Volume 10, Issue 5, May – 2025 ISSN No: -2456-2165

Research on Public Health Management

# An Epidemiological Analysis on Factors Leading to Rising Cases of Child Mortality and Neonatal Abnormalities: A Case Study on Major Ethnicities and Geographical Locations in Ontario Canada

Charlotte Maccarthy- Msc<sup>1</sup>; Vinsam Ouko-Msc, MPH, BIDA<sup>2</sup>

Publication Date: 2025/05/28

**How to Cite**: Charlotte Maccarthy- Msc; Vinsam Ouko-Msc, MPH, BIDA (2025) Research on Public Health Management *International Journal of Innovative Science and Research Technology*, 10(5), 1835-1876. https://doi.org/10.38124/ijisrt/25may381

# ABSTRACT

## > Introduction

Child mortality, defined as the death of a child before reaching the age of five, reflects the overall health and well-being of a population. Despite advancements in healthcare, socioeconomic disparities and preventable health conditions continue to contribute to child deaths. Understanding the multifactorial nature of child mortality was essential for implementing effective preventive strategies.

#### > Objectives

This study aimed to elucidate the factors contributing to child mortality in Ontario, Canada, and analyze their relative impacts on mortality rates. Additionally, it seemed to identify high-risk populations and areas for targeted interventions.

#### > Methods

Data from vital statistics and health records spanning a ten-year period (2012-2021) were analyzed to determine the leading causes of child mortality in Ontario. Statistical techniques, including regression analysis and descriptive epidemiology, were employed to assess the associations between various factors, such as socioeconomic status, access to healthcare, and specific health conditions, and child mortality rates.

#### > Findings

The analysis revealed several key findings regarding child mortality in Ontario. Premature birth, congenital anomalies, respiratory infections, and accidents emerged as leading causes of child mortality. Socioeconomic factors, including income inequality and access to healthcare services, were identified as significant determinants of child mortality rates. Furthermore, geographic disparities in mortality rates were observed, with certain regions exhibiting higher mortality rates than others.

## > Conclusion

This study underscores the importance of addressing socioeconomic determinants and improving access to healthcare services to reduce child mortality rates in Ontario, Canada. Targeted interventions aimed at vulnerable populations and geographical areas with elevated mortality rates are crucial for achieving substantial reductions in child mortality and advancing child health outcomes.

Keywords: Child Mortality, Ontario, Canada, Socioeconomic Determinants, Healthcare Access, Leading Causes, Preventive Strategies.

# TABLE OF CONTENTS

Chapter One Introduction	1840
Chapter Two Review of Related Literature	1844
Chapter Three Methodologies	1847
Chapter Four Results and Discussion	1850
Chapter Five Conclusion	1855
Chapter Six Concluding Remarks	1870
Chapter Seven Recommendations	1871
References	1872
Appendix	.1875

Volume 10, Issue 5, May – 2025 ISSN No: -2456-2165

## ACKNOWLEDGEMENTS

In the midst of this academic pursuit, we would like to extend my sincere appreciation to the Almighty God for endowing me with the requisite fortitude, benevolence, and sagacity. Throughout this difficult voyage, the Lord has been dependable to both my family and me. Furthermore, we would like to extend my most sincere gratitude to my family, particularly my extended family, for their altruistic support and monetary aid throughout my collegiate career. Furthermore, we wish to extend my most sincere appreciation to my Mentor and Supervisor, without whom we could not have succeeded in finishing this endeavor.

# **RESEARCH STATEMENT**

The objective of this research endeavor was to provide insight into the intricate determinants of infant mortality in Ontario, Canada, through a comprehensive examination of diverse socio-economic, healthcare accessibility, and environmental variables. The primary objective of this study was to provide insights for the development of policy strategies and targeted interventions aimed at mitigating preventable infant mortality in the province. The objective of this research endeavor was to provide insight into the intricate determinants of infant mortality in Ontario, Canada, through a comprehensive examination of diverse socio-economic, healthcare accessibility, and environmental variables. The primary objective of this study was to provide insights for the development of policy strategies and targeted interventions aimed at mitigating preventable infant mortality in the province.

# **CHAPTER ONE**

# **INTRODUCTION**

#### Background Analysis

Child mortality is a crucial measure of the general health and welfare of a society, indicating the success of healthcare systems, socioeconomic circumstances, and public health efforts. This extensive analysis delves into the various complex elements that contribute to child mortality in Ontario, Canada.

According to Tam et al. (2019), child mortality is a significant public health issue on a global scale since it provides insight into the state of social conditions in connection to the health of children. For the purpose of establishing targeted interventions and policies, it is essential to have a comprehensive understanding of the factors that contribute to the deaths of children. Even the highly lauded Canadian province of Ontario faces the problem of child mortality, despite its excellent healthcare system and high standard of living. Child mortality can be better understood in this province due to its varied socioeconomic landscape and ethnically and racially diverse population (Baker et al., 2021).

One of the leading causes of child mortality in Canada is perinatal conditions, which include complications during pregnancy, childbirth, and the neonatal period. Despite advancements in prenatal care and medical interventions, some infants are born prematurely or with congenital anomalies that increase their risk of mortality (Malic et al., 2020). According to Statistics Canada, perinatal conditions were responsible for a significant proportion of infant deaths in recent years, underscoring the importance of early detection, comprehensive prenatal care, and access to specialized neonatal services to improve outcomes for newborns (Groves et al., 2022).

Another significant cause of child mortality in Canada is congenital anomalies and birth defects. While many congenital anomalies are not preventable, timely diagnosis and appropriate medical interventions can help mitigate associated risks and improve outcomes for affected children. Genetic counseling, prenatal screening, and access to specialized medical care are essential components of comprehensive care for children with congenital anomalies, emphasizing the importance of early detection and intervention to reduce mortality rates associated with these conditions (Gilbert et al., 2013).

Infectious diseases also contribute to child mortality in Canada, albeit to a lesser extent compared to historical rates. Vaccination programs and public health measures have been instrumental in reducing the burden of infectious diseases among children, but outbreaks of vaccine-preventable illnesses still occur sporadically (Aoyama et al., 2020). Respiratory infections, gastrointestinal diseases, and vaccines that are able to prevent diseases such as measles and influenza can lead to severe complications and mortality, highlighting the ongoing importance of immunization and public health interventions to protect children from infectious diseases (Fell et al., 2020).

Furthermore, unintentional injuries remain a significant cause of child mortality in Canada. Accidents such as drowning, motor vehicle collisions, falls, and poisoning are leading causes of injury-related deaths among children (Blackburn et al., 2019). Prevention strategies, including education, legislation, and environmental modifications, play a crucial role in reducing the incidence of unintentional injuries and preventing child fatalities. Initiatives such as safe sleep practices, water safety education, car seat regulations, and poison prevention programs aim to mitigate risks and protect children from preventable injuries. Despite Ontario's best efforts in recent years, large gaps in health outcomes for children continue to exist by demographic and geographic area. A multitude of socio-economic, environmental, and healthcare-related factors interact intricately to cause child mortality (Guttmann et al., 2019).

In Canada, around 3.7% of infants were not to survive past their first birthday. Parents and caregivers may have psychological effects after the loss of an infant. Most common reasons for neonatal mortality: Lack of proper development, Birth abnormalities, either structural or functional, extremely low oxygen levels. The disease, the syndrome of sudden newborn death, possible causes of neonatal mortality include: lack of maternal education, substandard dwellings, problems obtaining medical treatment, uncertainty surrounding food availability, living in poverty. There has been some improvement in Canada's infant mortality rate over the last several decades, but the gains have not been evenly distributed. There is a high correlation between socioeconomic position and infant mortality in Canada.

#### Analysis of Various Data on Child Mortality

Analysis of various data on child mortality reveals both progress and persistent challenges in reducing child deaths globally. According to the United Nations Inter-Agency Group for Child Mortality Estimation (UN IGME), significant strides have been made in recent decades, with the global under-five mortality rate declining from 93 deaths per 1,000 live births in 1990 to 38 deaths per 1,000 live births in 2019. Despite this progress, disparities persist, with Sub-Saharan Africa and South Asia accounting for the majority of under-five deaths, with rates of 76 and 44 deaths per 1,000 live births, respectively, compared to the global average of 38 deaths per 1,000 live births.

#### International Journal of Innovative Science and Research Technology

## ISSN No: -2456-2165

## https://doi.org/10.38124/ijisrt/25may381

Examining regional and country-level data reveals stark inequalities in child mortality rates. Sub-Saharan Africa, in particular, continues to face significant challenges, with countries such as Chad, Nigeria, and Somalia experiencing under-five mortality rates well above the global average. Similarly, disparities exist within countries, with rural areas often experiencing higher mortality rates compared to urban areas. Factors contributing to these disparities include limited access to healthcare services, inadequate nutrition, poor sanitation, and higher rates of infectious diseases.

Furthermore, analysis of the leading causes of child mortality highlights the need for targeted interventions to address specific health challenges. According to the World Health Organization (WHO), pneumonia, diarrhea, and malaria remain leading causes of death among children under five, accounting for approximately one-third of all under-five deaths globally. Additionally, neonatal conditions such as preterm birth complications, birth asphyxia, and neonatal infections contribute significantly to child mortality. Effective strategies to reduce child mortality must prioritize maternal and child healthcare, immunization, nutrition, access to clean water and sanitation, and efforts to address poverty and social determinants of health. By leveraging data-driven insights and evidence-based interventions, policymakers and public health practitioners can work towards achieving global targets to end preventable child deaths and ensure every child has the opportunity to thrive.

Many young lives can be spared by basic lifesaving therapies such as immunizations, treatment for common childhood diseases, breastfeeding, postnatal care, competent delivery, and good nutrition. Particularly in cases of severe acute malnutrition, common childhood infections such as malaria, pneumonia, and diarrhea can be lethal for children who are undernourished.

#### > Child Mortalities based on Racial Segmentation

Infant deaths and complications associated with pregnancy are intricately linked. Approximately 66% of infant fatalities transpire within the initial month following birth, frequently attributable to complications stemming from preterm births and congenital anomalies. A substantial factor in the existence of racial disparities in infant mortality is preterm birth (Yu et al., 2019). More than half of this disparity can be attributed to the higher incidence of preterm births among African Americans (Perry, 2021).

Maternal and neonatal mortality disparities have their origins in racism. As a result of structural prejudice in the delivery of social services and health care, African American women frequently receive inferior care compared to their white counterparts (Fiscella, 2004). It signifies the withholding of medical attention from African American women experiencing severe pain or the failure of social service and health care providers for treating them with dignity and respect. The cumulative impacted racism and misogyny, coupled with these stressors, particularly during critical developmental stages, initiates a series of physiological mechanisms referred to as "weathering," which detrimentally affect the physical and mental well-being of African American women (King et al., 2014). Preeclampsia (high blood pressure associated with pregnancy), eclampsia (a seizure-related complication of preeclampsia), embolisms (obstructed blood vessels), and mental health disorders are among the medical conditions that African American women are more susceptible to due to the long-term psychological detrimental effects of racism (Moore et al., 2022).

#### Contribution of Covid-19 to Infant mortality in Canada.

The contribution of COVID-19 to child mortality in Canada had been relatively low compared to other age groups, but it had not been entirely absent. Children were generally less susceptible to severe illness from COVID-19 compared to adults, and mortality rates among children had remained low throughout the pandemic (Paulson et al., 2021). However, it was essential to recognize that children could still be affected by the virus, and there have been cases where COVID-19 had contributed to child mortality in Canada (Roberton et al., 2020).

According to a study published in the Journal (CMAJ) in October 2021, researchers analyzed data from across Canada and found that children under the age of 18 accounted for a small proportion of COVID-19 cases and deaths (Groves et al., 2022). The study highlighted that while severe outcomes such as hospitalization and death were less common among children compared to adults, they were not entirely absent. This underscores the importance of continued vigilance in protecting children from COVID-19, particularly those with underlying health conditions or other risk factors (Groves et al., 2022).

One significant concern regarding COVID-19 and child mortality in Canada was the indirect impact of the pandemic upon children's health and well-being. Measures such as school closures, disruptions to healthcare services, and economic hardships experienced by families can have indirect consequences on children's health, including mental health issues, malnutrition, and delays in accessing essential healthcare services. A report by the (SickKids) in Toronto highlighted these concerns, emphasizing the need for targeted interventions to mitigate the indirect effects of the pandemic on children's health (M. K. Li et al., 2021).

Furthermore, disparities in COVID-19 outcomes among children have also been observed, with certain demographic groups disproportionately affected. For example, Indigenous children and children from marginalized communities may face higher risks due to existing health inequities and social determinants of health. Addressing these disparities required targeted strategies to ensure equitable access to healthcare services, vaccination, and support for vulnerable populations (Sidhu et al., 2020).

It was crucial to note that ongoing monitoring and research were necessary to fully understand the impact of COVID-19 on child mortality in Canada (Doan et al., 2021). As the pandemic continued to evolve, continued efforts to protect children's health

## ISSN No: -2456-2165

## https://doi.org/10.38124/ijisrt/25may381

and well-being, including vaccination campaigns, public health measures, and support for families, are essential in mitigating the impact of COVID-19 on child mortality and ensuring the overall health and resilience of Canadian children.

#### Early mortality in children

There are a certain number of live births that do not result in a newborn baby living to be five years old. This percentage is referred to as the under-five mortality rate. According to Adebowale et al.'s 2020 research, in the year 2021, there were five million deaths among children younger than five years old. Infectious disorders such as malaria, pneumonia, and diarrhea are among the most common causes of mortality for children under the age of five around the world (Reduce Child Mortality, 2021).

Other causes of death include complications during childbirth and other concerns related to the delivery process. As of 2021, the global mortality rate for children under the age of five has decreased by 59%, going from 93 deaths per 1,000 live births in 1990 to 38 deaths in 2021.

Despite the substantial progress that has been made, there is still an urgent requirement to increase the percentage of children that survive (Nzioki et al., 2016). Tragically, there were 13,800 fatalities of children under the age of five in the year 2021. All of these deaths could have been avoided altogether.

#### Significance of the Study

This study on child mortality in Ontario, Canada carried substantial significance due to its potential to drive transformative changes in public health, policy development, and community well-being. By comprehensively investigating the multifaceted factors influencing child mortality, this research offered a unique opportunity to inform evidence-based interventions and shaped targeted policies that could directly impacted the lives of children and families. The findings held practical implications for policymakers, healthcare professionals, and community leaders, guiding them in the allocation of resources, the formulation of effective health strategies, and the establishment of support systems. As child mortality was not only a health indicator but also intricately linked to socio-economic, cultural, and environmental factors, this study's holistic approach was essential for addressing the root causes of child mortality. Moreover, its potential to contribute valuable insights to the global discourse on child health makes it not only regionally significant but also a source of knowledge that could be applied in diverse contexts. Ultimately, this research had the power to catalyze positive changes, fostering a healthier and more equitable future for the children of Ontario while providing a model for similar endeavors worldwide.

#### Scope of the study

This study on child mortality in Ontario, Canada has a defined scope, focusing on various factors influencing child health within the provincial context. The research encompasses a comprehensive analysis of medical infrastructure, socioeconomic determinants, public health initiatives, maternal health, environmental factors, and cultural influences. By utilizing both quantitative and qualitative research methods, the study aims to provide a nuanced understanding of the complexities surrounding child mortality over a specified time frame.

However, it is important to acknowledge certain limitations inherent in the research design. Firstly, the study's temporal scope may not capture rapid changes in socio-economic conditions, healthcare policies, or environmental factors. Additionally, the availability and accuracy of historical data, especially in certain cultural or remote communities, may pose challenges to a complete understanding of long-term trends.

#### > Justification of the Study

An in-depth analysis of factors contributing to child mortality in Ontario, Canada, is essential for several reasons. Firstly, understanding the determinants of child mortality was crucial for public health interventions aimed at minimizing mortality rates and improving children health outcomes across the province. By identifying and addressing the root causes of child mortality, policymakers, healthcare providers, and public health officials can implement targeted strategies to mitigate risks and enhance child well-being.

Moreover, such a study could help identify vulnerable populations disproportionately affected by child mortality. By examining demographic parameters like age, gender, socioeconomic status, and geographic location, the analysis could reveal disparities in mortality rates and inform interventions tailored to the specific needs of high-risk groups. This targeted approach was vital for ensuring health equity and addressing inequities in child health outcomes.

Additionally, an in-depth analysis will shed light on preventable causes of child mortality, guiding efforts to implement evidence-based interventions and preventive measures. By identifying modifiable risk factors and addressing systemic barriers to healthcare access, the study contributed to reducing the burden of preventable child deaths and promoting healthy childhood development.

Furthermore, understanding the factors contributing to child mortality could help improve the healthcare system by identifying gaps in healthcare delivery, access, and quality of care. By pinpointing areas for improvement, stakeholders can work towards

#### International Journal of Innovative Science and Research Technology

## ISSN No: -2456-2165

https://doi.org/10.38124/ijisrt/25may381

strengthening healthcare infrastructure, enhancing healthcare access, and optimizing the delivery of preventive and therapeutic interventions.

By providing evidence-based insights into the most significant contributors to child mortality, policymakers to allocate resources effectively, prioritize interventions, and implement policies that address the root causes of childhood deaths.

Finally, conducting an in-depth analysis fills existing gaps in the literature and expands our understanding of the complex interplay of factors influencing child mortality in Ontario. By synthesizing existing knowledge and generating new insights, the study contributed to the advancement of scientific understanding and informs future research directions in the field of child health and mortality. Therefore, an in-depth analysis of factors that contributed to child mortality in Ontario is justified by its potential to inform public health interventions, target vulnerable populations, address preventable causes, improve the healthcare system, guide policy development, and advance scientific knowledge in the field.

https://doi.org/10.38124/ijisrt/25may381

# CHAPTER TWO LITERATURE REVIEW

#### > Global Statistics and Analysis on Child and Infant Mortality

The world's rate of infant and child mortality has dropped significantly since 1990. Worldwide, the number of fatalities involving children under the age of five has decreased from 12.8 million in 1990 to 5 million in 2021 (Sharrow et al., 2022). In 1990, there were 93 deaths per 1000 live births; in 2021, that number drops to 38, a 59% decrease. There was a 5.2 million drop in newborn mortality in 1990 compared to 2.3 million in 2021 on a global scale. In contrast to post-neonatal under-5 mortality, the decrease in neonatal death from 1990 to 2021 was slower (Paulson et al., 2021). Every day, almost 6,400 infants lose their lives; this accounts for about 47% of all fatalities in children younger than five.

Regrettably, progress in reducing mortality rates has come to a standstill since 2010, and 63 nations will fail to reach the Sustainable Development Goal objective for neonatal mortality and 54 will fail to meet the target for under-5 mortality (Balaj et al., 2021). There will be needless loss of life among children under the age of five unless immediate measures are implemented to enhance healthcare services and the quality of care for infants and children (Karyani et al., 2015).

Worldwide, the most common causes of death for children younger than five years old are infectious diseases such as malaria, diarrhea, and acute respiratory infections; other causes include prematurity, difficulties during delivery, birth asphyxia, trauma, and congenital abnormalities (Robinson et al., 2021). Many young lives can be spared if people have access to fundamental lifesaving measures including safe and competent childbirth, good postnatal care, nursing, proper nutrition, immunizations, and treatment for common childhood illnesses (Y. Li et al., 2017).

#### Emerging Priorities for Children's Health

Newly prioritized issues in child health around the world include injuries, congenital abnormalities, and non-communicable diseases such as asthma, heart disease, cancer in children, diabetes, and obesity. Approximately one-third of all newborns are born with a birth defect, leaving 3.2 million children annually with a disability (Cardona et al., 2022). Despite the fact that many of the risk factors may be avoided, the worldwide burden of disease caused by non-communicable diseases is quickly growing, impacting both children and adults (Acheampong et al., 2019).

Among children ages 5 to 15, injuries (including those caused by road traffic, drowning, burns, and falls) are among the leading causes of death and permanent disability (Iddrisu et al., 2019). Nearly 740,000 children under the age of 15 lost their lives in 2012 due to violence and accidental injuries; the latter group accounted for 90% of these casualties (Aziz & Salim, 2020).

Similarly, even in nations where childhood undernourishment is common, the number of overweight children rose from around 31 million in 2000 to almost 42 million in 2015 (Jana et al., 2023).

#### Children Under the Age Of 5

Between the years 1990 and 2015, the fourth goal of the Millennium Development Goals was to lower the death rate among children under the age of five by two-thirds. There were 195 countries for which estimates were available, and 62 of them were successful in reaching this goal. Twenty-four of these countries have incomes that fall within the lower middle class or the poor category (UNICEF, 2015a).

Notwithstanding these successes, there was still not enough progress to meet MDG 4 on a global or regional scale. With their present rates of under-5 mortality reduction, 47 of the 79 nations with a rate more than 25 deaths per 1000 live births will fail to reach the proposed SDG target of 25 deaths per 1000 live births by 2030 (UNICEF, 2015b). Sub-Saharan Africa is home to 34 of these 47 nations. A significant acceleration is required to achieve the targets in those 47 nations; namely, 30 nations must at least double their present pace of reduction and 11 of those 30 must at least quadruple it (Iddrisu et al., 2020).

A demand for an equity-focused approach to reduce child mortality has been made in light of the wide differences in child death rates across sub-groups or areas within countries. Living in poverty, being born to a woman who did not receive basic education, or being born in a rural region all increase a child's chance of dying before the age of 5 (Laillou et al., 2021).

Diseases that kill children less than five can be easily prevented and treated with inexpensive and easy-to-implement solutions. Many young lives can be spared if health services are strengthened to offer these interventions to all children (United Nations, 2015). Children who are severely undernourished are more likely to die from common childhood illnesses including malaria, pneumonia, and diarrhea. Nearly half of all fatalities in children younger than five years old are caused by issues with their nutrition (United Nations, 2015).

#### ▶ Research from UNDESA's Population Division as Well as WHO, the World Bank Group, and UNICEF

The number of deaths that include children under the age of five has fallen from 12.7 million in 1990 to 5.9 million in 2015, as stated in a report that was recently released by (UNICEF), (WHO), the World Bank Group, and the Population Division of the

#### International Journal of Innovative Science and Research Technology

## ISSN No: -2456-2165

https://doi.org/10.38124/ijisrt/25may381

United Nations (UNDESA) (UNICEF, 2015b). In addition to stating that the global infant mortality rate has decreased by 53.5% over the course of the last quarter of a century, the report listed under-nutrition as the cause of death for children under the age of five.

Other causes of death included prematurity, pneumonia, difficulties during childbirth, diarrhea, sepsis, and malaria (UNICEF, 2015a). There is a new report on child mortality for 2015 that has been produced by the organs of the United Nations (UN). Each day, 16,000 children under the age of five pass away, despite the enormous progress that has been made on a worldwide scale. In the study, it is stated that the reduction in mortality rates among children under the age of five of 53.5% is not adequate to meet the Millennium Development Goals (MDGs), which need a reduction of two-thirds between the years 1990 and 2015 (UNICEF, 2015b).

In spite of their low incomes, Eritrea, Liberia, Madagascar, Malawi, Mozambique, Niger, Rwanda, Uganda, and Tanzania have all achieved the Millennium Development Goals (MDGs). However, sub-Saharan Africa faces the enormous problem of a growing under-five population, which is expected to climb by nearly 30% in the next 15 years, along with persistent poverty in numerous nations (Paulson et al., 2021).

According to the report, there is still a significant difference in a child's survival chances depending on their place of birth. The infant mortality rate in Sub-Saharan Africa is one in twelve, which is twelve times more than the average of one in one hundred forty-seven in high-income nations (Shahid Ali, 2015). This puts this region on top of the global rankings for under-five mortality. From 2000 to 2015, the region's under-five mortality rate dropped at a rate about 2.5 times faster than it did from 1990 to 2000. There has been significant worldwide success, particularly since the year 2000, when the rate of decrease of under-five mortality in several countries has tripled," stated Geeta Rao Gupta, UNICEF's Deputy Executive Director.

Furthermore, Dr. Flavia Bustreo, WHO Assistant Director-General, stated: "We know how to prevent unnecessary newborn mortality." Every year, thousands of lives can be spared by providing quality care during childbirth (WHO, UNICEF, UNFPA, 2015). This includes easy and inexpensive measures like making sure babies have early skin-to-skin contact, breastfeeding exclusively, and taking additional care of small or unwell babies. Global infant mortality rates dropped dramatically during the Millennium Development Goals period, according to the United Nations Under-Secretary-General for Economic and Social Affairs, Mr. Wu Hongbo (WHO, UNICEF, UNFPA, 2015).

As a result of quick advancements after the year 2000, millions of children's lives have been spared. We must maintain and speed up this progress if we are to achieve the child survival target set by the 2030 sustainable development agenda, particularly in sub-Saharan African nations with high infant death rates.

There has been tremendous success in reducing child death rates in many nations, according to Dr. Tim Evans, senior director of health, nutrition, and population at the World Bank Group. To guarantee that every child and woman can get the medical attention they require, we still have a long way to go until 2030 (WHO, 2015).

#### > Ongoing and Emerging Environmental Threats to Children's Health

More than a quarter of all deaths in children younger than five are attributed to unsafe environmental conditions. Two recent estimates from the World Health Organization (WHO) estimate that 1.7 million children under the age of five die each year as a result of environmental hazards. These risks include air pollution both indoors and outdoors, secondhand smoke, polluted water, insufficient sanitation, and a lack of personal hygiene (Landrigan, 2016).

Risk reduction interventions, such as providing access to clean cooking fuels and safe water, can prevent a large portion of the leading causes of mortality for children aged one month to five years—diarrhea, malaria, and pneumonia—as stated in the initial report, Inheriting a Sustainable World: Atlas on Children's Health and the Environment. "A polluted environment is lethal, especially for young children," states Dr. Margaret Chan, Director-General of the WHO. "Their developing organs and immune systems, and smaller bodies and airways, make them especially vulnerable to dirty air and water." In 2011, Sheffield and Landrigan Preterm birth is more likely when potentially harmful exposures become apparent during gestation.

Indoor and outdoor air pollution, along with secondhand smoke, increases the risk of pneumonia among newborns and preschoolers, who are already at a higher risk of developing asthma and other chronic respiratory disorders later in life. Lifetime exposure to air pollution may increase the danger of cardiovascular disease, cancer, and stroke (Sly et al., 2017).

As a supplement, a report "Keep my future clean". The environmental effects on children's health provided a thorough review of these effects, highlighting the magnitude of the problem. Air pollution, both indoors and outdoors, as well as secondhand smoke, was responsible for the deaths of 570,000 children under the age of five each year. These children often suffer from respiratory illnesses like pneumonia (*Reduce Child Mortality*, 2021). Without proper sanitation, hygiene, and access to clean water, 361,000 children under the age of five died each year from diarrhea. Inadequate access to clean water, sanitation, and hygiene in healthcare institutions, along with increased efforts to reduce air pollution, contribute to the premature deaths of 271,000 children in the first month of life. Reducing mosquito breeding places or covering drinking-water storage tanks are two examples of environmental

#### International Journal of Innovative Science and Research Technology

## ISSN No: -2456-2165

https://doi.org/10.38124/ijisrt/25may381

initiatives that could avert 200,000 malaria-related deaths in children younger than five years old. Unintentional environmental injuries, including poisoning, falls, and drowning, kill 200,000 children younger than five every year (WHO, 2015).

Dr. Maria Neira, Director of the World Health Organization's Department of Public Health and Environmental and Social Determinants of Health, warned that children's health took a serious hit when their surroundings is polluted. "Investing in the removal of environmental risks to health, such as improving water quality or using cleaner fuels, will result in massive health benefits."

For instance, children were exposed to chemicals through improperly recycled electronic and electrical trash, which could cause IQ deficiencies, attention deficits, lung damage, and cancer. From 2014–2018, the predicted growth in electronic and electrical waste creation is 19%, reaching 50 million metric tons in 2018.

Rising carbon dioxide and temperature levels were encouraging pollen growth, which in turn increases the prevalence of asthma in children. Eleven to fourteen percent of children five and older suffer from asthma symptoms, with environmental triggers accounting for around half of those cases. Indoor mold and moisture, secondhand smoking, air pollution, and cigarette smoke aggravate children's asthma.

Children were more likely to get sick with diarrhea and pneumonia in homes that lack access to essential services like clean water and sanitation or that use dirty fuels like coal or dung for cooking and heating, making the air unhealthy (World Health Organization, 2006).

Chemicals in food, water, air, and everyday items could also expose children to dangerous levels. Fluoride, lead, mercury, and other pesticides, as well as persistent organic pollutants, are just a few of the chemicals found in manufactured goods that end up in the food chain. Even though lead-containing gasoline has been banned in nearly every country, it is still widely used in paints and can harm a child's brain development.

# CHAPTER THREE LITERATURE REVIEW

#### A Cross-Sectional Study using Population-Based Data Was Conducted to Investigate the Factors That Contribute to The Mortality Rate of Children in the Kassena-Nankana District of Northern Ghana.

There has long been a focus on child mortality as a public health concern in Ghana. While death tolls had been trending decreasing since the late 1980s, the pace of decline was woefully inadequate. The decline slowed somewhat between 1988 and 2003, but the present rate of approximately 74 deaths per 1000 live births was still quite concerning (Babayara & Addo, 2018). Among Africa's most alarmingly high death tolls have been recorded in the country's northern regions, where poverty and overall living conditions were noticeably worse (Babayara & Addo, 2018).

In addition to infectious illnesses and diarrhea, malnutrition was identified as a significant risk factor in Ghana. Importantly, the Ghana VAST trial, which began in Navrongo in the early 1990s, tested vitamin A supplementation. It laid the groundwork for the nationwide distribution of vitamin A supplements and reduced infant mortality by 19.0% in the study region. Public health measures could be more effectively targeted when the primary risk factors are known, as this proves (Babayara & Addo, 2018).

Accordingly, this study was planned as a continuation of a matched case control study that Binka and colleagues performed in 1995 in the Kassena-Nankana District (KND) in Ghana's Upper East area to examine a number of risk factors (Babayara & Addo, 2018).

Untrained personnel conducting the delivery, a birth interval of less than 24 months, domestic violence perpetrated by the father, and an unprotected water source were all factors that Binka and colleagues linked to an increased risk of maternal mortality. Child mortality was not associated with weaning methods, parental education, socioeconomic status, or any of the hygiene-related variables that were examined (Babayara & Addo, 2018). More qualified personnel should be present during delivery, according to the study's recommendations, and socioeconomic conditions should be improved generally.

Much had reportedly transpired in the KND people's socioeconomic, cultural, and religious situations in the nearly twenty years after that survey. For example, after the CHPS compound program was successfully implemented nationwide, the primary health-care system was currently better than before. Despite an increase in the usage of contraceptives, the fertility rate in the Kassena-Nankana District had fallen (Babayara & Addo, 2018). Christianity and Islam were gaining popularity, whereas traditional African religion, which was once widely embraced, was losing adherents. When comparing the figures for 2002–2004 to those for 1995–1996, maternal mortality fell by 40.0%. From 15.0% in the 1990s to 4.9% in 2002, the practice of infanticide, also called the "spirit child phenomenon," decreased. There have been similar gains documented in numerous other variables that are likely to affect people's health status as a whole (Babayara & Addo, 2018).

It was possible that the risk variables identified by Binka et al. have evolved over time due to changes in the area's socioeconomic, cultural, and demographic aspects. So, in order to determine what causes child mortality in Northern Ghana's Kassena-Nankana district, they conducted this study.

#### > Study Findings

From January 1997 to December 2011, the DSS recorded 15745 children ranging in age from 1 month to 5 years. Out of them, 967 (6.14%) passed away before reaching the age of five, resulting in a child mortality rate of 61.4 per 1000 live births during that time. There were more men killed (53.3%) than women (46.7%). These children's median ages at death were 466 days, with a range of 29–1756 days. The mortality rate was highest among children aged one to four years old. The vast majority of the fatalities (89.5% to be exact) happened in private residences, and the vast majority of those deaths were recorded from rural areas. The bulk of deaths (60.3%) occurred during the wet season, although the distribution did vary according to the seasons.

Children in the district died most often from malaria, diarrhea, respiratory illnesses, anemia, and starvation. Out of all the fatalities, 38.2% were caused by malaria, while 11.1% were attributed to intestinal infectious disorders, the most common of which were diarrheal infections. The percentages were 8.3% for acute respiratory infections, 4.2% for anemia, and 2.8% for malnutrition. Other illnesses, meningitis, accidental drowning, submersion, and the spirit child phenomenon rounded out the list of six possible reasons.

Considering that these factors have been implicated in previous research, we took into account maternal characteristics including education level, age at childbirth, and family socioeconomic status (SES). Mothers in the 20-29 age bracket experienced the highest rate of infant mortality (44.7%). A large majority of the mothers whose infants died were uneducated (82.2%). The mothers who were born into the lowest socioeconomic status category accounted for a disproportionately high number of infant fatalities, at 29.0 percent.

A Decomposition Analysis of the Socioeconomic Determinants That Determine the Death Rate Among Children Under the Age of Five in Sub-Saharan Africa

#### International Journal of Innovative Science and Research Technology

## ISSN No: -2456-2165

#### https://doi.org/10.38124/ijisrt/25may381

Major differences in U5MR were still present in sub-Saharan Africa in 2016, according to this study, however different countries' experiences are not universal. By breaking down the Gini index using regression, we were able to determine the relative importance of four socioeconomic factors in explaining the variation in U5MR (Van Malderen et al., 2019).

#### From Country to Country, The Major Players Changed.

There are some countries in Africa that are among the most pronounced gender gap. Gender survival gaps are maintained until at least the age of five, according to the evidence (Van Malderen et al., 2019). Gender discrimination (e.g., different feeding and medical care practices, or reaction to HIV-related medications) and biological factors (e.g., a lower resistance to infection, an increased risk of premature birth, and difficult labor owing to a larger average body size and head circumference) may both play a role in the higher male child mortality rate (Van Malderen et al., 2019). After accounting for various individual, household, and community factors, the elevated male death rate persisted in a number of Sub-Saharan African nations. A number of factors were taken into consideration, such as mother education, skilled delivery attendance, age, birth order, and household affluence (Van Malderen et al., 2019).

Considerable disparities pertaining to domicile were noted in the following countries: Tanzania, Congo, Kenya, Lesotho, Namibia, Niger, Senegal, and Comoros. The urban areas of Senegal, Lesotho, Namibia, Niger, and Comoros have lower U5MR than the rural parts of Congo, Kenya, and Tanzania. Ecological context, political economy, and health system may have functioned to mediate the influence of domicile on U5MR after controlling for maternal education, household wealth, and child sex (Van Malderen et al., 2019). The gap between urban and rural areas is closing or even turning around in certain nations due to worse living conditions in urban slums and faster death rates in rural areas, although many nations still have an urban advantage. Families in metropolitan areas have it better since they have easier access to medical care and more job options. The presence of a health center within the community in Niger helped to explain, in part, the reported higher infant mortality (Van Malderen et al., 2019).

Extreme disparities in maternal education were seen in the following African countries: Burundi, Cameroon, Comoros, Gambia, Ghana, Lesotho, Liberia, Mozambique, Nigeria, Rwanda, Uganda, and Zambia; countries where maternal education was at least primary level showed reduced infant mortality rates (Van Malderen et al., 2019). It is possible that health and reproductive behaviors (such as birth spacing) or the consumption of health services (such as knowledge and awareness) mediated the impact of maternal education on U5MR after controlling for child sex, household income, and location (Van Malderen et al., 2019). Additionally, Comoros and Ghana revealed a protective impact of maternal education, after adjusting for a larger number of variables than in the current study. An investigation into the causes of U5MR in rural Ghana postulated, among other things, that: (1) more educated mothers would get prenatal care (a disparity that appears to be narrowing), and (2) fewer children would be born if mothers waited to have a family. According to a recent study that included Ghana and Nigeria among other countries, women's education levels were linked to the following maternal health service utilization factors: antenatal care provider type, antenatal care visit timing and frequency, place of delivery, and presence of a skilled birth attendant (Van Malderen et al., 2019). Government programs on women's education have enhanced maternal awareness of child health and cleanliness, which may explain in part the drop-in under-five death rates over the past two decades, according to another study that included Cameroon and Niger among other nations.

The wealthiest households in Angola, Benin, Burundi, Burkina Faso, the Democratic Republic of the Congo, Guinea, Mali, Namibia, Nigeria, Rwanda, and Zimbabwe had the lowest death rates. After controlling for factors including mother's education level, child's sex, and location, the impact of household wealth on U5MR may have worked via the availability of food, shelter, transportation, and medical care (Van Malderen et al., 2019).

#### ➢ Research Aim

The aim of this research was to comprehensively analyze the factors contributing to child mortality in Ontario, Canada, with the goal of identifying key determinants and patterns that influenced child health outcomes. By conducting a thorough investigation encompassing medical infrastructure, socioeconomic factors, public health initiatives, maternal health, environmental influences, and cultural dynamics, the research seemed to provide a nuanced understanding of the complex interplay shaping child mortality rates in the region. Through this analysis, the research aimed to inform evidence-based policy recommendations, interventions, and community strategies aimed at reducing child mortality and promoting the overall health and well-being of children in Ontario.

#### ➤ Objectives

The primary objectives of this dissertation are as follows:

- To analyze the prevalence and trends of child mortalities in Ontario, Canada.
- To investigate socio-economic determinants contributing to child mortalities in Ontario.
- To examine environmental factors influencing mortality outcomes.
- To explore the intersectionality between child mortality.

#### Research Questions

The research will address the following key questions

https://doi.org/10.38124/ijisrt/25may381

# ISSN No: -2456-2165

- What are the prevailing trends in child mortalities in Ontario, and how do they vary across demographic groups?
- What socio-economic factors contribute significantly to the prevalence of child mortalities in the province?
- How do environmental factors influence child mortality outcomes in Ontario?
- What are the prevailing trends and contributing factors to child mortality in Ontario?

#### ➤ Hypothesis analysis and testing

In the given regression analysis output, the hypothesis being tested revolved around the relationship between the independent variables (number of infant deaths and leading causes of infant death) and the dependent variable (unspecified). The null hypothesis (H0) states that there is no significant relationship between the independent variables and the dependent variable, while the alternative hypothesis (H1) suggests that there is a significant relationship.

The acceptance or rejection of the null hypothesis was determined by examining the statistical measures that were presented in the output. While all other variables remained constant, the estimated coefficients for each independent variable indicated the proportion of variation in the dependent variable that was attributed to a one-unit change in that variable. The t-statistic was utilized to assess the significance of individual coefficients, while the p-value associated with each coefficient signified the likelihood of observing that coefficient under the null hypothesis.

The t-statistics for both independent variables in this analysis were exceptionally large absolute values, suggesting that their relationships with the dependent variable were highly significant. Moreover, the p-values corresponding to both coefficients were exceedingly small, falling significantly below the conventional threshold of significance set at 0.05. This suggested that the available evidence was substantial to reject the null hypothesis and accept the alternative hypothesis, which suggested that there was a significant relationship between the dependent variable and both the number of infant deaths and the primary causes of infant death.

# CHAPTER FOUR METHODOLOGY

#### ➤ Introduction

In this methodology chapter, the primary aim was to provide a clear and detailed description of how the research study was conducted. This section served as a roadmap to understand the methods used to collect data, analyze information, and draw conclusions.

## ➢ Research Design

A retrospective study design was used for this research project. Both quantitative and qualitative research methodologies were utilized in order to achieve the goal of gaining an in-depth comprehension of the factors that contribute to the high rate of child death in Ontario. The implementation of this strategy enabled the triangulation of data, which resulted in an increase in the reliability and validity of the conclusions. The research design consisted of doing a retrospective analysis of previously collected data, which was augmented by qualitative insights obtained through interviews with subject matter experts.

#### Study Site

#### • Geographic Context

Ontario is Canada's most populous province and home to diverse urban, suburban, and rural communities. The study site analysis included an overview of Ontario's geographic regions, including major cities such as Toronto, Ottawa, and Hamilton, as well as rural areas and remote northern communities. Understanding the geographic distribution of child mortality rates and associated factors was crucial for identifying regional disparities and tailoring interventions to address specific needs.

#### • Demographic Profile

The analysis considered Ontario's demographic composition, including population size, age distribution, ethnic diversity, and socio-economic indicators. Demographic factors played a significant role in shaping child health outcomes, with disparities observed across different demographic groups. By examining demographic data, this study identified vulnerable populations and factors contributing to disparities in child mortality rates.

#### • Healthcare Infrastructure

The study site analysis evaluated Ontario's healthcare infrastructure, including hospitals, primary care facilities, and specialized pediatric services. Access to healthcare services was a critical determinant of child health outcomes, and disparities in healthcare access contributed to variations in child mortality rates. Assessing the availability and accessibility of healthcare services across different regions of Ontario helps identify areas with limited healthcare resources and informs strategies to improve access to care.

ISSN No: -2456-2165

• The Geographical Location of the Study Area



Fig 1 The Geographical Location of the Study Area

#### • *Quantitative Data*

From relevant sources and existing databases, quantitative data was gathered, including health records, statistical reports, and population surveys. Prevalence rates of infant mortality, socioeconomic indicators, and environmental factors are crucial variables. The data was collected over a substantial period of time in order to capture developments and trends that occurred over the years.

#### • Study Duration and Analysis

This study was conducted within a defined study duration from January 3, 2024, to February 18, 2024, focusing on the geographical region of Ontario, Canada. This study duration was approximately six weeks was chosen to allow for a comprehensive examination of factors contributing to child mortality within a specific timeframe while ensuring efficient data collection, analysis, and interpretation.

During this period, the researcher collected and analyzed data from various sources, including healthcare records, government databases, epidemiological studies, and other relevant sources. The study duration encompassed both retrospective data analysis and prospective data collection activities, allowing researchers to examine historical trends in child mortality while also capturing current data on contributing factors.

The study duration of January 3, 2024, to February 18, 2024, provided researchers with a focused timeframe to conduct indepth analyses while minimizing potential confounding factors associated with longer study periods. By limiting the study duration, researchers were able to maintain the relevance and timeliness of the study findings, ensuring that the results could inform timely interventions and policy decisions aimed at reducing child mortality rates in Ontario.

Throughout the study duration, researchers adhered to rigorous research methodologies and ethical guidelines to ensure the integrity and validity of the study findings. Data collection and analysis were conducted systematically, allowing researchers to identify patterns, trends, and associations between various factors and child mortality outcomes within the study area of Ontario.

#### • Study Population

The study population in the Ontario, Canada area comprised a diverse range of individuals, predominantly children aged between 0 to 5 and their families residing in urban, suburban, and rural communities. This population encompassed infants, toddlers, children, each with unique health needs and vulnerabilities. Families and caregivers responsible for their care were also integral to the study population, as their socio-economic status, education, and access to healthcare services significantly impact child health outcomes. Geographic diversity was evident, with individuals residing in urban centers like Toronto and Ottawa, as well as rural and remote regions in northern Ontario. Ontario's socio-economic and ethnic diversity was reflected in the study population, capturing individuals from various cultural backgrounds and socio-economic statuses. Additionally, children with diverse health statuses and medical histories were included, allowing for the identification of pre-existing risk factors and comorbidities contributing to child mortality. Therefore, the study population represented a heterogeneous mix, providing valuable insights into the factors influencing child health outcomes and mortality rates across Ontario.

- > Data and Data Analysis
- Quantitative Data

#### ✓ Data Sources

The HBHC-ISCIS Reporting Sub-System (IRSS), which is part of the Ministry of Children, Community, and Social Services, is the source of the data. Data from 2017 was extracted on August 27, 2018, data from 2018 was extracted on June 20, 2019, data from 2019 was extracted on July 23, 2020, data from 2020 was extracted on June 20, 2021, data from 2021 was extracted on June 3, 2022, and data from 2022 was extracted on January 3, 2024.

## ➢ Qualitative Data

Qualitative insights were acquired by conducting semi-structured interviews with professionals specializing in public health, community advocacy, obstetrics, and pediatrics. The purpose of conducting these interviews was to obtain comprehensive insights into the contextual elements that impact infant mortality. The qualitative data underwent a thematic analysis in order to extract comprehensive insights that complemented the quantitative results.

## ➤ Sampling Strategy

For quantitative data, a stratified sampling approach was employed to ensure representation across various demographic factors, such as age, socio-economic status, and geographic location. The sample was drawn from relevant health databases and surveys, providing a diverse and comprehensive datasets

The qualitative data collection in this study employed a purposive sampling strategy to ensure the selection of participants

#### International Journal of Innovative Science and Research Technology

#### ISSN No: -2456-2165

## https://doi.org/10.38124/ijisrt/25may381

who could provide rich and diverse insights into the factors contributing to child mortalities in Ontario, Canada. Purposive sampling, also known as selective or judgmental sampling, allowed for the deliberate selection of individuals based on specific criteria relevant to the research objectives. Key stakeholders involved in child healthcare, including healthcare professionals, policymakers, community leaders, and parents or caregivers of deceased children, were identified as potential participants. This approach ensured that participants possessed valuable knowledge and experiences related to child mortality, enabling the collection of comprehensive qualitative data.

#### Data Analysis

Utilizing statistical software STATA, Excel Adv, and SPSS, quantitative data were analyzed in a manner that included spatial analysis, regression analysis, and descriptive statistics. By investigating prevalence rates, trends, and associations between variables, the research will be built upon a quantitative framework. Thematic coding and content analysis were components of qualitative data analysis. Coding was performed on expert interview transcripts to identify recurring themes, patterns, and nuances. By integrating the qualitative and quantitative results, a comprehensive understanding of the causes of child mortality will be produced.

#### > Ethical Considerations

Prior to data collection, appropriate research ethics committees were consulted to obtain ethical approval. The privacy and confidentiality of the participants were rigorously preserved; throughout the analysis and reporting process, all data was an onymized. In addition to obtaining participants' informed consent, measures were taken to ensure a respectful and non-intrusive research environment.

The study conducted in this research followed ethical protocols established by pertinent institutions and organizations, placing the welfare and rights of participants first. All potential conflicts of interest were disclosed in a transparent and consentory manner.

## Inclusion and Exclusion Criteria

#### • Inclusion Criteria

- $\checkmark$  Children under the aged 0 to 5 years residing in Ontario, Canada.
- ✓ Cases of child mortality reported within the study period.
- ✓ Availability of relevant medical records, including hospital records, death certificates, and autopsy reports.
- ✓ Data on contributing factors to child mortality, including demographic information, medical history, and socio-economic status.
- ✓ Cases with sufficient information to allow for comprehensive analysis of factors contributing to child mortality.

#### • Exclusion Criteria

- ✓ Cases of child mortality occurring outside the study area of Ontario, Canada.
- ✓ Cases with incomplete or insufficient medical records, hindering the analysis of contributing factors.
- ✓ Instances of child mortality resulting from non-natural causes such as accidents, homicides, or suicides, unless directly related to underlying health conditions or other factors under investigation.
- ✓ Cases lacking demographic information or medical history necessary for the analysis.
- ✓ Cases with significant missing data or inconsistencies that preclude accurate analysis and interpretation.

#### > The Conceptual Framework

The conceptual framework for the study on factors contributing to child mortality in Ontario, Canada provided a theoretical lens through which to understand the complex interplay of factors influencing child health outcomes. This framework was drawn upon various theories and models from public health, sociology, and epidemiology to conceptualize the determinants of child mortality and guide the research process.

At its core, the conceptual framework acknowledges the multifactorial nature of child mortality, recognizing that biological, social, environmental, and healthcare-related factors all play a role in shaping child health outcomes. The framework was grounded in the socio-ecological model, which posits that individual health is influenced by interactions between personal, interpersonal, community, and societal factors.

Within this framework, key determinants of child mortality were categorized into multiple levels of influence. At the individual level, factors such as biological predispositions, genetic factors, and access to healthcare services are considered. Interpersonal factors encompass family dynamics, caregiver behaviors, and social support networks. Community-level determinants include neighborhood characteristics, access to resources, and environmental exposures. Lastly, societal factors encompass broader social, economic, and political structures that shape access to healthcare, education, and other resources.

The conceptual framework also integrated elements of the life course perspective, recognizing that experiences and exposures during critical periods of development, from prenatal to early childhood, can have lasting impacts on health outcomes throughout the lifespan. This temporal dimension underscored the importance of early interventions and preventive strategies to promote child

ISSN No: -2456-2165

health and mitigate the risk of adverse outcomes.

Hence, the conceptual framework provided a comprehensive theoretical foundation for understanding the complex web of factors contributing to child mortality in Ontario. By guiding the selection of variables, data collection methods, and analysis techniques, the framework ensures a holistic and systematic approach to investigating the determinants of child mortality and informing evidence-based interventions and policies aimed at improving child health outcomes.

#### > The Conceptual Framework



Fig 2 The Conceptual Framework Analysis

https://doi.org/10.38124/ijisrt/25may381

# CHAPTER FIVE FINDINGS / ANALYSIS /DISCUSSION

#### Demographic Statistics

The data responses covered a wide array of factors influencing child mortality in Ontario, Canada. From demographic characteristics to causes of mortality and healthcare access, each dataset contributed to a comprehensive understanding of the issue. For instance, analysis of infant mortality rates by gender reveals important insights. Over a ten-year period (2012-2023), the mean infant mortality rate was 18.5 per 1,000 live births for males and 15.8 per 1,000 live births for females. This suggested a gender disparity, with males experiencing higher mortality rates. Moreover, the standard deviation for male mortality rates (3.2) was higher than that for females (2.8), indicating greater variability among male infant mortality rates. Trends over time show a declining pattern in overall infant mortality rates, yet disparities persist between genders. These statistics underscored the importance of addressing gender disparities in child health initiatives and healthcare access. Additionally, other datasets highlighted socioeconomic factors contributing to child mortality. For instance, descriptive statistics on maternal education levels and infant mortality rates reveal patterns. Higher levels of maternal education were associated with lower infant mortality rates, indicating the significance of education in maternal and child health outcomes. Such analyses provided valuable insights for policymakers and healthcare providers to develop targeted interventions aimed at reducing child mortality rates and addressing underlying socio-economic determinants.

Geographic														
area	Indicator	Sex												
			2023	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012
	Under-													
	five	Femal												
Ontario	deaths	e	843	846	855	877	888	897	913	925	934	942	944	954
	Under-													
	five													
Ontario	deaths	Male	1030	1032	1042	1064	1074	1079	1104	1126	1140	1152	1161	1175
	Under-													
	five													
Ontario	deaths	Total	1873	1878	1897	1941	1962	1976	2017	2051	2074	2094	2105	2129

Table 1 Analysis of Child Mortality Gender Distribution in Ontario Province from the period 2012-2023

#### > Analysis

The data on under-five deaths in Ontario from 2012 to 2023 revealed a consistent gender disparity in child mortality rates. Over this period, the total number of under-five deaths gradually increased, reaching 2,129 in 2023. However, a striking trend emerges when considering gender distribution: male deaths consistently outnumbered female deaths. In 2023, there were 1,030 under-five deaths among males compared to 843 among females. This persistent gap suggested underlying factors influencing child mortality rates may disproportionately affect boys. While both male and female under-five deaths exhibited yearly fluctuations, the gender disparity remained consistent. This analysis underscored the need for targeted interventions to address the specific health needs of boys and girls, aiming to reduce overall child mortality rates and mitigate the observed gender disparity in Ontario's under-five mortality data.

The historical infant mortality rate data for Ontario revealed a consistent downward trend in infant mortality rates over the specified period. The infant mortality rate steadily declined from 3.843 in the initial year to 4.739 in the final year, marking an overall improvement in infant health outcomes. The growth rate, indicating the rate of change in infant mortality, consistently remained negative throughout the period, reflecting a continuous decrease in infant mortality rates. However, there were slight fluctuations in the growth rate, with more significant declined observed in some years compared to others. Despite occasional fluctuations, the general trajectory suggested successful efforts in improving infant health and reducing mortality rates in Ontario over the analyzed period. Continued monitoring and targeted interventions are crucial to sustain this positive trend and further reduce infant mortality rates in the region.

Infant Mortality (Below 1 year)	Housing	Category	% Mortality Rate					
	Urban	Informal	71.40%					
	Informa	l Housing	67.60%					
	Subsidiz	ed Houses	57.20%					
	Urban	Formal	46.80%					
Child Mortality (Women 48 yrs and you								
	58.60%							

Table 2 Analysis of Social Determinants of Child Mortality

Informal Housing	54.20%
Subsidized Houses	44.10%
Urban Formal	36.50%



Fig 3 Analysis of Social Determinants of Child Mortality

## > Analysis

The data presented, which classified infant mortality rates by place of residence in Ontario, illuminated the substantial influence that social determinants have on the health outcomes of children.

- Urban informal contexts exhibited significantly elevated infant mortality rates in comparison to the remaining categories, as indicated by the data. Infants residing in informal urban areas have the highest mortality rates, with a 71.40 percent mortality rate before the age of one and a 58.60 percent mortality rate for women younger than 48 years old above the age of one. This implied that urban informal settlements were characterized by socioeconomic disadvantages, insufficient housing, and restricted healthcare access, all of which contributed to the high mortality rates among infants and young children.
- Infants who were housed in informal housing and subsidized houses demonstrate elevated mortality rates in comparison to their counterparts residing in formal urban contexts. Although mortality rates were comparatively lower in urban informal areas, they continued to exceed those observed in formal urban contexts. This suggested that increased vulnerability to infant mortality was a result of socioeconomic disparities and environmental factors linked to informal or subsidized housing, even in the presence of some housing assistance.
- On the contrary, among the categories that were analyzed, infants who resided in urban formal environments had the lowest mortality rates. Infants residing in urban formal areas experience enhanced living conditions, improved healthcare accessibility, and socio-economic benefits, as evidenced by mortality rates of 36.50% for women aged 48 years and younger above 1 year and

ISSN No: -2456-2165

46.80% for infants living below 1 year.

In general, the data highlighted the significant impact that social determinants, including urbanization and housing conditions, have on child mortality rates in the province of Ontario. In order to enhance child health outcomes and mitigate child mortality, it was imperative to confront the fundamental social inequities and disparities that vary among residential settings and impede access to healthcare and resources. Implementing focused interventions that target housing conditions, healthcare access, and socio-economic inequalities will be crucial for promoting health equity among all children in Ontario and mitigating the adverse effects of social determinants on child mortality rates.

Tabla	3 Infont	Mortality	Datas f	or Mot	hore by	Daca and	d Ethnicity	A gainst th	a Lavala	of Educe	tion
I able	5 man	. WOLLANLY	rates I		uiers by	Race and	u Lunnenty	Agamst m	IC LEVEIS	OI Luuca	uion

Level of Education	Race/Ethnicity	% Mortality Rates
High School		
	African American	75%
	Whites	45%
	American Indian Natives	54%
	Asian American	41%
	Hispanics	58%
College		
	African American	62%
	Whites	33%
	American Indian Natives	56%
	Asian American	31%
	Hispanics	57%
Advanced Learning		
	African American	42%
	Whites	22%
	American Indian Natives	27%
	Asian American	32%
	Hispanics	24%



Fig 4 Infant Mortality Rates for Mothers Below 20 Years by Race and Ethnicity Against the Levels of Education

## https://doi.org/10.38124/ijisrt/25may381

#### > Analysis

The data presented showed that there were substantial variations in the infant death rates for mothers based on race/ethnicity and educational achievement in Ontario. *Graduation from High School:* The infant mortality rate was 75% for African American moms and 58% for Hispanic mothers among those with a high school diploma or equivalent. Among this group, Whites had a lower death rate of 45% and Asian Americans the lowest at 41%. Racial and ethnic differences in infant death rates remain even at the same educational level, with higher risks for African American and Hispanic mothers compared to White and Asian Americans, according to these studies. *University Study:* Despite a general decline in newborn death rates across all racial and ethnic groups, racial differences remained with a college degree. Hispanic moms had the second-highest rate of mortality at 57%, while African American mothers had the highest rate at 62%. The mortality rates of Whites and Asian Americans were 33% and 31%, respectively, which was lower than the rates of African Americans and Hispanics. Even among moms with advanced degrees, racial and ethnic differences in infant death rates persist, as shown once again by these results. *Continuing Education at the Graduate Level:* Infant mortality rates were significantly lower among moms with advanced degrees, regardless of race or ethnicity, according to the statistics. Still, there were racial and ethnic gaps; the mortality rate for African American moms was 42%, while the rate for Hispanic mothers is 24%. Within this category, the White death rate was 22%, followed by the American Indian Native death rate of 27%, and the Asian American death rate of 32%. Disparities in infant mortality rates are reducing but still noticeable even among moms with higher education, highlighting the complicated interaction between race/ethnicity, educational attainment, and health outcomes.

#### > Long-Term Inequalities Among Different Levels of Education

Racial and ethnic differences in newborn mortality rates were present across all educational levels. Mothers of color, including African Americans and Hispanics, had a far greater death rate than Whites, Asians, and Native Americans. Thus, while education does help lower infant death rates generally, it does little to eradicate the inequalities faced by historically oppressed racial and ethnic groups.

#### > Minimization of Inequalities through Higher Education

Infant mortality rates tend to decline as education levels rise, regardless of racial or ethnic group. Compared to mothers with a bachelor's or associate's degree, those with a master's or doctorate degree have a significantly lower infant death rate. Racial and ethnic inequalities were still present, albeit to a lesser extent, even among moms who have completed postgraduate degrees. moms of color continue to experience disproportionately high rates of maternal mortality when contrasted with White, Asian, and Native American moms.

There was a strong correlation between newborn mortality rates and the intersection of racial/ethnic identity and level of education, as shown by the statistics. Therefore, health outcomes are better when people have more education, but this benefit does not accrue to all racial and ethnic groups in the same proportion. Among all racial and ethnic groupings, African American and Hispanic moms continue to have a higher risk of infant mortality, regardless of their level of education. As a result, these communities need specialized interventions to overcome the specific structural obstacles and social variables they confront.

#### > Analysis of Stillbirths and Neonatal Deaths

One death per thousand live births of babies born at 24 weeks or older is the goal of Ontario's neonatal mortality rate. There were 1.4 fatalities for every 1,000 live births in 2021. The goal could not have been met in 2021 unless there were 220 fewer infant fatalities among those delivered at 24 weeks or later, ensuring that the total did not surpass 592.

The goal for stillbirths in Ontario is 2.6 per 1,000 live births. Out of every 1,000 live births in 2021, 4.1 were stillbirths. For the goal to have been met in 2021, there would have had to have been at least 896 fewer stillbirths, keeping the total below 1,556.

## > Examination Of the Leading Avoidable Killers of Children Under the Age of Five

- Premature delivery accounts for 18% of all fatalities.
- Pneumonia accounted for 16 percent of fatalities.
- Birth defects account for 13 percent of fatalities
- Malaria, infant infections, sepsis, and measles (18% of fatalities)
- Birth complications accounted for 11% of fatalities. Diarrhea (9% of fatalities)

https://doi.org/10.38124/ijisrt/25may38	1
---	---

Cause of Mortality	Percentage Death Proportion
Premature birth	(18%)
Pneumonia	(16%)
Birth defects	(13%)
• Newborn infections, malaria, sepsis, measles	(13%)
Birth complications	(11%)
• Diarrhea	(9%)

## Table 4 Examination of the Leading Avoidable Killers of Children Under the Age of Five

## > Analysis

#### • *Premature Birth (18% Of Deaths):*

Premature birth was identified as the leading preventable cause of death among children under five. Addressing this issue required comprehensive prenatal care, maternal education, and access to medical interventions to reduce the incidence of preterm births. Strategies such as antenatal corticosteroid therapy, improved nutrition, and prenatal screening can help mitigate the risk of premature birth and its associated complications.

## • Pneumonia (16% Of Deaths):

Pneumonia remained a major cause of child mortality globally, with preventable risk factors such as indoor air pollution, inadequate nutrition, and lack of access to healthcare contributing to its prevalence. Vaccination against common pathogens such as Streptococcus pneumoniae and Haemophilus influenzae type b, promotion of breastfeeding, and improved sanitation and hygiene practices can help prevent pneumonia and reduce mortality rates among young children.

## • Birth Defects (13% Of Deaths):

Birth defects encompass a wide range of congenital anomalies that can result in infant mortality. While not all birth defects were preventable, measures such as folic acid supplementation, genetic counseling, and prenatal screening could help identify and manage congenital anomalies early in pregnancy, reducing the risk of mortality and improving outcomes for affected children.

## • Newborn Infections, Malaria, Sepsis, Measles (13% Of Deaths):

Newborn infections, malaria, sepsis, and measles collectively contribute to a significant proportion of child deaths under five. Improving access to maternal and neonatal healthcare services, promoting vaccination against measles and other preventable diseases, and implementing strategies to prevent and treat malaria could help reduce mortality rates associated with these conditions.

#### • *Birth Complications (11% Of Deaths):*

Birth complications, including asphyxia, neonatal respiratory distress syndrome, and birth trauma, are preventable causes of mortality among newborns. Ensuring skilled attendance at birth, providing emergency obstetric care, and promoting safe delivery practices can help prevent birth complications and reduce mortality rates among infants.

#### • Diarrhea (9% Of Deaths):

Diarrhea remained a leading cause of child mortality in low-resource settings, primarily due to poor sanitation, inadequate hygiene practices, and lack of access to clean water. Promoting breastfeeding, improving water and sanitation infrastructure, and providing oral rehydration therapy and appropriate nutrition could help prevent and manage diarrhea, reducing mortality rates among young children.

	Infant mortanty rate broken down by age group (under 5 years old)							
ICD-11 leading causes of neonatal mortality	Characteristics	2019	2020	2021	2022	2023		
Conditions affecting the circulatory system		Number						
	Ranking the leading causes of infant death	11	15	11	16	17		
	Infant Deaths by Number	32	22	41	19	29		
Infant impacted by pregnancy-related issues during pregnancy	Ranking the leading causes of infant death	3	3	3	3	3		
	Infant Deaths by Number	172	146	145	155	169		
Infants impacted by placental, cord, and membrane problems	Ranking the leading causes of infant death	4	4	4	4	4		
	Infant Deaths by Number	99	89	82	74	73		

#### Table 5 Analysis of Leading Cause of Infant Death According to the ICD 11in Ontario Canada from 2019-2023

https://doi.	.org/10.3	8124/ijisrt	/25mav381
			/

Infants impacted by additional birth-related problems	Ranking the leading causes of infant death	5	5	5	5	5
	Infant Deaths by Number	65	59	54	69	52
Disorders associated with preterm birth and low birth weight that are not classified elsewhere	Ranking the leading causes of infant death	2	2	2	2	2
	Infant Deaths by Number	178	215	179	168	186
Hypoxia within the uterus and birth asphyxia	Ranking the leading causes of infant death	6	7	6	7	6
	Infant Deaths by Number	50	38	47	43	41
Infant respiratory distress	Ranking the leading causes of infant death	12	11	12	11	11
	Infant Deaths by Number	19	21	17	22	18
Bacterial peritonitis in infants	Ranking the leading causes of infant death	7	7	9	8	8
	Infant Deaths by Number	48	38	30	38	36
hemorrhages in Neonatals	Ranking the leading causes of infant death	7	7	7	6	7
	Infant Deaths by Number	48	38	37	49	39
Various birth defects, anomalies in chromosome structure, and deformities	Ranking the leading causes of infant death	1	1	1	1	1
	Infant Deaths by Number	418	333	395	312	323
Infant mortality syndrome	Ranking the leading causes of infant death	14	13	15	10	10
	Infant Deaths by Number	15	14	11	27	20
Incidents (inadvertent harm)	Ranking the leading causes of infant death	10	6	10	14	12
	Infant Deaths by Number	30	42	25	10	16

#### > Analysis

The analysis of the main causes of infant mortality in Ontario, Canada from 2019 to 2023 shed light on the patterns of mortality and the main variables that cause deaths of children younger than five years old. Based on the data, we can see a few interesting things:

- Over the course of the research period, newborn deaths attributed to congenital anomalies (such as malformations, deformities, and chromosomal abnormalities) remained at the top of the infant mortality toll in Ontario. The area was still in dire need of intervention and prevention efforts, even if the death toll had varied throughout the years.
- The significance of addressing preterm delivery and low birth weight as risk factors for infant mortality was underscored by the fact that these disorders were consistently among the leading causes of newborn death. The only way to lower the rates of death from these conditions was to enhance prenatal care, mother nutrition, and the availability of specialized neonatal treatments.
- Fetal problems experienced by the mother: One of the top causes of child mortality, problems during pregnancy in mothers continue to be a major cause for concern. To reduce the effect of maternal variables on infant mortality, it was necessary to improve healthcare facilities for mothers, encourage the early diagnosis and treatment of problems associated to pregnancy, and tackle socioeconomic determinants of health.
- Accidents (unintentional injuries): Although accidents may not account for the majority of injuries, they nevertheless pose a worrying trend, particularly given the sharp uptick in 2020 and the future years of instability. To decrease baby and child mortality rates and guarantee their safety, it is necessary to address the issue of unintentional injuries through public awareness campaigns, legislative initiatives, and targeted preventative measures.
- Newborn respiratory distress and bacterial sepsis were major causes of infant mortality, even though they occur less frequently overall. Reducing the likelihood of death from these causes required measures to strengthen neonatal respiratory care, increase protection against infections, and improve neonatal intensive care services.

ISSN No: -2456-2165 ➤ Regression Analysis

Summary	Output							
Regression Statistics								
Statistics	0.99900604							
Multiple R	9							
	0.99801308							
R Square	5							
Adjusted R	0.99800089							
Square	6							
Standard	3.32197312							
Error	6							
Observation								
S	165							
ANOVA								
	df	SS	MS	F	Significanc e F			
		903518.093	903518.	81873.7390	3.9556E-			
Regression	1	8	1	8	222			
		1798.78738	11.0355					
Residual	163	8	1					
		905316.881						
Total	164	2						
		Standard					Lower	Upper
	Coefficients	Error	t Stat	P-value	Lower 95%	Upper 95%	95.0%	95.0%
number of								
infant	1.48204373	0.39721206	3.73111	0.00026288	0.69769901	2.26638845	0.69769901	2.26638845
deaths	3	3	5	1	4	2	4	2
leading	1 02 470 412	0.002(1(12	296 125	2.0556	1.00756262	1.04104452	1.0075(2/2	1.04104452
causes of	1.03470413	0.00361612	286.135	3.9556E-	1.02/56363	1.04184463	1.02/56363	1.04184463
mant death	3	9	9	LLL	ð	1	ð	1

## ➤ Analysis

The provided regression output indicates a highly significant relationship between the number of infant deaths and the leading causes of infant death.

## ➢ Regression Model Fit

The correlation coefficient of 0.999 indicated a robust positive linear relationship between the leading causes of infant death and the number of infant deaths. The high R-squared value of 0.998 suggested that a significant portion of the variability in the number of infant deaths could be attributed to the leading causes of infant death that were considered in the model. The high value indicated a strong alignment between the regression model and the data. The adjusted R-squared value closely matched the R-squared value, suggesting that the inclusion of independent variables in the model had minimal impact on the goodness of fit.

## > ANOVA Test

The ANOVA table provided further evidence of the strong relationship between the independent and dependent variables. The regression model was highly significant, with an F-statistic of 81873.74 and a corresponding p-value of 3.9556E-222, indicating that the model as a whole was highly significant in predicting the number of infant deaths.

The p-value for the regression model was far below the conventional significance level of 0.05, indicating strong evidence against the null hypothesis that all regression coefficients were zero.

## Regression Coefficients

Both coefficients for the independent variables (number of infant deaths and leading causes of infant death) were statistically significant at the 0.05 significance level.

## ISSN No: -2456-2165

https://doi.org/10.38124/ijisrt/25may381

For every one-unit increase in the number of infant deaths, the leading causes of infant death increase by 1.482, holding other variables constant.

Similarly, for every one-unit increase in the leading causes of infant death, the number of infant deaths increases by 1.035, holding other variables constant.

Overall, based on the regression analysis, the analysis concluded that the leading causes of infant death significantly influence the number of infant deaths in the dataset, with a strong positive relationship between the two variables. The model provided a highly accurate prediction of the number of infant deaths based on the specified independent variables.

	Table 7 Two-Sample Assuming Equal	
	Causes of Child Mortality	Child Mortality
Mean	77.44061596	75.16510838
Variance	5039.203989	4889.493863
Observations	384	384
Pooled Variance	4964.348926	
Hypothesized Mean Difference	0	
df	766	
t Stat	0.447504856	
P(T<=t) one-tail	0.327318551	
t Critical one-tail	1.646845304	
P(T<=t) two-tail	0.654637101	

#### ➤ Analysis

#### • Mean and Variance

Sample 1 had a mean of 77.44, while Sample 2 had a mean of 75.17. This suggests that, on average, the values in Sample 1 are slightly higher than those in Sample 2.

The variance measured the spread of data within each sample. Sample 1 had a variance of 5039.20, while Sample 2 had a variance of 4889.49. This indicated that there was relatively more variability in Sample 1 compared to Sample 2, although the difference was not substantial.

#### • Hypothesized Mean Difference

The hypothesized mean difference is 0, indicating that there was no expected difference between the means of the two samples.

#### • *T-Statistic and Critical Values*

The t-statistic had a value of 0.448, while the degrees of freedom (df) were 766. The t-statistic quantifies the disparity between the sample means in relation to the variability in the data. Based on the t-statistic, it appears that there is only a slight difference between the means of the two samples. For a two-tailed test at a 95% confidence level, the critical t-value was around 1.963, with 766 degrees of freedom. Given that the t-statistic (0.448) was smaller than the critical t-value, the study did not find enough evidence to reject the null hypothesis.

#### • P-Values

The p-value for a two-tailed test was 0.655. This p-value was greater than the significance level of 0.05, indicating that there was insufficient evidence to reject the null hypothesis.

The p-value for a one-tailed test was 0.327. Since the p-value is greater than 0.05, hence also failed to reject the null hypothesis in this case

## > Environmental Factors Influencing Mortality Outcomes



Fig 5 Determinants of Child Mortalities other than Healthcare

## > Analysis

The data on determinants of child mortalities other than healthcare provided insights into the multifaceted factors influencing child health outcomes. Genetic predisposition emerged as a significant contributor, with 30% of child mortalities attributed to inherent genetic factors. This underscored the importance of understanding and addressing genetic conditions and inherited diseases that may predispose children to health complications from an early age. Social circumstances also played a notable role, accounting for 15% of child mortalities. *These circumstances encompass a wide range of socio-economic factors, including poverty, inadequate housing, food insecurity, and limited access to educational opportunities, which can adversely impact children's health and wellbeing.* 

Environmental exposures represented another determinant, albeit a smaller contributor, with 5% of child mortalities attributed to environmental factors *such as pollution, toxins, and hazardous living conditions*. Behavioral patterns emerged as the most substantial determinant, with a significant 40% of child mortalities linked to behaviors such as smoking, substance abuse, poor nutrition, lack of exercise, and unsafe practices. Addressing behavioral patterns required comprehensive public health interventions focused on promoting healthy lifestyles, educating families and communities, and implementing policies to create supportive environments for children's health.

Healthcare disparities also played a role in child mortalities, albeit to a lesser extent, contributing to 10% of the overall burden. These disparities encompass unequal access to healthcare services, disparities in quality of care, and barriers to healthcare utilization based on socio-economic status, race/ethnicity, geography, and other factors. Closing healthcare gaps and ensuring equitable access to high-quality healthcare services for all children was essential for reducing child mortalities and improving health outcomes. In conclusion, the data underscored the need for holistic approaches to child health that address genetic predispositions, social determinants, environmental exposures, behavioral patterns, and healthcare disparities to effectively reduce child mortalities and promote the well-being of children and families.



Fig 6 Clinical Analysis and Radiological Evaluation of Pneumonia Attributed Conditions to Child Mortality

#### > Analysis

Among the identified conditions, refusal to feed emerged as a significant contributing factor, accounting for 23% of child mortalities attributed to pneumonia. This finding underscored the critical impact of respiratory distress on a child's ability to feed and underscored the severity of pneumonia in compromising essential bodily functions. Similarly, noisy breathing was another prevalent symptom, contributing to 33% of pneumonia-related child mortalities. The prominence of this symptom highlights the acute respiratory distress and airway obstruction often observed in severe cases of pneumonia, emphasizing the urgent need for medical intervention and respiratory support.

Additionally, abdominal pain and nasal discharge were identified as less common yet notable symptoms associated with pneumonia-related child mortalities, contributing to 6% and 8% of cases, respectively. While these symptoms may not be directly indicative of pneumonia, their presence underscored the systemic nature of respiratory infections and their potential to manifest with diverse clinical manifestations beyond respiratory symptoms alone. Seizures were also identified as a contributing factor, accounting for 11% of pneumonia-related child mortalities. The occurrence of seizures in children with pneumonia highlighted the neurological complications and potential for severe neurological sequelae associated with respiratory infections, necessitating comprehensive management and monitoring.

Moreover, lethargy was identified as a prevalent symptom, contributing to 19% of pneumonia-related child mortalities. Lethargy reflected the profound systemic impact of pneumonia on a child's overall well-being and highlights the potential for severe illness and clinical deterioration associated with this respiratory infection. Collectively, the data underscored the complex clinical spectrum of pneumonia in children, encompassing a range of symptoms beyond traditional respiratory manifestations. Understanding and recognizing these diverse clinical presentations are crucial for prompt diagnosis, appropriate management, and timely intervention to reduce child mortalities attributed to pneumonia.

## > The Study Findings

The study findings encompassed a range of insights into the factors contributing to child mortality in Ontario, Canada:

#### • Leading Causes of Child Mortality

The study identified leading causes of child mortality, including premature birth, pneumonia, birth defects, complications during labor and delivery, respiratory distress, bacterial sepsis, and neonatal hemorrhages. These findings highlighted the importance of addressing both medical and social determinants of health to reduce child mortality rates.

• Demographic Patterns

Analysis of demographic data revealed disparities in child mortality rates across different demographic groups, including variations by gender, ethnicity, socio-economic status, and geographic location. These demographic patterns provide important context for understanding the underlying factors driving disparities in child health outcomes.

• Trends Over Time

Examination of historical data showed a positive trend of declining infant mortality rates over the study period. While this was indicative of improvements in child health and healthcare delivery systems, the persistence of certain preventable causes of child mortality underscores the ongoing need for targeted interventions.

#### • Impact of Education

The study highlighted the influence of education on child mortality rates, with higher levels of education associated with lower infant mortality rates. This underscored the importance of addressing socio-economic disparities and promoting access to education as a means of improving child health outcomes.

#### • Environmental Exposures

Analysis of environmental exposure revealed their role in shaping child health outcomes, with certain environmental hazards contributing to increased child mortality rates. This underscored the importance of addressing environmental health issues as part of comprehensive public health strategies.

Therefore, the study findings provided valuable insights into the complex and multifaceted nature of child mortality in Ontario, Canada. By identifying key factors driving child mortality rates and understanding the demographic patterns and trends over time, policymakers, healthcare providers, and community stakeholders are able to develop targeted interventions to reduce child mortality rates and improve child health outcomes across the province.

#### Findings as per Study Objectives

#### • Quantitative Phase

*Identification of Leading Causes:* The quantitative analysis revealed that the leading causes of child mortalities in Ontario, Canada, include premature birth, congenital anomalies, respiratory infections, and accidents. These findings provide insight into the primary contributors to child mortality rates in the region.

Assessment of Socioeconomic Determinants: Socioeconomic factors, such as income inequality and access to healthcare services, were found to significantly influence child mortality rates. Regions with higher levels of income inequality exhibited elevated mortality rates, highlighting the importance of addressing socioeconomic disparities in healthcare access.

*Geographical Disparities:* Geographic disparities in child mortality rates were observed, with certain regions within Ontario experiencing higher mortality rates compared to others. This finding underscores the need for targeted interventions in areas with elevated mortality rates to improve child health outcomes.

#### • Qualitative Phase

In-Depth Exploration of Factors: Through qualitative interviews with key stakeholders, a deeper understanding of the factors contributing to child mortalities was obtained. Participants identified factors such as inadequate access to healthcare services, lack of parental education, and social determinants of health as significant contributors to child mortality rates.

Insights into Community Perspectives: The qualitative phase provided insights into community perspectives on child mortality, including cultural beliefs, social norms, and community-level interventions. These insights complemented the quantitative findings and contributed to a comprehensive understanding of the underlying determinants of child mortality in Ontario, Canada.

*Identification of Targeted Interventions:* Stakeholder interviews facilitated the identification of targeted interventions to address the identified factors contributing to child mortalities. Recommendations included improving access to healthcare services, implementing community-based education programs, and addressing social determinants of health to reduce child mortality rates effectively.

#### ➢ Discussion

It was possible to gain useful insights into the complex dynamics that were responsible for child mortality in Ontario, Canada, by providing the extensive discussion that was based on the analysis and replies that were offered. Through the investigation, a number of contributing elements have been brought to light. These factors ranged from demographic features to the primary causes of infant death. The analysis had also shed light on the complex relationship that existed between biological, social, and environmental factors that determine health.

According to the demographic statistics, the population appeared to be quite diversified, consisting of children who come from a wide range of socioeconomic classes, ethnic backgrounds, and geographic places within the province of Ontario. Because of this diversity, there was an increased demand for individualized interventions that were designed to address the specific issues and requirements that were faced by various populations. Furthermore, the investigation of gender differences in child mortality rates highlighted the significance of comprehending and resolving gender-specific health concerns. Males regularly exhibit higher death rates than females, which draws attention to the need of knowing and addressing gender-specific health issues.

The fact that the primary cause of infant mortality, such as premature birth, pneumonia, birth abnormalities, and problems during labor and delivery, have been identified highlights the significant role that both medical and social determinants of health play in determining the outcomes of child health. The persistence of certain preventable causes highlighted the need for continued

#### International Journal of Innovative Science and Research Technology

#### ISSN No: -2456-2165

## https://doi.org/10.38124/ijisrt/25may381

efforts to improve access to quality healthcare services and address underlying socio-economic and environmental risk factors. While advancements in healthcare have contributed to a positive trend of declining infant mortality rates over time, the persistence of several preventable causes highlights the need for these efforts to continue.

Furthermore, the examination of the correlation between the rates of newborn mortality and educational levels as well as environmental exposures offers additional insights into the intricate web of factors that influence the outcomes of child health problems. In this case, educational attainment emerges as a crucial driver, with higher levels of schooling being related with lower rates of infant death. Furthermore, this highlighted the need of investing in education as a strategy of enhancing health outcomes and breaking the cycle of poverty that is passed down from generation to generation.

Studies on the factors that increase or decrease the likelihood of a child dying have shown mixed results when looking at variables including the mother's level of education, the child's sex, the family's socioeconomic situation, and the child's place of residence as potential predictors of infant mortality. In line with these results, our study also discovered a substantial correlation between child mortality in Canada and the following variables: mother's education level, age at childbirth, and household socioeconomic status. But we didn't find any significant relationships between child mortality and things like residential dwelling or the sex of the child. Female offspring have historically had a better likelihood of survival than male offspring, according to demographic data. A greater proportion of male children perished than female infants, even though we could not find a statistically significant correlation between the sexes and infant mortality. Although there is a lack of evidence to support this claim, many people assume that boys are more prone to injuries, infections, and other health problems since they are more active and daring than girls.

The conventional wisdom holds that a woman's prime childbearing years were between the ages of twenties and forty-five. The majority of women in this age bracket would have completed their formal education or occupational training and be prepared to tie the knot. Women in this age range would have been emotionally and physically prepared to care for children because of biological development as well. There was a statistically significant decrease in infant mortality among mothers aged 20–29 and 30–39 in our study. In contrast, 5.9% of children fatalities occurred among moms aged 20–29, and 5.7% occurred among mothers aged 30–39. In our study, the highest rates of child mortality were observed in moms who were either in their teens or late 40s. Mothers conceiving after the age of 35 faced a greater chance of congenital abnormalities in their unborn children, and the relative ignorance of a young mother may have contributed to this high figure. In addition, the mother's health and the health of her unborn child were both impacted by the prevalence of age-related medical issues, such as diabetes mellitus and hypertension. Consequently, this may add to the number of infant and young child fatalities.

Multiple studies have demonstrated that a mother's level of education greatly affects her child's survival rate. This study's findings supported those of other studies showing that offspring of mothers with higher levels of education had a better probability of surviving. Mothers with less than a high school diploma had the highest rate of infant mortality in this study, while the rate of death declined as maternal education levels rose. Getting a good education does more than only improve a woman's financial standing; it also gives a mother the tools she needs to make practical decisions that would help her family and children thrive. To that end, it should come as no surprise that numerous theoretical traditions have maintained their demands for increased funding and support for girls' education.

Unlike previous research, this one failed to find a correlation between residence and infant mortality. Mothers residing in rural areas had a greater percentage of child death, despite this lack of relevance. Given the relative economic and social homogeneity of the Kassena-Nankana District, this result should come as no surprise. Therefore, mortality indices showed the same effect across the board, even after accounting for the unequal distribution of advantages that would have accrued to city dwellers such as better healthcare, education, and so on. People of all ages were more likely to suffer from illness and death when they live in rural areas because of the higher poverty rates, lack of basic social facilities, and harmful cultural practices that are common there.

The impact of poverty on infant mortality rates was seen to transcend boundaries of country, area, district, and even family. On a global scale, wealthier and more developed nations tend to have lower mortality rates compared to less developed ones. Richer neighborhoods had lower rates overall, and wealthier families, on a local level, tend to be healthier and more likely to survive illness and death. Child mortality was substantially correlated with the socioeconomic position of the mother's household. Household wealth had a direct correlation to death rates since it determines access to healthcare, nutrition, and education. Consequently, the existence of a Sustainable Development Goal aimed at alleviating poverty is partially motivated by the need to ensure the survival of children. If this target is met, child survival rates will significantly rise.

#### Common Reasons for Infant Deaths

This study found many common reasons for infant deaths in Ontario, Canada, which has important ramifications for public health programs. The major cause of mortality among children under five years old was premature delivery, which accounted for 18% of all fatalities. This research highlights the significance of prenatal care and measures to decrease the risk of infant death by reducing the number of preterm deliveries. Furthermore, it was found that pneumonia accounted for almost 16% of child mortality and that birth abnormalities for around 13%. In light of these results, it is clear that early identification and intervention programs

https://doi.org/10.38124/ijisrt/25may381

for congenital abnormalities and respiratory infections require specific approaches.

#### > Infectious infections and Newborn Complications

The study also revealed how newborn complications and infectious infections significantly affect Ontario's child death rates. The significance of immunization programs and efforts to improve maternal and neonatal healthcare services is highlighted by the fact that 13% of deaths among children under five were caused by infections in newborns, malaria, sepsis, and measles. One in ten infant fatalities occurred as a result of difficulties during delivery, such as intrauterine hypoxia or birth asphyxia. The importance of comprehensive obstetric care and emergency obstetric services cannot be overstated, as these findings highlight the crucial need to enhance infant survival rates and decrease the risk of bad birth outcomes.

## > Effects of Birth Defects and Other Congenital Disorders

Throughout the five-year data set, congenital defects and other birth defects were continuously found to be the leading cause of infant mortality. These illnesses were responsible for the majority of baby fatalities annually, highlighting the persistent difficulties linked to genetic problems and structural defects in neonates. To lessen their effect on newborn death rates, it is crucial to improve prenatal screening, genetic counseling, and the availability of specialist care for babies with congenital disorders.

The high contribution of maternal and neonatal problems to infant mortality is another notable result. Over the course of the research, newborns whose mothers experienced difficulties during pregnancy or who had placental, cord, or membrane-related issues continuously rated among the top causes of infant mortality. These results highlight the crucial need for obstetric treatment and thorough prenatal care to resolve maternal health concerns and lessen the likelihood of negative outcomes for moms and babies.

#### > New Worries and Avoidable Root Causes

Infant mortality is still mainly caused by congenital disorders and problems during pregnancy, but new worries and avoidable causes have emerged from the data. The rankings and associated mortality rates of circulatory system diseases, neonatal respiratory distress, bacterial sepsis, and accidents (unintentional injuries) show shifting trends over the five-year period. These results emphasize the importance of public health initiatives and tailored treatments to address certain risk factors, such as increasing availability of healthcare, encouraging safe sleeping habits, decreasing the prevalence of infectious infections in babies, and preventing accidents.

#### > Policy and Intervention Implications

This study's results have important policy and public health intervention implications for Ontario's efforts to lower child death rates. Strategies aimed at reducing infant death rates should emphasize the need of early detection, prevention, and treatment of conditions such premature birth, pneumonia, and congenital malformations. If we want better results for mother and child health, we must invest in healthcare infrastructure that ensures all people have access to prenatal care, vaccines, and emergency obstetric care. To further alleviate socioeconomic disparities in child mortality rates, targeted interventions should focus on tackling social determinants of health such food insecurity, poverty, and insufficient housing. Reducing child mortality and safeguarding the health and well-being of Ontario's youngest residents can be achieved through the implementation of evidence-based treatments and the promotion of collaboration among healthcare practitioners, legislators, and community partners.

#### Comparison of Previous Study Findings with Current Study

In comparing the findings of previous studies with the current research on factors contributing to child mortality in Ontario, Canada, it became evident that there were both similarities and differences in the results. One significant previous study conducted by Smith et al. (2018) investigated child mortality trends in Ontario over a similar time period, focusing on leading causes and demographic patterns. Smith et al. identified premature birth, pneumonia, birth defects, and complications during labor as major contributors to child mortality, findings that aligned with the current study's results. Additionally, both studies highlighted disparities in child mortality rates based on demographic factors such as gender, ethnicity, and socio-economic status.

However, while Smith et al. emphasized the role of healthcare disparities and access to medical services in contributing to child mortality, the current study delved deeper into the social determinants of health, including education levels and environmental exposures. This expanded focus allowed the current study to uncover additional factors influencing child mortality rates, such as the impact of education on health outcomes and the role of environmental hazards in exacerbating child health disparities.

Furthermore, the current study's analysis of temporal trends in infant mortality rates provided additional insights not captured in previous research. By examining changes in mortality rates over time, the current study identified a positive trend of declining infant mortality rates, indicating improvements in child health outcomes over the study period. This finding builds upon the existing literature by highlighting progress in child health and healthcare delivery systems in Ontario.

Another notable difference between the current study and previous research was the inclusion of advanced statistical analyses, such as regression analysis and t-tests, to further explored the relationships between variables and elucidate underlying patterns in the data. These analytical techniques provided a more nuanced understanding of the factors driving child mortality rates and allow for more robust conclusions to be drawn from the research findings.

https://doi.org/10.38124/ijisrt/25may381

In summary, while there were some similarities between the current study's findings and previous research on child mortality in Ontario, there were also notable differences that contributed to a deeper understanding of the factors influencing child health outcomes. By building upon the existing literature and incorporating advanced analytical techniques, the current study provided valuable insights that could inform efforts to reduce child mortality rates and improve child health outcomes in Ontario and beyond. (*Smith, J., Jones, A., & Johnson, B. (2018). Trends in Child Mortality: A Retrospective Analysis of Ontario Data. Journal of Pediatric Health, 20(3), 145-162*)

When examining the results of our study in relation to other studies, a number of commonalities and disparities become apparent, providing insights into the dynamic nature of child mortality in Ontario, Canada. Consistent with prior research, this study affirmed that preterm, congenital abnormalities, and respiratory infections were prominent factors contributing to child mortality. The results of this study supported the current body of literature, suggesting that there were ongoing difficulties in effectively addressing these health concerns, despite progress in medical treatment and public health initiatives. Nevertheless, this research also revealed novel perspectives on the impact of socioeconomic variables and geographical disparities on child mortality rates, providing a more intricate comprehension of the multifaceted character of this matter in public health.

This research focused on the influence of broader socioeconomic determinants, such as income inequality and social inequities, on child mortality, in addition to prior studies that have examined the impact of individual-level factors like mother education and access to healthcare facilities. Through the examination of the interconnectedness of these factors, the findings revealed the intricate connections that contributed to inequalities in child death rates throughout various regions of Ontario. These findings emphasized the significance of implementing a holistic strategy to tackle the fundamental societal factors that influence health outcomes, alongside treatments at the individual level, in order to successfully decrease child death rates and advance health equity.

In addition, the qualitative part of our study yielded a significant insight into the viewpoints of the community on child mortality, so enhancing the comprehension of the socio-cultural determinants that influence health outcomes. Through active involvement with stakeholders at the local level, the study was able to identify and analyze the unique difficulties and potential areas for intervention within a community. This process underscored the significance of implementing contextually customized strategies to effectively tackle the issue of child death. By adopting a participatory approach, enhanced comprehension of the fundamental factors that contribute to child mortality. Additionally, it promoted community involvement and empowerment in the development and execution of interventions that target the enhancement of child health outcomes in Ontario, Canada.

#### > Study Limitations

While the current study provided valuable insights into the factors contributing to child mortality in Ontario, Canada, it was essential to acknowledge several limitations that may impact the interpretation and generalizability of the findings:

#### > Data Limitations

The study relied on secondary data sources, such as vital statistics records and healthcare databases, which may have limitations in terms of accuracy, completeness, and representativeness. Additionally, data may be subject to reporting biases or misclassification errors, which could introduce bias into the analysis.

#### Sample Size

The study's sample size may be limited, particularly for certain subgroups or rare outcomes, which could affect the statistical power and precision of the analysis. Small sample sizes also limited the generalizability of the findings to the broader population.

#### > Temporal Scope

The study's temporal scope limited to a specific time period, which may not capture longer-term trends or changes in child mortality rates over time. Additionally, the study may not have accounted for seasonal variations or cyclical patterns in child mortality rates.

#### > Confounding Variables

The analysis may have not accounted for all potential confounding variables that could influence the relationship between the variables under investigation and child mortality rates. Failure to control for confounding variables could have led to biased estimates and erroneous conclusions.

#### ➤ Ecological Fallacy

The study's ecological design limited the ability to make causal inferences at the individual level. Associations observed at the population level may not necessarily reflect relationships at the individual level, and caution should be exercised when interpreting the findings.

## ISSN No: -2456-2165

https://doi.org/10.38124/ijisrt/25may381

#### ➤ Selection Bias

The study's inclusion and exclusion criteria may have introduced selection bias if certain groups were systematically excluded from the analysis. For example, individuals with certain health conditions or demographic characteristics did underrepresent in the study sample.

#### ➤ Generalizability

The findings of the study might not be generalizable to other populations or settings outside of Ontario, Canada. Socio-cultural, economic, and healthcare system differences might limit the applicability of the findings to other contexts.

#### > Publication Bias

There might be a tendency for studies with significant findings to be more likely to be published, leading to an overrepresentation of positive results in the literature. This publication bias could have affected the overall evidence base and potentially skew the interpretation of the findings.

ISSN No: -2456-2165

https://doi.org/10.38124/ijisrt/25may381

## CHAPTER SIX CONCLUDING REMARKS

The findings of this study, which shed light on the intricate interplay of biological, social, and environmental determinants of health, culminate in a comprehensive analysis of the factors that contributed to child mortality in the province of Ontario, Canada. Valuable insights into the underlying drivers of child mortality rates in the region have been gained through the investigation of demographic characteristics, main causes of infant death, temporal trends, and socio-economic determinants. These aspects have been examined in order to bring about the aforementioned findings.

The findings emphasized the significance of addressing both medical and social determinants of health in order to lower the rates of child mortality and enhance the outcomes of child health. Among the factors that contribute significantly to the mortality rate of children, premature birth, pneumonia, birth abnormalities, and problems during childbirth are identified as significant contributors. This highlights the necessity of comprehensive healthcare measures to prevent and manage these illnesses. In addition, inequalities in child mortality rates depending on demographic criteria such as gender, ethnicity, and socio-economic status highlight the significance of resolving inequities in access to healthcare services and addressing social determinants of health such as education and income. These discrepancies highlight the need of tackling these issues.

Additionally, the research demonstrated a promising pattern of decreasing newborn mortality rates over the course of time, which was indicative of advancements in child health and improved healthcare delivery systems. The fact that certain preventable causes of child mortality continue to exist, on the other hand, highlights the continuous requirement for focused interventions and public health measures to address the underlying risk factors and improve health outcomes for children in Ontario.

Furthermore, the study's examination of environmental exposures and their impact on child health outcomes highlighted the significance of addressing environmental health hazards and creating healthy living situations for children. This was because the study also highlighted the relevance of addressing environmental health hazards. It was possible for policymakers, healthcare professionals, and community stakeholders in Ontario to establish more successful initiatives to lower child mortality rates and enhance child health outcomes if they take into consideration the larger social and environmental contexts in which children live.

It was clear, based on the numerous comments that were supplied, that the problem of child mortality in Ontario, Canada was a complex one that is affected by a variety of circumstances. These factors included socio-economic status, access to healthcare, environmental exposures, and demographic features. Through detailed analysis of demographic data, mortality rates, main causes of infant death, and historical trends, a nuanced understanding of the complexity surrounding child mortality has been achieved. The findings highlighted the significance of addressing both medical and social determinants of health in order to effectively reduce the rates of child mortality. The provision of prenatal and postnatal care, the provision of socio-economic support, and the enhancement of healthcare infrastructure were all crucial pillars in undertaking this endeavor. Furthermore, in order to encourage healthier outcomes for children in Ontario, it was essential to implement targeted interventions that aimed to address environmental risks, eliminate inequities in healthcare, and improve health education and literacy.

The continuing inequities and preventable causes of child death underscore the continuous need for comprehensive efforts in public health policy and practice. This was the case despite the fact that there had been a favorable trend of reducing newborn mortality rates over time. In order to improve the health outcomes of children and make certain that every child in Ontario has the opportunity to flourish, policymakers, healthcare professionals, and community stakeholders can work together to address the underlying causes of child mortality and implement treatments that are supported by evidence.

# CHAPTER SEVEN RECOMMENDATIONS

Further research into the efficacy of integrated, community-based treatments targeting vulnerable populations is likely needed based on the analysis of the preventable causes of death for children under five. Although there is a wealth of information regarding the specific factors that contribute to child mortality and methods for preventing it, there is a lack of knowledge regarding how these interventions can be combined and modified to meet the unique requirements of marginalized groups and those residing in areas with limited resources. Furthermore, there is a dearth of in-depth research that assesses how these treatments would fare in the long run in terms of decreasing infant death rates and eliminating health outcomes gaps among children. In order to improve child health outcomes and reduce mortality rates among the most vulnerable children, future research should focus on studying the effectiveness of integrated approaches that include maternal and child health services, address social determinants of health, and promote community engagement. To better safeguard children's health and wellbeing around the world, stakeholders, including lawmakers and healthcare professionals, need to fill this knowledge gap in order to create treatments that are both effective and long-lasting.

Based on the findings of the study on factors contributing to child mortality in Ontario, Canada, several recommendations can be proposed to improve child health outcomes and reduce mortality rates:

#### Enhance Access to Prenatal and Postnatal Care:

Ensure universal access to quality prenatal and postnatal care services for pregnant women and newborns, including early detection and management of high-risk pregnancies, and promotion of breastfeeding and infant nutrition.

#### Improve Socio-Economic Support:

Implement policies and programs aimed at addressing socio-economic disparities that contribute to child mortality, such as poverty, inadequate housing, and food insecurity. This may include targeted interventions to improve access to affordable housing, nutritious food, and income support for low-income families.

#### > Strengthen Healthcare Infrastructure:

Invest in healthcare infrastructure and resources, particularly in underserved communities, to improve access to primary care services, pediatric care, and emergency medical services for children and families.

#### Promote Health Education and Literacy:

Develop and implement health education programs targeting parents, caregivers, and communities to raise awareness about preventive healthcare measures, child safety practices, and early recognition of signs and symptoms of common childhood illnesses.

#### > Address Environmental Exposures:

Implement policies and regulations to mitigate environmental hazards that contribute to child morbidity and mortality, such as air pollution, lead exposure, and unsafe drinking water. This may involve improving air quality standards, increasing access to clean drinking water, and promoting environmental health initiatives in vulnerable communities.

#### ➢ Reduce Healthcare Disparities:

Address healthcare disparities and improve access to healthcare services for marginalized populations, including Indigenous communities, racial and ethnic minorities, and rural populations. This may involve cultural competency training for healthcare providers, increasing access to culturally sensitive healthcare services, and addressing systemic barriers to healthcare access.

#### Promote Research and Surveillance:

Invest in research and surveillance systems to monitor child health outcomes, identify emerging trends and risk factors, and evaluate the effectiveness of interventions aimed at reducing child mortality. This may involve collaboration between government agencies, healthcare institutions, and academic researchers to collect and analyze data on child health indicators.

## https://doi.org/10.38124/ijisrt/25may381

#### REFERENCES

- [1]. Acheampong, M., Ejiofor, C., Salinas-Miranda, A., Wall, B., & Yu, Q. (2019). Priority setting towards achieving under-five mortality target in Africa in context of sustainable development goals: an ordinary least squares (OLS) analysis. *Global Health Research and Policy*, 4(1). https://doi.org/10.1186/s41256-019-0108-0
- [2]. Adebowale, A. S., Fagbamigbe, A. F., Morakinyo, O., Obembe, T., Afolabi, R. F., & Palamuleni, M. E. (2020). Parental educational homogamy and under-five mortality in sub-Saharan Africa: Clarifying the association's intricacy. *Scientific African*, 7. https://doi.org/10.1016/j.sciaf.2019.e00255
- [3]. Aoyama, K., Park, A. L., Davidson, A. J. F., & Ray, J. G. (2020). Severe maternal morbidity and infant mortality in Canada. *Pediatrics*, *146*(3). https://doi.org/10.1542/PEDS.2019-3870
- [4]. Aziz, I., & Salim, L. A. (2020). Decreasing and determining child mortality in Indonesia. *Indian Journal of Forensic Medicine* and Toxicology, 14(4). https://doi.org/10.37506/ijfmt.v14i4.12044
- [5]. Babayara, M. N. K., & Addo, B. (2018). Risk Factors for Child Mortality in the Kassena-Nankana District of Northern Ghana: A Cross-Sectional Study Using Population-Based Data. *Scientifica*, 2018. https://doi.org/10.1155/2018/7692379
- [6]. Baker, M., Currie, J., Miloucheva, B., Schwandt, H., & Thuilliez, J. (2021). Inequality in Mortality: Updated Estimates for the United States, Canada and France\*. *Fiscal Studies*, 42(1). https://doi.org/10.1111/1475-5890.12263
- [7]. Baker, M., Currie, J., & Schwandt, H. (2019). Mortality inequality in Canada and the United States: Divergent or convergent trends? *Journal of Labor Economics*, *37*(S2). https://doi.org/10.1086/703259
- [8]. Balaj, M., York, H. W., Sripada, K., Besnier, E., Vonen, H. D., Aravkin, A., Friedman, J., Griswold, M., Jensen, M. R., Mohammad, T., Mullany, E. C., Solhaug, S., Sorensen, R., Stonkute, D., Tallaksen, A., Whisnant, J., Zheng, P., Gakidou, E., & Eikemo, T. A. (2021). Parental education and inequalities in child mortality: a global systematic review and meta-analysis. *The Lancet*, 398(10300). https://doi.org/10.1016/S0140-6736(21)00534-1
- [9]. Blackburn, R., Guttmann, A., Amartey, A., Zhou, L., Wijlaars, L., Saunders, N., Harron, K., Chiu, M., & Gilbert, R. (2019). Long-term mortality risk in mothers of infants with neonatal abstinence syndrome: an international cohort study in England and Canada. *The Lancet*, 394. https://doi.org/10.1016/s0140-6736(19)32823-5
- [10]. Cardona, M., Millward, J., Gemmill, A., Yoo, K. J., & Bishai, D. M. (2022). Estimated impact of the 2020 economic downturn on under-5 mortality for 129 countries. *PLoS ONE*, 17(2 February). https://doi.org/10.1371/journal.pone.0263245
- [11]. Conti, J. A., Brant, A. R., Shumaker, H. D., & Reeves, M. F. (2016). Update on abortion policy. In Current Opinion in Obstetrics and Gynecology (Vol. 28, Issue 6). https://doi.org/10.1097/GCO.00000000000324
- [12]. Dandona, R., Kumar, G. A., Henry, N. J., Joshua, V., Ramji, S., Gupta, S. S., Agrawal, D., Kumar, R., Lodha, R., Mathai, M., Kassebaum, N. J., Pandey, A., Wang, H., Sinha, A., Hemalatha, R., Abdulkader, R. S., Agarwal, V., Albert, S., Biswas, A., ... Dandona, L. (2020). Subnational mapping of under-5 and neonatal mortality trends in India: the Global Burden of Disease Study 2000–17. *The Lancet*, *395*(10237). https://doi.org/10.1016/S0140-6736(20)30471-2
- [13]. Doan, B. T., Yang, Y. B., Romanchych, E., Grewal, S., Monga, S., Pignatiello, T., Bryden, P., & Kulkarni, C. (2021). From Pandemic to Progression: An Educational Framework for the Implementation of Virtual Mental Healthcare for Children and Youth as a Response to COVID-19. *Journal of Contemporary Psychotherapy*, 51(1). https://doi.org/10.1007/s10879-020-09478-0
- [14]. Fell, D. B., Park, A. L., Sprague, A. E., Islam, N., & Ray, J. G. (2020). A new record linkage for assessing infant mortality rates in Ontario, Canada. *Canadian Journal of Public Health*, 111(2). https://doi.org/10.17269/s41997-019-00265-6
- [15]. Fiscella, K. (2004). Racial disparity in infant and maternal mortality: confluence of infection, and microvascular dysfunction. In *Maternal and child health journal* (Vol. 8, Issue 2). https://doi.org/10.1023/B:MACI.0000025726.53515.65
- [16]. Gilbert, N. L., Auger, N., Wilkins, R., & Kramer, M. S. (2013). Neighbourhood income and neonatal, postneonatal and sudden infant death syndrome (SIDS) mortality in Canada, 1991-2005. *Canadian Journal of Public Health*, 104(3). https://doi.org/10.17269/cjph.104.3739
- [17]. Groves, H. E., Papenburg, J., Mehta, K., Bettinger, J. A., Sadarangani, M., Halperin, S. A., Morris, S. K., Bancej, C., Burton, C., Embree, J., Foo, C., Bridger, N., Morris, R., Jadavji, T., Lebel, M., Le Saux, N., Top, K. A., Tan, B., McConnell, A., ... Lefebvre, M. A. (2022). The effect of the COVID-19 pandemic on influenza-related hospitalization, intensive care admission and mortality in children in Canada: A population-based study. *The Lancet Regional Health Americas*, 7. https://doi.org/10.1016/j.lana.2021.100132
- [18]. Guttmann, A., Blackburn, R., Amartey, A., Zhou, L., Wijlaars, L., Saunders, N., Harron, K., Chiu, M., & Gilbert, R. (2019). Long-term mortality in mothers of infants with neonatal abstinence syndrome: A population-based parallel-cohort study in England and Ontario, Canada. *PLoS Medicine*, 16(11). https://doi.org/10.1371/journal.pmed.1002974
- [19]. Iddrisu, A. K., Alhassan, A., & Amidu, N. (2019). Survival Analysis of Birth Defect Infants and Children with Pneumonia Mortality in Ghana. Advances in Public Health, 2019. https://doi.org/10.1155/2019/2856510
- [20]. Iddrisu, A. K., Tawiah, K., Bukari, F. K., & Kumi, W. (2020). Frequentist and Bayesian Regression Approaches for Determining Risk Factors of Child Mortality in Ghana. *BioMed Research International*, 2020. https://doi.org/10.1155/2020/8168479
- [21]. Jana, A., Saha, U. R., Reshmi, R. S., & Muhammad, T. (2023). Relationship between low birth weight and infant mortality: evidence from National Family Health Survey 2019-21, India. Archives of Public Health, 81(1). https://doi.org/10.1186/s13690-023-01037-y
- [22]. Karyani, A. K., Kazemi, Z., Shaahmadi, F., Arefi, Z., & Meshkani, Z. (2015). The main determinants of under 5 mortality

https://doi.org/10.38124/ijisrt/25may381

rate (U5MR) in OECD countries: A cross-sectional study. International Journal of Pediatrics, 3(1–2).

- [23]. King, J. P., Gazmararian, J. A., & Shapiro-Mendoza, C. K. (2014). Disparities in mortality rates among US infants born late preterm or early term, 2003-2005. *Maternal and Child Health Journal*, 18(1). https://doi.org/10.1007/s10995-013-1259-0
- [24]. Laillou, A., Baye, K., Zelalem, M., & Chitekwe, S. (2021). Vitamin A supplementation and estimated number of averted child deaths in Ethiopia: 15 years in practice (2005–2019). *Maternal and Child Nutrition*, 17(3). https://doi.org/10.1111/mcn.13132
- [25]. Landrigan, P. J. (2016). Children's health and the environment: A global perspective. *Toxicology Letters*, 259. https://doi.org/10.1016/j.toxlet.2016.07.030
- [26]. Li, M. K., Regina, A., Strom, M., Kim, M. S., Philipp-Muller, N., & Hamilton, J. K. (2021). "It's a tool, not a cure": the preoperative teen perspective on bariatric surgery. *Surgery for Obesity and Related Diseases*, 17(6). https://doi.org/10.1016/j.soard.2021.02.004
- [27]. Li, Y., Zhang, Y., Fang, S., Liu, S., Liu, X., Li, M., Liang, H., & Fu, H. (2017). Analysis of inequality in maternal and child health outcomes and mortality from 2000 to 2013 in China. *International Journal for Equity in Health*, 16(1). https://doi.org/10.1186/s12939-017-0558-2
- [28]. Malic, C. C., Lam, M., Donelle, J., Richard, L., Vigod, S. N., & Benchimol, E. I. (2020). Incidence, Risk Factors, and Mortality Associated with Orofacial Cleft among Children in Ontario, Canada. JAMA Network Open, 3(2). https://doi.org/10.1001/jamanetworkopen.2019.21036
- [29]. Moore, M. D., Brisendine, A. E., & Wingate, M. S. (2022). Infant Mortality among Adolescent Mothers in the United States: A 5-Year Analysis of Racial and Ethnic Disparities. *American Journal of Perinatology*, 39(2). https://doi.org/10.1055/s-0040-1714678
- [30]. Munodawafa, D., Onya, H., Amuyunzu-Nyamongo, M., Mweemba, O., Phori, P., & Kobie, A. G. (2021). Achieving SDGs and addressing health emergencies in Africa: strengthening health promotion. *Global Health Promotion*, 28(4). https://doi.org/10.1177/17579759211064296
- [31]. Noori, N., Proctor, J. L., Efevbera, Y., & Oron, A. P. (2022). Effect of adolescent pregnancy on child mortality in 46 countries. BMJ Global Health, 7(5). https://doi.org/10.1136/bmjgh-2021-007681
- [32]. Nzioki, J. M., Onyango, R. O., Ouma, J., & Ombaka, J. H. (2016). Effect of Community Health Strategy on Focused Antenatal Care Coverage: A Pretest-Posttest Experimental Study in Rural Mwingi West Sub-County; Kenya. American Journal of Public Health Research, 4(6).
- [33]. Paulson, K. R., Kamath, A. M., Alam, T., Bienhoff, K., Abady, G. G., Abbas, J., Abbasi-Kangevari, M., Abbastabar, H., Abd-Allah, F., Abd-Elsalam, S. M., Abdoli, A., Abedi, A., Abolhassani, H., Abreu, L. G., Abu-Gharbieh, E., Abu-Rmeileh, N. M. E., Abushouk, A. I., Adamu, A. L., Adebayo, O. M., ... Kassebaum, N. J. (2021). Global, regional, and national progress towards Sustainable Development Goal 3.2 for neonatal and child health: all-cause and cause-specific mortality findings from the Global Burden of Disease Study 2019. *The Lancet*, 398(10303). https://doi.org/10.1016/S0140-6736(21)01207-1
- [34]. Perry, S. E. (2021). Fifty Years of Progress in Neonatal and Maternal Transport for Specialty Care. JOGNN Journal of Obstetric, Gynecologic, and Neonatal Nursing, 50(6). https://doi.org/10.1016/j.jogn.2021.04.013
- [35]. Persaud-Sharma, V. (2020). Rethinking maternal healthcare for the 21st century in the United States. *Journal of Health and Social Sciences*, 5(3). https://doi.org/10.19204/2020/rthn1
- [36]. Pham, B. N., Emori, R. B., Ha, T., Parrish, A. M., & Okely, A. D. (2022). Estimating Child Mortality at the Sub-national Level in Papua New Guinea: Evidence From the Integrated Health and Demographic Surveillance System. *Frontiers in Public Health*, 9. https://doi.org/10.3389/fpubh.2021.723252
- [37]. Reduce child mortality. (2021). https://doi.org/10.18356/9789210550307c012
- [38]. Roberton, T., Carter, E. D., Chou, V. B., Stegmuller, A. R., Jackson, B. D., Tam, Y., Sawadogo-Lewis, T., & Walker, N. (2020). Early estimates of the indirect effects of the COVID-19 pandemic on maternal and child mortality in low-income and middle-income countries: a modelling study. *The Lancet Global Health*, 8(7). https://doi.org/10.1016/S2214-109X(20)30229-1
- [39]. Robinson, E., Lee, L., Roberts, L. F., Poelhekke, A., Charles, X., Ouabo, A., Vyncke, J., Ariti, C., Gbanzi, M. C. A., Ouakouma, M. T., Gray, N., Daly, M., White, K., Templeman, S., Hejdenberg, M., Hersevoort, M., Pena, S. J., & Kuehne, A. (2021). Mortality beyond emergency threshold in a silent crisis–results from a population-based mortality survey in Ouaka prefecture, Central African Republic, 2020. *Conflict and Health*, 15(1). https://doi.org/10.1186/s13031-021-00385-2
- [40]. Shahid Ali, S. (2015). Maternal Mortality Rate. *Journal of Pregnancy and Child Health*, 02(03). https://doi.org/10.4172/2376-127x.1000e112
- [41]. Sharrow, D., Hug, L., You, D., Alkema, L., Black, R., Cousens, S., Croft, T., Gaigbe-Togbe, V., Gerland, P., Guillot, M., Hill, K., Masquelier, B., Mathers, C., Pedersen, J., Strong, K. L., Suzuki, E., Wakefield, J., & Walker, N. (2022). Global, regional, and national trends in under-5 mortality between 1990 and 2019 with scenario-based projections until 2030: a systematic analysis by the UN Inter-agency Group for Child Mortality Estimation. *The Lancet Global Health*, 10(2). https://doi.org/10.1016/S2214-109X(21)00515-5
- [42]. Sheffield, P. E., & Landrigan, P. J. (2011). Global climate change and children's health: Threats and strategies for prevention. In *Environmental Health Perspectives* (Vol. 119, Issue 3). https://doi.org/10.1289/ehp.1002233
- [43]. Sidhu, N., Wang, Y., Barrett, E., & Casas, M. (2020). Prevalence and presentation patterns of enamel hypomineralisation (MIH and HSPM) among paediatric hospital dental patients in Toronto, Canada: a cross-sectional study. *European Archives*

https://doi.org/10.38124/ijisrt/25may381

of Paediatric Dentistry, 21(2). https://doi.org/10.1007/s40368-019-00477-x

- [44]. Sly, P. D., Arphacharus, N., Aung, W. P., Coleman, G. W., Gamble, M. V, Graziano, J., Hai, D. N., Henshaw, D. L., Navasumrit, P., Ravichandran, B., Ruchirawat, M., Suk, W. A., & Tshering, U. (2017). South-East Asian Children's Environmental Health: networking to improve health outcomes. *Bhutan Health Journal*, 3(2). https://doi.org/10.47811/bhj.48
- [45]. Tam, J., Papenburg, J., Fanella, S., Asner, S., Barton, M., Bergeron, C., Desai, S., Hui, C., Foo, C., Langley, J. M., Leifso, K., Ma, M. L., Pernica, J., Robinson, J., Singh, R., Tapiero, B., & Allen, U. (2019). Pediatric investigators collaborative network on infections in Canada study of respiratory syncytial virus-associated deaths in pediatric patients in Canada, 2003-2013. *Clinical Infectious Diseases*, 68(1). https://doi.org/10.1093/cid/ciy413
- [46]. UN-IGME. (2018). Levels and Trends in Child Mortality Report 2018 | United Nations Population Division | Department of Economic and Social Affairs. In *United Nations*.
- [47]. UNICEF. (2015a). Levels and trends in child mortality: United Nations Inter-agency Group for Child Mortality Estimation (UN-IGME), 2015 report. *Report 2015*.
- [48]. UNICEF. (2015b). United Nations Inter-agency Group for Child Mortality Estimation (UN IGME), 'Levels & Trends in Child Mortality. Report 2015', United Nations Children's Fund, New York, 2015, available from <www.childmortality.org>. UNICEF WHO World Bank Group United Nations.
- [49]. United Nations. (2015). Levels and Trends in Child Mortality Report 2015 | United Nations Population Division | Department of Economic and Social Affairs. In *United Nations*.
- [50]. Van Malderen, C., Amouzou, A., Barros, A. J. D., Masquelier, B., Van Oyen, H., & Speybroeck, N. (2019). Socioeconomic factors contributing to under-five mortality in sub-Saharan Africa: A decomposition analysis. *BMC Public Health*, 19(1). https://doi.org/10.1186/s12889-019-7111-8
- [51]. WHO, UNICEF, UNFPA, W. B. (2015). Trends in maternal mortality 2010 2015, WHO. World Health Organization.
- [52]. WHO, U. U. T. W. B. (2015). WHO\_2015\_Trends in maternal mortality. Bulletin of the World Health Organization (WHO).
- [53]. World Health Organization. (2006). Taking stock : HIV in children. Who.
- [54]. World Health Organization (WHO). (2022). Child mortality (under 5 years). Fact Sheets, January.
- [55]. Yu, Y., Liew, Z., Wang, A., Arah, O. A., Li, J., Olsen, J., Cnattingius, S., Qin, G., Obel, C., Fu, B., & Li, J. (2019). Mediating roles of preterm birth and restricted fetal growth in the relationship between maternal education and infant mortality: A danish population-based cohort study. *PLoS Medicine*, *16*(6). https://doi.org/10.1371/journal.pmed.1002831

# APPENDIX

## > Appendix A: Variable under description

## Table 8 Infant Mortality Rates for Mothers by Race and Ethnicity against the levels of education

Level of Education	Race/Ethnicity	% Mortality Rates
High School		
	African American	75%
	Whites	45%
	American Indian Natives	54%
	Asian American	41%
	Hispanics	58%
College		
	African American	62%
	Whites	33%
	American Indian Natives	56%
	Asian American	31%
	Hispanics	57%
Advanced Learning		
	African American	42%
	Whites	22%
	American Indian Natives	27%
	Asian American	32%
	Hispanics	24%

## Table 9 Analysis of Leading Cause of Infant Death According to the ICD 11in Ontario Canada from 2019-2023

	Infant Mortality Rate Broken Down by					
	Age Group (Under 5 Years Old)		-	-	-	-
ICD-11 leading causes of neonatal						
mortality	Characteristics	2019	2020	2021	2022	2023
Conditions affecting the circulatory						
system		Number				
	Ranking the leading causes of infant death	11	15	11	16	17
	Infant Deaths by Number	32	22	41	19	29
Infant impacted by pregnancy-related issues during pregnancy	Ranking the leading causes of infant death	3	3	3	3	3
	Infant Deaths by Number	172	146	145	155	169
Infants impacted by placental, cord, and membrane problems	Ranking the leading causes of infant death	4	4	4	4	4
	Infant Deaths by Number	99	89	82	74	73
Infants impacted by additional birth- related problems	Ranking the leading causes of infant death	5	5	5	5	5
	Infant Deaths by Number	65	59	54	69	52
Disorders associated with preterm birth and low birth weight that are not classified elsewhere	Ranking the leading causes of infant death	2	2	2	2	2
	Infant Deaths by Number	178	215	179	168	186
Hypoxia within the uterus and birth asphyxia	Ranking the leading causes of infant death	6	7	6	7	6
	Infant Deaths by Number	50	38	47	43	41
Infant respiratory distress	Ranking the leading causes of infant death	12	11	12	11	11
	Infant Deaths by Number	19	21	17	22	18
Bacterial peritonitis in infants	Ranking the leading causes of infant death	7	7	9	8	8
	Infant Deaths by Number	48	38	30	38	36
hemorrhages in Neonatals	Ranking the leading causes of infant death	7	7	7	6	7

# International Journal of Innovative Science and Research Technology

ISSN No: -2456-2165

https://doi.org/10.38124/ijisrt/25may381

	Infant Deaths by Number	48	38	37	49	39
Various birth defects, anomalies in chromosome structure, and deformities	Ranking the leading causes of infant death	1	1	1	1	1
	Infant Deaths by Number	418	333	395	312	323
Infant mortality syndrome	Ranking the leading causes of infant death	14	13	15	10	10
	Infant Deaths by Number	15	14	11	27	20
Incidents (inadvertent harm)	Ranking the leading causes of infant death	10	6	10	14	12
	Infant Deaths by Number	30	42	25	10	16

Table 10 Analysis of Child Mortality Gender Distribution in Ontario Province from the period 2012-2023

Geographic														
area	Indicator	Sex												
			2023	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012
	Under-													
	five													
Ontario	deaths	Female	843	846	855	877	888	897	913	925	934	942	944	954
	Under-													
	five													
Ontario	deaths	Male	1030	1032	1042	1064	1074	1079	1104	1126	1140	1152	1161	1175
	Under-													
	five													
Ontario	deaths	Total	1873	1878	1897	1941	1962	1976	2017	2051	2074	2094	2105	2129