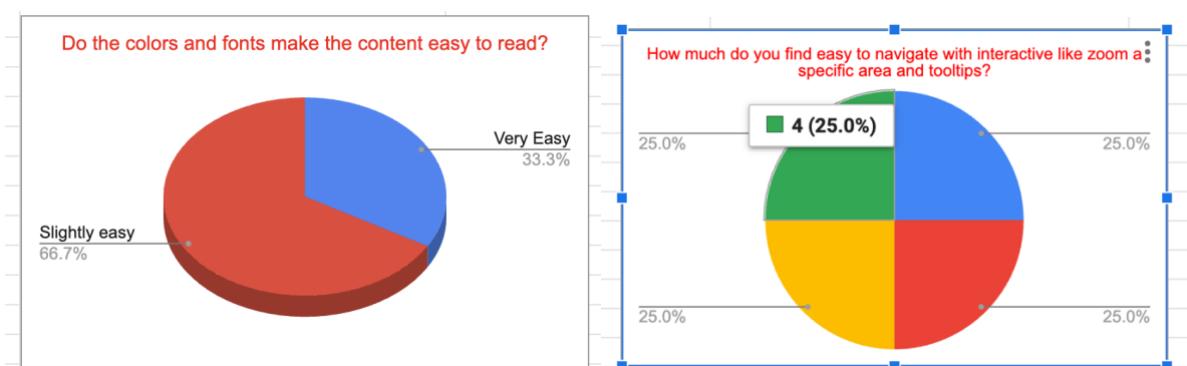
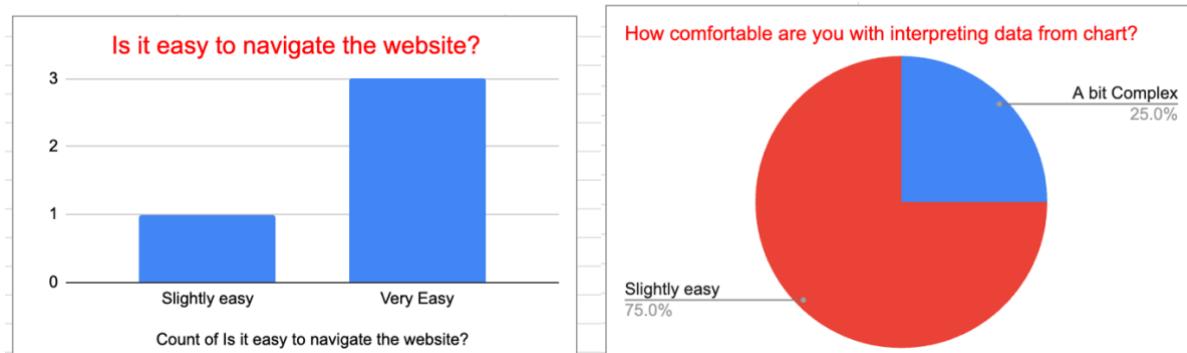
How much do you find easy to navigate with interactive like zoom a specific area and tooltips?

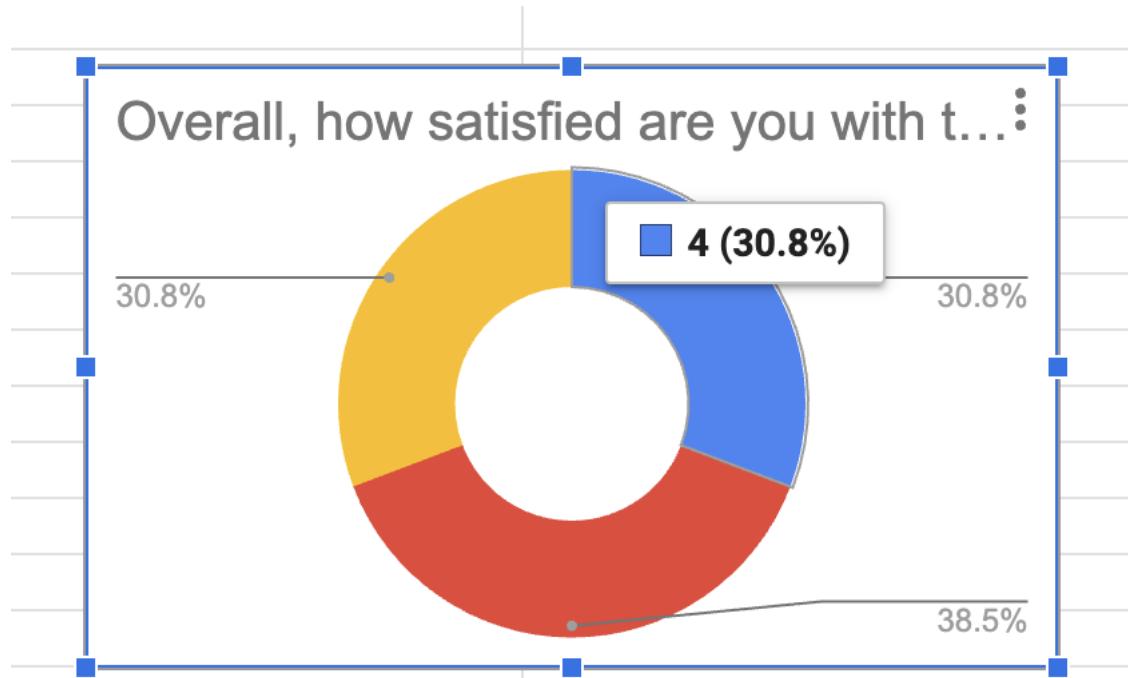
1 2 3 4 5
Not Helpful 5 - Very Helpful

Overall, how satisfied are you with the website?

1 2 3 4 5
Not Helpful 5 - Very Helpful

After we have sent the survey links to our friends, we got the survey answers as follow. Mostly, we got positive feedback for our website.





7.Design Justification

When creating data visualizations, especially interactive ones such as radial charts, line charts, choropleth maps, bubble maps, and heatmaps, it's crucial to follow basic design principles. These principles ensure the visuals are not only attractive but also functional, effectively communicating the information. Below are the essential principles to guide your design:

- Clarity: The main objective is to make the data easy to understand. This involves simplifying visuals by removing unnecessary elements, using clear and consistent labels and terminology, and choosing the most appropriate way to represent the data. For example, in a choropleth map of life expectancy, ensure the color scale is easy to read and includes a clear legend.
- Consistency: Consistency helps users form correct interpretations across different parts of the visualization. This includes using uniform design elements like colors, fonts, and styles, as well as ensuring consistent scales, axes, alignment, and spacing. For example, in a multiple line chart, make sure each line follows the same color scheme and the axes are scaled identically.
- Contextualization: Provide sufficient context so users can understand the data's relevance and meaning. This can be done through annotations, data descriptions, and comparisons. For instance, in a heatmap, label the different temperature ranges and include a description of the data source.

- Efficiency: Design visualizations to help users extract insights with minimal effort. Minimize cognitive load by keeping the visualization simple and intuitive, provide intuitive interactions like tooltips or filters, and pre-select common views or comparisons. For example, allow users to hover over regions in a bubble map for additional details.
- Accessibility: Ensure your visualizations are usable by all, including people with disabilities. This involves choosing color schemes that are distinguishable by colorblind users, maintaining enough text contrast, and enabling keyboard navigation for interactive elements.
- Data Integrity: Accurately represent the data and its context. Always cite the data source, and be transparent about how the data is presented, avoiding any manipulation or exaggeration.
- Interactivity: Enhance the user experience by providing dynamic features like zooming, filtering, and responsive hover feedback. For example, display the exact data value when a user hovers over a grid in a heatmap.
- Aesthetic Appeal: A well-designed visualization can make the data more engaging and easier to understand. Focus on clean layouts, thoughtful color usage, and readable typography to create visually appealing charts and graphs.

8. Conclusion

In conclusion, life expectancy, birth rate, and population growth are key factors that shape the future of countries, particularly in Southeast Asia (ASEAN). These factors provide a clear view of the health and development of a population, highlighting how social, economic, and political changes affect a country's growth, stability, and the well-being of its people.

By examining life expectancy, birth rate, and population growth across ASEAN countries, we gain insights into the trends shaping the region. Life expectancy data shows how health care and living conditions are improving, while birth rate and population growth help us predict future demographic changes, such as whether countries will have younger populations or face challenges with aging populations.

To present these trends, we used different types of charts. A stacked bubble chart was used to show how the population in each country has changed over time and how it might change in the future. Multiple Line chart was used to track life expectancy for females while heat map is used for displaying life expectancy for total(both genders). A radial stacked chart was used to

track life expectancy for males. Choropleth interactive map was used for birth rates, allowing us to visualize both past and future changes.

We gathered reliable data, processed it, and created visualizations to better understand demographic trends in ASEAN. Using the D3.js library, we added interactive features like tooltips and zooming, enabling users to explore the data more deeply. These features help users better understand the connections between life expectancy, birth rates, and population growth in each country.

To ensure the charts were effective, we tested them for clarity and ease of use. The testing showed that the visualizations clearly communicated the trends, were user-friendly, and provided useful information. The use of contrasting colors, clear labels, and additional background information made the data easier to interpret.

Ultimately, these visualizations give us a deeper understanding of how demographic trends are evolving in ASEAN countries. By tracking life expectancy, birth rates, and population growth, these tools can help policymakers, researchers, and the public make informed decisions about healthcare, economic development, and population management. As migration, urbanization, and globalization continue to influence these trends, it's crucial to understand demographic changes in ASEAN to develop policies that support fair and sustainable growth for everyone.

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