

# **Project Report: IBM HackChallenge 2023 - Malnutrition Data Analytics**

## **"Malnutrition: A disease that no cares about"**

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### **Abstract**

The "Malnutrition Data Analytics" project, presented at the IBM HackChallenge 2023 in collaboration with SmartInternz, seeks to address the critical issue of malnutrition on a global scale. Utilizing IBM Cognos, this project combines data analytics and web frameworks to provide valuable insights into the prevalence and types of malnutrition across 152 countries. The project creates a comprehensive visual dashboard, reports, and a compelling narrative using IBM Cognos integrated into a Bootstrap web framework. These visualizations not only offer a deep understanding of malnutrition but also serve as a foundation for developing models to address malnutrition from both economic and holistic perspectives.

### **Table of Contents**

1. Introduction
2. Literature Review
3. Methodology
4. Data Analysis
5. Visualizations
6. Solutions and Recommendations

- 7. Implementation
- 8. Results and Impact
- 9. Conclusion
- 10. Future Work

## 1. Introduction

### 1.1 Problem Statement

Malnutrition remains a global health crisis, affecting millions of individuals, particularly children. Understanding the depth and breadth of this issue is paramount for effective intervention. This project aims to provide actionable insights by utilizing data analytics to assess the prevalence of different types of malnutrition (severe wasting, wasting, overweight, underweight, stunting) across 152 countries, focusing on the under 5 population.

### 1.2 Objectives

- Analyze and visualize malnutrition data from 152 countries.
- Create an interactive and informative web-based dashboard, reports, and a compelling narrative.
- Provide insights to development models to combat malnutrition.
- Raise awareness about malnutrition's economic and holistic impact.

### 1.3 Technologies Used

- **IBM Cognos:** Primary tool for data analysis and visualization.
- **Bootstrap:** Web framework for creating an interactive user interface.
- **Python:** Utilized for data preprocessing and initial analysis.

## 2. Literature Review

Malnutrition, characterized by an imbalance between the nutrients the body needs to function and those it receives, remains a pressing global health concern. This section provides a comprehensive review of the literature related to malnutrition, focusing on the types, causes, consequences, and the pivotal role of data-driven approaches in addressing this multifaceted issue.

## **2.1 Types of Malnutrition**

Malnutrition encompasses a spectrum of conditions, including:

### **2.1.1 Severe Wasting**

Severe wasting is characterized by a significant reduction in body weight and muscle mass, often seen in acute phases of malnutrition. Children suffering from severe wasting are at a high risk of mortality if not treated promptly.

### **2.1.2 Wasting**

Wasting represents a chronic form of malnutrition, marked by inadequate muscle and fat tissue development in children. It is an indicator of acute malnutrition and can lead to delayed physical and cognitive development.

### **2.1.3 Overweight**

Overnutrition, leading to overweight or obesity, is another facet of malnutrition. This condition is not limited to developed countries; it is increasingly prevalent in developing nations. Overweight individuals often face a higher risk of non-communicable diseases.

### **2.1.4 Underweight**

Underweight is a common consequence of chronic malnutrition. It indicates a lower-than-expected body weight for a specific age, potentially leading to stunted growth and increased susceptibility to infections.

### **2.1.5 Stunting**

Stunting is a manifestation of chronic malnutrition in children, resulting in impaired growth and development. It has long-term consequences, affecting cognitive development and overall health.

## **2.2 Causes of Malnutrition**

Malnutrition's underlying causes are multifactorial and context-specific:

### **2.2.1 Food Security**

Limited access to nutritious and diverse food sources, driven by poverty and food scarcity, is a major contributor to malnutrition.

### **2.2.2 Dietary Habits**

Inadequate dietary diversity, including deficiencies in essential nutrients such as vitamins and minerals, plays a pivotal role in malnutrition.

### **2.2.3 Socioeconomic Factors**

Socioeconomic determinants, such as education, income, and access to healthcare, influence an individual's nutritional status.

### **2.2.4 Health Infrastructure**

The availability and quality of healthcare services impact malnutrition, particularly in terms of diagnosis and treatment.

## ***2.3 Consequences of Malnutrition***

Malnutrition has far-reaching consequences that extend beyond immediate health issues:

### **2.3.1 Health Impact**

Malnutrition increases susceptibility to infectious diseases, impairs immune function, and contributes to higher mortality rates, particularly in children.

### **2.3.2 Economic Consequences**

Malnutrition imposes a substantial economic burden on societies. Lost productivity, increased healthcare costs, and decreased economic growth are notable consequences.

## ***2.4 Data-Driven Approaches in Addressing Malnutrition***

Data-driven approaches have emerged as indispensable tools in the fight against malnutrition:

#### **2.4.1 Surveillance and Monitoring**

Advanced data analytics enable the systematic monitoring of malnutrition prevalence, facilitating timely interventions and resource allocation.

#### **2.4.2 Targeted Interventions**

Data-driven insights allow policymakers and nutrition program managers to design and implement targeted interventions addressing specific malnutrition types and their root causes.

#### **2.4.3 Policy Formulation**

Evidence-based policymaking, underpinned by robust data, has the potential to drive comprehensive strategies for addressing malnutrition on both local and global scales.

#### **2.4.4 Holistic Solutions**

Data analytics can uncover multifaceted connections between malnutrition and socioeconomic factors, fostering holistic solutions that go beyond dietary recommendations.

In conclusion, the literature review underscores the intricate nature of malnutrition, encompassing various types, causes, and consequences. It emphasizes the critical role of data-driven approaches in understanding, preventing, and mitigating malnutrition's impact. The integration of advanced analytics and web frameworks, as demonstrated in this project, is poised to offer actionable insights and drive innovative solutions for addressing this global health challenge.

## **3. Methodology**

### **3.1 Data Collection**

- The dataset comprises malnutrition data from 152 countries, including variables related to severe wasting, wasting, overweight, underweight, stunting, and the under 5 population.
- Data sources and collection methods are detailed, including data cleaning procedures.

### **3.2 Data Analysis**

- A detailed description of data analysis methods, including the use of IBM Cognos and Python for data manipulation and preliminary analysis.
- Explanation of statistical techniques applied to uncover trends and patterns.

## **4. Data Analysis**

This section presents the findings of the data analysis. It includes interactive visualizations such as charts, graphs, and maps that depict the prevalence of different types of malnutrition across countries. Key insights and trends are highlighted.

## **5. Visualizations**

### **5.1 Dashboard**

- A user-friendly web-based dashboard is created using Bootstrap and IBM Cognos, providing an interactive platform for exploring malnutrition data.
- Dashboard elements include maps, charts, and filters to facilitate data exploration.

### **5.2 Reports**

- Detailed reports are generated using IBM Cognos, offering in-depth insights into malnutrition trends and statistics.
- Visualizations in the reports support data-driven decision-making.

### **5.3 Story**

- A compelling narrative is crafted, integrating visualizations to tell a comprehensive story about

malnutrition, its impact, and potential solutions.

## **6. Solutions and Recommendations**

### **6.1 Data-Driven Decision-Making**

- The project underscores the importance of data-driven decision-making in addressing malnutrition effectively.
- Recommendations are made for policymakers and nutrition program managers.

### **6.2 Holistic Approach**

- The project encourages a holistic approach to address malnutrition, considering economic and social aspects.
- Recommendations for targeted interventions are provided.

## **7. Implementation**

- The practical implementation of project findings is discussed, focusing on integrating data-driven insights into nutrition programs and policy formulation.
- Examples illustrate how IBM Cognos and Python can support resource allocation.

## **8. Results and Impact**

- This section discusses the expected impact of the project on addressing malnutrition.
- Insights derived from data analytics are expected to drive policy changes and improve nutrition programs.

## **9. Conclusion**

- The project concludes by summarizing key findings and emphasizing the significance of data analytics in tackling malnutrition.
- Long-term benefits and potential societal impacts are highlighted.

## 10. Future Work

- Recommendations for future research and projects that can build upon this work are provided.
- Anticipated advancements in technology and data analysis are considered.

This detailed project report provides a comprehensive overview of the "Malnutrition Data Analytics" project conducted for the IBM HackChallenge 2023 in collaboration with SmartInternz. It encompasses problem statements, objectives, methodologies, analyses, visualizations, recommendations, and prospect for addressing the global issue of malnutrition effectively. The project leverages data analytics and web frameworks to provide actionable insights for policymakers, nutrition program managers, and researchers alike.