



Project Reflection

Reflection on the group's work
and the individual work of the
'Health Topics in Australia and
the world' project

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Introduction

The data visualization project has provided a broad overview about many health factors in Australia and in other countries. The primary objective of the project was to create a website that could provide real-world statistics and allow for discussions among the authorities and who are interested in the health topics by transforming large volume of datasets into an interactive website. This project gives our team a chance to make a difficult and complicated field like health more accessible to everyone. The project helps us our essential technical skills and serves as a valuable experience for our careers in the future.

Team Reflection

Data Visualization Concepts

To prepare well for this project, we have applied many data visualization techniques and concepts to make the visualizations efficient in conveying data:

- Choose the audience: Targeting the audience helps you determine the outline of the design to meet the need of the audience. In this project, the design is made for anyone who has interested in the health system, and people who are in the field of analysis, research and policy-making.
- Set the goal: The project is made to provide information about current health situations in Australia and the world. The project could be helpful for researchers to find solutions for existing health problems or the authorities to modify policies to improve the health system.
- Choose suitable types of chart: The choices of chart are made based on the audience, the datasets and the purpose of chart. For example, the donut chart is used to show the proportion of physicians in each region compared to all the physicians in Australia, while the bubble chart is used to compare the use of tobacco and alcohol among the countries in the world.

- Carefully use text: Legends are used to give a brief description of the data being displayed, so it is best practice to demonstrate the legends based on the order of appearance. Tooltips are used to provide additional information to the chart, so instead of putting the tooltips under the charts, it is more efficient to use interactive tooltips to show the tooltips when users hover the mouse over the data.
- Use interactive effects: The use of interactive effects encouraged readers to gain valuable insights from understanding the meaning of the dataset and the visualization. For instance, the interactive tooltips are used in the donut chart to give information about the statistics of the data point.
- Include comparisons: Comparisons help the users determine the data trends and patterns. For instance, the donut chart of the physicians in Australia allows the users to compare the proportion of physicians in each state and compare the number of physicians among different years.

The applications of suitable techniques and design principles helped us convert endless lines of data into vivid visualization so that everyone could have a brief understanding of many health factors not only in Australia but also in other countries.

Data Programming Concepts

The use of data programming concepts include the understanding of data types in the datasets, the use of functions and modules, the use of algorithm and data structures, the use of programming language for the data visualization (in this unit, students are taught to use D3, a JavaScript library for creating data visualizations).

To understand the datasets well, knowing which data types were in the datasets was important. This step was made after retrieving the datasets from the OECD database. For example, the dataset of physicians contained two main data types: region data, which indicated the states of Australia, is nominal and period, which indicated the years of the recorded data, is ratio. The application of indicating the data types is essential for the data analysis and the implementation of code.

Field Name	Description	Types of Data
Regions	The states of Australia (New South Wales, Victoria, etc.)	Nominal
Period	The years of the data recorded	Ratio
Period (%)	The years of the data recorded in percent	Ratio

Figure 1. The data types of the Physicians in Australia dataset

The use of suitable programming languages for the visualization is also important. There are many languages used for the visualization, with Python being the most used due to its popularity and its simplicity. In the unit, D3, a library of JavaScript, is used for data visualization. D3 provides many technical principles to create a visualization, such as selections, transitions and data-binding:

- **Selections:** This central principle allows the users to use a CSS-style selector to select Document Object Model (DOM) and manipulate them by operators (setting attributes, styles), based on HTML tags, classes, identifiers, or attributes. In the Physicians in Australia chart, this code set the attributes of the width, height of the donut chart.

```
var svg = d3.select('#donut')
    .append('svg')
    .attr('width', width)
    .attr('height', height)
```

Figure 2. Selection

- **Transitions:** Values for attributes and styles can be smoothly interpolated for a period of time. The following code in Physicians in Australia chart will help change the chart when the users choose another year in the dropdown bar.

```
function change(data) {
  var pieData = pie(data);

  path = path.data(pieData);

  path.transition().duration(750).attrTween("d", function (a) {
    var i = d3.interpolate(this._current, a);
    this._current = i(0);
    return function (t) {
      return arc(i(t));
    };
  });
}
```

Figure 3. Transition

- Data-binding: D3 loads datasets and creates an SVG object with properties (shape, colors, values) and behaviors (transitions, events). In the Physicians in Australia chart, the following code set the attributes of the regions in Australia (the 'title') with colors.

```
var path = svg.selectAll('path')
  .data(pie(data2021))
  .enter()
  .append('path')
  .attr('d', arc)
  .attr('fill', function (d, i) {
    return color(d.data.title);
  });
```

Figure 4. Data-binding

Functions are used to perform specific tasks and avoid writing many lines of code for duplicate functionalities. In the following code, the function is written to change the chart whether the users clicked on another year in the dropdown bar.

```
function change(data) {
  var pieData = pie(data);

  path = path.data(pieData);

  path.transition().duration(750).attrTween("d", function (a) {
    var i = d3.interpolate(this._current, a);
    this._current = i(0);
    return function (t) {
      return arc(i(t));
    };
  });
}
```

Figure 5. Function

The applications of data programming concepts contributed a lot to the process of visualizing data. These concepts were used in data collection, data cleaning, data visualization, evaluation. The use of these concepts help create an efficient visualization.

Design Guidelines and Principles

The project highlighted the importance of applying design guidelines in presenting data. The use of suitable colors and hues, interactive elements, concise labels, and descriptive titles was essential for converting complicated data into easy-to-read visualizations. Our compliance with these principles helped our audience clearly understand data patterns and showcased our valuable data findings.

Efficient Teamwork

Efficient teamwork always needs a healthy working environment and connection among the team members. Apart from our weekly workshops on Tuesday, we had an online meeting every Friday evenings and an in-person meeting each fortnight in State Library Victoria to discuss our ideas and the problems met, provide the solutions to tackle the problems, and update the progress of the project and the individual work. The efficiency of team communication helped promote team coordination, alleviate mutual disagreement and clashes, and foster friendship for future events.

While the team communication is necessary, the progress of the project is the most important since it reflects the effort of the team in the progress of making this project. Because of that, it is vital for the team to make a balance between communication and actual work, prioritizing the efficiency and the need of meetings and conversations. We also developed norms respecting the schedules and working routines of each member by only contacting the member if necessary, like asking for an unsolved problem or adding some features to the visualization.

Efficient team communication played a crucial role in the quality of the work of each member and the team, which could affect the quality of the project. This project provided valuable experience for us to enhance cooperation, improve the quality of our work, and promote a healthy, reliable working environment.

Personal Reflection

Incorporate Feedback

Through the project, I appreciated the value of feedbacks from our facilitators in both the design and the programming of the project. The four project stand-ups offered our team priceless opportunities to present our ideas and ask for problems we have faced during the process of making the project. For instance, when our team had struggle with putting all the visualization in a page, our tutor suggested us that we could put the introduction in the home page and the visualization in another page. We also got feedbacks from students who are currently studying this unit or students who have passed this unit to ensure that our work meets the requirements of the unit. The valuable feedbacks contributed a lot to the improvement of the functionalities and the visual of the website.

Data Findings, Research and Analysis

I participated in the stage of research, data findings and data analysis.

For data findings, I used the OECD database as the primary source of our datasets. The datasets were in the table form, so after I found all the relevant datasets, I retrieved the data from the datasets and converted it into usable form for the analysis and visualization.

After finding all the needed data, the next step is data cleaning and processing. The process is done by removing some of the irrelevant features of the data tables, such as the title of the tables or the unit of measurement. For these details, they will later be added by using HTML. This step helps maintain the integrity of the datasets and only keep needed features for the analysis and visualization. After cleaning the data, the dataset will be transformed into CSV files to be used for D3 visualization.


```

1 Health care - Regions
2 Frequency of observation: Annual
3 Measure: Active physicians
4 Unit of measure: Persons
5 Time period,2010,2011,2012,2013,2014,2015,2016,2017,2018,2019,2020,2021
6 Australia,"76,198","78,922","79,640","82,408","85,491","87,999","91,341","95,194","98,395","101,841","105,293","108,501"
7 New South Wales,"24,348","25,468","25,566","26,676","27,374","28,095","28,995","30,037","30,809","31,817","32,681","33,622"
8 Victoria,"18,704","19,437","19,621","20,230","21,186","21,893","22,712","23,762","24,641","25,684","26,822","27,590"
9 Queensland,"15,200","15,656","15,897","16,224","16,950","17,548","18,563","19,553","20,334","21,041","21,785","22,485"
10 South Australia,"6,137","6,337","6,296","6,457","6,618","6,712","6,836","7,009","7,161","7,365","7,500","7,640"
11 Western Australia,"7,600","7,671","7,906","8,232","8,667","8,937","9,251","9,631","9,974","10,276","10,692","11,119"
12 Tasmania,"1,778","1,814","1,777","1,845","1,900","1,902","1,964","2,059","2,211","2,259","2,386","2,483"
13 Northern Territory,934,974,"1,008","1,002","1,053","1,101","1,164","1,221","1,256","1,282","1,286","1,339"
14 Australian Capital Territory,"1,497","1,565","1,569","1,654","1,654","1,715","1,768","1,820","1,893","1,965","2,020","2,102"
15

```

Figure 6: Physicians in Australia

```

1 Region,2010,2011,2012,2013,2014,2015,2016,2017,2018,2019,2020,2021
2 Australia,76198,78922,79640,82408,85491,87999,91341,95194,98395,101841,105293,108501
3 New South Wales,24348,25468,25566,26676,27374,28095,28995,30037,30809,31817,32681,33622
4 Victoria,18704,19437,19621,20230,21186,21893,22712,23762,24641,25684,26822,27590
5 Queensland,15200,15656,15897,16224,16950,17548,18563,19553,20334,21041,21785,22485
6 South Australia,6137,6337,6296,6457,6618,6712,6836,7009,7161,7365,7500,7640
7 Western Australia,7600,7671,7906,8232,8667,8937,9251,9631,9974,10276,10692,11119
8 Tasmania,1778,1814,1777,1845,1900,1902,1964,2059,2211,2259,2386,2483
9 Northern Territory,934,974,1008,1002,1053,1101,1164,1221,1256,1282,1286,1339
10 Australian Capital Territory,1497,1565,1569,1654,1654,1715,1768,1820,1893,1965,2020,2102
11
12

```

Figure 7: Cleaned Physicians in Australia

After the process of cleaning the data, I examined the datasets to identify data types, data patterns and suitable visualization for the datasets. Also, I tried to find datasets that have correlations and connections with each other to broaden the health topics and provide more profound understanding of various health factors. The research and analysis of data laid the foundation for our design and programming process, ensuring the project suits with the need of the audience.

After that, I utilized many methods for data validation to ensure the use of reliable data sources and the data integrity. The use of high-quality datasets was crucial for interactive visualizations; hence preserving the credibility of our observations and interpretations.

Idea Planning

I contributed to the process of planning for our project. I found the relevant datasets and generated initial design sketches for these. The initial sketch emphasized on the look of the chart, their features and the interactive effects that we could add to the chart to increase its vividness. The planning process allowed us to brainstorm diverse design approaches, explore suitable visual presentation before making a decision on the presentation that best conveyed our datasets.

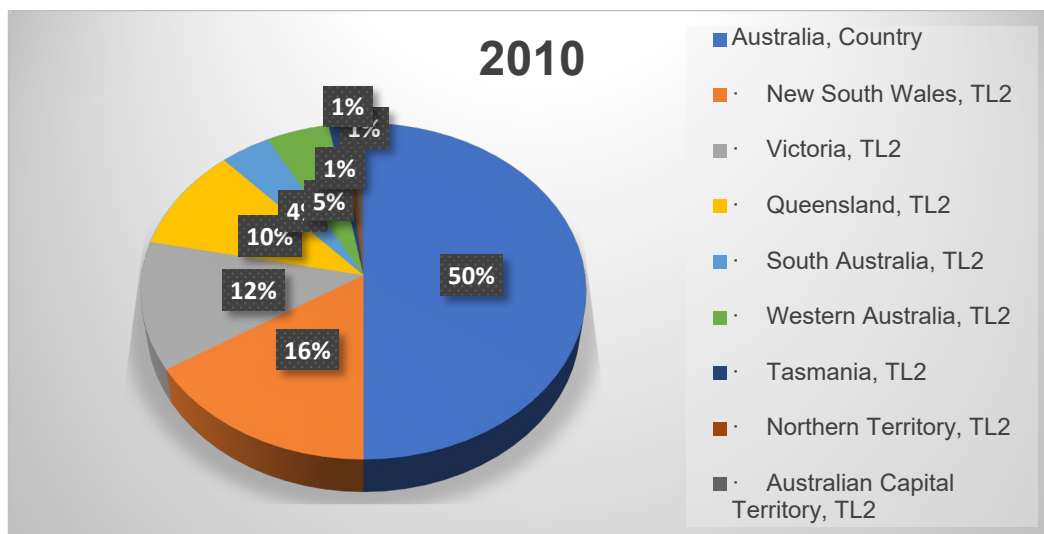


Figure 8. Initial Sketch of Physicians in Australia

Coding and Implementation

I contributed to converting initial design sketches into functional and interactive visualizations. Using my experience and knowledge in HTML, CSS, and JavaScript, I wrote the code for the visualization, involved the creation and the styles of attributes like titles, legends or tooltips while maintaining the responsiveness, accessibility, and interactive features. For the interactive effects, our main effect was the mouse hovering, which allowed the users to hover the mouse over the charts to see the statistics. The interactive effects help the users become more engaged in the process of data exploration and data analysis.

Web Development

The website consisted of 2 pages, one is for the introduction of our health topics and one is for the charts. Initially, we want to create a one-page website and put all the necessary information into one page but when we tried to do, the charts simply didn't appear on the website. So in the stand-up session of the unit, our tutor suggested we could make a two-page website and his suggestion is really helpful.

For the outline of the website, the home page contained a simple background with the heading indicating our aimed topic and an introduction about the importance of data

visualization to the analysis of health situations. Below the introduction is a button named 'Explore' that led to the chart page.

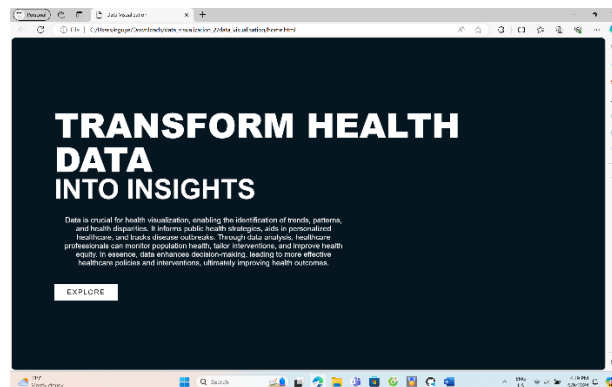


Figure 9. Home page

The chart page contained three charts, two bubble charts and one donut chart for three different datasets: the use of tobacco, alcohol and the number of physicians in Australia. The charts and the titles are aligned to the center of the webpage.

For the bubble charts, they are used to demonstrate the datasets of tobacco and alcohol consumption. The charts included multiple bubbles, with each one contained the name of a country and their value of consumption. The larger amount the consumption was, the larger the size of the bubble was.

For the donut chart, it is used to demonstrate the dataset of the physicians of Australia from 2010 to 2021. The chart has legends with separate colors for different regions for users to know which color is related to different parts of Australia. We also added the interaction of mouse hovering, so when the users want to know the specific statistics, they could hover the mouse over the chart and see the value and the percentage.

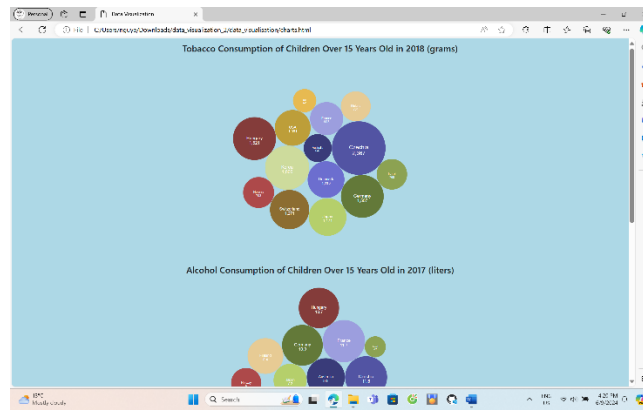


Figure 10. Chart page

The outcome of our team was the website of our data visualizations. I focused on testing the functionalities and the interaction of the visualizations of the website across various devices and browsers. The project offered an opportunity for my web development skills to be put into practice.

Collaboration and Communication

The performance of the team relied on the abilities of each member and the communication among team members. The team communication through discussing ideas, learning from mistakes and problems, and putting efforts into the work contributed to the success of the project and enhanced my soft skills.

Future Developments

In the future, there are many developments that could be applied to the website to make it better. The first development is the application of more datasets of the health topics to broaden the knowledge of the users about the health system. Moreover, more charts could be added to demonstrate different datasets. For example, line charts could be added to illustrate the life expectancy of people in the world. Also, more interactive effects could be added to improve the look of the website and encourage the interaction between the charts and the users.

Conclusion

The project was a valuable opportunity for students who have little experience in the field to use their skills and techniques of design, programming, user experience, and

social communication to make a website to illustrate data related to health topics. Learning about the field of health gave us a new viewpoint on the implications of health systems in today's lives through the use of data and the data interpretation for making decisions, raising the awareness of public, and the cooperation among countries around the world to work for a better health system. Through the project, we want to raise informed discussions and the modification of policies for the improvement of the health systems and the well-being. Through this unit, we have developed a website for health factors and honed our skills to prepare for our future careers.

References

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