Universiti Tunku Abdul Rahman

Faculty of Information and Communication Technology

UCCD 1143 Probability and Statistics for Computing

Assignment Title:

Worldwide cancer statistics of adults over 75 years old in 2019

Group Number: 3

Lecturer’s Name: Dr. Lim Seng Poh

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Part I – Report for Dataset 3

1. Sample Mean = 2643.83

Sample Median = 2633.10

Minimum = 1002.00

Maximum = 4276.10

Range = 3274.10

1. Sample Variance = 888899.40

Sample Standard Deviation = 942.81

1. According to the results that we have found from the dataset given, we are able to know that the sample mean is greater than the sample median. This statement means that the shape of the graph of the entire dataset will be skewed to the right which is positively skewed for the graph. In addition, we have two measurements of dispersion. They are range and standard deviation or variance. For the range, we are able to know the range of the dataset by getting the difference between the maximum value and the minimum value of the dataset provided. Meanwhile, the standard deviation, which is the square root of the variance, is able to define the distribution between the data and the sample mean. For this dataset, the data are widely scattered about their mean since there is a large standard deviation.
2. As for me, I will suggest the Histogram as the Histogram is able to show the skewness of the dataset. Also, we are able to look at the distribution of the data in the graph easily although all of the data have been grouped due to the classes of the Histogram. The histogram is able to show the skewness of the data and there will be a positive skewness, which is skewed to the right for the graph, and the distribution of the data is widely scattered in the graph.

Part II – Analysis and Findings of the Article

Article Links: <https://link.springer.com/article/10.1186/s12889-022-14412-1>

Group

Question A

The article's methodology includes collecting and analysing detailed data on cancer cases from 1990 to 2019 using the Global Burden of Disease database.[1] The GBD 2019 database provides detailed statistical data on 354 diseases across 204 nations and territories throughout the selected time.

Specifically, the focus of the study was on 29 types of cancers affecting individuals aged 75 years and older. These cancer types included breast cancer, bladder cancer, colon and rectal cancer, leukaemia, lung cancer (tracheal, bronchus, and lung cancer), and others.

The collected data was then analysed based on various parameters such as gender, country, region, and sociodemographic index (SDI). SDI is a measure of social progress, and the countries were divided into five categories ranging from low to high SDI. The study also compared cancer incidence and mortality rates in the specified age range (75 years and older) to other age groups, such as 0 to 14 years, 15 to 59 years, and 60 to 74 years.

To provide a full overview, the analysis considered the trends in cancer incidence and mortality rates against the backdrop of SDI and 21 geographic regions categorized by the GBD 2019. The geographic regions were most likely classified according to variables such as location, economic development, and other pertinent criteria.

All data utilized in the study was publicly available and sourced from the GBD 2019 database. The study sought to shed light on the patterns and trends in cancer incidence and mortality rates among people aged 75 and older, taking into consideration a variety of demographic and socioeconomic characteristics. [1]

Question B

A screenshot of a white sheet

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Figure B-1: List of the Cancer Disease and the data for each Cancer Disease

Through this form, we are able to know that the majority of cancers are more common in men than in women, but there are some cancers that only women can get rid of, such as Uterine cancer, Ovarian cancer, and Cervical cancer. This is due to the difference in the physiological structure of the human body.

Certain cancers, such as non-melanoma skin cancer, colon and rectum cancer, lung cancer, breast cancer, and bladder cancer, show decreasing trends in incidence rates over time. This could be attributed to successful public health initiatives, including smoking cessation programs and early detection campaigns. Some cancers, like testicular cancer and larynx cancer, demonstrate relatively stable incidence rates throughout the study period.

The data underscores the dynamic nature of cancer epidemiology, with varying trends observed across different types of cancers. These findings can inform healthcare policies, resource allocation, and research priorities to optimize cancer prevention, early detection, and treatment efforts. Continued surveillance and research are essential for understanding the underlying factors driving cancer trends and developing effective strategies to reduce the burden of cancer on individuals and society.

A screenshot of a graph

Description automatically generated

Figure B-2: Figure for the Table with the Cancer Cases Based on the Continents

Both sexes experienced an increase in cancer incidence rates from 1990 to 2019, with males having higher rates compared to females in both years. The Estimated Annual Percentage Change (EAPC) for males was 0.75 (95% CI: 0.82-0.67), while for females, it was 0.37 (95% CI: 0.47-0.27). This indicates a more pronounced upward trend in cancer incidence rates for males over the observed period.

The overall increase in cancer incidence rates suggests a growing burden of cancer among adults over 75 years old worldwide, particularly in high SDI regions and high-income countries. Varied trends across regions highlight the importance of region-specific interventions and healthcare policies tailored to address the unique challenges and risk factors contributing to cancer incidence.

Question C

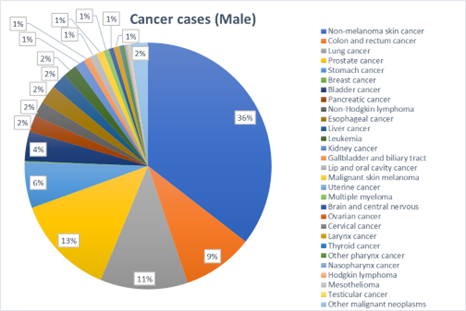
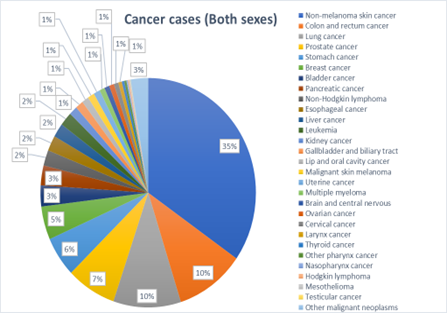


Figure B-3: Pie Chart of Cancer Cases for Figure B-4: Pie Chart of Cancer Both sexes Cases for male

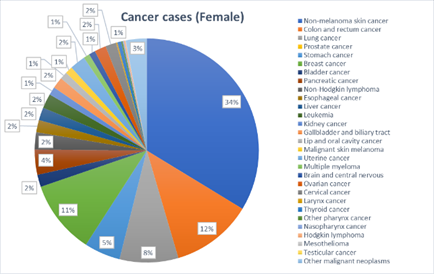


Figure B-5: Pie Chart of Cancer Cases

for female

According to the data provided by the article reviewed, it is known that there are three sets of data that is important to interpret from, which is both sexes, male and female cancer cases. Therefore, three pie charts can be created as a suggestion to show the data. One of the benefits of using pie charts is the data can be shown in percentage form, using pie charts can visualize how much each component of the data contributes to the overall data. Other than that, each section of the pie chart can also be compared with each other or across other pie charts for comparison, which the other charts such as histograms will be less effective compared to pie charts to do so.

The data from the article also consists of many different types of cancer which can be listed on the sides of the pie chart for quick reference, although some of the components are too less to be seen easily, it is still relatively easier to navigate the data from the pie chart than other charts. The percentage labels included in each section also help in providing a direct value to the data it represents.

Individual

Question D

Student A: RICHARD TING LI ZENG

New Paragraph:

The sophisticated interactions between comorbidities and cancer outcomes in older adults aged 75 and above present a nuanced challenge for the healthcare community. It's not just about tackling the cancer itself, but also about addressing the health conditions in different aspects that can impact treatment effectiveness and overall survival rates. Much like navigating the delicate balance between managing cardiac issues and diabetes simultaneously, a holistic approach that takes into consideration the patient's entire health profile is crucial for providing optimal care. Healthcare providers must change their focus beyond solely especially on managing cancer and prioritize the individual's overall well-being. By recognizing and understanding the relationship between cancer and comorbidities in older adults, especially those who are older than 75 years old, planned and effective treatment strategies can be developed. Medical professionals have to be encouraged to deliver personalised care that is related to individual needs and this not only improves the quality of life but also the patient is able to bring out a positive attitude and mindful thinking toward cancer treatment. Ultimately, embracing a comprehensive and individualised manner can lead to more personalized and successful outcomes in cancer management for our older adult population.

Reasons:

As for me, this additional paragraph may come out with helpful viewpoints on the opportunities and disadvantages of managing cancer in older adults who have various chronic medical conditions, ultimately leading to improvements in effectiveness and elaborate cancer care strategies.

Student B: MING, SHENGKAI

New Paragraph:

Research looking at the incidence of cancer worldwide among adults 75 years of age and older shows that they are more susceptible to non-communicable illnesses, including cancer. Since cancer is the primary cause of mortality for this group, it is essential to comprehend its epidemiology. The study employed the 2019 Global Burden of Disease database to examine the incidence and death rates of cancer in various geographies and socio-demographic categories. The study intends to give policymakers useful information to direct focused initiatives and budget allocation plans to enhance cancer-related outcomes worldwide. It highlights how crucial it is to address the particular difficulties that older people with cancer present, as their physiological, emotional, and financial vulnerabilities need for specialized treatment methods. The incidence of cancer in older persons is predicted to rise sharply as the world's population ages. It is crucial to comprehend the complex dynamics of cancer growth, treatment results, and risk factors unique to older age groups. The goal of the project is to provide evidence-based insights to healthcare stakeholders so they may optimize the delivery of cancer care and enhance health outcomes for this susceptible population.

Reasons:

I think that this paragraph can be added to the article to better explain the content of the article and make it easier for people to understand the knowledge related to cancer. At the same time, a brief summary of the previous paragraph is made for the reader's convenience.

Student C: LIM QI XUN

New Paragraph:

A few types of factors can cause more likelihood of cancer to happen, these factors include physical carcinogens (UV rays from sunlight, radiation), chemical carcinogens (tobacco smoking, alcohol consumption), biological carcinogens (HPV, hepatitis B and C), and genetics. [2] For example, common cancer causes for lip, tongue, and oral cavity cancer is caused by tobacco smoking and alcohol consumption. [3] Take tobacco smoking for reference, the population of smokers is increasing as the years progress as well as the age of individuals who started smoking has become more and more younger. [4] Another factor of location which can impact the incidence rates of certain cancers in the populations.

Reasons:

A graph with red and blue lines

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Figure B-6: Comparison between China and Australia for lip and mouth cancers

For my suggestion, the article can include the causes of some common cancers which are caused by certain activities or behaviors in the population’s lifestyle and habits. For example, in Figure B-6, we can observe that the cancer cases for lip cancer (red) in China (left) is lower when compared to Australia (right), while the cancer cases for mouth cancer is similar for both countries.[3] This phenomenon can also be affected by weather, lifestyle, average population age, and so on. The reasoning of this suggestion is because it is important to highlight the causes of these cancer cases to aid researchers in looking for the root of the issue that causes cancer cases to happen in a specific area, it can also help create awareness among the public regarding the importance of maintaining a healthy lifestyle will contribute to less in risk of having cancer, especially at an early age.

Student D: LOH BOON TEIK

New Paragraph:

The data presented in the article demonstrates the considerable changes in the projected annual percentage change (EAPC) for several cancer types from 1990 to 2019. Notably, nonmelanoma skin cancer, colon and rectal cancer, lung cancer, prostate cancer, and stomach cancer displayed the highest incidence rates in 2019. However, to observe the EAPC trends over the two decades, revealing that brain and central nervous system cancer, malignant melanoma, other pharynx cancer, nonmelanoma skin cancer, and kidney cancer exhibited the most significant increases during this period. On the other hand, lung cancer, colon and rectal cancer, stomach cancer, prostate cancer, and pancreatic cancer demonstrated higher mortality rates in 2019. The EAPC trends for kidney cancer, brain and central nervous system cancer, and other pharynx cancer indicated the steepest upward trajectory, while a slight decrease in overall cancer mortality was attributed to reductions in mortality from stomach cancer, cervical cancer, and Hodgkin lymphoma.

Reasons:

This additional information can be included after the paragraph that discusses the trends in cancer incidence and mortality rates between 1990 and 2019. By integrating this paragraph into the article, readers will gain a more comprehensive understanding of the nuances in the data, enabling a more extensive investigation of the factors leading to the observed patterns. Including this information contributes to the overall robustness of the study by providing a deeper analysis of specific cancer types and their changing dynamics over the specified time frame.

**References**

[1] Global Burden of Disease Study. (2019). Retrieved from <https://vizhub.healthdata.org/gbd-results/>

[2] Saini A, Kumar M, Bhatt S, Saini V and Malik A: Cancer causes and treatments. Int J Pharm Sci & Res 2020; 11(7): 3121-34. doi: <http://dx.doi.org/10.13040/IJPSR.0975-8232.11(7).3121-34>

[3] A. Miranda-Filho and F. Bray, “Global patterns and trends in cancers of the lip, tongue and mouth,” *Oral Oncology*, vol. 102, p. 104551, Mar. 2020, doi: <https://doi.org/10.1016/j.oraloncology.2019.104551>.

[4] J. L. Barrington-Trimis *et al.*, “Trends in the Age of Cigarette Smoking Initiation Among Young Adults in the US From 2002 to 2018,” *JAMA Network Open*, vol. 3, no. 10, p. e2019022, Oct. 2020, doi: <https://doi.org/10.1001/jamanetworkopen.2020.19022>.