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HEALTH ISSUES AND UTILIZATION PATTERN OF HEALTHCARE SERVICES AND MANAGEMENT DURING AND POST PANDEMIC 2020-2023 IN SINGAPORE

by

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Dedication

This is dedicated to my mother and to all the women who tirelessly strive to balance their dreams with the responsibilities of family and work. Your resilience and dedication are truly inspiring.

A special tribute to Dr. Minja Bolesnikov, whose unwavering support and mentorship have been a source of strength and guidance.

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ABSTRACT

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2025

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The World Health Organization (WHO) declared the COVID-19 pandemic on March 11, 2020, which triggered a global crisis that profoundly impacted health systems, economies, and social well-being (El Keshky MES et al., 2020; Patel U et al., 2020). Immense strain faced by healthcare systems Worldwide. Singapore emerged as a model for effective pandemic management, resulting in a low case fatality rate, through extensive screening, contact tracing, and quarantine measures (Munblit D et al., 2022; Tan et al., 2020; Wong J et al., 2020). Although research has extensively covered acute COVID-19 symptoms, a significant gap exists in understanding healthcare utilization trends and Post-COVID Conditions (PCC) (Munblit D et al., 2022; Smith P et al., 2022). This study explores the health challenges faced by individuals in Singapore during and after the pandemic, focusing on PCC prevalence, healthcare-seeking behaviors, and key factors influencing healthcare access and utilization.

This study used a mixed-methods approach and collected quantitative and qualitative. Data from individuals who tested positive for COVID-19 between January 2020 and December 2023. Findings reveal that 80.3% of respondents had contracted COVID-19, with 32.9% reporting persistent health issues, including respiratory, cardiovascular, and mental health complications. Despite Singapore's well-regulated healthcare system ensuring accessibility during the pandemic, healthcare utilization remained low,

influenced by financial concerns, fear of infection, and logistical barriers. Public healthcare services were the preferred choice (71.7%), though post-pandemic trends indicate a gradual shift toward private healthcare for specialized services. Telehealth adoption remained limited (28.3%), suggesting barriers such as technology access and user familiarity.

The results underscore the long-term burden of PCC on Singapore's healthcare system and highlight the urgent need for targeted policy interventions. Recommendations include expanding Long-COVID clinics, enhancing mental health support, and strengthening chronic disease management programs. Understanding healthcare utilization patterns during and after the pandemic is essential for improving accessibility, affordability, and efficiency in healthcare delivery. These insights will assist policymakers, healthcare providers, and researchers in strengthening Singapore's healthcare system and improving preparedness for future health crises.

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EXECUTIVE SUMMARY

        The World Health Organization (WHO) declared COVID-19 a global pandemic on March 11, 2020, triggering a global crisis that affected health, well-being, politics, the environment, and economies (El Keshky MES et al., 2020; Patel U et al., 2020). The pandemic placed immense pressure on healthcare systems, necessitating swift responses worldwide, with Singapore standing out for its effective management through extensive screening, contact tracing, and quarantine measures, resulting in a low case fatality ratio (Munblit D et al., 2022; Tan et al., 2020; Wong J et al., 2020). As a multi-ethnic nation with a population of 5.64 million in June 2022, Singapore has a well-regulated healthcare system ensuring affordability and accessibility, contributing to high life expectancy (DSS, 2022; MOH-SG, 2022; Phua KH, 2020). However, while studies have extensively covered acute COVID-19 symptoms, data on Post-COVID Conditions (PCC) and healthcare service utilization remain limited, leaving significant knowledge gaps (Munblit D et al., 2022; Smith P et al., 2022). COVID-19 disproportionately affected individuals with comorbidities, yet research on long-term impacts is scarce, and the prevalence of PCC varies widely (Patel U et al., 2020; Munblit D et al., 2022). Factors such as cultural beliefs, access, cost, and insurance influence healthcare utilization, making it crucial to assess how individuals navigated healthcare services during and after the pandemic (Phua KH, 2020; Ann S et al., 2022). This study, focusing on Singapore, will examine health issues, healthcare utilization patterns, and behavioral factors affecting healthcare-seeking behavior during and post-pandemic. By collecting quantitative and qualitative data from individuals who tested positive for COVID-19 between January 2020 and December 2023, the study will offer insights into healthcare accessibility, policy planning, and preparedness for future health crises (Lum A et al., 2021). Understanding epidemiological trends, post-pandemic health conditions, and healthcare behavior is essential for enhancing healthcare systems and ensuring equitable access to medical services in Singapore and beyond.

METHODOLOGY

This study employed a mixed-methods approach, combining quantitative surveys with qualitative interviews, to investigate health issues and healthcare utilization patterns during and post-COVID-19 in Singapore. Participants, who tested positive for COVID-19 between January 2020 and December 2023, provided data on their experiences and perceptions, enabling a comprehensive analysis of prevalent health conditions and factors influencing healthcare-seeking behaviors.

RESULTS

Demographic Overview

- **Youth Dominance**: The sample is heavily skewed towards younger individuals, with 26.3% aged 18–25, and minimal representation (3.3%) from those aged 70+, signaling potential digital exclusion among older adults.

- **Gender Distribution**: Responses were fairly balanced—males at 54.6%, females at 44.1%, and 1.3% identifying as "Other"—allowing for nuanced gender-based analyses.

- **Employment & Income Patterns**: Nearly half (46.1%) of respondents were students, contributing to the high proportion (68.4%) earning below SGD 2,000. Only 9.2% reported earnings above SGD 8,000.

- **Educational Attainment**: Most held a diploma (32.9%) or bachelor's degree (27%), suggesting a highly educated but early-career demographic. Only 3.3% had primary education.

- **Ethnic and Residency Profiles**: Ethnic composition reflected national trends—Chinese (47.4%), Indian (22.4%), Malay (19.7%). Most participants were Singapore citizens (68.4%), with the rest comprising permanent residents and foreigners.

Health Status Across Pandemic Phases

- **Pre-COVID Health Issues**: Chronic conditions such as asthma, hypertension, diabetes, and arthritis were common. Mental health issues, including depression and (Borderline Personality Disorder) BPD, were also reported.

- **During the Pandemic**: A wide array of health issues emerged—COVID-19 infection (80.3%), joint pain, chest discomfort, depression, and respiratory ailments. Mental health challenges intensified amid isolation.

- **Post-COVID Complications**: 32.9% reported ongoing health concerns—chest pain, persistent cough, shortness of breath, and mental health symptoms were among the most cited. This reflects the need for extended post-pandemic healthcare support.

Healthcare Utilization Patterns

- **Pre-Pandemic Behavior**: Healthcare use was relatively low—59.9% seldom sought care, possibly due to cost, accessibility, or cultural attitudes.

- **Public vs. Private Sector Use**: Public healthcare dominated (71.7%), attributed to affordability and subsidies. Private care (28.3%) was preferred for specialized or trusted services.

- **Key Drivers of Healthcare Choices**: Cost, proximity, insurance coverage, and family influence were central. Many chose public institutions for affordability but opted for private services when specialized or familiar care was needed.

- **Pandemic-Era Shifts**: Healthcare visits increased for 33.6%, reflecting delayed care or heightened concern. Conversely, 9.2% reduced visits, citing infection fears or telehealth reliance.

Accessibility and Efficiency of Care

- **Satisfaction During Pandemic**: 69.7% expressed satisfaction with healthcare access during COVID-19. A minority (3.3%) voiced dissatisfaction, raising concerns about equity.

- **Post-Pandemic Access**: 63.8% remained satisfied post-pandemic, but a notable 16.4% were neutral, indicating room for improvement.

- **System Efficiency**: While 55.3% rated healthcare as efficient during the pandemic, post-pandemic satisfaction rose to 57.9%. However, neutral responses suggest disparities in experiences.
- **Telehealth Adoption**: Only 28.3% used telehealth services, and most (69.7%) were neutral about the experience. Adoption was limited by digital literacy, trust, and patient preferences for in-person care.

The pandemic altered some healthcare behaviors, increasing the demand for care and creating barriers due to fear of infection. Public healthcare remains the primary choice, with an increased role for private services post-pandemic. Future policies should focus on enhancing accessibility, affordability, and preventive care. Most respondents were generally satisfied with healthcare services, but neutrality in responses suggests that access and efficiency varied. The limited uptake of telehealth services points to the need for greater integration and development of telemedicine. While healthcare access and efficiency were largely viewed positively, there remains room for improvement, particularly in telehealth adoption. Targeted interventions are needed to enhance healthcare infrastructure and address gaps in access and satisfaction.

CONCLUSION

The This study highlights the ongoing impact of COVID-19 on both physical and mental health, with many individuals still managing post-infection complications such as respiratory issues, cardiovascular concerns, and emotional strain. These long-term effects point to the need for continued public health planning that extends beyond crisis response, focusing instead on sustainable care models and follow-up support.

The pandemic also changed how people approach healthcare. While many became more attentive to their health, fear of exposure led some to avoid medical settings altogether. Public healthcare remains the main source of treatment for most, but private

healthcare has gained importance, particularly for those seeking faster or more personalized care.

Although most respondents were generally satisfied with the accessibility and efficiency of healthcare services during and after the pandemic, there are still clear areas for improvement. Telehealth, for example, was underutilized, and even among those who used it, satisfaction was mixed. This suggests that simply offering digital services isn't enough—there needs to be better infrastructure, clearer communication, and more support for users to feel confident and comfortable using them.

In the end, while Singapore's healthcare system showed resilience, the experiences shared in this study emphasize the importance of building more inclusive, flexible, and person-centered care—especially as we look toward recovery and future preparedness.

DISCUSSION

The study highlights the significant impact of COVID-19 on healthcare utilization, public health management, and long-term health outcomes. It underscores how the pandemic led to a shift in healthcare delivery, emphasizing resilience, adaptability, and the integration of digital health solutions. Key findings indicate a rise in healthcare use post-pandemic, with fear of infection, healthcare system strain, and government policies shaping healthcare-seeking behaviors (OECD, 2020). However, telehealth adoption remained low (28.3%), suggesting that digital literacy and affordability influenced accessibility (Omboni et al., 2022). The study also reveals disparities in healthcare access, particularly among lower-income groups, aligning with global research on financial barriers in healthcare (Betancourt et al., 2020). Although qualitative data tried to focus on ageing population , notably, the underrepresentation of older adults in the quantitative segment of study limits insights into ageing populations, reinforcing the need for targeted research on elderly healthcare utilization and post-pandemic health conditions (Trabelsi et al., 2021).The findings also highlight the long-term health effects of COVID-19, with 32.9% of respondents reporting post-COVID conditions, consistent with literature on Long-COVID's multi-system impact (Munblit et al., 2022). Chronic conditions such as asthma,

hypertension, and diabetes were prevalent, reinforcing the link between pre-existing health issues and COVID-19 severity. Mental health concerns, though underreported, emerged as a critical issue, necessitating stronger integration of mental health services into primary care (Xiong et al., 2020). Public health recommendations emphasize enhancing research representation of older adults, improving mental health interventions, addressing Long-COVID, strengthening public healthcare infrastructure, and expanding telehealth access (Winkelmann et al., 2022; Patel et al., 2020). Ultimately, the study reinforces the importance of proactive healthcare policies, interdisciplinary collaboration, and investment in healthcare resilience to prepare for future pandemics (Keshky et al., 2020).

RECOMMENDATION

- Expansion of Long-COVID Clinics – Establish dedicated clinics to address ongoing post-COVID symptoms.
- Enhanced Mental Health Support – Provide targeted interventions for individuals experiencing post-pandemic psychological distress.
- Strengthened Public Healthcare Capacity – Increase investment in public healthcare to improve accessibility and service delivery.
- Promotion of Preventive Care – Encourage early intervention and vaccination to reduce long-term complications.
- Telehealth Integration – Improve accessibility and adoption of telemedicine through better digital infrastructure and awareness programs.
- Healthcare Policy Adjustments – Consider financial assistance for individuals affected by post-COVID conditions to ensure equitable access to treatment.

CHAPTER I:

INTRODUCTION

1.1 Introduction

The World Health Organization (WHO) declared COVID-19 a global pandemic on March 11, 2020, initiating a crisis that had far-reaching effects on various aspects of life. The pandemic not only impacted physical and mental health but also emotional well-being, quality of life, political landscapes, environmental conditions, and the global economy (El Keshky MES et al, 2020, Patel U et al, 2020).

This global health emergency prompted an immediate response from healthcare systems and research networks worldwide, straining healthcare systems and causing upheaval. While the impact of the COVID-19 pandemic was profound in most countries, some, like Singapore, managed not only the pandemic itself but also the post-pandemic challenges successfully. Singapore, with its low case fatality ratio, employed immediate public health measures such as extensive screening, contact tracing, and quarantine to effectively manage the situation (Munblit D et al, 2022, Tan et al 2020, Wong J et al, 2020).

Singapore, a multilingual and multi-ethnic country with a population of 5.64 million as of June 2022, has prioritized healthcare. In 2021, the life expectancy at birth for males and females was 81.1 years and 85.5 years, respectively, and the sex ratio for residents in 2022 was 955 males per 1,000 females (DSS, 2022). Singapore's healthcare system, regulated by the Ministry of Health and statutory boards, ensures quality, affordability, and accessibility of healthcare services, making it one of the best healthcare systems globally. It not only provides necessary medical services but also conducts preventive health programs while maintaining high standards of clean water and sanitation, striving to achieve better health for all (MOH-SG 2022, Phua KH, 2020).

The available studies on COVID-19 and Post-Pandemic Health Conditions (PCC) provide limited data, creating a paucity of information on health issues and healthcare services

utilization. To plan and implement effective healthcare programs and policies, it is crucial to have a thorough understanding of these issues. The current study aims to provide insights into health issues and patterns of healthcare service utilization. It will serve as a valuable resource for planners, policymakers, researchers, healthcare providers, and other stakeholders to better address the healthcare needs and provide improved healthcare services and programs.

The available studies suggest that while there has been a focus on understanding the pathophysiology and management of acute COVID-19 symptoms, factors related to PCC and other health issues have been relatively neglected (Munblit D et al, 2022). COVID-19 is more prevalent and severe in individuals with comorbidities such as hypertension, diabetes, cardiovascular diseases, and respiratory distress (Patel U et al, 2020). While there is comprehensive data on acute symptoms and clinical management, established studies on PCC are limited. With the global vaccination drives gradually reducing the number of COVID-19 cases, the impact of the pandemic is far from over. Depending on the definition and duration used, the prevalence of PCC varies from 5% to 80% (Munblit D et al, 2022; Smith P et al, 2022).

Understanding who contracted COVID-19, what health issues they faced, who is more likely to experience PCC, and the reasons and consequences for these conditions is crucial for effective pandemic and post-pandemic healthcare management. Factors affecting healthcare service utilization, such as cultural beliefs, access, cost, and insurance, play a significant role in healthcare resource utilization. Poor or delayed healthcare service utilization can have adverse effects on patients' health and the healthcare management system (Phua KH, 2020, Ann S et al, 2022).

The current study will provide insights into health issues and behavioral patterns regarding healthcare services utilization during the pandemic and post-pandemic. It will offer information on managing health issues during the pandemic and post-pandemic, serving as

a valuable resource for policymakers and healthcare practitioners to plan post-COVID services effectively (Smith P et al, 2022).

Singapore reported its first COVID-19 case in January 2020, and by January 2021, it had registered 58,542 cases and 29 deaths due to the disease. The primary healthcare in Singapore is funded both publicly and privately, with the government providing necessary equipment and support to private general practitioners under the Public Health Preparedness Clinic (PHPC) scheme (Lum A et al, 2021).

Based on the preliminary literature review, the study's scope and objectives were established. The study aims to provide information on prevalent health issues and factors affecting healthcare service utilization during COVID-19 and post-COVID-19. It also seeks to understand the patterns of healthcare service utilization during these periods. The study will provide data on people's perceptions and behavioral patterns regarding health issues and services. The study will answer questions such as the health conditions during COVID-19 and post-COVID-19 and the factors influencing healthcare service utilization during these times.

The study will collect both quantitative and qualitative data, using tools like open and close-ended questionnaires, in-depth interviews, and focus group discussions. The study will include people residing in Singapore who tested positive for COVID-19 between January 2020 and December 2023. The data will be collected from January 2020 to December 2023 from individuals who had COVID-19 at least once during this period and are willing to participate. The study will provide valuable insights into health issues and healthcare service utilization, despite some limitations, and will be carried out with informed consent from the participants.

Since the first COVID-19 case in Singapore in January 2020, data will be collected from individuals living in Singapore who tested positive for COVID-19 at least once between 2020 and 2023 (Lum A et al, 2021). The study will not include individuals who experienced COVID-19 before or after this period. Understanding the epidemiology of COVID-19 and

post-COVID conditions is crucial for comprehending their health impact during and after the pandemic. Post-pandemic health issues like post-COVID conditions have emerged as a significant concern, affecting individuals across various demographics. Understanding their prevalence, impact, and prevention strategies is essential for effective healthcare management and preparedness for future health crises.

1.2 Research Problem

The World Health Organization declared COVID-19 a global pandemic in March 2020, precipitating a worldwide crisis that significantly impacted various dimensions of life, including physical, mental, emotional well-being, and socio-economic aspects (El Keshky MES et al, 2020; Patel U et al, 2020). The ensuing public health emergency prompted a global response from healthcare systems, causing strain and disruptions. Amid this, Singapore emerged as a noteworthy example, effectively managing both the pandemic and post-pandemic crises with immediate public health actions (Munblit D et al, 2022; Tan et al 2020; Wong J et al, 2020).

Singapore, a multilingual and multi-ethnic nation, boasts a robust healthcare system ensuring quality, affordability, and accessibility of services, making it one of the best globally (MOH-SG 2022; Phua KH, 2020). However, despite the global attention on COVID-19, there is a paucity of comprehensive data on health issues and healthcare service utilization during and after COVID-19, hindering effective planning and policy implementation (Munblit D et al, 2022; Smith P et al, 2022). To address this gap, the current study aims to provide insights into prevalent health issues, patterns of healthcare service utilization, and factors influencing these dynamics.

The preliminary literature review underscores the neglect of post-COVID conditions (PCC) in existing studies, emphasizing the need to understand the health impact beyond acute symptoms (Munblit D et al, 2022). With COVID-19 being more severe in individuals with comorbidities, there is a critical gap in established studies on PCC, despite global vaccination efforts reducing case numbers (Patel U et al, 2020). Understanding the

epidemiology of COVID-19 and PCC is essential for comprehensive healthcare management, requiring a deep understanding of health issues, behavioral patterns, and factors influencing healthcare service utilization (Phua KH, 2020; Ann S et al, 2022).

It is essential to address this knowledge gap to better comprehend the health issues faced by individuals during and after the COVID-19 pandemic, as well as the patterns of healthcare service utilization. The study will provide valuable insights into the health conditions that arise during the pandemic and post-pandemic periods, offering a more comprehensive understanding of who is more likely to experience post-COVID conditions and the factors contributing to these conditions. Additionally, it will shed light on the behavioral patterns of individuals in seeking healthcare services, addressing the impact of cultural beliefs, access, cost, and insurance on healthcare utilization. Poor or deferred utilization of healthcare services has the potential to lead to severe consequences for individual health and strain healthcare management systems.

Given the unique case of Singapore, this study will focus on providing insights into health issues and behavioral patterns related to healthcare service utilization during and after the pandemic. By doing so, it will offer valuable information to policymakers, researchers, and healthcare providers to design and implement better healthcare services and programs, catering to the evolving needs of the population in the face of the ongoing global health crisis and the potential long-term health consequences that may follow. The study will contribute to the preparedness and effectiveness of healthcare systems in Singapore and potentially serve as a model for other regions seeking to manage and respond to the challenges posed by the COVID-19 pandemic and its aftermath

In conclusion, the absence of comprehensive data on COVID-19 and PCC-related health issues and healthcare service utilization in Singapore poses a significant challenge. This study seeks to fill these gaps by collecting both quantitative and qualitative data from individuals in Singapore who tested positive for COVID-19 between January 2020 and December 2023. The objectives include providing information on prevalent health issues,

understanding patterns of healthcare service utilization, and offering insights into people's perceptions and behavioral patterns during and post-COVID-19. The study's findings will serve as a valuable resource for planners, policymakers, researchers, and healthcare providers, contributing to effective healthcare strategies and programs, ultimately improving healthcare services and ensuring the well-being of the population.

1.3 Purpose of Research

The COVID-19 pandemic, declared by the World Health Organization (WHO) in March 2020, had a profound impact on global health systems, economies, and societal well-being. While significant research has been conducted on acute COVID-19 cases, there remains a substantial gap in understanding post-COVID conditions (PCC) and the long-term utilization of healthcare services. Singapore, recognized for its efficient public health responses and healthcare system, provides an ideal case study to examine these critical issues.

This research aims to analyze the prevalent health issues and patterns of healthcare service utilization during and post-pandemic, focusing on the factors influencing healthcare-seeking behaviors. By addressing this knowledge gap, the study will contribute to more effective healthcare planning and policy implementation, ensuring that healthcare systems are adequately prepared for future health crises and long-term consequences of COVID-19.

1.4 Significance of Study

Despite global vaccination efforts and the decline in severe COVID-19 cases, the long-term health consequences of the virus remain inadequately explored. Understanding the epidemiology of COVID-19 and PCC, particularly in populations with preexisting conditions, is critical for shaping healthcare policies and service delivery.

Singapore's multi-ethnic and multilingual landscape, coupled with its well-established healthcare infrastructure, provides a unique opportunity to study these trends comprehensively. However, there is a paucity of data on how individuals accessed and utilized healthcare services during and after the pandemic. This study will address this gap by examining healthcare-seeking behaviors, the role of cultural and socio-economic factors, and the impact of cost, insurance, and accessibility on healthcare utilization.

The findings will offer insights for actionable insights to enhance healthcare service delivery, improve preparedness for future pandemics, and support individuals experiencing PCC. Additionally, the study's implications may serve as a model for other regions.

1.5 Research Purpose and Questions

Purpose of Study

The COVID-19 pandemic significantly impacted healthcare systems worldwide, altering healthcare-seeking behaviors and utilization patterns. This study aims to examine these changes and identify prevalent health issues during and after the pandemic to inform future healthcare policies and interventions.

Primary Objective:

- To identify prevalent health issues and understand healthcare utilization patterns during and post the COVID-19 pandemic.

Secondary Objectives:

- To investigate factors influencing changes in healthcare-seeking behavior.
- To explore the experiences and perspectives of individuals regarding health services during the specified period.

By analyzing these aspects, the study seeks to provide insights into how healthcare systems adapted, the challenges faced by individuals, and the long-term implications for healthcare accessibility and delivery.

Research Questions:

- **Health Issues during and post-COVID-19:** What are the primary health issues faced by the population in Singapore during and after the pandemic?
- **Utilization Patterns of Healthcare Services**: What is the utilization of healthcare services? Did it change? How has it changed during the specified period?
- **Determinants in Healthcare-Seeking Behavior:** What factors contribute to the observed patterns in healthcare service utilization?

This study will provide valuable data to inform future healthcare strategies, ensuring that healthcare services remain accessible, effective, and responsive to the needs of the population in Singapore and beyond.

CHAPTER II:

REVIEW OF LITERATURE

2.1 Introduction

COVID-19 Pandemic and Post-Pandemic Health Conditions

Governments worldwide are navigating unprecedented uncertainties due to the COVID-19 crisis, leading to challenging decisions involving health, economy, and society. The pandemic rapidly escalated into a global crisis in early 2020, resulting in widespread school closures affecting over a billion students and imposing unprecedented lockdown measures on more than half of the global population. The health impact has been significant, with millions of cases and deaths worldwide. For instance, the USA alone reported over 51 million cases and 805,000 deaths attributed to COVID-19 by December 2021. This global crisis has also profoundly affected healthcare systems, presenting unique challenges in managing patient surges, resource allocation, and addressing diverse health needs. The pandemic's impact on healthcare has extended to physical, mental, and environmental aspects, and the health challenges have highlighted the importance of adapting to new healthcare paradigms. As a response to the pandemic, governments worldwide have implemented a range of measures, such as widespread testing, contact tracing, and social distancing, to mitigate transmission. This has necessitated the strengthening of healthcare infrastructure and capacity to handle the influx of patients effectively. However, COVID-19 has not only disrupted the provision of regular healthcare services but has also altered healthcare utilization patterns. Telemedicine emerged as a vital tool to ensure continued care, while hospital admissions for non-COVID-related cases decreased, possibly due to fear of exposure or prioritization of COVID-19 cases. Understanding these utilization patterns is crucial for healthcare resource allocation and long-term planning. To address these challenges, this literature review focuses on exploring health issues, healthcare service utilization patterns, and management strategies in Singapore during and post the pandemic years of 2020-2023. By synthesizing existing research, this review aims to provide insights into the healthcare system's challenges and potential strategies for

improved management. Such insights are vital for policymakers, healthcare professionals, and stakeholders to enhance healthcare services, ensure better preparedness, and tackle future health crises effectively. Amid the pandemic, a study by Patel et al. assessed the global burden and outcomes of COVID-19, revealing significant mortality and morbidity rates. Vulnerable groups with comorbidities were more prone to severe outcomes, emphasizing the need for comprehensive strategies for disease control. Furthermore, there is growing concern about post-acute COVID-19 syndrome, which encompasses symptoms persisting after the acute infection. Diverse populations, objective outcomes, and the broader impact of the pandemic must be considered to better understand and manage this condition. Debski et al. highlighted the global scale of the pandemic and efforts to predict post-COVID-19 syndrome. Research continuity is crucial to addressing the long-term effects experienced by a substantial number of individuals post-infection. In conclusion, the COVID-19 pandemic has transformed all aspects of society, particularly healthcare systems. Understanding health challenges, healthcare utilization shifts, and effective management strategies during and after the pandemic is essential for better preparedness and improved healthcare services. By analyzing existing research, this review aims to provide valuable insights to guide policymakers and healthcare professionals in navigating and mitigating the lasting impacts of the pandemic on healthcare systems and overall well-being. (Ann SN et al, 2022; Betancourt JA, et,al. 2020;Cassell K, et, al 2022; CDC 2021A;Debski M et al., 2022; Dujeepa D. Samarasekera 2023; El Keshky MES et al., 2020; Garfan S et al 2021; Kelli N. O'LaughlinI, 2021;Munblit D et al, 2022 ; OECD, 2020; Omboni, S et, al. 2022; Patel U et al., 2020; Renaud CJ, et al 2021 ; Shamsi Al et al., 2020; Soojin K et, al 2022.;Tan JB, et al 2020; WHO, 2020); Winkelmann J,et ,al 2022; Yang Y, et ,al. 2022.)

Post-Pandemic Health Issues - Post-COVID Conditions (PCC) or Long-COVID

Post-pandemic health issues, often referred to as Post-COVID Conditions or Long-COVID, are gaining recognition as the long-term consequences of COVID-19 (KhuntK and Mahoney LO, 2022). These conditions encompass a range of persistent health

problems that individuals may experience after being infected with the virus that causes COVID-19. The term encompasses various symptoms and conditions that persist beyond the acute phase of infection, affecting anyone, including those with mild initial infections. The CDC and other partners collaboratively defined this term to include the diverse array of symptoms that can last for weeks, months, or even years (CDC, 2023c).

The SARS-CoV-2 virus, responsible for COVID-19, can lead to post-acute symptoms or persistent health issues lasting long after the initial infection. These issues collectively form Post-COVID Conditions or Long-COVID. This review offers an overview of these conditions, including their definition, prevalence, impact, and prevention.Two different definitions exist for post-COVID conditions. The National Institute for Health and Care Excellence (NICE) categorizes symptoms lasting 4 to 12 weeks as ongoing symptomatic COVID-19, and those extending beyond 12 weeks as Post-COVID-19 syndrome. On the other hand, the World Health Organization (WHO) defines Long-COVID, or Post COVID-19 condition, as new symptoms emerging or continuing three months after the initial infection, persisting for at least 2 months without other explanations (Debski M et al, 2022).

Studies indicate that around 10-20% of SARS-CoV-2 infected individuals could develop Long-COVID. The WHO European Region experienced over 17 million cases in the initial years of the pandemic. Estimates suggest that globally, about 65 million people are affected, with varying rates depending on hospitalization and vaccination statuses. A Singaporean study, however, suggests that vaccinated individuals have a lower risk of developing "Long-COVID" symptoms (Davis HE, 2023; NCID, 2023).

Post-COVID Conditions encompass a wide range of new, recurring, or ongoing health problems that arise after COVID-19 infection. While most people recover within a few weeks after the initial infection, post-COVID-19 syndrome is generally considered when symptoms persist for at least four weeks. These conditions present various symptoms, affecting physical, neurological, respiratory, and other aspects. Vulnerable groups, such as those with underlying health conditions, severe COVID-19 illness, or MIS, face a higher

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risk of developing these conditions. Preventing Post-COVID Conditions involves vaccination, ventilation, testing, and treatment, with ongoing research to better understand and manage the condition (CDC, 2023b; CDC, 2023c).

Understanding the epidemiology of COVID-19 and post-COVID conditions is crucial to comprehending their health impact during and post-pandemic. Multiple methods are employed to estimate the prevalence and characteristics of Post-COVID Conditions, including self-reported symptoms, medical records, and surveys. Due to study variations, estimates of the proportion affected can vary. The CDC shares data and analyses on Post-COVID Conditions, contributing to a better understanding of their effects (CDC, 2023 A).

Post-pandemic health issues like Post-COVID Conditions have emerged as a significant concern. They encompass a wide range of symptoms and conditions that persist after COVID-19 infection, affecting individuals across various demographics. Understanding their prevalence, impact, and prevention strategies is essential for effective healthcare management and preparedness for future health crises (CDC, 2023a).

2.2 COVID-19 and Post-Pandemic Health: Conditions, Care, and Service Utilization

Epidemiology of COVID 19

COVID-19, stemming from the novel coronavirus SARS-CoV-2, has rapidly spread worldwide since its emergence in late 2019. A profound comprehension of COVID-19's epidemiology is vital for the implementation of effective public health measures and the containment of its transmission. Through epidemiological studies, a deeper understanding of various facets of COVID-19 has emerged, encompassing transmission dynamics, risk factors, clinical attributes, and outcomes.

The primary mode of SARS-CoV-2 transmission is through respiratory droplets emitted during activities like coughing, sneezing, speaking, or breathing. Close interactions,

particularly indoors, heighten transmission risk. Additionally, while airborne transmission and contamination of surfaces remain possible, they are less frequent occurrences (CDC, 2021A). The virus's incubation period, which denotes the time from exposure to symptom onset, averages around 5-6 days, extending from 2 to 14 days. A notable challenge lies in the ability of asymptomatic individuals to transmit the virus (Lauer SA et al., 2020).

Several risk factors have been associated with severe COVID-19 outcomes. Notably, advanced age, especially among those above 65, proves to be a significant contributor to severe illness and mortality. Comorbidities such as hypertension, diabetes, obesity, cardiovascular disease, and respiratory conditions have also been linked to higher risks of severe outcomes (Onder G et al., 2020; Williamson E et al., 2020).

The global impact of COVID-19 has been substantial, affecting millions across the world. Nonetheless, the pandemic's effects vary across regions and populations due to factors like population density, healthcare resources, socioeconomic conditions, and public health interventions (JHU, 2021). Effective public health measures like testing, contact tracing, isolation, quarantine, mask-wearing, and social distancing have proven essential in controlling transmission. Vaccination campaigns have further contributed to reducing illness severity and hospitalizations (WHO, 2021).

Psychological consequences also accompany the pandemic, disproportionately affecting females, older individuals, and those with underlying chronic conditions (Ammar A et al., 2020). Studies show that various factors, such as age, gender, comorbidities, and smoking status, contribute to COVID-19-related hospitalization and mortality (Cummins L et al., 2021; Dessie ZG and ZewotiT 2021). Several factors, including advanced age, male gender, obesity, and dyspnea at admission, were associated with severe COVID-19, while presenting with a headache was linked to a decreased risk of severity; factors associated with death included advanced age, male gender, immunosuppression, diabetes, chronic kidney disease, dyspnea, and specific inflammatory markers (Kaeuffer C et al, 2020).

Elderly patients over 65 years had higher short-term healthcare utilization after diagnosis, while those aged 45-65 experienced the greatest long-term medical expenses (Kompias A et al., 2022).

The incubation period of COVID-19 typically ranges from 2 to 14 days, with an average of 5-6 days, and individuals can transmit the virus even without symptoms; advanced age and comorbidities like hypertension, diabetes, obesity, cardiovascular disease, and respiratory conditions are significant risk factors for severe outcomes (Lauer et al., 2020; Onder et al., 2020; Williamson et al., 2020). Risk factors for COVID-19 infection included older age, male gender, higher body mass index (BMI), deprivation, smoking, and comorbidities such as diabetes, respiratory diseases, and cardiovascular diseases (Sudre CH et al., 2021).

The COVID-19 pandemic had widespread effects on physical, mental, and emotional health, as well as healthcare systems; understanding affected demographics, associated health issues, and post-COVID-19 conditions is essential for pandemic management (Lum et al., 2021; Phua KH, 2020; Ann SN et al., 2022). Mental health challenges and barriers to accessing regular healthcare services were notable issues during the pandemic (Wang J et al., 2020; Al-Shamsi et al., 2020)

Understanding COVID-19's epidemiology is pivotal for effective disease control and management. By examining its transmission, risk factors, clinical impact, and outcomes, we gain insights essential for tailored interventions and preparedness. Public health measures and vaccination campaigns continue to play a crucial role in minimizing the virus's impact on public health.

Epidemiology of Post-COVID Conditions

Since the onset of the COVID-19 pandemic, concerns about its long-term health implications have grown. Long-COVID, also known as post-COVID syndrome or post-acute sequelae of SARS-CoV-2 infection, pertains to symptoms that persist beyond the

acute phase of the disease. This section provides an overview of Long-COVID's prevalence, risk factors, symptoms, and its impact on both adults and children.

Long-COVID affects both hospitalized and non-hospitalized individuals, but its incidence estimates vary due to the absence of a standardized definition. Studies have identified common symptoms like fatigue, dyspnea, arthralgia, and chest pain, with symptom persistence ranging from 4% to 66% between 4 and 20 weeks post-acute infection. However, the diversity in diagnostic criteria, populations studied, timing, and follow-up types complicates estimating the affected population. Researchers have delineated two symptom patterns in Long-COVID patients: one involving symptoms like fatigue and headache, and the other encompassing systemic manifestations such as fever and gastroenterological symptoms (Greenhalgh T et al., 2021; Staffloni S et al., 2022).

A study conducted in Norfolk, UK, found that 52.1% of respondents reported post-COVID syndrome symptoms. Interestingly, male gender was associated with a protective effect against post-COVID symptoms. Logistic regression was employed to identify predictors for post-COVID syndrome and subsequent healthcare utilization (Debski M et al 2022). The absence of a universally recognized definition for Long-COVID complicates estimating its occurrence. Research indicates that symptom persistence in Long-COVID is not necessarily correlated with the severity or duration of initial COVID-related symptoms (Staffloni S et al 2022).

Long-COVID, or Post-COVID-19 Condition, can impact individuals irrespective of age or the initial symptom's severity. Prevalent in patients who were hospitalized, studies indicate that 4% to 66% of patients experience sustained symptoms lasting from 4 to 20 weeks post-acute infection. In addition, Long-COVID's impact extends to pediatric populations, exhibiting symptoms like fatigue, headache, dyspnea, chest pain, and sleep disturbances. These symptoms display variable patterns and fluctuating intensity, with post-exertional exacerbation as a potential trigger. Nonetheless, inconsistency in symptom elicitation and description necessitates further research to grasp Long-COVID's nature among children

(WHO, 2023, Davis HE et al 2023A , Davis HE et al 2023C ,Morrow AK et al 2022, Staffloni S et al 2022; Vanichkachorn G, et, al 2021)..

Long-COVID risk factors encompass female sex, ethnic minority status, lower socioeconomic status, smoking, obesity, and various comorbidities, with a higher susceptibility observed in younger individuals (Subramanian A et al 2022). This risk pattern holds under both the World Health Organization (WHO) and alternative definitions of Long-COVID (Subramanian A et al 2022). Sociodemographic and clinical factors are key determinants of Long-COVID incidence (Subramanian A et al 2022). Specifics encompass age, sex, ethnicity, socioeconomic indicators, smoking habits, general and mental health, overweight/obesity, diabetes, hypertension, hypercholesterolemia, and asthma (Thompson EJ et, al. 2021). Moreover, Long-COVID prevalence is higher in individuals with poor pre-pandemic general and mental health, asthma, overweight/obesity, and certain age groups (Mansell V et al 2022). Mental health conditions like anxiety, depression, and cognitive impairment are prevalent among COVID-19 survivors, particularly those hospitalized (Mansell V et al 2022).

Long-COVID's prevalence varies widely, with estimates ranging from 13.3% in community-based surveys with confirmed COVID-19 cases to as high as 71% among hospitalized patients. A global pooled prevalence suggests that approximately 43% of individuals experience persistent or new symptoms after recovering from the initial infection (Khunt K and Mahoney LO 2022, Thompson EJ et al 2021). Reports reveal prevalence estimates ranging from 14.5% to 18.1% for ongoing symptomatic COVID-19 and 7.8% to 17% for post-COVID-19 syndrome. Lower proportions are observed when considering symptoms impacting daily activities (Thompson EJ et al 2021).

A study in Moscow found that post-COVID-19 condition (PCC) was prevalent in 50% of adults and 20% of children at the 6-month follow-up, which decreased to 34% and 11% at 12 months, respectively. Risk factors included female sex and pre-existing hypertension in adults, and neurological comorbidities or allergic respiratory diseases in children

(Pazukhina E et al 2022). Advanced age and the presence of allergic conditions were linked to an increased likelihood of experiencing enduring symptoms during the follow-up period (Ismail M Osmanov and Ekaterina Spiridonova 2021).

Age is linked to an increased risk of Long-COVID, particularly from 20 to 70 years of age (Thompson EJ et al., 2021). Being female, having poor pre-pandemic mental and general health, asthma, and being overweight or obese are associated with a higher risk of Long-COVID (Thompson EJ et al., 2021). A study found that 52.1% of respondents experienced post-COVID syndrome symptoms, with male sex being protective against these symptoms (Debski M et al., 2022). Interestingly, non-white ethnic minority groups had a lower risk of Long-COVID, with low hospitalization rates among participants (Thompson EJ et al., 2021). Risk factors for post-COVID conditions (PCC) include being over 10 years old, having comorbidities, and hospitalization during the acute phase. Pre-Omicron variants also had a higher association with PCC compared to the Omicron variant, while vaccination showed a reduced but not statistically significant risk of developing PCC (Morella R et al., 2023). The prevalence of Long-COVID was higher among females, individuals with comorbidities, and those who had not received booster shots or were unvaccinated (Robertson M.M. et al., 2023). Regarding Long-COVID, older age, female gender, higher BMI, the presence of multiple pre-existing comorbidities, and more severe acute COVID-19 symptoms were associated with long-term effects (Sudre CH et al., 2021). Long-COVID is a complex condition with varying symptoms and patterns, especially in children and adolescents. Further research is needed to fully understand it in pediatric populations (Morrow AK et al., 2022). There is also emerging concern about Long-COVID persisting beyond the acute phase, with various persistent symptoms in both adults and children (Morand A. et al., 2022).

Population-based surveys and future research are crucial for understanding and managing Long-COVID, with a focus on early identification of high-risk individuals and targeted treatments. Robust studies encompassing various populations, control groups, and factors like ethnicity, socioeconomic status, COVID-19 variants, and vaccination status are needed

to enhance our understanding of Long-COVID (Robertson M.M. et al., 2023; KhuntK and Mahoney LO, 2022). The impact of COVID-19 on older individuals goes beyond physical health, affecting mental and social well-being, especially due to lockdowns and loss of loved ones. Vaccination appears to reduce the effects of Long-COVID, underscoring its importance for older individuals, especially those in aged care facilities (Mansell V et al., 2022). Healthcare professionals should consider Long-COVID as a potential diagnosis in older individuals with relevant symptoms, providing early multidisciplinary assessment and management to mitigate its impact and improve overall health and quality of life (Mansell V et al., 2022). Understanding Long-COVID's epidemiology is crucial for devising effective interventions and support systems. Factors like age, gender, ethnicity, comorbidities, and pre-existing conditions contribute to its manifestation. By grasping the intricate web of risk factors and prevalence patterns, the scientific community can better address the challenges posed by Long-COVID and provide targeted strategies for its prevention and management.

Comorbidities in Relation to COVID-19 and Post-COVID Conditions

Comorbidities refer to pre-existing health conditions that coexist with COVID-19 or Long-COVID. The presence of comorbidities significantly influences the outcomes and management of both conditions. Numerous common comorbidities have been associated with COVID-19 and Long-COVID. The COVID-19 pandemic has underscored the impact of comorbid conditions on disease progression and management. Comorbidities, characterized by pre-existing health conditions alongside COVID-19 or Long-COVID, play a pivotal role in shaping the severity and prognosis of these conditions. Grasping the interplay between comorbidities and COVID-19/Long-COVID is paramount for risk evaluation, treatment strategies, and public health interventions. Numerous studies have unveiled prevalent comorbidities linked to COVID-19, including hypertension, diabetes mellitus, cardiovascular diseases, chronic respiratory diseases, and obesity (Zhou et al., 2020; Li B et al., 2020; Cai et al., 2020; Lippi G et al., 2020; Sattar N et al., 2020). These comorbidities escalate the vulnerability to severe illness, increased hospitalization rates,

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ICU admissions, and mortality (Subramanian A et al 2022). For instance, comorbidities such as COPD, benign prostatic hyperplasia, fibromyalgia, anxiety, erectile dysfunction, depression, migraine, multiple sclerosis, celiac disease, and learning disabilities have been associated with an elevated risk of Long-COVID (Richardson S et, al. (2020); Subramanian A et al 2022).

Furthermore, the influence of comorbidities extends beyond the acute COVID-19 phase. Long-COVID, marked by persistent symptoms and functional limitations post-COVID-19 infection, is impacted by pre-existing health conditions. Individuals with conditions like chronic obstructive pulmonary disease (COPD) are more prone to experiencing prolonged respiratory symptoms during recovery (Carfì et al., 2020). Similarly, individuals with chronic fatigue syndrome or autoimmune conditions may face an increased risk of enduring fatigue and other incapacitating symptoms linked to Long-COVID (Townsend L et al., 2021).

This literature review seeks to delve into the influence of comorbid conditions on COVID-19 and Long-COVID outcomes. By shedding light on prevalence, implications, and management strategies concerning comorbidities during and after the pandemic, this review synthesizes existing research to inform risk assessment, patient care, and targeted interventions for those with comorbidities.

Common Comorbidities Linked to COVID-19: Studies reveal that specific comorbidities heighten the risk of severe illness and complications in COVID-19 patients. These comorbidities include

- Hypertension (high blood pressure) (Zhou et al., 2020)
- Diabetes mellitus (high blood sugar levels) (Li et al., 2020)
- Cardiovascular diseases, such as coronary heart disease (Cai et al., 2020)
- Chronic respiratory diseases, including chronic obstructive pulmonary disease (COPD) (Lippi et al., 2020)
- Obesity (Sattar N et al., 2020)

Comorbidities' presence is associated with worsened COVID-19 outcomes, encompassing higher hospitalization rates, ICU admissions, and mortality. Individuals with comorbidities often experience heightened symptoms and complications due to the interplay between COVID-19 and their pre-existing health conditions. For instance, cardiovascular disease patients are at a higher risk of myocardial injury and cardiovascular complications (Cai et al., 2020). Similarly, individuals with diabetes mellitus experience elevated rates of severe illness and mortality due to COVID-19's impact on glucose metabolism (Li et al., 2020).

Comorbidities and Long-COVID**:** Comorbidities also shape the development and persistence of Long-COVID symptoms. Research indicates that individuals with specific pre-existing conditions are more likely to endure prolonged symptoms and functional impairments after COVID-19 infection. For instance, a study by (Carfì A et al. 2020) found that individuals with respiratory conditions like COPD were more prone to enduring persistent respiratory symptoms during recovery. Similarly, those with chronic fatigue syndrome or autoimmune conditions may have a higher likelihood of facing lasting fatigue and other debilitating symptoms associated with Long-COVID (Townsend L et al., 2021).

Understanding comorbidities' role in COVID-19 and Long-COVID is critical for risk assessment, patient care, and targeted interventions supporting individuals with pre-existing health conditions.

Symptoms of COVID-19 and Post-COVID Conditions

Functional somatic disorders, previously referred to as medically unexplained symptoms, encompass post-viral syndromes that can impact various organ systems or present with specific symptoms (Mansell V et al., 2022). Long-COVID falls within this category, although research data, particularly for older adults, remain limited. The etiology of functional somatic disorders involves processes encompassing both the body (immune system, autonomic nervous system, etc.) and cognition (perception of bodily signals, psychological adaptation, etc.) (Mansell V et al., 2022). An overlap exists between Long-COVID and chronic fatigue syndrome, as well as other functional somatic disorders, yet

further research is required. Common symptoms in Long-COVID, such as fatigue and shortness of breath, especially in older individuals, resemble those in chronic fatigue syndrome (Mansell V et al., 2022). Cases of post-infective fatigue syndrome due to different microorganisms have been linked to the development of chronic fatigue syndrome. While most Long-COVID patients recover gradually, some may endure symptoms like energy depletion, pain, and cognitive limitations episodically, even after an extended period (Mansell V et al., 2022).

Longitudinal studies have shown that a small percentage of COVID-19 cases (ranging from 1.2% to 4.8%) experienced symptoms affecting normal functioning for 12 or more weeks, classified as Long-COVID. A larger proportion (ranging from 7.8% to 17%) reported any symptoms lasting 12 or more weeks (Thompson EJ et al., 2021). The most frequent symptoms of Long-COVID Syndrome reported by patients were fatigue, exercise intolerance, walking intolerance, muscle pain, and shortness of breath (Asadi-Pooya AA et al., 2021). Older patients, especially those initially with respiratory distress, continue to experience symptoms like fatigue, loss of smell, sleep disorders, anxiety, depression, and cognitive dysfunction even after the acute infection resolves. Some previously healthy, independent older individuals are unable to return home after hospital discharge. Many COVID-19 survivors face anxiety, depression, functional abnormalities, and sleep disturbances months later. Survivors aged 60 and older have an increased risk of cognitive decline and dementia. The disruptive effects of COVID-19, including lockdowns and reduced social interactions, significantly impact older individuals' mental and physical well-being, leading to declines in various health aspects (Mansell V et al., 2022). Overweight/obesity increases the odds of symptoms lasting 4+ weeks, while asthma is associated with increased odds of symptoms lasting 4+ weeks (Thompson EJ et al., 2021).

In non-hospitalized adults with confirmed SARS-CoV-2 infection, identifying symptoms associated with Long-COVID revealed 62 symptoms significantly linked to infection beyond 12 weeks. The highest risk was observed for anosmia, hair loss, sneezing, ejaculation difficulty, and reduced libido (Subramanian A et al., 2022).

A study found that even eight months after hospital discharge, a considerable number of children continued to experience persistent Covid-19 symptoms. The most common long-term effects were fatigue, sensory changes, and sleep problems, with approximately one in ten children having symptoms affecting multiple systems. Age and allergic disease were identified as main risk factors for persistent symptoms (Osmanov IM et al., 2022).

Post-COVID Conditions is characterized by the emergence or persistence of new symptoms lasting at least two months and appearing three months after the initial infection without any other explanation. While fatigue, shortness of breath, and cognitive dysfunction are commonly reported symptoms, over 200 different symptoms have been reported, significantly impacting daily life (WHO, 2023 D). Symptoms of post-acute COVID-19 are diverse, including cough, low-grade fever, fatigue, shortness of breath, chest pain, headaches, muscle pains, gastrointestinal upset, skin rashes, metabolic disruption, thromboembolic conditions, and mental health issues. Symptoms may relapse and remit (Greenhalgh T et al., 2021).

Post-COVID Conditions or Long-COVID syndrome can manifest in both hospitalized and non-hospitalized patients, although it's more common in the hospitalized group. Around 20% of non-hospitalized patients may experience symptoms consistent with Long-COVID, even 5 weeks after initial infection. Post-COVID Conditions symptoms vary among adults and children, with fatigue, post-exertional malaise, cognitive difficulties, headaches, orthostatic symptoms, and cardiopulmonary symptoms commonly reported in children. Mental health, behavioral symptoms, taste and smell changes are also prevalent. Different phenotypes may exist within the broad term "Long-COVID," requiring additional studies (Morrow AK et al., 2022).

According to systematic research from primary research articles in established journals, the most common and debilitating symptoms of post-COVID-19 syndrome are fatigue and cognitive impairment. The study also reported inflammatory correlates and functional consequences associated with post-COVID-19 syndrome (Felicia Ceban, 2021).

Researchers have identified two symptom patterns in people with Long-COVID, one including fatigue, headache, and respiratory complaints, and the other including systemic manifestations such as fever and gastrointestinal symptoms (Staffloni S et al., 2022). Among unrecovered participants, 86.7% experienced fatigue at the time of survey, and patients with Long-COVID continue to experience significant symptom burdens, especially systemic and neurological/cognitive symptoms, even after seven months (Davis HE et al., 2023 B).

The most common symptom of Long-COVID is severe fatigue, often accompanied by other symptoms such as lymph node swelling, headache, muscle and joint pain, sore throat, hoarseness, and sleep disturbances. Approximately 55% of Long-COVID patients reported fatigue using the Fatigue Severity Scale. Other prevalent symptoms include worsened quality of life, chest pain, skin rashes, hair loss, palpitations, loss of smell and taste, anorexia, abdominal pain, and diarrhea (Yan et al., 2021 and C; Iwu CJ, et al 2021).

Long-COVID can lead to various negative outcomes, including cardiovascular and cerebrovascular disease, type 2 diabetes, ME/CFS, and POTS. Symptoms can persist for years, preventing many from returning to work and contributing to labor shortages (Davis HE, 2023). A study reported less commonly found Long-COVID symptoms such as anaphylaxis, new allergies, seizures, changes in sensitivity to medication, vision loss, hearing loss, and facial paralysis. The study suggests further exploration into the role of mast cells in Long-COVID, as symptoms like anaphylaxis, new allergies, and changes in sensitivity to medication overlap with Mast Cell Activation Syndrome (MCAS) symptoms (Davis HE et al., 2021). Another study with 377 participants found that even eight months after hospital discharge, a significant number of children experienced persistent Covid-19 symptoms. The most common long-term effects were fatigue, sensory changes, and sleep problems. About one in ten children had symptoms affecting multiple systems. Age and allergic disease were identified as the main risk factors for persistent symptoms (Osmanov IM et al., 2021).

Long-COVID has a disproportionate impact on premenopausal women, but its effects on female reproductive health are inadequately researched. A study based on literature review examines potential disruptions Long-COVID may cause in areas such as the menstrual cycle, gonadal function, ovarian sufficiency, menopause, fertility, and exacerbation of symptoms during menstruation. It also explores overlapping illnesses like ME/CFS, POTS, EDS, and endometriosis, predominantly affecting women. These conditions often involve increased dysmenorrhea, amenorrhea, oligomenorrhea, dyspareunia, endometriosis, infertility, vulvodynia, intermenstrual bleeding, ovarian cysts, uterine fibroids, pelvic congestion syndrome, gynecological surgeries, and adverse pregnancy complications. Menstrual cycle, pregnancy, and menopause can also influence symptoms in Long-COVID and associated illnesses (Pollack B et al., 2023).

In summary, the major symptoms of Long-COVID encompass weakness, muscle and joint pain, fatigue, sleep difficulties, shortness of breath, chest pain, palpitations, cough, loss of smell and taste, sore throat, headache, dizziness, brain fog, sweating, exercise intolerance, walking intolerance, diarrhea, abdominal pain, and anorexia (Asadi-Pooya AA et al., 2021). Female-related symptoms include dysmenorrhea, amenorrhea, oligomenorrhea, dyspareunia, endometriosis, infertility, vulvodynia, intermenstrual bleeding, ovarian cysts, uterine fibroids, pelvic congestion syndrome, gynecological surgeries, and adverse pregnancy complications (Pollack B et al., 2023). Mental disorders such as depression and anxiety disorders (Iwu CJ, et al, 2021.)

The following can be noted as major symptoms:

Clinical Manifestations (Asadi-Pooya AA et al , 2021; CDC 2023 A; Vanichkachorn G, et,al (2021).

- Weakness
- Muscle pain
- Joint pain
- Fatigue

- Sleep difficulty
- Shortness of breath
- Chest pain
- Palpitation
- Cough
- Excess sputum
- Loss of smell 21
- Loss of taste
- Sore throat
- Headache
- Dizziness
- Brain fog
- Excess sweating
- Exercise intolerance
- Walking intolerance
- Diarrhea
- Abdominal pain
- Anorexia
- Anosmia or dysgeusia
- Menstrual cycle irregularities
- Erectile dysfunction
- Myalgia
- Paresthesia
- Tachycardia
- Arthralgia
- lightheadedness
- Impaired daily function and mobility
- Pain

- Rash (e.g., urticaria)
- Mood changes
- Post-exertional malaise (PEM)

The COVID-19 pandemic has had significant mental and emotional effects, including increased rates of anxiety, depression, stress, and psychological distress among the general population (Xiong et al., 2020; Wang et al., 2021). The uncertainty and social isolation associated with the pandemic have contributed to these psychological challenges. Individuals with Long-COVID may also experience mental health issues like post-traumatic stress disorder (PTSD) and cognitive impairments (Taquet et al., 2021).

Impact of COVID-19 and Long-COVID on Body Systems

Various factors, such as hypoxia, intensive care, immobilization, and social isolation during severe COVID-19 infection, can give rise to cardiovascular and neurological complications (Mansell V et al., 2022). The enduring neurological effects of COVID-19 encompass a range of symptoms, including headaches, stroke, organ failure, muscle and joint pain, fatigue, and psychological symptoms. Neurological symptoms are believed to be connected to neuroinflammation and may be triggered by the virus entering the nervous system through receptors like ACE2 (Patel UK et al., 2022).

Long-COVID is a multifaceted condition with diverse effects on various body systems, presenting differently in individuals. Older adults, specifically those aged 65 and above, face an increased risk of persistent COVID-19 symptoms. Furthermore, COVID-19 can exacerbate or provoke chronic conditions frequently found in older individuals, such as cardiovascular and respiratory diseases, neurodegenerative conditions, and functional decline (Mansell V et al., 2022). Post-acute COVID-19 or "Long-COVID" constitutes a multisystem disorder that can manifest following a relatively mild acute illness (Greenhalgh T et al., 2021). Sudre et al.'s (2021) study offers valuable insights into the risk factors associated with COVID-19 infection and the development of Long-COVID. Identifying these risk factors enables healthcare professionals to better comprehend

individuals prone to infection and potential long-term effects, facilitating targeted interventions and support. Long-COVID involves the persistence of symptoms for months after recovering from COVID-19, affecting multiple organ systems, including the nervous, respiratory, and reproductive systems (Davis HE et al., 2021).

Respiratory System: The most prevalent respiratory symptoms are shortness of breath and dyspnea. Pulmonary fibrosis sequelae (PFS) are common in patients undergoing mechanical ventilation. Even exams performed 2-3 months post-discharge reveal radiological abnormalities like bronchiectasis, pulmonary micronodules, and pulmonary vascular disease (Staffloni S et al., 2022a; Yan et al., 2021).

Long-COVID also impacts the respiratory system, with shortness of breath and cough being frequent respiratory symptoms. Imaging studies demonstrate that non-hospitalized individuals with Long-COVID can display pulmonary abnormalities, including air trapping and lung perfusion issues (Davis HE et al., 2021).

Nervous System: The COVID-19 pandemic has raised concerns about SARS-CoV-2's impact on mental health, resulting in an increased prevalence of major depressive disorder and anxiety disorder. The emergence of Long-COVID, characterized by chronic conditions and multiorgan involvement, has been identified as a fourth phase of COVID-19. Other nervous symptoms such as post-traumatic stress disorder, difficulty concentrating, cognitive decline, insomnia, and tremors are also reported. Rare complications like Guillain-Barré syndrome have been linked to Long-COVID (Staffloni S et al., 2022a; Yan et al., 2021).

Long-COVID is often linked to Postural Orthostatic Tachycardia Syndrome (POTS), an autonomic nervous system disorder causing symptoms like dizziness, lightheadedness, and heart palpitations. Mast cell activation syndrome, connective tissue disorders, neuro-orthopedic spinal and skull conditions, and endometriosis are common comorbidities, associated with both Long-COVID and Myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS) (Davis HE et al., 2023 Band C).

Cardiovascular System: Long-COVID encompasses subacute to chronic conditions with multi-organ involvement. A common cardiovascular manifestation is postural orthostatic tachycardia syndrome (POTS), an autonomic disorder causing an increased heart rate upon standing. POTS symptoms include dizziness, palpitations, blurred vision, headache, weakness, and exercise intolerance. Other less common cardiovascular manifestations encompass myocardial infarction, myocarditis, pericarditis, arrhythmias, cardiac failure, and venous thromboembolism (Staffloni s et al., 2022a; Yan et al., 2021).

Reproductive System: Long-COVID can impact the reproductive system, affecting both sexes. It can lead to menstrual alterations, decreased ovarian reserve, and reproductive endocrine disorders in women with COVID-19. Additionally, erectile dysfunction and impairments in sperm count, semen volume, motility, morphology, and concentration have been reported in men (Davis HE et al., 2023 B and C).

Long-COVID, a chronic ailment, affects multiple body systems and can result in lifelong disabilities if not addressed. Millions worldwide are affected, and current diagnostic and treatment options remain inadequate. Further research and clinical trials are essential to pinpoint effective treatments that address underlying biological mechanisms, including viral persistence, neuroinflammation, excessive blood clotting, and autoimmunity (Davis HE et al., 2023 A, B and C).

Classification of PCC/ Long-COVID

Researchers classified post-acute COVID-19 based on the chronicity of symptoms post COVID-19 infection as follows: -

- Subacute or persistent symptomatic COVID-19 symptoms where the symptoms persist up to 12 weeks from the initial acute episode.
- Chronic or post-Covid syndrome, where the symptoms are present beyond 12 weeks. However, 21it should not be attributable to an alternative diagnosis (Chippa V et al 2022; Nalbandian et al 2021)

Healthcare Services, Utilization, and Management in the Context of COVID-19 and Post covid Conditions

The study conducted by Williamson et al. (2020) presents crucial insights into the risk factors linked to COVID-19. Understanding these factors empowers public health authorities and healthcare professionals to effectively target preventive measures, prioritize vaccination for high-risk individuals, and implement strategies to curtail virus transmission.

The COVID-19 pandemic has underscored the significance of proactive healthcare emergency planning and a heightened dedication to global public health preparedness. It has laid bare the inadequacies of existing healthcare systems in responding to 21st-century infectious disease outbreaks, prompting a call for transformative changes in healthcare practices. The successful integration of technology-driven solutions should become a norm in healthcare design and delivery. Achieving optimal outcomes necessitates active engagement of both patients and healthcare providers in this transformation. Nonetheless, ethical, regulatory, and legal concerns that emerged during the pandemic must be addressed. The experiences gained during this global crisis serve as a foundation for a substantial healthcare transformation in the post-COVID-19 era, enhancing preparedness against future global threats (Jazieh AR and Kozlakidis Z, 2020).

The adoption of telehealth services has witnessed a significant surge during the COVID-19 pandemic, facilitating patient screening, monitoring, and management from their homes. This transition to telehealth is expected to persist beyond the pandemic, offering patient-centered care and addressing healthcare system challenges. Mental healthcare has also embraced online therapy and e-health tools, which are poised to become integral to regular services in a blended approach. The pandemic has underscored the importance of enhanced surveillance systems, data analysis, and international collaboration to detect and respond effectively to infectious disease outbreaks. Additionally, the development of legislative, political, and healthcare management frameworks is imperative to tackle

challenges related to technology, security, privacy, and ethics (Jazieh AR and Kozlakidis Z, 2020).

In Lombardy, an Italian region severely impacted by COVID-19, a study analyzed the post-COVID-19 condition's effects on healthcare utilization. The study examined data from individuals who survived COVID-19 and tested negative subsequently. Results revealed heightened rehospitalizations, emergency room visits, outpatient medical consultations, and the increased use of additional healthcare resources such as spirometry, chest CT scans, and electrocardiography. These findings underscore the augmented burden on healthcare resources and suggest the presence of post-COVID-19 comorbidities (Mannucci PM et, al. 2022).

Another scoping review aimed to outline the current evidence regarding the design of rehabilitation care for post-COVID-19 condition. This review emphasized the significance of multidisciplinary teams, continuity of care, people-centered approach, and shared decision-making in the care model. Rehabilitation services were integrated across different levels of the healthcare system, with healthcare professionals like physiotherapists, occupational therapists, and psychologists playing pivotal roles. Policy recommendations focused on implementing a multilevel and multiprofessional model, leveraging existing healthcare system strengths, and prioritizing standardized outcomes and patient safety in rehabilitation research (Décary S et al., 2022).

Long-COVID can result in multi-organ damage, causing varied symptoms including neurological, cognitive, audiovestibular manifestations, and impacts on the immune, blood vessels, and endocrine systems. The enduring effects of Long-COVID remain to be fully understood (Davis HE, 2023). This condition, often referred to as "post-acute COVID-19" or "Long-COVID," can manifest after a relatively mild acute illness (Greenhalgh T et al., 2020). The impact of vaccination against COVID-19 has been studied, showing reductions in hospitalizations, symptoms, and their duration after SARS-CoV-2 infection. Despite this, frailty and adverse health determinants increase the risk of post-vaccination infection

in older adults. However, two vaccine doses have been found to reduce the risk of Long-COVID by about half. Notably, fully vaccinated individuals are less likely to develop Long-COVID, particularly for symptoms like fatigue, headache, muscle pain, and shortness of breath (Mansell V et al., 2022).

In managing Long-COVID, carefully monitored exercise has proven beneficial, unlike in chronic fatigue syndrome where it can exacerbate symptoms. Rehabilitation programs and quality standards in primary care have shown to alleviate symptoms in Long-COVID patients (Mansell V et al., 2022). It's important for healthcare professionals to consider Long-COVID as a potential diagnosis when older individuals present with relevant symptoms, rather than solely attributing it to increasing frailty. Early multidisciplinary assessment and management of persistent symptoms are essential, encompassing physical, psychological, and psychiatric aspects of care. Addressing the comprehensive impact of Long-COVID can mitigate its consequences and enhance the overall health and quality of life for older individuals (Mansell V et al., 2022). Vaccination showed a reduced but not statistically significant risk of developing Post COVID Conditions and there is the need for new strategies to prevent and treat pediatric PCC, emphasizing the long-term persistence of symptoms in some cases (Morella R, et al 2023).

The study further identified distinct sub phenotypes with varying functional status and quality-of-life outcomes at six months, underscoring the necessity for personalized care. Though additional research is required, these findings hold significant implications for clinical practice and the formulation of targeted treatment strategies for Long-COVID (KhuntK and Mahoney LO, 2022). Ongoing studies are underway to investigate the diagnosis, treatment, rehabilitation, and recovery of non-hospitalized individuals following acute SARS-CoV-2 infection. Collaborations and international efforts are imperative to comprehend the trajectories of Long-COVID (KhuntK and Mahoney LO, 2022).

In the pursuit of understanding Long-COVID, future research should focus on early identification of high-risk individuals and tailored treatment approaches. Rigorous studies

involving diverse populations and control groups are essential to deepen our comprehension of Long-COVID, taking into account factors such as ethnicity, socioeconomic status, COVID-19 variants, and vaccination status. The duration of symptoms post-infection remains uncertain, with reports indicating persistence of symptoms even two years after acute SARS-CoV-2 infection. Given our limited understanding of this novel virus, extensive long-term studies with robust designs are indispensable to fully grasp the epidemiology of Long-COVID (KhuntK and Mahoney LO, 2022). Furthermore, targeted public health interventions and consistent monitoring are pivotal in reducing mortality risk and preventing severe complications in vulnerable groups (Dessie ZG and ZewotiT, 2021).

Future research endeavors should be directed toward the early identification of individuals at higher risk and the development of targeted treatments. To enhance our understanding of Long-COVID, robust studies encompassing diverse populations and incorporating control groups are essential. These studies should take into consideration factors like ethnicity, socioeconomic status, COVID-19 variants, and vaccination status. While the duration of symptoms following disease onset remains uncertain, reports suggest that ongoing symptoms may persist even two years after acute SARS-CoV-2 infection. Given the limited understanding of this novel virus, conducting further long-term studies with rigorous designs is imperative to comprehensively elucidate the epidemiology of Long-COVID (KhuntK and Mahoney LO, 2022).

The findings underscore the significance of population-based surveys as an effective surveillance tool, complementing ongoing efforts to monitor Long-COVID. The study proposes potential areas for future research in both understanding and managing Long-COVID (Robertson, M.M., et al., 2023).

As the pandemic unfolded rapidly, researchers focused primarily on understanding the acute symptoms and clinical management of COVID-19 infection. However, factors such as post-COVID conditions (PCC) were often neglected (Munblit D et al., 2022).

Furthermore, COVID-19 was particularly severe in patients with comorbidities such as hypertension, diabetes mellitus, cardiovascular diseases, acute respiratory distress, secondary infections, and more (Patel U et al., 2020). While comprehensive data is available on acute symptoms and their management, established studies on post-COVID conditions are limited. Despite global vaccination efforts, the pandemic's impact is far from over. Prevalence of post-COVID conditions varies widely based on definitions and systems used, ranging from 5% to 80% (Munblit D et al., 2022; Smith P et al., 2022). The pandemic not only affected physical, mental, and emotional well-being but also placed considerable strain on healthcare systems worldwide (Lum A et al., 2021).

Understanding the specific groups that experienced COVID-19 and are at risk of developing post-COVID conditions, as well as the reasons and consequences for these conditions, is crucial. Effective management of the pandemic and its aftermath requires preparedness, which is grounded in a deep understanding of health issues and individuals' healthcare approaches. Utilization of available healthcare services is influenced by diverse factors, including traditional and cultural beliefs, access, cost, insurance coverage, and more. Thus, understanding factors affecting healthcare utilization is pivotal in service delivery. Suboptimal utilization of healthcare resources can lead to detrimental outcomes for patient health and strain the healthcare management system (Phua KH, 2020; Ann SN et al., 2022). This study aims to shed light on health issues and behavioral patterns related to healthcare utilization during and after the pandemic. It will offer insights into managing health issues during the pandemic and serve as valuable information for stakeholders such as policymakers and healthcare practitioners, aiding in planning post-COVID services (Smith P et al., 2022).

The declaration of COVID-19 as a global pandemic by the World Health Organization in 2020 triggered a widespread setback affecting multiple facets of life, including physical, mental, emotional well-being, quality of life, politics, environment, and the global economy (El Keshky MES et al., 2020; Patel U et al., 2020). The public health emergency prompted an immediate response from healthcare systems and research networks

worldwide. Globally, healthcare systems were strained and challenged. The pandemic had a profound impact on every country, though some managed the situation and its subsequent crises more effectively. Singapore is a standout example in this regard. With immediate public health measures such as large-scale screening, contact tracing, and quarantine protocols, Singapore demonstrated adept management of the situation (Munblit D et al., 2022; Tan JB et al., 2020; Wong J et al., 2020).

Singapore, a multilingual and multiethnic country with a population of 5.64 million as of June 2022, prioritizes healthcare accessibility, affordability, and quality for all segments of society. Singapore's healthcare system, regulated by the Ministry of Health and statutory boards, stands as a model for providing efficient and effective medical services. This commitment, coupled with continuous efforts to maintain high standards and implement preventive health programs, has earned Singapore a reputation for having one of the world's best healthcare systems. Amid the current context, primary care providers can play a pivotal role in managing various Post-COVID Conditions by adopting patient-centered strategies. It's important not to solely rely on objective laboratory or imaging results to gauge a patient's well-being. Normal findings in these tests do not negate the significance or severity of a patient's Post-COVID symptoms or conditions. Both healthcare providers and patients are advised to collaboratively set realistic goals and approach treatment by targeting specific symptoms (like headaches) or conditions (such as dysautonomia). Developing a comprehensive management plan that addresses physical, mental, and social well-being can be beneficial for certain patients. However, as our understanding evolves, approaches to caring for patients with these conditions are likely to evolve over time(Tan JB et al., 2020, Tan THY , et al 2020)

The study by Sagn Nahm Ann et al. investigates the impact of the COVID-19 pandemic on healthcare utilization, costs, and perceived health among middle-aged and older individuals in Singapore. Using a monthly panel survey and a difference-in-differences approach, they analyze changes in healthcare usage, spending, chronic condition diagnoses, and self-reported health status before and during the pandemic in 2020. Data

from a representative sample of 7569 individuals reveals that during the initial peak of the pandemic (January to April 2020), doctor visits decreased by 30%, out-of-pocket medical spending dropped by 23%, and the likelihood of chronic condition diagnoses decreased by 19%. Healthcare utilization and spending rebounded after the national lockdown was lifted in June 2020 and remained comparable to pre-pandemic levels for the rest of the year. The study indicates a significant impact of the pandemic on healthcare usage and chronic condition diagnoses among older individuals in Singapore during the initial phase, emphasizing the need for further research into long-term health effects on non-COVID-19 patients. A World Health Organization (WHO) scientific brief reveals a 25% increase in global prevalence of anxiety and depression during the first year of the COVID-19 pandemic. The brief highlights the pandemic's effects on mental health services and different demographic groups. Factors like social isolation, work constraints, fear of infection, loss, and financial worries contribute to the rise in anxiety and depression. Young people, women, and those with pre-existing health conditions are disproportionately affected. Disruptions in mental health services worsen the situation, creating gaps in care. Online support has been crucial, underscoring the need for accessible digital tools. While WHO and partners provide resources to address mental health impacts, a global shortage of mental health resources persists, calling for increased investment in mental health support. The aftermath of the pandemic is anticipated to lead to a surge of psychiatric illnesses due to extraordinary circumstances people have faced. Symptoms range from anxiety, depression, and sleep disturbances to severe mental illnesses, straining global mental health systems. Addressing this crisis requires early assessment and treatment, improved support for frontline workers, self-care education, reduced stigma, and expanded services like Telepsychiatry, Telemedicine. These measures are vital to mitigate the pandemic's impact on mental well-being. The COVID-19 pandemic has triggered a profound global crisis affecting health, economies, and societies. Lives lost, disrupted livelihoods, family separations, and interrupted education have taken a toll. Mental health has been widely impacted, leading to increased anxiety, depression, and serious mental health issues. Psychological distress, anxiety, depression, and post-traumatic stress

symptoms are reported, even among healthcare workers. Vulnerable groups, like young people and women, experience heightened distress due to social isolation, family stress, and violence. Rising mental health needs clash with disrupted services due to redeployment and fear of infection, hindering access to care. Fear of COVID-19 discourages seeking help, posing challenges to accessing support. A study investigated the effects of the COVID-19 lockdown on mental well-being in older adults through an online survey, which showed reduced mental well-being, sleep quality, and physical activity during the lockdown. Regression analysis indicated that changes in sleep quality and physical activity were linked to the decline in mental well-being and underscores the detrimental impact of lockdown on lifestyle and mental health in older adults. (Betancourt JA, et,al. 2020;Costa ACDS et ,al.2022; Omboni S, et, al. (2022); SangNam A et al 2022; Trabelsi K, A A,et, al. 2021; WHO2023 B; WHO2023 C; Xiong, J,et al. (2020).

Furthermore, the CDC, in collaboration with partners, is actively gathering and assessing data on post-COVID conditions and associated health issues through various public health initiatives. These efforts encompass:

1. Long-term studies tracking individuals over time.
2. Sentinel surveillance capturing information from specific public health sources regarding post-COVID condition cases.
3. Examination of medical charts to compile data on healthcare and treatment for patients with these conditions.
4. Analysis of electronic healthcare records and extensive patient databases.
5. Utilization of state and national health surveys.
6. Assessment of different care models.

CDC places significant emphasis on ensuring that data and analyses of Post-COVID Conditions are inclusive of factors such as race/ethnicity, age, gender, and other relevant variables (CDC 2023 C) The available studies on COVID-19 and PCC provide limited data and hence there is a paucity of enough data health issues and utilization of healthcare

services, especially in reference to Singapore. To plan, design, and implement better healthcare services programs and policies, it's at most important to have information and understanding of these issues. The current study will attempt to provide some insights into health issues and patterns of utilizing the health care services, to the planner's policymakers, researchers, and healthcare providers, to cater to the needs and provide better healthcare services and programs

2.2 Theories

The study is based on the three theories,

- Theory of Reasoned Action (TRA)
- Health Belief Model (HBM)
- Theory of Planned Behavior (TPB)

This study draws on three well-established behavioral theories—the Theory of Reasoned Action (TRA), the Health Belief Model (HBM), and the Theory of Planned Behavior (TPB)—to explore the complex drivers behind healthcare-seeking behavior during and after the COVID-19 pandemic. Each theory contributes a unique lens: TRA emphasizes how individuals' intentions to seek care are shaped by their attitudes (such as perceived benefits or risks) and social norms (like family influence or government messaging). HBM adds a health-specific perspective by focusing on how people's beliefs about their vulnerability, the severity of illness, and perceived barriers or benefits guide their decisions. Meanwhile, TPB extends TRA by accounting for perceived behavioral control—how much control people feel they have over accessing care, especially under pandemic constraints. Together, these frameworks provide a multi-dimensional understanding of how internal beliefs, external influences, and structural limitations intersect to shape both intention and actual healthcare behavior, including the adoption of alternatives like telehealth

Table 2.2 Theoretical Framework

Sno	Theory	Key Constructs	Survey / Interview Questions	Application to Study	Research Hypotheses
		- Attitude Toward the Behavior	- Q3.3, Q3.5, Q3.7 (Attitudes)	Explores how beliefs (e.g., fear, benefits, finances) and social context (e.g., government policies) influenced intent and actual use of healthcare services across pandemic phases.	
		- Subjective Norms	- Q3.5, Interview Sec. 5 & 6 (Norms)		
		- Behavioral Intention	- Q3.1–Q3.8, Interview Q4–Q9 (Intention)		
	Theory of Reasoned Action (TRA)	- Actual Behavior	- Q3.2, Q3.6, Q3.8, Interview Q6 (Behavior)		H1–H5: Attitudes, social norms, and policy impacts influenced utilization, especially telehealth.
		- Perceived Susceptibility	- Q2.3, Q3.5, Interview Q1 (Susceptibility)	Dissects internal motivations (risk perception, severity) and external obstacles (costs, access) to clarify how individuals weigh decisions about care.	
		- Perceived Severity	- Q2.4, Q3.5, Interview Q1 (Severity)		
		- Perceived Benefits	- Q3.3, Q3.7, Interview Q6 (Benefits)		
		- Perceived Barriers	- Q3.5, Q3.8, Q4.1, Interview Q8, Q10 (Barriers)		H1–H5: Susceptibility, severity, and perceived benefits drive use; barriers and lack of cues hinder it.
	Health Belief Model (HBM)	- Cues to Action	- Q3.5, Interview Q5 (Cues)		

	- Perceived Behavioral Control	- Q3.5, Q3.8, Q4.1, Q4.3, Q4.4, Interview Q8, Q10 (Control)	Adds the dimension of "control" (e.g., telehealth access, scheduling difficulties) to existing TRA model, highlighting how autonomy and resource constraints impact intent and follow-through.	
	- Attitude Toward Behavior	- Same as TRA for Attitudes, Norms, Intention, and Behavior		
	- Subjective Norms			
	- Behavioral Intention			
Theory of Planned Behavior (TPB)	- Actual Behavior			H1–H5: Control (esp. over telehealth) is a major driver; attitudes and norms still matter.

The integration of TRA, HBM, and TPB within this study provides a comprehensive framework to examine how individuals made healthcare decisions before, during, and after the COVID-19 pandemic. TRA contributes by framing the behavioral intention through attitudes (e.g., fear, financial strain) and social influences like public health messaging. HBM enriches this by unpacking perceptions of vulnerability, illness severity, and structural barriers, showing how internal risk assessment intersects with real-world constraints. Meanwhile, TPB builds on TRA by emphasizing perceived behavioral control—particularly important in a pandemic marked by sudden restrictions, telehealth pivots, and shifting access norms.

Together, these models illuminate the multi-layered dynamics of healthcare-seeking behavior: not only were people influenced by how risky or beneficial care seemed (TRA, HBM), but also by whether they could access it at all (TPB). Hypotheses derived from these theories will allow the study to empirically test how beliefs, norms, and structural

realities shaped both intention and action—offering insights that are particularly relevant for designing resilient, equitable healthcare systems in the post-COVID landscape.

2.3 Human Behavior

This study applies three key behavioral theories—Theory of Reasoned Action (TRA)**,** Health Belief Model (HBM)**, and** Theory of Planned Behavior (TPB)—to explore the factors that influenced healthcare-seeking behavior during and after the COVID-19 pandemic. TRA highlights how individual attitudes and perceived social expectations shape one's intention to seek care. HBM adds a health-focused lens, emphasizing how perceptions of risk, illness severity, and barriers influence decisions. TPB builds on these by introducing perceived behavioral control, acknowledging that people may intend to seek care but feel constrained by external factors like access and affordability. Through both the survey and interview tools, this study examines how these theoretical constructs play out in real-life healthcare decisions. To deepen this alignment, additional questions are proposed to better quantify perceptions, social influences, and control over access, offering a more complete understanding of healthcare utilization in a post-pandemic context.

2.4 Conclusion

The COVID-19 crisis has presented unprecedented challenges for governments worldwide, leading to difficult decisions involving health, economy, and society. The pandemic swiftly escalated into a global crisis in 2020, resulting in widespread school closures, lockdown measures, and significant health impacts. Healthcare systems faced unique challenges in managing patient surges and resource allocation. Governments responded with measures like testing, contact tracing, and social distancing, necessitating healthcare infrastructure strengthening. However, the pandemic disrupted regular healthcare services and altered utilization patterns, with telemedicine playing a crucial role. This literature review focuses on health issues, healthcare utilization patterns, and management strategies in Singapore

during and post-pandemic. The review aims to offer insights for policymakers, healthcare professionals, and stakeholders to enhance healthcare services and preparedness.

The COVID-19 pandemic has reshaped all facets of society, particularly healthcare systems. Understanding health challenges, shifts in healthcare utilization, and effective management strategies during and after the pandemic is imperative for future preparedness and improved healthcare services. By analyzing existing research, this review offers valuable insights to guide policymakers and healthcare professionals in navigating and mitigating the enduring impacts of the pandemic on healthcare systems and overall well-being. Additionally, post-pandemic health issues such as Post-COVID Conditions, with their range of persistent symptoms, have gained recognition. Understanding their prevalence, impact, and prevention strategies is vital for effective healthcare management and preparedness for potential future health crises. Continual research and collaboration will be essential in addressing the long-term health implications of the pandemic

The COVID-19 pandemic, caused by the SARS-CoV-2 virus, has led to unprecedented challenges for governments worldwide. The pandemic resulted in global lockdowns, school closures, and widespread health and economic impacts. Governments responded by implementing measures such as testing, contact tracing, and social distancing. The pandemic significantly strained healthcare systems, highlighting the need for adaptive healthcare paradigms. Long-term health consequences, known as Long-COVID or post-COVID conditions, have emerged as a concern, with symptoms persisting beyond the acute infection phase. This literature review explores the epidemiology of COVID-19 and Long-COVID, comorbidities' impact, symptomatology, and the effects on various body systems.

COVID-19 pandemic has illuminated the intricate interplay between health, society, and policy responses. The profound implications of the virus on global health systems and the emergence of Long-COVID as a post-infection challenge underscore the necessity of continuous research, preparedness, and adaptation. By understanding the epidemiology of both acute COVID-19 and Long-COVID, the medical community can better comprehend

risk factors, symptoms, and impacts across different populations. The classification of Long-COVID and its effects on various body systems further emphasizes the multifaceted nature of the pandemic's aftermath. Effective mitigation and management strategies require collaborative efforts from policymakers, healthcare professionals, researchers, and the broader society. As governments and healthcare systems continue to navigate uncertainties, the insights from this review contribute to informed decision-making and improved healthcare delivery, offering hope for a more resilient future in the face of health crises.

"Post-pandemic health conditions" refer to the various health issues and challenges that individuals may experience after the acute phase of a pandemic has subsided and the initial crisis has passed. These conditions can arise as a result of the pandemic's impact on healthcare systems, societal changes, and the individual's physical, mental, and emotional well-being.In the context of the COVID-19 pandemic, there have been reports of several post-pandemic health conditions that individuals, even those who have recovered from the acute phase of the virus, may continue to experience. Some examples include:

1. Long-COVID (Post-COVID Syndrome): Some individuals who have recovered from COVID-19 continue to experience a range of symptoms for weeks or months after their initial infection. These symptoms can include fatigue, shortness of breath, joint pain, brain fog, and more.

2. Mental Health Issues: The pandemic has taken a toll on mental health for many people. Anxiety, depression, and other mental health disorders may persist even after the pandemic has subsided due to the lingering effects of stress, isolation, and uncertainty.

3. Delayed Medical Care: During the pandemic, many individuals delayed or postponed routine medical care and elective procedures due to lockdowns, overwhelmed healthcare systems, and fear of exposure to the virus. These delays could lead to worsened health conditions or complications post-pandemic.

4. Chronic Health Conditions: Some individuals who experienced severe cases of COVID-19 may develop chronic health conditions as a result of the virus's impact on organs and bodily systems.

5. Healthcare System Strain: Healthcare systems around the world have been under immense strain during the pandemic, which could lead to longer wait times for medical care, delayed treatments, and other healthcare-related challenges even after the pandemic's acute phase ends.

6. Economic and Social Impact: The economic and social disruptions caused by the pandemic can have lasting effects on health, including increased stress, poverty-related health issues, and limited access to resources that promote well-being.

7. Behavioral Changes: Changes in lifestyle behaviors, such as increased sedentary behavior, altered sleep patterns, and changes in diet, during the pandemic could contribute to long-term health conditions.

It's important to note that the full extent and scope of post-pandemic health conditions are still being studied, as the COVID-19 pandemic is ongoing and research on its long-term effects is ongoing. Each pandemic can have unique effects on health, and the specific post-pandemic health conditions may vary depending on the nature of the pandemic, the response measures taken, and the resilience of healthcare and social system. (Soojin K et al 2022; Xiong, J,et al. (2020).).

The global impact of the COVID-19 pandemic is staggering. The pandemic's profound influence on healthcare systems, exemplified by Singapore's challenges in managing cases and ensuring resources, underscores the need to comprehend health issues and healthcare utilization during and after the crisis for effective management and future readiness. Amid the pandemic, healthcare systems confronted diverse issues that required adaptability and resilience, yet some aspects like patient-centered care (PCC) were overlooked. Mental health challenges escalated, while chronic disease management complexities grew due to limited healthcare access. Notably, telemedicine adoption surged, and hospital admission patterns shifted, emphasizing the importance of resource allocation, long-term outcomes,

and planning. Effective strategies, like Singapore's comprehensive measures, were pivotal in mitigating the pandemic's impact, necessitating widespread testing, contact tracing, and healthcare infrastructure reinforcement. This review has analyze health issues, utilization trends, and strategies during and post-pandemic in Singapore, providing insights for enhancing healthcare services and preparedness. Addressing healthcare utilization post-COVID requires understanding the virus's impact on diverse populations, objective outcomes, and factors like mental health, food security, and mobility. Additionally, global efforts to predict post-COVID-19 syndrome highlight the necessity of continued research, as millions suffer persistent symptoms beyond the acute infection phase. The pandemic's declaration as a global crisis by the WHO in March 2020 significantly affected multiple facets of life, emphasizing the importance of comprehensive response strategies to address its far-reaching consequences (Betancourt JA, et,al. 2020;Cassell K, et, al 2022; Debski M et al., 2022; Dujeepa D. Samarasekera 2023; El Keshky MES et al., 2020; Garfan S et al 2021; Kelli N. O'LaughlinI, 2021;Munblit D et al, 2022 ; OECD, 2020; Omboni, S et, al. 2022; Patel U et al., 2020; Renaud CJ, et al 2021 ; Shamsi Al et al., 2020; Soojin K et, al 2022.;Tan JB, et al 2020; WHO, 2020); Winkelmann J,et ,al 2022; Yang Y, et ,al. 2022.)

Further research into the long-term effects on older adults' mental wellbeing is necessary. Information and Communication Technology (ICT) solutions like smart devices and apps can aid in promoting active and healthy lifestyles, reducing psychosocial strain especially in vulnerable population such as older adults (Trabelsi K, A ,et, al. 2021).

The available studies on COVID 19 and PCC provide limited data and hence there is a paucity of enough data health issues and utilization of healthcare services, especially in reference to Singapore. To plan, design and implement better healthcare services programs and policies, it is at most important to have information and understanding of these issues. Current study will attempt to provide some insights health issues and pattern on utilizing the health care services, to the planner's policy makers, researcher, healthcare provider, to cater the needs and provide better healthcare services and programs.

2.5 Summary

The COVID-19 pandemic, originating in early 2020, has left an indelible mark on the global landscape, impacting not only public health but also economies and societies worldwide. It ushered in widespread school closures and lockdowns, affecting billions of individuals, while also resulting in millions of reported cases and fatalities on a global scale. Healthcare systems, initially grappling with surges in patient numbers, had to swiftly adapt to new paradigms and challenges. Governments introduced measures such as widespread testing and telemedicine, which significantly altered patterns of healthcare utilization. This comprehensive literature review zooms in on the experience of Singapore during the pandemic years spanning from 2020 to 2023, delving into the prevailing health concerns, shifts in healthcare utilization, and strategies employed in managing this public health crisis. Furthermore, the aftermath of the pandemic has given rise to a unique set of health challenges termed "Post-COVID Conditions" or "Long-COVID," which manifest as persistent health problems following a COVID-19 infection. Current estimates suggest that between 10% to 20% of individuals who contract COVID-19 could develop Long-COVID, although vaccination has been observed to reduce this risk. These conditions encompass a diverse array of symptoms, affecting not only physical health but also having neurological and respiratory implications. Understanding the epidemiology of Long-COVID is of paramount importance for healthcare management and future preparedness. (Ann SN et al., 2022; Betancourt JA et al., 2020; Cassell K et al., 2022; CDC 2021A; Debski M et al., 2022; Dujeepa D. Samarasekera 2023; El Keshky MES et al., 2020; Garfan S et al., 2021; Kelli N. O'LaughlinI, 2021; Munblit D et al., 2022; OECD, 2020; Omboni S et al., 2022; Patel U et al., 2020; Renaud CJ et al., 2021; Shamsi Al et al., 2020; Soojin K et al., 2022; Tan JB et al., 2020; WHO, 2020; Winkelmann J et al., 2022; Yang Y et al., 2022; KhuntK and Mahoney LO, 2022; CDC, 2023c; Davis HE, 2023; NCID, 2023; CDC, 2023b; CDC, 2023a). This literature review provides a comprehensive overview of the COVID-19 pandemic's multifaceted impact, from its global spread in late 2019 to its repercussions on public health, including insights into Long-COVID. It is critical to understand the evolving

epidemiology of the virus, which primarily spreads through respiratory droplets and has an incubation period of 2-14 days. Various risk factors, such as age and comorbidities like hypertension, diabetes, and obesity, influence the severity of COVID-19 outcomes. The pandemic's impact is not uniform across regions and is shaped by public health measures and vaccination efforts. Additionally, the psychological effects of the pandemic, particularly on specific demographic groups, have been profound. Long-COVID, a condition with symptoms extending beyond the acute phase, affects individuals of all age groups, with certain factors like age, gender, and underlying health conditions contributing to the risk. These long-lasting symptoms encompass a wide range of health issues, from fatigue to cognitive impairments, with older individuals being particularly vulnerable. The presence of comorbidities exacerbates the severity of both COVID-19 and Long-COVID. Symptoms of Long-COVID can persist for months and impact multiple body systems, including the nervous, respiratory, and reproductive systems, often leading to mental health challenges. A nuanced understanding of these aspects is imperative for effective disease management and the establishment of robust support systems (CDC, 2021A; WHO, 2021; Lauer et al., 2020; Onder et al., 2020; Williamson et al., 2020; JHU, 2021; Ammar et al., 2020; Cummins et al., 2021; Dessie and ZewotiT, 2021; Kaeuffer et al., 2020; Kompias et al., 2022; Sudre et al., 2021; Morrow et al., 2022; Staffloni et al., 2022; Osmanov et al., 2022; Thompson et al., 2021; Felicia Ceban, 2021; Pollack et al., 2023; Mansell et al., 2022; Patel U et al., 2022; Taquet et al., 2021).

This review has not only examined the global impacts but has also honed in on the specific experiences of Singapore during these pandemic years. The pandemic's effects on healthcare utilization, health issues, and the management strategies employed in Singapore provide valuable insights into how different regions have responded to the crisis. The overarching goal is to bridge existing gaps in our understanding of health issues and healthcare utilization patterns, particularly within the Singaporean context. This knowledge will serve as a cornerstone for better healthcare service planning and policy development. This study leverages the Theory of Reasoned Action (TRA), the Health

Belief Model (HBM), and the Theory of Planned Behavior (TPB) to comprehensively understand healthcare utilization patterns during and after the COVID-19 pandemic. The TRA helps explain how attitudes and social norms influence intentions, which in turn drive behavior. The HBM provides insights into how perceptions of susceptibility, severity, benefits, and barriers affect healthcare-seeking decisions. The TPB extends this by examining perceived behavioral control, acknowledging that even with intentions, external factors can limit actions

The Theory of Reasoned Action (TRA) posits that an individual's intention to perform a behavior is the strongest predictor of that behavior. The Health Belief Model (HBM) focuses on health perceptions in decision-making. It includes constructs like perceived susceptibility, severity, benefits, barriers, and cues to action. The Theory of Planned Behavior (TPB) builds on TRA by incorporating perceived behavioral control, which refers to an individual's belief in their ability to perform a behavior. This is crucial in explaining healthcare utilization, as individuals may have had the intention to seek healthcare but were limited by external factors.

The questionnaire and interview guide are designed to capture these theoretical constructs through questions assessing perceived risks and benefits, social influences, health perceptions, and control over healthcare access. To further enhance the study's alignment with these theories, additional questions are suggested to quantify these constructs and provide a more nuanced understanding of the factors influencing healthcare utilization.

CHAPTER III:

METHODOLOGY

3.1 Overview of the Research Problem

The World Health Organization declared COVID-19 a global pandemic in March 2020, precipitating a worldwide crisis that significantly impacted various dimensions of life, including physical, mental, emotional well-being, and socio-economic aspects (El Keshky MES et al, 2020; Patel U et al, 2020). The ensuing public health emergency prompted a global response from healthcare systems, causing strain and disruptions. Amid this, Singapore emerged as a noteworthy example, effectively managing both the pandemic and post-pandemic crises with immediate public health actions (Munblit D et al, 2022; Tan et al 2020; Wong J et al, 2020).

Singapore, a multilingual and multi-ethnic nation, boasts a robust healthcare system ensuring quality, affordability, and accessibility of services, making it one of the best globally (MOH-SG 2022; Phua KH, 2020). However, despite the global attention on COVID-19, there is a paucity of comprehensive data on health issues and healthcare service utilization during and post-COVID-19, hindering effective planning and policy implementation (Munblit D et al, 2022; Smith P et al, 2022). To address this gap, the current study aims to provide insights into prevalent health issues, patterns of healthcare service utilization, and factors influencing these dynamics.

The preliminary literature review underscores the neglect of Post-COVID Conditions (PCC) in existing studies, emphasizing the need to understand the health impact beyond acute symptoms (Munblit D et al, 2022). With COVID-19 being more severe in individuals with comorbidities, there is a critical gap in established studies on PCC, despite global vaccination efforts reducing case numbers (Patel U et al, 2020). Understanding the epidemiology of COVID-19 and PCC is essential for comprehensive healthcare

management, requiring a deep understanding of health issues, behavioral patterns, and factors influencing healthcare service utilization (Phua KH, 2020; Ann S et al, 2022).

It is essential to address this knowledge gap to better comprehend the health issues faced by individuals during and after the COVID-19 pandemic, as well as the patterns of healthcare service utilization. The study will provide valuable insights into the health conditions that arise during the pandemic and post-pandemic periods, offering a more comprehensive understanding of who is more likely to experience Post-COVID Conditions and the factors contributing to these conditions. Additionally, it will shed light on the behavioral patterns of individuals in seeking healthcare services, addressing the impact of cultural beliefs, access, cost, and insurance on healthcare utilization. Poor or deferred utilization of healthcare services has the potential to lead to severe consequences for individual health and strain healthcare management systems.

Given the unique case of Singapore, this study will focus on providing insights into health issues and behavioral patterns related to healthcare service utilization during and after the pandemic. By doing so, it will offer valuable information to policymakers, researchers, and healthcare providers to design and implement better healthcare services and programs, catering to the evolving needs of the population in the face of the ongoing global health crisis and the potential long-term health consequences that may follow. The study will contribute to the preparedness and effectiveness of healthcare systems in Singapore and potentially serve as a model for other regions seeking to manage and respond to the challenges posed by the COVID-19 pandemic and its aftermath,

In conclusion, the absence of comprehensive data on COVID-19 and PCC -related health issues and healthcare service utilization in Singapore poses a significant challenge. This study seeks to fill these gaps by collecting both quantitative and qualitative data from individuals in Singapore who tested positive for COVID-19 between January 2020 and December 2023. The objectives include providing information on prevalent health issues,

understanding patterns of healthcare service utilization, and offering insights into people's perceptions and behavioral patterns during and post-COVID-19. The study's findings will serve as a valuable resource for planners, policymakers, researchers, and healthcare providers, contributing to effective healthcare strategies and program, ultimately improving healthcare services and ensuring the well-being of the population.

3.2 Operationalization of Theoretical Constructs

S.No	Research Area	Theoretical Construct	Operationalization
1	Health Issues	Broad concept of health problems experienced by individuals.	Quantitative: Self-reported presence of symptoms (e.g., fatigue, respiratory issues, anxiety), diagnosis of chronic or post-COVID conditions via self-report or records, and number of pre-existing comorbidities.
			Qualitative: Interview questions exploring impact of health issues on daily life; narratives describing lived health experiences.
2	Healthcare Service Utilization	Extent to which individuals engage with healthcare systems and services.	Quantitative: healthcare providers, types of services used
			Qualitative: In-depth accounts of accessing care, challenges in navigating services, satisfaction levels, and the perceived adequacy of care received.
3	Factors Influencing Healthcare-Seeking Behavior	Determinants shaping decisions around seeking healthcare.	Quantitative: Measures of perceived accessibility affordability (costs, insurance), cultural beliefs, and socioeconomic indicators (income, education).
			Qualitative: Exploration of reasons for seeking/delaying care, social support influences, cultural perceptions, and structural or emotional barriers to healthcare access.
4	Questionnaire Constructs	Demographics, health status, service use, and	Demographics: Age, gender, occupation, income, education, ethnicity, residency status (all as categorical variables).

			Health Issues: Pre-, during-, and post-COVID conditions (dichotomous with free-text for elaboration).
		perceptions of healthcare systems.	Healthcare Utilization: Frequency, type of services, reasons for use, change in behavior, influencing factors, and access challenges.
			Access & Satisfaction: Accessibility and efficiency ratings (ordinal); telehealth usage and satisfaction.
			Health Issues: Impact and management of health concerns during COVID.
			Healthcare Utilization: Behavioral patterns, decision-making influences, and satisfaction.
			Healthcare Behavior Change: Shifts in habits and telehealth engagement.
			Access to Facilities: Barriers and enablers during/post-pandemic.
		Thematic exploration of experiences with health	Policy and Governance: Feedback on government interventions.
5	Qualitative Interview Guide	and healthcare systems.	Community Support

3.3 Research Purpose and Questions

Purpose of the Study

The COVID-19 pandemic, declared a global health emergency by the World Health Organization (WHO) in March 2020, has had profound effects on multiple aspects of life, including physical health, mental well-being, socio-economic stability, and healthcare systems worldwide. While much attention has been given to acute COVID-19 symptoms and immediate pandemic responses, there remains a significant knowledge gap regarding post-COVID conditions (PCC) and healthcare service utilization during and after the pandemic. This study aims to address this gap by providing comprehensive insights into prevalent health issues, healthcare-seeking behaviors, and service utilization patterns in Singapore from January 2020 to December 2023.

Singapore's effective management of the pandemic, characterized by extensive screening, contact tracing, and public health interventions, presents a unique case for understanding healthcare service utilization during this period. Despite the country's robust healthcare system, there is limited data on the long-term health implications of COVID-19 and the evolving patterns of healthcare access and utilization post-pandemic. Understanding these aspects is essential for informing healthcare policies, optimizing resource allocation, and improving service delivery.

This study aims to:

1. Identify the primary health issues faced by individuals in Singapore during and after the COVID-19 pandemic.
2. Examine the patterns of healthcare service utilization, including changes in healthcare-seeking behavior during the pandemic and post-pandemic periods.
3. Investigate factors influencing healthcare utilization, such as socio-economic status, accessibility, affordability, cultural beliefs, and insurance coverage.
4. Explore the experiences and perceptions of individuals regarding healthcare services during and after the pandemic.
5. Provide data-driven insights to aid policymakers, healthcare providers, and researchers in designing and implementing effective post-pandemic healthcare strategies.

By collecting both quantitative and qualitative data from individuals who tested positive for COVID-19 between January 2020 and December 2023, the study will generate valuable evidence on the health challenges faced by the population and the determinants of healthcare utilization. These insights will contribute to strengthening healthcare systems, enhancing post-pandemic health interventions, and ensuring preparedness for future public health crises.

3.4 Research Design

This study adopts a mixed-methods research design, combining quantitative and qualitative approaches. A cross-sectional study design was employed, that allows for the collection of data at a single point in time, offering insights into health issues and healthcare utilization during the targeted period

The quantitative phase involve a survey to assess healthcare utilization patterns, prevalence of health issues, and factors influencing changes in healthcare-seeking behavior. The qualitative phase employed in-depth interviews to explore the experiences and perspectives of experts during and post the COVID-19 pandemic.

3.5 Population and Sample Selection

Study Population

Study population includes people living in Singapore during 2020 and 2023, age 18 and above.

Inclusion Criteria:

1. Geographic Location:
   - Participants were residing in Singapore during the specified study period (2020-2023).
2. Age:
   - Individuals aged 18 years and above.
3. Language Proficiency:
   - Participants should be fluent in English or a language for which translation resources are available.
4. Consent and Willingness:
   - Participants must provide informed consent to participate in the study.
   - Willingness to share personal experiences related to health issues and healthcare utilization.

Exclusion Criteria:

1. Age:
   - o Individuals below the age of 18.
2. Geographic Location:
   - o Participants residing outside of Singapore during the study period.
3. Language Barriers:
   - o Individuals who do not understand or speak English or any language for which translation resources are unavailable.
4. Cognitive Impairment:
   - o Participants with severe cognitive impairments that may hinder their ability to provide coherent and reliable responses.
5. Inability to Provide Consent:
   - o Individuals who are unwilling or unable to provide informed consent for participation.

These inclusion and exclusion criteria were aimed to ensure that the study includes participants who can contribute relevant information about health issues and healthcare utilization in Singapore during and post the COVID-19 pandemic. These criteria also help in maintaining the ethical standards of the research and ensuring the validity and reliability of the data collected.

3.6 Sampling Method

Purposive Sampling: Participants were selected based on their relevance to the study, such as those with recent healthcare experiences or diverse demographic backgrounds.

Convenience Sampling: Participants were recruited opportunistically from public spaces, workplaces, community centers, and other accessible locations.

Snowball Sampling: Initial participants were asked to refer others who might have relevant experiences with health issues and healthcare utilization during and post the pandemic.

3.7 Sample Size

The 95% Confidence interval with a 4-8% margin of error is considered a good sample size. For this study, 95% Confidence interval with a 4% margin of error for the Singapore population is 601 and 95% Confidence interval with an 8% margin of error for the Singapore population (5.92 million) is 151 (NPTD,2023). Considering the nature of the study, academic purpose, and limitation concerning the availability of resources, a sample size of this with a 95% Confidence interval with 8% margin of error is deemed feasible for this study, considering the practical constraints of a single researcher within a limited timeline. We managed to secure 152 respondents for this study. This number allows for meaningful insights while acknowledging the limitations of the chosen sampling methods. Since most of our participants were young group due to the purposive snowball and Convenience sampling and because the population of Singapore is one of the hubs of ageing in Asia, a cautious and mindful effort was taken in collecting the qualitative data to get crucial information on ageing. For qualitative data, in-depth interviews with 8 experts were conducted. These are inclusive of experts from different sectors, including health, social, academic, research, policy, and planning will be interviewed.

Instrumentation:

Semi-structured Questionnaire for survey, including closed and open-ended questions to collect quantitative data, and an Interview guide for collecting qualitative data

3.8 Data Collection Procedures

Quantitative Data (Survey-Based Research)

To understand health issues and healthcare utilization patterns, a survey was carried out with 152 participants living in Singapore. The survey was developed using a semi-structured questionnaire, which included both multiple-choice and open-ended questions. After a pilot test, adjustments were made to improve clarity before conducting the final round of data collection.

The survey gathered information on participants' demographic profiles, health conditions experienced during the pandemic, and how they accessed healthcare services before, during, and after COVID-19. It also asked about the challenges they faced and the factors that influenced their healthcare decisions.

Surveys were conducted both online and in person, depending on what was most convenient for each participant. This flexible approach helped ensure better participation while respecting confidentiality and autonomy. No personal identifiers were collected.

A mix of purposive, convenience, and snowball sampling methods was used. Participants were recruited through community groups, social media, and referrals. The sample included people of different ages and genders, all living in Singapore.

In addition to the primary data, publicly available secondary data from government sources (e.g., the Ministry of Health) was used to support the analysis. Variables such as age, income, education, health conditions, hospital visits, and healthcare usage were analyzed.

The survey data was examined using basic statistical tools to highlight general trends—such as how often people used healthcare services or what influenced their choices. The analysis focused mainly on descriptive statistics and frequency distributions, with the aim of identifying broader patterns in healthcare behavior within the community. The data covers the period from 2020 to 2023 to reflect the pandemic and post-pandemic phases.

Qualitative Data (In-Depth Interviews)

To complement the survey findings and explore experiences in more depth, in-depth interviews were conducted using a semi-structured guide. These conversations focused on people's personal experiences with health, healthcare access, and system challenges during the pandemic. Participants included a purposive sample of Singapore residents from different sectors, such as healthcare, academia, policy, and community work. Since the survey data leaned toward younger respondents, interviews were also conducted with experts in ageing and elderly care to ensure older adults' perspectives were represented. In total, eight interviews were included in the study. Published interviews with healthcare providers were also considered as supplementary sources. The interviews explored a range of topics, including:

- Experiences with health issues and daily life disruptions during COVID-19
- Changes in healthcare-seeking behavior
- Use of telehealth and digital services
- Barriers to accessing care
- Perceptions of public healthcare responses and government policies
- Community support and collaboration during the crisis

Participants were asked for consent, and the conversations were carried out respectfully and confidentially. Data from these interviews were analyzed thematically to identify common threads and meaningful insights across different narratives.

3.9 Data Analysis

Quantitative Data: Descriptive statistics were used to analyze survey responses, highlighting trends in health issues and healthcare usage.

Qualitative Data: Thematic analysis of interviews identified key themes in participants' experiences with healthcare during the pandemic.

Timeline

- Quantitative data collection took place early, followed by analysis.
- Qualitative interviews were conducted later, due to scheduling issues, with data collection and analysis overlapping.
- Writing and final edits were completed by March 2025, taking longer than expected.

3.10 Ethical Considerations

This study was conducted in full compliance with established ethical guidelines for research involving human participants. Prior to the commencement of any data collection—whether quantitative or qualitative—written informed consent was obtained

from all participants. The objectives, scope, and potential contributions of the research were clearly explained to each participant to ensure transparency and understanding. Participation in the study was entirely voluntary, and individuals were assured that they could decline to answer any questions or withdraw from the study at any point without any consequences.

Confidentiality and privacy were strictly maintained throughout the research process. All data were anonymized to protect participant identities, and any identifying information was securely stored and accessible only to the research team. Sensitivity was exercised during interviews and survey administration, particularly when discussing health-related or personal topics. The dignity, autonomy, and well-being of each participant were prioritized at every stage of the research.

This ethical approach not only aligns with institutional review board standards but also reflects a deep respect for the lived experiences of those who contributed to the study.

This study was conducted strictly for academic purposes as part of a doctoral research project. While no personally identifiable information (PII) was collected from participants, ethical research standards were rigorously followed. The study involved voluntary participation through anonymous surveys and/or interviews, with informed consent obtained from all participants prior to data collection. Personal identifiers will be removed to ensure anonymity for identification for in depth interviews .

As the research posed minimal risk and maintained participant anonymity throughout, it falls under the category of low-risk academic research. This was done in accordance with institutional guidelines, and thereby formal IRB approval was not required. However, ethical principles—including respect for persons, beneficence, and justice—were carefully upheld. Participants were informed of their rights, including the right to withdraw at any time, and all data was handled with strict confidentiality and sensitivity.

3.11 Research Design Limitations

Simple stratified sampling method is quite not feasible considering the limitation of resources. Hence the sampling method we will use may introduce bias, particularly in the

case of purposive and snowball sampling. This have further affected the composition of the sample. However to balance the in-depth interviews were conducted considering the missing elements of the sample in reference with the demographic of Singapore, In addition to this , since the study tools are in English the people who cannot understand English won't be included. Moreover, the study will not include less than 18-year participants. These may affect generalizable to the entire population. Also due to sampling method the age representation in quantitative data was skewed, however we tried to balance the effect by including people from ageing sector for interviews.

Despite the limitations, the study manages to provide valuable insights into health issues and healthcare service utilization patterns in Singapore during and post the COVID-19 pandemic. The overall results offer localized perspectives that contribute to the broader understanding of the subject. This study could be beneficial in below mentioned ways:

Innovation and Business Strategies

The innovation behind our work lies in the integration of a mixed-methods research design with advanced sampling techniques and comprehensive data analysis methods. By combining quantitative surveys with qualitative in-depth interviews, we gain a multifaceted understanding of health issues and utilization patterns. Our approach allows us to capture not only statistical trends but also the nuanced experiences and perspectives of individuals and experts from various sectors. Additionally, our innovative sampling methods, including purposive, convenience, and snowball sampling, ensure that we gather diverse and representative insights from the population of interest. This inclusive approach enhances the validity and reliability of our findings, providing a more holistic understanding of healthcare dynamics. Furthermore, our utilization of both secondary and primary data sources, such as health records, national surveys, and published reports, alongside structured surveys and semi-structured interviews, enables us to triangulate information and validate results. This rigorous data collection and analysis process

enhances the credibility and robustness of our conclusions. Overall, our innovative approach empowers us to uncover deep insights into health issues and utilization patterns, informing evidence-based decision-making and driving meaningful improvements in healthcare delivery and policy formulation, especially considering the Singapore's demographic dynamics.

Framework business model: Innovation and Business Strategies

The results from the study is used to design logic models and customer in this case as are patients , so patients journey mapping in the context of healthcare .Along with this a comprehensive road map integrating logic model and patient journey mapping
Here's how:

A) **Logic Model**: A logic model is a visual representation that outlines the relationship between program inputs, activities, outputs, outcomes, and impacts. The study findings can inform the development of a logic model by providing insights into the factors influencing healthcare utilization, the effectiveness of interventions, and the outcomes achieved.

   For example:
   - **Inputs**: Resources invested in healthcare programs and interventions.
   - **Activities**: Healthcare services, interventions implemented, and policies enacted.
   - **Outputs**: Services delivered or utilized by patients, patient engagement
   - **Outcomes**: Changes in health behaviors, health outcomes, and satisfaction levels among patients.
   - **Impacts**: Long-term changes in population health, reduction in healthcare disparities, and enhanced healthcare access and quality.

B) **Patient Journey Mapping:**

Patient journey mapping offers a structured lens to understand how individuals engage with healthcare systems—from recognizing health needs to post-treatment care. Findings from this study reveal six key stages, each highlighting barriers and opportunities:

1. Awareness & Health Perception: Health literacy is low, especially among low-income groups. Preventive care is underutilized due to cost and cultural beliefs. *Opportunity*: Promote preventive care and targeted outreach.

2. Symptom Onset & Decision-Making: Fear of COVID-19 and financial concerns shape decisions. Public vs. private care choices hinge on affordability and access. *Opportunity*: Expand telemedicine and financial support.

3. Seeking Care: Public healthcare remains overcrowded; appointment systems and digital access need improvement. *Opportunity*: Improve scheduling systems and telehealth integration.

4. Treatment & Diagnosis: Doctor-patient interactions are limited; follow-up care is inconsistent, especially for chronic and long-COVID cases. *Opportunity*: Enhance specialist services and triage efficiency.

5. Post-Treatment & Follow-Up: Mental health and rehabilitation services are lacking. Long-term care is costly and fragmented. *Opportunity*: Invest in mental health, rehabilitation, and eldercare.

6. Long-Term Health & Prevention: Disparities in access and affordability persist.System resilience remains a concern. *Opportunity*: Strengthen equity-focused policies and emergency preparedness.

Mapping these stages provides critical insight into patient needs and system inefficiencies, guiding more responsive and inclusive healthcare planning

 C) Comprehensive Road Map

we can align the patient journey framework with a logic model. This helps translate real-world patient experiences into actionable strategies across six key stages:

Discuss Issues, Strategies, Outcomes, and Long-Term Impact of bellow 6 key stages

1. Awareness & Health Perception
2. Symptom Onset & Decision to Seek Care.

3. Accessing Services During Crisis

4. Diagnosis & Treatment Experience

5. Recovery & Follow-Up Care

6. Long-Term Engagement & Prevention

Utilization of the results from this study

Beyond academic value, the findings of this study hold practical relevance for a range of stakeholders in the healthcare sector. They can inform quality improvement efforts by highlighting service gaps, patient needs, or systemic challenges, enabling healthcare institutions to enhance care delivery. Educational institutions may integrate these insights into training programs to better prepare future healthcare professionals for evolving demands. The insights gathered through this research extend well beyond academic inquiry and have the potential to benefit a wide range of stakeholders across the healthcare landscape. Given the study's focus on healthcare utilization, access, and long-term health impacts in Singapore during and after the COVID-19 pandemic, the findings can meaningfully inform both policy and practice.

Healthcare institutions may use the results to identify areas where services can be improved, especially in light of disruptions and shifts in patient behavior caused by the pandemic. This could support ongoing quality improvement efforts and patient-centered care strategies. Equally, training institutions—such as medical and nursing schools—can draw from the study to provide students with real-world examples that reflect current challenges and changing care models.

Additionally, the study offers evidence that can be used to refine health planning and public health preparedness, particularly in terms of resource distribution and system resilience. For instance, if findings suggest growing acceptance of telehealth, there may be opportunities to scale digital care models more effectively. Community organizations might also use the data to tailor outreach and education efforts, ensuring they are responsive to the specific needs of vulnerable or underserved groups.

Moreover, the data may serve as a foundation for further academic research—whether through follow-up studies, international comparisons, or longitudinal tracking of healthcare trends in the post-pandemic era. Despite its limitations, this study provides a meaningful starting point for deeper inquiry and offers a practical resource to support evidence-based decisions, both in Singapore and potentially in similar healthcare contexts elsewhere.

CHAPTER IV:

RESULTS

4.1 Introduction

This is a mixed-methods study that employed both quantitative and qualitative approaches to examine health issues and healthcare utilization among people living in Singapore during and after the COVID-19 pandemic. The quantitative component involved structured surveys distributed through purposive, convenience, and snowball sampling, targeting individuals across age, gender, and occupation. Data were collected online and offline, with participants responding to closed and open-ended questions covering demographic details, health status, service use, and access challenges. Descriptive statistics were used to analyze frequencies and trends over the 2020–2023 period, supplemented by secondary data from national health reports and Ministry of Health publications. Parallel to this, qualitative data were gathered through in-depth, semi-structured interviews with individuals from diverse backgrounds, including community members, healthcare professionals, and policymakers. These interviews explored lived experiences, behavioral shifts, and system-level barriers, providing rich contextual insight. Thematic analysis was used to draw out key patterns, focusing on areas such as telehealth uptake, fear-driven healthcare avoidance, chronic disease management, and community support during crisis

4.2 Methodology: Organization of data

This study employed a mixed methods approach, integrating both quantitative and qualitative data to comprehensively explore healthcare utilization, access, and health outcomes in the context of the COVID-19 pandemic in Singapore. The organization of

data collection and analysis was structured in a way that allowed each dataset to offer unique but complementary insights.

Quantitative Data: Structure and Key Areas of Focus

The quantitative component of the study was derived from a structured survey distributed online. The survey comprised a combination of closed-ended questions aimed at capturing demographic variables, health history across different pandemic phases, patterns of healthcare usage, and perceptions of service efficiency and accessibility.

The quantitative data was organized around two main analytic phases:

1. **Descriptive and Univariate Analysis**
   This initial phase focused on providing a demographic profile of the sample and examining the distribution of key variables. Variables such as age, gender, education level, employment status, income, residency, and healthcare choices were explored individually. These univariate findings offered foundational insight into who the respondents were, their general health status, and the nature of their engagement with the healthcare system.

2. **Epidemiological Analysis**
   Building upon the descriptive data, this phase aimed to explore patterns and associations within the dataset. Particular attention was given to infection prevalence, chronic disease history, post-COVID complications, and shifts in healthcare behavior. This analysis enabled identification of population-level trends and health disparities, particularly around healthcare access and health outcomes during different stages of the pandemic. It also highlighted areas of unmet need, especially among groups affected by long COVID symptoms and barriers to service use.

Qualitative Data: Thematic Structure and Focus Areas

To complement the quantitative findings and delve deeper into personal and systemic experiences, semi-structured interviews were conducted with older adults, healthcare providers, and community stakeholders. These interviews were audio-recorded, transcribed verbatim, and analyzed using thematic analysis.

The qualitative data was organized thematically to capture recurring challenges, behavioral adaptations, and institutional gaps experienced during the pandemic. Key themes included:

- Disruption in chronic disease and mental health management
- Fear-driven avoidance of healthcare facilities
- Digital exclusion and the limitations of telehealth
- Community and informal support systems
- Policy gaps and the need for integrated care
- Evolving health behaviors post-pandemic

Thematic analysis was selected as the most appropriate framework for this part of the study because of its flexibility and capacity to surface rich, nuanced insights from the lived experiences of participants. Themes were identified through iterative coding, constant comparison, and alignment with the theoretical frameworks guiding the study— namely, the Health Belief Model (HBM), Theory of Planned Behavior (TPB), and Theory of Reasoned Action (TRA).

Integration of Data for Analysis

While the quantitative and qualitative datasets were analyzed separately, findings were integrated during interpretation to draw more holistic conclusions. Together, they revealed not just how healthcare access and behaviors shifted during the pandemic, but also why those changes occurred—and how individuals navigated the system under evolving constraints.

This integrated approach ensured that the study did not reduce healthcare experiences to statistics alone but recognized the human factors, emotional responses, and social dynamics that shape how people interact with health systems, particularly during times of crisis.

4.3 Quantitative: Descriptive and Univariate Results

4.3.1 Section 1: Demographics

Table 4.1.1Demographic Table

Demographic	Category	Subcategory	Frequency	Percent (%)
	Age Range	18-25	40	26.3
		26-30	10	6.6
		31-35	16	10.5
		36-40	6	3.9
		41-45	12	7.9
		46-50	9	5.9
		51-55	1	0.7
		56-60	5	3.3
		61-65	4	2.6
		66-70	4	2.6
		71-75	0	0
		76-80	3	2
		81+	2	1.3
	Gender	Female	67	44.1

		Male	83	54.6
		Other	2	1.3
	Occupation	Employed	47	30.9
		Homemaker	17	11.2
		Retired	14	9.2
		Student	70	46.1
		Unemployed	4	2.6
	Income Level (SGD per month)	Above 8,000	14	9.2
		Below 2,000	104	68.4
		2,001 - 5,000	14	9.2
		5,001 - 8,000	20	13.2
	Education Level	Bachelor's Degree	41	27
		Diploma	50	32.9
		Postgraduate Degree	20	13.2
		Primary School	5	3.3
		Secondary School	36	23.7
	Ethnicity/Race	Chinese	72	47.4
		Indian	34	22.4
		Malay	30	19.7
		Other	16	10.5
	Status in Singapore	Citizen	104	68.4
		Foreigner	12	7.9
		Permanent Resident	36	23.7

Age Distribution

The majority of respondents (26.3%) fall within the 18-25 age group, indicating a younger demographic presence. Notably, participation decreases significantly beyond age 50, with minimal representation among individuals aged 70 and above (3.3%). This suggests a potential age-related digital divide or survey accessibility issues for older adults.

Gender Representation

The gender distribution shows a near-balanced split, with males (54.6%) slightly outnumbering females (44.1%), while a small percentage (1.3%) identified as "Other." This distribution reflects general population trends, though further analysis is needed to determine if gender plays a role in responses.

Occupation and Economic Status

A significant proportion (46.1%) of respondents are students, aligning with the dominant age group (18-25). The employment rate (30.9%) is moderate, while homemakers(11.2%) and retirees (9.2%) make up a smaller segment. Income levels are heavily skewed towards the "Below 2,000 SGD" category (68.4%), likely due to the high number of students. A smaller proportion earns above 8,000 SGD (9.2%), suggesting income disparity among the respondents.

Educational Background

Most respondents have either a Diploma (32.9%) or a Bachelor's Degree (27%), indicating a relatively educated population. Postgraduate degree holders (13.2%) are present but not dominant, while a notable 23.7% have only secondary education. A small proportion (3.3%) has only primary-level education, potentially impacting their socioeconomic mobility.

Ethnicity and Residency Status

The ethnic composition is led by Chinese respondents (47.4%), followed by Indian (22.4%) and Malay (19.7%) participants, reflecting Singapore's broader demographic makeup. Foreigners (7.9%) and permanent residents (23.7%) form a minority, with citizens comprising the majority (68.4%).

Young and Student-Dominated Sample: The predominance of 18-25-year-olds and students (46.1%) suggests that survey responses may reflect younger perspectives, with limited input from older populations. Low-Income Representation: The high percentage (68.4%) earning below 2,000 SGD highlights economic constraints, possibly due to student status or underemployment. Educational Attainment is Relatively High: A substantial number have diplomas or degrees, suggesting respondents are in the early or mid-stages of their professional development. Citizens Form the Majority: Singapore citizens make up 68.4%, while foreign participation is relatively low, which may influence perspectives on policies affecting residents versus non-residents.

Gender distribution is fairly balanced, and while many respondents are unemployed or underemployed, income levels are skewed towards the lower end—likely reflecting student status. Educational attainment is relatively high, with most holding diplomas or degrees, indicating a generally well-educated group. Ethnic representation mirrors Singapore's broader population, with Chinese, Indian, and Malay respondents forming the bulk. Most participants are citizens, with fewer permanent residents and foreigners, which may shape views on national versus resident-specific healthcare policies.

4.3.2 Section 2: Health Issues:

4.3.2.1Health Issues Reported During COVID-19
The health issues noted before Covid 19

Table 4.3.2.2 Health issues before Covid: Frequency of participants

Response	Frequency	Percent
- No	120	78.9
- Yes	32	21.1
Total	152	100.0

The health conditions identified in this study prior to the COVID-19 pandemic encompass a range of chronic and acute illnesses affecting different body systems. Respiratory conditions such as asthma, with both childhood occurrences and isolated attacks in adulthood, as well as sinus-related issues and allergies, were reported. Additionally, individuals experienced flu, common colds, and persistent runny noses.

Metabolic disorders, particularly diabetes and hypertension, were commonly mentioned, sometimes coexisting. Musculoskeletal issues, including arthritis, joint pain, muscle pain, and sarcopenia, were also prevalent. Chronic back problems, both from younger years and persisting into later life, were highlighted, along with lower back pain.

Mental health concerns included depression and borderline personality disorder (BPD), while neurodegenerative conditions such as Alzheimer's disease were also noted. Kidney-related health issues ranged from kidney infections to kidney disease.

Other reported conditions included appendicitis, as well as a history of cancer. These varied health conditions indicate a complex interplay of chronic illnesses, acute infections, and age-related degenerative diseases experienced before the onset of COVID-19.

4.3.2.3 Health Issues –During COVID

Table 4.3.2.3 Health Issues –During COVID. Have you had a COVID-19 infection?

Covid prevalence		Frequency	Percent
	- No	30	19.7
	- Yes	122	80.3
	Total	152	100.0

The analysis of the data reveals that a significant majority (80.3%) responded with "Yes," while a smaller proportion (19.7%) answered "No." This indicates that the affirmative response is the dominant trend in the dataset. With a total of 152 participants, the findings suggest a strong inclination toward the "Yes" category, highlighting its relevance in the given context.

4.3.2.4 Health issues Post-COVID -19 Health Issues

The health issues noted post covid are mentioned below:

Table 4.3.2.4 Health issues Post-COVID-19: Frequency of participants

Sr No	Post-COVID 19	Frequency	Percent
1	- No	102	67.1
2	- Yes	50	32.9
3	Total	152	100.0

The data presents the prevalence of post-COVID-19 health issues among 152 respondents. A majority (67.1%) reported no health complications following infection, while **32.9%** experienced lingering health concerns. This suggests that nearly one-third of individuals may face post-COVID-19 effects, highlighting the need for further

investigation into long-term health outcomes. Understanding these trends can inform healthcare strategies for post-infection care and recovery support.

4.3.2.5 *Health issues - PCC*

Table 4.3.2.5 If yes, please specify health issue(s)

Health Issue	Frequency	Percentage (%)
Chest Pain	6	12.00%
Diabetes	5	10.00%
Asthma	3	6.00%
Anxiety/Depression	3	6.00%
Fever	2	4.00%
Coughing (Prolonged)	5	10.00%
Shortness of Breath/Breathlessness	4	8.00%
Heart Disease/Heart Attack	2	4.00%
Hypertension/High Blood Pressure	1	2.00%
Joint/Muscle Pain & Inflammation	5	10.00%
Kidney Disease	1	2.00%
Fatty Liver	1	2.00%
Jaundice	1	2.00%
Gout	1	2.00%
Sinus/Nose Infection	1	2.00%
Osteoporosis	1	2.00%
Migraines/Headaches	4	8.00%
Acne Flare-ups	1	2.00%
Breathing Issues During Exercise	2	4.00%
Severe Lung Pain While Coughing	2	4.00%
No Issues (Nil)	1	2.00%
Total	**50**	**100%**

Of the 50 respondents

Post-COVID health complications vary widely, with chest pain (12.0%), diabetes (10.0%), prolonged coughing (10.0%), and joint/muscle pain (10.0%) being the most frequently reported issues. Shortness of breath and frequent headaches/migraines (8.0%) also appear significant, indicating ongoing respiratory and neurological effects. Conditions such as asthma (6.0%), anxiety and depression (6.0%) and breathing difficulties during exercise (4.0%) suggest lingering impacts on both physical and mental well-being. Less common but notable issues include hypertension, kidney disease, jaundice, and sinus infections (each 2.0%), highlighting the diverse nature of post-COVID health concerns. The data suggests that COVID-19 has lasting effects on multiple organ systems, reinforcing the need for ongoing medical support and rehabilitation.

The data provides insights into the prevalence of COVID-19 infections, post-infection health impacts, and specific conditions experienced by individuals who had COVID-19.

4.3.3 Section 3: Healthcare Utilization

4.3.3.*1 Frequency of utilizing health services*

Table 4.3.3.1 Before the pandemic, how often did you seek healthcare services?

Response	Frequency	Percent
- Frequently	2	1.3
- Occasionally	52	34.2
- Rarely	91	59.9
- Regularly	7	4.6
Total	152	100.0

The data indicates that a significant majority of respondents (59.9%) rarely sought healthcare services before the pandemic, suggesting a pattern of low healthcare utilization. A smaller proportion (34.2%) sought care occasionally, while only 4.6% accessed healthcare regularly. Notably, just 1.3% reported frequent healthcare visits.

This trend may be attributed to multiple factors, including perceived good health, financial constraints, accessibility issues, or cultural attitudes toward healthcare-seeking behavior. The low percentage of regular and frequent users highlights potential gaps in preventive care and routine health monitoring, which could have long-term implications for health outcomes. These findings underscore the importance of strengthening healthcare engagement strategies to encourage timely medical consultations, particularly in light of emerging health crises such as the COVID-19 pandemic.

The data indicates that the majority of respondents (59.9%) rarely sought healthcare services before the pandemic, while 34.2% accessed care occasionally. Only a small proportion reported frequent (1.3%) or regular (4.6%) healthcare visits. This pattern suggests that healthcare utilization was relatively low, potentially due to factors such as perceived good health, financial constraints, accessibility issues, or cultural attitudes toward healthcare-seeking behavior. The findings highlight a possible gap in preventive care engagement, which may have implications for health outcomes, especially in times of crisis like a pandemic.

4.3.3.2 Heath services utilization before pandemic

Table 4.3.3.2 Which Health services did you use then? before pandemic

Responses		Frequency	Percent
Type of services	- Private	43	28.3
	- Public	109	71.7
	Total	152	100.0

The data indicates that prior to the pandemic, a significant majority (71.7%) of respondents utilized public healthcare services, while a smaller proportion (28.3%) relied on private healthcare. This suggests a greater dependency on publicly funded healthcare, potentially due to affordability, accessibility, or trust in government-provided services. The lower utilization of private services may reflect financial constraints, limited

availability, or personal preferences. Understanding these trends is crucial for shaping healthcare policies, especially in ensuring equitable access and preparedness for future health crises.

4.3.3.3 Reasons for utilizing particular services

Table 4.3.3.3 Open-ended question to suggest

Theme	Key Reasons Mentioned
Affordability and Cost-effectiveness	Cheaper than private, affordable and cheap, under the government scheme, with government subsidies, public healthcare is cheap
Accessibility and Convenience	Easily accessible, convenient travel from home, polyclinics are easy to access, widespread clinics, and hospitals
Government and Corporate Insurance Support	Insured by the company, under parents' insurance, government subsidy, company-offered insurance
Routine and Preventive Healthcare	Regular checkups, monthly health monitoring, early diagnosis, and preventive care
Treatment for Common Ailments	Flu, colds, headaches, minor illnesses, and getting medication
Trust, Reliability, and Family Influence	Family tradition, more reliable, trustworthy and reasonably priced, widely used by family members
Quality of Care and Specialized Services	Better quality despite higher cost, more personal needs met, private institutions for mental health, and customized services

The data reveals that affordability and accessibility are the most significant factors influencing healthcare choices, with many relying on government subsidies and insurance to manage costs. Convenience also plays a crucial role, as people prefer services close to home with minimal wait times. Additionally, routine checkups and treatment for common illnesses are key drivers of healthcare utilization. Family influence and trust in the system further shape decision-making, with many following long-standing healthcare practices. Lastly, while affordability dominates, some individuals prioritize quality and specialized services, demonstrating a spectrum of healthcare preferences based on financial and personal needs.

People choose healthcare services based on what works best for them, often considering cost, convenience, and familiarity. Public healthcare is a go-to option for many because government subsidies make it more affordable. Having insurance through work or family

also helps cut down expenses, making it easier to get medical care without worrying too much about the cost. Accessibility matters too—many prefer clinics and hospitals that are close to home and easy to reach, especially for minor illnesses.

Trust plays a big role in healthcare decisions. Many stick with public healthcare because it's reliable and widely used. Family habits also shape choices, as people tend to go where their parents or relatives have always gone. Private healthcare, while offering shorter wait times and better facilities, can be expensive, so most people still opt for public services. In the end, it's about balancing cost, quality, and accessibility to get the care they need

Table 4.3.3.A Detailed table for reasons with quotes

Theme	Description	Example Quotes
Affordability and Cost-effectiveness	The cost of services significantly influenced healthcare choices. Government subsidies, corporate insurance, and national healthcare schemes made services more accessible. Public healthcare institutions were often preferred over private ones.	"It is affordable." "Cheaper than private." "Under government scheme." "Subsidised by the government." "My company insurance covered it."
Accessibility and Convenience	Healthcare services were easy to access due to proximity, widespread availability, and efficient service structures. Government-funded healthcare institutions were commonly highlighted.	"Close to home." "Easily accessible." "There were clinics almost everywhere, which made it accessible." "Polyclinics are easy to access." "Convenient travel from my house."
Family and Social Influence	Family traditions and social networks played a role in healthcare choices. Many individuals used healthcare services because of family habits or insurance coverage.	"My family uses it." "Family tradition." "Parents brought me there." "Used by family." "Recommended by friends and family."

		"To get medication."
Nature of Health Concerns	Healthcare was often sought for minor illnesses such as colds, fevers, headaches, or routine check-ups rather than specialized treatments.	"For normal coughs and illnesses, sometimes checkups." "Check-ups and colds." "I had a cold here and there." "To diagnose my sickness."
Reliability and Quality of Care	Trust in public healthcare was linked to government backing, while private healthcare was sometimes preferred for better facilities and personalized care.	"Trustworthy, reasonably priced." "Issued by the government, so more reliable in my opinion." "More personal needs met." "Although expensive, it is of better quality." "More reliable for me."
Insurance and Government Support	Many respondents cited insurance schemes as critical factors in their decision-making, making healthcare more affordable.	"Under my parents' corporate insurance." "Covered by my husband's insurance." "Was under corporate insurance." "Lots of government schemes available." "Easier and reasonable way to access healthcare."
Preference for Public vs. Private Healthcare	Public healthcare was favored for affordability and accessibility, while private healthcare was chosen for better quality and shorter waiting times.	"Private institutions have better facilities when it comes to mental health." "Expensive but more customized services." "Faster waiting time." "More prevalent in society." "More access to a variety of treatments."

4.3.3.4 Frequency of seeking healthcare services changed during and after the pandemic

Table 4.3.3.4 How has your frequency of seeking healthcare services changed during and after the pandemic?

Sno	Responses	Frequency	Percent
1	- Decreased significantly	2	1.3
2	- Decreased slightly	12	7.9
3	- Increased significantly	4	2.6
4	- Increased slightly	51	33.6
5	- Remained the same	83	54.6
6	Total	152	100.0

During the pandemic, healthcare-seeking behaviors underwent notable shifts, largely influenced by restrictions, fear of infection, and healthcare system strain. According to the data, a majority (54.6%) reported no change in their frequency of seeking healthcare services, suggesting that their medical needs and access remained stable. However, 33.6% experienced a slight increase, possibly due to delayed care from earlier restrictions or heightened health awareness. A small percentage (2.6%) saw a significant rise in healthcare visits, likely due to chronic disease management or post-COVID complications. Conversely, 9.2% reported a decrease, with 1.3% significantly reducing their visits, reflecting either improved self-care, reliance on telemedicine, or continued concerns about exposure. These trends highlight the pandemic's lasting impact on healthcare utilization, emphasizing the need for adaptable and resilient healthcare systems.

Table 4.3.3.5   What factors influenced your decision to seek healthcare services during the pandemic?

Theme	Description
Fear of Contracting COVID-19 or Other Infections	Fear of exposure to the virus led to delays or avoidance of healthcare services, particularly among vulnerable populations.
Government Guidelines and Policy Restrictions	Lockdowns, movement restrictions, and healthcare prioritization influenced patient behavior and system responsiveness.
Financial Constraints	Economic instability, job losses, and high medical costs limited healthcare access.
Access to Healthcare Facilities	Overburdened hospitals, transportation issues, and service disruptions posed barriers to care.

Severity of Health Issues	The level of illness severity determined whether individuals sought medical attention despite risks.
Insurance Coverage	Having health insurance provided financial security, whereas lack of coverage exacerbated cost barriers.

The barriers to healthcare access during the COVID-19 pandemic were multifaceted, with fears of infection, economic constraints, and policy restrictions playing significant roles. Many individuals had to weigh the risks of exposure against the urgency of their health concerns, leading to delayed or forgone medical care. Addressing these challenges requires policies that strengthen financial protection, improve healthcare system resilience, and mitigate psychological deterrents to seeking medical care. Ensuring equitable access during future crises will require a balance between public health safety measures and the continuous provision of essential healthcare services.

4.3.3.6 Current/present utilization of services

Table 4.3.3.6 Current/present utilization of services

Response		Frequency	Percent
1	Private	53	34.9
2	Public	99	65.1
	Total	152	100.0

The analysis of the data shows that a majority (65.1%) of the respondents are from public institutions, while 34.9% are from private institutions. This indicates a higher representation of public sector participants, which could influence the overall findings depending on the study's focus. The total sample size is 152, ensuring a reasonable distribution for comparative analysis.

4.3.3.7 Reasons for present utilization of services

Table 4.3.3.7 Reasons Present use: Why are you using those services?

Theme	Key Factors	Common Responses
Affordability & Cost	Government subsidies, insurance coverage, and cheaper alternatives	"It's cheaper", "Subsidized by the government", "Affordable"
Accessibility & Convenience	Proximity to home, easy booking, shorter wait times	"Close to my house", "Easier to book", "Easily accessible"
Insurance Coverage	Company, parental, government-sponsored insurance	"Under my parents' insurance", "Corporate insurance"
Quality & Trust	Familiar doctors, better service, and reliability	"Better quality of services", "Doctors know my history"
Specific Healthcare Needs	Chronic conditions, mental health, and regular check-ups	"Sports injuries", "Mental health services", "Regular checkups"

The decision to utilize healthcare services is primarily influenced by affordability, accessibility, and insurance coverage. Many individuals rely on government subsidies or corporate insurance to manage costs, making public healthcare the preferred option. Convenience, such as proximity to home and ease of booking, also plays a significant role in shaping healthcare choices. Trust in healthcare providers and the quality of services further impact decision-making, with some opting for private institutions for specialized care. Additionally, chronic conditions and mental health needs drive specific service usage. Lastly, cultural and social influences, including family traditions and peer recommendations, shape healthcare-seeking behavior, reinforcing established healthcare preferences.

4.3.3.8 Challenges you faced in accessing healthcare services during the pandemic

Table 4.3.3.8 Were there any challenges you faced in accessing healthcare services during the pandemic?

Responses for challenges faced Yes/No	Frequency	Percent

1	No	132	86.8
2	Yes	20	13.2
3	Total	152	100.0

The data indicates that the vast majority (86.8%) of respondents did not face challenges in accessing healthcare services during the pandemic, while a smaller proportion (13.2%) reported difficulties. This suggests that healthcare systems in the surveyed population were largely resilient, ensuring continued access to care despite the crisis. However, the experiences of 13.2% who faced challenges should not be overlooked, as they may highlight systemic gaps such as resource shortages, mobility restrictions, digital divide in telemedicine, or financial constraints. Further qualitative insights could help understand the specific barriers faced by this group, enabling targeted policy interventions to improve healthcare accessibility in future crises. This may be due to Singapore's strong healthcare system and effective COVID-19 response likely contributed to the high percentage (86.8%) of respondents who did not face challenges in accessing care. Measures such as early detection, widespread testing, telemedicine expansion, and financial support ensured continuity of services. However, the 13.2% who faced difficulties may represent vulnerable groups, such as older adults or those with complex health needs. Understanding these gaps is crucial for strengthening future healthcare resilience (Anand SV, et al 2021, Wang F et al 2022).

4.3.3.9 *Challenges Faced in Accessing Healthcare Services During the Pandemic.*

Table 4.3.3.9 Challenges Faced in Accessing Healthcare Services During the Pandemic.
- Open-ended challenges you faced in accessing healthcare services during the pandemic
- Challenges in Healthcare Access During the Pandemic

Theme	Description
Prolonged Waiting Times	Extended queues and delays in consultations due to high patient influx and limited capacity.
Reduced Quality of Care	Shortened doctor-patient interactions, rushed consultations, and inadequate medical attention.
Stricter Guidelines	Increased restrictions, social distancing measures, and limited hospital visitations.
Fear of Infection	Patients were afraid of contracting COVID-19 in crowded healthcare facilities.
Healthcare Workforce Shortage	Staff shortages led to delays in treatment and prioritization of critical cases.
Difficulties in Appointments	High demand made it challenging to schedule medical visits and consultations.
Emotional and Psychological Toll	Patients faced isolation due to hospital restrictions and the overall stress of seeking healthcare.

In this study respondents mentioned the challenges faced. The open-ended answers suggested that during the pandemic, accessing healthcare became an arduous task due to long waiting times, limited doctor interactions, and strict restrictions. The fear of infection, along with staff shortages and appointment difficulties, exacerbated the strain on patients. Additionally, the emotional toll of isolation and uncertainty highlighted the need for more patient-centered and crisis-resilient healthcare systems.

4.3.4 Section 4: Access to Healthcare Facilities

Table 4.3.4.1. How satisfied are you with the accessibility of healthcare facilities during the pandemic?

Response	Frequency	Percentage
Dissatisfied	5	3.3
Neutral	41	27
Satisfied	92	60.5
Very satisfied	14	9.2
Total	**152**	**100**

Most respondents (69.7%) were satisfied or very satisfied with healthcare access during the pandemic, reflecting a generally positive experience. However, 27% remained neutral, possibly indicating mixed experiences or uncertainty. A small but important 3.3% expressed dissatisfaction, pointing to potential gaps in service delivery and equity. Understanding these disparities requires further exploration of factors like socioeconomic status and location.

Table 4.3.4.2 How satisfied are you with the accessibility of healthcare facilities post-pandemic?

Sno	Responses	Frequency	Percent
1	Neutral	25	16.4
2	Satisfied	97	63.8
3	Very satisfied	30	19.7
4	Total	152	100.0

The majority of respondents (63.8%) reported being satisfied with the accessibility of healthcare facilities post-pandemic, while a smaller proportion (19.7%) were very satisfied. However, 16.4% remained neutral, suggesting that some individuals may still experience barriers or inconsistencies in healthcare access. These findings indicate an overall positive perception but highlight the need for further improvements to ensure equitable access for all.

4.3.4.3 Rate the efficiency of the healthcare services

Table 4.3.4.3 How would you rate the efficiency of the healthcare services you received during the pandemic?

Sno	Responses	Frequency	Percent
1	Efficient	84	55.3

2	Inefficient	7	4.6
3	Neutral	42	27.6
4	Very efficient	19	12.5
5	Total	152	100.0

The data reflects varied perceptions of healthcare efficiency during the pandemic. A majority (55.3%) found services efficient, while 12.5% rated them very efficient, suggesting that the healthcare system largely met expectations. However, 27.6% remained neutral, possibly indicating inconsistencies in service delivery or mixed experiences. Notably, 4.6% found the system inefficient, highlighting areas requiring improvement. These findings suggest that while healthcare responses were generally effective, gaps in accessibility, responsiveness, or resource allocation may have influenced differing experiences. Addressing these concerns through targeted reforms could enhance future healthcare resilience

Table 4.3.4.4   How would you rate the efficiency of the healthcare services you received post-pandemic?

Sno	Response	Frequency	Percent
1	Efficient	88	57.9
2	Inefficient	1	.7
3	Neutral	21	13.8
4	Very efficient	42	27.6
5	Total	152	100.0

The analysis of post-pandemic healthcare service efficiency, based on a sample of 152 respondents, reveals predominantly positive perceptions. A significant majority (57.9%) rated the services as "Efficient," while 27.6% found them "Very Efficient," indicating that over 85% of respondents had a favorable experience. In contrast, only 0.7% rated the services as "Inefficient," suggesting minimal dissatisfaction. A notable 13.8% remained neutral, possibly reflecting variability in service delivery or personal expectations.

These findings suggest that healthcare systems adapted well post-pandemic, with most individuals experiencing efficient services. The minimal dissatisfaction rate may indicate improvements in accessibility, response time, or care coordination. However, the neutral responses highlight the need for further exploration into potential service gaps or disparities.

Table 4.3.4.5 utilization of telehealth services during the pandemic

Sno	Response	Frequency	Percent
1	No	109	71.7
2	Yes	43	28.3
3	Total	152	100.0

The data indicates that a significant majority (71.7%) of respondents did not utilize telehealth services during the pandemic, while only 28.3% reported using them. This suggests that despite the increased emphasis on telehealth as a critical healthcare delivery mode during the crisis, barriers such as digital literacy, accessibility, trust in virtual consultations, or preference for in-person care may have limited its uptake. The findings highlight potential gaps in telehealth adoption and the need for targeted strategies to improve access, awareness, and confidence in remote healthcare services, particularly in crisis situations.

Table 4.3.4.6 Rate your satisfaction with telehealth services.If yes, please rate your satisfaction with telehealth services.

S.no	Response	Frequency	Percent
1	- Dissatisfied	2	1.3
2	- Neutral	106	69.7
3	- Satisfied	31	20.4
4	- Very satisfied	13	8.6
5	Total	152	100.0

The analysis of satisfaction with telehealth services reveals that the majority of respondents (69.7%) remain neutral, indicating a lack of strong opinions, either positive or negative. A notable proportion (20.4%) report being satisfied, while a smaller group (8.6%) express high satisfaction. Only 1.3% of respondents are dissatisfied, suggesting that outright dissatisfaction is minimal. The predominance of neutrality may reflect uncertainties regarding telehealth's effectiveness, accessibility, or user experience. It could also indicate that while telehealth meets basic expectations, it has yet to exceed them to elicit strong approval. Future research should explore the underlying reasons behind neutrality to enhance user satisfaction and optimize telehealth services.

Table 4.3.4.7 Additional comments

Theme	Key Insights	Impact
Efficiency & Responsiveness	Healthcare services were fast and met individual needs.	Improved patient satisfaction and timely care.
Improved Accessibility	COVID-19 led to better access to healthcare services.	Faster check-ups and streamlined processes.
Structural Healthcare Shifts	Digitalization and system reforms enhanced healthcare delivery.	Long-term improvements in healthcare efficiency.

The responses highlight the significant shift in healthcare services during COVID-19, emphasizing improved accessibility and responsiveness. The urgency of the pandemic accelerated digitalization, streamlined check-up processes, and enhanced healthcare efficiency. These changes not only improved immediate patient care but also set the foundation for long-term improvements in healthcare systems.

4.3.2 Quantitative – Epidemiological and Critical Analysis of Health Conditions Before, During, and After COVID-19

4.3.2.1 Health Conditions Before COVID-19

The health conditions reported before the COVID-19 pandemic illustrate a broad spectrum of chronic and acute diseases, indicating a complex interplay of metabolic, musculoskeletal, respiratory, neurological, and mental health issues. The prevalence of diabetes and hypertension suggests a growing burden of non-communicable diseases (NCDs), which aligns with global epidemiological trends of aging populations and lifestyle-related health risks. Respiratory conditions such as asthma and chronic sinus issues highlight pre-existing vulnerabilities to infections, while musculoskeletal disorders (arthritis, sarcopenia, joint pain) underscore age-related degeneration. The presence of neurodegenerative diseases like Alzheimer's, mental health disorders including depression and borderline personality disorder (BPD), and chronic kidney conditions signals the multifaceted healthcare needs before the pandemic. This baseline health status serves as a critical reference point for understanding how COVID-19 further impacted these populations.

4.3.2.2 Health Issues During COVID-19

The onset of the pandemic brought an increase in both physical and psychological health challenges. The reported cases of COVID-19 infections (3), chest pain (3), joint pain (3), arthritis (2), hypertension (1), and diabetes (1) align with global trends that link COVID-19 with exacerbation of pre-existing conditions. Notably, the emergence of gestational diabetes, lung disease, stroke, and heart attack suggests COVID-19's role as a catalyst for acute health deterioration. The presence of mental health conditions such as depression and BPD, coupled with social isolation and the lack of intimate physical contact, points to the psychological toll of the pandemic. The interplay between physical health and mental well-being is evident, indicating a need for an integrated healthcare response that includes both medical treatment and psychosocial support.

4.3.2.3 COVID-19 Infection Prevalence

A striking 80.3% of respondents reported having contracted COVID-19, while only 19.7% remained uninfected. This high prevalence is indicative of widespread community transmission, possibly exacerbated by factors such as inadequate preventive measures, high population density, or insufficient vaccine coverage during early phases. The epidemiological significance of this finding underscores the necessity for continuous public health interventions, including vaccination campaigns, early detection strategies, and improved healthcare accessibility to manage future outbreaks.

4.3.2.4 Post-COVID-19 Health Issues

Post-COVID-19 health complications affected 32.9% of respondents, suggesting that a significant proportion faced lingering health challenges. Among those experiencing post-COVID conditions (PCC), the most common symptoms included chest pain (12.0%), diabetes (10.0%), prolonged coughing (10.0%), and joint/muscle pain (10.0%). Additionally, respiratory difficulties (shortness of breath, asthma, breathing challenges during exercise) and neurological symptoms (headaches/migraines, anxiety, depression) highlight the multifaceted impact of post-viral syndrome.

The recurrence of cardiovascular concerns such as hypertension, heart attack, and chest tightness (9.1%) suggests that COVID-19 may have long-term effects on vascular and cardiac health. Metabolic complications, including diabetes, kidney disease, and fatty liver, further reinforce concerns about COVID-19's role in exacerbating pre-existing NCDs or triggering new onset conditions. Less frequent but notable occurrences of osteoporosis, gout, and sinus infections add to the complexity of post-COVID recovery.

The findings highlight key epidemiological concerns, including:

1. Pre-existing Health Vulnerabilities: Chronic diseases such as diabetes, hypertension, and respiratory illnesses were already prevalent before COVID-19, making certain populations more susceptible to severe outcomes.

2. Pandemic-Exacerbated Conditions: COVID-19 did not only cause acute illness but also worsened pre-existing conditions. The data suggests a bidirectional relationship between chronic disease and COVID-19 severity.

3. Mental Health Burden: The pandemic had profound psychological effects, exacerbated by social isolation and pre-existing mental health conditions. The integration of mental health services within primary healthcare remains critical.

4. Long-Term Health Consequences: The presence of PCC among nearly one-third of respondents highlights the need for post-recovery monitoring. The persistence of cardiovascular, metabolic, and respiratory symptoms calls for a comprehensive approach to long-term care and rehabilitation.

5. Implications for Public Health Policy: These findings reinforce the need for strengthened healthcare infrastructure, targeted intervention strategies, and a holistic approach to aging and post-pandemic recovery planning. Special attention should be given to the intersection of chronic disease management and infectious disease preparedness.

6. Conclusion

The epidemiological patterns emerging from this study underscore the profound and lasting impact of COVID-19 on health. With a significant burden of pre-existing conditions, pandemic-induced health complications, and lingering post-COVID syndromes, there is an urgent need for integrated healthcare approaches that address both immediate and long-term health outcomes. Moving forward, healthcare policies must prioritize chronic disease prevention, mental health support, and post-COVID rehabilitation to ensure resilience against future health crises.

4.3.2.5: Healthcare Utilization

Pre-Pandemic Healthcare Utilization Trends

The data reveals that a significant proportion of respondents (59.9%) rarely sought healthcare services before the pandemic, while 34.2% accessed care occasionally. In contrast, only a small fraction reported frequent (1.3%) or regular (4.6%) healthcare visits. This pattern suggests that healthcare utilization was relatively low, potentially driven by factors such as perceived good health, financial limitations, geographic and logistical barriers, or sociocultural attitudes toward seeking medical care. The findings highlight a gap in preventive healthcare engagement, which may have long-term consequences, particularly in times of health crises. A lack of regular interaction with healthcare systems may lead to undiagnosed or unmanaged chronic conditions, ultimately exacerbating health disparities during pandemics or other public health emergencies.

3.2 Public vs. Private Healthcare Utilization

Prior to the pandemic, 71.7% of respondents relied on public healthcare services, while 28.3% opted for private healthcare. The higher dependency on public healthcare likely stems from factors such as cost-effectiveness, accessibility, and trust in government-funded institutions. Public healthcare systems often provide subsidized services, making them more affordable for a larger segment of the population. Conversely, the lower reliance on private healthcare suggests financial constraints, limited private healthcare availability, or personal preferences. These trends underscore the critical role of public healthcare infrastructure in ensuring equitable access to medical services, particularly for lower-income populations. Future healthcare policies should focus on enhancing both sectors to improve service delivery and accessibility, ensuring that no population segment is underserved.

4.3.2.6 Determinants of Healthcare Choices

Table 4.3.2.6 Determinants of Healthcare Choices

Theme	Key Reasons Mentioned
Affordability & Cost-effectiveness	Public healthcare is cheaper due to government subsidies, insurance coverage, and national health schemes.
Accessibility & Convenience	Proximity to home, ease of travel, widespread availability of clinics and hospitals.
Insurance Coverage	Government schemes, corporate-sponsored insurance, and parental insurance reduce out-of-pocket expenses.
Routine & Preventive Healthcare	Regular check-ups, health monitoring, and early diagnosis encourage periodic visits.
Treatment for Common Ailments	Access to medications and treatment for minor illnesses like flu, colds, and headaches.
Trust & Reliability	Long-standing trust in public healthcare institutions, often influenced by family traditions.
Quality & Specialized Services	Private healthcare is preferred for its personalized approach, mental health services, and shorter waiting times.

The data indicates that affordability and accessibility remain the primary factors influencing healthcare decisions. Many respondents rely on government subsidies and insurance schemes to manage costs, while proximity to healthcare facilities ensures convenience. Family influence and trust in the system also play a critical role, reinforcing habitual healthcare-seeking behaviors. While public healthcare dominates due to its affordability, a segment of the population still prefers private services for their perceived higher quality and specialized care options.

4.3.2.7 Changes in Healthcare Utilization During and After the Pandemic
The pandemic significantly altered healthcare-seeking behaviors. According to the data, 54.6% of respondents reported no change in their healthcare utilization patterns, suggesting stability in medical needs and access. However, 33.6% reported a slight increase in healthcare visits, potentially due to the resumption of postponed medical treatments or heightened health concerns. A smaller proportion (2.6%) experienced a

significant rise in medical visits, likely due to chronic disease management or post-COVID complications. Conversely, 9.2% of respondents reduced their healthcare visits, with 1.3% reporting a drastic decline. This reduction may be attributed to improved self-care practices, reliance on telemedicine, or persistent fears of healthcare facility exposure. The findings highlight the need for a resilient and adaptable healthcare system that accommodates shifts in demand while ensuring continuous access to essential services.

4.3.2.8 Factors Influencing Healthcare Utilization During the Pandemic

Several barriers influenced healthcare-seeking behavior during the pandemic, including fear of infection, economic constraints, and policy-driven restrictions. Many individuals had to assess the risks of exposure against the urgency of their medical needs, leading to delays or avoidance of healthcare services. Addressing these barriers requires strengthening financial protection mechanisms, improving healthcare system resilience, and mitigating psychological deterrents to seeking medical care. Ensuring equitable access during future health crises necessitates a balance1 between public health safety measures and the uninterrupted provision of essential healthcare services.

4.3.2.9 Present Healthcare Utilization Patterns

Currently, 65.1% of respondents utilize public healthcare services, while 34.9% rely on private institutions. This distribution underscores the continued significance of public healthcare in meeting population health needs. The following factors influence healthcare choices in the post-pandemic context:

Table 4.3.2.9.A Present Healthcare Utilization Patterns

Theme	Key Factors	Common Responses
Affordability & Cost	Government subsidies, insurance coverage, lower out-of-pocket expenses	"It's cheaper," "Subsidized by the government," "Affordable."
Accessibility & Convenience	Proximity to home, ease of booking appointments, shorter wait times	"Close to my house," "Easier to book," "Easily accessible."

	Coverage under corporate, government, or parental insurance	"Under my parent's insurance," "Corporate insurance."
Insurance Coverage		
Quality & Trust	Familiarity with doctors, reliability, quality of care	"Doctors know my history," "Better quality of services."
Specific Healthcare Needs	Chronic disease management, mental health, preventive care	"Sports injuries," "Mental health services," "Regular checkups."

These findings reinforce that affordability remains the dominant factor in healthcare decisions. Additionally, ease of access and trust in healthcare providers continue to shape choices, with some individuals preferring private healthcare for specialized services. As chronic conditions and mental health issues become more prevalent, there is an increasing need for integrated and accessible care models.

4.3.2.10 Challenges in Healthcare Access During the Pandemic

While most respondents (86.8%) reported no challenges in accessing healthcare services, 13.2% faced difficulties. These challenges may indicate systemic gaps such as resource shortages, mobility constraints, digital barriers in telemedicine, or financial hardship. Singapore's strong healthcare infrastructure and effective COVID-19 response likely contributed to the high percentage of uninterrupted access. However, the experiences of the minority who encountered obstacles must not be overlooked, as they provide insights into areas for improvement. Vulnerable groups, including older adults and individuals with complex health needs, may have faced greater difficulties, underscoring the importance of targeted interventions to improve healthcare resilience.

4.3.2.11 Specific Challenges in Healthcare Access During the Pandemic

The qualitative responses suggest that pandemic-related healthcare disruptions created additional stress for patients, particularly those requiring frequent medical attention. Addressing these barriers in future public health emergencies requires a

patient-centered, crisis-resilient healthcare approach that ensures continuity of care while mitigating emotional and logistical challenges for the population.

Table 4.3.2.11 Specific Challenges in Healthcare Access During the Pandemic

Theme	Description
Prolonged Waiting Times	Increased patient influx led to longer queues and delays in consultations.
Reduced Quality of Care	Shorter doctor-patient interactions and rushed medical attention.
Stricter Guidelines	Social distancing measures and hospital visitation restrictions.
Fear of Infection	Patients avoided healthcare facilities due to COVID-19 exposure concerns.
Healthcare Workforce Shortages	Limited staff availability led to delayed treatments.
Appointment Difficulties	High demand made scheduling medical visits challenging.
Emotional & Psychological Toll	Stress, isolation, and anxiety are related to accessing healthcare services.

4.3.2.13 Accessibility During the Pandemic

The data reveals that 69.7% of respondents were satisfied or very satisfied with healthcare accessibility during the pandemic, indicating that the majority had a relatively positive experience. However, the 27% who remained neutral suggest that access was inconsistent, possibly due to regional disparities, variations in healthcare system capacity, or socioeconomic barriers. The 3.3% who expressed dissatisfaction highlight critical gaps in healthcare equity, particularly for marginalized or vulnerable populations. These findings necessitate further analysis of how location, healthcare infrastructure, and pre-existing health conditions influenced accessibility during the crisis.

4.3.2.14 Accessibility Post-Pandemic

Post-pandemic, the satisfaction rate slightly declined to 63.8%, with 19.7% reporting very high satisfaction. However, 16.4% remained neutral, indicating that while healthcare systems adapted, barriers to access persisted. Factors such as healthcare workforce shortages, financial constraints, and the continued burden of post-pandemic healthcare demands may contribute to this trend. Policymakers must examine whether improvements in accessibility during the pandemic were sustained or if they diminished as emergency measures were lifted.

4.3.2.15 Efficiency During the Pandemic

The majority (55.3%) found healthcare services efficient, with 12.5% rating them as very efficient, demonstrating a broad confidence in service delivery during the crisis. However, 27.6% remained neutral, which may indicate varied service quality, delays, or difficulty in accessing timely care. The 4.6% reporting inefficiency highlights critical areas where healthcare systems struggled, possibly due to overwhelmed hospitals, resource shortages, and operational bottlenecks. These findings underscore the need for targeted reforms in crisis preparedness and healthcare system resilience to mitigate inefficiencies in future health emergencies.

4.3.2.17Efficiency Post-Pandemic

Post-pandemic data shows an overall improvement in perceived efficiency, with 57.9% rating healthcare services as efficient and 27.6% as very efficient, totaling over 85% positive feedback. The low dissatisfaction rate (0.7%) suggests effective post-pandemic adaptations, including improved resource allocation, digitalization, and policy-driven reforms. However, the 13.8% who remained neutral indicate that not all healthcare settings experienced the same level of improvement. Further research is needed to explore disparities in service efficiency across different healthcare facilities and population groups.

4.3.2.18 Utilization of Telehealth Services

A significant majority (71.7%) did not use telehealth services during the pandemic, with only 28.3% reporting usage. This low adoption rate, despite the global emphasis on telemedicine, points to multiple barriers, including digital literacy, access to technology, trust issues, and the preference for in-person consultations. The findings emphasize the need for more inclusive telehealth policies, targeted digital health literacy programs, and infrastructure improvements to enhance accessibility for diverse population groups, particularly older adults and low-income communities.

4.3.2.19 Satisfaction with Telehealth Services

Among those who used telehealth, the majority (69.7%) remained neutral regarding satisfaction, indicating that telehealth services met but did not exceed expectations. While 20.4% were satisfied and 8.6% highly satisfied, the minimal dissatisfaction rate (1.3%) suggests that telehealth was a functional alternative but lacked elements that could drive stronger approval. The neutrality may stem from concerns about the quality of remote consultations, technological challenges, or limitations in the scope of services provided. Future studies should investigate specific aspects of telehealth that need enhancement to increase acceptance and satisfaction among users.

4.3.2.20 Additional Insights and Implications

Table 4.3.2.20.i Additional Insights and Implications

Theme	Key Insights	Impact
Efficiency & Responsiveness	Healthcare services were fast and met individual needs.	Improved patient satisfaction and timely care.
Improved Accessibility	COVID-19 led to better access to healthcare services.	Faster check-ups and streamlined processes.
Structural Healthcare Shifts	Digitalization and system reforms enhanced healthcare delivery.	Long-term improvements in healthcare efficiency.

The pandemic triggered significant shifts in healthcare delivery, particularly in improving responsiveness and accessibility. The urgency of the crisis accelerated digitalization and led to structural reforms that may have lasting impacts on healthcare efficiency. However, the findings also suggest that while improvements were made, disparities in access and efficiency persist, necessitating continued investment in healthcare infrastructure, workforce development, and equitable policy interventions to sustain progress beyond the pandemic.

4.4 Qualitative-Thematic Analysis: Healthcare Challenges and Behavioral Adaptations During COVID-19

The COVID-19 pandemic was a defining moment for global healthcare, revealing both resilience and systemic fragilities. Fear and uncertainty dictated early responses, influencing risk perceptions and behavioral adaptations among healthcare workers and the public. Ethical dilemmas emerged as professionals navigated between clinical duty and compassionate care, often facing distressing choices. While rapid innovations such as telemedicine and large-scale testing showcased adaptability, they also highlighted disparities in access, particularly among marginalized populations. Economic barriers and digital literacy gaps further deepened inequities in healthcare utilization. The crisis underscored the urgent need for sustainable policy reforms, particularly in long-term care, mental health, and workforce resilience. Applying behavioral frameworks such as HBM, TPB, and TRA provides valuable insights into decision-making processes during

crises, reinforcing the importance of integrating community-centered approaches, digital inclusion, and ethical governance into future healthcare strategies. Moving forward, building a more equitable and responsive healthcare system requires balancing technological advancements with human-centered care.

Thematic analysis of the interview data revealed several recurring and interrelated themes: health vulnerability and chronic disease management, fear-driven avoidance of care, digital exclusion in telehealth, reliance on community and informal support systems, and gaps in healthcare governance and policy. These themes highlight the nuanced and often strained healthcare experiences of older adults and frontline providers during the pandemic. Health Belief Model (HBM) is particularly useful in explaining how perceptions of susceptibility and severity—such as fears of COVID-19 infection and worsening chronic illness—shaped whether individuals sought care. Many older adults weighed these perceived threats against perceived barriers like transportation difficulties, clinic overcrowding, and digital illiteracy, which often deterred them from accessing services. The role of government messaging, peer support, and helplines functioned as crucial *cues to action*, prompting limited engagement with healthcare services. Theory of Reasoned Action (TRA) supports understanding of how attitudes toward healthcare especially beliefs around safety, service efficiency, and trust in public health measures influenced behavioral intentions. Social and environmental norms, such as the stigma around burdening the healthcare system or pressure to adhere to lockdown guidelines, also impacted decision-making. The hesitancy to seek in-person care, balanced with the cautious embrace of telehealth, was often shaped by both personal attitudes and perceived expectations from others. Expanding on this, the Theory of Planned Behavior (TPB) helps contextualize how perceived behavioral control—such as the ability to navigate

telehealth platforms or access transportation—limited or enabled healthcare actions. Even

with positive intentions and favorable attitudes, many participants felt restricted by

systemic constraints, highlighting the gap between intention and actual behavior. This is

especially evident in older adults' reliance on community volunteers or home-based care

when other options were inaccessible. Collectively, these theories provide a

comprehensive framework to interpret the behavioral shifts observed in the data. They

highlight how internal beliefs, social influences, and structural constraints interacted to

shape healthcare utilization during the pandemic. This integrated theoretical approach

offers valuable insights for designing more responsive, equitable, and resilient healthcare

systems—particularly for vulnerable populations such as the elderly

4.5 Thematic analysis of qualitative data

Table 4.4.i Thematic analysis of qualitative data

Theme	Key Findings	Theoretical Frameworks (HBM, TPB, TRA)
Impact of the Pandemic on Health	Older adults experienced worsening chronic conditions and increased mental health issues due to restricted healthcare access.	HBM: Perceived risk led to avoidance; TRA: Community narratives influenced behavior.
Barriers to Chronic Disease Management	Delays in check-ups and limited access to non-essential services worsened chronic conditions.	HBM: Barriers discouraged care; TPB: Lack of control limited access.
Healthcare Utilization During the Pandemic	Older adults used telehealth for minor issues but struggled with complex care needs and digital barriers.	TPB: Mixed attitudes on telehealth; TRA: Social support encouraged adoption.
Fear-Driven Healthcare Avoidance	Fear of infection and overwhelmed hospitals led to a shift toward home-based care.	HBM: Fear reduced hospital visits; TPB: Lack of control reinforced avoidance.
Accessibility and Efficiency of Healthcare Services	Transportation, digital illiteracy, and lack of support limited healthcare access for vulnerable seniors.	HBM: Perceived barriers reduced engagement; TRA: Community helped access.
Variability in Healthcare Efficiency	Vaccination rollouts were efficient, but follow-up and specialist care were inconsistent.	TPB: Positive vaccination experience improved trust; TRA: Peer perception influenced reliability.
Long-Term Changes in Healthcare Behavior	Older adults became more proactive with home-based monitoring and preventive health practices.	HBM: Benefits of self-monitoring encouraged behavior change; TPB: Better attitudes formed.

		TPB: Self-efficacy boosted telehealth
Continued Use of Telehealth	Telehealth became preferred for minor ailments; digital skills still need improvement.	use; TRA: Social influence supported use.
Policy and Governance in Pandemic Healthcare Response	COVID-19 care was prioritized, but non-COVID services and integrated policies lagged behind.	HBM: Policies increased perception of vaccine value; TPB: Trust in governance mattered.
Need for Geriatric-Focused Policies	Existing healthcare policy lacked focus on long-term, age-inclusive strategies.	TPB: Attitudes affected care-seeking; TRA: Advocacy influenced policies.
Community Response and Support Systems	Community support filled critical gaps by offering logistical and emotional help.	TRA: Community cohesion promoted healthcare use; HBM: Support reduced barriers.
Strengthening Future Community-Based Care	Calls for more digital literacy programs, integrated care, and cross-sector partnerships.	TPB: Training could boost control and access.

The COVID-19 pandemic profoundly disrupted healthcare access and delivery, exposing longstanding gaps and forcing rapid adaptation across systems. Through thematic analysis of interviews with older adults, healthcare providers, and community representatives, this study surfaced the lived realities of healthcare challenges during the crisis. Core themes included the worsening of chronic conditions, the psychological toll of social isolation, and significant barriers in navigating digital healthcare tools. While telehealth emerged as a practical solution, it was not universally accessible, especially for seniors with limited digital literacy or without caregiver support. Community networks played a vital role in bridging service gaps, often becoming the first line of support for vulnerable populations.

Policy gaps—particularly in geriatric care, mental health, and continuity of non-COVID services—were evident, and participants stressed the need for more coordinated, age-inclusive healthcare planning. Theoretical frameworks such as the Health Belief Model (HBM), Theory of Reasoned Action (TRA), and Theory of Planned Behavior (TPB) helped contextualize these experiences, highlighting how perceived risk, social norms, and access constraints shaped behavioral choices. Despite the challenges, there were also stories of resilience, healthcare workers adapting in real time, older adults building self-care routines, and communities rallying together to support their most vulnerable

members. The findings underscore the critical need to design healthcare systems that are not only technologically advanced but also human-centered and equitable. For ageing populations, digital innovation alone is insufficient unless paired with targeted support for digital literacy, accessible infrastructure, and policies that prioritize continuity of care beyond emergencies. Behavioral responses during the pandemic were not merely shaped by fear or risk, but by a complex interplay of attitudes, perceived control, and community context, as captured through the integration of HBM, TRA, and TPB. Going forward, resilience in healthcare must be understood not just as system readiness, but as the ability to uphold care for all, especially the elderly, in times of crisis. Investing in community-based models, mental health resources, and inclusive digital strategies will be essential in preparing for future public health emergencies and ensuring no one is left behind.

4.6 Conclusion and summary of findings

A significant proportion of individuals experienced post-COVID health issues, with respiratory, cardiovascular, metabolic, and mental health symptoms being prominent. The findings emphasize the need for sustained healthcare support for those recovering from COVID-19. Policymakers should prioritize post-COVID rehabilitation, mental health resources, and chronic disease management to mitigate the long-term burden of the pandemic.

The survey data presents distinct and nuanced patterns in how demographic characteristics—such as gender, age, occupation, and income—intersect with health outcomes and healthcare utilization during and after the COVID-19 pandemic. These patterns offer critical insights for public health planning and policy, particularly in contexts of crisis response and recovery.

Gender and Health Issues

As shown in Table 1.2, gender was not significantly associated with having general health issues before the pandemic ($\chi^2 = 2.337$, p = 0.311). This trend remained consistent during

(Table 4.2, χ^2 = 1.821, p = 0.402) and after COVID-19 infection (Table 3.2, χ^2 = 0.365, p = 0.833). Likewise, no significant relationship was found between gender and actual COVID-19 infection status (Table 2.2, χ^2 = 1.172, p = 0.557). These findings suggest that, overall, gender did not play a determinative role in whether individuals experienced health issues or contracted the virus.

However, the story becomes more complex when analyzing the type of health conditions reported. In Table 5, gender differences in specific symptoms during COVID-19 reached strong statistical significance (χ^2 = 113.287, p = 0.000), as they did in Table 6 for post-COVID health issues (χ^2 = 125.193, p = 0.012). While the likelihood of experiencing any health issue was comparable across gender identities, the nature of symptoms diverged. This suggests underlying biological differences, gender-specific exposures, and perhaps socialized patterns of symptom expression or help-seeking behavior. These distinctions are vital for tailoring gender-sensitive healthcare and post-COVID support strategies.

Occupation and Health Outcomes (Table 62).Occupation emerged as a significant factor influencing both the presence and type of health issues, with p-values ranging from 0.002 to 0.036 across different tests. This likely reflects differential exposure to risk, stress, and workplace safety across occupational sectors. Essential workers, for instance, may have faced greater viral exposure and stress-induced health impacts. These findings underscore the importance of prioritizing occupational health protections and mental health support in pandemic preparedness.

Income and Symptom Type (Table 63). Interestingly, while income did not show a significant link to the overall presence of health issues, it did influence the types of symptoms reported (χ^2 = 104.362, p = 0.041). This pattern hints at the complex role of socioeconomic status—not only in access to healthcare but in how illness is experienced, reported, and treated. Individuals from lower-income brackets may face barriers in recognizing or addressing symptoms early, while those with more resources may report or seek care for a broader range of conditions.

Age and Health Outcomes (Tables 37, 39, 40, 41, 42, 68). Age was consistently and significantly associated with health outcomes across all pandemic phases. For pre-existing health issues, Table 37 indicates significance (p = 0.049). During the pandemic, Table 40 maintains this association (p = 0.032). Post-COVID, Table 39 is borderline significant on the Pearson test (p = 0.051) but statistically significant via the Likelihood Ratio (p = 0.002), reinforcing age as a key determinant in long-term symptomatology. Moreover, Tables 41 and 42 reveal highly significant associations (p = 0.000) between age and specific health conditions. Though some chi-square assumptions were potentially violated due to low cell counts (particularly in Table 68, $\chi^2 = 1875.919$, p = 0.000), the trend remains robust. Older adults consistently presented with more complex and persistent health challenges, suggesting a heightened need for age-specific health interventions, especially for Long-COVID.

Gender and Healthcare Utilization (Table 70). Healthcare-seeking behavior varied significantly by gender. According to Table 70, females were substantially more likely to use healthcare services (OR = 20467.975, p = 0.000). Although the odds ratio is unusually high—possibly indicating model instability or data sparsity—it aligns with broader literature showing that women tend to utilize health services more frequently, especially for chronic or follow-up care.

Healthcare Satisfaction and Perceptions (Tables 71 & 72) Patient satisfaction during the pandemic was a strong predictor of post-pandemic satisfaction (Table 71, $\chi^2 = 105.871$, p = 0.000). Similarly, satisfaction with care was closely linked to perceptions of healthcare system efficiency during (Table 72, $\chi^2 = 89.200$, p = 0.000) and after the pandemic ($\chi^2 = 26.682$, p = 0.002). These relationships underscore the enduring influence of crisis-time experiences on public trust and healthcare system legitimacy. Trust built (or eroded) during emergencies appears to carry forward, influencing post-crisis evaluations of care.

Healthcare Access and System Efficiency (Tables 45.2, 46.2, 47.2). Access to care during the pandemic significantly shaped perceptions of both current access and system

efficiency. Table 45.2 demonstrates that satisfaction with access during the pandemic was strongly associated with post-pandemic access satisfaction (p = 0.000). Similarly, Table 46.2 and Table 47.2 show that satisfaction with access had a significant bearing on perceived service efficiency (p = 0.000 and p = 0.002, respectively). These findings reinforce that equitable, timely access remains foundational to both perceived and actual healthcare quality.

Healthcare Utilization Patterns (Tables 43.3, 43.4)

The analysis of healthcare utilization patterns using ordinal measures (Somers' d, Gamma, Kendall's tau-b/c) revealed statistically significant associations (all p = 0.036) in Tables 43.3 and 43.4. Individuals who previously utilized healthcare services in certain ways— such as preferring public or private providers—tended to maintain those preferences. These findings imply that health-seeking behaviors are habitual and may persist even after the acute phase of a health crisis, with implications for long-term planning and resource allocation.

Marginal but Notable Findings (Tables 31.2 & 39). Two additional findings merit attention despite not reaching standard significance thresholds. Table 31.2 revealed a near-significant association (p = 0.054) between citizenship status and pre-pandemic health issues. This may suggest structural or socioeconomic inequities among different residency groups in Singapore. Likewise, Table 39 approached significance for the relationship between age and post-COVID health outcomes (p = 0.051), with the Likelihood Ratio again supporting a significant association. Both instances warrant further exploration, particularly through qualitative or mixed methods.

Satisfaction and utilization of services (Table 72)- The chi-square tests offer a mixed picture of how satisfaction relates to healthcare experiences. In Section 1.1, the Pearson Chi-Square value of 5.030 (p = 0.17) indicates no statistically significant link between satisfaction and telehealth use—suggesting that how individuals felt about accessibility didn't necessarily influence whether they chose telehealth services. However, the results

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from Section 1.2 (χ^2 = 105.871, p < 0.001) present a very different pattern. Here, satisfaction during the pandemic strongly predicted satisfaction afterward, reflecting a lasting impact of individuals' early experiences with healthcare systems under stress.

Further, the association between satisfaction and perceived efficiency was clearly evident. In Section 1.3, the chi-square statistic (χ^2 = 89.2, p < 0.001) revealed that those who felt satisfied during the pandemic were more likely to view the healthcare system as efficient. This trend persisted post-pandemic, as shown in Section 1.4 (χ^2 = 26.682, p = 0.002), where earlier satisfaction was associated with continued perceptions of efficiency. Overall, while satisfaction didn't appear to influence specific behaviors like telehealth use, it played a substantial role in shaping broader evaluations of healthcare quality over time.

Conclusion

The statistical analysis reveals that while general health status may appear uniformly distributed across population groups, more granular examination uncovers clear disparities linked to gender, occupation, income, and age. These variables not only affect who experiences health issues but also shape the type of symptoms reported and the healthcare pathways taken.

Crucially, satisfaction with healthcare services and perceived system efficiency are closely tied to experiences during crises—highlighting the long-term importance of delivering responsive, accessible care during emergencies. Patterns of care utilization also tend to persist over time, reinforcing the importance of early intervention and sustained engagement. Furthermore the COVID-19 pandemic exposed critical gaps in healthcare access, especially for older adults, revealing how digital exclusion, disrupted chronic care, and social isolation compounded health challenges despite the rise of telehealth. Drawing from interviews and guided by behavioral theories like HBM, TRA, and TPB, this study highlights the urgent need for age-inclusive, community-based, and equity-driven healthcare systems that prioritize continuity, mental health, and digital support beyond crisis response.

From a policy and public health perspective, the findings call for targeted, equity-driven responses—particularly gender-sensitive, occupation-aware, and age-specific strategies to enhance healthcare delivery and resilience. While some associations must be interpreted with caution due to methodological limitations (e.g., small expected frequencies), the overarching trends provide a compelling basis for future research, intervention, and policy development in the post-pandemic landscape.

- Strengths**:** The pandemic accelerated healthcare system adaptation, boosting telehealth and vaccination strategies.
- Challenges**:** Digital illiteracy, inequitable healthcare access, and policy gaps persisted.
- Future Recommendations:
    1. Mental Health Support**:** Develop structured psychological assistance for older adults and healthcare workers.
    2. Ethical Care Guidelines**:** Establish frameworks balancing infection control with compassionate patient care.
    3. Strengthened Crisis Communication**:** Improve transparency and public trust in healthcare directives.
    4. Digital Inclusion in Healthcare**:** Expand digital literacy programs for older adults to enhance telehealth accessibility.
    5. Sustainable Healthcare Workforce Planning**:** Address staff burnout and shortages through long-term workforce reforms.
    6. Integrated Community-Based Healthcare: Strengthen coordination between hospitals, community clinics, and social organizations for better service delivery

CHAPTER V:

DISCUSSION

5.1 Discussion of Results

The findings from this study align with existing literature on the profound impact of the COVID-19 pandemic on healthcare utilization, health outcomes, and public health management strategies. The pandemic created a paradigm shift in healthcare delivery, emphasizing the importance of resilience, adaptability, and the integration of digital health solutions. The discussion integrates insights from the literature review with the study results to highlight key themes and implications for future healthcare preparedness.

Table 5.1 Key Findings

Category	Key Statistics/Findings
Demographic Profile	
Age	Predominantly young: 18–25 (26.3%), followed by 31–35 (10.5%) and 41–45 (7.9%), with progressively fewer participants in older age groups, and minimal representation above age 70.
Gender	Male (54.6%), Female (44.1%), Other (1.3%)
Occupation	Students (46.1%), Employed (30.9%), Retired (9.2%), homemaker 11.2%, Unemployed2.6%
Income	Below SGD 2,000 (68.4%), Above SGD 8,000 (9.2%), 2,001–5,000 (9.2%), 5,001–8,000 (13.2%)
Education	Diploma/Bachelor's (59.9%), Postgraduate (13.2%)
Ethnicity	Chinese (47.4%), Indian (22.4%), Malay (19.7%), Other (10.5%)
Citizenship	Singapore Citizen (68.4%), Permanent Resident (23.7%), Foreigner (7.9%)
Health Status Across Pandemic Phases	
Pre-COVID Health Issues	Chronic conditions such as asthma, hypertension, diabetes, and arthritis were common. Mental health issues, including depression and (Borderline Personality Disorder) BPD,

During the Pandemic	COVID-19 infection (80.3%), joint pain, chest discomfort, depression, and respiratory ailments. Mental health challenges intensified amid isolation.
Post-COVID Complications	32.9% reported ongoing health concerns—chest pain, persistent cough, shortness of breath, and mental health symptom
COVID-19 Infection & Post-Infection Effects	
Infection Rate	80.3% had COVID-19
Post-COVID Issues	32.9% reported post-COVID health issues
Healthcare Utilization	
Pre-Pandemic	Mostly rare public healthcare use (59.9% rarely)
During and Post pandemic	54.6% reported no change in their frequency of seeking healthcare services 33.6% experienced a slight increase,
Type of services (Public vs private)	Before pandemic-71.7%) of respondents utilized public healthcare services, while a smaller proportion (28.3%) relied on private healthcare Current- majority (65.1%) of the respondents are from public institutions, while 34.9% are from private institutions
Key Drivers of Healthcare Choices	
Factors	Cost, proximity, insurance coverage, and family influence
Accessibility and Efficiency of Care	
Satisfaction During Pandemic	69.7% expressed satisfaction with healthcare access during COVID-19
Post-Pandemic Access	63.8% remained satisfied post-pandemic
System Efficiency	55.3% rated healthcare as efficient during the pandemic, post-pandemic satisfaction rose to 57.9%.

Demographic Considerations and Health Disparities

The study's demographic profile highlights an underrepresentation of older adults, which limits the generalizability of findings related to ageing populations. This is a critical gap, as older individuals are disproportionately affected by both acute COVID-19 infections and post-pandemic health conditions, including Long-COVID. The literature supports the

need for targeted studies focusing on elderly populations to address healthcare utilization patterns, chronic disease management, and mental health needs post-pandemic (Trabelsi et al., 2021). Furthermore, the study's sample had a lower-income skew, suggesting that financial barriers may play a significant role in healthcare accessibility, consistent with global findings on healthcare disparities (Betancourt et al., 2020).

Health Issues During and Post-Pandemic

Long-COVID emerged as a critical issue. Nearly one-third (32.9%) of respondents indicated ongoing health problems post-COVID, with fatigue, breathlessness, and mental health challenges being the most common. These symptoms mirror those identified by Davis et al. (2021), Bai et al. (2022), and Ceban et al. (2022), who noted that Long-COVID often persists independent of the severity of the initial infection. This also aligns with recent literature findings on the prevalence of Long-COVID and its multi-system impact, including respiratory, cardiovascular, and neurological symptoms (Munblit et al., 2022. Gender also appeared to influence outcomes, with women showing a higher tendency toward Long-COVID symptoms, as highlighted in Bai et al. (2022).

Mental health took a significant hit during the pandemic. Isolation, fear, and disrupted routines contributed to heightened anxiety and depression levels, particularly among the youth. Ammar et al. (2020) underscored how lockdowns led to psychological distress, echoing our findings where many respondents identified mental health issues as an ongoing concern.

Healthcare Utilization Patterns and Barriers

The study reveals a notable shift in healthcare utilization patterns, with 33.6% of respondents reporting increased healthcare use during and after the pandemic. Fear of

infection, healthcare system strain, and government policies were major determinants of healthcare-seeking behavior. These findings mirror global trends where delayed or reduced healthcare utilization was observed due to pandemic-related fears, leading to potential long-term consequences (OECD, 2020).

Telemedicine adoption remained low (28.3%), despite its potential to bridge gaps in healthcare access. This suggests that while digital health solutions gained prominence during the pandemic, factors such as digital literacy, affordability, and personal preferences may have limited widespread adoption (Omboni et al., 2022). Policymakers must prioritize strategies to enhance telehealth accessibility and effectiveness, particularly for vulnerable populations.

The COVID-19 pandemic deeply disrupted healthcare systems globally, but its impact was not uniform across populations. Our survey reflects this imbalance, revealing a respondent base largely made up of younger individuals, students, and low-income earners. Only 3.3% of respondents were aged 70 and above, highlighting a digital divide and a lack of representation from older adults—those most vulnerable to the virus and its long-term effects (Ahn, Kim, & Koh, 2022).

Older adults often faced significant health risks during the pandemic. Ahn et al. (2022) found that in Singapore, the healthcare utilization of older individuals declined, and their self-reported health worsened. Our findings support this: although most respondents were not elderly, those who were reported worsening chronic conditions such as diabetes, hypertension, and mental health issues like anxiety and depression. This aligns with findings from Akbarialiabad et al. (2021) and Almas et al. (2022), who documented persistent post-COVID conditions that continue to affect daily life and well-being.

When it comes to healthcare access, our survey found that although 69.7% of respondents were satisfied with healthcare services during the pandemic, challenges remained. Cost, long wait times, and fear of infection kept some people away from hospitals. This aligns with the Health Belief Model (HBM), where perceived barriers—

such as fear of contracting the virus—can discourage people from seeking care (Blackstone, 2012).

Public healthcare was the preferred choice due to affordability and subsidies, yet quality and speed drove some to choose private providers. This reflects a practical decision-making process shaped by perceived benefits, convenience, and familiarity with healthcare providers. These findings resonate with the Theory of Planned Behavior (TPB), where attitudes, control, and subjective norms influence behavior.

Interestingly, telehealth adoption remained limited—only 28.3% of respondents used it. While some found it convenient for follow-ups or minor ailments, many expressed neutrality or skepticism. Barriers such as lack of digital access, unfamiliarity, and preference for face-to-face interactions may explain this low uptake, consistent with findings by Betancourt et al. (2020) and Garfan et al. (2021).

Furthermore, even though the healthcare system adapted rapidly—introducing digital tools and streamlining access—there were inconsistencies, particularly in specialist care. This mixed experience points to a need for better coordination and more inclusive strategies, especially for the elderly, as discussed by Mansell et al. (2022).

Community support filled many gaps. Mutual aid efforts, home delivery of medicines, and digital assistance helped many navigate the pandemic. The Theory of Reasoned Action (TRA) suggests that social norms and perceived support shape behavior, which our results support.

The road ahead demands more than digital solutions. Geriatric care must become a central focus. As our data show, older adults struggled the most with accessing and using healthcare. Training programs for digital tools, better community-based support, and integrated policies can make healthcare more inclusive.

In summary, the pandemic magnified existing disparities while also revealing the potential of adaptive healthcare models. Long-COVID remains a pressing concern, particularly for women and those with chronic conditions. Moving forward, healthcare reforms must strike a balance between technology and empathy, data and lived

experience. To build a system that works for all—especially the most vulnerable—we need policies grounded in both evidence and compassion**.**

Public Health Implications and Policy Recommendations

1. Enhanced Representation of Older Adults in Research

   Given the underrepresentation of older adults in the study sample, future research should ensure comprehensive inclusion of elderly populations to better inform aging-related healthcare policies. Understanding their unique healthcare needs is essential for designing effective long-term care models.

2. Strengthening Mental Health Interventions

   The pandemic exacerbated mental health challenges, necessitating a stronger focus on mental health services. This includes integrating mental health support into primary care, enhancing community-based interventions, and reducing stigma associated with mental health conditions (Shamsi et al., 2020).

3. Addressing Long-COVID and Chronic Disease Management

   With a substantial proportion of respondents experiencing post-COVID symptoms, healthcare systems must develop surveillance mechanisms for Long-COVID. Early intervention strategies, rehabilitation services, and patient-centered chronic disease management plans should be prioritized (Winkelmann et al., 2022).

4. Strengthening Public Healthcare Infrastructure

   The preference for public healthcare underscores the need for continued investment in public health infrastructure, ensuring affordability and accessibility. Addressing pandemic-related fears through clear communication, infection control measures, and healthcare worker training is crucial for future preparedness (Cassell et al., 2022).

5. Enhancing Telehealth Integration

While telemedicine presents a promising alternative, barriers to adoption must be addressed. This includes improving digital infrastructure, ensuring affordability, and enhancing digital literacy among older and low-income populations (Patel et al., 2020).

Lessons Learned and Future Directions

The COVID-19 pandemic provided invaluable lessons on healthcare resilience, emergency preparedness, and systemic adaptability. Effective crisis communication, ethical healthcare decision-making, and enhanced support for healthcare workers are critical areas for improvement (El Keshky et al., 2020). Moving forward, interdisciplinary collaboration among policymakers, healthcare providers, and researchers will be essential in mitigating future health crises and enhancing healthcare equity.

In conclusion, the findings underscore the multifaceted impact of COVID-19 on healthcare utilization, chronic disease management, and mental health. Addressing these challenges requires sustained public health efforts, targeted policy interventions, and continuous research to strengthen healthcare systems for future pandemics.

5.2 Patient Journey Map

Patient Experience, Pain Points, and Opportunities for Improvement an guided map to project the journey. (Rismanchian, F.,et al 2022)

5.2.1. Awareness & Health Perception (Pre-pandemic & General Health Status)

Patient Experience:

- Individuals perceive themselves as either healthy or at risk based on their personal health history and lifestyle choices.
- Healthcare visits are often infrequent due to financial constraints, leading to limited preventive care.

- Many rely on family influence, cultural beliefs, and past healthcare experiences to make decisions about medical treatment and wellness.

Pain Points:

- A general lack of awareness regarding the importance of preventive healthcare and early intervention.
- Cost-related concerns, particularly among low-income populations, discourage routine health check-ups and screenings.
- Cultural preferences and traditional beliefs impact healthcare choices, sometimes leading to the neglect of medical care.

Opportunities for Improvement:

- Implement comprehensive health literacy campaigns to educate the public on the benefits of preventive healthcare.
- Design targeted outreach programs and subsidies for low-income populations to encourage regular health check-ups.
- Strengthen community-based health initiatives that respect cultural preferences while promoting evidence-based care.

5.2.2 Onset of Symptoms & Decision-Making (Pre & Post COVID-19)

Patient Experience:

- When symptoms appear or chronic conditions worsen, individuals assess their options for medical care.
- Decisions are based on affordability, accessibility, and prior experiences with healthcare systems.
- The choice between public and private healthcare facilities is often influenced by financial considerations.

Pain Points:

- Fear of exposure to COVID-19 deters patients from seeking timely medical attention.
- Financial constraints continue to be a significant barrier to accessing necessary healthcare services.
- Public healthcare facilities often have long wait times, making access to timely care difficult.

Opportunities for Improvement:

- Expand telemedicine and digital health solutions to provide remote consultations and reduce in-person visits.
- Strengthen financial assistance programs, including subsidies and expanded insurance coverage, to improve affordability.
- Optimize patient flow and triage systems in public healthcare facilities to reduce long wait times.

5.2.3. Seeking Healthcare Services (During Pandemic & Post-Pandemic)

Patient Experience:

- Individuals visit public or private healthcare providers based on cost, accessibility, and urgency of their condition.
- Some patients turn to digital healthcare options, such as telemedicine and online consultations, to receive medical advice.
- Government regulations and policies influence healthcare-seeking behavior during crises such as the COVID-19 pandemic.

Pain Points:

- Overcrowding in public healthcare facilities leads to delays in receiving medical attention.
- Patients experience challenges in scheduling appointments due to high demand and inefficient booking systems.
- Non-urgent medical conditions are often deprioritized, leading to delays in necessary treatments.

Opportunities for Improvement:

- Enhance appointment scheduling efficiency through digital solutions and centralized systems.
- Strengthen telehealth integration for non-emergency medical conditions to reduce unnecessary hospital visits.
- Develop infrastructure to improve healthcare accessibility in rural and underserved areas.

5.2.4. Treatment & Diagnosis (Hospital & Clinic Experience)

Patient Experience:

- Patients receive medical consultations, diagnoses, and prescriptions based on their condition.
- Some individuals require follow-up visits for chronic disease management or post-COVID complications.
- Experiences vary significantly between public and private healthcare settings, often influenced by resource availability.

Pain Points:

- Doctor-patient interaction time is reduced due to high patient demand, affecting quality of care.

- Follow-up care for chronic conditions is inconsistent, leading to potential health deterioration.
- Specialized treatments in private healthcare facilities are costly, limiting accessibility for lower-income patients.

Opportunities for Improvement:

- Expand access to specialized care within public hospitals to reduce dependency on expensive private care.
- Introduce AI-driven triage systems to enhance efficiency in patient management and reduce waiting times.
- Improve continuity of care through better patient tracking systems and follow-up mechanisms.

5.2.5. Post-Treatment & Follow-Up (Recovery & Ongoing Health Management)

Patient Experience:

- Patients recovering from COVID-19 or managing chronic conditions often require long-term medical support.
- Mental health challenges, including anxiety and depression, persist post-treatment.
- Individuals evaluate their long-term healthcare needs, including rehabilitation, elderly care, and chronic disease management.

Pain Points:

- Accessible mental health services are lacking, leaving many patients without necessary psychological support.
- Rehabilitation services, particularly for post-COVID recovery, remain underdeveloped.

- The cost of long-term care, including home-based and geriatric care, is prohibitively high for many families.

Opportunities for Improvement:

- Develop and implement comprehensive long-term post-COVID rehabilitation programs.
- Expand mental health services, ensuring affordable and accessible psychological support.
- Strengthen geriatric and home-based care models to support aging populations and those with chronic conditions.

5.2.6. Long-Term Health & Prevention (Sustained Healthcare Engagement)

Patient Experience:

- Some patients adopt healthier habits, while others continue facing financial and accessibility barriers.
- Public health interventions shape long-term healthcare engagement and decision-making.
- Policy changes at national and regional levels influence healthcare accessibility, affordability, and quality.

Pain Points:

- Persistent disparities in healthcare access, particularly affecting low-income and non-citizen groups.
- Financial barriers continue to hinder access to necessary healthcare services.
- Inadequate preparedness for future pandemics remains a concern, affecting public health security.

Opportunities for Improvement:

- Enhance equitable healthcare policies to ensure accessibility for all populations.
- Strengthen collaborations between the public and private sectors to improve healthcare infrastructure and service delivery.
- Improve emergency preparedness plans to better respond to future pandemics and public health crises.

This detailed framework provides a comprehensive look at the various stages of the patient experience, their associated challenges, and actionable strategies for improvement, ensuring a more accessible, efficient, and patient-centric healthcare system.

Table 5.2.6. Long-Term Health & Prevention (Sustained Healthcare Engagement)

Patient Journey Map

Awareness & Health Perception	Onset of Symptoms & Decision-Making	Seeking Healthcare Services	Treatment & Diagnosis	Post-Treatment & Follow-Up	Long-Term Health & Prevention

Patient Experience

Awareness & Health Perception	Onset of Symptoms & Decision-Making	Seeking Healthcare Services	Treatment & Diagnosis	Post-Treatment & Follow-Up	Long-Term Health & Prevention
• Individuals perceive selves as healthy or at risk based on personal health history and lifestyle choices • Healthcare visits often infrequent due to financial constraints, leading to limited preventive care • Many rely on family influence, cultural beliefs, and past healthcare experiences to make decisions about medical treatment and wellness	• When symptoms appear or chronic conditions worsen, individuals assess options for medical care • Decisions based on affordability, accessibility, and prior experiences with healthcare systems • Choice between public and private healthcare facilities often influenced by financial considerations	• Individuals visit public or private healthcare providers based on cost, accessibility, and urgency of condition. • Some patients turn to digital healthcare options (telemedicine, online consultations) for medical advice • Government regulations and policies influence healthcare-seeking behavior during crises like COVID-19 pandemic	• Patients receive medical consultations, diagnoses, and prescriptions based on condition • Some individuals require follow-up visits for chronic disease management or post-COVID complications • Experiences vary significantly between public and private healthcare settings, often influenced by resource availability	• Patients recovering from COVID-19 or managing chronic conditions often require long-term medical support • Mental health challenges, including anxiety and depression, persist post-treatment • Individuals evaluate their long-term healthcare needs, including rehabilitation, elderly care, and chronic disease management	• Some patients adopt healthier habits, while others continue facing financial and accessibility barriers. • Public health interventions shape long-term healthcare engagement and decision-making. • Policy changes at national and regional levels influence healthcare accessibility, affordability, and quality

Pain Points

Awareness & Health Perception	Onset of Symptoms & Decision-Making	Seeking Healthcare Services	Treatment & Diagnosis	Post-Treatment & Follow-Up	Long-Term Health & Prevention
• General lack of awareness regarding importance of preventive healthcare and early intervention • Cost-related concerns, particularly among low-income populations, discourage routine health check-ups and screenings • Cultural preferences and traditional beliefs impact healthcare choices, leading to neglect of medical care	• Fear of exposure to COVID-19 deters patients from seeking timely medical attention • Financial constraints continue to be significant barrier to accessing necessary healthcare services • Public healthcare facilities often have long wait times, making access to timely care difficult	• Overcrowding in public healthcare facilities leads to delays in receiving medical attention • Patients experience challenges in scheduling appointments due to high demand and inefficient booking systems • Non-urgent medical conditions are often deprioritized, leading to delays in necessary treatments	• Doctor-patient interaction time is reduced due to high patient demand, affecting quality of care. • Follow-up care for chronic conditions is inconsistent, leading to potential health deterioration. • Specialized treatments in private healthcare facilities are costly, limiting accessibility for lower-income patients	• Accessible mental health services lacking, leaving many patients without necessary psychological support • Rehabilitation services, particularly post-COVID recovery, remain underdeveloped • Cost of long-term care, including home-based and geriatric care, is prohibitively high for many families	• Persistent disparities in healthcare access, particularly affecting low-income and non-citizen groups • Financial barriers continue to hinder access to necessary healthcare services. • Inadequate preparedness for future pandemics remains a concern, affecting public health security

Opportunities for Improvement

Awareness & Health Perception	Onset of Symptoms & Decision-Making	Seeking Healthcare Services	Treatment & Diagnosis	Post-Treatment & Follow-Up	Long-Term Health & Prevention
• Implement comprehensive health literacy campaigns to educate the public on the benefits of preventive healthcare. • Design targeted outreach programs and subsidies for low-income populations to encourage regular health check-ups. • Strengthen community-based health initiatives that respect cultural preferences while promoting evidence-based care	• Expand telemedicine and digital health solutions to provide remote consultations and reduce in-person visits. • Strengthen financial assistance programs, including subsidies and expanded insurance coverage, to improve affordability. • Optimize patient flow and triage systems in public healthcare facilities to reduce long wait times	• Enhance appointment scheduling efficiency through digital solutions and centralized systems. • Strengthen telehealth integration for non-emergency medical conditions to reduce unnecessary hospital visits. • Develop infrastructure to improve healthcare accessibility in rural and underserved areas	• Expand access to specialized care within public hospitals to reduce dependency on expensive private care. • Introduce AI-driven triage systems to enhance efficiency in patient management and reduce waiting times. • Improve continuity of care through better patient tracking systems and follow-up mechanisms	• Develop and implement comprehensive long-term post-COVID rehabilitation programs. • Expand mental health services, ensuring affordable and accessible psychological support. • Strengthen geriatric and home-based care models to support aging populations and those with chronic conditions	• Enhance equitable healthcare policies to ensure accessibility for all populations. • Strengthen collaborations between public and private sectors to improve healthcare infrastructure and service delivery. • Improve emergency preparedness plans to better respond to future pandemics and public health crises

5.3 Logic Model for Post-COVID Healthcare Utilization and Impact

Goal:

To improve healthcare access, utilization, and outcomes, particularly for vulnerable populations, by addressing post-COVID health issues, improving healthcare infrastructure, and enhancing healthcare delivery systems.

Problem Statement:

The COVID-19 pandemic has highlighted and worsened existing vulnerabilities in the healthcare system, especially for marginalized groups like the elderly, low-income populations, and individuals with chronic conditions in Singapore. These groups have faced significant barriers to accessing necessary healthcare services, including fear of infection, financial constraints, and logistical challenges. While public healthcare services have seen increased demand, there is also underutilization of essential services like telehealth and post-COVID care, particularly for conditions such as respiratory, cardiovascular, and mental health issues. The long-term effects of COVID, including Long-COVID, require urgent intervention to make healthcare systems more accessible, equitable, and resilient. Addressing these disparities is essential to ensuring timely, effective, and affordable care for all, particularly in the post-pandemic era.

Resources:

- Survey data on health issues, healthcare utilization, and demographic factors (age, income, education, ethnicity, etc.).
- Post-COVID health concerns: Respiratory, cardiovascular, musculoskeletal, and mental health complications.
- Healthcare system data: Public vs. private utilization, cost barriers, and pre-existing system dynamics.
- Underreporting and biases due to pandemic constraints.
- Government healthcare initiatives and subsidies.

- Telehealth technology platforms.
- Healthcare providers (public and private systems).
- Mental health support and rehabilitation services.
- Post-COVID care infrastructure, such as Long-COVID clinics.

Stakeholders:

- Singaporean citizens and permanent residents.
- Public and private healthcare institutions.
- Government agencies (Ministry of Health, etc.).
- NGOs and community organizations.
- Technology providers for telemedicine platforms.

Inputs to Activities:

- **Data Collection & Monitoring**:
    - Analyze health trends (chronic conditions, mental health, Long-COVID symptoms) through surveys and studies.
    - Monitor healthcare utilization patterns, identifying barriers and gaps.
- **Healthcare Access Improvement**:
    - Expand public healthcare services to address post-COVID demand.
    - Increase the availability of telehealth services, focusing on underserved populations.
    - Improve affordability of healthcare services, particularly for low-income groups and the elderly.
- **Post-COVID Support Initiatives**:
    - Strengthen mental health programs and long-term disease management, especially for those with Long-COVID and chronic conditions.
    - Train healthcare professionals to manage post-COVID complications and utilize telehealth platforms.

o Promote preventive care and chronic disease management through targeted outreach, especially for elderly populations.

Activities:

- **Public Health Interventions**:
  - o Enhance accessibility to healthcare services, particularly in public settings, by reducing waiting times and improving service availability.
  - o Launch public health campaigns to increase awareness about post-COVID health issues, including respiratory, cardiovascular, and mental health complications.
  - o Encourage vaccination and preventive care to reduce the future burden of disease.

- **Healthcare Utilization**:
  - o Promote the adoption of telehealth services to overcome barriers such as fear of infection and logistical constraints.
  - o Improve patient satisfaction with healthcare services through better infrastructure and streamlined processes.
  - o Expand post-COVID and Long-COVID clinic offerings, including rehabilitation services.

- **Training & Education**:
  - o Provide specialized training for healthcare professionals to effectively manage post-COVID symptoms.
  - o Train healthcare workers in telehealth practices, improving remote care delivery.
  - o Educate communities about preventive care, mental health resources, and chronic disease management.

Outputs:

- **Healthcare Services**:

- o Increased utilization of public healthcare services, particularly telehealth and Long-COVID management services.
  - o Expansion of post-COVID care services, including dedicated clinics and rehabilitation programs.
  - o Strengthened infrastructure to reduce healthcare delays and improve patient satisfaction.
- **Patient Engagement**:
  - o Improved healthcare-seeking behaviors, particularly among marginalized populations like the elderly and low-income groups.
  - o Higher levels of engagement with chronic disease management and preventive care programs.
  - o Increased adoption of telemedicine among patients facing barriers to in-person care.
- **Policy Development**:
  - o New public health policies supporting post-COVID care and integrated chronic disease management.
  - o Development of strategies to enhance healthcare sustainability and resilience for future crises.

Outcomes:

- **Short-Term**:
  - o Immediate improvement in healthcare access and satisfaction, especially for vulnerable populations.
  - o Increased utilization of preventive care and chronic disease management services.
  - o Expanded awareness and uptake of Long-COVID clinics and specialized care services.
- **Medium-Term**:

- o Reduced barriers to healthcare (financial, technological, and logistical) with improved mental health support systems in place.
- o Increased adoption of telemedicine and remote healthcare solutions.
- o Improved healthcare delivery efficiency and reduced strain on public healthcare systems.
- **Long-Term**:
  - o A more equitable healthcare system that offers affordable, accessible, and timely care to all population segments.
  - o Enhanced health outcomes, particularly for the elderly, low-income populations, and those with chronic conditions or post-COVID complications.
  - o A resilient healthcare system prepared to manage future health crises and long-term health conditions.

Impact:

- **Health Equity**:
  - o Reduction in health disparities, particularly for elderly populations and ethnic minorities.
  - o Greater inclusion of marginalized groups in healthcare systems, with improved access to both specialized and general care.
- **Healthcare Sustainability**:
  - o A more resilient healthcare system that can address future public health emergencies and long-term health issues.
  - o Integration of telehealth and chronic disease management into regular healthcare infrastructure.
- **Public Health Resilience**:
  - o Health systems that are well-equipped to manage long-term recovery from pandemics and effectively address Long-COVID and other long-term conditions.

    o   Greater coordination across healthcare sectors (public, private, telehealth) to provide continuous, patient-centered care.

Table 5.3 Logic Model for Post-COVID Healthcare Utilization and Impact

Inputs	Activities		Outputs	Outcomes	Impact

Inputs

Resources
- Survey data on health issues, healthcare utilization, demographics
- Post-COVID health concerns
- Healthcare system data (cost barriers, utilization, etc.)
- Under-reporting and biases
- Government healthcare initiatives
- Telehealth platforms
- Healthcare providers
- Mental health support / rehab services
- Post-COVID care infrastructure

Stakeholders
- Singapore Citizens
- Permanent Residents
- Public & Private healthcare institutions
- Government agencies
- NGOs & community organizations
- Technology providers for telemedicine

Activities

Data Collection & Monitoring
- Analyse health trends (surveys)
- Monitor healthcare utilization patterns, barriers

Healthcare Access Improvement
- Expand public healthcare services to address post-COVID demand
- Increase telehealth availability to underserved
- Improve affordability for low income and elderly

Post-COVID Support Initiatives
- Strengthen mental health programs & long-term disease management
- Train healthcare professionals to manage post-COVID complications
- Promote preventive care and chronic disease management especially for elderly

Public Health Interventions
- Enhance accessibility, reducing wait time, improving availability
- Launch campaigns to increase awareness of post-COVID health issues
- Encourage vaccination and preventive care

Healthcare Utilization
- Promote adoption of telehealth
- Improve infrastructure and streamline processes
- Expand Post-COVID and Long COVID clinic offerings

Training & Education
- Specialised training for HCP to manage post-COVID symptoms & telehealth practices
- Education communities on preventive health, mental health, and chronic disease management

Outputs

Healthcare Services
- Increased utilization of public healthcare services (telehealth & long COVID management)
- Expansion of Post-COVID care services
- Strengthened infrastructure (reduced delays, improved satisfaction)

Patient Engagement
- Improved healthcare seeking behaviours (elderly and low-income groups)
- Increased engagement with chronic disease management and preventive care programs
- Increased telemedicine usage

Policy Development
- New public health policies supporting post-COVID care and integrated chronic disease management
- Development of strategies to enhance healthcare sustainability and resilience for future crises

Outcomes

Short Term
- Immediate improvement in healthcare access and satisfaction, especially for vulnerable population
- Increased utilization of preventive care and chronic disease management services
- Expanded awareness and uptake of Long COVID clinics and specialized care services

Mid Term
- Reduced barriers to healthcare with improved mental health support systems
- Increased adoption of telemedicine and remote healthcare solutions
- Improved healthcare delivery efficiency and reduced strain on public healthcare

Long Term
- More equitable healthcare system (affordable, accessible, timely care to all populations)
- Enhanced health outcomes, especially for elderly, low-income populations and those with chronic conditions or post-COVID complications
- Resilient healthcare system prepared to manage future health crises and long-term health conditions

Impact

Health Equity
- Reduction in health disparities, particularly for elderly population and ethnic minorities
- Greater inclusion of marginalized groups in healthcare systems, with improved access to specialized and general care

Healthcare Sustainability
- More resilient healthcare system that can address future public health emergencies and long-term health issues
- Integration of telehealth and chronic disease management into regular healthcare infrastructure

Public Health Resilience
- Health systems well-equipped to manage long-term recovery from pandemics and effectively address long COVID and other long-term conditions
- Greater coordination across healthcare sectors to provide continuous, patient centred care

5.4 Innovation in Healthcare

- Telemedicine Expansion**:** Virtual consultations reduced patient load in hospitals and improved accessibility.
- AI-Driven Diagnostics: AI-based screening and predictive analytics helped in early disease detection and management.
- Mobile Health Clinics**:** Brought essential healthcare services to underserved communities, improving access.
- Integrated Digital Health Records**:** Enhanced coordination among healthcare providers, reducing redundant tests and improving treatment plans.
- Workforce Upskilling & Mental Health Support**:** Training programs for healthcare workers ensured better pandemic preparedness and resilience.
- Public-Private Collaborations**:** Strengthened partnerships for vaccine distribution, emergency response, and resource-sharing.

Outcomes & Future Directions

- Improved Healthcare Awareness**:** Increased preventive healthcare measures and regular check-ups among the population.
- Enhanced Digital Health Utilization**:** Higher adoption of telehealth and AI-driven tools for better patient outcomes.
- More Equitable Healthcare Access**:** Mobile clinics and digital health solutions bridged gaps in underserved areas.
- Stronger Emergency Preparedness**:** Improved public health response frameworks for future pandemics.
- Sustainable Healthcare Reforms**:** Policy adaptations ensuring affordability, reduced wait times, and expanded geriatric care.

Recommendations for Future Healthcare Improvements

- Expand Healthcare Access**:** Mobile clinics and telemedicine to reach underserved areas.

- Improve Affordability**:** Strengthen subsidies and introduce price regulations.

- Reduce Wait Times**:** Increase healthcare workforce capacity and optimize scheduling systems.

- Support Older Adults**:** Expand geriatric care units and home-based care models.

- Enhance Digital Healthcare**:** Develop AI-based diagnostics and expand telehealth services.

- Strengthen Emergency Preparedness**:** Improve public-private partnerships and integrated response frameworks.

- Continuous Monitoring & Policy Adjustments**:** Regular data collection and patient feedback to refine healthcare strategies.

Conclusion

- The pandemic significantly impacted healthcare utilization and accessibility.

- While improvements have been made, continued focus on affordability, wait times, and equitable access is crucial.

- Long-term investments in digital health, workforce expansion, and emergency preparedness will ensure a more resilient healthcare system.

5.5 Comprehensive Roadmap

Enhancing post-COVID healthcare access, utilization, and outcomes, especially for vulnerable populations.

Application of the patient journey framework to a logic model, we need to map each stage of the patient's journey to specific components in the logic model, including inputs, activities, outputs, outcomes, and impact (Joseph A., et al 2023). Below is a breakdown

of how each stage of the patient journey can be integrated into the logic model for post-COVID healthcare utilization:

5.5.1. Awareness & Health Perception (Pre-pandemic & General Health Status)

- Patient Experience: Individuals evaluate their health status based on personal experiences and external influences, impacting their healthcare decisions.
- Pain Points: Lack of awareness regarding preventive care and affordability barriers.
- Opportunities for Improvement: Health literacy campaigns and outreach to underserved populations.

Logic Model Integration:

- Inputs: Data on health perceptions, socio-economic status, and demographics; community engagement resources.
- Activities: Public health campaigns to improve health literacy; targeted outreach programs for low-income and marginalized groups.
- Outputs: Increased health awareness and more people seeking preventive care.
- Outcomes: Short-term increase in engagement with preventive healthcare; Medium-term improvement in health-seeking behavior.
- Impact: Long-term improvements in health equity and accessibility, especially for marginalized groups.

5.5.2. Onset of Symptoms & Decision-Making (Pre & Post COVID-19)

- Patient Experience: The decision-making process on whether to seek healthcare based on symptoms and external factors such as fear of COVID-19 and financial constraints.
- Pain Points: Fear of exposure, financial barriers, and long wait times.

- Opportunities for Improvement: Expand telehealth services, financial assistance, and optimize triage systems.

Logic Model Integration:

- Inputs: Survey data on healthcare-seeking behavior, telehealth infrastructure.
- Activities: Expansion of telehealth services, subsidized healthcare programs, and improving triage systems to reduce wait times.
- Outputs: More patients using remote consultations; increased healthcare utilization.
- Outcomes: Short-term improvement in access to healthcare, particularly for high-risk groups (elderly, low-income).
- Impact: Long-term improvement in healthcare accessibility, reducing healthcare delays, and enhancing care delivery.

5.5.3. Seeking Healthcare Services (During Pandemic & Post-Pandemic)

- Patient Experience: Seeking care, navigating overcrowded facilities, and utilizing digital solutions.
- Pain Points: Overcrowded facilities, inefficiencies in appointment scheduling, and prioritization of urgent cases.
- Opportunities for Improvement: Telehealth adoption, scheduling optimization, and improving rural healthcare access.

Logic Model Integration:

- **Inputs**: Data on healthcare facility congestion, telemedicine platforms, and rural healthcare needs.
- **Activities**: Improve digital infrastructure, enhance scheduling systems, and increase availability of services in underserved areas.

- **Outputs**: Reduced wait times, increased adoption of telehealth, and better access to healthcare.
- **Outcomes**: Medium-term reduction in facility congestion, increased patient satisfaction with care delivery.
- **Impact**: Long-term health system resilience with efficient use of resources and reduced strain on physical healthcare infrastructure.

5.5.4. Treatment & Diagnosis (Hospital & Clinic Experience)

- **Patient Experience**: Interaction with healthcare professionals for diagnosis and treatment, especially for chronic conditions and COVID-related complications.
- **Pain Points**: Limited doctor-patient time, inadequate follow-up care, high costs for specialized treatment.
- **Opportunities for Improvement**: Expand access to specialized care, introduce AI-driven triage systems, enhance continuity of care.

Logic Model Integration:

- **Inputs**: Data on diagnosis trends, healthcare professional training, and AI technology for triage.
- **Activities**: Train healthcare professionals, implement AI tools to streamline triage, expand specialized care in public hospitals.
- **Outputs**: Improved patient management, quicker diagnoses, and better continuity of care.
- **Outcomes**: Short-term improvement in diagnosis and care efficiency, increased satisfaction with healthcare services.
- **Impact**: Long-term improvement in healthcare quality and patient care, reducing healthcare inequality.

5.5.5. Post-Treatment & Follow-Up (Recovery & Ongoing Health Management)

- **Patient Experience**: Long-term care needs post-treatment, including rehabilitation, mental health support, and chronic condition management.
- **Pain Points**: Lack of accessible mental health services, inadequate rehabilitation options, and high cost of long-term care.
- **Opportunities for Improvement**: Strengthen rehabilitation services, expand mental health services, and support home-based and geriatric care models.

Logic Model Integration:

- **Inputs**: Data on rehabilitation needs, mental health services, post-COVID complications, and chronic disease management.
- **Activities**: Strengthen mental health and rehabilitation services, train professionals to manage long-term health issues, increase funding for home-based care.
- **Outputs**: Increased availability of rehabilitation programs, mental health services, and affordable long-term care options.
- **Outcomes**: Medium-term improvement in patient recovery and mental health support, reduction in long-term health complications.
- **Impact**: Long-term improvements in recovery outcomes, quality of life, and support for elderly populations.

5.5.6. Long-Term Health & Prevention (Sustained Healthcare Engagement)

- **Patient Experience**: Long-term engagement with healthcare systems for prevention and management of chronic diseases, influenced by policy changes.
- **Pain Points**: Persistent healthcare access disparities, financial barriers, and lack of pandemic preparedness.
- **Opportunities for Improvement**: Enhance equitable healthcare policies, strengthen collaboration between sectors, and improve emergency preparedness.

Logic Model Integration:

- **Inputs**: Policy data, demographic health trends, financial barriers, emergency preparedness data.
- **Activities**: Policy development, strengthen public-private partnerships, increase funding for healthcare infrastructure.
- **Outputs**: More equitable healthcare policies, improved healthcare infrastructure.
- **Outcomes**: Long-term improvements in access to care and healthcare equity.
- **Impact**: A resilient, equitable healthcare system capable of managing future crises and ensuring long-term patient care.

By integrating each stage of the patient journey with specific activities, inputs, outputs, and outcomes, this logic model provides a comprehensive roadmap for improving healthcare access, utilization, and outcomes post-COVID, especially for vulnerable populations.

	Awareness & Health Perception (Pre-pandemic & General health status)	Onset of Symptoms & Decision-making (Pre & Post COVID-19)	Seeking Healthcare Service (During and post-pandemic)	Treatment & Diagnosis (Hospital & Clinic Experience)	Post-Treatment & Follow-up (Recovery & Ongoing Health Management)	Long-term Health & Prevention (Sustained Healthcare Engagement)
Patient Experience	Individuals evaluate their health status based on personal experiences and external influences, impacting healthcare decisions	The decision-making process on whether to seek healthcare based on symptoms and external factors such as fear of COVID-19 and financial constraints	Seeking care, navigating overcrowded facilities, and utilizing digital solutions	Interaction with healthcare professionals for diagnosis and treatment, especially for chronic conditions and COVID-related complications	Long-term care needs post-treatment, including rehabilitation, mental health support, and chronic condition management	Long-term engagement with healthcare systems for prevention and management of chronic diseases, influenced by policy changes
Pain Points	Lack of awareness regarding preventive care and affordability barriers	Fear of exposure, financial barriers, and long wait times	Overcrowded facilities, inefficiencies in appointment scheduling, and prioritization of urgent cases	Limited doctor-patient time, inadequate follow-up care, high costs for specialized treatment	Lack of accessible mental health services, inadequate rehabilitation options, high cost of long-term care	Persistent healthcare access disparities, financial barriers, and lack of pandemic preparedness
Opportunities for Improvement	Health literacy campaigns and outreach to underserved populations	Expand telehealth services, financial assistance, and optimize triage systems	Telehealth adoption, scheduling optimization, improving rural healthcare access	Expand access to specialized care, introduce AI-driven triage systems, enhance continuity of care	Strengthen rehabilitation services, expand mental health services, and support home-based and geriatric care models	Enhance equitable healthcare policies, strengthen collaboration between sectors, and improve emergency preparedness

LOGIC MODEL

Inputs	Data on health perceptions, socio-economic status, and demographics; community engagement resources	Survey data on healthcare-seeking behavior, telehealth infrastructure	Data on healthcare facility congestion, telemedicine platforms, rural healthcare needs	Data on diagnosis trends, healthcare professional training, and AI technology for triage	Data on rehabilitation needs, mental health services, post-COVID complications, and chronic disease management	Policy data, demographic health trends, financial barriers, emergency preparedness data
Activities	Public health campaigns to improve health literacy; targeted outreach programs for low-income and marginalized groups	Expansion of telehealth services, subsidized healthcare programs, improving triage systems to reduce wait times	Improve digital infrastructure, enhance scheduling systems, increase service availability in underserved areas	Train healthcare professionals, implement AI tools to streamline triage, expand specialized care in public hospitals	Strengthen mental health & rehabilitation services, train professionals to manage long-term health issues, increase funding for home-based care	Policy development, strengthen public-private partnerships, increase funding for healthcare infrastructure
Outputs	Increased health awareness and more people seeking preventive care	More patients using remote consultations; increased healthcare utilization	Reduced wait times, increased adoption of telehealth, and better access to healthcare	Improved patient management, quicker diagnoses, and better continuity of care	Increased availability of rehabilitation programs, mental health services, and affordable long-term care options	More equitable healthcare policies, improved healthcare infrastructure
Outcomes	Short-term increase in engagement with preventive healthcare; Medium-term improvement in health-seeking behavior	Short-term improvement in access to healthcare, particularly for high-risk groups (elderly, low-income)	Medium-term reduction in facility congestion, increased patient satisfaction with care delivery	Short-term improvement in diagnosis and care efficiency, increased satisfaction with healthcare services	Medium-term improvement in patient recovery and mental health support, reduction in long-term health complications	Long-term improvements in access to care and healthcare equity
Impact	Long-term improvements in health equity and accessibility, especially for marginalized groups	Long-term improvement in healthcare accessibility, reducing healthcare delays and enhancing care delivery	Long-term health system resilience with efficient use of resources and reduced strain on physical healthcare infrastructure	Long-term improvement in healthcare quality and patient care, reducing healthcare inequality	Long-term improvements in recovery outcomes, quality of life, and support for elderly populations	A resilient, equitable healthcare system capable of managing future crises & ensuring long-term patient care

CHAPTER VI:

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

6.1 Summary

The demographic profile of respondents shows a clear skew toward younger individuals, especially those aged 18 to 25, who made up over a quarter of the sample. In contrast, older adults—particularly those aged 70 and above—were barely represented, which may point to challenges in digital access or survey outreach among seniors. Gender representation was fairly balanced, with a slight majority identifying as male. Nearly half of all respondents were students, which helps explain why a large proportion reported monthly incomes below SGD 2,000. Educational attainment was relatively high overall, with most holding diplomas or degrees, though a small number reported only primary-level education. Ethnic distribution largely mirrored Singapore's national makeup, with Chinese, Indian, and Malay groups all represented, and most respondents were citizens.

Health status varied across the pandemic timeline. Before COVID-19, many respondents were already managing chronic conditions like asthma, hypertension, and diabetes, alongside musculoskeletal pain and some mental health concerns. During the pandemic, COVID-19 infections were widespread, and physical symptoms such as joint pain and chest discomfort were common. Mental health issues, including depression, also appeared to worsen—likely due to isolation and uncertainty. After infection, nearly one-third of those who had COVID reported ongoing issues, particularly respiratory symptoms, fatigue, and mental health struggles, suggesting a continued burden of care even after recovery.

When it comes to healthcare utilization, most people used services infrequently before the pandemic. Public healthcare was the preferred choice, mostly because of its affordability and the availability of government subsidies. Private healthcare, while more expensive, was used by some for its shorter wait times and perceived quality, especially

for specialized care. Decisions around where and when to seek care were influenced by factors such as cost, proximity, insurance coverage, and family habits.

The pandemic clearly altered some behaviors. About a third of respondents increased their healthcare visits during this period, while others reduced them due to fear of infection or shifted to telehealth. Satisfaction with healthcare access was generally high, both during and after the pandemic, though many respondents were neutral in their evaluations—possibly reflecting uneven experiences across the system. Perceptions of service efficiency were also mostly positive, with a slight improvement post-pandemic.

Telehealth usage remained surprisingly low, with only around a quarter of participants using it during the pandemic. Among those who did, most reported neutral satisfaction. This suggests that while the infrastructure may have been available, issues such as digital comfort, trust, and personal preferences for face-to-face interaction limited its broader use.

In sum, the results show that while Singapore's healthcare system managed to stay accessible and fairly efficient during the pandemic, gaps remain—especially around digital inclusion, telehealth engagement, and support for those dealing with long-term post-COVID effects. These findings call attention to areas where policy and practice can evolve to better meet the needs of different population groups, especially older adults and those with chronic health conditions.

Healthcare utilization patterns shifted markedly. While public healthcare was preferred before the pandemic for reasons such as affordability, convenience, and trust, the frequency of healthcare use increased for some and decreased for others during the crisis. Access was generally maintained, reflecting Singapore's robust healthcare infrastructure, although a minority still faced barriers, including long wait times and emotional distress. Telehealth remained underutilized, despite its expansion during the pandemic, with mixed satisfaction levels among users.

The healthcare system showed resilience, addressing economic disparities, workforce shortages, and post-COVID care needs will be critical for ensuring an equitable and sustainable healthcare future. Personal narratives from healthcare professionals illustrate

the resilience and adaptability of Singapore's healthcare system. While the response was efficient, ethical and psychological challenges emerged as key areas for improvement.

The statistical analysis reveals that while general health status may appear uniformly distributed across population groups, more granular examination uncovers clear disparities linked to gender, occupation, income, and age. These variables not only affect who experiences health issues but also shape the type of symptoms reported and the healthcare pathways taken.

Crucially, satisfaction with healthcare services and perceived system efficiency are closely tied to experiences during crises—highlighting the long-term importance of delivering responsive, accessible care during emergencies. Patterns of care utilization also tend to persist over time, reinforcing the importance of early intervention and sustained engagement.

From a policy and public health perspective, the findings call for targeted, equity-driven responses—particularly gender-sensitive, occupation-aware, and age-specific strategies to enhance healthcare delivery and resilience. While some associations must be interpreted with caution due to methodological limitations (e.g., small expected frequencies), the overarching trends provide a compelling basis for future research, intervention, and policy development in the post-pandemic landscape.

6.2 Implications

1. Healthcare Accessibility vs. Actual Utilization: While healthcare services remained largely accessible during the pandemic—particularly in the public sector—this did not translate into consistent service utilization. The data indicates that many respondents, especially during peak COVID-19 periods, avoided seeking care despite accessibility. This was driven by perceived risks of infection, uncertainty about exposure, and a preference for self-management or telehealth alternatives. These findings point to a critical gap between the presence of services and the willingness or ability to engage with them. Policymakers must consider both structural and behavioral dimensions when designing healthcare

strategies—addressing not just system capacity, but also public trust, communication, and perceived value of care.

2. **Uneven Adoption of Telehealth and the Digital Divide:** Despite a growing emphasis on telehealth as a pandemic-era solution, adoption remained limited in this study, with only 28.3% of respondents using such services. Digital literacy, trust in remote consultations, and a preference for in-person care—especially among older adults and low-income groups—appeared to be key barriers. These results highlight persistent inequities in digital healthcare access. For telehealth to be a viable long-term solution, significant investment is needed in digital infrastructure, patient education, and inclusive design. Efforts should also focus on training healthcare professionals in tele-consultation skills and on bridging digital gaps across age and income groups.

3. **Lingering Post-COVID Health Burden:** The study shows that approximately one-third of COVID-positive respondents continued to face health complications long after their initial recovery. These ranged from chest pain and fatigue to depression, anxiety, and chronic respiratory symptoms. The long tail of COVID-19 underscores the importance of developing structured follow-up care, integrated rehabilitation services, and multi-disciplinary support for individuals with post-COVID conditions. Without targeted intervention, the cumulative impact of these long-term effects may strain the healthcare system and deepen inequalities in health outcomes.

4. **Behavioral Shifts Driven by Fear and Perceived Risk:** Health-seeking behavior during the pandemic was influenced not only by access and availability but also by emotional and psychological responses to the crisis. Fear of infection was reported by nearly one-third of respondents as a reason for delaying or avoiding

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care. This aligns with constructs in the Health Belief Model—particularly perceived susceptibility and severity—as well as external cues such as government restrictions. Future public health responses must address these behavioral barriers by ensuring transparent communication, enhancing public confidence in infection control measures, and integrating mental health support into routine healthcare delivery.

5. **Trust and Family Influence in Healthcare Choices:** The role of social norms and cultural habits was clearly evident. Many respondents reported that their healthcare decisions were shaped by family routines and long-standing trust in public institutions. The Theory of Reasoned Action helps explain these choices—where attitudes toward care and subjective norms (family or peer influence) affect individual behavior. Even when private healthcare offered shorter wait times or higher personalization, affordability and familiarity with public services took precedence. Healthcare planning must continue to recognize and leverage these social influences, especially when rolling out new services or interventions.

6. **Public Healthcare System Pressures:** Although public healthcare institutions remained the preferred choice for most respondents both before and after the pandemic, challenges such as prolonged waiting times, limited consultation durations, and overburdened staff were raised in qualitative responses. This indicates a growing strain on public sector capacity. To improve healthcare delivery, Singapore's health system will need to invest in workforce expansion, decentralization (e.g., satellite clinics, mobile services), and digital innovations that reduce administrative bottlenecks and improve patient flow.

7. **Shifting Utilization Patterns and System Resilience:** The pandemic prompted changes in how and when people sought care. About 33.6% reported increased

healthcare visits during this period, likely to address delayed issues or new concerns. Meanwhile, others cut back on visits, either due to fear, financial worries, or reliance on self-care. These dual shifts highlight both vulnerability and adaptability within the system. Building greater flexibility into the system, such as surge capacity, rapid response units, and better integration of telehealth, is essential for navigating future health crises.

8. **Satisfaction Levels and Future Policy Focus:** Although post-pandemic satisfaction with healthcare services was generally positive (with over 80% either satisfied or very satisfied), a sizeable neutral segment (16.4%) suggests that not all patients felt their needs were fully met. Factors such as affordability, service speed, and doctor-patient engagement continue to affect satisfaction. Policy efforts should prioritize reducing regional and demographic disparities, expanding financial protection schemes, and emphasizing more patient-centered approaches in routine and crisis care alike.

9. **Crisis Preparedness and Emergency Response:** Singapore's healthcare system demonstrated notable responsiveness during the pandemic, including the setup of Acute Respiratory Infection (ARI) wards and nationwide swabbing efforts. However, the study underscores the need to institutionalize crisis preparedness as an ongoing priority, not just a reactive one. This means building and routinely updating emergency response frameworks, running simulation exercises, and ensuring flexibility in policy and logistics across agencies.

10. **Emotional and Ethical Considerations in Care Delivery:** The psychological toll on healthcare workers and the ethical dilemmas they faced, such as barring families from end-of-life visits, must not be overlooked. Future healthcare planning must embed structured psychological support for frontline workers,

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including counseling, peer networks, and decompression protocols. Additionally, ethical guidance around compassionate care during crises (e.g., supervised farewells, virtual last rites) should be formalized to maintain dignity without compromising safety.

11. Socioeconomic Disparities in Healthcare Access: The data points to clear disparities among low-income respondents and non-citizens in accessing timely and affordable care. These groups often lacked adequate insurance coverage or were more susceptible to cost-related barriers. Community-based initiatives, such as mobile health units and subsidized outreach clinics, should be expanded to close these access gaps, especially in times of crisis.

12. Strengthening Inter-Agency Collaboration and Governance: Singapore's coordinated response, especially through collaboration with the Singapore Armed Forces and other institutions, was crucial in managing the public health emergency. Moving forward, there is a need to formalize these networks, create standardized protocols for inter-agency work, and establish shared information systems to support rapid coordination and decision-making.

13. Data-Driven Reforms and Predictive Policy Planning: One of the key lessons from the pandemic was the value of real-time data and flexible policymaking. As case definitions, safety protocols, and service priorities evolved, so too did the need for data-informed agility. Investing in digital surveillance systems, regular equity assessments, and predictive analytics will strengthen Singapore's ability to respond to both emerging infectious threats and ongoing public health challenges.

14. Community Engagement and Health Communication: Community-driven initiatives played a vital role during the pandemic, from supporting healthcare workers to spreading public health information. However, misinformation and

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mixed messages also contributed to confusion and anxiety. Strengthening public health communication—especially through multilingual platforms, community ambassadors, and culturally relevant messaging—will be essential for building trust and ensuring adherence during future emergencies.

Conclusion

- The qualitative insights from healthcare professionals during the pandemic provide valuable lessons for future healthcare resilience. Addressing psychological support for healthcare workers, ensuring ethical patient care, reducing healthcare disparities, and strengthening policy frameworks are critical for improving healthcare preparedness. By implementing these recommendations, healthcare systems can better navigate future public health.

- The findings highlight critical socio-economic, educational, and systemic factors influencing healthcare access and utilization. Economic disparities remain a significant barrier, necessitating stronger financial assistance programs. While education levels suggest a foundation for healthcare awareness, targeted health literacy initiatives are essential for lower-educated groups.

- Ethnic and citizenship disparities underscore the need for culturally inclusive healthcare policies and expanded coverage for non-citizens. The long-term health impacts of COVID-19 reinforce the urgency of integrated healthcare models addressing both physical and mental health recovery.

- Public healthcare system strain, exacerbated by workforce shortages and accessibility issues, calls for strategic investments in digital health, decentralized services, and community-based care. The pandemic's influence on healthcare-seeking behaviors highlights the importance of clear communication and resilient healthcare policies to mitigate fear-driven avoidance.

- Finally, while overall healthcare satisfaction has improved, concerns around affordability, accessibility, and service efficiency persist. Addressing regional

disparities, enhancing subsidies, and prioritizing patient-centered care will be key to fostering a more equitable and sustainable healthcare system.

6.3 Recommendations

Strengthening Healthcare Access and Affordability

1. **Expand Healthcare Access**
   o Establish mobile clinics and enhance telemedicine services to improve accessibility, particularly in underserved areas.
2. **Enhance Affordability**
   o Strengthen healthcare subsidies and introduce price regulations to mitigate financial barriers, ensuring equitable access for all, including low-income and non-citizen groups.
3. **Reduce Wait Times**
   o Implement integrated scheduling systems and optimize workforce expansion strategies to improve service efficiency and patient experience.
4. **Strengthen Geriatric Care** *(With a focus on Singapore's ageing population)*
   o Expand home-based care models and specialized geriatric units to support the growing elderly population and improve long-term care.
5. **Improve Data Monitoring**
   o Conduct regular health surveys and implement equity tracking systems to inform policy adjustments and enhance healthcare planning.
6. **Invest in Digital Health & Telemedicine**
   o Increase awareness and accessibility of digital health solutions for preventive and routine care.
   o Develop AI-driven diagnostics and expand telehealth services to enhance efficiency and accessibility.
7. **Strengthen Emergency Preparedness**

- Bolster pandemic resilience through enhanced public-private partnerships and integrated response frameworks.

8. **Enhance Public Healthcare Efficiency**
   - Reduce wait times through integrated scheduling systems and workforce expansion.
   - Train and expand healthcare professionals to meet rising demand.

9. **Strengthen Financial Support & Affordability Measures**
   - Increase subsidies and improve insurance coverage for vulnerable populations.
   - Expand financial assistance programs for better healthcare affordability.

10. **Improve Post-COVID & Chronic Care Management**

    - Develop long-term rehabilitation programs to support post-COVID recovery.
    - Expand mental health services and geriatric care units to address ongoing health challenges.

11. **Ensure Equitable Access Across Demographics**

    - Address healthcare disparities between urban and rural populations.
    - Strengthen targeted interventions for marginalized groups.

12. **Support Older Adults**

    - Expand geriatric care units and promote home-based care models for ageing populations.

13. **Continuous Monitoring & Policy Adjustments**

    - Implement regular data collection mechanisms and patient feedback systems to refine healthcare strategies and ensure ongoing improvements.

14. **Expand healthcare access** – Mobile clinics, telemedicine for in underserved underprivileged areas.

15. **Improve affordability** – Subsidies, price regulations.

16. **Reduce waiting times** – Integrated systems, staff retention.

17. **Support older adults** – Geriatric care units, home-based models.

18. **Strengthen data tracking** – Regular surveys, equity monitoring.

6.4 Conclusion

This study provides a comprehensive look into the state of healthcare access, health behavior, and system responsiveness in Singapore during and after the COVID-19 pandemic, drawing from both quantitative survey results and qualitative thematic insights. The findings highlight the nuanced realities of healthcare-seeking behavior, shaped by demographic composition, personal health history, system-level factors, and psychosocial dynamics.

The demographic data reveals a predominantly young, student-heavy sample (46.1%), with the majority earning under SGD 2,000 monthly (68.4%) and holding diploma or bachelor's level qualifications. This reflects a population still early in their professional and health trajectories, which may partially explain the relatively low pre-pandemic healthcare utilization (59.9% reported rarely seeking care). However, the data also captures clear vulnerabilities: underrepresentation of older adults (only 3.3% aged 70+), economic precarity, and a dependence on public healthcare (71.7%) due to affordability and accessibility(Ageing National Population and Talent Division, 2023).

Pre-pandemic health conditions, as reported by 21.1% of participants, encompassed chronic diseases such as asthma, hypertension, and diabetes, with mental health conditions like depression and BPD also emerging. During the pandemic, 80.3% of respondents contracted COVID-19—a significant epidemiological marker—and 32.9% of them went on to experience post-COVID complications, particularly chest pain,

prolonged coughing, joint pain, respiratory issues, and mental health symptoms. These findings reinforce the long-term impact of COVID-19 on physical and psychological health, particularly for those with pre-existing vulnerabilities.

Healthcare utilization patterns shifted during the pandemic. While more than half of respondents (54.6%) maintained consistent engagement, 33.6% increased their use of services—likely a reflection of delayed care needs, post-COVID health concerns, or heightened health awareness. Notably, public healthcare remained the dominant choice post-pandemic (65.1%), reaffirming its role as a vital safety net. Decisions around healthcare access were driven largely by affordability, insurance coverage, convenience, and familiarity with providers—factors consistently highlighted in both survey responses and qualitative interviews.

Satisfaction with healthcare access and efficiency remained generally positive, with over 85% rating services as "efficient" or "very efficient" post-pandemic. However, neutral responses—16.4% for accessibility and 13.8% for efficiency—point to uneven experiences, possibly influenced by regional or institutional disparities. Challenges during the pandemic, though reported by a minority (13.2%), included long wait times, reduced quality of care, emotional stress, and difficulty scheduling appointments—all themes that emerged prominently in open-ended responses and interviews.

Telehealth, despite its promise, saw limited uptake: only 28.3% of respondents used it during the pandemic. Most reported neutral satisfaction, suggesting that while telehealth met basic needs, it lacked depth, especially for complex or chronic conditions. Qualitative data reinforces this, with older adults and less digitally literate users expressing frustration with the impersonal nature of virtual care and the barriers posed by technology.

The qualitative findings enrich the quantitative picture, particularly in highlighting systemic gaps and human experiences that numbers alone cannot capture. Interviews with older adults and healthcare professionals revealed how fear of infection, digital exclusion, and service fragmentation shaped decisions to delay or avoid care. Yet, stories of resilience—community-led support, improvised care strategies, and growing self-reliance—demonstrated how individuals and systems adapted under pressure.

The application of behavioral frameworks such as the Health Belief Model (HBM), Theory of Planned Behavior (TPB), and Theory of Reasoned Action (TRA) helps contextualize these patterns. Perceived risk, fear, and barriers (HBM); personal and social attitudes (TRA); and feelings of control or constraint (TPB) all played crucial roles in shaping how people navigated the health system during an unprecedented crisis.

In sum, this study sheds light on the multifaceted ways in which a global health emergency impacted healthcare utilization, access, and outcomes in Singapore. While the system demonstrated strength in areas such as public healthcare accessibility and crisis response, the findings reveal clear areas for improvement—including digital inclusion, chronic disease management, mental health integration, and equitable service delivery. As Singapore and other health systems move into a post-pandemic era, these insights offer critical guidance for building a more resilient, responsive, and inclusive future

The COVID-19 pandemic placed extraordinary stress on healthcare systems and exposed gaps in care that were previously hidden or underappreciated. In Singapore, while the public healthcare infrastructure largely withstood the pressure, this study shows that not all groups experienced care in the same way (Kim S et al 2022). The data reflect a system that is responsive and efficient for many, but still leaves some behind—particularly older adults, individuals with limited digital access, and those managing long-term health conditions.

What stands out most is the adaptive behavior of individuals and communities. When formal healthcare services became difficult to access, people turned to alternatives: self-monitoring, telehealth, community clinics, and informal networks. These responses speak not only to the resilience of individuals, but also to the importance of trust, access, and agency in healthcare decision-making.

The pandemic also served as a stress test for public health policy. While Singapore's centralized system allowed for a coordinated vaccination rollout and swift responses to rising infections, gaps remained in areas such as mental health support, continuity of non-COVID care, and digital inclusion. If anything, this crisis reaffirmed that health is not merely about service availability, but also about equity, trust, and the human experience of care

REFERENCES

- Ahn, S., Kim, S., & Koh, K. (2022). Associations of the COVID-19 pandemic with older individuals' healthcare utilization and self-reported health status: A longitudinal analysis from Singapore. *BMC Health Services Research*, *22*(1). https://doi.org/10.1186/s12913-021-07446-5

- Akbarialiabad, H., Taghrir, M. H., Abdollahi, A., Ghahramani, N., Kumar, M., Paydar, S., Razani, B., Mwangi, J., Asadi-Pooya, A. A., Malekmakan, L., & Bastani, B. (2021). Long-COVID, a comprehensive systematic scoping review. *Infection, 49*(6), 1163–1186. https://doi.org/10.1007/s15010-021-01666-x

- Almas, T., Malik, J., Alsubai, A. K., Zaidi, S. M. J., Iqbal, R., Khan, K., Ali, M., Ishaq, U., Alsufyani, M., Hadeed, S., Alsufyani, R., Ahmed, R., Thakur, T., Huang, H., Antony, M., Antony, I., Bhullar, A., Kotait, F., & Al-Ani, L. (2022). Post-acute COVID-19 syndrome and its prolonged effects: An updated systematic review. *Annals of Medicine and Surgery, 80*. https://doi.org/10.1016/j.amsu.2022.103995

- Ammar, A., Mueller, P., Trabelsi, K., Chtourou, H., Boukhris, O., Masmoudi, L., Bouaziz, B., Brach, M., Schmicker, M., Bentlage, E., How, D., Ahmed, M., Aloui, A., Hammouda, O., Paineiras-Domingos, L. L., Braakman-Jansen, A., Wrede, C., Bastoni, S., Pernambuco, C. S., . . . Hoekelmann, A. (2020). Psychological consequences of COVID-19 home confinement: The ECLB-COVID19 multicenter study. PLoS ONE, 15(11), e0240204. https://doi.org/10.1371/journal.pone.0240204

- Anand SV, Shuy YK, Lee PSS, Lee ES. One Year on: An Overview of Singapore's Response to COVID-19-What We Did, How We Fared, How We Can Move Forward. Int J Environ Res Public Health. 2021 Aug 30;18(17):9125. doi: 10.3390/ijerph18179125. PMID: 34501718; PMCID: PMC8431401.

o Asadi-Pooya, A. A., Akbari, A., Emami, A., Lotfi, M., Rostamihosseinkhani, M., Nemati, H., Barzegar, Z., Kabiri, M., Zeraatpisheh, Z., Farjoud-Kouhanjani, M., Jafari, A., Sasannia, F., Ashrafi, S., Nazeri, M., Nasiri, S., & Shahisavandi, M. (2021). Risk factors associated with Long-COVID syndrome: A retrospective study. *DOAJ (DOAJ: Directory of Open Access Journals)*, *46*(6), 428–436. https://doi.org/10.30476/ijms.2021.92080.2326

o Bai, F., Tomasoni, D., Falcinella, C., Barbanotti, D., Castoldi, R., Mulè, G., Augello, M., Mondatore, D., Allegrini, M., Cona, A., Tesoro, D., Tagliaferri, G., Viganò, O., Suardi, E., Tincati, C., Beringheli, T., Varisco, B., Battistini, C. L., Piscopo, K., . . . Monforte, A. D. (2022). Female gender is associated with Long-COVID syndrome: A prospective cohort study. *Clinical Microbiology and Infection*, *28*(4), 611.e9-611.e16. https://doi.org/10.1016/j.cmi.2021.11.002

o Betancourt, J. A., Rosenberg, M. A., Zevallos, A., Brown, J. R., & Mileski, M. (2020). The impact of COVID-19 on telemedicine utilization across multiple service lines in the United States. *Healthcare*, *8*(4), 380. https://doi.org/10.3390/healthcare8040380

o Blackstone, A. (2012). *Sociological inquiry principles: Qualitative and quantitative methods*. Saylor Foundation.

o Cai, Q., Chen, F., Wang, T., Luo, F., Liu, X., Wu, Q., He, Q., Wang, Z., Liu, Y., Liu, L., Chen, J., & Xu, L. (2020). Obesity and COVID-19 severity in a designated hospital in Shenzhen, China. *Diabetes Care*, *43*(7), 1392–1398. https://doi.org/10.2337/dc20-0576

o Carfì, A., Bernabei, R., & Landi, F. (2020). Persistent symptoms in patients after acute COVID-19. *JAMA*, *324*(6), 603. https://doi.org/10.1001/jama.2020.12603

o Ceban, F., Ling, S., Lui, L. M. W., Lee, Y., Gill, H., Teopiz, K. M., Rodrigues, N. B., Subramaniapillai, M., Di Vincenzo, J. D., Cao, B., Lin, K., Mansur, R. B., Ho, R. C., Rosenblat, J. D., Miskowiak, K. W., Vinberg, M.,

Maletic, V., & McIntyre, R. S. (2022). Fatigue and cognitive impairment in Post-COVID-19 syndrome: A systematic review and meta-analysis. *Brain Behavior and Immunity*, *101*, 93–135. https://doi.org/10.1016/j.bbi.2021.12.020

o Centers for Disease Control and Prevention. (2023a). *CDC Science and the Public Health approach to Long-COVID.* https://www.cdc.gov/covid/php/long-covid/?CDC_AAref_Val=https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-care/post-covid-science.html

o Centers for Disease Control and Prevention. (2023b). *Clinical overview of Long-COVID.* https://www.cdc.gov/covid/hcp/clinical-overview/?CDC_AAref_Val=https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-care/post-covid-conditions.html

o Centers for Disease Control and Prevention. (2023c). *Long-COVID basics.* https://www.cdc.gov/covid/long-term-effects/?CDC_AAref_Val=https://www.cdc.gov/coronavirus/2019-ncov/long-term-effects/index.html

o Centers for Disease Control and Prevention. (2023d, March 10). *Symptoms of COVID-19.* https://www.cdc.gov/covid/signs-symptoms/?CDC_AAref_Val=https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html

o Centers for Disease Control and Prevention. (2024). *About COVID-19.* https://www.cdc.gov/covid/about/index.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fprevent-getting-sick%2Fhow-covid-spreads.html

o Chen C, Haupert SR, Zimmermann L, Shi X, Fritsche LG, Mukherjee B. Global Prevalence of Post-Coronavirus Disease 2019 (COVID-19) Condition or Long-COVID: A Meta-Analysis and Systematic Review. J Infect Dis. 2022

Nov 1;226(9):1593-1607. doi: 10.1093/infdis/jiac136. PMID: 35429399; PMCID: PMC9047189.

o Chippa, V., Aleem, A., & Anjum, F. (2024). *Postacute coronavirus (COVID-19) syndrome*. StatPearls - NCBI Bookshelf. https://www.ncbi.nlm.nih.gov/books/NBK570608/

o Claire E. Hastie, David J. Lowe, Andrew McAuley, Nicholas L. Mills, Andrew J. Winter, Corri Black, Janet T. Scott, Catherine A. O'Donnell, David N. Blane, Susan Browne, Tracy R. Ibbotson & Jill P. Pell. True prevalence of long-COVID in a nationwide, population cohort study. Nat Commun 14, 7892 (2023). https://doi.org/10.1038/s41467-023-43661-w

o Costa, A. C. D. S., Menon, V., Phadke, R., Dapke, K., Miranda, A. V., Ahmad, S., Essar, M. Y., & Hashim, H. T. (2022). Mental health in the post COVID-19 era: Future perspectives. *Einstein (São Paulo)*, *20*. https://doi.org/10.31744/einstein_journal/2022ce6760

o Cummins, L., Ebyarimpa, I., Cheetham, N., Brown, V. T., Brennan, K., & Panovska-Griffiths, J. (2021). Factors associated with COVID-19 related hospitalisation, critical care admission and mortality using linked primary and secondary care data. *Influenza and Other Respiratory Viruses*, *15*(5), 577–588. https://doi.org/10.1111/irv.12864

o Davis, H. E., Assaf, G. S., McCorkell, L., Wei, H., Low, R. J., Re'em, Y., Redfield, S., Austin, J. P., & Akrami, A. (2021). Characterizing Long-COVID in an international cohort: 7 months of symptoms and their impact. *EClinicalMedicine*, *38*, 101019. https://doi.org/10.1016/j.eclinm.2021.101019

o Davis, H. E., McCorkell, L., Vogel, J. M., & Topol, E. J. (2023). Long-COVID: Major findings, mechanisms and recommendations. *Nature Reviews Microbiology*, *21*(3), 133–146. https://doi.org/10.1038/s41579-022-00846-2

o Debski, M., Tsampasian, V., Haney, S., Blakely, K., Weston, S., Ntatsaki, E., Lim, M., Madden, S., Perperoglou, A., & Vassiliou, V. S. (2022). Post-COVID-19 syndrome risk factors and further use of health services in East

England. *PLOS Global Public Health*, *2*(11), e0001188.
https://doi.org/10.1371/journal.pgph.0001188

o Décary, S., De Groote, W., Arienti, C., Kiekens, C., Boldrini, P., Lazzarini, S.
G., Dugas, M., Stefan, T., Langlois, L., Daigle, F., Naye, F., LeBlanc, A., &
Negrini, S. (2022). Scoping review of rehabilitation care models for post
COVID-19 condition. *Bulletin of the World Health Organization*, *100*(11),
676–688. https://doi.org/10.2471/blt.22.288105

o Department of Statistics Singapore. (2022). *Singapore population*. Base.
https://www.singstat.gov.sg/modules/infographics/population

o Dessie, Z. G., & Zewotir, T. (2021). Mortality-related risk factors of COVID-
19: A systematic review and meta-analysis of 42 studies and 423,117 patients.
BMC Infectious Diseases, *21*(1). https://doi.org/10.1186/s12879-021-06536-3

o Ettman, C. K., Abdalla, S. M., Cohen, G. H., Sampson, L., Vivier, P. M., &
Galea, S. (2020). Prevalence of depression symptoms in US adults before and
during the COVID-19 pandemic. *JAMA Network Open*, *3*(9), e2019686.
https://doi.org/10.1001/jamanetworkopen.2020.19686

o Fainardi, V., Meoli, A., Chiopris, G., Motta, M., Skenderaj, K., Grandinetti,
R., Bergomi, A., Antodaro, F., Zona, S., & Esposito, S. (2022). Long-COVID
in children and adolescents. *Life*, *12*(2), 285.
https://doi.org/10.3390/life12020285

o Garfan, S., Alamoodi, A., Zaidan, B., Al-Zobbi, M., Hamid, R. A., Alwan, J.
K., Ahmaro, I. Y., Khalid, E. T., Jumaah, F., Albahri, O., Zaidan, A., Albahri,
A., Al-Qaysi, Z., Ahmed, M., Shuwandy, M. L., Salih, M. M., Zughoul, O.,
Mohammed, K., & Momani, F. (2021). Telehealth utilization during the
Covid-19 pandemic: A systematic review. *Computers in Biology and
Medicine*, *138*, 104878. https://doi.org/10.1016/j.compbiomed.2021.104878

o Greenhalgh, T., Jimenez, J. L., Prather, K. A., Tufekci, Z., Fisman, D., &
Schooley, R. (2021). Ten scientific reasons in support of airborne

transmission of SARS-CoV-2. *The Lancet*, *397*(10285), 1603–1605.
https://doi.org/10.1016/s0140-6736(21)00869-2

o Greenhalgh, T., Knight, M., A'Court, C., Buxton, M., & Husain, L. (2020).
Management of post-acute covid-19 in primary care. *BMJ*, m3026.
https://doi.org/10.1136/bmj.m3026

o Guan, W., Ni, Z., Hu, Y., Liang, W., Ou, C., He, J., Liu, L., Shan, H., Lei, C.,
Hui, D. S. C., Du, B., Li, L., Zeng, G., Yuen, K., Chen, R., Tang, C., Wang,
T., Chen, P., Xiang, J., . . . Zhong, N. (2020). Clinical characteristics of
Coronavirus Disease 2019 in China. *New England Journal of Medicine*,
382(18), 1708–1720. https://doi.org/10.1056/nejmoa2002032

o Hall, G., Laddu, D. R., Phillips, S. A., Lavie, C. J., & Arena, R. (2020). A tale
of two pandemics: How will COVID-19 and global trends in physical
inactivity and sedentary behavior affect one another? *Progress in
Cardiovascular Diseases*, *64*, 108–110.
https://doi.org/10.1016/j.pcad.2020.04.005

o Ho, F. K., Celis-Morales, C. A., Gray, S. R., Katikireddi, S. V., Niedzwiedz,
C. L., Hastie, C., Ferguson, L. D., Berry, C., Mackay, D. F., Gill, J. M., Pell,
J. P., Sattar, N., & Welsh, P. (2020). Modifiable and non-modifiable risk
factors for COVID-19, and comparison to risk factors for influenza and
pneumonia: Results from a UK Biobank prospective cohort study. *BMJ Open*,
10(11), e040402. https://doi.org/10.1136/bmjopen-2020-040402

o Iwua, C. J., Iwu, C. D., & Wiysonge, C. S. (2021). The occurrence of Long-
COVID: A rapid review. *Pan African Medical Journal*, *38*.
https://doi.org/10.11604/pamj.2021.38.65.27366

o Jazieh, A. R., & Kozlakidis, Z. (2020). Healthcare transformation in the post-
Coronavirus pandemic era. *Frontiers in Medicine*, *7*.
https://doi.org/10.3389/fmed.2020.00429

o Jennings, G., Monaghan, A., Xue, F., Mockler, D., & Romero-Ortuño, R.
(2021). A systematic review of persistent symptoms and residual abnormal

functioning following acute COVID-19: Ongoing symptomatic phase vs. post-COVID-19 syndrome. *Journal of Clinical Medicine*, *10*(24), 5913. https://doi.org/10.3390/jcm10245913

o Johns Hopkins Coronavirus Resource Center. (2021). *COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU)*. https://coronavirus.jhu.edu/map.html

o Joseph, A. L., Costello, J., Monkman, H., & Quintana, Y. (2023). Applying logic to the healthcare journey. *Studies in Health Technology and Informatics*. https://doi.org/10.3233/shti230373

o Kaeuffer, C., Hyaric, C. L., Fabacher, T., Mootien, J., Dervieux, B., Ruch, Y., Hugerot, A., Zhu, Y., Pointurier, V., Clere-Jehl, R., Greigert, V., Kassegne, L., Lefebvre, N., Gallais, F., Meyer, N., Hansmann, Y., Hinschberger, O., & Danion, F. (2020). Clinical characteristics and risk factors associated with severe COVID-19: Prospective analysis of 1,045 hospitalised cases in North-Eastern France, March 2020. *Eurosurveillance*, *25*(48). https://doi.org/10.2807/1560-7917.es.2020.25.48.2000895

o Keshky, M. E. S. E., Basyouni, S. S., & Sabban, A. M. A. (2020). Getting through COVID-19: The pandemic's impact on the psychology of sustainability, quality of life, and the global economy – A systematic review. *Frontiers in Psychology*, *11*. https://doi.org/10.3389/fpsyg.2020.585897

o Kim, S., Goh, Y., & Kang, J. H. B. (2022). Moving toward a common goal via cross-sector collaboration: Lessons learned from SARS to COVID-19 in Singapore. *Globalization and Health*, *18*(1). https://doi.org/10.1186/s12992-022-00873-x

o Koumpias, A. M., Schwartzman, D., & Fleming, O. (2022). Long-haul COVID: Healthcare utilization and medical expenditures 6 months post-diagnosis. *BMC Health Services Research*, *22*(1). https://doi.org/10.1186/s12913-022-08387-3

o Lauer, S. A., Grantz, K. H., Bi, Q., Jones, F. K., Zheng, Q., Meredith, H. R., Azman, A. S., Reich, N. G., & Lessler, J. (2020). The incubation period of Coronavirus Disease 2019 (COVID-19) from publicly reported confirmed cases: Estimation and application. *Annals of Internal Medicine*, *172*(9), 577–582. https://doi.org/10.7326/m20-0504

o Li, B., Yang, J., Zhao, F., Zhi, L., Wang, X., Liu, L., Bi, Z., & Zhao, Y. (2020). Prevalence and impact of cardiovascular metabolic diseases on COVID-19 in China. *Clinical Research in Cardiology*, *109*(5), 531–538. https://doi.org/10.1007/s00392-020-01626-9

o Lippi, G., & Henry, B. M. (2020). Chronic obstructive pulmonary disease is associated with severe Coronavirus Disease 2019 (COVID-19). *Respiratory Medicine*, *167*, 105941. https://doi.org/10.1016/j.rmed.2020.105941

o Lopez-Leon, S., Wegman-Ostrosky, T., Del Valle, N. C. A., Perelman, C., Sepulveda, R., Rebolledo, P. A., Cuapio, A., & Villapol, S. (2022). Long-COVID in children and adolescents: A systematic review and meta-analyses. *Scientific Reports*, *12*(1). https://doi.org/10.1038/s41598-022-13495-5

o Lum, A., Goh, Y., Wong, K. S., Seah, J., Teo, G., Ng, J. Q., Abdin, E., Hendricks, M. M., Tham, J., Nan, W., & Fung, D. (2021). Impact of COVID-19 on the mental health of Singaporean GPs: A cross-sectional study. *BJGP Open*, *5*(4), BJGPO.2021.0072. https://doi.org/10.3399/bjgpo.2021.0072

o Mannucci, P. M., Nobili, A., Tettamanti, M., D'Avanzo, B., Galbussera, A. A., Remuzzi, G., Fortino, I., Leoni, O., & Harari, S. (2022). Impact of the post-COVID-19 condition on health care after the first disease wave in Lombardy. *Journal of Internal Medicine*, *292*(3), 450–462. https://doi.org/10.1111/joim.13493

o Mansell, V., Dykgraaf, S. H., Kidd, M., & Goodyear-Smith, F. (2022). Long-COVID and older people. *The Lancet Healthy Longevity*, *3*(12), e849–e854. https://doi.org/10.1016/s2666-7568(22)00245-8

o Mazza, M. G., De Lorenzo, R., Conte, C., Poletti, S., Vai, B., Bollettini, I., Melloni, E. M. T., Furlan, R., Ciceri, F., Rovere-Querini, P., & Benedetti, F. (2020). Anxiety and depression in COVID-19 survivors: Role of inflammatory and clinical predictors. *Brain Behavior and Immunity*, *89*, 594–600. https://doi.org/10.1016/j.bbi.2020.07.037

o Michelen, M., Manoharan, L., Elkheir, N., Cheng, V., Dagens, A., Hastie, C., O'Hara, M., Suett, J., Dahmash, D., Bugaeva, P., Rigby, I., Munblit, D., Harriss, E., Burls, A., Foote, C., Scott, J., Carson, G., Olliaro, P., Sigfrid, L., & Stavropoulou, C. (2021). Characterising Long-COVID: A living systematic review. *BMJ Global Health*, *6*(9), e005427. https://doi.org/10.1136/bmjgh-2021-005427

o Ministry of Health Singapore. (2022). *Our healthcare system*. Retrieved November 27, 2022, from https://www.moh.gov.sg/home/our-healthcare-system

o Morand, A., Campion, J., Lepine, A., Bosdure, E., Luciani, L., Cammilleri, S., Chabrol, B., & Guedj, E. (2021). Similar patterns of [18F]-FDG brain PET hypometabolism in paediatric and adult patients with Long-COVID: A paediatric case series. *European Journal of Nuclear Medicine and Molecular Imaging*, *49*(3), 913–920. https://doi.org/10.1007/s00259-021-05528-4

o Morello, R., Mariani, F., Mastrantoni, L., De Rose, C., Zampino, G., Munblit, D., Sigfrid, L., Valentini, P., & Buonsenso, D. (2023). Risk factors for post-COVID-19 condition (Long-COVID) in children: A prospective cohort study. *EClinicalMedicine*, *59*, 101961. https://doi.org/10.1016/j.eclinm.2023.101961

o Morrow, A. K., Malone, L. A., Kokorelis, C., Petracek, L. S., Eastin, E. F., Lobner, K. L., Neuendorff, L., & Rowe, P. C. (2022). Long-term COVID 19 sequelae in adolescents: The overlap with orthostatic intolerance and ME/CFS. *Current Pediatrics Reports*, *10*(2), 31–44. https://doi.org/10.1007/s40124-022-00261-4

o   Munblit, D., Nicholson, T. R., Needham, D. M., Seylanova, N., Parr, C., Chen, J., Kokorina, A., Sigfrid, L., Buonsenso, D., Bhatnagar, S., Thiruvengadam, R., Parker, A. M., Preller, J., Avdeev, S., Klok, F. A., Tong, A., Diaz, J. V., De Groote, W., Schiess, N., . . . Williamson, P. R. (2022). Studying the post-COVID-19 condition: Research challenges, strategies, and importance of Core Outcome Set development. *BMC Medicine*, *20*(1). https://doi.org/10.1186/s12916-021-02222-y

o   Munipalli, B., Seim, L., Dawson, N. L., Knight, D., & Dabrh, A. M. A. (2022). Post-acute sequelae of COVID-19 (PASC): A meta-narrative review of pathophysiology, prevalence, and management. *SN Comprehensive Clinical Medicine*, *4*(1). https://doi.org/10.1007/s42399-022-01167-4

o   Nalbandian, A., Sehgal, K., Gupta, A., Madhavan, M. V., McGroder, C., Stevens, J. S., Cook, J. R., Nordvig, A. S., Shalev, D., Sehrawat, T. S., Ahluwalia, N., Bikdeli, B., Dietz, D., Der-Nigoghossian, C., Liyanage-Don, N., Rosner, G. F., Bernstein, E. J., Mohan, S., Beckley, A. A., . . . Wan, E. Y. (2021). Post-acute COVID-19 syndrome. *Nature Medicine*, *27*(4), 601–615. https://doi.org/10.1038/s41591-021-01283-z

o   National Population and Talent Division. (2023). *Population in brief 2023* [Report]. https://www.population.gov.sg/files/media-centre/publications/population-in-brief-2023.pdf

o   O'Mahoney, L., & Khunti, K. (2022). Long-COVID: risk factors, outcomes, and future directions for research. *BMJ Medicine*, *1*(1), e000257. https://doi.org/10.1136/bmjmed-2022-000257

o   Omboni, S., Padwal, R. S., Alessa, T., Benczúr, B., Green, B. B., Hubbard, I., Kario, K., Khan, N. A., Konradi, A., Logan, A. G., Lu, Y., Mars, M., McManus, R. J., Melville, S., Neumann, C. L., Parati, G., Renna, N. F., Ryvlin, P., Saner, H., . . . Wang, J. (2022). The worldwide impact of telemedicine during COVID-19: Current evidence and recommendations for the future. *Connected Health*. https://doi.org/10.20517/ch.2021.03

o   Onder, G., Rezza, G., & Brusaferro, S. (2020). Case-fatality rate and
    characteristics of patients dying in relation to COVID-19 in Italy. *JAMA*,
    328(18), 1775–1776. https://doi.org/10.1001/jama.2020.4683

o   Organisation for Economic Co-operation and Development. (2021). The
    territorial impact of COVID-19: Managing the crisis and recovery across
    levels of government. In *OECD Policy Responses to Coronavirus (Covid-19)*.
    https://doi.org/10.1787/a2c6abaf-en

o   Osmanov, I. M., Spiridonova, E., Bobkova, P., Gamirova, A., Shikhaleva, A.,
    Andreeva, M., Blyuss, O., El-Taravi, Y., DunnGalvin, A., Comberiati, P.,
    Peroni, D. G., Apfelbacher, C., Genuneit, J., Mazankova, L., Miroshina, A.,
    Chistyakova, E., Samitova, E., Borzakova, S., Bondarenko, E., . . . Munblit,
    D. (2021). Risk factors for post-COVID-19 condition in previously
    hospitalised children using the ISARIC Global follow-up protocol: A
    prospective cohort study. *European Respiratory Journal*, *59*(2), 2101341.
    https://doi.org/10.1183/13993003.01341-2021

o   Pairo-Castineira, E., Clohisey, S., Klaric, L., Bretherick, A. D., Rawlik, K.,
    Pasko, D., Walker, S., Parkinson, N., Fourman, M. H., Russell, C. D., Furniss,
    J., Richmond, A., Gountouna, E., Wrobel, N., Harrison, D., Wang, B., Wu, Y.,
    Meynert, A., Griffiths, F., . . . Baillie, J. K. (2020). Genetic mechanisms of
    critical illness in COVID-19. *Nature*, *591*(7848), 92–98.
    https://doi.org/10.1038/s41586-020-03065-y

o   Patel, U. K., Mehta, N., Patel, A., Patel, N., Ortiz, J. F., Khurana, M.,
    Urhoghide, E., Parulekar, A., Bhriguvanshi, A., Patel, N., Mistry, A. M.,
    Patel, R., Arumaithurai, K., & Shah, S. (2022). Long-term neurological
    dequelae among devere COVID-19 patients: A systematic review and meta-
    analysis. *Cureus, 14*(9), e29694. https://doi.org/10.7759/cureus.29694

o   Patel, U., Malik, P., Mehta, D., Shah, D., Kelkar, R., Pinto, C., Suprun, M.,
    Dhamoon, M., Hennig, N., & Sacks, H. (2020). Early epidemiological
    indicators, outcomes, and interventions of COVID-19 pandemic: A systematic

review. *Journal of Global Health*, *10*(2).
https://doi.org/10.7189/jogh.10.020506

o Pazukhina, E., Andreeva, M., Spiridonova, E., Bobkova, P., Shikhaleva, A.,
El-Taravi, Y., Rumyantsev, M., Gamirova, A., Bairashevskaia, A., Petrova,
P., Baimukhambetova, D., Pikuza, M., Abdeeva, E., Filippova, Y.,
Deunezhewa, S., Nekliudov, N., Bugaeva, P., Bulanov, N., Avdeev, S., . . .
Zuykova, E. (2022). Prevalence and risk factors of post-COVID-19 condition
in adults and children at 6 and 12 months after hospital discharge: A
prospective, cohort study in Moscow (StopCOVID). *BMC Medicine*, *20*(1).
https://doi.org/10.1186/s12916-022-02448-4

o Pellegrino, R., Chiappini, E., Licari, A., Galli, L., & Marseglia, G. L. (2022).
Prevalence and clinical presentation of Long-COVID in children: A
systematic review. *European Journal of Pediatrics*, *181*(12), 3995–4009.
https://doi.org/10.1007/s00431-022-04600-x

o Pfefferbaum, B., & North, C. S. (2020). Mental health and the COVID-19
pandemic. *New England Journal of Medicine*, *383*(6), 510–512.
https://doi.org/10.1056/nejmp2008017

o Phua, K. H. (2020). The Singapore healthcare system. In T. Koh (Ed.), *Fifty
Secrets of Singapore's Success* (pp. 80–87). Straits Times Press.
https://www.researchgate.net/publication/344616980_THE_SINGAPORE_H
EALTHCARE_SYSTEM

o Pollack, B., Von Saltza, E., McCorkell, L., Santos, L., Hultman, A., Cohen, A.
K., & Soares, L. (2023). Female reproductive health impacts of Long-COVID
and associated illnesses including ME/CFS, POTS, and connective tissue
disorders: A literature review. *Frontiers in Rehabilitation Sciences*, *4*.
https://doi.org/10.3389/fresc.2023.1122673

o Renaud, C. J., Chen, Z. X., Yuen, H., Tan, L. L., Pan, T. L. T., &
Samarasekera, D. D. (2021). Impact of COVID-19 on health profession
education in Singapore: Adoption of innovative strategies and contingencies

across the educational continuum. *The Asia Pacific Scholar*, *6*(3), 14–23. https://doi.org/10.29060/taps.2021-6-3/ra2346

o Richardson, S., Hirsch, J. S., Narasimhan, M., Crawford, J. M., McGinn, T., Davidson, K. W., Barnaby, D. P., Becker, L. B., Chelico, J. D., Cohen, S. L., Cookingham, J., Coppa, K., Diefenbach, M. A., Dominello, A. J., Duer-Hefele, J., Falzon, L., Gitlin, J., Hajizadeh, N., Harvin, T. G., . . . Zanos, T. P. (2020). Presenting characteristics, comorbidities, and outcomes among 5700 patients hospitalized with COVID-19 in the New York City area. *JAMA*, *323*(20), 2052. https://doi.org/10.1001/jama.2020.6775

o Rismanchian, F., Kassani, S. H., Shavarani, S. M., & Lee, Y. H. (2022). A Data-Driven approach to support the understanding and improvement of patients' journeys: A case study using electronic health records of an emergency department. *Value in Health*, *26*(1), 18–27. https://doi.org/10.1016/j.jval.2022.04.002

o Robertson, M. M., Qasmieh, S. A., Kulkarni, S. G., Teasdale, C. A., Jones, H. E., McNairy, M., Borrell, L. N., & Nash, D. (2022). The epidemiology of long Coronavirus Disease in US adults. *Clinical Infectious Diseases*, *76*(9), 1636–1645. https://doi.org/10.1093/cid/ciac961

o Samarasekera, D. D. (2022). Emerging stronger post pandemic: Medical and health professional education. *The Asia Pacific Scholar*, *8*(1), 1–2. https://doi.org/10.29060/taps.2023-8-1/ev8n1

o Sandler, C. X., Wyller, V. B. B., Moss-Morris, R., Buchwald, D., Crawley, E., Hautvast, J., Katz, B. Z., Knoop, H., Little, P., Taylor, R., Wensaas, K., & Lloyd, A. R. (2021). Long-COVID and post-infective fatigue syndrome: A review. *Open Forum Infectious Diseases*, *8*(10). https://doi.org/10.1093/ofid/ofab440

o Sattar, N., Ho, F. K., Gill, J. M., Ghouri, N., Gray, S. R., Celis-Morales, C. A., Katikireddi, S. V., Berry, C., Pell, J. P., McMurray, J. J., & Welsh, P. (2020). BMI and future risk for COVID-19 infection and death across sex, age and

ethnicity: Preliminary findings from UK biobank. *Diabetes & Metabolic Syndrome Clinical Research & Reviews*, *14*(5), 1149–1151. https://doi.org/10.1016/j.dsx.2020.06.060

o Sibicky, S. L. (2021). COVID-19 "Long-Haulers": Caring for older people in the aftermath of a global pandemic. *The Senior Care Pharmacist*, *36*(8), 361–362. https://doi.org/10.4140/tcp.n.2021.361

o Singu, S., Acharya, A., Challagundla, K., & Byrareddy, S. N. (2020). Impact of social determinants of health on the emerging COVID-19 pandemic in the United States. *Frontiers in Public Health*, *8*. https://doi.org/10.3389/fpubh.2020.00406

o Smith, P., Proesmans, K., Van Cauteren, D., Demarest, S., Drieskens, S., De Pauw, R., Cornelissen, L., De Ridder, K., & Charafeddine, R. (2022). Post COVID-19 condition and its physical, mental and social implications: Protocol of a 2-year longitudinal cohort study in the Belgian adult population. *Archives of Public Health*, *80*(1). https://doi.org/10.1186/s13690-022-00906-2

o Staffolani, S., Iencinella, V., Cimatti, M., & Tavio, M. (2022). Long-COVID-19 syndrome as a fourth phase of SARS-CoV-2 infection. *Infezioni in Medicina*, *30*(1). https://doi.org/10.53854/liim-3001-3

o Subramanian, A., Nirantharakumar, K., Hughes, S., Myles, P., Williams, T., Gokhale, K. M., Taverner, T., Chandan, J. S., Brown, K., Simms-Williams, N., Shah, A. D., Singh, M., Kidy, F., Okoth, K., Hotham, R., Bashir, N., Cockburn, N., Lee, S. I., Turner, G. M., . . . Haroon, S. (2022). Symptoms and risk factors for Long-COVID in non-hospitalized adults. *Nature Medicine*, *28*(8), 1706–1714. https://doi.org/10.1038/s41591-022-01909-w

o Sudre, C. H., Murray, B., Varsavsky, T., Graham, M. S., Penfold, R. S., Bowyer, R. C., Pujol, J. C., Klaser, K., Antonelli, M., Canas, L. S., Molteni, E., Modat, M., Cardoso, M. J., May, A., Ganesh, S., Davies, R., Nguyen, L. H., Drew, D. A., Astley, C. M., . . . Steves, C. J. (2021). Attributes and

predictors of Long-COVID. *Nature Medicine*, *27*(4), 626–631.
https://doi.org/10.1038/s41591-021-01292-y

o Sun, Q., Qiu, H., Huang, M., & Yang, Y. (2020). Lower mortality of COVID-19 by early recognition and intervention: experience from Jiangsu Province. *Annals of Intensive Care*, *10*(1). https://doi.org/10.1186/s13613-020-00650-2

o Tan, J. B., Cook, M. J., Logan, P., Rozanova, L., & Wilder-Smith, A. (2020). Singapore's pandemic preparedness: An overview of the first wave of COVID-19. *International Journal of Environmental Research and Public Health*, *18*(1), 252. https://doi.org/10.3390/ijerph18010252

o Tan, T. H. Y., Toh, M. P. H. S., Vasoo, S., Lye, D. C. B., Ang, B. S. P., Leo, Y. S., Lee, V. J. M., Puah, S. H., & Kurup, A. (2020). Coronavirus Disease 2019 (COVID-19): The Singapore experience. A review of the first eight months. *Annals of the Academy of Medicine Singapore*, *49*(10), 764–778. https://doi.org/10.47102/annals-acadmedsg.2020306

o Taquet, M., Geddes, J. R., Husain, M., Luciano, S., & Harrison, P. J. (2021). 6-month neurological and psychiatric outcomes in 236 379 survivors of COVID-19: A retrospective cohort study using electronic health records. *The Lancet Psychiatry*, *8*(5), 416–427. https://doi.org/10.1016/s2215-0366(21)00084-5

o Thompson, E. J., Williams, D. M., Walker, A. J., Mitchell, R. E., Niedzwiedz, C. L., Yang, T. C., Huggins, C. F., Kwong, A. S. F., Silverwood, R. J., Di Gessa, G., Bowyer, R. C. E., Northstone, K., Hou, B., Green, M. J., Dodgeon, B., Doores, K. J., Duncan, E. L., Williams, F. M. K., Walker, A. J., . . . Steves, C. J. (2021). Risk factors for Long-COVID: Analyses of 10 longitudinal studies and electronic health records in the UK. *Nature Communications*, *13*(1). https://doi.org/10.1038/s41467-022-30836-0

o Townsend, L., Dyer, A. H., Jones, K., Dunne, J., Mooney, A., Gaffney, F., O'Connor, L., Leavy, D., O'Brien, K., Dowds, J., Sugrue, J. A., Hopkins, D., Martin-Loeches, I., Cheallaigh, C. N., Nadarajan, P., McLaughlin, A. M.,

Bourke, N. M., Bergin, C., O'Farrelly, C., . . . Conlon, N. (2020). Persistent fatigue following SARS-CoV-2 infection is common and independent of severity of initial infection. *PLoS ONE*, *15*(11), e0240784. https://doi.org/10.1371/journal.pone.0240784

o Trabelsi, K., Ammar, A., Masmoudi, L., Boukhris, O., Chtourou, H., Bouaziz, B., Brach, M., Bentlage, E., How, D., Ahmed, M., Mueller, P., Mueller, N., Hsouna, H., Elghoul, Y., Romdhani, M., Hammouda, O., Paineiras-Domingos, L., Braakman-Jansen, A., Wrede, C., . . . Hoekelmann, A. (2021). Sleep quality and physical activity as predictors of mental wellbeing variance in older adults during COVID-19 lockdown: ECLB COVID-19 international online survey. *International Journal of Environmental Research and Public Health*, *18*(8), 4329. https://doi.org/10.3390/ijerph18084329

o van der Made, C. I., Netea, M. G., van der Veerdonk, F. L., & Hoischen, A. (2022). Clinical implications of host genetic variation and susceptibility to severe or critical COVID-19. *Genome Medicine*, *14*(1). https://doi.org/10.1186/s13073-022-01100-3

o Vanichkachorn, G., Newcomb, R., Cowl, C. T., Murad, M. H., Breeher, L., Miller, S., Trenary, M., Neveau, D., & Higgins, S. (2021). Post–COVID-19 syndrome (long haul syndrome): Description of a multidisciplinary clinic at Mayo Clinic and characteristics of the initial patient cohort. *Mayo Clinic Proceedings*, *96*(7), 1782–1791. https://doi.org/10.1016/j.mayocp.2021.04.024

o Velavan, T. P., Pallerla, S. R., Rüter, J., Augustin, Y., Kremsner, P. G., Krishna, S., & Meyer, C. G. (2021). Host genetic factors determining COVID-19 susceptibility and severity. *EBioMedicine*, *72*, 103629. https://doi.org/10.1016/j.ebiom.2021.103629

o Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., McIntyre, R. S., Choo, F. N., Tran, B., Ho, R., Sharma, V. K., & Ho, C. (2020). A longitudinal study on the mental health of general population during the COVID-19 epidemic in China.

Brain Behavior and Immunity, *87*, 40–48.

https://doi.org/10.1016/j.bbi.2020.04.028

o   Wang F, Fang Y, Deng H, Wei F. How community medical facilities can promote resilient community constructions under the background of pandemics. Indoor Built Environ. 2022 Apr;31(4):1018-1027. doi: 10.1177/1420326X211048537. PMID: 35431637; PMCID: PMC9002296.

o   Wiersinga, W. J., Rhodes, A., Cheng, A. C., Peacock, S. J., & Prescott, H. C. (2020). Pathophysiology, transmission, diagnosis, and treatment of Coronavirus Disease 2019 (COVID-19). *JAMA*, *324*(8), 782. https://doi.org/10.1001/jama.2020.12839

o   Williamson, E. J., Walker, A. J., Bhaskaran, K., Bacon, S., Bates, C., Morton, C. E., Curtis, H. J., Mehrkar, A., Evans, D., Inglesby, P., Cockburn, J., McDonald, H. I., MacKenna, B., Tomlinson, L., Douglas, I. J., Rentsch, C. T., Mathur, R., Wong, A. Y. S., Grieve, R., . . . Goldacre, B. (2020). Factors associated with COVID-19-related death using OpenSAFELY. *Nature*, *584*(7821), 430–436. https://doi.org/10.1038/s41586-020-2521-4

o   Winkelmann, J., Webb, E., Williams, G. A., Hernández-Quevedo, C., Maier, C. B., & Panteli, D. (2022). European countries' responses in ensuring sufficient physical infrastructure and workforce capacity during the first COVID-19 wave. *Health Policy*, *126*(5), 362–372. https://doi.org/10.1016/j.healthpol.2021.06.015

o   Wong, J. E. L., Leo, Y. S., & Tan, C. C. (2020). COVID-19 in Singapore— Current experience. *JAMA*, *323*(13), 1243. https://doi.org/10.1001/jama.2020.2467

o   World Health Organization. (2022a, March 2). *COVID-19 pandemic triggers 25% increase in prevalence of anxiety and depression worldwide*. https://www.who.int/news/item/02-03-2022-covid-19-pandemic-triggers-25-increase-in-prevalence-of-anxiety-and-depression-worldwide

o   World Health Organization. (2022b, June 16). *The impact of COVID-19 on mental health cannot be made light of*. https://www.who.int/news-

room/feature-stories/detail/the-impact-of-covid-19-on-mental-health-cannot-be-made-light-of

o World Health Organization. (2023, August 9). *Coronavirus disease (COVID-19): Post COVID-19 condition*. https://www.who.int/news-room/questions-and-answers/item/coronavirus-disease-(covid-19)-post-covid-19-condition

o Xiong, J., Lipsitz, O., Nasri, F., Lui, L. M., Gill, H., Phan, L., Chen-Li, D., Iacobucci, M., Ho, R., Majeed, A., & McIntyre, R. S. (2020). Impact of COVID-19 pandemic on mental health in the general population: A systematic review. *Journal of Affective Disorders*, *277*, 55–64. https://doi.org/10.1016/j.jad.2020.08.001

o Yan, Z., Yang, M., & Lai, C. (2021). Long-COVID-19 Syndrome: A comprehensive review of its effect on various organ systems and recommendation on rehabilitation plans. *Biomedicines*, *9*(8), 966. https://doi.org/10.3390/biomedicines9080966

o Zhou, F., Yu, T., Du, R., Fan, G., Liu, Y., Liu, Z., Xiang, J., Wang, Y., Song, B., Gu, X., Guan, L., Wei, Y., Li, H., Wu, X., Xu, J., Tu, S., Zhang, Y., Chen, H., & Cao, B. (2020). Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: A retrospective cohort study. *The Lancet*, *395*(10229), 1054–1062. https://doi.org/10.1016/s0140-6736(20)30566-3

APPENDIX A:

SURVEY COVER LETTER

Invitation to Participate in Research Study on Health Issues and Healthcare Utilization Patterns During and Post-COVID-19 in Singapore

Dear Participant,

I hope this letter finds you well. I am writing to invite you to participate in a research study titled **"**Health Issues and Healthcare Utilization Patterns During and Post-COVID-19 in Singapore**"**, led by Dr. Preeti Hemchandra Wasnik. This study aims to explore the challenges and experiences of individuals in accessing healthcare during and after the COVID-19 pandemic, contributing to a broader understanding of healthcare utilization and its impact on public health policies.

Purpose of the Study:

The primary objective of this study is to assess the impact of the pandemic on healthcare-seeking behavior, healthcare access, and overall health conditions in Singapore. By participating, you will help provide valuable insights that may contribute to improving healthcare services and policies in the future.

Participation Details:

- **Survey:** You will be asked to complete an online survey, which will take approximately 10-20 minutes.

Voluntary Participation & Confidentiality:

Participation in this study is entirely voluntary. You may refuse to answer any questions or withdraw from the study at any time without any consequences. All information provided will remain strictly confidential, and personal identifiers will be removed to ensure anonymity. Data will be securely stored and accessible only to me.

Risks and Benefits:

There are no foreseeable risks associated with participating in this study. While there may be no direct benefits to you, your participation will help inform future healthcare strategies and improve accessibility to healthcare services for communities affected by the pandemic.

Consent & Next Steps:

If you agree to participate, kindly select the appropriate consent options within the survey form. Should you have any questions or require further clarification, please feel free to contact Dr. Preeti Hemchandra Wasnik at **+65 8498006** or via email at **drpreetimph@gmail.com**.

Your insights are invaluable to this study, and we sincerely appreciate your time and consideration. Thank you for your support in advancing healthcare research.

Best regards,

Dr. Preeti Hemchandra Wasnik

INTERVIEW COVER LETTER

Invitation to Participate in Research Study on Health Issues and Healthcare Utilization Patterns During and Post-COVID-19 in Singapore

Dear Participant,

I hope this letter finds you well. I am writing to invite you to participate in a research study titled "Health Issues and Healthcare Utilization Patterns During and Post-COVID-19 in Singapore", led by Dr. Preeti Hemchandra Wasnik. This study aims to explore the challenges and experiences of individuals in accessing healthcare during and after the COVID-19 pandemic, contributing to a broader understanding of healthcare utilization and its impact on public health policies.

Purpose of the Study:
The primary objective of this study is to assess the impact of the pandemic on healthcare-seeking behavior, healthcare access, and overall health conditions in Singapore. By participating, you will help provide valuable insights that may contribute to improving healthcare services and policies in the future.

Participation Details:

- Interview: You will be asked to complete an online survey, which will take approximately 30 -40 minutes.

Voluntary Participation & Confidentiality:
Participation in this study is entirely voluntary. You may refuse to answer any questions or withdraw from the study at any time without any consequences. All information provided will remain strictly confidential, and personal identifiers will be removed to ensure anonymity. Data will be securely stored and accessible only to me.

Risks and Benefits:

There are no foreseeable risks associated with participating in this study. While there may be no direct benefits to you, your participation will help inform future healthcare strategies and improve accessibility to healthcare services for communities affected by the pandemic.

Consent & Next Steps:

If you agree to participate, kindly select the appropriate consent options within the form. Should you have any questions or require further clarification, please feel free to contact Dr. Preeti Hemchandra Wasnik at 8498006 or via email at drpreetimph@gmail.com.

Your insights are invaluable to this study, and we sincerely appreciate your time and consideration. Thank you for your support in advancing healthcare research.

Best regards,

Dr. Preeti Hemchandra Wasnik

SURVEY INFORMED CONSENT FORM

Informed Consent Form

Title of Study: Health Issues and Healthcare Utilization Patterns During and Post-COVID-19 in Singapore

Purpose of the Study: You are invited to participate in a research study on health issues and healthcare utilization patterns during and after the COVID-19 pandemic in Singapore. The study aims to understand the challenges and experiences of individuals regarding healthcare access, health conditions, and changes in healthcare-seeking behavior.

Procedures: If you agree to participate, you will be asked to few questions which will take approximately [10-20] minutes.

Voluntary Participation: Your participation in this study is completely voluntary. You may refuse to answer any questions or withdraw from the study at any time without any consequences.

Risks and Benefits: There are no foreseeable risks associated with participating in this study. While you may not directly benefit from participating, your insights will contribute to a better understanding of healthcare utilization during and after the pandemic, which may inform future healthcare policies and services.

Confidentiality: All responses will be kept confidential and used for research purposes only. Data will be stored securely and accessible only to authorized researchers. Personal identifiers will be removed to ensure anonymity.

Consent Statement: By selecting "I agree" below, you confirm that you have read and understood the study details, and you voluntarily agree to participate.

□ I agree to participate in this study.

If you agree please proceed with questions

For any questions or concerns, please contact: Dr. Preeti Hemchandra Wasnik at [M+658498006, drpreetimph@gmail.com]

Informed Consent Form

Title of Study: Health Issues and Healthcare Utilization Patterns During and Post-COVID-19 in Singapore

Purpose of the Study: You are invited to participate in a research study on health issues and healthcare utilization patterns during and after the COVID-19 pandemic in Singapore. The study aims to understand the challenges and experiences of individuals regarding healthcare access, health conditions, and changes in healthcare-seeking behavior.

Procedures: If you agree to participate, you will be asked to few questions which will take approximately [30-40] minutes.

Voluntary Participation: Your participation in this study is completely voluntary. You may refuse to answer any questions or withdraw from the study at any time without any consequences.

Risks and Benefits: There are no foreseeable risks associated with participating in this study. While you may not directly benefit from participating, your insights will contribute to a better understanding of healthcare utilization during and after the pandemic, which may inform future healthcare policies and services.

Confidentiality: All responses will be kept confidential and used for research purposes only. Data will be stored securely and accessible only to authorized researchers. Personal identifiers will be removed to ensure anonymity.

Consent Statement: By selecting "I agree" below, you confirm that you have read and understood the study details, and you voluntarily agree to participate.

□ I agree to participate in this study.

If you agree please proceed with questions

For any questions or concerns, please contact: Dr. Preeti Hemchandra Wasnik at [M8498006, drpreetimph@gmail.com

SURVEY FORM

Questionnaire for the Study on Health Issues and Healthcare Utilization Patterns During and Post-COVID-19 in Singapore

Section 1: Demographic Information

1.1 Age:

1. ☐ 18-25
2. ☐ 26-35
3. ☐ 36-45
4. ☐ 46-55
5. ☐ 56 and above

1.2 Gender:

1. ☐ Male
2. ☐ Female
3. ☐ Other

1.3 Occupation

1. ☐ Employed
2. ☐ Unemployed
3. ☐ Student
4. ☐ Homemaker
5. ☐ Retired
6. ☐ Other (please specify

1.4 Income Level:

1. ☐ Below SGD 2,000
2. ☐ SGD 2,001 - 5,000
3. ☐ SGD 5,001 - 8,000
4. ☐ Above SGD 8,000

1.5 Education Level

1. ☐ Primary School
2. ☐ Secondary School
3. ☐ Diploma
4. ☐ Bachelor's Degree
5. ☐ Postgraduate Degree

1.6 Ethnicity/ Race

1. ☐ Indian
2. ☐ Chinese
3. ☐ Malay
4. ☐ Other

1.7 Status

1. ☐ Citizen
2. ☐ Permanent resident
3. ☐ Foreigner

Section 2: Health Issues

2.1 Have you experienced any health issues before the COVID-19 pandemic?

1. ☐ Yes
2. ☐ No
3. ☐ If yes, please specify the nature of the health issue(s): _____

2.2 Have you experienced any health issues during the COVID-19 pandemic?

1. ☐ Yes
2. ☐ No
3. ☐ If yes, please specify the nature of the health issue(s): _____

2.3 Have you had a COVID-19 infection?

1. ☐ Yes
2. ☐ No

2.4 Have you experienced any health issues post-COVID-19 infection?

1. ☐ Yes
2. ☐ No
3. ☐ If yes, please specify the nature of the health issue(s): _____

Section 3: Healthcare Utilization

3.1 Before the pandemic, how often did you seek healthcare services?

1. ☐ Rarely
2. ☐ Occasionally
3. ☐ Regularly
4. ☐ Frequently

3.2 Which services did you use then?

1. ☐ Public
2. ☐ Private

3.3 Why did you use those services?

_____

3.4 How has your frequency of seeking healthcare services changed during and after the pandemic?

1. ☐ Increased significantly
2. ☐ Increased slightly
3. ☐ Remained the same
4. ☐ Decreased slightly
5. ☐ Decreased significantly

3.5 What factors influenced your decision to seek healthcare services during the pandemic?

1. ☐ Fear of contracting COVID-19 or other infections
2. ☐ Severity of health issue
3. ☐ Access to healthcare facilities

4. □ Financial constraints

5. □ Government guidelines

6. □ Insurances

7. Other (please specify): _____

3.6 What services are you using now?

1. □ Public

2. □ Private

3.7 Why are you using those services?

_____

3.8 Were there any challenges you faced in accessing healthcare services during the pandemic?

1. □ Yes

2. □ No

3. □ If yes, please specify the challenges: _____

Section 4: Access to Healthcare Facilities

4.1 How satisfied are you with the accessibility of healthcare facilities during the pandemic and post-pandemic?

A) During pandemic:

1. □ Very satisfied

2. □ Satisfied

3. ☐ Neutral

4. ☐ Dissatisfied

5. ☐ Very dissatisfied

B) Post-pandemic:

1. ☐ Very satisfied

2. ☐ Satisfied

3. ☐ Neutral

4. ☐ Dissatisfied

5. ☐ Very dissatisfied

4.2 How would you rate the efficiency of the healthcare services you received during the pandemic?

A) During the pandemic:

1. ☐ Very efficient

2. ☐ Efficient

3. ☐ Neutral

4. ☐ Inefficient

5. ☐ Very inefficient

B) Post-pandemic:

1. ☐ Very efficient

2. ☐ Efficient

3. ☐ Neutral

4. ☐ Inefficient

5. ☐ Very inefficient

4.3 Did you utilize telehealth services during the pandemic?

1. ☐ Yes
2. ☐ No

4.4 If yes, please rate your satisfaction with telehealth services.

1. ☐ Very satisfied
2. ☐ Satisfied
3. ☐ Neutral
4. ☐ Dissatisfied
5. ☐ Very dissatisfied

Section 5: Additional Comments

5.1 Is there anything else you would like to share about your experiences with health issues and healthcare utilization during the pandemic?

Thank you for participating in this study! Your input is valuable for understanding health issues and healthcare utilization patterns during and post the COVID-19 pandemic.

- Thank the participant for their time and valuable insights.
- Will reiterate the confidentiality of your responses.
- Please contact Dr. Preeti Hemchandra Wasnik at [drpreetimph@gmail.com] for any further questions or clarifications.

INTERVIEW GUIDE

Qualitative Interview Guide

Introduction:

- Welcome/ Greet the participant and provide a brief overview of the study.
- Ensure the participant understands the purpose of the interview and the confidentiality of their responses.
- Obtain verbal consent/ written to proceed with the interview.
- Additionally, we would like to gather insights into the factors influencing healthcare utilization and patient experiences during the pandemic to develop logic models and customer journey maps.

Section 1: Health Issues

1. Can you share your experiences with health issues during the pandemic?
   - Probing: How did these health issues impact your daily life?
2. Were there specific health concerns that you found more challenging during the pandemic?
   - Probing: Did you seek medical attention for these concerns?
3. How did you manage your health issues during this period, including during COVID-19?
   - Probing: Did you find any particular coping mechanisms or strategies helpful?

Section 2: Healthcare Utilization

4. Can you describe any changes in your patterns of seeking healthcare services during the pandemic?

    o   Probing: What prompted these changes?

5. What factors influenced your decision to seek or not seek healthcare services?

    o   Probing: Were there any external factors, such as fear of COVID-19, that influenced your decision?

6. Were there any challenges you faced in accessing healthcare services during the pandemic?

    o   Probing: Can you provide specific examples of these challenges?

7. How satisfied were you with the healthcare services you received during this period?

    o   Probing: Were there specific aspects of the healthcare services that stood out to you, positively or negatively?

Section 3: Changes in Healthcare Behavior

8. In what ways do you think your healthcare-seeking behavior has changed during and after the pandemic?

    o   Probing: Are there any long-term changes you anticipate in your healthcare behavior?

9. Did you utilize telehealth services during the pandemic?

    o   Probing: How was your experience with telehealth services? What do you see as the advantages and disadvantages?

Section 4: Access to Healthcare Facilities

10. Can you share your thoughts on the accessibility of healthcare facilities during the pandemic?

- o Probing: Did you encounter any barriers or facilitators to accessing healthcare?
11. How would you rate the efficiency of the healthcare services you received during the pandemic?
    - o Probing: Were there specific instances that contributed to your perception of efficiency or inefficiency?

Section 5: Policy and Governance

12. What are your thoughts on the government's policies and strategies related to healthcare during the pandemic?
    - o Probing: How do you think these policies have influenced healthcare accessibility and quality?
13. Are there any gaps or areas for improvement in the governance of healthcare services during the pandemic?

Section 6: Community Response and Support

14. How do you perceive the role of community support systems in addressing healthcare needs during the pandemic?
    - o Probing: Were there any community initiatives or support networks that you found particularly helpful?
15. Do you think there were effective collaborations between community organizations, healthcare providers, and government agencies in responding to healthcare challenges during the pandemic?
16. Is there anything else you would like to add about your experiences with health issues and healthcare utilization during and post the COVID-19 pandemic?
    - o Probing: Any recommendations or insights you believe would be valuable for improving healthcare services in similar situations?

- Thank the participant for their time and valuable insights.
- Will reiterate the confidentiality of your responses.
- Please contact Dr. Preeti Hemchandra Wasnik at [drpreetimph@gmail.com] for any further questions or clarifications

APPENDIX G:

STATISTICAL ANALYSIS

Section 1: Health Issues

a. Gender and Health Issues

Table 1.1 *Gender and Health issues Before COVID-19*

		Section 2: Health Issues 2.1 Have you experienced any health issues before the COVID-19 pandemic?		
		- No	- Yes	Total
1.2 What's your Gender?	- Female	56	11	67
	- Male	63	20	83
	- Other	1	1	2
Total		120	32	152

Table 1.2 *Chi-Square Test of Gender and Health Issues Before COVID-19*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	2.337[a]	2	.311
Likelihood Ratio	2.183	2	.336
N of Valid Cases	152		
a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is .42.			

Table 2.1 *Gender and COVID-19 Infection*

		2.3 Have you had a COVID-19 infection?		
		- No	- Yes	Total
1.2 What's your Gender?	- Female	13	54	67
	- Male	16	67	83
	- Other	1	1	2
Total		30	122	152

Table 2.2 *Chi-Square Test of Gender and COVID-19 Infection*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	1.172[a]	2	.557
Likelihood Ratio	.928	2	.629
N of Valid Cases	152		
a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is .39.			

Table 3.1 *Gender and Health Issues Post-COVID-19 Infection*

		2.4 Have you experienced any health issues post-COVID-19 infection?		
		- No	- Yes	Total
1.2 What's your Gender?	- Female	46	21	67
	- Male	55	28	83
	- Other	1	1	2
Total		102	50	152

Table 3.2 *Chi-Square Test of Gender and Health Issues Post-COVID-19 Infection*

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	.365ᵃ	2	.833
Likelihood Ratio	.349	2	.840
N of Valid Cases	152		
a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is .66.			

Table 4.1 *Gender and Health Issues During the COVID-19 Pandemic*

		2.2 Have you experienced any health issues during the COVID-19 pandemic?		
		- No	- Yes	Total
1.2 What's your Gender?	- Female	56	11	67
	- Male	65	18	83
	- Other	1	1	2
Total		122	30	152

Table 4.2 *Chi-Square Test of Gender and Health Issues During the COVID-19 Pandemic*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	1.821ᵃ	2	.402
Likelihood Ratio	1.595	2	.451
N of Valid Cases	152		
a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is .39.			

Table 5 *Chi-Square Test of Gender and Specific Health Issues During COVID-19 Pandemic*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	113.287ᵃ	54	.000

Likelihood Ratio	52.672	54	.526
N of Valid Cases	152		
a. 80 cells (95.2%) have expected count less than 5. The minimum expected count is .01.			

Table 6 *Chi-Square Test of Gender and Specific Health Issues Post-COVID-19 Infection*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	125.193[a]	92	.012
Likelihood Ratio	76.331	92	.881
N of Valid Cases	152		
a. 138 cells (97.9%) have expected count less than 5. The minimum expected count is .01.			

ccupation and Health Issues

Table 7.1 Occupation and Health Issues Before COVID-19 Pandemic

		Section 2: Health Issues 2.1 Have you experienced any health issues before the COVID-19 pandemic?		Total
		- No	- Yes	
1.3 What's your Occupation?	- Employed	34	13	47
	- Homemaker	14	3	17
	- Retired	8	6	14
	- Student	60	10	70
	- Unemployed	4	0	4
Total		120	32	152

Table 7.2 Chi-Square Test of Occupation and Health Issues Before COVID-19 Pandemic

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8.353[a]	4	.079
Likelihood Ratio	8.640	4	.071
N of Valid Cases	152		
a. 4 cells (40.0%) have expected count less than 5. The minimum expected count is .84.			

Table 8.1 *Occupation and COVID-19 Infection*

		2.3 Have you had a COVID-19 infection?		Total
		- No	- Yes	
1.3 What's your Occupation?	- Employed	8	39	47
	- Homemaker	1	16	17
	- Retired	4	10	14
	- Student	17	53	70
	- Unemployed	0	4	4
Total		30	122	152

Table 8.2 *Chi-Square Test of Occupation and COVID-19 Infection*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	4.866[a]	4	.301
Likelihood Ratio	6.155	4	.188
N of Valid Cases	152		
a. 4 cells (40.0%) have expected count less than 5. The minimum expected count is .79.			

Table 9.1 *Occupation and Health Issues Post-COVID-19 Infection*

		2.4 Have you experienced any health issues post-COVID-19 infection?		Total
		- No	- Yes	
1.3 What's your Occupation?	- Employed	28	19	47
	- Homemaker	8	9	17
	- Retired	7	7	14
	- Student	55	15	70
	- Unemployed	4	0	4
Total		102	50	152

Table 9.2 *Chi-Square Test of Occupation and Health Issues Post-COVID-19 Infection*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	12.288[a]	4	.015
Likelihood Ratio	13.484	4	.009
N of Valid Cases	152		
a. 3 cells (30.0%) have expected count less than 5. The minimum expected count is 1.32.			

Table 10.1 *Occupation and Health Issues During the COVID-19 Pandemic*

		2.2 Have you experienced any health issues during the COVID-19 pandemic?		Total
		- No	- Yes	
1.3 What's your Occupation?	- Employed	38	9	47
	- Homemaker	12	5	17
	- Retired	6	8	14
	- Student	62	8	70
	- Unemployed	4	0	4
Total		122	30	152

Table 10.2 *Chi-Square Test of Occupation and Health Issues During the COVID-19 Pandemic*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	17.414[a]	4	.002
Likelihood Ratio	15.627	4	.004
N of Valid Cases	152		
a. 4 cells (40.0%) have expected count less than 5. The minimum expected count is .79.			

Figure 1 *Bar Chart of Occupation and Specific Health Issues*

Table 11 *Chi-Square Test of Occupation and Specific Health Issues*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	135.801ª	108	.036
Likelihood Ratio	99.463	108	.709
N of Valid Cases	152		
a. 135 cells (96.4%) have expected count less than 5. The minimum expected count is .03.			

196

Figure 2 *Bar Chart of Occupation and Detailed Health Issues*
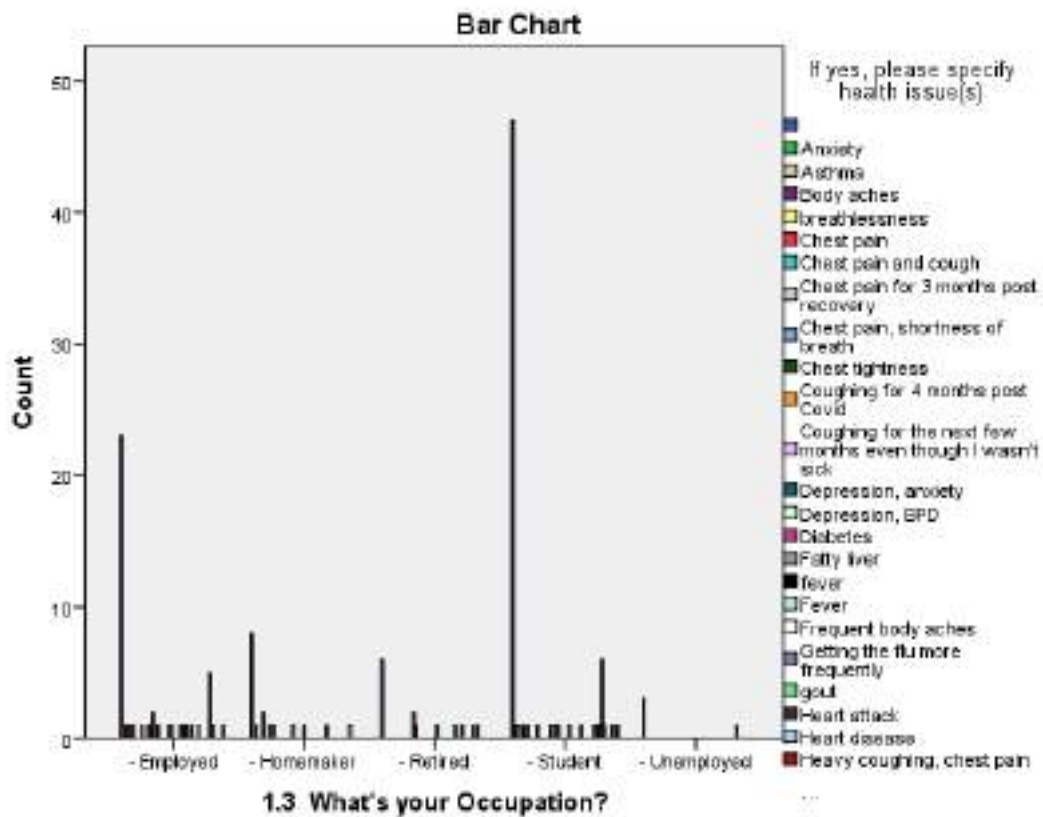
Table 12: *Chi-Square Test of Occupation and Detailed Health Issues*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	213.331[a]	184	.068
Likelihood Ratio	141.980	184	.991
N of Valid Cases	152		
a. 230 cells (97.9%) have expected count less than 5. The minimum expected count is .03.			

b. Income and Health Issues

Table 13.1 *Income Level and Health Issues Before the COVID-19 Pandemic*

		Section 2: Health Issues 2.1 Have you experienced any health issues before the COVID-19 pandemic?		Total
		- No	- Yes	Total
1.4 Your income Level (per month)?	- Above SGD 8,000	9	5	14
	- Below SGD 2,000	85	19	104
	- SGD 2,001-5,000	10	4	14
	- SGD 5,001 - 8,000	16	4	20
Total		120	32	152

Table 13.2 *Chi-Square Test of Income Level and Health Issues Before the COVID-19 Pandemic*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	2.785[a]	3	.426
Likelihood Ratio	2.544	3	.467
N of Valid Cases	152		
a. 3 cells (37.5%) have expected count less than 5. The minimum expected count is 2.95.			

Table 14.1 *Income Level and COVID-19 Infection*

| | | 2.3 Have you had a COVID-19 infection? | | |
		- No	- Yes	Total
1.4 Your income Level (per month)?	- Above SGD 8,000	3	11	14
	- Below SGD 2,000	21	83	104
	- SGD 2,001-5,000	1	13	14
	- SGD 5,001 - 8,000	5	15	20
Total		30	122	152

Table 14.2 *Chi-Square Test of Income Level and COVID-19 Infection*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	1.790a	3	.617
Likelihood Ratio	2.124	3	.547
N of Valid Cases	152		
a. 3 cells (37.5%) have expected count less than 5. The minimum expected count is 2.76.			

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Table 15.1 *Income Level and Health Issues Post-COVID-19 Infection*

		2.4 Have you experienced any health issues post-COVID-19 infection?		Total
		- No	- Yes	
1.4 Your income Level (per month)?	- Above SGD 8,000	9	5	14
	- Below SGD 2,000	72	32	104
	- SGD 2,001-5,000	9	5	14
	- SGD 5,001 - 8,000	12	8	20
Total		102	50	152

Table 15.2 *Chi-Square Test of Income Level and Health Issues Post-COVID-19 Infection*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	.771ᵃ	3	.856
Likelihood Ratio	.758	3	.860
N of Valid Cases	152		
a. 2 cells (25.0%) have expected count less than 5. The minimum expected count is 4.61.			

Table 16.1 *Income Level and Health Issues During the COVID-19 Pandemic*

		2.2 Have you experienced any health issues during the COVID-19 pandemic?		Total
		- No	- Yes	
1.4 Your income Level (per month)?	- Above SGD 8,000	9	5	14
	- Below SGD 2,000	84	20	104
	- SGD 2,001-5,000	13	1	14
	- SGD 5,001 - 8,000	16	4	20
Total		122	30	152

Table 16.2 *Chi-Square Test of Income Level and Health Issues During the COVID-19 Pandemic*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.675[a]	3	.299
Likelihood Ratio	3.710	3	.295
N of Valid Cases	152		
a. 3 cells (37.5%) have expected count less than 5. The minimum expected count is 2.76.			

Figure 3 *Bar Chart of Income Level and Specific Health Issues*
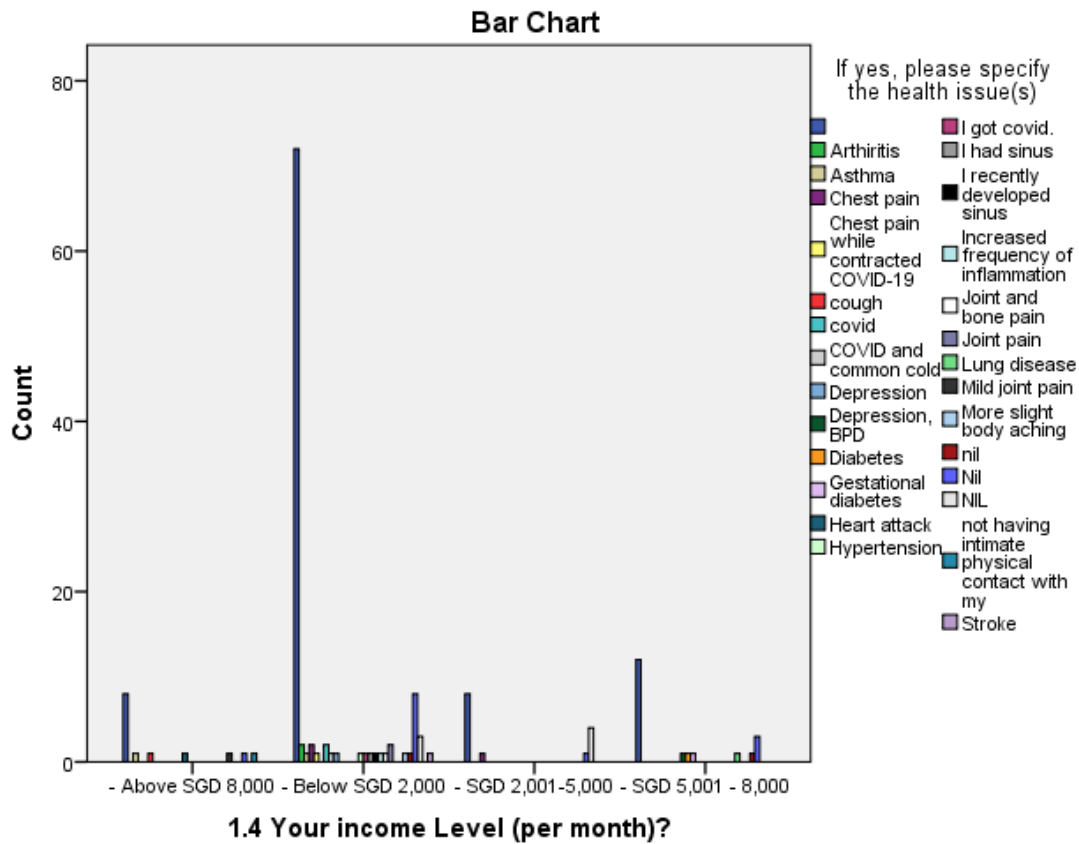
Table 17 *Chi-Square Test of Income Level and Specific Health Issues*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	104.362a	81	.041
Likelihood Ratio	68.845	81	.830
N of Valid Cases	152		
a. 107 cells (95.5%) have expected count less than 5. The minimum expected count is .09.			

Figure 4 *Bar Chart of Income Level and Detailed Health Issues*

Bar Chart
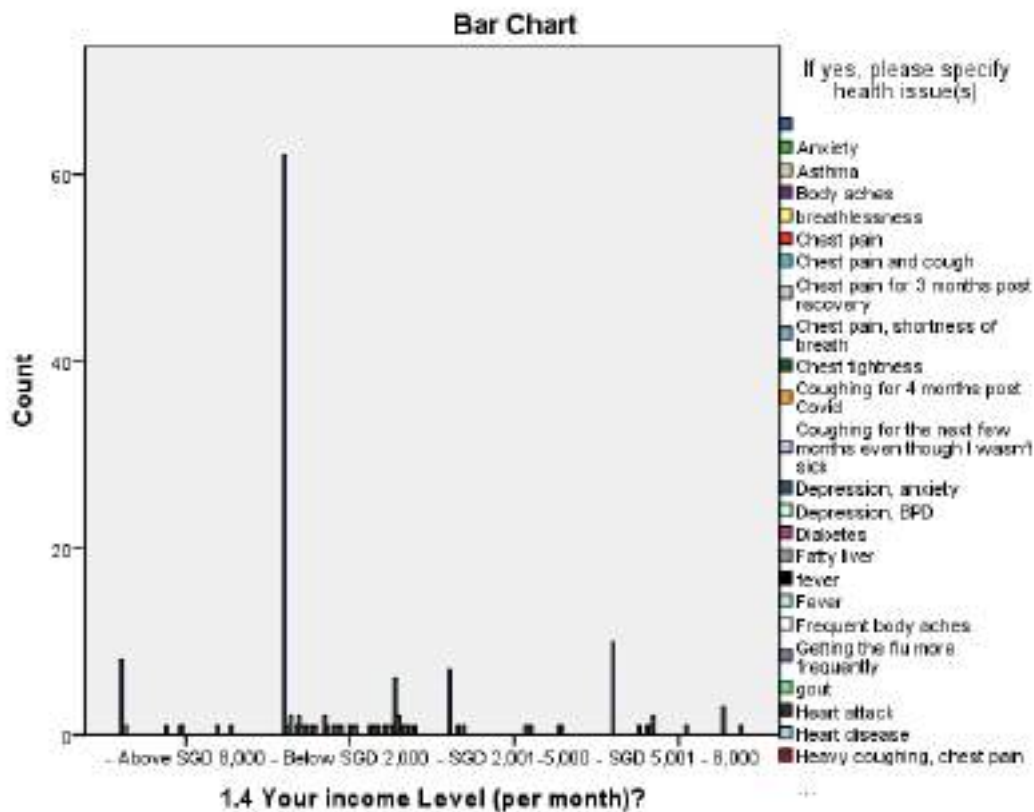
Table 18 *Chi-Square Test of Income Level and Detailed Health Issues*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	139.934[a]	138	.438
Likelihood Ratio	93.209	138	.999
N of Valid Cases	152		
a. 183 cells (97.3%) have expected count less than 5. The minimum expected count is .09.			

c. **Education and Health Issues**

*Table 19.1**Education Level and Health Issues Before COVID-19 Pandemic*

		Section 2: Health Issues 2.1 Have you experienced any health issues before the COVID-19 pandemic?		Total
		- No	- Yes	Total
1.5 Education Level?	- Bachelor's Degree	34	7	41
	- Diploma	40	10	50
	- Postgraduate Degree	13	7	20
	- Primary School	4	1	5
	- Secondary School	29	7	36
Total		120	32	152

Table 19.2 *Chi-Square Test of Education Level and Health Issues Before COVID-19 Pandemic*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	2.824[a]	4	.588
Likelihood Ratio	2.567	4	.633
N of Valid Cases	152		
a. 3 cells (30.0%) have expected count less than 5. The minimum expected count is 1.05.			

Table 20.1 *Education Level and COVID-19 Infection*

		2.3 Have you had a COVID-19 infection?		Total
		- No	- Yes	
1.5 Education Level?	- Bachelor's Degree	8	33	41
	- Diploma	9	41	50
	- Postgraduate Degree	5	15	20
	- Primary School	1	4	5
	- Secondary School	7	29	36
Total		30	122	152

Table 20.2 *Chi-Square Test of Education Level and COVID-19 Infection*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	.448[a]	4	.978
Likelihood Ratio	.430	4	.980
N of Valid Cases	152		
a. 3 cells (30.0%) have expected count less than 5. The minimum expected count is .99.			

Table 21.1 *Education Level and Health Issues Post-COVID-19 Infection*

		2.4 Have you experienced any health issues post-COVID-19 infection?		
		- No	- Yes	Total
1.5 Education Level?	- Bachelor's Degree	25	16	41
	- Diploma	33	17	50
	- Postgraduate Degree	14	6	20
	- Primary School	4	1	5
	- Secondary School	26	10	36
Total		102	50	152

Table 21.2 *Chi-Square Test of Education Level and Health Issues Post-COVID-19 Infection*

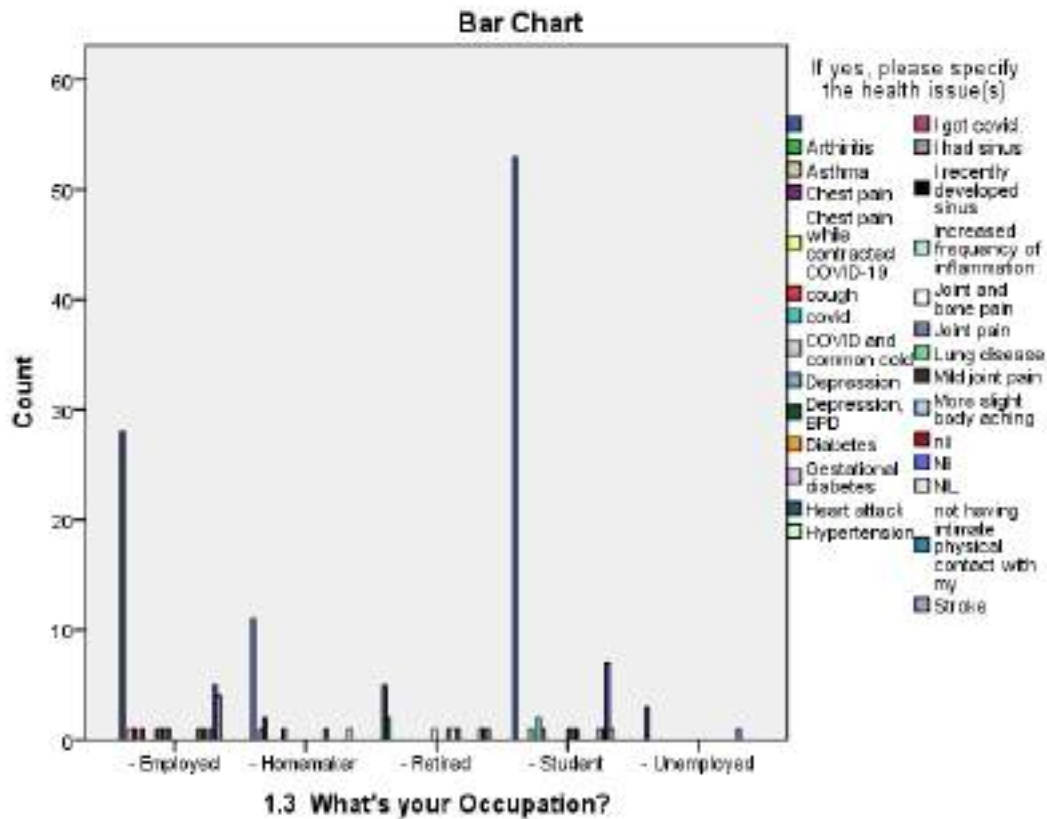| Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	1.605ª	4	.808
Likelihood Ratio	1.634	4	.803
N of Valid Cases	152		
a. 2 cells (20.0%) have expected count less than 5. The minimum expected count is 1.64.			

Table 22.1 *Education Level and Health Issues During the COVID-19 Pandemic*

		2.2 Have you experienced any health issues during the COVID-19 pandemic?		Total
		- No	- Yes	
1.5 Education Level?	- Bachelor's Degree	29	12	41
	- Diploma	41	9	50
	- Postgraduate Degree	19	1	20
	- Primary School	4	1	5
	- Secondary School	29	7	36
Total		122	30	152

Table 22.2 *Chi-Square Test of Education Level and Health Issues During the COVID-19 Pandemic*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	5.191[a]	4	.268
Likelihood Ratio	5.883	4	.208
N of Valid Cases	152		
a. 3 cells (30.0%) have expected count less than 5. The minimum expected count is .99.			

Figure 5 *Bar Char of Education Level and Specific Health Issues*
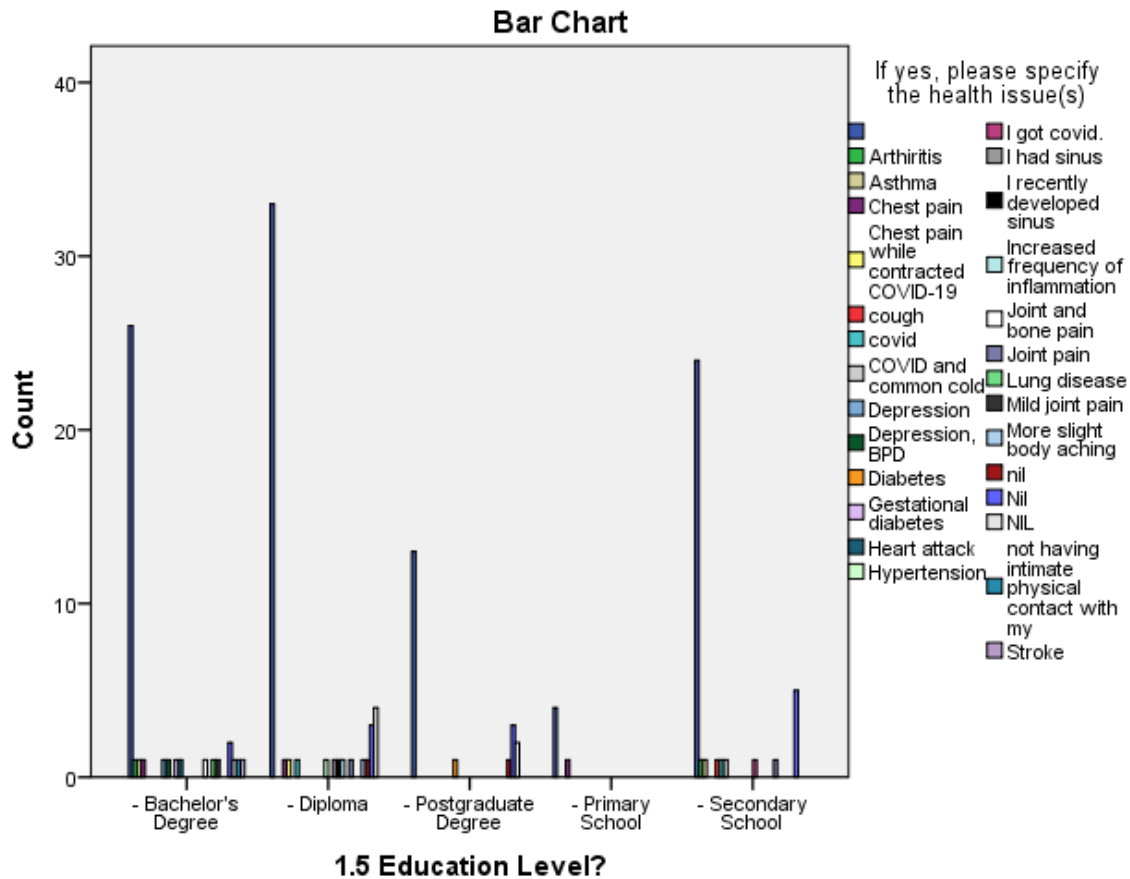
Table 23 *Chi-Square Test of Education Level and Specific Health Issues*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	81.409[a]	108	.974
Likelihood Ratio	78.617	108	.985
N of Valid Cases	152		
a. 136 cells (97.1%) have expected count less than 5. The minimum expected count is .03.			

Figure 6 *Bar Char of Education Level and Detailed Health Issues*

1.5 Education Level? * If yes, please specify health issue(s)
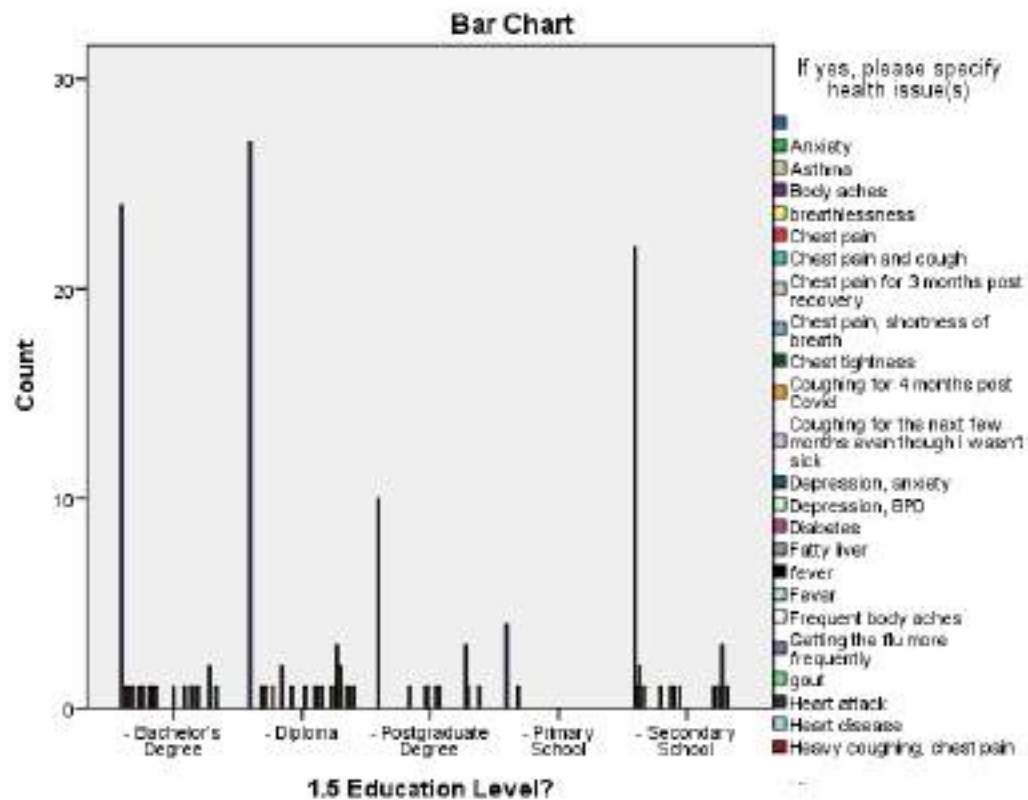
Table 24 *Chi-Square Test of Education Level and Detailed Health Issues*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	147.131[a]	184	.979
Likelihood Ratio	131.455	184	.999
N of Valid Cases	152		
a. 231 cells (98.3%) have expected count less than 5. The minimum expected count is .03.			

d. Ethnicity and Health Issues

Table 25.1 *Ethnicity/Race and Health Issues Before the COVID-19 Pandemic*

		Section 2: Health Issues 2.1 Have you experienced any health issues before the COVID-19 pandemic?		
		- No	- Yes	Total
1.6 Ethnicity/ Race?	- Chinese	55	17	72
	- Indian	27	7	34
	- Malay	24	6	30
	- Other	14	2	16
Total		120	32	152

Table 25.2 *Chi-Square Test of Ethnicity/Race and Health Issues Before the COVID-19 Pandemic*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	1.012[a]	3	.798
Likelihood Ratio	1.095	3	.778
N of Valid Cases	152		
a. 1 cells (12.5%) have expected count less than 5. The minimum expected count is 3.37.			

Table 26.1 *Ethnicity/Race and COVID-19 Infection*

		1.6 Ethnicity/ Race? 2.3 Have you had a COVID-19 infection?		
		- No	- Yes	Total
1.6 Ethnicity/ Race?	- Chinese	14	58	72
	- Indian	7	27	34
	- Malay	7	23	30
	- Other	2	14	16
Total		30	122	152

Table 26.2 *Chi-Square Test of Ethnicity/Race and COVID-19 Infection*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	.793[a]	3	.851
Likelihood Ratio	.844	3	.839
N of Valid Cases	152		
a. 1 cells (12.5%) have expected count less than 5. The minimum expected count is 3.16.			

Table 27.1 *Ethnicity/Race and Health Issues Post-COVID-19 Infection*

		2.4 Have you experienced any health issues post-COVID-19 infection?		Total
		- No	- Yes	
1.6 Ethnicity/ Race?	- Chinese	49	23	72
	- Indian	24	10	34
	- Malay	20	10	30
	- Other	9	7	16
Total		102	50	152

Table 27.2 Chi-Square Test of Ethnicity/Race and Health Issues Post-COVID-19 Infection

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	1.073[a]	3	.784
Likelihood Ratio	1.039	3	.792
N of Valid Cases	152		
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.26.			

**Table 28.1** *Ethnicity/Race and Health Issues During the COVID-19 Pandemic*

		2.2 Have you experienced any health issues during the COVID-19 pandemic?		Total
		- No	- Yes	
1.6 Ethnicity/ Race?	- Chinese	59	13	72
	- Indian	25	9	34
	- Malay	23	7	30
	- Other	15	1	16
Total		122	30	152

Table 28.2 *Chi-Square Test of Ethnicity/Race and Health Issues During the COVID-19 Pandemic*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.184[a]	3	.364
Likelihood Ratio	3.628	3	.304
N of Valid Cases	152		
a. 1 cells (12.5%) have expected count less than 5. The minimum expected count is 3.16.			

Figure 7 *Bar Char of Ethnicity/Race and Specific Health Issues*
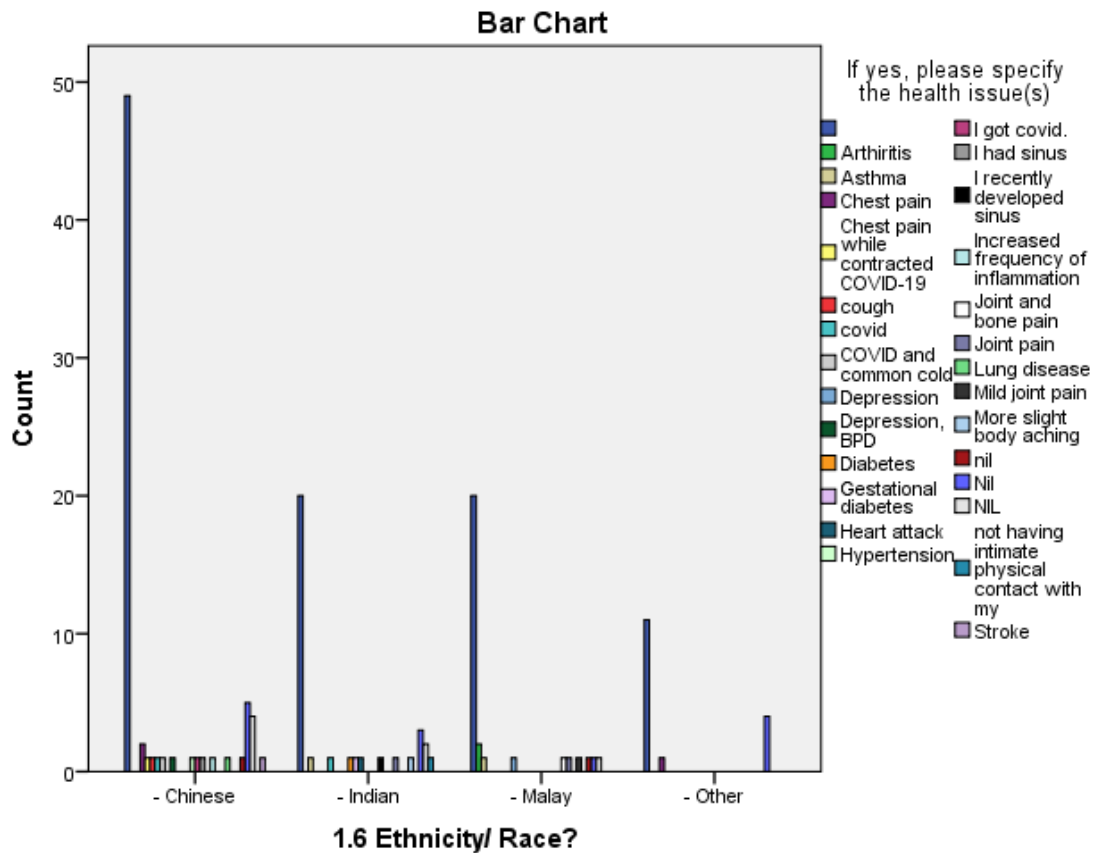
Table 29 *Chi-Square Test of Ethnicity/Race and Specific Health Issues*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	71.339[a]	81	.770
Likelihood Ratio	70.408	81	.793
N of Valid Cases	152		
a. 107 cells (95.5%) have expected count less than 5. The minimum expected count is .11.			

Figure 8 *Bar Char of Ethnicity/Race and Detailed Health Issues*

Bar Chart
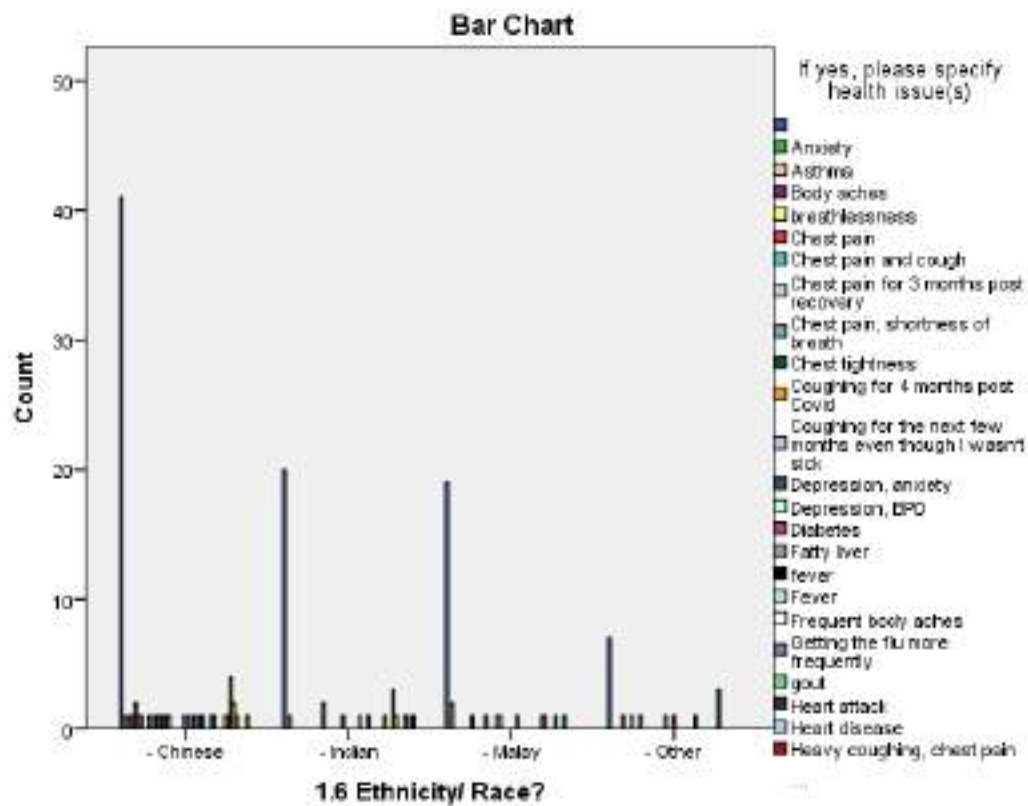
Table 30 *Chi-Square Test of Ethnicity/Race and Detailed Health Issues*

=Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	136.184a	138	.528
Likelihood Ratio	116.983	138	.902
N of Valid Cases	152		
a. 183 cells (97.3%) have expected count less than 5. The minimum expected count is .11.			

e. Status in Singapore and Health Issues

Table 31.1 *Status in Singapore and Health Issues Before the COVID-19 Pandemic*

		Section 2: Health Issues 2.1 Have you experienced any health issues before the COVID-19 pandemic?		Total
		- No	- Yes	
1.7 Your Status In Singapore?	- Citizen	77	27	104
	- Foreigner	12	0	12
	- Permanent resident	31	5	36
Total		120	32	152

Table 31.2 *Chi-Square Test of Status in Singapore and Health Issues Before the COVID-19 Pandemic*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	5.819[a]	2	.054
Likelihood Ratio	8.331	2	.016
N of Valid Cases	152		
a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 2.53.			

Table 32.1 *Status in Singapore and COVID-19 Infection*

		2.3 Have you had a COVID-19 infection?		Total
		- No	- Yes	
1.7 Your Status In Singapore?	- Citizen	20	84	104
	- Foreigner	5	7	12
	- Permanent resident	5	31	36
Total		30	122	152

Table 32.2 *Chi-Square Test of Status in Singapore and COVID-19 Infection*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	4.437[a]	2	.109
Likelihood Ratio	3.867	2	.145
N of Valid Cases	152		
a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 2.37.			

Table 33.1 *Status in Singapore and Health Issues Post-COVID-19 Infection*

| | | 2.4 Have you experienced any health issues post-COVID-19 infection? | | |
		- No	- Yes	Total
1.7 Your Status In Singapore?	- Citizen	66	38	104
	- Foreigner	10	2	12
	- Permanent resident	26	10	36
Total		102	50	152

Table 33.2 *Chi-Square Test of Status in Singapore and Health Issues Post-COVID-19 Infection*

| | | 2.4 Have you experienced any health issues post-COVID-19 infection? | | |
		- No	- Yes	Total
1.7 Your Status In Singapore?	- Citizen	66	38	104
	- Foreigner	10	2	12
	- Permanent resident	26	10	36
Total		102	50	152

Table 34.1 *Status in Singapore and Health Issues During the COVID-19 Pandemic*

		2.2 Have you experienced any health issues during the COVID-19 pandemic?		
		- No	- Yes	Total
1.7 Your Status In Singapore?	- Citizen	82	22	104
	- Foreigner	10	2	12
	- Permanent resident	30	6	36
Total		122	30	152

Table 34.2 *Chi-Square Test of Status in Singapore and Health Issues During the COVID-19 Pandemic*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	.417a	2	.812
Likelihood Ratio	.427	2	.808
N of Valid Cases	152		
a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 2.37.			

Figure 9 *Bar Chart of Status in Singapore and Specific Health Issues*
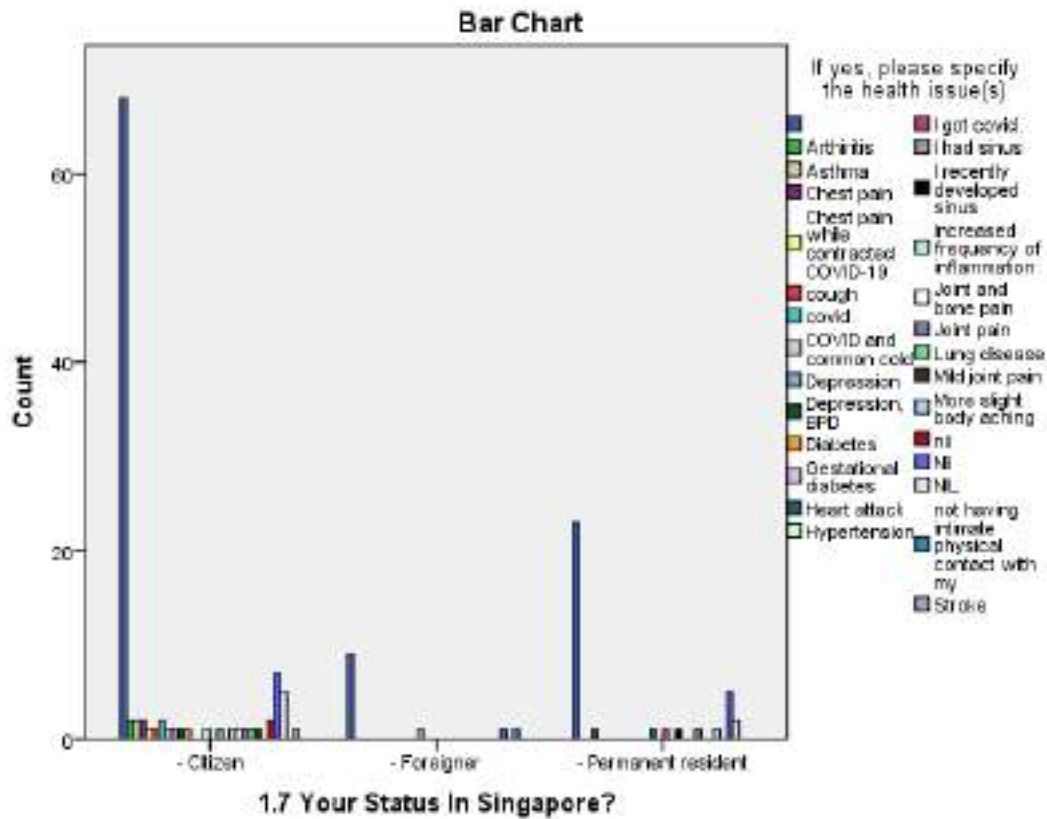
Table 35 *Chi-Square Test of Status in Singapore and Specific Health Issues*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	49.525a	54	.647
Likelihood Ratio	41.858	54	.886
N of Valid Cases	152		
a. 80 cells (95.2%) have expected count less than 5. The minimum expected count is .08.			

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Figure 10 *Bar Chart of Status in Singapore and Detailed Health Issues*
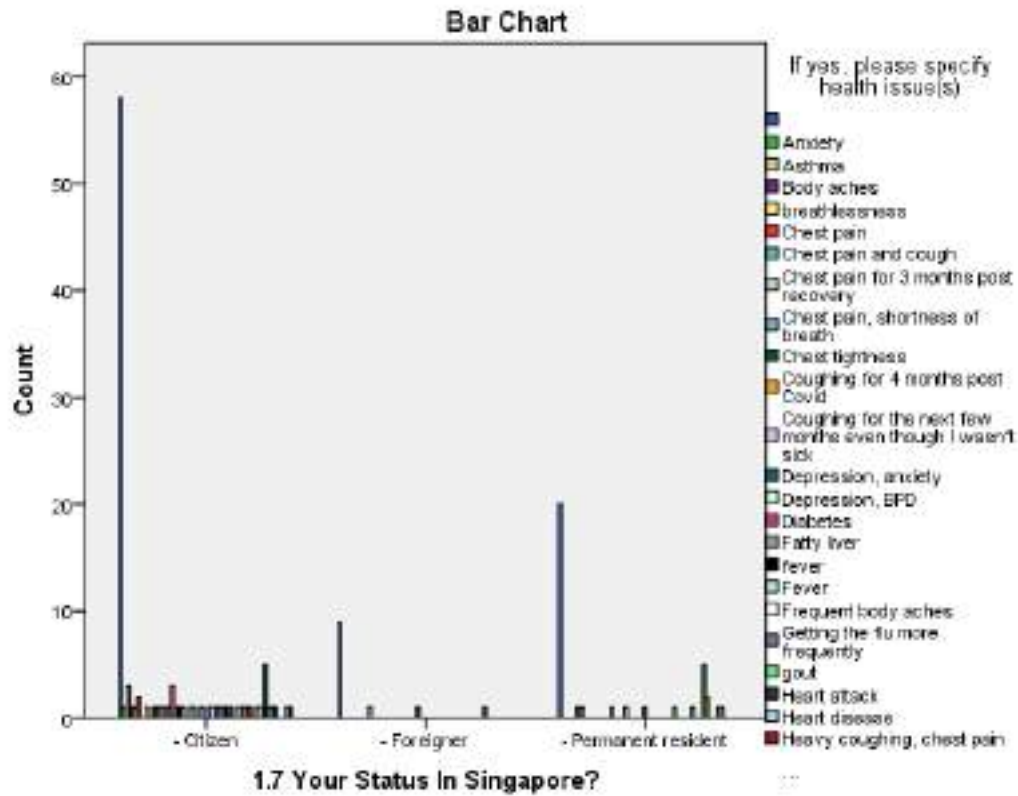
Table 36 *Chi-Square Test of Status in Singapore and Detailed Health Issues*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	69.647ᵃ	92	.960
Likelihood Ratio	64.196	92	.988
N of Valid Cases	152		
a. 137 cells (97.2%) have expected count less than 5. The minimum expected count is .08.			

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f. Age and Health Issues

Figure 11 Bar Chart of Age and Health Issues Before the COVID-19 Pandemic
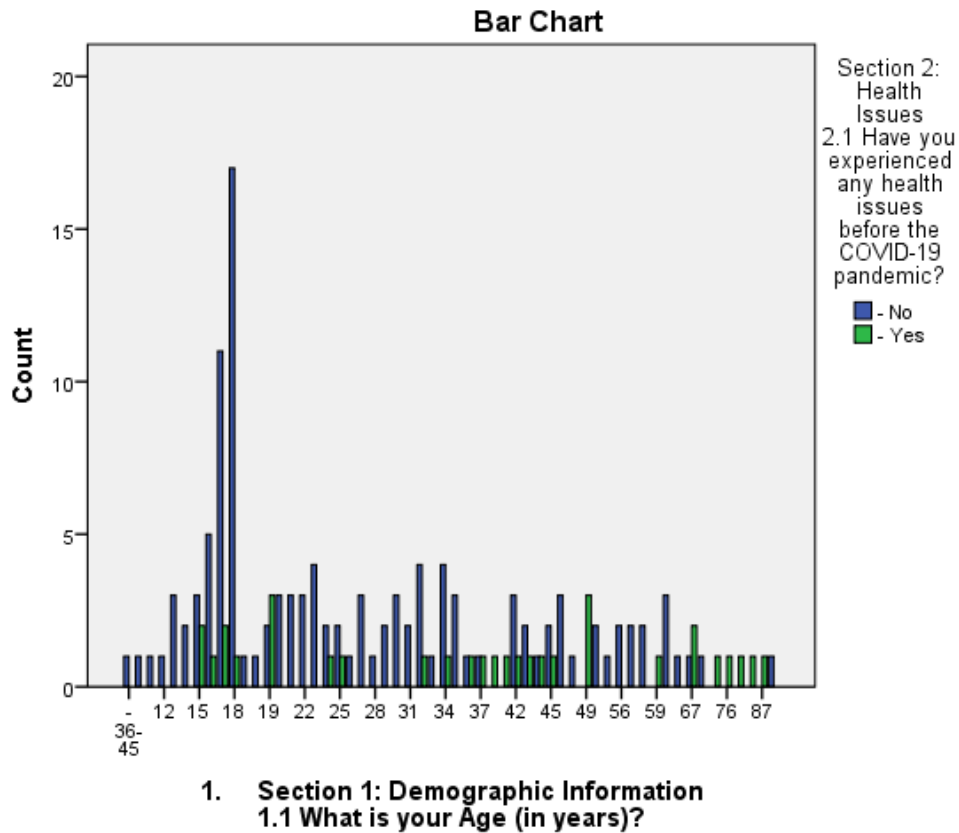
Table 37 Chi-Square Test of Age and Health Issues Before the COVID-19 Pandemic

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	73.462[a]	55	.049
Likelihood Ratio	76.781	55	.028
N of Valid Cases	152		
a. 110 cells (98.2%) have expected count less than 5. The minimum expected count is .21.			

Figure 12 *Bar Chart of Age and COVID-19 Infection*

Table 38 *Chi-Square Test of Age and COVID-19 Infection*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	57.711[a]	55	.375
Likelihood Ratio	62.358	55	.231
N of Valid Cases	152		
a. 110 cells (98.2%) have expected count less than 5. The minimum expected count is .20.			

Figure 13 *Bar Chart of Age and Health Issues Post-COVID-19 Infection*

Table 39 *Chi-Square Test of Age and Health Issues Post-COVID-19 Infection*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	73.165ᵃ	55	.051
Likelihood Ratio	90.344	55	.002
N of Valid Cases	152		
a. 109 cells (97.3%) have expected count less than 5. The minimum expected count is .33.			

Figure 14 *Bar Chart of Age and Health Issues During the COVID-19 Pandemic*

Bar Chart
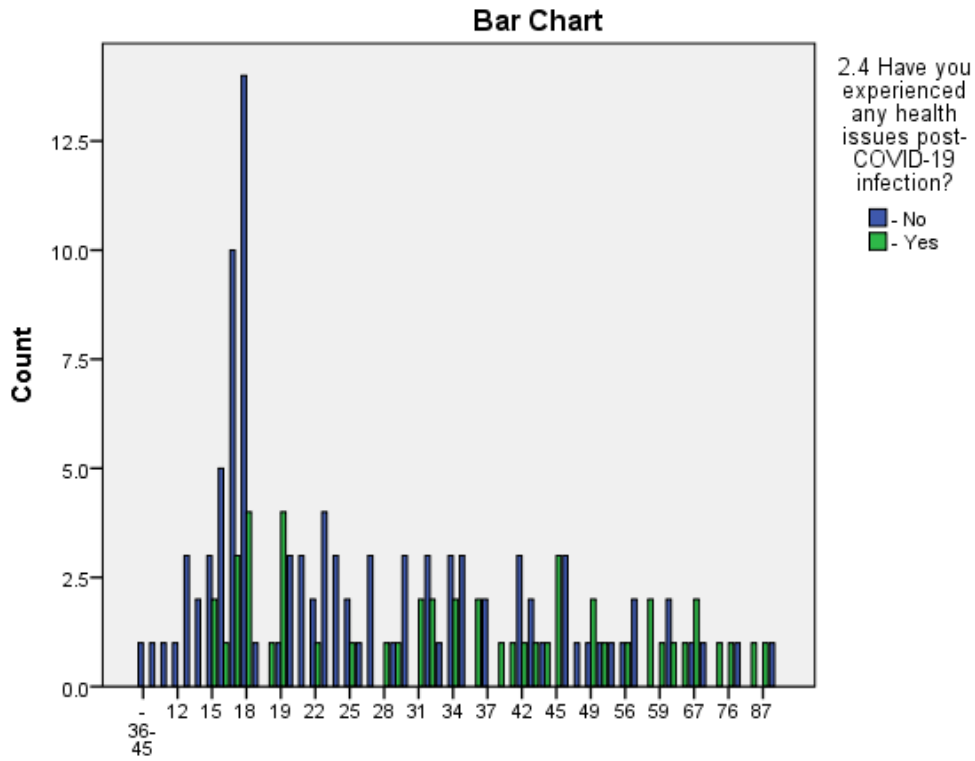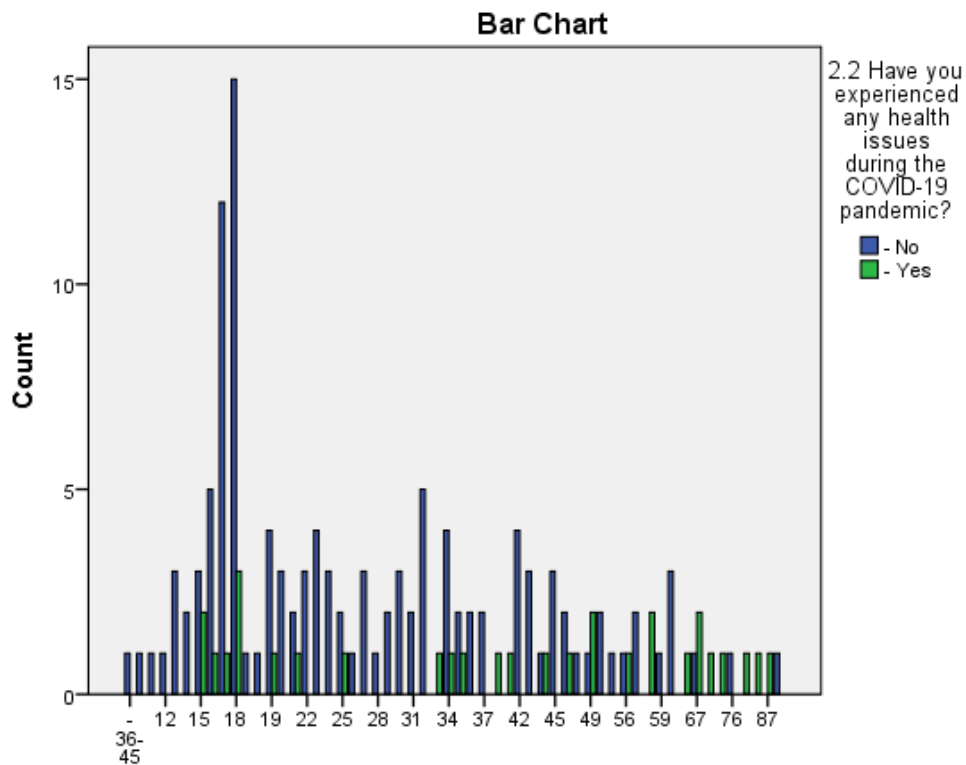
1. Section 1: Demographic Information
1.1 What is your Age (in years)?

Table 40 *Chi-Square Test of Age and Health Issues During the COVID-19 Pandemic*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	75.893a	55	.032
Likelihood Ratio	77.131	55	.026
N of Valid Cases	152		
a. 110 cells (98.2%) have expected count less than 5. The minimum expected count is .20.			

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Figure 15 *Bar Chart of Age and Specific Health Issues*
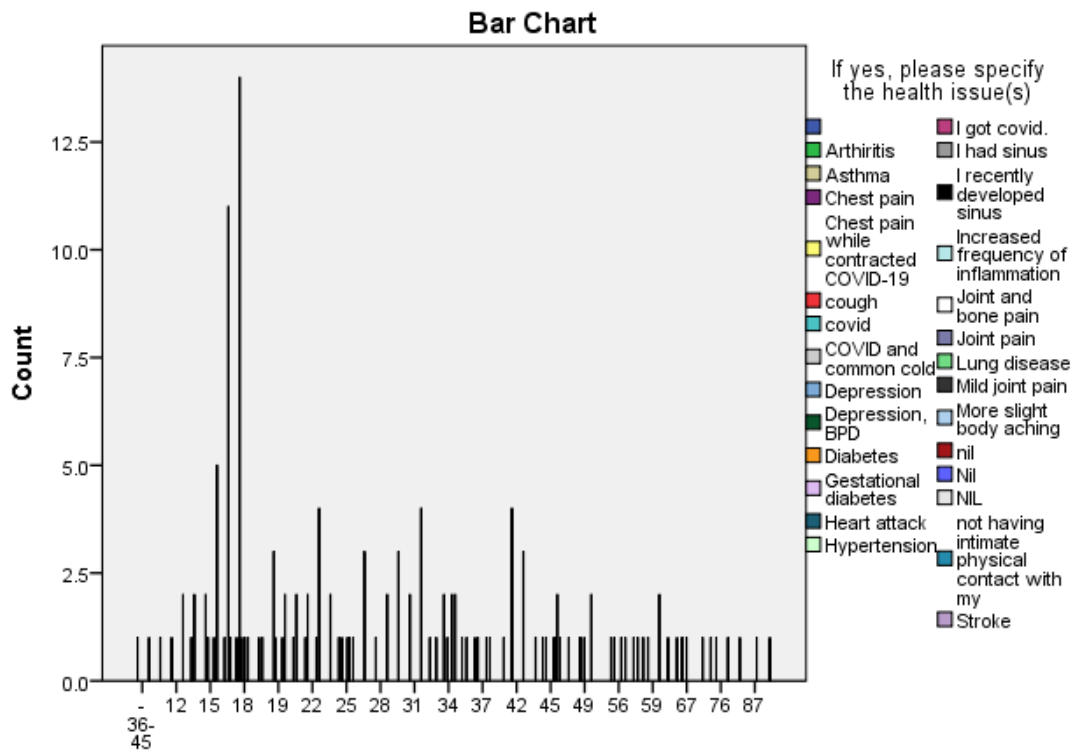
Table 41 *Chi-Square Test of Age and Specific Health Issues*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	1875.919[a]	1485	.000
Likelihood Ratio	330.405	1485	1.000
N of Valid Cases	152		
a. 1566 cells (99.9%) have expected count less than 5. The minimum expected count is .01.			

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Figure 16 *Bar Chart of Age and Detailed Health Issues*
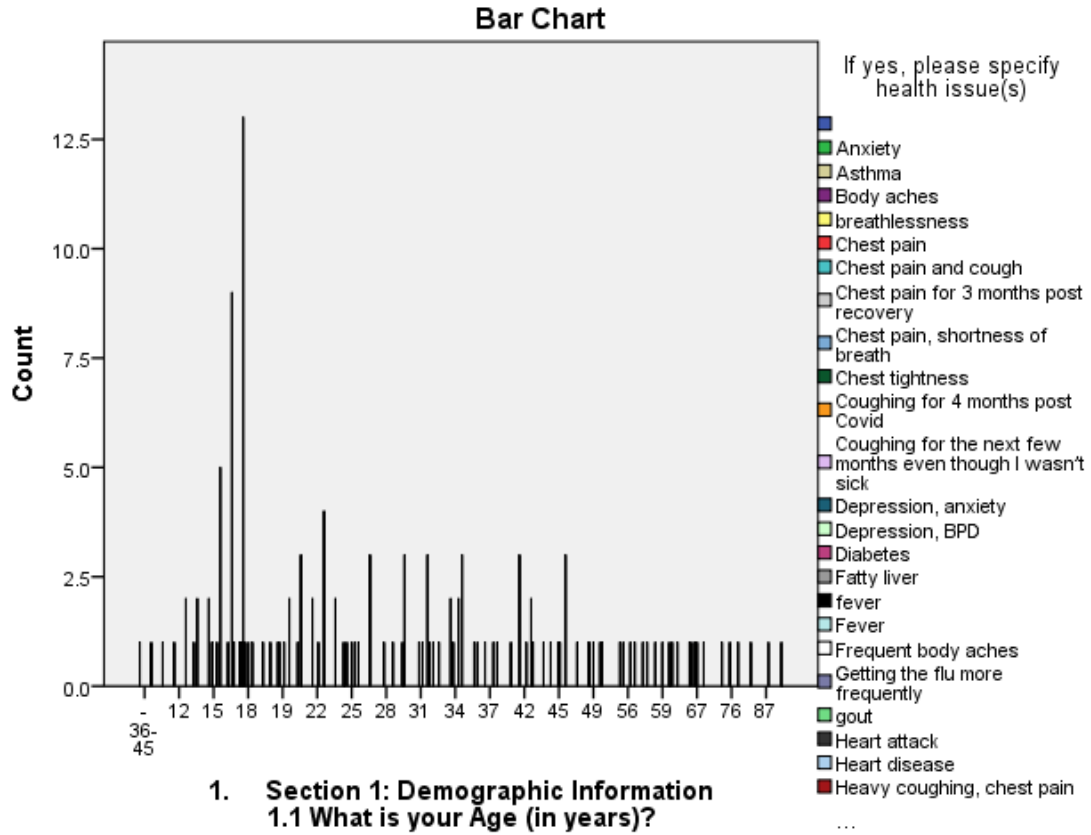
Table 42 *Chi-Square Test of Age and Detailed Health Issues*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	2924.124[a]	2530	.000
Likelihood Ratio	465.689	2530	1.000
N of Valid Cases	152		
a. 2630 cells (99.9%) have expected count less than 5. The minimum expected count is .01.			

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Section 2: Health Care Utilization

Table 43.1 *Services Used Now and Healthcare Utilization Before the Pandemic*

		Section 3: Healthcare Utilization 3.1 Before the pandemic, how often did you seek healthcare services?				
		- Frequently	- Occasionally	- Rarely	- Regularly	Total
3.6 What services are you using now?	Private	1	13	34	5	53
	Public	1	39	57	2	99
Total		2	52	91	7	152

Table 43.2 *Chi-Square Test of Services Used Now and Healthcare Utilization Before the Pandemic*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	6.801[a]	3	.079
Likelihood Ratio	6.668	3	.083
McNemar-Bowker Test	.	.	.[b]
N of Valid Cases	152		
a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is .70.			
b. Computed only for a PxP table, where P must be greater than 1.			

Table 43.3 *Directional Measures of Services Used Now and Healthcare Utilization Before the Pandemic*

			Value	Asymptotic Standardized Error[a]	Approximate T[b]	Approximate Significance
			Directional Measures			
Nominal by Nominal	Lambda	Symmetric	.026	.026	1.003	.316
		3.6 What services are you using now? Dependent	.057	.055	1.003	.316
		Section 3: Healthcare Utilization 3.1 Before the pandemic, how often did you seek healthcare services? Dependent	.000	.000	.[c]	.[c]
	Goodman and Kruskal tau	3.6 What services are you using now? Dependent	.045	.032		.080[d]
		Section 3: Healthcare Utilization 3.1 Before the pandemic, how often did you seek healthcare services? Dependent	.014	.014		.098[d]
	Uncertainty Coefficient	Symmetric	.029	.022	1.306	.083[e]
		3.6 What services are you using now? Dependent	.034	.026	1.306	.083[e]

		Section 3: Healthcare Utilization 3.1 Before the pandemic, how often did you seek healthcare services? Dependent	.025	.019	1.306	.083[e]
Ordinal by Ordinal	Somers' d	Symmetric	-.164	.077	-2.094	.036
		3.6 What services are you using now? Dependent	-.153	.072	-2.094	.036
		Section 3: Healthcare Utilization 3.1 Before the pandemic, how often did you seek healthcare services? Dependent	-.176	.084	-2.094	.036
a. Not assuming the null hypothesis.						
b. Using the asymptotic standard error assuming the null hypothesis.						
c. Cannot be computed because the asymptotic standard error equals zero.						
d. Based on chi-square approximation						
e. Likelihood ratio chi-square probability.						
f. ETA statistics are available for numeric data only.						

Table 43.4 *Symmetric Measures of Services Used Now and Healthcare Utilization Before the Pandemic*

			Asymptotic Standardized Error[a]	Approximate T[b]	Approximate Significance
		Value			
Nominal by Nominal	Phi	.212			.079
	Cramer's V	.212			.079
	Contingency Coefficient	.207			.079
Ordinal by Ordinal	Kendall's tau-b	-.164	.078	-2.094	.036
	Kendall's tau-c	-.160	.076	-2.094	.036
	Gamma	-.331	.153	-2.094	.036
Measure of Agreement	Kappa	.[d]			
N of Valid Cases		152			
a. Not assuming the null hypothesis.					
b. Using the asymptotic standard error assuming the null hypothesis.					
c. Correlation statistics are available for numeric data only.					
d. Kappa statistic cannot be computed. It requires a two-way table in which the variables are of the same type.					

(Table title row: Symmetric Measures)

Figure 17 *Bar Chart of Services Used Now and Healthcare Utilization Before the Pandemic*

Bar Chart
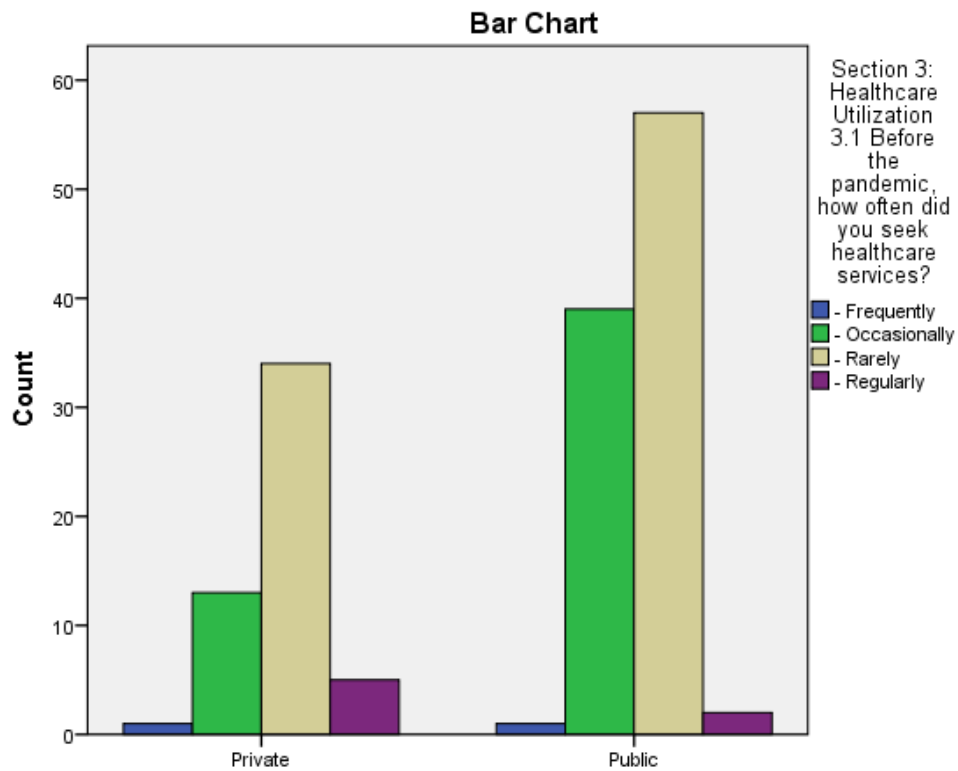
3.6 What services are you using now?

Section 3: Healthcare Accessibility

Table 44.1 *Satisfaction with Access to Healthcare Facilities and Utilization of Telehealth During the Pandemic*

| | | 4.3 Did you utilize telehealth services during the pandemic? | | |
		No	Yes	Total
Section 4: Access to Healthcare Facilities	Dissatisfied	4	1	5
	Neutral	33	8	41
	Satisfied	65	27	92

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4.1.a How satisfied are you with the accessibility of healthcare facilities during the pandemic?	Very satisfied			
		7	7	14
Total		109	43	152

Table 44.2 Chi-Square Test of Satisfaction with Access to Healthcare Facilities and Utilization of Telehealth During the Pandemic

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	5.030[a]	3	.170
Likelihood Ratio	4.835	3	.184
McNemar-Bowker Test	.	.	.[b]
N of Valid Cases	152		
a. 3 cells (37.5%) have expected count less than 5. The minimum expected count is 1.41.			
b. Computed only for a PxP table, where P must be greater than 1.			

Table 45.1 *Satisfaction with Access to Healthcare Facilities During and Post-Pandemic*

		4.1.b How satisfied are you with the accessibility of healthcare facilities post-pandemic?			Total
		Neutral	Satisfied	Very satisfied	
Section 4: Access to Healthcare Facilities 4.1.a How satisfied are you with the accessibility of healthcare facilities during pandemic?	Dissatisfied	0	5	0	5
	Neutral	25	15	1	41
	Satisfied	0	73	19	92
	Very satisfied	0	4	10	14
Total		25	97	30	152

Table 45.2 *Chi-Square Test of Satisfaction with Access to Healthcare Facilities During and Post-Pandemic*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	105.871[a]	6	.000
Likelihood Ratio	101.958	6	.000
McNemar-Bowker Test	.	.	.[b]
N of Valid Cases	152		
a. 5 cells (41.7%) have expected count less than 5. The minimum expected count is .82.			
b. Computed only for a PxP table, where P must be greater than 1.			

Table 46.1 *Satisfaction with Access to Healthcare Facilities and Efficiency of Healthcare Services During the Pandemic*

		4.2.a How would you rate the efficiency of the healthcare services you received during pandemic?				
		Efficient	Inefficient	Neutral	Very efficient	Total
Section 4: Access to Healthcare Facilities 4.1.a How satisfied are you with the accessibility of healthcare facilities during the pandemic?	Dissatisfied	1	3	1	0	5
	Neutral	13	2	23	3	41
	Satisfied	65	1	18	8	92
	Very satisfied	5	1	0	8	14
Total		84	7	42	19	152

Table 46.2 *Chi-Square Test of Satisfaction with Access to Healthcare Facilities and Efficiency of Healthcare Services During the Pandemic*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	89.200[a]	9	.000
Likelihood Ratio	59.514	9	.000
McNemar-Bowker Test	.	.	.[b]
N of Valid Cases	152		
a. 9 cells (56.3%) have expected count less than 5. The minimum expected count is .23.			
b. Both variables must have identical values of categories.			

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Table 47.1 *Satisfaction with Access to Healthcare Facilities During the Pandemic and Efficiency of Healthcare Services Post-Pandemic*

		4.2.b How would you rate the efficiency of the healthcare services you received post-pandemic?				
		Efficient	Inefficient	Neutral	Very efficient	Total
Section 4: Access to Healthcare Facilities 4.1.a How satisfied are you with the accessibility of healthcare facilities during the pandemic?	Dissatisfied	2	0	2	1	5
	Neutral	19	0	13	9	41
	Satisfied	62	1	5	24	92
	Very satisfied	5	0	1	8	14
Total		88	1	21	42	152

Table 47.2 *Chi-Square Test of Satisfaction with Access to Healthcare Facilities During Pandemic and Efficiency of Healthcare Services Post-Pandemic*

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	26.682[a]	9	.002
Likelihood Ratio	24.348	9	.004
McNemar-Bowker Test	.	.	.[b]
N of Valid Cases	152		
a. 9 cells (56.3%) have expected count less than 5. The minimum expected count is .03.			
b. Both variables must have identical values of categories.			

Section 4: Cross-tabulation

a. Gender and Accessibility of Healthcare Facilities During and Post-Pandemic

Table 48 *Cross-tabulation of Gender and Satisfaction with Accessibility of Healthcare Facilities During and Post-Pandemic*

4.1.b How satisfied are you with the accessibility of healthcare facilities post-pandemic?			Section 4: Access to Healthcare Facilities 4.1.a How satisfied are you with the accessibility of healthcare facilities during pandemic?				Total
			Dissatisfied	Neutral	Satisfied	Very satisfied	Total
Neutral	1.2 What's your Gender?	- Female		14			14
		- Male		11			11
	Total			25			25
Satisfied	1.2 What's your Gender?	- Female	1	2	34	2	39
		- Male	4	13	38	2	57
		- Other	0	0	1	0	1
	Total		5	15	73	4	97
Very satisfied	1.2 What's your Gender?	- Female		1	10	3	14
		- Male		0	9	6	15
		- Other		0	0	1	1
	Total			1	19	10	30
Total	1.2 What's your Gender?	- Female	1	17	44	5	67
		- Male	4	24	47	8	83
		- Other	0	0	1	1	2
	Total		5	41	92	14	152

b. Gender, Accessibility, and Efficiency of Healthcare Services During the Pandemic

Table 49 Cross-tabulation of Gender, Satisfaction with Accessibility of Healthcare Facilities, and Efficiency of Healthcare Services During the Pandemic

4.2.a How would you rate the efficiency of the healthcare services you received during the pandemic?			Section 4: Access to Healthcare Facilities 4.1.a How satisfied are you with the accessibility of healthcare facilities during the pandemic?				Total
			Dissatisfied	Neutral	Satisfied	Very satisfied	Total
Efficient	1.2 What's your Gender?	- Female	0	5	34	1	40
		- Male	1	8	31	4	44
	Total		1	13	65	5	84
Inefficient	1.2 What's your Gender?	- Female	1	1	0	0	2
		- Male	2	1	1	1	5

			3	2	1	1	7
Neutral	1.2 What's your Gender?	- Female	0	11	7		18
		- Male	1	12	11		24
	Total		1	23	18		42
Very efficient	1.2 What's your Gender?	- Female		0	3	4	7
		- Male		3	4	3	10
		- Other		0	1	1	2
	Total			3	8	8	19
Total	1.2 What's your Gender?	- Female	1	17	44	5	67
		- Male	4	24	47	8	83
		- Other	0	0	1	1	2
	Total		5	41	92	14	152

Gender, Accessibility During the Pandemic and Efficiency of Healthcare Services Post-pandemic

Table 50 Cross-tabulation of Gender, Satisfaction with Accessibility of Healthcare Facilities During the Pandemic and Efficiency of Healthcare Services Post-Pandemic

			Section 4: Access to Healthcare Facilities 4.1.a How satisfied are you with the accessibility of healthcare facilities during pandemic?				
4.2.b How would you rate the efficiency of the healthcare services you received post-pandemic?			Dissatisfied	Neutral	Satisfied	Very satisfied	Total
Efficient	1.2 What's your Gender?	- Female	0	6	27	2	35
		- Male	2	13	34	3	52
		- Other	0	0	1	0	1
	Total		2	19	62	5	88
Inefficient	1.2 What's your Gender?	- Female			1		1
	Total				1		1
Neutral	1.2 What's your Gender?	- Female	1	9	2	1	13
		- Male	1	4	3	0	8
	Total		2	13	5	1	21
Very efficient	1.2 What's your Gender?	- Female	0	2	14	2	18
		- Male	1	7	10	5	23
		- Other	0	0	0	1	1
	Total		1	9	24	8	42

Total	1.2 What's your	- Female		1	17	44	5	67
	Gender?	- Male		4	24	47	8	83
		- Other		0	0	1	1	2
	Total			5	41	92	14	152

c. Gender, Satisfaction with Healthcare Accessibility During the Pandemic, and Use of Telehealth Services

Table 51 *Cross-tabulation of Gender, Satisfaction with Accessibility of Healthcare Facilities, and Utilization of Telehealth Services During the Pandemic*

			Section 4: Access to Healthcare Facilities 4.1.a How satisfied are you with the accessibility of healthcare facilities during pandemic?				
4.3 Did you utilize telehealth services during the pandemic?			Dissatisfied	Neutral	Satisfied	Very satisfied	Total
No	1.2 What's your Gender?	- Female	0	14	30	2	46
		- Male	4	19	35	4	62
		- Other	0	0	0	1	1
	Total		4	33	65	7	109
Yes	1.2 What's your Gender?	- Female	1	3	14	3	21
		- Male	0	5	12	4	21
		- Other	0	0	1	0	1
	Total		1	8	27	7	43
Total	1.2 What's your Gender?	- Female	1	17	44	5	67
		- Male	4	24	47	8	83
		- Other	0	0	1	1	2
	Total		5	41	92	14	152

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Figure 18 *Bar Chart of Gender, Satisfaction with Accessibility of Healthcare Facilities and Utilization of Telehealth Services During the Pandemic*
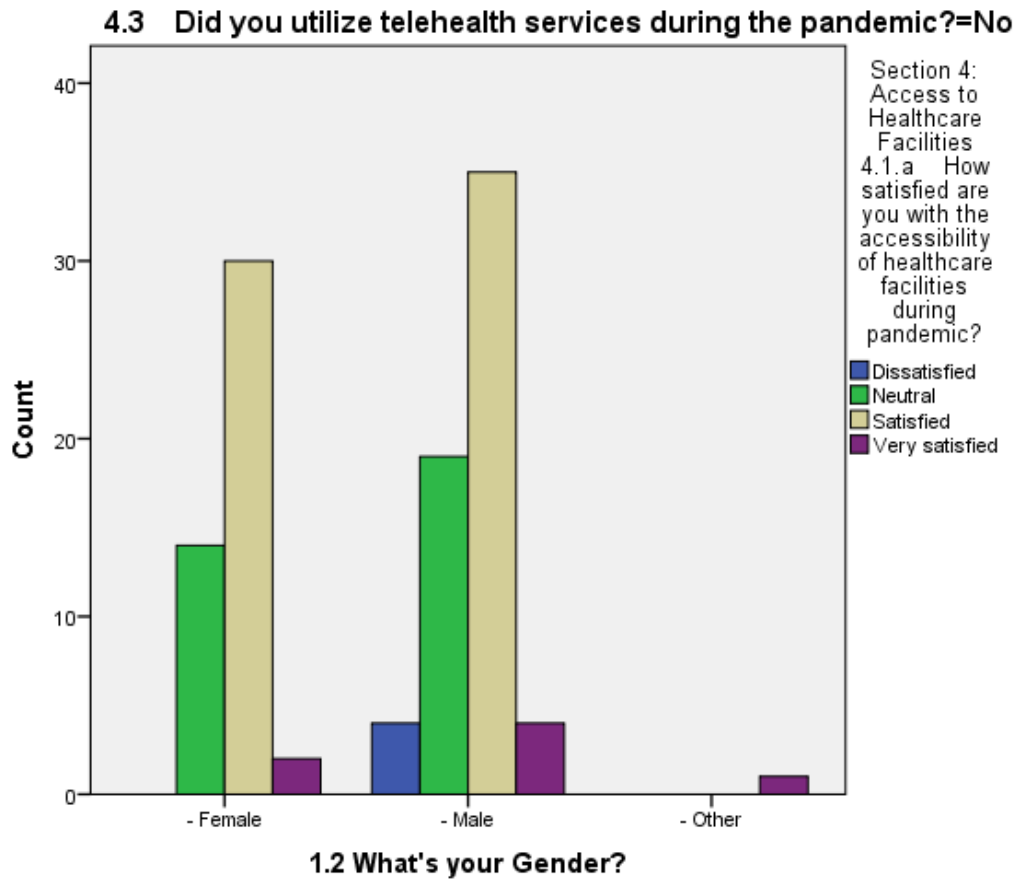
d. Gender and Satisfaction with Healthcare Accessibility and Telehealth Services

Table 52 *Cross-tabulation of Gender, Satisfaction with Accessibility of Healthcare Facilities During the Pandemic, and Satisfaction with Telehealth Services*

			Section 4: Access to Healthcare Facilities 4.1.a How satisfied are you with the accessibility of healthcare facilities during the pandemic?				
4.4 If yes, please rate your satisfaction with telehealth services.			Dissatisfied	Neutral	Satisfied	Very satisfied	Total
- Dissatisfied	1.2 What's your Gender?	- Male			2		2
	Total				2		2

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- Neutral	1.2 What's your Gender?	- Female	1	14	26	2	43
		- Male	4	19	35	4	62
		- Other	0	0	0	1	1
	Total		5	33	61	7	106
- Satisfied	1.2 What's your Gender?	- Female		2	15	1	18
		- Male		4	6	3	13
	Total			6	21	4	31
- Very satisfied	1.2 What's your Gender?	- Female		1	3	2	6
		- Male		1	4	1	6
		- Other		0	1	0	1
	Total			2	8	3	13
Total	1.2 What's your Gender?	- Female	1	17	44	5	67
		- Male	4	24	47	8	83
		- Other	0	0	1	1	2
	Total		5	41	92	14	152

e. **Satisfaction with Healthcare Accessibility during Pandemic with Education Level and Efficiency of Services Received**

Table 53 Cross-tabulation of Education Level, Satisfaction with Accessibility of Healthcare Facilities, and Efficiency of Healthcare Services During Pandemic

4.2.a How would you rate the efficiency of the healthcare services you received during the pandemic?			Section 4: Access to Healthcare Facilities 4.1.a How satisfied are you with the accessibility of healthcare facilities during the pandemic?				
			Dissatisfied	Neutral	Satisfied	Very satisfied	Total
Efficient	1.5 Education Level?	- Bachelor's Degree	0	4	16	2	22
		- Diploma	0	4	20	1	25
		- Postgraduate Degree	0	1	10	0	11
		- Primary School	0	2	1	0	3

	1.5 Education Level?					
		- Secondary School	1	2	18	2	23
	Total		1	13	65	5	84
Inefficient	1.5 Education Level?	- Bachelor's Degree	1	0	1	0	2
		- Diploma	2	1	0	0	3
		- Postgraduate Degree	0	1	0	1	2
	Total		3	2	1	1	7
Neutral	1.5 Education Level?	- Bachelor's Degree	0	5	7		12
		- Diploma	0	7	7		14
		- Postgraduate Degree	0	3	2		5
		- Primary School	0	2	0		2
		- Secondary School	1	6	2		9
	Total		1	23	18		42
Very efficient	1.5 Education Level?	- Bachelor's Degree		0	2	3	5
		- Diploma		2	4	2	8
		- Postgraduate Degree		0	2	0	2
		- Secondary School		1	0	3	4
	Total			3	8	8	19
Total	1.5 Education Level?	- Bachelor's Degree	1	9	26	5	41
		- Diploma	2	14	31	3	50
		- Postgraduate Degree	0	5	14	1	20
		- Primary School	0	4	1	0	5
		- Secondary School	2	9	20	5	36
	Total		5	41	92	14	152

f. **Satisfaction Levels of Ethnic Groups with Healthcare Accessibility during the Pandemic with Use of Telehealth Services**

Table 54 *Cross-tabulation of Ethnicity/Race, Satisfaction with Accessibility of Healthcare Facilities During the Pandemic, and Utilization of Telehealth Services During the Pandemic*

4.3 Did you utilize telehealth services during the pandemic?			Section 4: Access to Healthcare Facilities 4.1.a How satisfied are you with the accessibility of healthcare facilities during the pandemic?				
			Dissatisfied	Neutral	Satisfied	Very satisfied	Total
No	1.6 Ethnicity/ Race?	- Chinese	3	15	33	4	55
		- Indian	1	7	13	3	24
		- Malay	0	9	13	0	22
		- Other	0	2	6	0	8
	Total		4	33	65	7	109
Yes	1.6 Ethnicity/ Race?	- Chinese	1	4	9	3	17
		- Indian	0	2	6	2	10
		- Malay	0	1	6	1	8
		- Other	0	1	6	1	8
	Total		1	8	27	7	43
Total	1.6 Ethnicity/ Race?	- Chinese	4	19	42	7	72
		- Indian	1	9	19	5	34
		- Malay	0	10	19	1	30
		- Other	0	3	12	1	16
	Total		5	41	92	14	152

g. Satisfaction Levels of Ethnic Groups with Healthcare Accessibility and Telehealth Services during Pandemic with Use of Telehealth Services

Table 55 Cross-tabulation of Ethnicity/Race, Satisfaction with Accessibility of Healthcare Facilities During the Pandemic and Satisfaction with Telehealth Services

4.4 If yes, please rate your satisfaction with telehealth services.			Section 4: Access to Healthcare Facilities 4.1.a How satisfied are you with the accessibility of healthcare facilities during pandemic?				Total
			Dissatisfied	Neutral	Satisfied	Very satisfied	
- Dissatisfied	1.6 Ethnicity/ Race?	- Malay			2		2
	Total				2		2
- Neutral	1.6 Ethnicity/ Race?	- Chinese	4	15	32	4	55
		- Indian	1	7	12	3	23
		- Malay	0	9	12	0	21
		- Other	0	2	5	0	7
	Total		5	33	61	7	106
- Satisfied	1.6 Ethnicity/ Race?	- Chinese		3	9	2	14
		- Indian		1	2	1	4
		- Malay		1	5	1	7
		- Other		1	5	0	6
	Total			6	21	4	31
- Very satisfied	1.6 Ethnicity/ Race?	- Chinese		1	1	1	3
		- Indian		1	5	1	7
		- Other		0	2	1	3
	Total			2	8	3	13
Total	1.6 Ethnicity/ Race?	- Chinese	4	19	42	7	72
		- Indian	1	9	19	5	34
		- Malay	0	10	19	1	30
		- Other	0	3	12	1	16
	Total		5	41	92	14	152

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h. Income Levels and Satisfaction with Accessibility of Healthcare Facilities During and Post-pandemic

Table 56 Cross-tabulation of Income Level, Satisfaction with Accessibility of Healthcare Facilities During the Pandemic and Satisfaction with Accessibility of Healthcare Facilities Post-Pandemic

			Section 4: Access to Healthcare Facilities 4.1.a How satisfied are you with the accessibility of healthcare facilities during pandemic?				
4.1.b How satisfied are you with the accessibility of healthcare facilities post-pandemic?			Dissatisfied	Neutral	Satisfied	Very satisfied	Total
Neutral	1.4 Your income Level (per month)?	- Above SGD 8,000		2			2
		- Below SGD 2,000		20			20
		- SGD 2,001-5,000		1			1
		- SGD 5,001 - 8,000		2			2
	Total			25			25
Satisfied	1.4 Your income Level (per month)?	- Above SGD 8,000	0	1	8	0	9
		- Below SGD 2,000	4	11	49	3	67
		- SGD 2,001-5,000	0	3	6	0	9
		- SGD 5,001 - 8,000	1	0	10	1	12
	Total		5	15	73	4	97
Very satisfied	1.4 Your income Level (per month)?	- Above SGD 8,000		0	1	2	3
		- Below SGD 2,000		1	11	5	17
		- SGD 2,001-5,000		0	3	1	4

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				0	4	2	6
		- SGD 5,001 - 8,000					
	Total			1	19	10	30
Total	1.4 Your income Level (per month)?	- Above SGD 8,000		0	3	9	2	14
		- Below SGD 2,000		4	32	60	8	104
		- SGD 2,001- 5,000		0	4	9	1	14
		- SGD 5,001 - 8,000		1	2	14	3	20
	Total			5	41	92	14	152

This dataset provides insights into the relationship between income levels and satisfaction with

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Section 5: Logistic Regression

- **Logistic Regression Model of Socioeconomic Status (SES) with Healthcare Utilization before COVID-19 Pandemic**

Table 57 *Logistic Regression Model of SES with Healthcare Utilization Before COVID-19 Pandemic*

Parameter Estimates									
Section 3: Healthcare Utilization 3.1 Before the pandemic, how often did you seek healthcare services? A		B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
- Frequently	Intercept	-9.416	14.224	.438	1	.508			
	[@1.2WhatsyourGender=- Female]	9.927	1.950	25.924	1	.000	20467.975	448.285	934534.254

[@1.2WhatsyourGender=- Male]	9.666	0.000		1		15778.990	15778.990	15778.990
[@1.2WhatsyourGender=- Other]	0[b]			0				
[@1.3WhatsyourOccupation=- Employed]	.545	12.527	.002	1	.965	1.724	3.743 E-11	79412045917.897
[@1.3WhatsyourOccupation=- Homemaker]	-1.667	11.176	.022	1	.881	.189	5.792 E-11	615556687.542
[@1.3WhatsyourOccupation=- Retired]	.263	10.791	.001	1	.981	1.300	8.491 E-10	1990813912.212
[@1.3WhatsyourOccupation=- Student]	-.071	10.533	.000	1	.995	.932	1.009 E-09	860479455.035
[@1.3WhatsyourOccupation=- Unemployed]	0[b]			0				
[@1.4YourincomeLevelpermonth=- Above SGD 8,000]	-1.763	5.922	.089	1	.766	.172	1.562 E-06	18852.754
[@1.4YourincomeLevelpermonth=- Below SGD 2,000]	.084	8.378	.000	1	.992	1.087	8.032 E-08	14717355.120
[@1.4YourincomeLevelpermonth=- SGD 2,001-5,000]	1.736	7.459	.054	1	.816	5.672	2.540 E-06	12667286.011
[@1.4YourincomeLevelpermonth=- SGD 5,001 - 8,000]	0[b]			0				
[@1.5EducationLevel=- Bachelor's Degree]	-.486	2.890	.028	1	.866	.615	.002	177.231
[@1.5EducationLevel=- Diploma]	-.334	2.187	.023	1	.878	.716	.010	52.043
[@1.5EducationLevel=- Postgraduate Degree]	-1.057	4.451	.056	1	.812	.347	5.656 E-05	2134.177
[@1.5EducationLevel=- Primary School]	-.045	7.766	.000	1	.995	.956	2.346 E-07	3900073.686
[@1.5EducationLevel=- Secondary School]	0[b]			0				
[@1.6EthnicityRace=- Chinese]	2.180	5.407	.163	1	.687	8.850	.000	354481.523

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		B	Std. Error	Wald	df	Sig.	Exp(B)	Lower	Upper
	[@1.6EthnicityRace=- Indian]	-1.482	5.602	.070	1	.791	.227	3.867E-06	13332.714
	[@1.6EthnicityRace=- Malay]	1.610	5.555	.084	1	.772	5.005	9.354E-05	267813.449
	[@1.6EthnicityRace=- Other]	0b			0				
	[@1.7YourStatusInSingapore=- Citizen]	-2.719	2.138	1.617	1	.204	.066	.001	4.358
	[@1.7YourStatusInSingapore=- Foreigner]	.077	7.133	.000	1	.991	1.080	9.164E-07	1272840.652
	[@1.7YourStatusInSingapore=- Permanent resident]	0b			0				
- Occasionally	Intercept	16.214	132.014	.015	1	.902			
	[@1.2WhatsyourGender=- Female]	-9.207	131.920	.005	1	.944	.000	########	###################
	[@1.2WhatsyourGender=- Male]	-10.213	131.915	.006	1	.938	3.670E-05	########	###################
	[@1.2WhatsyourGender=- Other]	0b			0				
	[@1.3WhatsyourOccupation=- Employed]	-.665	8.195	.007	1	.935	.514	5.441E-08	4861830.439
	[@1.3WhatsyourOccupation=- Homemaker]	-3.840	6.075	.399	1	.527	.021	1.449E-07	3189.110
	[@1.3WhatsyourOccupation=- Retired]	-1.693	6.090	.077	1	.781	.184	1.204E-06	28127.669
	[@1.3WhatsyourOccupation=- Student]	-2.458	5.932	.172	1	.679	.086	7.638E-07	9602.337
	[@1.3WhatsyourOccupation=- Unemployed]	0b			0				
	[@1.4YourincomeLevelpermonth=- Above SGD 8,000]	-3.655	2.837	1.660	1	.198	.026	9.956E-05	6.715
	[@1.4YourincomeLevelpermonth=- Below SGD 2,000]	-.965	6.417	.023	1	.880	.381	1.314E-06	110425.713

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		B	Std. Error	Wald	df	Sig.	Exp(B)	Lower Bound	Upper Bound
	[@1.4YourincomeLevelpermonth=- SGD 2,001-5,000]	-.283	6.134	.002	1	.963	.753	4.523E-06	125426.593
	[@1.4YourincomeLevelpermonth=- SGD 5,001 - 8,000]	0^b			0				
	[@1.5EducationLevel=- Bachelor's Degree]	-.035	1.611	.000	1	.983	.966	.041	22.728
	[@1.5EducationLevel=- Diploma]	.897	1.457	.379	1	.538	2.451	.141	42.598
	[@1.5EducationLevel=- Postgraduate Degree]	-.463	1.715	.073	1	.787	.629	.022	18.155
	[@1.5EducationLevel=- Primary School]	1.315	4.850	.074	1	.786	3.727	.000	50113.023
	[@1.5EducationLevel=- Secondary School]	0^b			0				
	[@1.6EthnicityRace=- Chinese]	.400	2.675	.022	1	.881	1.492	.008	282.342
	[@1.6EthnicityRace=- Indian]	-1.459	2.634	.307	1	.580	.232	.001	40.606
	[@1.6EthnicityRace=- Malay]	-.621	2.747	.051	1	.821	.537	.002	116.981
	[@1.6EthnicityRace=- Other]	0^b			0				
	[@1.7YourStatusInSingapore=- Citizen]	-1.069	1.482	.520	1	.471	.343	.019	6.271
	[@1.7YourStatusInSingapore=- Foreigner]	.475	3.146	.023	1	.880	1.608	.003	765.832
	[@1.7YourStatusInSingapore=- Permanent resident]	0^b			0				
- Rarely	Intercept	-2.063	1377.391	.000	1	.999			
	[@1.2WhatsyourGender=- Female]	8.150	1377.382	.000	1	.995	3464.678	0.000	.^c
	[@1.2WhatsyourGender=- Male]	7.234	1377.381	.000	1	.996	1385.958	0.000	.^c

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	B			df				
[@1.2WhatsyourGender=- Other]	0[b]			0				
[@1.3WhatsyourOccupation=- Employed]	-.799	8.178	.010	1	.922	.450	4.918 E-08	4113674.697
[@1.3WhatsyourOccupation=- Homemaker]	-2.688	6.041	.198	1	.656	.068	4.902 E-07	9437.460
[@1.3WhatsyourOccupation=- Retired]	-2.912	6.098	.228	1	.633	.054	3.508 E-07	8431.786
[@1.3WhatsyourOccupation=- Student]	-1.803	5.929	.092	1	.761	.165	1.481 E-06	18341.664
[@1.3WhatsyourOccupation=- Unemployed]	0[b]			0				
[@1.4YourincomeLevelpermonth=- Above SGD 8,000]	-1.547	2.760	.314	1	.575	.213	.001	47.650
[@1.4YourincomeLevelpermonth=- Below SGD 2,000]	-.678	6.395	.011	1	.916	.508	1.831 E-06	140868.816
[@1.4YourincomeLevelpermonth=- SGD 2,001-5,000]	-.025	6.119	.000	1	.997	.975	6.032 E-06	157721.231
[@1.4YourincomeLevelpermonth=- SGD 5,001 - 8,000]	0[b]			0				
[@1.5EducationLevel=- Bachelor's Degree]	.848	1.553	.298	1	.585	2.335	.111	48.964
[@1.5EducationLevel=- Diploma]	.903	1.430	.399	1	.528	2.467	.150	40.662
[@1.5EducationLevel=- Postgraduate Degree]	-1.042	1.610	.419	1	.518	.353	.015	8.273
[@1.5EducationLevel=- Primary School]	2.256	4.750	.225	1	.635	9.543	.001	105480.646
[@1.5EducationLevel=- Secondary School]	0[b]			0				
[@1.6EthnicityRace=- Chinese]	-.101	2.611	.001	1	.969	.904	.005	150.795
[@1.6EthnicityRace=- Indian]	-.940	2.563	.135	1	.714	.391	.003	59.291

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	B	Std. Error	Wald	df	Sig.	Exp(B)	Lower Bound	Upper Bound
[@1.6EthnicityRace=- Malay]	-.984	2.670	.136	1	.713	.374	.002	70.019
[@1.6EthnicityRace=- Other]	0ᵇ			0				
[@1.7YourStatusInSingapore=- Citizen]	-.068	1.436	.002	1	.962	.934	.056	15.593
[@1.7YourStatusInSingapore=- Foreigner]	1.948	3.084	.399	1	.528	7.013	.017	2959.808
[@1.7YourStatusInSingapore=- Permanent resident]	0ᵇ			0				

a. **Logistic Regression Model of Socioeconomic Status (SES) with Healthcare Utilization During Pandemic**

Table 58.1 Logistic Regression Model of SES with Healthcare Utilization During the Pandemic

Parameter Estimates									
								95% Confidence Interval for Exp(B)	
3.2 Which services did you use then?ª		B	Std. Error	Wald	df	Sig.	Exp(B)	Lower Bound	Upper Bound
-Private	Intercept	-19.588	2.422	65.392	1	.000			
	[@1.2WhatsyourGender=- Female]	16.884	.488	1199.099	1	.000	21498972.267	8267968.56	55903188.966
	[@1.2WhatsyourGender=- Male]	16.718	.000	.	1	.	18224210.922	18224210.922	18224210.922
	[@1.2WhatsyourGender=- Other]	0ᵇ	.	.	0	.	.	.	.
	[@1.3WhatsyourOccupation=- Employed]	1.612	1.899	.721	1	.396	5.013	.121	207.246

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	B	S.E.	Wald	df	Sig.	Exp(B)		
[@1.3WhatsyourOccupation=- Homemaker]	.068	1.436	.002	1	.962	1.070	.064	17.870
[@1.3WhatsyourOccupation=- Retired]	.186	1.395	.018	1	.894	1.204	.078	18.537
[@1.3WhatsyourOccupation=- Student]	-.609	1.285	.224	1	.636	.544	.044	6.747
[@1.3WhatsyourOccupation=- Unemployed]	0[b]	.	.	0	.	.	.	.
[@1.4YourincomeLevelpermonth=- Above SGD 8,000]	.818	.869	.886	1	.347	2.265	.413	12.437
[@1.4YourincomeLevelpermonth=- Below SGD 2,000]	1.540	1.570	.962	1	.327	4.667	.215	101.296
[@1.4YourincomeLevelpermonth=- SGD 2,001-5,000]	-1.804	1.282	1.979	1	.159	.165	.013	2.032
[@1.4YourincomeLevelpermonth=- SGD 5,001 - 8,000]	0[b]	.	.	0	.	.	.	.
[@1.5EducationLevel=- Bachelor's Degree]	-.212	.711	.089	1	.765	.809	.201	3.259
[@1.5EducationLevel=- Diploma]	-.647	.608	1.135	1	.287	.523	.159	1.723
[@1.5EducationLevel=- Postgraduate Degree]	.644	.906	.506	1	.477	1.904	.323	11.237
[@1.5EducationLevel=- Primary School]	-16.175	2750.899	.000	1	.995	9.447E-8	.000	.[c]
[@1.5EducationLevel=- Secondary School]	0[b]	.	.	0	.	.	.	.
[@1.6EthnicityRace=- Chinese]	-.549	.900	.372	1	.542	.577	.099	3.372
[@1.6EthnicityRace=- Indian]	-.667	.895	.556	1	.456	.513	.089	2.965
[@1.6EthnicityRace=- Malay]	-1.193	1.001	1.422	1	.233	.303	.043	2.156

[@1.6EthnicityRace=- Other]	0[b]	.	.	0	.	.	.	.
[@1.7YourStatusInSingapore=- Citizen]	1.589	.797	3.970	1	.046	4.898	1.026	23.378
[@1.7YourStatusInSingapore=- Foreigner]	2.500	1.085	5.309	1	.021	12.177	1.453	102.079
[@1.7YourStatusInSingapore=- Permanent resident]	0[b]	.	.	0	.	.	.	.

a. The reference category is: - Public.

b. This parameter is set to zero because it is redundant.

c. Floating point overflow occurred while computing this statistic. Its value is therefore set to system missing.

Table 58.2 *Likelihood Ratio Test*

	Model Fitting Criteria	Likelihood Ratio Tests		
Effect	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	99.416[a]	.000	0	.
@1.2WhatsyourGender	100.678	1.262	2	.532
@1.3WhatsyourOccupation	102.400	2.984	4	.561
@1.4YourincomeLevelpermonth	105.768	6.352	3	.096
@1.5EducationLevel	103.945	4.529	4	.339
@1.6EthnicityRace	101.320	1.904	3	.593
@1.7YourStatusInSingapore	107.501	8.085	2	.018

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.

a. This reduced model is equivalent to the final model because omitting the effect does not increase the degrees of freedom.

b. Logistic Regression of __SES with type of utilization of services

Table 59.1 *Case Processing Summary*

		N	Marginal Percentage
Case Processing Summary			
3.2 Which services did you use then?	- Private	43	28.3%
	- Public	109	71.7%
1.2 What's your Gender?	- Female	67	44.1%
	- Male	83	54.6%
	- Other	2	1.3%
1.3 What's your Occupation?	- Employed	47	30.9%
	- Homemaker	17	11.2%
	- Retired	14	9.2%
	- Student	70	46.1%
	- Unemployed	4	2.6%
1.4 Your income Level (per month)?	- Above SGD 8,000	14	9.2%
	- Below SGD 2,000	104	68.4%
	- SGD 2,001-5,000	14	9.2%
	- SGD 5,001 - 8,000	20	13.2%
1.5 Education Level?	- Bachelor's Degree	41	27.0%
	- Diploma	50	32.9%
	- Postgraduate Degree	20	13.2%
	- Primary School	5	3.3%
	- Secondary School	36	23.7%
1.6 Ethnicity/ Race?	- Chinese	72	47.4%
	- Indian	34	22.4%
	- Malay	30	19.7%
	- Other	16	10.5%
1.7 Your Status In Singapore?	- Citizen	104	68.4%
	- Foreigner	12	7.9%
	- Permanent resident	36	23.7%
Valid		152	100.0%
Missing		0	
Total		152	
Subpopulation		89[a]	
a. The dependent variable has only one value observed in 71 (79.8%) subpopulations.			

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Table 59.2 *Model Fitting*

Model Fitting Information				
	Model Fitting Criteria	Likelihood Ratio Tests		
Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	138.304			
Final	99.416	38.888	18	.003

Table 59.3 *R-Square Test*

Pseudo R-Square	
Cox and Snell	.226
Nagelkerke	.324
McFadden	.215

Table 59.4 *Likelihood Ratio Test*

Likelihood Ratio Tests				
	Model Fitting Criteria	Likelihood Ratio Tests		
Effect	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	99.416[a]	.000	0	.
@1.2WhatsyourGender	100.678	1.262	2	.532
@1.3WhatsyourOccupation	102.400	2.984	4	.561
@1.4YourincomeLevelpermonth	105.768	6.352	3	.096
@1.5EducationLevel	103.945	4.529	4	.339
@1.6EthnicityRace	101.320	1.904	3	.593
@1.7YourStatusInSingapore	107.501	8.085	2	.018
The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.				
a. This reduced model is equivalent to the final model because omitting the effect does not increase the degrees of freedom.				

Table 59.5 Summary table: Logistic Regression Model of SES with type of services

3.2 Which services did you use then?[a]		B	Std. Error	Wald	d f	Si g.	Exp(B)	Lower Bound	Upper Bound
								95% Confidence Interval for Exp(B)	
- Priva te	Intercept	- 19.5 88	2.422	65.392	1	.00 0			
	[@1.2WhatsyourGender=- Female]	16.8 84	.488	1199.0 99	1	.00 0	21498972. 267	8267968.5 56	55903188. 966
	[@1.2WhatsyourGender=- Male]	16.7 18	.000	.	1	.	18224210. 922	18224210. 922	18224210. 922
	[@1.2WhatsyourGender=- Other]	0[b]	.	.	0	.	.	.	.
	[@1.3WhatsyourOccupatio n=- Employed]	1.61 2	1.899	.721	1	.39 6	5.013	.121	207.246
	[@1.3WhatsyourOccupatio n=- Homemaker]	.068	1.436	.002	1	.96 2	1.070	.064	17.870
	[@1.3WhatsyourOccupatio n=- Retired]	.186	1.395	.018	1	.89 4	1.204	.078	18.537
	[@1.3WhatsyourOccupatio n=- Student]	-.609	1.285	.224	1	.63 6	.544	.044	6.747
	[@1.3WhatsyourOccupatio n=- Unemployed]	0[b]	.	.	0	.	.	.	.
	[@1.4YourincomeLevelper month=- Above SGD 8,000]	.818	.869	.886	1	.34 7	2.265	.413	12.437
	[@1.4YourincomeLevelper month=- Below SGD 2,000]	1.54 0	1.570	.962	1	.32 7	4.667	.215	101.296
	[@1.4YourincomeLevelper month=- SGD 2,001-5,000]	- 1.80 4	1.282	1.979	1	.15 9	.165	.013	2.032

Table header: Parameter Estimates

	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
[@1.4YourincomeLevelper month=- SGD 5,001 - 8,000]	0^b	.	.	0	.	.	.	.
[@1.5EducationLevel=- Bachelor's Degree]	-.212	.711	.089	1	.765	.809	.201	3.259
[@1.5EducationLevel=- Diploma]	-.647	.608	1.135	1	.287	.523	.159	1.723
[@1.5EducationLevel=- Postgraduate Degree]	.644	.906	.506	1	.477	1.904	.323	11.237
[@1.5EducationLevel=- Primary School]	-16.175	2750.899	.000	1	.995	9.447E-8	.000	.^{c}
[@1.5EducationLevel=- Secondary School]	0^b	.	.	0	.	.	.	.
[@1.6EthnicityRace=- Chinese]	-.549	.900	.372	1	.542	.577	.099	3.372
[@1.6EthnicityRace=- Indian]	-.667	.895	.556	1	.456	.513	.089	2.965
[@1.6EthnicityRace=- Malay]	-1.193	1.001	1.422	1	.233	.303	.043	2.156
[@1.6EthnicityRace=- Other]	0^b	.	.	0	.	.	.	.
[@1.7YourStatusInSingapore=- Citizen]	1.589	.797	3.970	1	.046	4.898	1.026	23.378
[@1.7YourStatusInSingapore=- Foreigner]	2.500	1.085	5.309	1	.021	12.177	1.453	102.079
[@1.7YourStatusInSingapore=- Permanent resident]	0^b	.	.	0	.	.	.	.

a. The reference category is: - Public.

b. This parameter is set to zero because it is redundant.

c. Floating point overflow occurred while computing this statistic. Its value is therefore set to system missing.

Table 60 *Logistic Regression Model Assessing the Impact of SES on Healthcare Utilization*

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1ᵃ	@1.2WhatsyourGender			.115	2	.944	
	@1.2WhatsyourGender(1)	-20.629	27687.079	.000	1	.999	.000
	@1.2WhatsyourGender(2)	-20.464	27687.079	.000	1	.999	.000
	@1.3WhatsyourOccupation			3.011	4	.556	
	@1.3WhatsyourOccupation(1)	-1.612	1.899	.721	1	.396	.199
	@1.3WhatsyourOccupation(2)	-.068	1.436	.002	1	.962	.934
	@1.3WhatsyourOccupation(3)	-.186	1.395	.018	1	.894	.830
	@1.3WhatsyourOccupation(4)	.609	1.285	.224	1	.636	1.838
	@1.4YourincomeLevelpermonth			4.844	3	.184	
	@1.4YourincomeLevelpermonth(1)	-.818	.869	.886	1	.347	.441
	@1.4YourincomeLevelpermonth(2)	-1.540	1.570	.962	1	.327	.214
	@1.4YourincomeLevelpermonth(3)	1.804	1.282	1.979	1	.159	6.073
	@1.5EducationLevel			2.726	4	.605	
	@1.5EducationLevel(1)	.212	.711	.089	1	.765	1.236
	@1.5EducationLevel(2)	.647	.608	1.135	1	.287	1.910
	@1.5EducationLevel(3)	-.644	.906	.506	1	.477	.525
	@1.5EducationLevel(4)	19.908	17789.050	.000	1	.999	442650589.094
	@1.6EthnicityRace			1.866	3	.601	
	@1.6EthnicityRace(1)	.549	.900	.372	1	.542	1.732
	@1.6EthnicityRace(2)	.667	.895	.556	1	.456	1.948
	@1.6EthnicityRace(3)	1.193	1.001	1.422	1	.233	3.297
	@1.7YourStatusInSingapore			6.536	2	.038	
	@1.7YourStatusInSingapore(1)	-1.589	.797	3.970	1	.046	.204
	@1.7YourStatusInSingapore(2)	-2.500	1.085	5.309	1	.021	.082
	Constant	23.333	27687.079	.000	1	.999	13601168262.408
a. Variable(s) entered on step 1: @1.2WhatsyourGender, @1.3WhatsyourOccupation, @1.4YourincomeLevelpermonth, @1.5EducationLevel, @1.6EthnicityRace, @1.7YourStatusInSingapore.							

Gender and Health Issues

Table 61 *Chi-Square Test Results: Health Issues and Gender*

Analysis Area	Chi-Square Statistic	P-Value	Significance (α = 0.05)	Conclusion
Pre-COVID Health Issues vs. Gender	2.337	0.311	Not Significant	No significant association between gender and pre-COVID health issues.
Health Issues During COVID-19 vs. Gender	1.821	0.402	Not Significant	No significant association between gender and health issues during COVID-19.
Health Issues Post-COVID vs. Gender	0.365	0.833	Not Significant	No significant association between gender and health issues post-COVID.
COVID-19 Infection vs. Gender	1.172	0.557	Not Significant	No significant association between gender and COVID-19 infection.
Specific Health Issues During COVID-19 vs. Gender	113.287	0	Significant	Significant association between gender and specific health issues during COVID-19.
Specific Health Issues Post-COVID vs. Gender	125.193	0.012	Significant	Significant association between gender and specific health issues post-COVID.

Table 62 Health Issues and occupation

Category	Chi-Square Value	p-value	Significance	Conclusion
Health Issues Before COVID-19	8.353	0.079	Not Significant	No significant association between occupation and health issues before COVID-19. Differences observed are likely due to chance.
COVID-19 Infection Status	4.866	0.301	Not Significant	No significant relationship between occupation and likelihood of contracting COVID-19.
Health Issues Post-COVID-19 Infection	12.288	0.015	Significant	Significant association between occupation and health issues after COVID-19 infection. Occupation influences post-infection health conditions.
Health Issues During COVID-19	17.414	0.002	Significant	Significant association between occupation and health issues during the pandemic. Different occupations experienced varying rates of health issues.
Specific Health Issues	135.801	0.036	Significant	Significant association between occupation and the types of health issues experienced.
Health Issues (Detailed Responses)	213.331	0.068	Borderline Significant	Weak evidence of an association between occupation and specific detailed health issues. Further research is needed.

Table 63 Income Level and Health Issues

Category	Chi-Square Value	p-value	Significance	Conclusion
Income Level and Pre-COVID Health Issues	2.785	0.426	Not Significant	No relationship between income and health issues before COVID-19. Income is not a determining factor.
Income Level and COVID-19 Infection	1.79	0.617	Not Significant	No significant evidence that income influences the likelihood of COVID-19 infection.
Income Level and Post-COVID Health Issues	0.771	0.856	Not Significant	No significant impact of income on post-COVID health issues. Experiences were similar across income levels.
Income Level and Health Issues During COVID-19	3.675	0.299	Not Significant	No strong association between income and health issues during the pandemic.
Income Level and Specific Health Issues	104.362	0.041	Significant	Significant relationship between income and specific health issues. Higher and lower-income groups may report different issues. Caution is needed in interpretation.
Income Level and Detailed Health Issues	139.934	0.438	Not Significant	No significant effect of income on detailed health issues. Other factors may be more influential.

Table 64 Education Level and Health Issues

Aspect	Chi-Square Result	Inference
Education Level and Health Issues Before COVID-19	Pearson Chi-Square = 2.824 (p-value = 0.588)	No significant association between education level and pre-pandemic health issues (p > 0.05). Other factors like age, lifestyle, or socioeconomic status may have influenced health more.
Education Level and Health Issues During the COVID-19 Pandemic	Pearson Chi-Square = 5.191 (p-value = 0.268)	No significant association (p > 0.05). The pandemic's health impact was widespread across all education levels, suggesting a universal effect rather than one influenced by education.
Education Level and Health Issues Post-COVID-19 Infection	Pearson Chi-Square = 1.605 (p-value = 0.808)	No significant relationship (p > 0.05). Post-infection complications, such as Long-COVID, were likely influenced by factors like age, pre-existing conditions, or severity of infection rather than education.
Education Level and COVID-19 Infection History	Pearson Chi-Square = 0.448 (p-value = 0.978)	No significant association (p > 0.05). COVID-19 infections were not influenced by education level, suggesting that exposure risk, public health measures, and behavior were more critical factors.
Educational Disparities in Specified Health Issues	Pearson Chi-Square = 81.409 (p-value = 0.974)	No significant relationship (p > 0.05). Health issues reported were similar across all education levels, likely due to the diverse nature of pandemic-related health challenges.

Table 65 Education and health outcomes

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Analysis Area	Chi-Square Result (Pearson Chi-Square)	P-Value	Inference	Implications/Observations
1. Education Level & Health Issues Before COVID-19	2.824	0.588	No significant association.	Pre-pandemic health issues were not significantly influenced by education level. Other factors (age, lifestyle, socioeconomic conditions) may be more relevant.
2. Education Level & Health Issues During COVID-19	5.191	0.268	No significant association.	The pandemic's health impact was widespread across all education levels. The toll was largely universal.
3. Education Level & Health Issues Post-COVID-19	1.605	0.808	No significant association.	Post-infection health complications (e.g., Long-COVID) were not significantly influenced by education level. Biological/systemic effects may be more related to age, pre-existing conditions, or infection severity.
4. Education Level & COVID-19 Infection History	0.448	0.978	No significant association.	Contracting COVID-19 was not significantly influenced by education level. Virus spread indiscriminately; exposure risk, public health measures, and personal behavior may be more influential.
5. Education Level & Specified Health Issues	81.409	0.974	No significant association.	Individuals from all education backgrounds reported similar types of health issues. Diverse nature of health issues during the pandemic made concerns less correlated with education.

Table 66 Ethnicity/Race and Health Issues

Aspect/category	Chi-Square Result	Inference
Health Issues Before the COVID-19 Pandemic	Pearson Chi-Square = 1.012 (p-value = 0.798)	No significant association (p > 0.05). Ethnicity/race does not appear to influence pre-pandemic health status.
COVID-19 Infection	Pearson Chi-Square = 0.793 (p-value = 0.851)	No significant association (p > 0.05). COVID-19 infection rates do not differ significantly across ethnic groups.
Health Issues Post-COVID-19 Infection	Pearson Chi-Square = 1.073 (p-value = 0.784)	No significant association (p > 0.05). Ethnicity/race does not significantly affect post-COVID-19 health outcomes.
Health Issues During the COVID-19 Pandemic	Pearson Chi-Square = 3.184 (p-value = 0.364)	No significant association (p > 0.05). Ethnicity/race does not significantly impact health issues experienced during the pandemic.
Health Issues (Specific Types)	Pearson Chi-Square = 71.339 (p-value = 0.770) and 136.184 (p-value = 0.528)	No significant difference (p > 0.05). Ethnicity/race is not a key factor in the type or nature of health issues reported

Status in Singapore and Health Issues

Table 67 Status in Singapore and Health Issues

Aspect	Key Observation	Chi-Square Result	Inference

Health Issues Before the Pandemic	A higher proportion of citizens (77) reported no health issues before the pandemic compared to foreigners (12) and permanent residents (31).	p-value = 0.054	Marginal association between pre-pandemic health status and citizenship. Citizens may have had better healthcare access.
Health Issues During the Pandemic	Most citizens (82) reported no health issues during the pandemic, while fewer foreigners (10) and permanent residents (30) reported the same.	p-value = 0.812	No significant relationship between health issues during the pandemic and citizenship status. Other factors like occupation or living conditions may have played a larger role.
Health Issues Post-COVID-19 Infection	More citizens (38) reported post-COVID health issues compared to foreigners (2) and permanent residents (10).	p-value = 0.647	No significant association, but citizens may have reported more lingering effects due to healthcare access or severity of infections.
COVID-19 Infection Status	Citizens (84) reported higher infection rates than foreigners (7) and permanent residents (31).	p-value = 0.109	Borderline non-significant association. Higher infection rates among citizens may be due to greater exposure through occupation or social interactions.
Specific Health Issues	Sparse data across groups, making patterns unclear.	p-values range from 0.647 to 0.960	No significant relationship between specific health issues and citizenship status, likely due to data sparsity.

Age and Health Issues

Table 68 Age and Health Issues

Section	Chi-Square Results	Analysis	Inference
Health Issues Before the	Pearson Chi-Square: 73.462 (df =	A statistically significant association between age and pre-pandemic health issues (p < 0.05).	Age may influence pre-pandemic health issues, but low expected

COVID-19 Pandemic (2.1)	55, p-value = 0.049)		counts in cells (98.2% < 5) suggest caution in interpretation.
	Likelihood Ratio: 76.781 (df = 55, p-value = 0.028)		
Health Issues During the COVID-19 Pandemic (2.2)	Pearson Chi-Square: 75.893 (df = 55, p-value = 0.032)	A significant association between age and health issues during the pandemic (p < 0.05).	Different age groups experienced varying health impacts, but low expected counts (98% < 5) affect the reliability of results.
	Likelihood Ratio: 77.131 (df = 55, p-value = 0.026)		
Health Issues After COVID-19 Infection (2.4)	Pearson Chi-Square: 73.165 (df = 55, p-value = 0.051)	Pearson Chi-Square is marginally insignificant (p = 0.051), but Likelihood Ratio shows strong significance (p = 0.002).	Possible relationship between age and post-COVID health issues, but discrepancy in test results suggests sensitivity to sample distribution.
	Likelihood Ratio: 90.344 (df = 55, p-value = 0.002)		
Specific Health Issues (2.3)	Pearson Chi-Square: 1875.919 (df = 1485, p-value = 0.000)	Pearson Chi-Square shows a highly significant association, but Likelihood Ratio shows no significance. 99.9% of cells have expected counts < 5.	Certain health issues are more prevalent in specific age groups, but data sparsity affects validity, leading to conflicting test results.

	Likelihood Ratio: 330.405 (df = 1485, p-value = 1.000)			

Table 68.B Age and Health Issues

Section/Analysis Area	Chi-Square Result (Pearson Chi-Square)	Chi-Square Result (Likelihood Ratio)	P-Value (Pearson)	P-Value (Likelihood)	Inference	Observations/Warnings
1. Health Issues Before COVID-19 (2.1)	73.462 (df = 55)	76.781 (df = 55)	0.049	0.028	Significant association between age and pre-pandemic health issues.	98.2% of cells have expected count < 5, potentially unreliable results.
2. Health Issues During COVID-19 (2.2)	75.893 (df = 55)	77.131 (df = 55)	0.032	0.026	Significant association between age and health issues during the pandemic.	Over 98% of cells have expected count < 5, interpret with caution.
3. Health Issues Post-COVID-19 (2.4)	73.165 (df = 55)	90.344 (df = 55)	0.051	0.002	Pearson: Marginal significance; Likelihood:	Discrepancy due to low expected counts, interpret with caution.

					Strong association.	
4. Specific Health Issues (2.3)	1875.919 (df = 1485)	330.405 (df = 1485)	0	1	Pearson: Highly significant; Likelihood: No association.	Discrepancy due to 99.9% of cells having expected count < 5, highly unreliable results.

HealthCare Utilization

Health Services Used Now and Healthcare Utilization

Table 69..A Services Used Now and Healthcare Utilization

Category	Subcategory	Frequently	Occasionally	Rarely	Regularly	Total
Services Used Now	Private	1	13	34	5	53
	Public	1	39	57	2	99
Total		2	52	91	7	152

Table 69.B Services Used Now and Healthcare Utilization Chi-Square Test Results

Test	Value	Degrees of Freedom (df)	Asymptotic Significance (2-sided)
Pearson Chi-Square	6.801	3	0.079
Likelihood Ratio	6.668	3	0.083

Table 70 Factors influencing healthcare utilization before the pandemic across various demographic

Factor	Findings	Odds Ratio (Exp(B))	P-value	Statistical Significance
Gender	- Females were significantly more likely to seek healthcare frequently.	**Females:** 20467.975	**0.000** (Females)	**Significant for females**
	- No significant effect observed for males.	**Males: N/A**		
Occupation	- Employed individuals were less likely to use healthcare services frequently.	**Employed:** 1.724	0.965	**Not significant**
	- Lower healthcare utilization also observed among Homemakers, Retired individuals, and Students, but not significant.			
Income	- Higher-income individuals (>SGD 8,000) were less likely to seek healthcare frequently.	**>SGD 8,000:** 0.172	0.766	**Not significant**
	- Lower-income individuals (<SGD 2,000) had higher odds of frequent healthcare use, but not significant.	**<SGD 2,000:** 1.087		
Education	- Higher education levels correlated with less frequent healthcare visits.	**Bachelor's Degree:** 0.615	**0.866 (Bachelor's)**	**Not significant**
	- Statistically significant inverse relationship for Bachelor's and Postgraduate degrees.	**Postgraduate Degree:** 0.347	**0.812 (Postgraduate)**	
Ethnicity	- Chinese and Malay ethnic groups had higher odds of frequent healthcare utilization.	**Chinese:** 8.850	Not provided	**Not significant for "Occasionally"**

Section	Variables Compared	Crosstab Summary	Chi-Square Test Results	Interpretation
		- Indian ethnic group was less likely to seek healthcare frequently.	**Malay:** 5.005	or "Rarely" categories
			Indian: 0.227	
Residency Status	- Singapore Citizens were less likely to seek healthcare frequently compared to Permanent Residents or Foreigners.			
	- Not statistically significant.			
	- Higher p-values indicate lower reliability in predicting healthcare utilization.	N/A	0.204	**Not significant**

Gender: Females showed a highly significant, extremely high odds ratio for frequent healthcare seeking. Males showed no significant effect.

Table 71 Access to HealthCare Facilities

Section	Variables Compared	Crosstab Summary	Chi-Square Test Results	Interpretation
1.1	**Satisfaction with healthcare accessibility during the pandemic × Telehealth utilization**	- Dissatisfaction correlates with lower telehealth usage (4 dissatisfied individuals did not use telehealth).	**Pearson Chi-Square = 5.030, p = 0.170** (not significant).	No significant relationship between satisfaction with accessibility and telehealth utilization.
		- Neutral satisfaction group had varied telehealth usage (8 out of 33 used telehealth).	Likelihood Ratio = 0.184.	
1.2	**Satisfaction with healthcare accessibility during the pandemic × Post-**	- No dissatisfied respondents during the pandemic remained dissatisfied post-pandemic.	**Pearson Chi-Square = 105.871, p = 0.000** (highly significant).	A strong association exists; satisfaction during the pandemic

		- Neutral respondents shifted toward higher satisfaction.		predicts post-pandemic satisfaction, suggesting continuity or improvement in healthcare access.
1.3	**Satisfaction with healthcare accessibility during the pandemic** × **Perceived efficiency of healthcare services during the pandemic**	- Dissatisfied individuals rated healthcare efficiency as "inefficient" or "neutral."		Those who were satisfied with accessibility were more likely to perceive healthcare services as efficient.
		- Satisfied respondents rated services as "efficient" or "very efficient."	**Pearson Chi-Square = 89.200, p = 0.000** (highly significant).	
		- Strong correlation between satisfaction with accessibility and service efficiency.		
1.4	**Satisfaction with healthcare accessibility during the pandemic** × **Perceived efficiency of healthcare services post-pandemic**	- Many satisfied individuals during the pandemic rated post-pandemic healthcare services as efficient or very efficient.		Satisfaction with accessibility during the pandemic is associated with positive efficiency ratings post-pandemic.
		- Neutral respondents maintained a neutral stance on post-pandemic efficiency.	**Pearson Chi-Square = 26.682, p = 0.002** (significant).	

Table 72 Satisfaction and utilization of services

Section/Analysis Area	Crosstab Summary	Chi-Square Result (Pearson Chi-Square)	P-Value	Interpretation
1.1: Satisfaction vs. Telehealth Utilization	- Dissatisfaction: Lower telehealth usage. - Neutral: Varied usage. - High satisfaction: Tendency towards telehealth usage.	5.030	0.17	No significant association. Satisfaction with accessibility doesn't strongly predict telehealth use.
1.2: Satisfaction During vs. Post-Pandemic	- Dissatisfied (during): Shift to satisfaction (post). - Neutral (during): Shift to satisfaction (post) - Highly satisfied (during): Continued satisfaction (post).	105.871	0.000	Highly significant association. Satisfaction during the pandemic predicts satisfaction post-pandemic.
1.3: Satisfaction vs. Healthcare Efficiency (During)	- Dissatisfied: Varied efficiency ratings. - Satisfied: Predominantly efficient/very efficient ratings. - High satisfaction: Correlates with higher efficiency ratings.	89.2	0.000	Highly significant association. Satisfaction with accessibility correlates with perceived efficiency (during).
1.4: Satisfaction vs. Healthcare Efficiency (Post)	- Satisfied (during): Efficient/very efficient ratings (post). - Neutral	26.682	0.002	Significant association. Satisfaction with accessibility (during)

	(during): Neutral efficiency ratings (post).			predicts efficient ratings (post).