



**Yale** *Institute for Global Health*

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**Non-Communicable Diseases in a Humanitarian Crisis:  
Sudanese Refugees in Chad**

**Case Writing Team**

Atalay Demiray, MD, MSc – Yale School of Public Health

Adwoa Difie Antwi – Yale School of Public Health

Jack Carew, MPH – Yale School of Public Health

**Case Team Advisors**

Charles Minicucci – Yale School of Public Health

Patricia Ryan-Krause, MS, MSN – Yale School of Nursing

Eman Salih, MSc, MCP – Yale School of Public Health



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## Introduction

*“... This [conflict] affects the lives of a very large number of citizens, especially those with chronic diseases, of whom more than 18,000 oncology patients receive chemotherapy and more than 9,000 chronic kidney disease patients receive dialysis in Gezira State. Overall, more than seven million citizens with chronic diseases are at risk of dying a slow death unless the movement of medical supplies between different Sudanese states is not managed.”*

Dr. Haitham Mohamed Ibrahim, Sudanese Federal Minister of Health  
December 23, 2023

The chronic disease burden in Sudan amid the ongoing war has reached critical levels, with significant implications for the country's healthcare system and the wellbeing of its population. The conflict has led to a health crisis for the massive number of people who have been forced to flee, either within the country or to nearby nations.

Since April 2023, the conflict in Sudan has displaced nearly 7 million people, with over 1.3 million fleeing to neighboring countries, including Chad. In Chad alone, more than 480,000 refugees and returnees have crossed the border since the outbreak of war (1). Approximately 4.2 million people remain within the country but are unable to return to their homes, becoming internally displaced persons (IDPs). Displacement and infrastructure disruption have left over 1.5 million Sudanese with only limited access to hospitals for emergencies (7). Women and children are particularly affected, making up a significant portion of both IDPs and refugees (2).

Sudanese refugees and IDPs are increasingly struggling with non-communicable diseases (NCDs), such as cardiovascular disease, cancer, diabetes, and mental health conditions. Managing these conditions is particularly challenging in the context of displacement due to the need for consistent treatment, recurring prescriptions, and access to specialized care. The health consequences of unmanaged NCDs are compounded by outbreaks of infectious disease, malnutrition, and other illnesses in these displaced populations, who are often in hard-to-reach locations with limited access to basic services (3).

The widespread nature of the conflict has exacerbated these challenges, overstressing a healthcare infrastructure that is struggling to cope with increasing demand. Particularly in Darfur, the healthcare challenges are acute, with limited access to medicines, medical supplies, electricity, and water posing enormous obstacles to care delivery. The unavailability of specialized facilities and essential medications like insulin are especially obstructive to NCD management (1, 4). The transient nature of refugee populations adds even further challenges, essentially eliminating opportunities for patient follow-up and referral.

The WHO Sudan Health Emergency Report No. 2 emphasized the war's risks to persons with NCDs including diabetes, hypertension, and cancer, highlighting the urgent need to ensure access to life-saving care – particularly for those requiring renal dialysis or kidney transplants (5). The management of diabetes is especially critical in these crisis contexts. The IDF Diabetes Atlas estimates that 3.5 million people in Sudan live with diabetes (6). The lack of insulin has led to reported cases of diabetic ketoacidosis, an extremely dangerous and potentially fatal complication. UNICEF reports that power cuts have damaged

insulin cold-storage facilities, worsening the shortage and placing over 1,400 children at risk of dying from insulin deficiency (7).

This situation is a stark example of the critical need to prioritize treatment for long-term and often-overlooked conditions like diabetes in humanitarian crises. As evidenced by Dr. Ibrahim's quote above, there is a growing call for humanitarian aid efforts in Sudan to include chronic disease considerations, including the integration of refugees living with NCDs into the health systems of host countries. The current humanitarian response by WHO and other agencies is comprehensive, aiming to address immediate health needs, outbreak control, malnutrition, and care coordination. However, these efforts continue to be hindered by the historical challenges in the region, including prolonged conflict and resource limitations. The situation in Sudan remains a complex crisis, deeply impacting chronic disease management and overall population health. Increased international support and an innovative, coordinated response for NCD care will be essential to mitigating the long-term consequences of the war on the health of those most in need.

## Case Prompt

### *Background*

The Sudanese refugee crisis, particularly along Chad's border with Darfur, highlights the complexity of addressing chronic health conditions in humanitarian contexts. Managing conditions like diabetes in these challenging conditions implicates more than supply chain management, health worker training, and service delivery – it also involves the logistics of basic needs, including streamlined registration, provision of shelter, and nutritional support (6, 8). Additionally, health information systems in humanitarian facilities are often rudimentary, lacking electronic health records or NCD-specific registries. This, combined with re-displacement and problems in refugee registration, further hampers the quality and continuity of care for people living with NCDs (5). Lastly, limited healthcare staffing in the current humanitarian settings – typically just two or three medical officers per temporary facility – can explain how NCDs are often overlooked, deprioritized, or inadequately addressed (26).

The International Rescue Committee (IRC) is currently working from Sudan's capital city of Khartoum to compile and distribute basic NCD supplies to the crisis-hit areas of the country, but due to funding constraints, there is no capacity to store or dispense insulin or other cold-chain pharmaceuticals (8). This has led to a critical shortage. Additionally, the WHO Non-Communicable Diseases Kit (WHO-NCDK) – a comprehensive package of essential medicines and equipment designed for primary NCD care in emergency situations – has faced logistical issues, including distribution and repacking delays as well as a similar lack of cold-chain storage capacity. (4, 8).

The WHO-NCDK has somewhat improved NCD service availability during supply chain disruptions in Sudan to date, but progress remains inadequate due to medicine stockouts, staff turnover, limited patient knowledge, and low community engagement. While WHO-NCDKs are designed to meet the NCD management needs of 10,000 people for three months, the actual effectiveness of these kits (and other packaged interventions like them) depends heavily on contextual factors. For instance, existing local familiarity, existing local NCD services capacities, and the quality of monitoring and evaluation significantly influence the performance and utility of such tools. Inadequate communication and failures of leadership & governance have also been obstacles, with mismatches between recipient needs and capacities further hindering the deployment and performance of delivered kits. Clinical guidelines have also been identified as a shortcoming, with a clear need for more precise, nationally aligned (but contextually relevant) instructional guidance on NCD care delivery in over-stressed primary care clinics and humanitarian settings (4, 8).

These insights underscore the urgency of improved NCD services for Sudanese refugees – especially those reliant on insulin, and those residing in the lowest-resource areas like the Darfur border region of Chad. Humanitarian and healthcare operations are in desperate need of new and better tools and systems to manage NCDs among the crisis-afflicted populations they are trying to serve. The life-and-death consequences of medication shortages and care shortfalls cannot be overstated, and necessitate immediate and coordinated action to stem unnecessary mortality and suffering resulting from the war.

## Team Instructions

In light of the health challenges Sudanese refugees in Chad face and will continue to face in the future, the United Nations High Commissioner for Refugees (UNHCR) is seeking contractor assistance in their ongoing provision of NCD services for these populations – especially regarding diabetes. UNHCR has issued a Request for Proposal (RFP) for a cooperative agreement of USD 5 million over one year. The goal of the agreement is to involve new, innovative partners in developing community-level solutions for displaced populations residing along Chad’s border with West Darfur. You will take on the role of a social impact company, a small NGO, or an academic institute and submit a bid for the award detailing a locally implementable intervention to address NCDs exacerbated by conflict and displacement.

You will be given 10 minutes to present your proposal to a panel of judges representing UNHCR program officers, humanitarian operations coordinators, and Chadian health officials. An additional 5-minute question-and-answer session will follow. Proposals will be assessed according to seven criteria:

- **Rapid Implementation.** The intervention should become operational very quickly in order to reach affected populations in extreme, immediate need.
- **Rapid Scalability.** The scale of the intervention should be easily adjustable on-the-fly to respond to constant shifts in demand.
- **Feasibility.** The intervention should be realistic, cost-effective, and operationally viable. Lasting, measurable impact should be demonstrated within six months.
- **Applicability.** The intervention design should demonstrate an awareness of and alignment with national and funder priorities, including those of UNHCR and regional authorities in Chad.
- **Local Relevance.** In addition to addressing national and funder priorities, the intervention should demonstrate clear contextual awareness and cultural sensitivity. Community priorities and values must be addressed, and intended levels of community engagement should be described.
- **Integration.** Teams should focus on the immediate need outlined in the case, but should also address at least one secondary stakeholder priority in their proposal.
- **Adaptability.** The intervention should demonstrate post-implementation flexibility in order to adapt to future emergencies or unforeseen circumstances in the longer term.

A successful proposal will include a detailed and well-researched project plan that spans the full funding timeline, an outline of how funds will be used, and a description of specific metrics that will be used to measure progress and impact. Proposals should summarize high-quality evidence that directly support the feasibility and relevance of the proposed intervention. Presentations should communicate how the project addresses critical community needs at the *local level*, and partners’ priorities at the *national level*. Additional aspects, such as tools to manage stakeholder relationships or a public relations strategy, may be considered.

## Supporting Information

### *Humanitarian Challenges along the Chad-Darfur Border*

In eastern Chad, provinces like Sila, Ouaddai, and Wadi Fira are accommodating large groups of people fleeing violence (5). The Darfur region faces both acute and longstanding humanitarian challenges due to:

- **Prolonged Conflict.** Decades of conflict have led to widespread legacies of displacement, destruction of infrastructure, and limited access to basic services.
- **Disease Outbreaks.** Disease outbreaks, including cholera, measles, malaria, and dengue, are increasing due to disrupted public health services.
  - As of October 17, there were at least 1,457 suspected cases of cholera, including 64 deaths, reported from Gedaref, South Kordofan, and Khartoum states. By December 3, this number had more than doubled to 5,414 suspected cholera cases with 170 associated deaths. As of January 6, 2024 that number has grown to 9,000 suspected cases of cholera, including 245 associated deaths, across nine states (15).
  - In addition to cholera, measles cases continue to rise, with 4,039 cases and 107 deaths reported across 12 states. Dengue fever is also a concern, with at least 506 suspected cases, including 295 confirmed cases (2). Healthcare facilities and workers have also been attacked, severely hindering medical access.
- **Food Insecurity and Malnutrition.** About 15 million people, or 31% of the population, were acutely food insecure between October 2023 and February 2024, almost double the number from the previous year. This spike signifies that an additional 7.3 million people have become acutely food insecure due to the conflict and other aggravating factors (2).
- **Security and Accessibility Issues.** Insecurity and logistical challenges have consistently hampered humanitarian aid and health services delivery.

After nine months of conflict, the number of displaced people continues to rise. This crisis has affected not only Sudan but also neighboring countries like Chad, Egypt, and South Sudan. Unfortunately, there is a critical shortfall in international aid for humanitarian organizations operating in the region. The total funding requirement stands at USD 2.57 billion, of which only 42.6% (approximately USD 1.09 billion) has been met. This leaves a substantial shortfall of 57.4% (around USD 1.47 billion). The health sector has fared somewhat better, with USD 130.2 million of the required USD 178.6 million (72.9%) funded. However, the situation is particularly critical for nutrition, where only 23.0% of the required funding has been met, with a mere USD 80.7 million out of the required USD 350.1 million (9).

These funding insufficiencies are worsened by access and operational challenges presented by the geography and climate of this remote region. Transportation is a struggle given the scarcity of means and the precarious state of roadways. Simply reaching people in need in such a rugged landscape can require agile and innovative mobility solutions beyond standard mobile health units. In addition, the impending rainy season will turn many of the border area's *wadis* (seasonally dry riverbeds) into impassable rivers that could close key travel routes for days or even weeks. The rainy season may also increase the risk of communicable disease outbreaks such as malaria and diarrhea, creating added strains on Chad's refugee settlements (5).

The formal registration of refugees is crucial for personal identification and access to healthcare services. Despite disruptions to regular government functioning, UNHCR is advocating the Sudanese government

to continue issuing national identity numbers and documents as an essential step in ensuring that refugees can integrate into their host country's health system and access basic services (1).

Refugees and asylum seekers arriving in border regions often face precarious security conditions. A primary concern is relocating these individuals to safer areas and addressing their immediate shelter needs to prevent overcrowding. Overcrowded conditions in refugee settlements not only exacerbate the spread of infectious diseases but can also overwhelm limited supplies of essentials like food and water. Additionally, as a security concern, the UNHCR is prioritizing protections against gender-based violence. The trauma associated with such violence can have far-reaching effects on the health of survivors. Such protections include support for survivors and victims, psychosocial treatment, case management, and implementing preventative measures (1, 2).

### *Current Humanitarian Response by WHO and Médecins Sans Frontières (MSF)*

The health systems in Sudan and Chad, particularly regarding NCDs like diabetes, face significant challenges. In Sudan, over 70% of health facilities in conflict areas are non-functional, leading to a heavy reliance on humanitarian aid. Besides deploying WHO-NCDKs, the WHO has been instrumental in coordinating health responses and ensuring adequate supply provision for trauma care at the borders. As of early July, WHO dispatched significant medical supplies, including treatments for injuries, cholera, malnutrition, and basic medical supplies. This effort also extended to vaccinating over 51,000 children against polio in refugee settlements (5).

MSF is actively addressing the needs of approximately 450,000 refugees and returnees in Chad, providing vital services such as: maternity and surgical care; water and sanitation services; malnutrition and disease treatments; and primary healthcare for both refugees and returnees. MSF's operations span several locations in eastern Chad, including Adré, Ourang, and Metche, with a focus on supporting pediatric and nutrition wards, constructing hospitals, and treating acute malnutrition, malaria, and other prevalent conditions (1). Despite these efforts, the operation faces a high staff turnover and an insufficient healthcare workforce, making effective diabetes management and overall NCD care a challenge.

MSF's operations are spread across four key locations, where they are providing a range of vital services:

- **Maternity and Surgical Care:** In Adré, a city hosting approximately 130,000 refugees across various camps, MSF is actively involved in two hospitals. Here, they offer surgical care, especially for war-wounded individuals, and support pediatric and nutrition wards (1).
- **Water and Sanitation Services:** MSF is contributing significantly to improving these services in all refugee camps, which is crucial for preventing water-borne disease.
- **Malnutrition and Disease Care:** MSF teams are addressing the acute needs of patients both in hospitals and through mobile clinics, trying to reach remote areas with medical services (1).
- **Support in Refugee Camps:** In addition to Adré, MSF is active in the Ourang refugee settlement, with roughly 50,000 people, and a new settlement in Metche which accommodates roughly 40,000. In Metche, MSF is constructing a large hospital that began receiving patients in early December, significantly expanding healthcare access for the settlement (1).
- **Healthcare for Returnees and Refugees:** In the Deguesssa settlement, MSF teams are providing healthcare to both returnees and refugees, addressing the diverse health needs of these vulnerable groups.

## *Impact of Malnutrition on the Burden of Type 2 Diabetes in Sudan*

Malnutrition intersects with diabetes in multiple ways. Inadequate childhood nourishment can influence long-term risks of developing type 2 diabetes and other metabolic disorders. In a strained healthcare setting, without reliable access to nutritious foods, blood sugar levels and symptoms of diabetes can be difficult to safely manage. As of December 2023, about 31% of Sudan's population were acutely food insecure (See Figure 2) (10). This number is nearly double the previous year, indicating that an additional 7.3 million people have become acutely food insecure due to conflict and associated factors. Before the conflict, Sudan already faced high levels of acute malnutrition among children under five, with 3 million affected and 612,000 severely malnourished (2). The conflict has aggravated this crisis, with the number of acutely malnourished children under five increasing to 3.4 million, of whom 690,000 are severely malnourished. This surge is largely due to displacement, leading to restricted access to essential services like nutritious food, basic health care, safe water, and sanitation. Health facilities have registered a significant increase in malnutrition cases; for example, one facility saw cases rise from 10-15 per month to 56 in a month. UNICEF and its partners are striving to address this through over 1,500 nutrition sites, providing therapeutic and nutrition supplies, support for mass screening, and nutrition care capacity building (7).

## *Population Health and Healthcare in Sudan*

The total population of Sudan was approximately 44 million in 2021, and children under 5 made up 15.4% (2). Life expectancy at birth is 69.1 years, and fertility is 3.9 per 1,000. The crude birth rate is 33 per 1,000, while the crude death rate is 16.7 per 1000 (17.2 among males and 16.3 among females) (11). The population growth rate was 2.6% in 2022.

Sudan is a lower-middle-income country with widespread poverty. Per capita gross national income in Sudan was USD 760 in 2022, though income can vary significantly by region (12). Two-thirds of people in Sudan live below the national poverty line, and the overall basic school enrollment rate is 74% (21).

Sudan's under-5 mortality rate is 68 deaths per 1000 live births, the maternal mortality rate was 295 per 100,000 live births in 2017, and the infant mortality rate is 33 deaths per 1000 live births. The WHO classifies 100 to 499 deaths per 100,000 live births as a high or moderate maternal mortality rate. The primary causes of maternal death are severe hemorrhage, infection, high blood pressure during pregnancy (pre-eclampsia and eclampsia), complications during childbirth, and unsafe abortions (13, 14). A shortage of skilled birth attendants and antenatal care contribute to these high mortality rates. Most births are home deliveries without skilled birth attendants present, and there is a gap in emergency obstetric care at many medical facilities. Significant disparities exist in maternal-child health outcomes; for example, the under-5 mortality rate ranges from 112 per 1000 live births in East Darfur State to 30 per 1000 live births in the Northern State. Furthermore, the under-5 mortality rate in the poorest households (84 per 1000) is more than double that of the wealthiest households (39 per 1000).

Malnutrition is frequently an underlying cause of child mortality in Sudan, and childhood and maternal vaccination rates for common childhood diseases are low. For example, only 69% of women have received a tetanus vaccination, and only 64% of children have received two doses of the measles vaccine (13).

Only 63% of Sudanese have access to clean water, and access to sanitation is even lower. Approximately 12 million people lack access to clean water, and nearly a third of children and their families openly

defecate (7). Sudan is ranked as 139<sup>th</sup> of 157 countries by the World Bank Human Capital Index and 170<sup>th</sup> of 189 countries by the 2019 Human Development Index.

The health system in Sudan is characterized by high out-of-pocket costs and low government investment. Government spending on healthcare was 3.02% of GDP in 2020, with significant variation between different states. This falls below the global average among low-income countries at 5.13% of GDP (16). Despite government commitments to free health care in emergency situations, free medicine for children under 5 years of age, and free care for specific diseases, citizens often pay high out-of-pocket costs. Of all health spending in Sudan, 74% are out-of-pocket payments (leaving only 26% as public spending). After the beginning of the recent conflict, estimates put 2024 spending on healthcare at 2.20% of GDP (2, 17).

In addition to high costs, the health sector in Sudan is experiencing numerous challenges related to human capital. There are significant disparities in health expertise between the public and private sectors and between urban and rural areas. Furthermore, there are high rates of turnover and emigration among healthcare personnel, which severely limits the Federal Ministry of Health in responding to population health needs. Provider-patient ratios are low, with 33.5 nurses and midwifery professionals and 2.8 physicians per 10,000 people. This is below the global low-income country average of 4.0 physicians per 10,000 people (18).

According to the 2021 National Health Strategic Plan, key challenges facing Sudan's healthcare system include:

- Poorly defined roles and responsibilities at all levels of the health system and a weak central authority
- High out-of-pocket costs and low public spending on health systems
- Low availability of essential services, including medications and treatments
- Significant disparities in the distribution of health care personnel at state and local levels
- A lack of an aggregated health information system, resulting in uninformed decision-making
- A lack of community and academic participation in the health care system
- Poor coordination and collaboration between the public and private health sectors
- Insufficient capacity to prepare for, prevent, detect, and respond to health emergencies in a timely manner

The high turnover of medical staff and the limited number of healthcare professionals per facility add to the complexity of providing continuous care for diabetes patients. Sudan's low physician and nurse densities further exacerbate the challenges in managing healthcare needs effectively, especially concerning NCDs. Logistical issues, including delays in supply distribution and the lack of capacity to store or dispense insulin or other cold-chain pharmaceuticals, are significant obstacles (4).

The WHO has described the conflict-context health situation in Sudan as "gravely serious", with more than two-thirds of hospitals out of service by August 2023 and increasing reports of attacks on health facilities, leaving 11 million people in need of healthcare. This has resulted in deaths, injuries, and a severe compromise in access to emergency care (19). Additionally, the armed violence in Sudan has led to a near-total breakdown of health systems in conflict hotspots. The impact on the health system is devastating, particularly for children and families. In response to this crisis, organizations like UNICEF are focusing on maintaining critical and lifesaving services for children and vulnerable individuals, including sustaining community and primary healthcare services and immunization services across multiple states.

## *Background of Violence in Darfur*

The Darfur region, marked by a complex history and diverse geography, has faced many years of civil conflict and political instability, with recurrent humanitarian issues culminating in the current severe crisis (2). Hundreds of civilians were killed by the militias in West Darfur in early November 2023. Sexual violence against women and girls has been reported throughout the conflict, though especially in November in the Ardamata IDP settlement close to El-Genina, the capital of West Darfur (20, 21). This settlement has existed at least since 2006, when there were 22,000 IDPs; the population increased to 27,300 in 2009, though more recent population estimates are unavailable. Dozens of civilians were killed in Nyala, South Darfur, by an air raid on December 29, 2023 (22).

The present-day situation in Darfur has its roots in a turbulent history of local militias and violent regional geopolitics. The most significant armed group, the Janjaweed, originated from Arab nomad communities in eastern Chad that were armed by the Libyan government in 1980 during the Chadian Civil War. At the same time, the Sudanese government armed and trained Arabic-speaking Abbala nomads in Darfur, bordering eastern Chad, in order to prevent Chadian incursions into Sudan. These two groups formed a loose coalition over the course of the Chadian Civil War, and were involved in the resurgence of the Sudanese Civil War in 1983. Actions by these groups ranged from raiding villages along the Chad-Sudan border to fomenting violence between farmers and pastoralists over land and water rights. Importantly, the Sudanese government at the time did little to curb these militias and, instead, supplied them in return for support against the rebel Sudanese People's Liberation Army (23).

The role of these militias intensified in the early 2000s when rebels from Darfur's predominantly non-Arab sedentary farming communities began an uprising in response to what they viewed as discriminatory and oppressive policies by the Arab-dominated national government. The government responded with aerial bombings of rebel strongholds and the mobilization of Arab militias as a counterinsurgency force, which by this point had come to be known as the Janjaweed. From 2003 to 2005, the government and the Janjaweed conducted a scorched earth campaign in Darfur, systematically depopulating land inhabited by Fur, Masalit, and Zaghawa ethnic groups. Tactics included the bombing of civilians, gross human rights abuses, obstruction of international humanitarian access, persistent harassment of IDPs, and the use of sexual violence as a weapon of war. The Darfur genocide amounted to the murder of 200,000 people and the displacement of two million (24).

## *Sociopolitical Context*

On April 15, 2023, conflict erupted between the national Sudanese Armed Forces (SAF) and the Rapid Support Forces (RSF), a paramilitary group led by Mohamed Hamdan Dagalo ("Hemedti") (25). The RSF has its roots in the Janjaweed and associated militias implicated in the Darfur genocide (26). Sudan's former president, Omar al-Bashir, supported the RSF during and after the genocide as a counterweight to the SAF, in an attempt to prevent either faction gaining sufficient power to attempt a coup. Once popular protests resulted in the SAF-led ouster of al-Bashir in 2019, the RSF and SAF became staunch political and military rivals. However, there had been animosity between the groups for years due to cultural, tribal, and political differences. Military analysts regard the SAF as a professional army, having received formal training in Egypt, and with an officer corps of command college graduates (26). By contrast, the RSF is considered an ad-hoc mercenary force.

Between 2019 and 2023, efforts had been ongoing to establish civilian rule (27). Under the transitional government, talks focused heavily on security sector reforms, including the means by which the RSF and SAF would be combined into a cohesive national security force. Still, at no point in negotiations did the transitional government have authority over the military powers in Sudan.

In October, 2021, the SAF, led by Abdel Fattah al-Burhan, seized power and dissolved the transitional government (28). Civil unrest exploded, with widespread demonstrations calling for civilian rule taking place until January 2022. During this period, the intervention of security forces in demonstrations led to 114 reported fatalities. Additionally, the political unrest in Sudan severely disrupted the already-fragile healthcare system, leading to diminished services and accessibility as facilities were closed or repurposed for security operations. This situation diverted attention and necessary health resources, with compound consequences for the immediate and long-term health of civilians – both physical and mental.

Negotiations about transitioning Sudan to civil rule continued under SAF leadership, but the broke down in 2023 and resulted in the current conflict (26). Whether or not either the RSF or SAF would ever support a civilian government in Sudan remains an open question. Both factions have obstructed the creation of such a government in the past. The SAF claim to support civilian rule and have signed peace accords to that effect; however, the clear preparations for war that both the SAF and RSF undertook prior to the outbreak of violence April 15<sup>th</sup> cast doubt on the prospects of civilian leadership in the near future.

### *Geographic Context*

Sudan is located in East-Central Africa and borders seven countries (Central African Republic, Chad, Egypt, Eritrea, Ethiopia, Libya, and South Sudan) and the Red Sea. Sudan is the third-largest country in Africa and covers an area of 1.8 million km<sup>2</sup> (16). The country's geography is characterized by deserts and semi-desert arid regions, with the exception of the central clay plains and the narrow fertile zone bordering the Nile River (29). Mean temperatures range between 26°C and 32°C across Sudan, though summer temperatures in the far north frequently exceed 43°C. Numerous vulnerability indices rank Sudan as one of the most at-risk countries to climate variability and climate change. The frequency of droughts and rainfall anomalies have increased over the past several decades, stressing the agricultural and pastoral livelihoods of many rural Sudanese. Furthermore, desertification has occurred at an alarming rate, especially in North Darfur, due to precipitation declines and depletion of groundwater. The resulting unstable crop yields and reduction in land and water resources have played a role in the displacement of millions of people across rural parts of Sudan, coupled with severe food insecurity.

Chad is Africa's fifth-largest country, with a rapidly growing population of 17.73 million in 2022 (30). Chad is landlocked and borders Libya, Sudan, Central African Republic, Cameroon, Nigeria, and Niger. Mean temperatures range between 20°C and 27°C in winter and between 27°C and 35°C in summer. Rainfall also varies considerably across the country, increasing on a gradient from north to south. Chad has three primary climatic zones: the arid Saharan desert in the north, the subtropical, semi-arid Sahel region in the center, and the tropical savannah in the south. Chad and other Sahelian countries are particularly vulnerable to climate change and face numerous challenges, including extreme droughts, heatwaves, floods, and desertification. The Notre Dame Global Adaptation Initiative ranks Chad as the world's second-most vulnerable country to climate change (31).

## *Economic and Geopolitical Context*

Sudan's location grants it access to important trade routes, as it serves as an important conduit for trade between the Sahel (through its border with Chad) and the Red Sea, a key economic thoroughfare (32). Prior to the recent conflict, Sudan had one of the highest economic growth rates among countries in Sub-Saharan Africa. Agriculture is the most important economic sector, representing a third of the country's GDP and employing two-thirds of the country's workforce. In 2021, Sudan's exports and imports totaled USD 5.44 billion and USD 8.58 billion, respectively (33). Primary exports include livestock, cash crops, and crude petroleum. Notably, approximately one-quarter of exported livestock originate from Darfur. Primary imports include sugar, refined petroleum, wheat, and pharmaceutical products. While Sudan's foreign reserves have fluctuated in recent years, from a low of USD 696.7 million in 2016 to a high of USD 3.045 billion in 2019, the most recent 2024 data reports a value of USD 1.484 billion (34).

Oil and agriculture play a similarly large role in Chad's economy. As is the case in Sudan, the majority of the workforce is employed in the agricultural sector, including farming and livestock rearing. Primary exports are unrefined petroleum, gold, sesame, cotton, and cattle (35). Primary imports include textiles, automobiles, pharmaceutical products, and jewelry. In 2021, Chad's imports and exports totaled USD 1.09 billion and USD 2.71 billion, respectively. Foreign reserves have fluctuated considerably in recent years and were USD 211.6 million in 2021 (36).

Due to Sudan's significant role in trade, many neighboring countries have a stake in the outcome of the ongoing civil war and have accordingly sided with either the RSF or SAF. In Libya, militia forces are supporting the RSF with fuel and weapons. In the Central African Republic, the RSF has been attempting to activate rebel forces to come to its aid. They have also appealed to Eritrea for supplies and additional troops. Egypt is playing an operational role supporting the SAF, and Chad is mobilizing forces on its side of the border in support of the SAF well. The government of Chad has a mutual defense treaty with the SAF that could be activated if the RSF tries to fall back to Darfur or enter Chad.

## Supplemental Figures



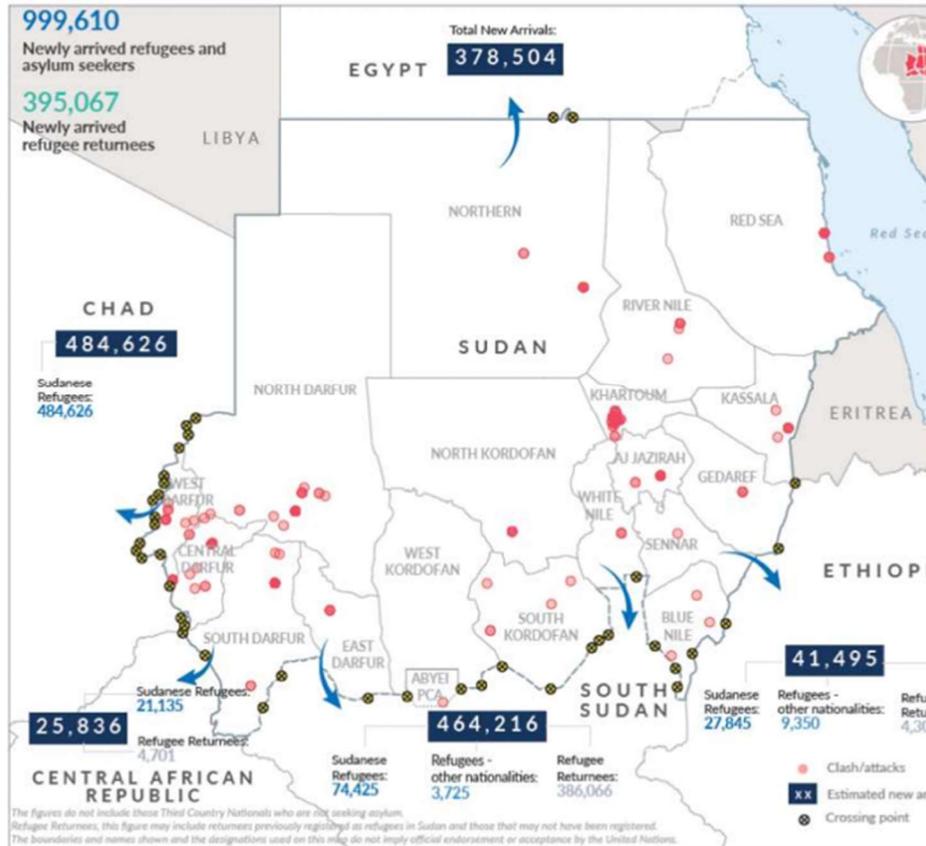
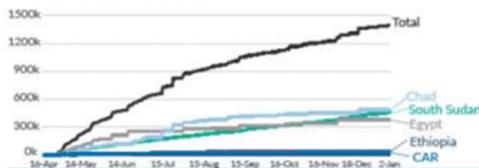
**OVERVIEW:** There are now more than 7 million forcibly displaced due to the outbreak of conflict in Sudan since April 2023, including 5.8 million internally and over 1.39 million in neighbouring countries. Sudan and neighbouring countries were already hosting large refugee populations before this new emergency and require additional support to provide protection and critical life-saving assistance, including for those who have been secondarily displaced within Sudan. Urgent needs include water, food, shelter, health, and core relief items. The current priority activities are the registration of new arrivals, relocation away from border areas, identification of especially vulnerable families and persons with specific needs, and putting mechanisms in place to prevent and respond to gender-based violence and ensure alternative care services for unaccompanied refugee children.

**7,445,782** Forcibly Displaced  
**5,855,848** New IDPs in Sudan  
**1,394,677** Newly arrived refugees, asylum seekers and returnees  
**195,257** Self-relocated Refugees in Sudan

### Arrivals by population and estimated gender type



### New arrivals from Sudan



UNHCR EHAGL DIMA | dimaehagl@unhcr.org

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Figure 1. Status of Sudanese Refugees and IDPs, January 2, 2024



## Projected Acute Food Insecurity | October 2023 - February 2024



17.7M

About 17.7 million people in Sudan are likely to experience high acute food insecurity (IPC Phase 3 or above) through February 2024.

37 percent of the analysed population is in IPC Phase 3 or above

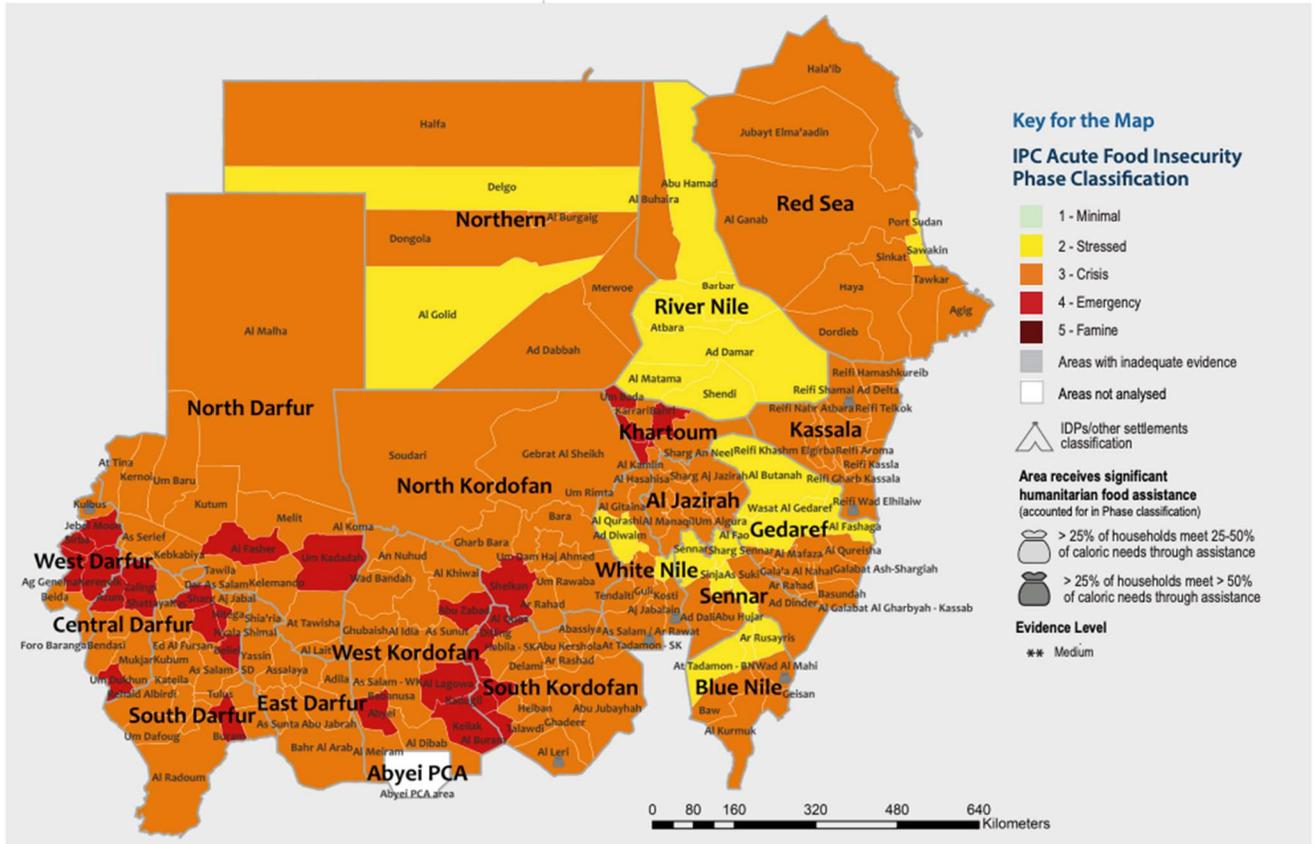
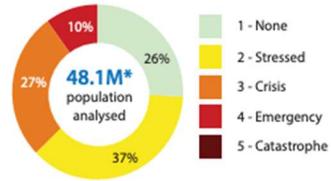


Figure 2. Projected Food Insecurity in Sudan, October 2023-February 2024



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**Ibrahim Bani, MBBS, PhD**

Yale University  
School of Public Health

**Mayur Desai, PhD, MPH**

Yale University  
School of Public Health

**Nükte Göç Gürpınar, MPH**

New York University  
School of Global Public Health

**Michael Skonieczny**

Yale University  
Yale Institute for Global Health

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