# CSC 490
# Final Report – Chronic Diseases
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## Introduction

Several nations are not meeting their worldwide obligations to reduce early mortality caused by chronic illnesses such as diabetes, lung cancer and chronic kidney disease. Chronic diseases are estimated, “to kill almost 41 million people a year worldwide” (O'Hare, 2020). This makes up seven out of ten deaths globally. Unlike typically acute ailments, chronic diseases usually are not communicable and infectious, though there are exceptions (Fuller, 2018). Chronic diseases usually have multiple causes. They may worsen or often progress in one way, but always stay static in another sense (Fuller, 2018). For example, chronic diseases tend to stay the same for a long period of time.

Furthermore, unfortunately chronic diseases remain incurable, “despite many curative miracles of modern medical science” (Fuller, 2018). Research shows that death rates from chronic diseases such as, “diabetes, lung canacer, colon cancer and liver cancer are declining too slowly or worsening in many countries” (O'Hare, 2020). This is mainly because many nations are falling behind on global targets to cut premature deaths from chronic diseases (O'Hare, 2020). The internationally agreed target was, “to cut premature deaths from chronic diseases by one third by 2030” (O'Hare, 2020). This target is still achievable but as stated earlier many countries are failing being and this is happening due to the impacts of covid-19 pandemic. The coronavirus pandemic ended up, “severely disrupting services [and the] ability to deliver regular screening and diagnosis, treatment and prevention” (O'Hare, 2020), due to which many nations are behind on their prevention targets with chronic diseases.

In terms of prevention, most strategies aimed at preventing chronic diseases emphasize lifestyle modifications (Hassan et al., 2023). But for many individuals, who lack awareness or are, “unknown of chronic diseases they might be vulnerable depending on their mental, and physical fitness and their health records, it is tough for them to alter their way of living to avoid chronic diseases” (Hassan et al., 2023). Additionally, the World Health Organization (WHO) has stated that chronic diseases are the most serious threat to human life on this planet. Furthermore, WHO has shed light on environmental behavioural patterns that contribute to the growing number of chronic diseases. Some of these environmental variables include, “unhealthy food, laziness, utilization of tobacco and alcohol, air population, age and genetics” (Hassan et al., 2023).

In this literature review, my goal is to examine how unique situations and conditions experienced by individuals can worsen chronic diseases. Additionally, I intend to thoroughly explore research findings to understand how environmental factors and personal behaviors play a role in worsening chronic conditions. Furthermore, I seek to propose strategies and approaches to control these aspects, ultimately aiming to lower the mortality rates associated with chronic diseases.

## Objectives

The overarching objective of this literature review is to meticulously analyze and present extensive data and insights concerning chronic diseases, with a keen emphasis on three primary conditions: Diabetes, Chronic Kidney Disease, and Lung Cancer. Specifically, the aim is to investigate and elucidate the unique circumstances experienced by individual patients that contribute to the chronic nature of these diseases.

Moreover, this review seeks to establish a robust foundation for the development of informative dashboards utilizing PowerBI. These dashboards will visually represent data related to the

aforementioned chronic diseases, providing a deep dive into patient-specific details such as age, contributing variables, and other pertinent factors. The comprehensive exploration and discussion of these aspects within this paper will guide the design and content of the envisioned dashboards, ultimately enhancing our understanding of chronic diseases and enabling effective data visualization for informed decision-making.

## Methodologies and Materials

In this section, I would like to highlight some of the most crucial definitions in this area of the literature review and share the information I found in books and other publicly accessible sources. Thus, the following are the key definitions:

- Chronic Diseases: Chronic diseases, also referred to as chronic conditions, are medical conditions persisting for a duration of 3 months or more. These ailments cannot be prevented through vaccination or completely cured by medication, and they do not typically resolve on their own. Broadly defined, chronic diseases encompass conditions lasting for a year or more, necessitating ongoing medical care, impacting daily activities, or both. These conditions often require continuous management and may have a lasting impact on an individual's overall health and well-being (Center for Disease Control and Prevention, 2022).
- Diabetes: Diabetes is a persistent metabolic disorder characterized by elevated levels of blood glucose (or blood sugar), resulting in gradual and significant harm to critical organs such as the heart, blood vessels, eyes, kidneys, and nerves. The prevalent form is type 2 diabetes, typically diagnosed in adults, wherein the body develops resistance to insulin or fails to produce sufficient insulin. On the other hand, type 1 diabetes, previously referred to as juvenile diabetes or insulin-dependent diabetes, is a chronic ailment marked by inadequate or complete absence of insulin production in the pancreas (World Health Organization, n.d.).
- Lung Cancer: Is categorized as a chronic disease in clinical practice when it exhibits slow progression for several months or more. This chronicity label is attributed under specific circumstances. Chronic lung cancer encompasses a persistent, malignant condition marked by uncontrolled growth of abnormal cells within the lung tissues, forming tumors and disrupting normal function. Identification is based on the prolonged presence and progression of cancerous cells within the lungs, often requiring continual medical care and management for disease control and symptom alleviation (World Health Organization, n.d.).
- Chronic Kidney Disease: Chronic Kidney Disease (CKD) refers to a condition where the kidneys are impaired, leading to an inadequate filtration of blood. This condition is primarily linked to risk factors such as diabetes, high blood pressure, heart disease, and a family history of kidney failure, making individuals more susceptible to its development. The impairment of kidney function in CKD significantly affects the blood filtration process, disrupting normal physiological balance and necessitating ongoing medical management (National Kidney Foundation).
- World Health Organization (WHO): The World Health Organization (WHO) is a specialized agency of the United Nations that plays a vital role in advancing global health initiatives. At its core, WHO leads the international endeavor to broaden access to universal health coverage. This encompasses a comprehensive approach, addressing health needs throughout the lifespan, from antenatal care to elder care. WHO takes on the responsibility of directing and coordinating the global response to health emergencies, ensuring a harmonized and effective reaction to crises (World Health Organization, n.d.).

Additionally, I aim to provide insight into the datasets essential for the completion of this research project. These datasets will be instrumental in creating informative data visuals through PowerBI, shedding light on crucial aspects regarding chronic illnesses. This includes understanding the factors that classify an illness as chronic based on patient attributes and identifying elements contributing to the onset of the disease. Furthermore, we will explore variables that exacerbate the condition in various cases, encompassing age, gender, genetics, lifestyle, and more. Please refer to the following Figure 1, that represents the datasets used for the chronic diseases.

*Figure 1: Datasets Used from Kaggle*

| Dataset Number | Title | Platform | Keywords | Number of Rows |
|---|---|---|---|---|
| 1 | Diabetes Healthcare: Comprehensive Dataset-AI | Kaggle | Pregnancies, Glucose plasma, Glucose concentration, Oral glucose tolerance test, Blood pressure diastolic, Skin thickness triceps skinfold thickness, Insulin, (BMI) body mass index, Diabetes pedigree function | 768 |
| 2 | Lung Cancer | Kaggle | Smoking, Yellow fingers, Anxiety, Peer pressure, Chronic disease, Fatigue, Allergy, Wheezing, Alcohol, Coughing, Shortness of Breath, Swallowing Difficulty, Chest pain, | 309 |
| 3 | Chronic Kidney Disease dataset | Kaggle | Blood pressure, Specific gravity, Albumin, Sugar Red blood cells, Pus cell, Puss cell clumps, Bacteria, Blood sugar, Bu, Sc, Sodium, Pot, Hemoglobin, Packed cell volume, White blood cells, Hypertension, Diabetes mellitus, Coronary artery disease, Appetite, Pedal edema, Anemia, CKD Diagnosis | 400 |

Moreover, I intend to provide an overview of the diverse resources gathered from various platforms. Refer to Figure 2 and Figure 3 for University Library resources used in this paper. And Figure 4 for external platform used. These figures provide a comprehensive breakdown, showcasing the total count of resources utilized, the respective platform sources, keywords extracted from each resource, and their corresponding reference details.

*Figure 2: Resources used from UVIC Library*

| Article Number | Title | Platform | Keywords | Reference |
|---|---|---|---|---|
| 6 | Preventing Cancer by Ending Tobacco Use | University of Victoria Library | Tobacco Control, Tobacco Industry, Tobacco Company, Public Health Goal, Tobacco Advertising | Miller, A. B. (Ed.). (2013). Epidemiologic Studies in Cancer Prevention and Screening (1st ed. 2013.). Springer New York. https://doi.org/10.1007/978-1-4614-5586-8 |
| 7 | Non-small Cell Lung Cancer as a Chronic Disease - A Prospective Study from the Czech TULUNG Registry | University of Victoria Library | 2-year survival, Non-small cell lung cancer; chronic disease, modern-era treatment, personalized treatment | Bratova, M., Karlinova, B., Skrickova, J., Pesek, M., Kolek, V., Koubkova, L., Hrnciarik, M., Krejci, J., Barinova, M., Havel, L., Grygarkova, I., & Brat, K. (2020). Non-small Cell Lung Cancer as a Chronic Disease - A Prospective Study from the Czech TULUNG Registry. In Vivo (Athens), 34(1), 369–379. https://doi.org/10.21873/invivo.11783 |
| 8 | The Healthy Living Partnerships to Prevent Diabetes Study 2-Year Outcomes of a Randomized Controlled Trial | University of Victoria Library | ScienceDirect, Article, Research, Scholarly publication, Health informatics, User interfaces, Electronic health records, Usability, Healthcare technology, Health information systems | Katula, J. A., Vitolins, M. Z., Morgan, T. M., Lawlor, M. S., Blackwell, C. S., Isom, S. P., Pedley, C. F., & Goff, D. C. (2013). The Healthy Living Partnerships to Prevent Diabetes Study 2-Year Outcomes of a Randomized Controlled Trial. American Journal of Preventive Medicine, 44(4), S324–S332. https://doi.org/10.1016/j.amepre.2012.12.015 |
| 9 | Global health governance and the challenge of chronic, non-communicable disease | University of Victoria Library | Gale, PowerSearch, Academic, databases, Research resources<br>Digital library, Scholarly content, Information retrieval, Online platform<br>Academic journals, Educational resources | Magnusson, R. S. (2010). Global Health Governance and the Challenge of Chronic, Non-Communicable Disease. The Journal of Law, Medicine & Ethics, 38(3), 490–507. https://doi.org/10.1111/j.1748-720X.2010.00508.x |
| 10 | Population Causes and Consequences of Leading Chronic Diseases: A Comparative Analysis of Prevailing Explanations | University of Victoria Library | Health disparities<br>Healthcare access<br>Social determinants of health<br>Health equity, Public health<br>Health policy, Health services<br>Socioeconomic factors, Health outcomes, Health disparities research | STUCKLER, D. (2008). Population Causes and Consequences of Leading Chronic Diseases: A Comparative Analysis of Prevailing Explanations. The Milbank Quarterly, 86(2), 273–326. https://doi.org/10.1111/j.1468-0009.2008.00522.x |
| 11 | Use Your Words Carefully: What Is a Chronic Disease? | University of Victoria Library | Chronic disease, Definition, Terminology, Public health, Disease classification, Health terminology, Disease characterization, Chronic illness, Disease understanding, Health awareness | Bernell, S., & Howard, S. W. (2016). Use Your Words Carefully: What Is a Chronic Disease?. Frontiers in public health, 4, 159. https://doi.org/10.3389/fpubh.2016.00159 |

*Figure 3: Resources used from IEEE*

| Article Number | Title | Platform | Keywords | Reference |
|---|---|---|---|---|
| 1 | What are chronic diseases | IEEE | Chronic disease, Metaphysics, Ontology, Dispositions, Concept analysis, Experimental philosophy, Philosophy of medicine | Fuller, J. (2018). What are chronic diseases? Synthese (Dordrecht), 195(7), 3197–3220. https://doi.org/10.1007/s11229-017-1368-1 |
| 2 | Prediction of Chronic Diseases using Machine Learning Classifiers | IEEE | Chronic diseases, Machine learning, Prediction, Classifiers, R. Hassan, B. Sharan, N. Kumari, T. Rafiq, G. Thakur, R. Bhargav, International Conference on Computing for Sustainable Global Development, Data analysis, Health prediction, Sustainable global development | R. Hassan, B. Sharan, N. Kumari, T. Rafiq, G. Thakur and R. Bhargav, "Prediction of Chronic Diseases using Machine Learning Classifiers," 2023 10th International Conference on Computing for Sustainable Global Development (INDIACom), New Delhi, India, 2023, pp. 885-889. |

*Figure 4: Resources used from External Sources*

| Article Number | Title | Platform | Keywords | Reference |
|---|---|---|---|---|
| 3 | **Many nations falling behind on global efforts to cut chronic disease deaths** | **Imperial College London** | **Chronic diseases, Global efforts, Nations, Health, Disease burden, Global health, Imperial College London** | **O'Hare, R. (2020, September 3). Many nations falling behind on global efforts to cut chronic disease deaths: Imperial News: Imperial College London. Imperial College London. https://www.imperial.ac.uk/news/203373/many-nations-falling-behind-global-efforts/#:~:text=Chronic%20diseases%20are%20estimated%20to,younger%20than%20expected%20on%20average.** |
| 4 | **Effects of chronic kidney disease on patients & families** | **Ontario Renal Network** | **Chronic kidney disease, Patients, Families, Health effects, Ontario Renal Network, Kidney care resources, Living with chronic kidney disease, Health impact, Lifestyle adjustments, Restricting activities, Kidney health, Ontario, Canada, Health information** | **Ontario Renal Network. (2019, October 16). Effects of chronic kidney disease on patients & families. ORN. https://www.ontariorenalnetwork.ca/en/kidney-care-resources/living-with-chronic-kidney-disease/effects-chronic-kidney-disease#:~:text=If%20you%20are%20living%20with,eat%20or%20restricting%20certain%20activities.)** |
| 5 | **Kidney disease statistics for the United States - NIDDK** | **National Institute of Diabetes and Digestive and Kidney Diseases** | **Disease), Health statistics, United States, National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), Health information, Prevalence, Demographics, Health disparities, Chronic kidney, disease statistics, Racial disparities** | **Human Services, U. S. D. of H. (2023, May). Kidney disease statistics for the United States - NIDDK. National Institute of Diabetes and Digestive and Kidney Diseases. https://www.niddk.nih.gov/health-information/health-statistics/kidney-disease#:~:text=CKD%20is%20slightly%20more%20common,Hispanic%20Asian%20adults%20have%20CKD.** |
| 12 | **About Chronic Diseases** | **Center for Disease Control and Prevention** | **CDC (Centers for Disease Control and Prevention), Chronic disease, Health, Disease prevention, Public, health, Chronic illness, Health promotion, Disease control, Health awareness, Disease management** | **Centers for Disease Control and Prevention. (2022, July 21). About chronic diseases. Centers for Disease Control and Prevention. https://www.cdc.gov/chronicdisease/about/index.htm** |
| 13 | **Chronic kidney disease (CKD)** | **National Kidney Foundation** | **Chronic kidney disease, Kidney health, National Kidney Foundation Facts, Disease information, Kidney function, Health awareness, Disease prevention, Medical conditions, Renal health, Kidney disease facts, Kidney disease awareness, Chronic, kidney disease overview, Kidney disease risks, Kidney disease symptoms** | **Facts about chronic kidney disease. National Kidney Foundation. (2023, July 23). https://www.kidney.org/atoz/content/about-chronic-kidney-disease#what-chronic-kidney-disease** |

# Background and Related Work

## Diabetes

Now, let's delve into a more detailed discussion of each chronic illness, beginning with Diabetes. Research shows that, "With over 1.1 billion adults [are] overweight (312 million of whom are obese (9)), the incidence of diabetes is expected to double from 171 million to 366 million cases over the period 2000-2030" (Magnusson, 2010). Furthermore, through the statistics we can understand that, "70% of the diabetes burden is borne by developing countries" (Magnusson, 2010). This statistic is understandable because the World Health Organization has stated that, "80% of … diabetes could be prevented through smoking cessation, a healthy diet, and adequate physical activity (Magnusson, 2010). However, based on our understanding of public health, we know that, altering behaviors on a global scale to improve lifestyles is an immense challenge, raising questions about the starting point and methodology for achieving such widespread change (Magnusson, 2010). So, the main question is how can we make this widespread change possible globally? The first step is to realize that a, "collective

response at the global level is required" (Magnusson, 2010). Additionally, the stats point to another realization that, this trend, "towards non-communicable diseases [like diabetes] in developed countries is now occurring rapidly in developing countries" (Magnusson, 2010), which means that this illness is expanding rapidly and globally. There are numerous factors linked to urbanization and economic growth that contribute to the escalation of chronic diseases like diabetes (Magnusson, 2010). These factors encompass changes in daily diet, lifestyle, and the widespread marketing of tobacco, alcohol, and processed foods with excessive levels of salt, sugar, and fat, deviating from traditional diets (Magnusson, 2010). There are Diabetes Prevention Project (DPP) that have build methods through the support of public health which have shown positive short-term impacts in raising awareness regarding such lifestyle changes in a community-based setting (Katula et al., 2013). This study was conducted to, "examine the impact of a 24-month, community-based diabetes prevention program on fasting blood glucose, insulin, insulin resistance as well as body weight, waist circumference, and BMI" (Katula et al., 2013). Overall, the Diabetes Prevention Project (DPP) method to administer such a program in a community-based system, "delivered by community health workers is effective at inducing significant long-term reductions in metabolic indicators and adiposity" (Katula et al., 2013). Even though, such a widespread change in lifestyle cannot happen instantly, such community-based programs to raise awareness can be very helpful in this global fight again decreasing mortality caused by diabetes.

## Lung Cancer

Moving on to discuss the next chronic illness, let's focus on lung cancer. Lung cancer holds the unfortunate distinction of being the most prevalent cancer globally, marked by alarming rates of both incidence and mortality. In the year 2018 alone, 2,093,876 new cases of lung cancer were reported worldwide, while the disease claimed the lives of 1,761,007 individuals (Bratova et al., 2020). Lung cancer has the highest mortality rate for both men and women compared to all other cancer types. The World Health Organization has stated that, "[s]moking is the leading cause of lung cancer, responsible for approximately 85% of all cases" (World Health Organization, n.d.). It is extremely unfortunate that, "[l]ung cancer is often diagnosed at advanced stages when treatment options are limited (World Health Organization, n.d.), but on the other hand, "[s]creening high risk individuals has the potential to allow early detection and to dramatically improve survival rates" (World Health Organization, n.d.). Similar case as diabetes, with lung cancer has primary prevention such as," tobacco control measures and reducing exposure to environmental risk factors" (World Health Organization, n.d.), may help reduce the incidence of lung cancer and decrease mortality rates as a result. Lung cancer primarily manifests in two main forms, non-small cell carcinoma (NSCLC) and small cell carcinoma (SCLC) (World Health Organization, n.d.). NSCLC, being the more prevalent type, tends to progress at a slower pace, whereas SCLC, although less common, is characterized by a faster rate of growth (World Health Organization, n.d.). Even though, smoking is the primary risk factor for lung cancer, non-smokers can also get effected by this illness. According to the World Health Organization, some other risk factors include, "exposure to secondhand smoke, occupational hazards (such as asbestos, radon and certain chemicals), air pollution, hereditary cancer syndromes, and previous chronic lung diseases" (World Health Organization, n.d.). The World Health Organization states that, "not smoking tobacco is the best way to prevent lung cancer" (World Health Organization, n.d.), but how is this change possible when the, "[t]obacco companies have become expert in adapting to tobacco control measures and neutralizing or mitigating their effect" (Miller, 2013)?

Public health has a goal to decrease the usage of tobacco and "[m]ost of the tobacco control measures implemented to date seek to discourage tobacco use by smokers and potential smokers" (Miller, 2013). There exists a global tobacco control treaty, which came into effect in 2005. And some of the tobacco control measures set by this treaty include the following:

- Higher tobacco taxes to discourage consumption
- Bans on smoking in public places and workplaces
- Reporting of toxic substances in tobacco
- Large health warnings on packages (preferably with pictures)
- Extensive restrictions or bans on tobacco advertising
- Health education, health promotion
- Smoking cessation services
- Controls on smuggling
- Bans on sales to minors
- Promotion of alternative livelihoods for displaced tobacco workers
- Facilitation of legal liability action against tobacco companies (Miller, 2013)

Even through so many restrictions exist and many more were added throughout the years, tobacco companies always find a way to work around such restrictions and sell their products (Miller, 2013). There have been many discussions with public health that propose the best outcome in this case to be transferring the tobacco supply to a, "non-profit agency with a public health purpose to phase out tobacco" (Miller, 2013), but the tobacco suppliers do not wish to accept this request. Therefore, the only solution the government has for this problem is raising, "[g]reater awareness of the role of the tobacco industry in sustaining the tobacco epidemic" (Miller, 2013). The government believes that this could serve as an effective starting point in promoting broader public awareness regarding the imperative for a robust public health strategy in regulating tobacco and other mind-altering substances (Miller, 2013).

## Chronic Kidney Disease

Transitioning to our discussion on the next chronic illness, let's delve into chronic kidney disease (CKD). Chronic kidney disease is a progressive condition that affects 10% of the general population worldwide, amounting to around 800 million individuals (Kovesdy, 2022). Research and statistics show that, "chronic kidney disease is more prevalent in older individuals, women, racial minorities, and in people experiencing diabetes mellitus and hypertension" (Kovesdy, 2022). Unfortunately, chronic kidney disease creates a significant impact on low- and middle-income nations for various key reasons. Some of these factors include a lack of public awareness and education regarding kidney health as well as low access to treatment options.

The National Institute of Diabetes and Digestive and Kidney Diseases states that the main causes of CKD include diabetes and high blood pressure. Further, research states that, "[t]esting may be the only way to know if you have kidney disease"( U.S. Department of Health and Human Services, 2023), especially if you have diabetes, high blood pressure, heart disease, or a family history of kidney failure. The sooner this illness is diagnosed the easier and more efficient it is to get treated. There a number of steps that a patient may take to better manage this illness, including: managing their diet, preventing this disease if you have related family history, controlling blood pressure, taking proper medications, aiming for healthy

weight, no smoking, cope with mental health illnesses, getting enough sleep, etc. ( U.S. Department of Health and Human Services, 2023). There are many ongoing clinical trials that are run by The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) and other components of the National Institutes of Health (NIH). There clinical trials are currently open and recruiting patients.

Overall, preventing the chronic kidney disease is much easier than preventing diabetes or lung cancer. At the same time, it is important to consider the physical and mental discomfort the patient has to endure upon being diagnosed by CKD. Additionally, it could have a major effect on your family, such as experiencing stress and financial difficulties. Research shows that, "[t]he treatment for chronic kidney disease is lifelong and intensive" (Ontario Renal Network, 2019), moreover, "[o]nce a person's kidneys fail, the treatment options include dialysis, kidney transplant and comprehensive conservative renal care"(Ontario Renal Network, 2019).

# Results

The facts discussed earlier highlight a big problem: many people worldwide are dying from chronic diseases. Chronic diseases pose a severe threat to human life for several reasons. I would like to take this moment to discuss some of the main reasons. Firstly, one of the main reasons why chronic diseases are so threatening to human life is due to the fact that they remain for long term. This means that the illness is long-lasting and persistent, which requires the patient to manage the illness and ensure ongoing treatment. This constant management of the treatment for an extended period of time increases the likelihood of complications (Stuckler, 2008). Moreover, Chronic diseases are of progressive nature. This implies that without efforts to manage chronic diseases, they continue to worsen, affecting other organs negatively. Research shows that, "health systems in resource-poor settings are less effective at stopping chronic disease progression" (Stuckler, 2008). Due to less resources and education, resources-poor health care settings deal with a high level of progressive chronic illnesses, leading to higher number of deaths. Furthermore, chronic diseases can give rise to other health problems and additional complications that can potentially strain the body and intensify the overall health impact. For example, the chronic illness diabetes can potentially cause, "long-term complications, such as skin ulcers, [which] are clearly infectious" (Stuckler, 2008). Additionally, many chronic diseases go undiagnosed or are diagnosed late. The main reason for this is because of lack of knowledge and information. Lastly, one of the main reasons that chronic diseases have such high mortality rates is due to the individual's lifestyle. As stated already in this paper, WHO has announced that, unhealthy lifestyle choices, such as poor diet, lack of physical activity, smoking, excessive alcohol consumption, etc., are choices that can lead to increased risk of chronic illnesses.

## Results From Power BI Dashboards

In this section, I aim to provide a detailed overview of the insights derived from the PowerBI dashboards focusing on Diabetes, Chronic Kidney Disease, and Lung Cancer.

Examining the Diabetes dashboard unveils pivotal determinants that significantly impact the probability of diabetes onset, encompassing crucial factors such as Body Mass Index (BMI), Glucose Levels, Blood

Pressure, Skin Thickness, Pregnancies, and Age. Please refer to the visually informative Figure 5 for a comprehensive overview.

Graph A conspicuously illustrates a compelling correlation between higher BMI and a positive diabetes outcome, derived from a thorough analysis of available patient data. Specifically, individuals with a BMI exceeding 50kg exhibit a heightened propensity for a positive diabetes outcome, while the average BMI for a healthy individual falls within the range of 18.5 Kg to 25 Kg.

Similar noteworthy patterns emerge in the case of Glucose Levels, Skin Thickness, and Blood Pressure, as eloquently depicted in graphs C, D, and E, respectively. Elevated glucose levels surpassing 150 mmol/L, skin thickness registering at 50 and above, and blood pressure below 40 mm Hg or surpassing 100 mm Hg signal an increased likelihood of diabetes. For reference, optimal glucose levels for a healthy individual range between 70 mg/dL and 100 mg/dL, while healthy skin thickness hovers between 1.9-2.4 mm, and ideal blood pressure is less than 120/80 mmHg.

Furthermore, a discernible trend materializes in graph F, indicating that an upsurge in the number of pregnancies in women is intricately linked to an augmented likelihood of diabetes development.

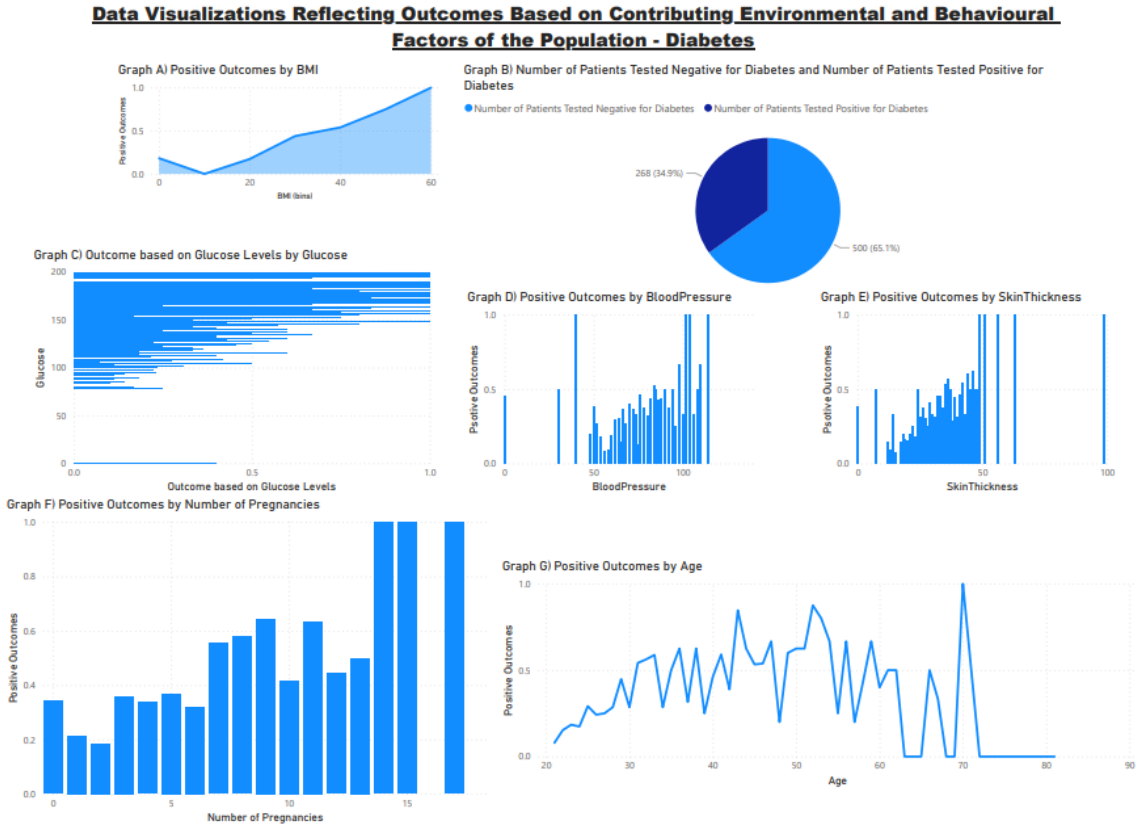


*Figure 5: Diabetes Visualization*

Navigating to the Lung Cancer dashboard, our in-depth analysis unveils a spectrum of influential factors in the genesis of lung cancer. These factors, ranging from age and gender to chest pain, smoking, and alcohol consumption, intricately interplay in shaping the onset of this condition. Notably, a discernible correlation emerges between advancing age and an escalated susceptibility to lung cancer, particularly when juxtaposed with gender dynamics.

Upon delving into the patient demographics within our case study, a distinct trend surfaces, indicating a heightened vulnerability among men as opposed to women, as vividly depicted in Graph B. Moreover, the nexus between alcohol consumption and smoking emerges as a significant contributor to an elevated risk of contracting this debilitating illness, elucidated through the compelling data presented in Graphs D and F.

For a comprehensive and visually insightful exploration of the Lung Cancer dashboard, we invite you to refer to the detailed depiction in Figure 6.

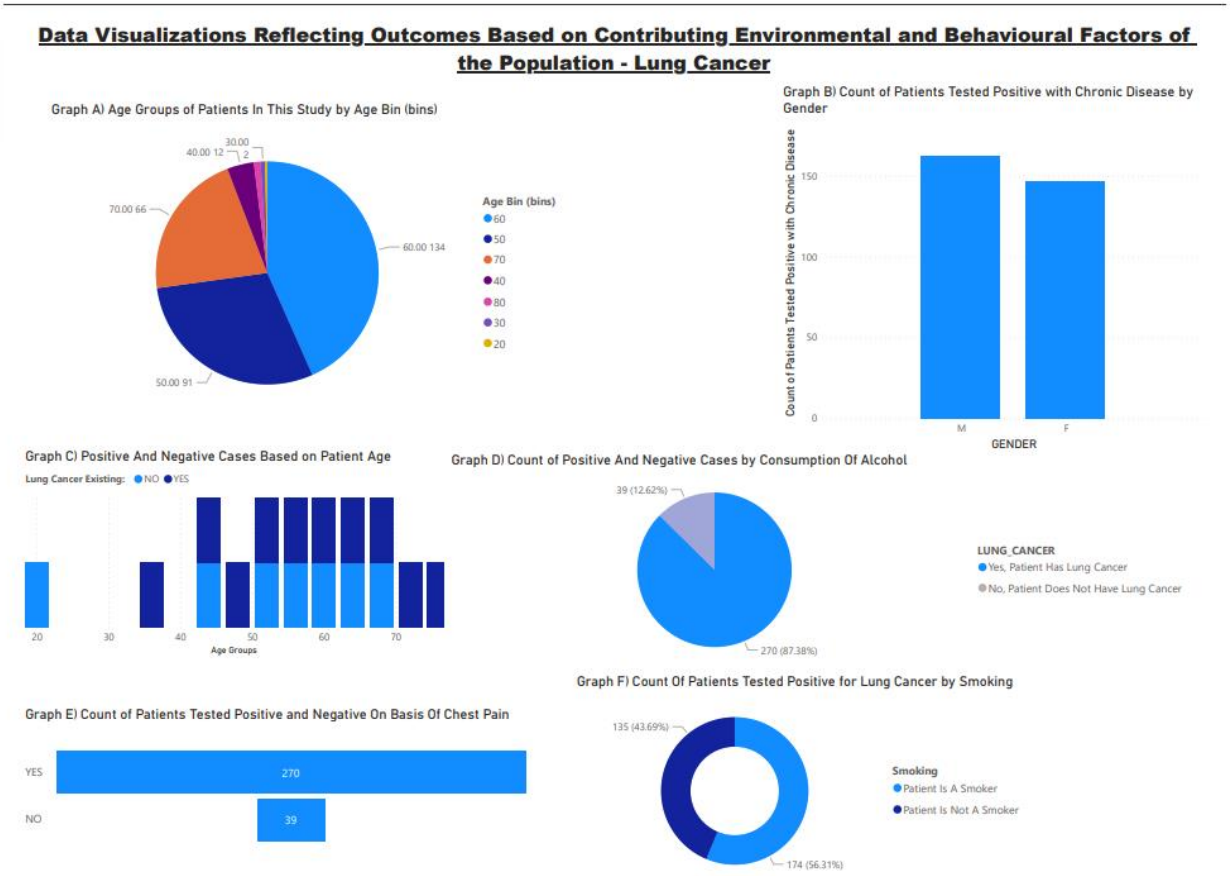


*Figure 6: Lung Cancer Visualization*

A dedicated Chronic Kidney Disease (CKD) dashboard offers valuable insights, highlighting key contributors to CKD development such as blood sugar levels, blood pressure, age, blood urea, hemoglobin, and anemia. Elevated levels of blood sugar, blood urea, blood pressure, and hemoglobin accelerate CKD progression as shown by graphs F, G and D. Patients with blood sugar levels between 70

mmol/L to 140 mmol/L are less likely to have CKD, and those with blood urea and hemoglobin levels above 13 mg/dL are also less prone to CKD. The blood sugar levels for a healthy individual is less than 100 mg/dL. Additionally,  blood urea of a normal person is 5 to 20 mg/dl and the normal Hb level for males is 14 to 18 g/dl and for females is 12 to 16 g/dl. Caution is advised for individuals with anemia, as its presence could heighten the risk of CKD as shown in graph C. Refer to Figure 7 for a more detailed visual representation.

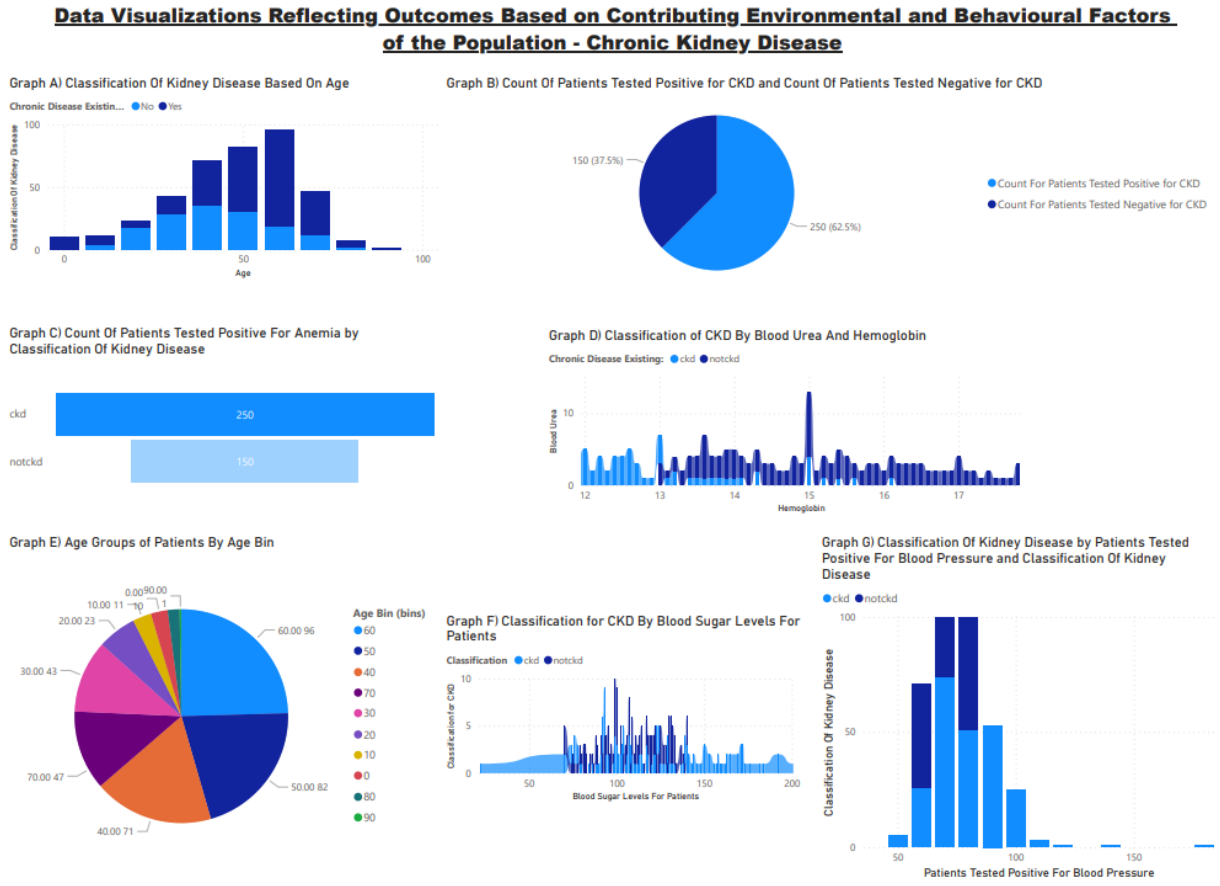


*Figure 7: Chronic Kidney Disease Visualization*

## Discussion

The Power BI data visualizations offer insights into the three illnesses: Diabetes, Chronic Kidney Disease (CKD), and Lung Cancer. In Diabetes, key influencers include Body Mass Index (BMI), Glucose Levels, Blood Pressure, Skin Thickness, Pregnancies, and Age. Higher BMI, elevated glucose levels, increased skin thickness, and abnormal blood pressure indicate a greater likelihood of diabetes. For Lung Cancer, factors such as age, gender, chest pain, smoking, and alcohol consumption contribute to its onset, with advancing age and male gender correlating to a higher susceptibility. Alcohol consumption and smoking are associated with an elevated risk. In CKD, the dashboard highlights contributors like blood sugar levels, blood pressure, age, blood urea, hemoglobin, and anemia. Elevated levels of these factors accelerate CKD progression.

Recognizing that these factors influence the likelihood of positive outcomes for chronic illnesses, a common thread emerges—the patient often possesses the ability to proactively modify aspects of their lifestyle. This proactive adjustment can lead to improved health outcomes and a reduced likelihood of testing positive for these illnesses. This observation aligns with the earlier sections of the paper, reinforcing the idea that lifestyle choices significantly impact health. Consequently, it can be inferred that in many instances, individuals have substantial control over their lifestyle decisions, enabling them to mitigate the risk of developing chronic diseases.

The dataset utilized for generating these data visualizations provided valuable insights into various factors influencing chronic illnesses. However, one notable limitation was the absence of genetic information for the patients. Research indicates that a patient's genetic history plays a significant role in the likelihood of developing chronic diseases (Centers for Disease Control and Prevention, 2022). Unfortunately, this crucial genetic data was not available in the dataset, preventing the exploration of how genetic factors might contribute to these health outcomes. Addressing this limitation in future work with a dataset that includes genetic information could enhance the comprehensiveness of the analysis and contribute to a more holistic understanding of the factors influencing chronic illnesses.

As previously highlighted in this paper, numerous nations are lagging behind in achieving global targets for reducing premature deaths attributed to chronic diseases. This discrepancy primarily stems from inadequate governmental emphasis on the development of robust community outreach programs. Furthermore, the lack of individual commitment to lifestyle changes exacerbates this challenge. A transformative approach involves constructing comprehensive dashboards featuring expansive population datasets and compelling data representations. Presenting these dashboards to a broad audience, including patients and the World Health Organization, has the potential to instill motivation and catalyze a more substantial collective effort. This, in turn, could exert significant pressure on governments to prioritize and address this critical issue, ultimately leading to the fulfillment of their predetermined targets

## Conclusion

In conclusion, chronic diseases pose a significant worldwide health challenge, contributing to large numbers of annual deaths. The prevalence of chronic diseases, including diabetes, lung cancer, and chronic kidney disease, highlights the urgent need for effective strategies to decrease their impact on public health. Chronic diseases are persistent and often progressive, presenting a prolonged burden that necessitates ongoing medical care and lifestyle management. Despite the advancements in medical science, chronic diseases remain incurable. This places a heavy burden on the healthcare system, patients and families. Prevention strategies predominantly focus on lifestyle modifications, emphasizing the importance of healthy behaviors to decrease the risk of being diagnosed with chronic diseases. However, achieving widespread behavior change at a global scale is a complex task that demands collective efforts and a multifaceted approach involving public health initiatives, education, policy interventions, and community-based programs.

In the case of Diabetes, lifestyle choices, socioeconomic factors, genetics, and environmental variables all play crucial roles in controlling its mortality rate. With lung cancer, tobacco control measures, reducing

exposure to secondhand smoke, occupational pollution and air pollution can support with reduction of mortality rates. Chronic kidney disease is an illness that is often linked to risk factors like diabetes and high blood pressure. And the best prevention strategy for this illness is early detection through testing and proactive management to prevent its progression.

A consistent theme emerges across these chronic illnesses—the proactive modification of lifestyle factors by individuals can lead to improved health outcomes and reduced susceptibility to these conditions. This echoes the overarching narrative in the paper, emphasizing the profound impact of lifestyle choices on health.

In the ongoing battle against chronic diseases, a comprehensive strategy is imperative. This includes prioritizing prevention through education, awareness, and public health campaigns. The integration of business intelligence tools, exemplified by Power BI dashboards, emerges as a game-changer. By enhancing data visualization and supporting informed decision-making, these dashboards empower individuals and policymakers to take proactive measures. This dynamic approach presents a promising avenue for better control and management of chronic diseases on a global scale, offering hope for a healthier future.

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