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**Child Health in Darfur, Sudan: Addressing the Effects of Armed  
Conflict on Children's Health in Darfur**

**By**

Judith Natukunda

A Capstone Project submitted in partial fulfillment of the requirement for the  
degree of Master's in Public Health

Health Policy Leadership

University of San Francisco

August 2022

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This project is dedicated to all brave children who have survived the effects of armed conflict globally.

## **ABSTRACT**

**Background:** For 19 years, the Darfur region of Sudan has experienced unending civil unrest and war, resulting in more than 2 million deaths and over 4 million displaced persons. The war led to severe food insecurity, clean and safe drinking water shortages, high disease prevalence, destruction of infrastructure, and a broken health care system. Despite the interventions by the global community and various humanitarian agencies, over 2.8 million people are still displaced and living in IDP camps across Darfur. Over 300,000 children are living in neighboring Chad. The armed conflict led to high levels of child malnutrition, a high prevalence of infectious diseases, and an increased child mortality rate within the region.

**Purpose:** This review focuses on children aged 0-5 years that are displaced and currently living in IDP camps due to the armed conflict in Darfur. The review aims at addressing the effects of the armed conflict on the health of these children

**Recommendations:** The review recommends the introduction of WASH and wastes management facilities within camps, a massive child immunization campaign, and the inclusion of nutritious food supplements and therapeutic feeding centers to avert the public health crisis among the children in Darfur.

**Conclusion:** The recommendations in this review are not limited to the children in Darfur or regions affected by armed conflicts. Humanitarian emergencies disproportionately affect children due to their vulnerability to advocate for themselves, especially in low- and middle-income countries. The recommendations are applicable in most public health crises to improve the health and well-being of children.

**Keywords:** Effects, Armed conflict, Children's health, Darfur, Sudan

## **1. Introduction**

### **1.1 Brief Background of Darfur's Armed Conflict**

An armed conflict, also known as "The Land Cruiser War," raged in the Darfur region of Sudan from February 2003 to August 2020 ("War in Darfur," 2021). Darfur lies in western Sudan near Libya, Chad, and the Central African Republic (CAR). The armed conflict began with two rebel groups (Sudan Liberation Movement SLM and Justice and Equality Movement JEM) fighting against the Sudanese government. The rebel groups believed the Sudanese government was oppressing Darfur's non-Arab population ("War in Darfur," 2021). In response, the Sudanese government carried out a campaign of ethnic cleansing that led to the massive and ruthless killing of Darfur's non-Arabs. As of spring 2020, there have been over 480,000 deaths, and more than 2.8 million people were displaced from their homes and communities (*Sudan – Darfur « World Without Genocide - Making It Our Legacy*, n.d.). On August 31, 2021, the Sudanese government and several rebel factions signed a comprehensive peace agreement to end the armed hostilities ("War in Darfur," 2021). The Peace Agreement led to the indictment of Sudan's president, Omar al-Bashir, for war crimes and crimes against humanity by the International Criminal Court (ICC) ("War in Darfur," 2021).

### **1.2 Current Standing**

There has been a wave of intercommunal violence in West Darfur. Darfur's returning refugees are continually clashing with the new settlers causing strife, violence, and deaths over former land ownership, cattle, and property. As of June 2021, inter-communal conflicts have led to over 250 deaths and over 10,000 displacements of civilians, mainly women and children, and the destruction of aid delivery locations, hospitals, and government buildings (*Sudan*, 2021). Displaced civilians continue to seek refuge in neighboring Chad. Today, tensions remain high in

West Darfur localities. This has worsened the health crisis in refugee camps both in Darfur and in neighboring countries like Chad.

#### **1.4 Purpose of the Review**

The purpose of this research paper is to assess the effects that the armed conflict has had on the health of children in Darfur and to recommend solutions that would advance better health outcomes for these children. The conflict in Darfur has left devastating long-term effects on all its citizens irrespective of age, sex, and social-economic status. Children, a significantly vulnerable population, were severely impacted. Many children have migrated into internally displaced peoples' camps (IDPs). In this paper, Internally Displaced Peoples (IDPs) camps mean refugee camps for individuals and families who have been forced from their communities and homes and are living in temporary tents with minimal basic needs like food, water, and medicine. The most significant number of civilians living in IDP camps are children and women.

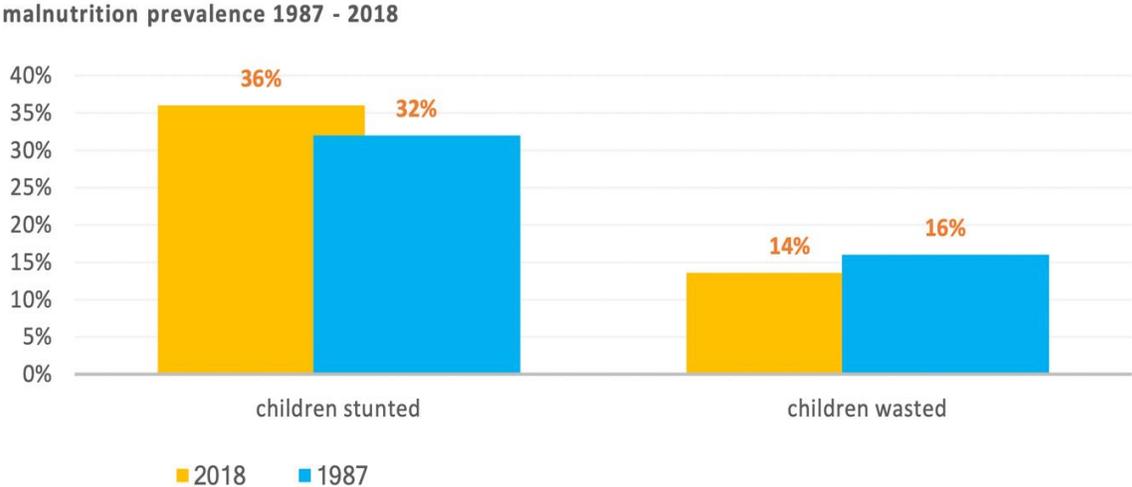
## **2. Literature review**

### **2.1 Acute Malnutrition**

The leading risk factor causing most deaths and disabilities in Sudan is malnutrition (Murray et al., 2020). According to the World Health Organization (WHO), malnutrition refers to deficiencies or excesses in nutrient intake, imbalance of essential nutrients, or impaired nutrient utilization (*Malnutrition*, n.d.). Malnutrition has two broad categories: undernutrition and overweight or obesity. Children suffering from malnutrition may experience stunting, underweight, wasting, and micronutrient shortages. Wasting is defined as low weight-for-height (Caulfield et al., 2006). It is severe weight loss and can also persist for a long time. It usually results from one's failure to have enough food in both quality and quantity. Wasting in children under five years is associated with a higher risk of death if not treated properly (Ezzati et al., 2002). Stunting is defined as low height-for-age. Stunting is identified by assessing a child's height (recumbent length for children less than 2 years old and standing height for children age 2 years or older) and interpreting the measurements by comparing them with an acceptable set of standard values (de Onis & Branca, 2016). Both conditions result in acute malnutrition, linked with disorders like kwashiorkor and marasmus (Dipasquale et al., 2020). Acute malnutrition is responsible for almost one-third of all deaths globally in children under 5 years of age (Shahrin et al., 2015).

This paper will focus on acute malnutrition, a condition facing most of Darfur's children resulting in stunting, wasting, and underweight children in Darfur. Based on a 2021 report, approximately 3.3 million people are acutely malnourished, 522,000 children are suffering from severe acute malnutrition, and about 2.2 million children require treatment for moderate acute malnutrition (Abu-Manga et al., 2021). In addition, a 2021 UNICEF Nutrition Report on Sudan

also indicated that 1 out of every 18 would not reach their fifth birthday, and 1 in 7 will not have enough food to prevent wasting and stunting (*UNICEF Sudan-Nutrition- Report (2021).Pdf*, n.d.). Malnutrition among children under five increased between 2006 and 2014 due to the severity of the armed conflict and displacement of families. The prevalence of underweight children in Darfur rose from 27% in 2006 to 29.7% in 2010, and this rate increased further to 33% by 2014 (Dahab et al., 2020). Although malnutrition rates in Sudan have improved in the past 30 years, the number of children who are stunted and wasted has increased since 1987, especially in Sudan’s conflict-ridden Darfur region (*UNICEF Sudan-Nutrition- Report (2021).Pdf*, n.d.).



**Figure 1: Malnutrition prevalence in Sudan from 1987 - 2018**

Malnutrition is primarily due to a lack of food security and adequate health care services provided by the government, particularly immunization. The militias loot and destroy household property and assets like livestock and burn down plantations and other farm crops. These inhumane actions threaten household food security, affecting children's food consumption, a direct determinant of malnutrition. In addition, civilians cannot find and keep jobs due to a lack of safety or constant running. Consequently, families are unable to afford to buy food. Families

are forced to flee into bushes and IDP camps. Within the IDP camps, there is a scarcity of food, clean water, and poor sanitation, leaving children vulnerable to starvation and diseases.

## **2.2 Infectious Diseases**

Humanitarian emergencies negatively affect public health and increase the risk of infectious diseases (Hammer et al., 2019). Populations displaced by armed conflict have increased vulnerabilities to health risks due to overcrowding in camps, inadequate water, poor sanitation, and lack of proper healthcare services (Allotey & Reidpath, 2019). Children in IDP camps are vulnerable to infectious diseases like cholera, dysentery, and other diarrheal diseases. Infectious diseases are responsible for about 25% to 47% of deaths among children under five years in Darfur (Grandesso et al., 2005). The lack of access to clean and safe water sources and poor human waste management are critical risk factors promoting the health crisis (Macleod et al., 2019).

Around 40% of un and under-vaccinated children are vulnerable to diseases like measles and polio and live either partially or entirely affected by conflict, leading to deaths or profound disability (*Immunization and Conflict*, n.d.). Children lack healthcare services, particularly immunization, leaving them vulnerable to diseases like measles, Hepatitis B, tetanus, and polio, among others. Infectious disease outbreaks in IDP camps have been attributed to a lack of essential healthcare services like timely immunizations and disrupted immunization schedules due to displacements, breakdown, and destruction of health facilities, supplies, and equipment, as well as abduction and killing of health workers (Kadir et al., 2019). Although the last reported polio cases in Sudan were in 2009, children living in camps remain in high-risk areas due to low immunization levels, overly crowded camps, and high malnutrition rates (Grundy & Biggs, 2018).

### 2.3 Public health trends and health outcomes

The conflict in Darfur has led to infrastructural gaps, especially within the already fragile healthcare system. There has been a lack of proper access to health facilities, limited resources, and an inadequate workforce, which have all contributed to the poor implementation of health programs (Charani et al., 2019). The delicacy of Sudan's healthcare system has contributed to its ranking of 152 out of 195 countries by the Global Health Index (*Sudan.Pdf*, n.d.). As per the Global Health Security Index report 2021, Sudan's health system is ranked at 12.8 compared to the global average of 31.5 and 178<sup>th</sup> out of 195 countries with high public health vulnerabilities (*Sudan.Pdf*, n.d.). The failure of access to functional healthcare facilities, shortage of healthcare workers, high rates of infection, poor disease control practices, and the political and security risks have all contributed to the poor health conditions of children. This has contributed to the global burden of disease. In addition, Sudan's continuous failure to meet the United Nations Sustainable Development Goals (SDGs) has been attributed to its broken healthcare system and political instability (*THE 17 GOALS / Sustainable Development*, n.d.).

The severity of the crisis has worsened with increasing morbidity and mortality rates among children under five. The prolonged conflict has led to increased severity of diseases, malnutrition, deaths, and a diminished public health system. An increase in infectious diseases has contributed to 30% of deaths. For example, the malaria endemic is estimated at 1.5 million cases annually, with Sudan accounting for 35% of the malaria burden in the Eastern Mediterranean region (Charani et al., 2019). In addition, there have been hundreds of suspected cases of measles reported across East Darfur this year (*MSF Is Supporting Ministry of Health in Conducting Measles Vaccination Campaign in East Darfur State - Sudan*, n.d.-a). In addition, Sudan's fragile healthcare system was further devastated by the COVID-19 pandemic leading to

a high mortality rate due to a lack of clean and safe water sources and cleaning supplies (*Health.Pdf*, n.d.).

#### **2.4 The morbidity and mortality associated with the Darfur crisis**

The armed conflict in Darfur has left its citizens, particularly children living in constant fear and migrating from one village to another or into IDP camps on the border of Chad. Adults have lost their property from the looting and burning of villages by militias, and children are constantly at risk of being abducted and turned into war soldiers (Morgos et al., 2007). The armed conflict has also left neighboring countries like Chad, the Central African Republic (CAR), Democratic Republic of Congo (DRC) in a public health crisis with the increasing densely populated IDP camps. These governments are compelled to offer the refugees health care services and other essential needs, yet their healthcare systems are not robust enough to assist.

According to 2019 data from the Institute of Health Metrics and Evaluation (IHME), Sudan's leading risk factors for death and disability are malnutrition and WASH (Water, Sanitation, and Hygiene), contributing to 42.9% and 59.0%, respectively (*Sudan*, n.d.). Diarrheal diseases contribute to 61% of deaths within the region, mainly due to lack of access to clean and safe drinking water, poor sanitation, malnutrition, and improper disposal of human waste. Children impacted by the conflict in Darfur are 3.15 times more likely to die before their first birthday in Darfur (88.5 deaths per 1000 live births) due to malnutrition and infectious diseases (Boutayeb et al., 2020). According to UNICEF's 2020 report on Sudan, children continue to die from preventable diseases such as pneumonia, diarrhea, and malaria, with malnutrition as the underlying factor (*Health.Pdf*, n.d.). Though there have been efforts to combat the health crisis among children in Darfur, disease prevalence and mortality rates are indicators that there is a

need for more interventions targeted at children, especially under five years, rather than trying to resolve the crisis without programs and interventions tailored for specific affected populations.

## **2.5 Current steps to address the Darfur crisis**

International Organizations like the United Nations High Commissioner for Refugees (UNHCR), United Nations Children's Fund (UNICEF), and other international humanitarian agencies like the World Food Program (WFP) have operated in Darfur for years addressing the public health crisis. They have set up, funded, and operated temporary health care facilities and feeding centers coupled with active screening for malnutrition among children under 5 years (Carroll et al., 2017). The African Union-United Nations Hybrid Operation in Darfur (UNAMID) was established in 2007 with the core mandate of protection of civilians but is also tasked with contributing to security for humanitarian assistance, monitoring and verifying the implementation of agreements, assisting an inclusive political process, contributing to the promotion of human rights and the rule of law, and monitoring and reporting on the situation along the borders with Chad and the Central African Republic (*UNAMID*, n.d.). UNAMID's activities in Darfur ended on December 31, 2020, leaving civilians vulnerable to the current intercommunal violence ongoing in Darfur today.

The Sudanese government, International Non-Governmental Organizations (NGOs) have also intervened to address the public health crisis in Darfur. International NGOs like World Vision and Doctors Without Borders have delivered immunization and healthcare services for children and women in Darfur and IDP camps on Chad's border. Private healthcare providers have also offered labor in vaccinating the displaced populations of Darfur. Fifty five percent of private health facilities in Sudan provide immunization services within Khartoum and Darfur (N. Ahmed et al., 2019). The vaccines are provided by the government and administered at no cost.

In 2017, private providers administered around 16% of all third doses of diphtheria, pertussis, tetanus, hepatitis B, and Haemophilus influenza type b vaccines to children who were unvaccinated or had disrupted their vaccination schedules (N. Ahmed et al., 2019).

## **2.6 Existing Gaps/ Conclusion**

Over the years, persistent efforts have been made to end Darfur's public health crisis. However, there are existing gaps in the access to healthcare services among the displaced children of Darfur. Children have been displaced from their homes, separated from their family members and caretakers, and live in overly crowded IDP camps. Children have been left vulnerable to abductions from IDP by the militias and recruited as war soldiers because they are promised essential health needs like food, proper shelter, water, and protection. The current interventions are insufficient to address the growing influx of child refugees within the camps. This paper will address the two major public health crises affecting the health of children in Darfur. These are acute malnutrition and infectious diseases. These continue to severely impact children under 5 years in Darfur and the surrounding IDP camps, leaving them vulnerable to disease, starvation, and death.

### 3. Methods

#### 3.1 Search Strategy

In conducting this literature review on, “Addressing the effects of armed conflict on the health of children in Darfur, Sudan,” a search strategy was developed. The PICO (Population, Intervention, Comparison, Outcome) model framework (Eriksen & Frandsen, 2018) was used to identify what the review will focus on.

<b>Population</b>	<b>Intervention</b>	<b>Comparison</b>	<b>Outcome</b>
Children of Darfur aged 0-5 years	<ul style="list-style-type: none"><li>• Establishment of WASH facilities and Waste management facilities</li><li>• Massive child Immunization campaign</li><li>• Inclusion of nutritious food supplements and therapeutic feeding centers</li></ul>	N/A	Better and positive health outcomes among children and reduction of high mortality rates caused by preventable diseases

**Table 1: PICO model framework for the literature review**

Keywords were used to direct the search to the specific and relevant literature. These included: effects, implications, impacts, results, outcomes, armed conflict, war, civil unrest, Sub-Saharan Africa, Sudan, Darfur children, infants, public health, and child health. The Boolean expressions "AND," "OR," and "NOT" were applied to filter the articles, focus the search, and increase relevancy. The search was limited to years between 2003-2022. *Appendix A for search strategy*

#### 3.2 Settings

The literature review focuses on children living in Darfur from 2003 till today. According to the United Nations Convention on the Rights of the Child, a child means “every human being

below the age of eighteen years unless under the law applicable to the child, the majority is attained earlier” (*Convention on the Rights of the Child*, n.d.). This literature review focuses on children aged 0-5 as the study population.

### **3.3 Data and information collected**

The literature was mainly retrieved through searching online databases. Databases searched were BMC Public Health, The Lancet, PubMed Central, BMJ Global Health, Journal of Peace Research, Public Library of Science, JAMA, the Achieves of Disease in Childhood, International Journal of Social Psychiatry, Archives of Pediatrics and Adolescent Medicine, International Journal of Human Rights, Africa Health Sciences, and UNICEF USA. The search retrieved both primary and secondary sources. In addition, the research involved reference chaining, whereby I looked through the articles’ reference lists to find relevant articles that did not appear in the search. After the search, inclusion and exclusion criteria were also used. This criterion excluded non-English literature, articles published before 2003, news articles, editorials, and handbooks. Articles that did not focus on children as the target population were also excluded. Thirty-two articles fit the criteria to support this literature review.

#### **4. Recommendations.**

Internally displaced children in Darfur currently live in refugee camps in Darfur and across the borders of Chad, DRC, Uganda, and the Central African Republic. Despite the ongoing efforts to combat the crisis in Darfur, there is a constant influx of refugees within the camps due to the unending cycles of violence and conflict within the region. This has left them very crowded, leaving the children vulnerable to a wide range of diseases and infections and a high morbidity and mortality rate within the region. The recommendations shared in this paper apply to children currently living in IDP camps in Darfur and the surrounding areas because of the armed conflict. The armed conflict has led to mass displacement of children, separation from family members and caretakers, starvation, malnutrition, and a high disease prevalence.

##### **4.1 Recommendation 1 - Expansion of WASH (Water, Sanitation, and Hygiene) and waste management facilities.**

Clean water and sanitation are among the most significant innovations in Public Health history (Boseley, 2007) due to the ability to save lives and prevent disease and infections. The United Nations' Sustainable development goal (SDG) no.6 calls for the elimination of open defecation and universal access to safe drinking water, sanitation, and hygiene for all (Odagiri et al., 2018). According to the 2020 WHO report, 3.6 billion people lacked safely managed sanitation services, 2.3 billion lacked adequate handwashing facilities, soap, and water, and just under 900 million people were practicing open defecation globally. (Als et al., 2020). Over 8 million children are currently in need of humanitarian assistance (*UNICEF Sudan- Water, Sanitation and Hygiene- Report (2021).Pdf*, n.d.), and it is now more than ever that this essential health need is delivered to the children of Darfur. The armed conflict in Darfur is responsible for

the mass displacement of children into IDP camps. Children living in camps risk exposure to unsafe and insufficient water supply and inadequate sanitation facilities (Als et al., 2020).

Expansion of WASH and waste management facilities would provide easy access to clean and safe drinking water, improve personal hygiene, and decrease the prevalence of diarrheal diseases like cholera and dysentery and morbidity and mortality rates. The global burden of disease and mortality rates would reduce by about 9.1% and 6.3%, respectively, if WASH facilities were available (Joshi & Amadi, 2013). In addition, the outbreak of COVID-19 within IDP camps has exacerbated the crisis. The lack of WASH facilities essential for personal hygiene and combatting the spread of the virus and other infections have left children vulnerable to disease and death. Ensuring easy access to WASH facilities is crucial to increasing personal hygiene and hand washing and achieving optimal health and well-being for children in Darfur.

#### **4.1.2 Implementation strategy**

The United Nations Children's Fund (UNICEF), United High Commission for Refugees, and World Vision are among the international humanitarian agencies currently operating in Darfur, offering children essential needs like food, shelter, healthcare, clean water, education, and child protection services. Over the last two decades, there have been efforts to provide WASH facilities for children and the population in IDP camps. In the 2021 WASH annual report from UNICEF, 244,714 children benefited from sanitation interventions, and 370,000 children had access to essential water services (*UNICEF Sudan- Water, Sanitation and Hygiene- Report (2021).Pdf*, n.d.). The services averted many diseases and infections within the region.

Despite these efforts, Darfur's cycle of violence continues to cause mass displacements and shortages of essential health services. The services need to be expanded to 98,000 women and children in West Darfur as of June 2022 ("Sudan," 2022). This can be achieved by

constructing water tanks to collect and filter rainwater in IDP camps to increase easy and quick access. Women and children spend long days in queues for a few liters of clean water, forcing many to resort to stagnant water in wells that have increased disease prevalence.

The installation of water tanks would be productive with the provision of large water storage gallons (20 liters) to avoid lining up daily for water. This is a temporary solution as the agencies work towards constructing more efficient and sustainable water systems. In addition, the scarcity of waste management can be addressed by rehabilitating the old and poor-quality latrines in the camps. The rehabilitation would be quicker and more efficient in managing the constant influx of refugees into camps. This will reduce open defecation within the camps and decrease breeding grounds for germs and diarrheal diseases.

#### **4.1.3 Program funding and evaluation strategy**

UNICEF, the central international agency offering humanitarian assistance for vulnerable children in Darfur, receives its program funding mainly from donations from governments, NGOs, the private sector, and individual donors. The top three resource partners in 2021 were the US government (\$884 million), Germany (\$868 million), and the European Union (\$585 million) (*Funding to UNICEF*, n.d.). Private sector contributors included the National Committees of the US, Japan, and Germany, among others. World Vision, an NGO, receives its funding from donors like WHO, World Food Program, Irish Aid, European Commission, Global Affairs Canada, UKAID, USAID, and Danish Relief Alliance, among others. With this funding, these organizations can deliver life-changing services for children in crisis, including those in Darfur.

The impact of programs implemented in Darfur by various organizations can't be assessed unless a situational analysis is conducted. With the available funding, collecting the

data on the child population in need of assistance should be the first step before any programs are implemented in the region. The organizations should also be able to keep track of new refugees joining the camps through a registration program that can be set up within the camp and operated by organizational staff. The organizations should be aware of risk factors increasing disease prevalence and implement intentional programs that are more likely to reduce the regional disease burden. Evaluations can be conducted by the organizational staff every three months to assess the increase or decrease in hygiene practices, use of latrines, and diarrheal disease prevalence. `

#### **4.2 Recommendation 2 – Carrying out a massive immunization campaign for children under 5 years**

Immunization remains one of the essential and cost-effective public health interventions to decrease child mortality and morbidity, saving 2-3 million deaths each year globally (Meleko et al., 2017). The leading causes of child morbidity and mortality in Sub-Saharan Africa are infections and communicable diseases (M. A. A. Ahmed et al., 2022). The high levels of child mortality are primarily due to preventable infectious diseases like measles, tuberculosis, diphtheria, whooping cough, polio, and tetanus. A 2019 study on infant mortality in Sudan indicated that children living in the state of Darfur are 3.15 times more likely to die before their first birthday compared to other states in Sudan (Boutayeb et al., 2020). These deaths have been linked to their underlying nutritional status (Grandesso et al., 2005). Access to WASH facilities doesn't wholly resolve the current health tragedy among children in Darfur unless they are immunized.

As of early 2022, there have been hundreds of suspected measles cases in East Darfur, mainly affecting children between six months and fifteen years (*MSF Is Supporting Ministry of*

*Health in Conducting Measles Vaccination Campaign in East Darfur State - Sudan*, n.d.-a). The mass displacements of children and their separation from parents and caretakers have left them vulnerable to infectious diseases, especially measles, due to their contagious nature. The immunization campaign would intentionally seek out children whose immunization schedules are disrupted or have not been immunized due to a lack of access to the vaccines and safe healthcare facilities.

#### **4.2.1 Implementation strategy**

Over the past several decades, health facilities and health workers have become direct targets of the militia, making them unsafe for health care delivery (Kadir et al., 2018). Despite the various immunization campaigns previously carried out in Darfur camps, the population feels unsafe seeking expert health care from health facilities for their safety and their children. The destruction of medical and public health infrastructure has continued to affect children due to the limited access to quality health care services. This has left many children unvaccinated and vulnerable to diseases and other infections. To address this, the humanitarian organization should consider building and deepening relationships with faith-based organizations and religious leaders. This is fundamental in advancing health priorities in Darfur. Faith-based organizations are trusted by their communities to influence healthy lifestyles and thus deliver health care services and health education in remote areas more than international agencies (*Faith-Based Organizations*, 2019). Leveraging these relationships is the first step to successfully implementing these programs within the region.

The humanitarian organizations would leverage these relationships to reach a larger population through their trusted religious leaders. It would bridge the gap between the refugee population and the humanitarian agencies as well as resolve the issue of a language barrier. With

the collaboration, they can train community health educators to work towards the mobilization of the population and offer referral services. In addition, the immunization should not have to be received only at the healthcare facilities. Several immunization clinics should be set up within the camps at least twice a week to overcome the barrier of hesitancy to visit health care facilities. This would also reduce the long wait times at the health facilities and reduce walking distances for parents who want their children vaccinated.

In collaborating with Sudan's Ministry of Health, UNICEF, Doctors Without Borders, World Vision, and Darfur Peace and Development Organization are ensuring the provision of essential healthcare needs to these children. The humanitarian agencies would avail the labor to train local community health workers. The agency staff would conduct the professional healthcare delivery and administer vaccines. The Sudanese Ministry of Health is also working toward involving private providers in distributing and administering vaccines to the people in camps, including children (N. Ahmed et al., 2019). The vaccines would, however, be distributed by the government and must be administered free of charge.

#### **4.2.2 Program funding and evaluation strategy**

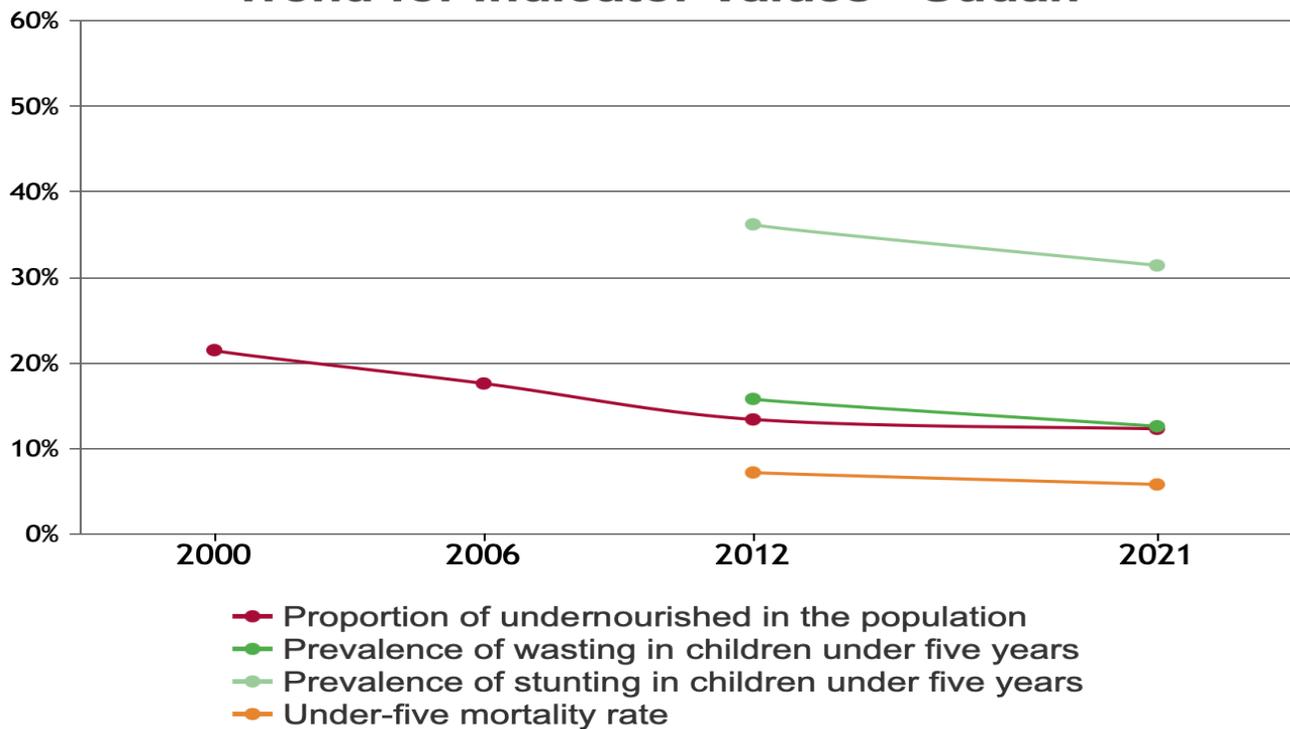
The humanitarian agencies operating in Darfur are not limited to specific service delivery. They include food distribution, health care services, WASH facilities, child protection, and education. The funds received from various donors can effectively be allocated to different programs to fit the needs of the target population. USAID, one of the largest donors of assistance (\$377 million) to the people of Sudan, continues to fund various projects through UNICEF, World Vision, and other NGOs that continue to access the funds through grants (*Find a Funding Opportunity*, 2021).

Agencies like UNICEF carry out different types of evaluation depending on the program region. In Darfur, UNICEF conducts the regional assessment. [The evaluation policy is guided by the norms and standards of the United Nations Evaluation Group \(UNEG\)](#) and good international practices, including assessing humanitarian assistance and children's rights and providing timely evidence for policy changes and advancement of SDGs (*File.Pdf*, n.d.). This would ensure that the programs have a successful impact on the children in Darfur. The evaluation results are available in the agency's annual report and are widely accessible.

#### **4.3 Recommendation 3 – Inclusion of nutritious food supplements and therapeutic feeding centers**

Food and nutrition insecurities become increasingly worse in areas affected by armed conflict (Loewenberg, 2015) due to mass displacements and broken economic systems. The International Policy Research Institute estimates that approximately 112 million malnourished children live in conflict-torn regions accounting for a third of all malnourished children in developing countries (Carroll et al., 2017). Sudan has been highlighted for high prevalence levels of malnutrition among children under 5 years, with a score of 25.1 according to the global hunger index 2021 (*Sudan-1.Pdf*, n.d.). It has been mainly attributed to the prolonged armed conflict. Addressing malnutrition in conflict areas can be challenging and often has been limited to minimal interventions like regular food distribution.

## Trend for Indicator Values - Sudan



**Figure 2 illustrates malnutrition trends and their impact on under-five mortality (*Sudan-1.Pdf, n.d.*).**

The inclusion of nutritious food supplements for children experiencing acute malnutrition will boost the amount of nutrient intake. Nutritional food supplements would be an addition to supplement immunization of the children. Vaccines like vitamin A and C would be administered to children to address vitamin deficiencies and support proper growth and recovery. The nutritious supplements would be successfully distributed through the set-up of therapeutic and supplementary feeding centers.

### 4.3.1 Implementation strategy

Therapeutic and supplementary feeding centers can be set up at different camps to address malnutrition among these children. The centers would offer screening services for malnutrition and enroll malnourished children into the program, where they would access personalized food plans and monitoring as they recover. UNICEF can equitably allocate funds to train local community workers to set up enrollment points within IDP camps. With these, parents can register their children for supplementary nutritious food and treatment. This would resolve

the workforce issue required to implement the program and the language barrier. In 6 studies on therapeutic and supplemental feeding, nutritional food packages including powdered milk, corn flour, powdered eggs, baby food, dried mashed potatoes, margarine, and treatment were provided to severely malnourished children weekly (Carroll et al., 2017). Overall, the therapeutic and supplementary feeding centers were effective in helping children gain a substantial amount of weight to recover from severe and acute malnutrition, with a reduced infant mortality rate among children as the secondary outcome (Tappis et al., 2012)

#### **4.3.2 Program funding and evaluation strategy**

UNICEF, one of the major UN agencies operating in Darfur, upholds children's rights in addition to advancing SDGs. UNICEF staff would carry out program evaluations using patient data collected. A reduced prevalence of malnutrition would be an indicator of better health outcomes among the children in Darfur.

## 5. Implications and Discussion

Armed conflict creates a series of destructive but indirect impacts beyond the number of deaths in battle or combat (Geneva Declaration Secretariat, 2008). Armed conflict has been associated with a high prevalence of preventable diseases and infections, hunger, and malnutrition. Water, sanitation and hygiene, vaccinations, nutrition, access to healthcare, and political will are some of the significant risk factors determining population health in armed conflict (Hammer et al., 2019). A study conducted in a refugee camp in Malawi showed a decrease in diarrhea incidence among refugee children under 5 by providing clean water sources and storage (Roberts et al., 2001). Access to WASH facilities can significantly decrease the high morbidity and mortality rates, especially among children under five during a humanitarian crisis and long-term. The reduction in the prevalence of infectious disease outbreaks like cholera and other diarrheal diseases is a step towards the attainment of SDG no. 6, "Ensure availability and sustainable management of water and sanitation for all" (Goal 6 | Department of Economic and Social Affairs, n.d.) in war-torn regions of Sudan.

Immunization is a global health and development success story, saving millions of lives every year. (*Vaccines and Immunization*, n.d.). Lifesaving vaccines for children, particularly those under five, have significantly reduced the prevalence of diseases like polio, measles, diphtheria, and hepatitis B in low- and middle-income countries. However, children living in humanitarian emergencies are still at low vaccination coverage and vulnerable to vaccine-preventable diseases such as whooping cough, meningitis, polio, tetanus, and measles (Ismail et al., 2020). The successful implementation of vaccination programs would change children's lives, benefit the entire population, and reduce the global disease burden.

The inclusion of nutritious food supplements for children experiencing acute malnutrition in war-torn countries has shown modest results in decreasing the prevalence of stunting, wasting, underweight, reduction in severe or moderate acute malnutrition or both, mortality, anemia, and diarrhea (Carroll et al., 2017). The equitable distribution of food, nutritional supplements, and treatment for children in Darfur will reduce the percentage of children experiencing acute malnutrition in Darfur.

### **5.1 Limitations to this approach**

Despite the persistent efforts by multiple humanitarian agencies to avert the public health crisis in Darfur, the unending violence in the region has been a significant barrier. As of April 2022, Darfur is experiencing inter-communal violence. The Arab Rzeigat and the African Masalit communities clashed in West Darfur, leading to nearly 200 deaths, including at least 21 children and two healthcare workers (West Darfur, 2022). These clashes led to burning of government buildings, police stations, and Kreinik's only hospital, forcing the United Nations to suspend food distribution in the region. The intercommunal acts of violence in Darfur wreck the path to recovery and withdrawal of humanitarian personnel and services, thus cutting off essential health needs for children.

In 2010, the Sudanese government expelled international humanitarian organizations, including International Rescue Mission, Oxfam International, and Save the Children UK (October 2010, 2010). This was because the president believed that the organizations were collaborating with the international criminal court to prosecute him for war crimes and crimes against humanity. The Sudanese government, under the presidency of Omar Al- Bashir, cut off its citizens' essential healthcare services, access to clean water, food supplies and nutrition programs, education, and other resources that were being provided. The NGOs have been

welcomed back after the change of regime, but the crisis has worsened with inter-communal violence and the outbreak of COVID-19 within the camps. The path to recovery seems tougher today than before the attack of COVID-19.

## **5.2 Future Research**

In conflict-affected countries, the prevalence rates of mental health disorders are rising, affecting significant proportions of their populations (Shoib et al., 2022). Sudan's 19-year civil war has been linked to mental health disorders like depression and post-traumatic stress (PTSD, especially among children (Morgos et al., 2007). The effects of witnessing killings, forced mass migrations, hunger, and starvation have left children in severe fear and grief. The children continue to manifest severe depression and anxiety symptoms as they grow and comprehend several incidences that occurred in their past (Kadir et al., 2019). More resources are available for managing disease and food insecurity, but few are available for former children-soldiers and children experiencing mental health issues. Mental health treatment, coping, and recovery programs have not been implemented. Further research is necessary to address the psychological effects faced by children of Darfur, especially the formerly abducted children that have managed to return or have been rescued.

## **6. Conclusion**

The armed conflict in Darfur has left devastating effects on all civilians regardless of age. Children have suffered the most consequences seen in the high mortality rates. Children under five years have suffered acute malnutrition due to severe food insecurity and lack of healthcare services, especially immunization. This has been attributed to the destruction of health facilities providing these services, leaving thousands of children vulnerable to infections and high infant mortality rates. Infectious diseases are the norm in refugee camps due to poor sanitation,

personal hygiene, lack of clean and safe water, and cleaning supplies like soap. The recommendations herein would significantly improve the children's health and decrease the high morbidity and mortality rates among children under five. The COVID-19 pandemic has exacerbated the war's effects. Darfur's children are constantly at greater risk of contracting the COVID-19 virus and other diseases due to the shortage of the two most important innovations in public health clean water and vaccines. The continuous lack of these services affects Darfur's children and the entire population and increases the global burden of disease. The successful implementation of these recommendations would not only change the lives of these children but would be beneficial to the entire population. These recommendations would also reduce the global disease burden and advance United Nations SDGs 2030 in Sudan.

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## APPENDIX

### APPENDIX A

STEPS	SEARCH STRATEGY								
<b>Review Topic</b>	Addressing the effects of armed conflict on the health of children in Darfur, Sudan.								
<b>Keywords</b>	Keyword A	Effects							
	Keyword B	Armed conflict							
	Keyword C	Children's Health							
	Keyword D	Darfur, Sudan							
<b>Synonyms, Related terms, alternate forms of keywords</b>	Keyword A	Impacts, implications, outcome, results							
	Keyword B	War, civil unrest							
	Keyword C	Infants, public health, child health							
	Keyword D	Sub-Saharan Africa, war-torn countries							
<b>Search strategy</b>	Keyword A	Effects	<b>OR</b>	Impact	<b>OR</b>	Implications	<b>OR</b>	results	
	<b>AND</b>								
	Keyword B	War	<b>OR</b>	Armed conflict			<b>OR</b>	Civil unrest	
	<b>AND</b>								
	Keyword C	Children's Health	<b>OR</b>	Infants	<b>OR</b>	Public health		<b>OR</b>	Child health
	<b>AND</b>								
Keyword D	Darfur	<b>OR</b>	Sudan	<b>OR</b>	War-torn countries		<b>OR</b>	Sub-Saharan Africa	
<b>Databases</b>	BMC Public Health, The Lancet, PubMed Central, BMJ Global Health, Journal of Peace Research, Public Library of Science, JAMA, Defense, and Peace Economics, the Achieves of Disease in Childhood, International Journal of Social Psychiatry, Archives of Pediatrics and Adolescent Medicine, International Journal of Human Rights, Africa Health Sciences, Tropical Medicine and International Health and UNICEF USA.								

**Table 2: Summary of Search Strategy**

## APPENDIX B

### CEPH Foundational Competencies

Competency	Anticipated ILEX Component
<b>Evidence-based Approaches to Public Health</b>	
1. Apply epidemiological methods to the breadth of settings and situations in public health practice	
2. Select quantitative and qualitative data collection methods appropriate for a given public health context	I used quantitative and qualitative data collection methods to collect and analyze data on the prevalence of disease, malnutrition, and infections among children in Darfur
3. Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming, and software as appropriate	
4. Interpret results of data analysis for public health research, policy, and practice	I interpreted the data on various public health issues among Darfur children and used it to recommend practices, policy changes, and program implementation strategies.
<b>Public Health &amp; Health Care Systems</b>	
5. Compare the organization, structure and function of health care, public health, and regulatory systems across national and international settings	
6. Discuss how structural bias, social inequities, and racism undermine health and create challenges to achieving health equity at organizational, community, and societal levels	
<b>Planning &amp; Management to Promote Health</b>	
7. Assess population needs, assets, and capacities that affect communities' health	I assessed the health needs of internally displaced children living in Darfur.
8. Apply awareness of cultural values and practices to the design or implementation of public health policies or programs	Analyze how the understanding of cultural values and practices are significant role in designing or implementing public health policies or programs
9. Design a population-based policy, program, project, or intervention	I recommend public health practices and evidence-based programs to avert the public health crisis in Darfur.
10. Explain basic principles and tools of budget and resource management	
11. Select methods to evaluate public health programs	
<b>Policy in Public Health</b>	
12. Discuss multiple dimensions of the policy-making process, including the roles of ethics and evidence	
13. Propose strategies to identify stakeholders and build coalitions and partnerships for influencing public health outcomes	I identified stakeholders in global health that are also major humanitarian organizations working to address the crisis in Darfur.
14. Advocate for political, social, and economic policies and programs that will improve health in diverse populations	

15. Evaluate policies for their impact on public health and health equity	
<b>Leadership</b>	
16. Apply principles of leadership, governance, and management, which include creating a vision, empowering others, fostering collaboration, and guiding decision making	I suggested collaborating with humanitarian organizations operating in Darfur and local faith organizations to mobilize IDPs in camps and inform them about the available resources.
17. Apply negotiation and mediation skills to address organizational or community challenges	
<b>Communication</b>	
18. Select communication strategies for different audiences and sectors	
19. Communicate audience-appropriate public health content, both in writing and through oral presentation	Written presentation of the analysis of the public health crisis among children in Darfur
20. Describe the importance of cultural competence in communicating public health content	
<b>Interprofessional Practice*</b>	
21. Perform effectively on interprofessional teams	
<b>Systems Thinking</b>	
22. Apply systems thinking tools to a public health issue	

## APPENDIX C

### MPH – Health Policy Leadership Competencies

Competency	Anticipated ILEX Component
1. Apply economic concepts to understand the effect of changes in policies at the government, health systems, and public health sectors	
2. Synthesize economic concepts to assess equity and efficiency in making health policy recommendations in underserved communities	
3. Formulate efficient health policy change recommendations through the analysis of proposed health policy initiatives that could affect health outcomes of vulnerable populations	Formulated recommendations could affect the health outcomes and well-being of children affected by the armed conflict in Darfur
4. Develop recommendations to improve organizational strategies and capacity to implement health policy	
5. Analyze policy options to address environmental health needs at the local, state, and federal levels	