



# Darfur: Counting the Deaths

## *Mortality Estimates from Multiple Survey Data*

May 26, 2005

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Disclaimer: Any opinions and views expressed in this report are entirely those of the authors alone who bear all responsibility.

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# 1 Introduction

The exact number of deaths in the Darfur region due to the conflict will probably never be known. But most certainly, it is far too many. Estimating mortality in conflicts is a notoriously difficult exercise, even more so in Darfur where the conditions causing death are extremely variable. Malnutrition, epidemics and violence occur sporadically, claiming many lives in some areas and none in others. Recognising the importance of tracking mortality and estimating deaths, humanitarian aid agencies working in the region have undertaken mortality surveys among their beneficiaries at different times to assess the condition of their status and the severity of the crises. These are based on sound statistical and epidemiological techniques and provide insights into the varying levels of mortality over the entire region.

Estimating numbers of deaths from surveys depends on representativeness of the sample, double counting of deaths, under or over-reporting by respondents. Another key concern is that intensity of the conflict varies over time and in different areas of Darfur and therefore a blanket application of rates from a few surveys will invariably distort results.

The humanitarian assistance, although slow in early stages, since the first half of 2004 in Darfur has been massive and is widely acknowledged to have saved many lives. As humanitarian needs continue to grow the situation today is deteriorating again and it is clear to the authors that humanitarian aid has to be increased and important international measures to end the aggression must be taken.

From a majority of deaths being caused by military/violence in the wars in the first half of the 20<sup>th</sup> century, armed conflicts over the last 20 years have taken their toll among the civil populations. Disease and malnutrition have been the main causes of deaths among civilians in most of the major conflicts of the past two decades. These include deaths due to lack of access to health care, to food or harvests leading to starvation, dehydration and disease during displacement. Direct war-related violence on civilians leading to death (massacres, shootings), while heinous, contributes a small part of the total deaths, but remains the only direct evidence of the blunt hostility of armed groups on unarmed inhabitants.

In this paper we present two alternate methods that were used to calculate estimations of mortality in Darfur. The first one was elaborated by epidemiologists at the Brussels-based *Centre for Research on the Epidemiology of Disasters (CRED)*. The second one was performed by the *Bureau of Intelligence and Research* of the US Department of State.

In summary, the CRED method estimated approximately 134,000 total deaths in Darfur and Eastern Chad over the 17 months from September 2003 to January 2005. Of these deaths, 120,000 were excess deaths directly attributable to the conflict, 35,000 of which were violent deaths. The US State Department method estimated a possible range of 98,000 – 181,000 total deaths over 23 months - from March 2003 to January 2005. Estimates of excess deaths due to the conflict ranged from 63,000 – 146,000 over the same period.

## **2 Review of conflict related mortality estimates for Darfur and eastern Chad**

The conflict in Darfur has given rise to a wide range of estimates, from fairly precise numbers of dead such as 396,563 persons<sup>1</sup> to more general statements such as the UN Office for the Coordination of Humanitarian Affairs' (OCHA) figure of 180,000.<sup>2</sup> Regardless of the levels of mortality reported, we assume that none of these sources may be considered as having generated politically motivated or deliberately biased results to make a point. The validity of estimates instead is dependent on methodological rigour and soundness of the assumptions on which they are based. Lower estimations, if indeed valid, do not necessarily diminish the severity of the humanitarian situation or express callousness to the suffering and death in Darfur.

### **2.1 Building Blocks**

There have been numerous estimates put forth on overall death figures in Darfur. Although originating from various sources, all are based in whole or in large part on the same two sources, with extrapolation to the broader Darfur population and the entire length of the conflict. The first source is a collection of 1,132 interviews conducted with Darfur refugees in eastern Chad by a US State Department/USAID/Coalition for

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<sup>1</sup> Coalition for International Justice “New Analysis Claims Darfur Deaths Near 400,000: Experts estimate 500 people a day are dying.” April 21,2005.

[http://www.cij.org/pdf/Press\\_Release\\_CIJ\\_Mortality\\_Study\\_April\\_21\\_2005.pdf](http://www.cij.org/pdf/Press_Release_CIJ_Mortality_Study_April_21_2005.pdf)

<sup>2</sup> “180,000 die from Hunger in Darfur.” The Guardian, March 16, 2005.

<http://www.guardian.co.uk/sudan/story/0,14658,1438471,00.html>

International Justice (CIJ)/American Bar Association (ABA), hereafter referred to as the Atrocities Documentation Team (ADT), in July/August 2004. The second is a UN World Health Organization (WHO) mortality survey of IDP populations of West and North Darfur in August 2004 with a two month recall period and the subsequent WHO mortality projection covering a seven month period (March –September 2003).

### **2.1.1 State/USAID/CIJ/ABA Interviews**

The Atrocities Documentation Team’s project was an important effort to reveal the widespread atrocities occurring in Darfur at a time when awareness of the tragedy and international response to the crisis was still very limited. These interviews, however, were not designed in any way to function as a mortality survey nor was there an overall systematic sampling methodology<sup>3</sup> used that could make it representative of the roughly 200,000 refugees that fled to eastern Chad, much less of the entire 2.4 million people affected of Darfur.

The interviews were semi-structured and qualitative in nature and there was neither a sample universe indicated (population of which it is intended to be representative) nor a defined recall period specified in the questionnaire from which a mortality rate could be accurately calculated. These interviews, and the derived mortality rate, undoubtedly represent the most violent period of the conflict, prior to any real international presence or humanitarian assistance, of a cohort tremendously impacted by violence.

The open-ended and qualitative nature of ADT interviews provides not only a sense of the overall scope of atrocities but also details of their brutality. The inappropriate misuse of these interviews, however, as a proxy for the aggregate Darfur population for the entire conflict (despite the availability of other more reliable data, Table 4) has been a major basis of overestimation of deaths (common in most estimates).

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<sup>3</sup> There was no overall sampling methodology that determined selection of settlement/camps and the number of interviews to be conducted in each location. Instead, non-probability sampling, factors such as access, weather, supplies, etc. determined the location and numbers of interviews conducted. In an effort to reduce selection bias at the camp/settlement level, every 10th household was chosen and then one member was randomly selected for interview.

## 2.1.2 WHO Mortality Survey and WHO Mortality Projection

### WHO Mortality Survey

The September 2004 WHO mortality survey of displaced populations, found the CMR for North Darfur to be 1.5/10,000/day and 2.9/10,000/day in West Darfur. Non-displaced affected populations were not included in this survey. Deaths attributed to “injury or violence” represented 21% of deaths in North Darfur and 12% in West Darfur. Due to security problems, the survey was completed in only one camp (Kalma) in South Darfur (3.8/10,000/day) representing 73,658 displaced persons.<sup>4</sup>

### WHO Mortality Projection

The WHO survey was representative of a total of 955,812 IDPs (North Darfur-382,626, West Darfur-489,528, Kalma camp-73,658) for a two-month recall period (June 15 - August 15, 2004). The higher crude mortality rate (CMR) of 2.6/10,000/day was estimated (after factoring in a survey of a single camp in South Darfur) for the larger affected Darfur population. While the exact method used for the extrapolation is not entirely clear it appears that the 2.6 CMR, derived from approximately 956,000 internally displaced persons (IDPs), was applied to the total 1.8 million affected (both displaced and non-displaced) population (affected population in September 2004). Application of this rate to the larger 1.8 million population, allowing for other available information, was the basis for projected deaths for the preceding seven-month period.

The WHO estimate of October 15, 2004 states “at the end of September cumulative excess deaths (since March 1) is between 70,000 and 35,000”.<sup>5</sup> Unfortunately, the plausible range suggested by this estimate has been utterly ignored and instead only the high end 70,000 (or 10,000/month) figure has been used, in large part, as the basis for the majority of other extrapolations and therefore this partial reading of the estimate has also contributed to the overall overestimation of deaths. Application of CMRs from this two-month period, during the hunger season and an outbreak of dysentery-like illness in El Geneina, West Darfur, to a broader seven-month period, much less to the

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<sup>4</sup> World Health Organization. “Retrospective Mortality Survey Among the Internally Displaced Population Greater Darfur, Sudan. 2004” August, 2004  
<http://www.who.int/disasters/repo/14656.pdf>

<sup>5</sup> World Health Organization. “Mortality projections for Darfur.” October 15, 2004  
<http://www.who.int/mediacentre/news/briefings/2004/mb5/en/>



entire 27 month-long conflict, is also likely to have contributed to high-end miscalculations.

The WHO mortality survey and the WHO mortality projections have often been confused and misguidedly used interchangeably. This has led some to misinterpret a WHO statement<sup>6</sup> indicating exclusion of violent death from the WHO estimate, as also meaning violent deaths were not included in the WHO mortality surveys. This wrong assumption has led to double counting of violent deaths in many subsequent projections.

## ***2.2 Mortality Estimations***

The numbers put forth on Darfur deaths include impromptu press statements, circular reporting of other figures, and actual extrapolations. We have chosen to focus on the prominent cited numbers.

### **2.2.1 Coalition for International Justice (CIJ)<sup>7</sup>**

The CIJ report estimates the conflict related deaths in Darfur to be 396,563 dead based on interviews of 1,136 refugees (assumed violent deaths) to which it adds an average of the two CMRs from the WHO mortality surveys in West and North Darfur (health related deaths). The report finds a CMR of 3.3/10,000/day. This rate was then extrapolated over 26 months (February 2003 to April 2005).

This estimate has some limitations. First, the WHO rates were added to the violent death numbers from the CIJ interviews, as death rates from non-violent causes only (disease and malnutrition). However, the WHO survey specifically covers violent deaths and reports the proportion of violent deaths in N and W Darfur separately.<sup>8</sup> This addition, apart from the differences in period and population, results in double counting, since both include violent deaths.

Second, the interviews were conducted among refugees in Chad who fled extreme violence in their villages. Their experience was then converted into rates and applied to

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<sup>6</sup> “These projections have not sought to detail deaths due to violent incidents within Darfur communities - particularly the kinds of incidents that prompted people to flee their villages. A significant percentage of deaths - even between June and August 2004 - is associated with violence, though its origins and nature have not been determined. We have not been able to estimate violence-related deaths.” David Nabarro, WHO, October 15, 2004

<sup>7</sup> Coalition for International Justice. “Press Release, Darfur Mortality Study, 21 April 2005”. [http://www.cij.org/pdf/Press\\_Release\\_CIJ\\_Mortality\\_Study\\_April\\_21\\_2005.pdf](http://www.cij.org/pdf/Press_Release_CIJ_Mortality_Study_April_21_2005.pdf)

the entire affected Darfur population on the assumption that the entire displaced population experienced the same level of violence and mortality from March 2003 until the present day.

Consideration of results from surveys such as the one by MSF/Epicentre<sup>9</sup>, which shows violence related mortality rates to drop sharply following arrival in camps or adjusting for the WHO survey that includes violence related deaths, would refine the CIJ results significantly. Finally, 3.3/10,000/day mortality rate should be reviewed in the light of the fact that no mortality survey from different NGOs or UN agencies (see Table 4) has shown a CMR over 1.2 for all causes since fall of 2004.

### 2.2.2 Other public offices

A UK Parliament report<sup>10</sup> has also issued estimates of numbers of dead in Darfur. It offers the following statement but no new analysis of mortality:

“The World Health Organization’s widely-quoted mortality estimate of 70,000 is a gross underestimate. Jan Egeland, the UN Emergency Relief Coordinator, has stated that the real figure is likely to be several times that estimate. That is, we suggest, somewhere around 300,000.”

Jan Egeland, the UN Emergency Relief Coordinator in March 2005 stated “Is it three times that, is it five times that, I don't know, but it's several times the number of 70,000 that have died altogether”<sup>11</sup>. A week later Egeland clarified by reporting the 180,000 figure — about 10,000 deaths a month from October 2003 until March 2005<sup>12</sup>.

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<sup>8</sup> World Health Organization. “Retrospective Mortality Survey Among the Internally Displaced Population Greater Darfur, Sudan. 2004” pages 14, 21

<sup>9</sup> Depoortere E, Checchi F, Broillet F, Gerstl S, Minetti A, Gayraud O, et al. “Violence and mortality in West Darfur, Sudan (2003-04): epidemiological evidence from four surveys.” *Lancet* 2004;364(9442):1315-20.

<sup>10</sup> UK House of Commons International Development Committee. “Darfur, Sudan and the Responsibility to Protect, March 30, 2005.”

<http://www.publications.parliament.uk/pa/cm200405/cmselect/cmintdev/67/67i.pdf>

<sup>11</sup> Reuters. “UN Envoy says Deaths in Darfur Underestimated.” March 9,2005

<sup>12</sup> The Guardian. “180,000 die from Hunger in Darfur.” March 16, 2005.  
<http://www.guardian.co.uk/sudan/story/0,14658,1438471,00.html>

### **3 Recent history**

The following brief narrative<sup>13</sup> illustrates the complex and evolving nature of the Darfur conflict through four phases and illustrates the vastly differing conditions specific to each time frame and region. The varying periods are also used as a framework for disaggregating mortality accordingly.

#### ***3.1 Initial outbreak of violence (March-September 2003)***

The conflict between the government and two rebel groups in Darfur began in February 2003 when the Sudan Liberation Movement/Army (SLM/A) and the Justice and Equality Movement (JEM) carried out the first major attack against a government airport in North Darfur. The government and its local militia allies responded; the conflict then spread to other areas of North Darfur, including Malha and Kabkabiyah as well as parts of West Darfur. In the early stages, the conflict was relatively limited in scope and resulted in about 110,000 IDPs in North Darfur and an additional 30,000 IDPs in West Darfur by September 2003. The first Sudanese refugees began to arrive in Chad during this time.

#### ***3.2 Breakdown of cease-fire/escalation of conflict (October 2003-March 2004)***

Failure to implement the September 2003 cease-fire agreement among the SLM/A, JEM, and the government was followed by a swift intensification of the conflict and increased attacks on civilian villages by Janjaweed and government troops. Large-scale displacement occurred and refugees began to arrive in Chad in large numbers. The fighting in South Darfur was relatively light during this period.

#### ***3.3 Second cease-fire agreement (April-June 2004)***

The April 8 cease-fire agreement among the SLM/A, JEM, and the government, though often violated, led to a significant decrease in the level of violence in Darfur. The decline in violence was brought about by increased international pressure, a greater humanitarian presence in Darfur, and the retreat of rebel forces following a series of battlefield defeats. Violence as a cause of death therefore decreased, but mortality rates among displaced populations in both Darfur and Chad remained elevated because of the

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<sup>13</sup>Sudan: Death Toll in Darfur, US Department of State Fact sheet, March 25, 2005.  
<http://www.state.gov/s/inr/rls/fs/2005/45105.htm>

increasingly weakened condition of persons arriving at camps and deficient humanitarian assistance. Populations in West Darfur and Chad suffered the highest mortality and morbidity rates because of their inaccessibility from humanitarian aid workers. The conflict and violence spread south and the IDP population of South Darfur doubled in June.

Though region-wide mortality rates dropped, a high number of deaths occurred because of an increase in the affected population throughout Darfur and higher mortality rates in South Darfur. Non-displaced populations hosting large numbers of displaced persons also began to experience elevated mortality rates as their water and food resources became strained and they became more vulnerable to infectious diseases. Major battles, resulting in a large loss of combatants on either side, sharply declined.

#### ***3.4 Increased international humanitarian response (July 2004-January 2005)***

Following increased international pressure, the government gradually lifted most restrictions on access to Darfur for international aid organizations starting in June 2004. The number of humanitarian workers in Darfur increased from 200 in March 2004 to nearly 10,000 (local and international) by March 2005. South Darfur and parts of North Darfur continue to experience fighting and new displacement. Stabilization of humanitarian conditions began first in North and then started in West Darfur. Low-level violence and widespread insecurity have continued throughout the region, with another surge in fighting in November and December 2004. Because of greater humanitarian assistance, mortality rates gradually decreased in mid- to late 2004 and early 2005, but pockets of higher mortality remain, particularly in South Darfur.

## 4 Current statistics and discussion

According to the latest estimates of the Darfur Humanitarian Profile approximately 2.6 million people are affected by the conflict in Darfur. On top of this there are some 200,000 Sudanese refugees in Chadian camps.

**Table 1: Estimation of affected IDP and resident population in Darfur (UN Darfur Humanitarian Profile No. 13 - 01 April 2005)**

| State        | Total number     | IDPs             | Residents      |
|--------------|------------------|------------------|----------------|
| North Darfur | 754,789          | 479,342          | 275,447        |
| South Darfur | 918,985          | 770,808          | 148,177        |
| West Darfur  | 948,714          | 715,708          | 233,006        |
| <b>TOTAL</b> | <b>2,622,488</b> | <b>1,965,858</b> | <b>656,630</b> |

The total population in the three Darfur states was estimated to be 5.6 million in 2001. Bearing in mind an increase of the population, we can assume that the population in 2005 was approximately 6 million. This means that at this moment almost half of the total population of Darfur is affected by the conflict.

Prior to the conflict, the nutritional and mortality situation in Darfur was comparable to other states in Sudan. The Multiple Indicator Cluster Survey 2000 (MICS 2000) of UNICEF reported figures of child mortality showing Darfur to be in the middle group.

**Table 2: Child mortality rates and malnutrition for the 3 Darfur states and country average (MICS 2000)**

|                | U5MR<br>(/1000 live births) | Underweight<br>(%) | Chronic<br>Malnutrition<br>(%) | Acute<br>Malnutrition<br>(%) |
|----------------|-----------------------------|--------------------|--------------------------------|------------------------------|
| North Darfur   | 101                         | 47.4               | 44.3                           | 22.5                         |
| South Darfur   | 98                          | 39.4               | 46.7                           | 12.4                         |
| West Darfur    | 104                         | 37.4               | 51.2                           | 8.8                          |
| <b>Country</b> | <b>104</b>                  | <b>40.7</b>        | <b>43.3</b>                    | <b>15.7</b>                  |

The numbers on malnutrition show some major differences between the different states. North Darfur seemed to be the most affected state by acute malnutrition but had the lowest numbers of chronic malnutrition. West Darfur on the other hand was the opposite.

## 5 Materials and methods

### 5.1 Materials

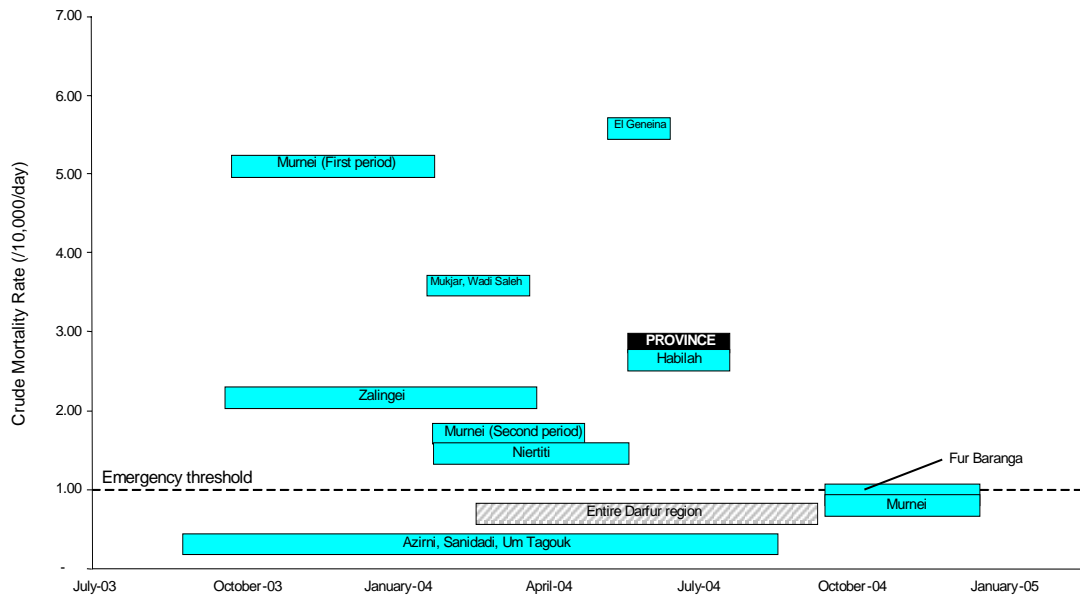
We collected data from 24 surveys conducted during the period April 2004 – January 2005. Taking the mortality recall period into account, the covered period was September 2003 – January 2005.

**Table 3: Mortality surveys conducted in Darfur and refugee camps in Chad from CE-DAT database (April 2004 - January 2005)**

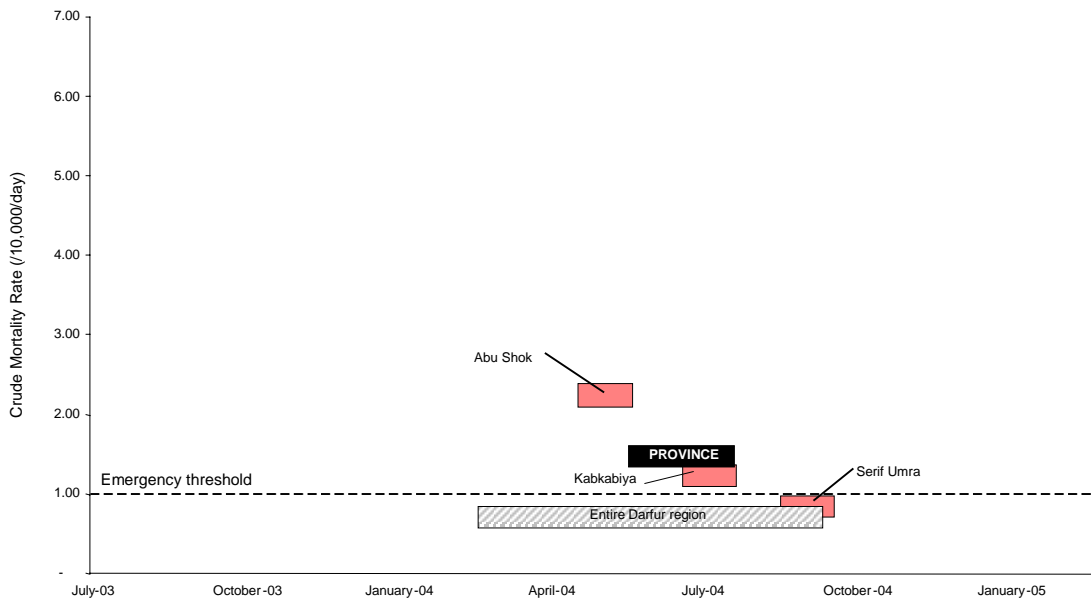
| Location                    | Period              | CMR                                   | U5MR                                  | Violence related | Conducted by         |
|-----------------------------|---------------------|---------------------------------------|---------------------------------------|------------------|----------------------|
| <b>Darfur region</b>        | Feb – Sep 2004      | 0.72 (0.44-0.99)                      | 1.03 (0.38-1.68)                      | 35 %             | CDC, WFP             |
| <b>North Darfur</b>         |                     |                                       |                                       |                  |                      |
| Abu Shok                    | May – Jun 2004      | 2.15 (NA)                             | 6.76 (NA)                             |                  | ACF-F                |
| Entire Province             | Jun – Aug 2004      | 1.50 (1.10-1.90)                      | 2.50 (1.60-3.90)                      | 21 %             | WHO, Epiet           |
| Kabkabiya                   | Jul – Aug 2004      | 1.20 (0.70-1.80)                      | 2.90 (1.50-5.30)                      |                  | Epicentre, MSF       |
| Serif Umra                  | Sep – Oct 2004      | 0.80 (0.40-1.30)                      | 1.80 (1.00-3.00)                      | 4 %              | Epicentre, MSF       |
| <b>West Darfur</b>          |                     |                                       |                                       |                  |                      |
| Zalingei                    | Oct 2003 – Apr 2004 | 2.20 (1.80-2.70)                      | 1.80 (1.10-3.00)                      | 49 %             | Epicentre, MSF       |
| Murnei                      | Oct 2003 – May 2004 | 3.40 (3.10-3.80)                      | 1.60 (1.10-2.20)                      | 75 %             | Epicentre, MSF       |
| Azirni, Sanidadi, Um Tagouk | Sep 2003 – Sep 2004 | 0.27 (NA)                             | NA                                    | 35 %             | CIEDRS, World Relief |
| Mukjar, Wade Salch          | Feb – Apr 2004      | 3.60 (2.70-4.60)                      | 5.20 (1.80-2.60)                      |                  | MSF-H                |
| Niertiti                    | Feb – Jun 2004      | 1.50 (1.20-1.90)                      | 2.10 (1.50-3.00)                      | 27 %             | Epicentre, MSF       |
| El Geneina                  | May – June 2004     | 5.60 (4.10-7.60)                      | 14.10 (9.70-20.10)                    | 10 %             | Epicentre, MSF       |
| Habilah                     | Jun – Aug 2004      | 2.60 (1.80-3.60)                      | 6.70 (1.20-11.00)                     |                  | Epicentre, MSF       |
| Entire Province             | Jun – Aug 2004      | 2.90 (2.40-3.60)                      | 3.10 (2.10-4.70)                      | 12 %             | WHO, Epiet           |
| Fur Baranga                 | Oct 2004 – Jan 2005 | 0.89 (0.54-1.25)                      | 1.80 (0.79-2.81)                      |                  | SCF-US               |
| Murnei                      | Oct 2004 – Jan 2005 | 0.79 (NA)                             | 1.16 (NA)                             | 14 %             | Concern              |
| <b>South Darfur</b>         |                     |                                       |                                       |                  |                      |
| Kass                        | May – Sep 2004      | 3.20 (2.20-4.10)                      | 5.90 (3.80-8.00)                      |                  | Epicentre, MSF       |
| Muhajiria                   | Feb – Sep 2004      | 1.20 (0.90-1.40)                      | 0.70 (0.30-1.10)                      | 46 %             | Epicentre, MSF       |
| Muhajiria                   | Aug – Sep 2004      | 2.30 (1.20-3.40)                      | 1.00 (0.03-1.90)                      | 72 %             | Epicentre, MSF       |
| Kalma                       | Feb – Sep 2004      | 1.60 (1.20-2.00)                      | 2.90 (2.00-3.90)                      | 28 %             | Epicentre, MSF       |
| Kalma                       | Aug – Sep 2004      | 2.00 (1.30-2.70)                      | 3.50 (1.50-5.70)                      | 7 %              | Epicentre, MSF       |
| Kalma                       | Jun – Aug 2004      | 3.80 (2.90-5.00)                      | 11.70 (7.40-18.10)                    | 10 %             | WHO, Epiet           |
| <b>Chad</b>                 |                     |                                       |                                       |                  |                      |
| Iridimi, Touloum            | Aug – Oct 2004      | 1.30 (0.80-1.80)                      | 2.20 (1.20-3.10)                      |                  | MSF                  |
| Bahai, Cariari              | Nov 2003 – Jun 2004 | 1.07 (0.96-1.18)<br>0.62 (0.53-0.70)* | 0.44 (0.31-0.57)                      |                  | UNHCR, CDC, CNNIA    |
| Iridimi, Touloum, Kounoungo | Nov 2003 – Jun 2004 | 2.57 (2.42-2.71)<br>1.56 (1.44-1.67)* | 1.64 (1.47-1.81)<br>1.46 (1.30-1.62)* |                  | UNHCR, CDC, CNNIA    |

\* CMR without including missing people

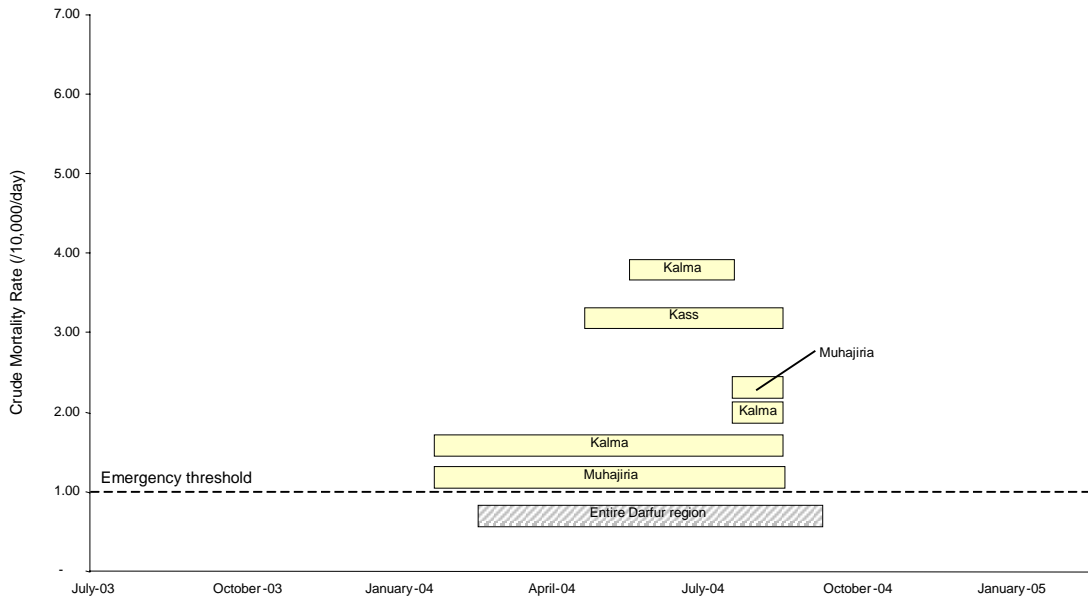
**Figure 1: Surveys in West Darfur (Sep 2003 – Jan 2005)**



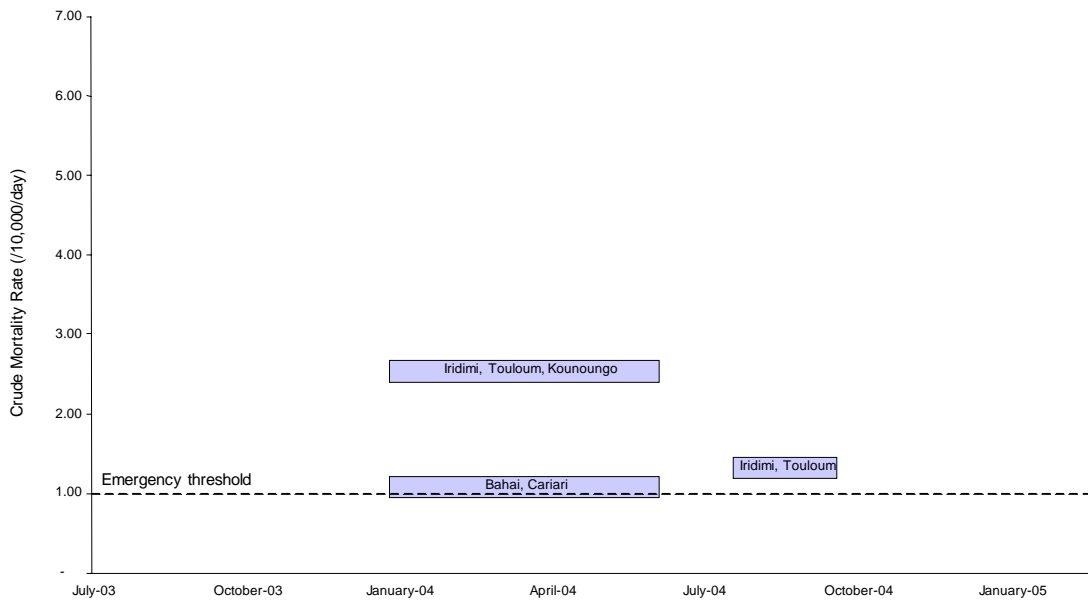
**Figure 2: Surveys in North Darfur (Sep 2003 – Jan 2005)**



**Figure 3: Surveys in South Darfur (Sep 2003 – Jan 2005)**

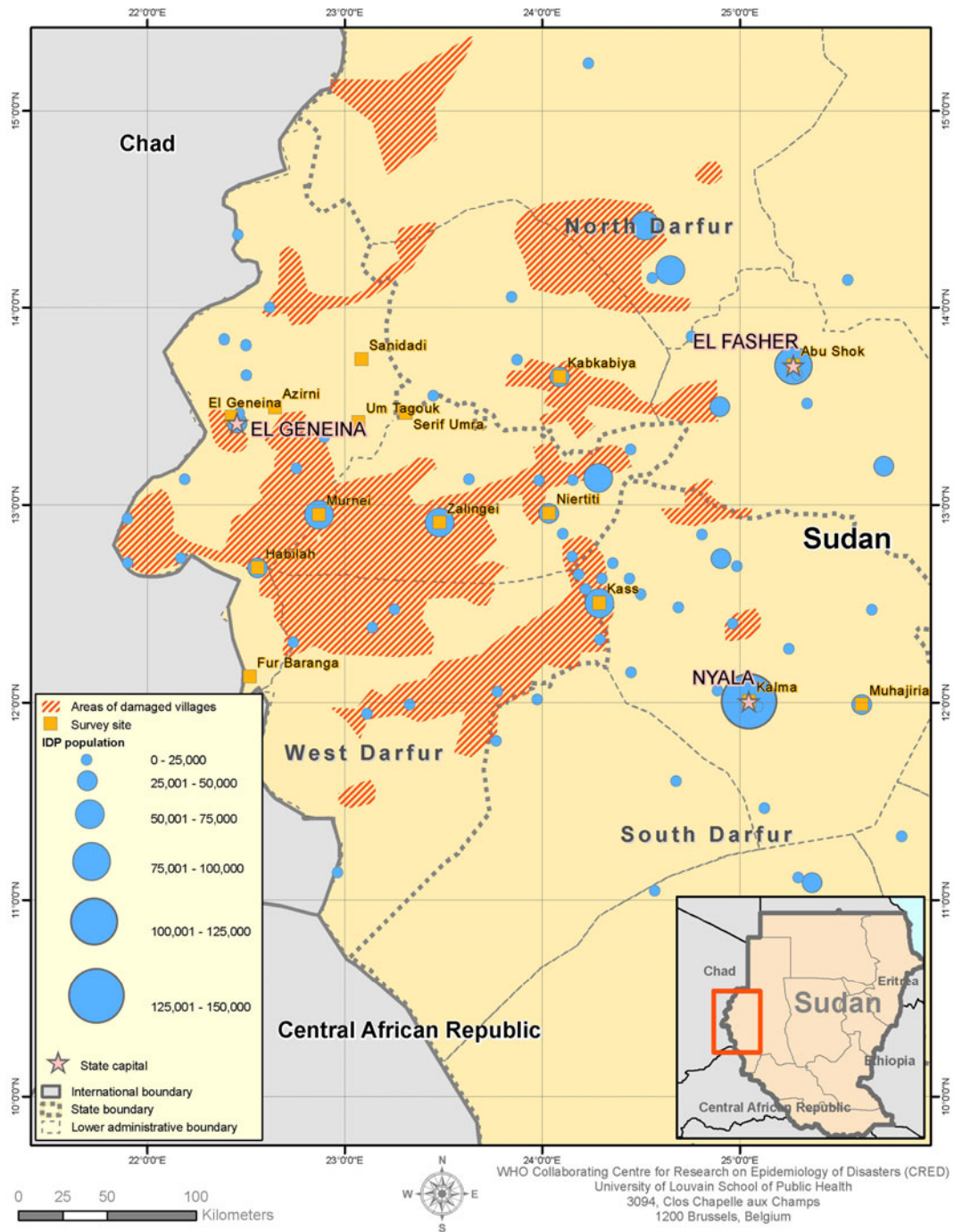


**Figure 4: Surveys in refugee sites in Chad (Sep 2003 – Jan 2005)**





**Figure 5: Map of Darfur showing affected areas, IDP location and survey sites (March 2005)**



Data from the different surveys was compiled from the Complex Emergency Database (CE-DAT ([www.cred.be/cedat](http://www.cred.be/cedat))). This CRED project aims at improving evidence-based policy on conflict prevention and response by providing standardized

and comprehensive data on the human impact of conflict. The project involves producing an online, publicly accessible database that is a compilation of quantitative and qualitative information from numerous credible sources on several countries, including Sudan.

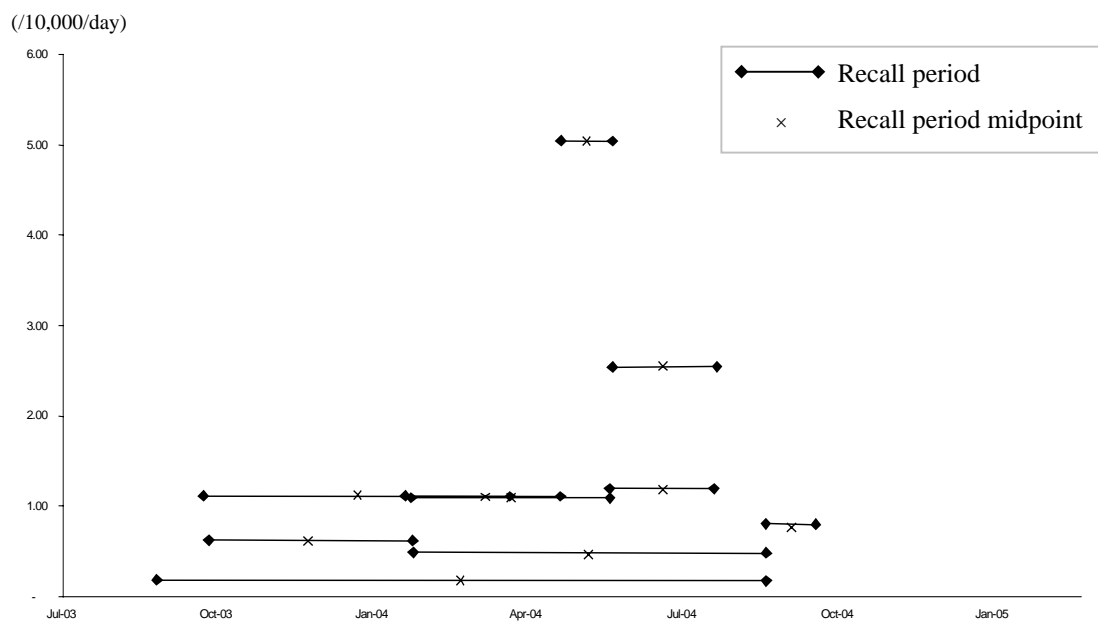
## 5.2 Methods

Two different approaches were used for calculating the number of deaths. Both will be illustrated.

### 5.2.1 Method 1 (Center for Research on the Epidemiology of Disasters)

#### 5.2.1.1 Non-violence related mortality

**Figure 6: Non-violence related mortality rate in North and West Darfur (Sep 2003 - Sep 2004)**



Based on 17 surveys providing data on non-violence related deaths, we analyzed the non-violence related mortality rate for which most surveys give a rather stable figure with a maximum of  $\pm 1.1/10,000/\text{day}$  except for mid 2004. During the months June - August, the non-violence related mortality rate increased significantly. Therefore we decided to use the figures by state from the WHO survey, which covered those months. We subtracted the given proportion of violence in order to obtain a rate that would account for non-violent deaths. This gave us for North and West Darfur respectively

1.19 and 2.55/10,000/day. The high value for West Darfur also covers a possible epidemic outbreak in El Geneina during June (MSF/Epicentre El Geneina non violence-related mortality rate: 5.04/10,000/day).

For South Darfur, WHO only surveyed Kalma camp. However, an MSF survey covering the same period in Muhajiria showed a lower mortality rate. In order not to underestimate the mortality in this state, we decided to use the highest value of both, namely 3.42/10,000/day (non-violence related mortality rate in Kalma).

### **5.2.1.2 Violence-related mortality**

Using the same 17 surveys that were used for the non-violence-related mortality, we analyzed the violence-related deaths during the period from December 2003 to January 2005, which covers a considerable part of the months with heavy violence.

An exponential regression was performed on all surveys except for the one conducted in Muhajiria, showing a significantly different pattern than the other ones. We considered it to be an outlier and did not include it in the regression. A possible explanation is the presence in South Darfur of “clusters of violence” which cannot be considered representative for the entire Darfur region.

Since the period September 2003 - November 2003 was not included in the regression, we applied the proportion of violence we obtained for December, which is the closest value in time we have.

After September 2004, the same proportion of violence has been applied to South Darfur as to North and West Darfur. However, there is no survey giving any information on the level of violence in South Darfur for that period. Therefore, we decided not to make any unfounded assumptions and to leave the possible higher proportion of violence related deaths due to outbreaks of violence in South Darfur during that period out of our calculations.

### **5.2.1.3 Crude mortality rate**

We considered the CMR to be the sum of the violence-related and non-violence-related mortality. Since an approximation of the proportion of violence-related deaths was available using the regression and that the non-violence-related mortality rate had

been estimated to be rather stable except for the period around harvesting, we were able to calculate a probable CMR, using the following equation:

$$\text{CMR} = \frac{\text{non violence related mortality rate}}{1 - \text{proportion violence related deaths}}$$

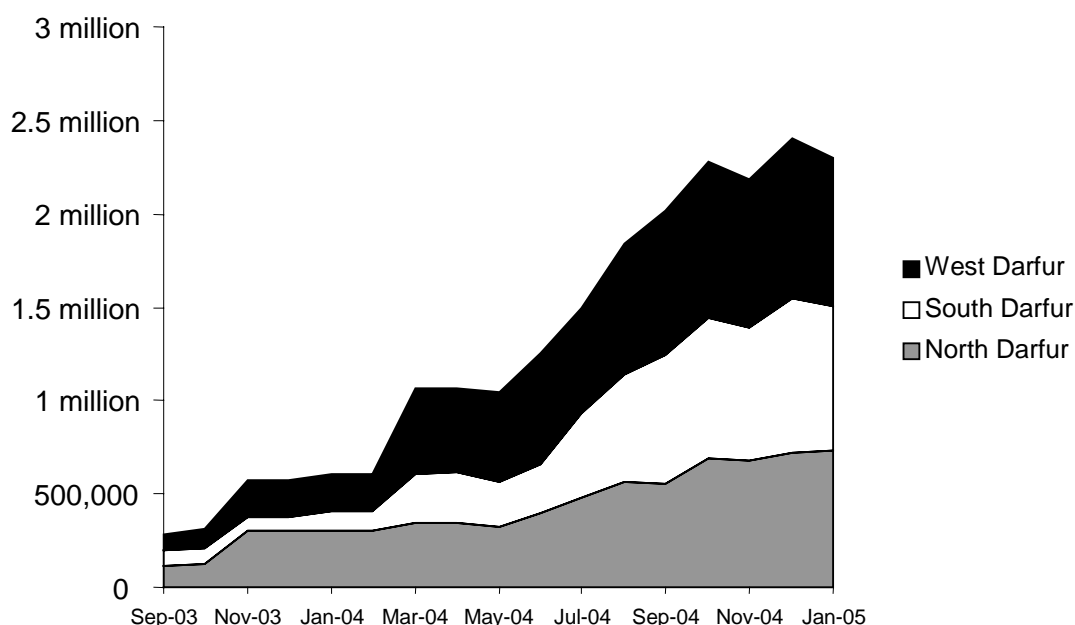
#### 5.2.1.4 Reference values

The value that was used to calculate the expected number (without the conflict) of deaths was the crude mortality rate of 2003. According to UNICEF<sup>14</sup> this was, for the entire country, 11/1,000/year or 0.3/10,000/day. As described in section 3, the under 5 mortality rate (U5MR) in Darfur was similar to the country average. Therefore we assume that the national data on CMR is applicable to the Darfur region.

#### 5.2.1.5 Universe

The Darfur Humanitarian Profile provides monthly estimations of the affected population and the number of IDPs in Darfur since September 2003, but not of refugees.

*Figure 7: Affected population in Darfur (Sept 2003 - Jan 2005)*



<sup>14</sup> UNICEF. (2003) “The State of the World’s Children 2003”

The affected population started with a regional total of less than 500,000 in September 2003, increased steadily from then and reached some 2.4 million in January 2005.

## **5.2.2 Method 2 (US Department of State Estimates)**

### **5.2.2.1 Overview**

This analysis drew on all available information - epidemiological surveys of mortality and nutrition, displacement trends, patterns of village destruction, remote sensing data and documentation of attacks reported by the press and human rights groups - to estimate ranges of mortality rate by region and month throughout the three Darfur states and eastern Chad from March 2003 to early 2005 based on the progression of the conflict. "High" and "low" estimates of mortality rates were then applied to UN data for all affected populations by month. Separate mortality rates were applied to displaced and otherwise affected populations due to different levels of vulnerability. Expected baseline mortality for sub-Sahara Africa populations<sup>15</sup> (.5/10,000/day) was subtracted from total deaths and therefore only "excess" deaths attributed to the conflict are represented. This analysis did not attempt to differentiate between violent and non-violent deaths but rather estimate upper and lower bounds of a range of plausible all cause mortality.

### **5.2.2.2 Mortality rate estimation**

We first compiled all available mortality surveys, deemed to have been conducted with sound epidemiological methods, (Table 3: Mortality surveys conducted in Darfur and refugee camps in Chad from CE-DAT database (April 2004 - January 2005)) from the Darfur region and spatially depicted the results by location and time periods of which they were representative (defined recall periods). This enabled us to construct a framework of mortality rates on which to base overall crude mortality rates (CMR) estimations by state, as well as to evaluate existing data and gaps (Figure 1-Figure 4).

Next, areas with existing mortality data were evaluated in terms of displacement patterns<sup>16</sup>, village destruction<sup>17</sup>, 'fire mapping' remote sensing data<sup>18</sup> and retrospective

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<sup>15</sup> World Health Organization. "World Health Report, 2004"

<sup>16</sup> MSF/Epicentre data, ADT data, UN Humanitarian Profiles No. 1-10

<sup>17</sup> HIU Map [http://www.usaid.gov/locations/sub-saharan\\_africa/sudan/satelliteimages.html](http://www.usaid.gov/locations/sub-saharan_africa/sudan/satelliteimages.html), database

<sup>18</sup> University of Maryland Fire Mapping Center. <http://maps.geog.umd.edu/activefire.asp>

reporting of attacks<sup>19, 20, 21</sup> to determine if the existing mortality rates could be applied as the overall mortality rate estimate to a broader population within that region, or if a higher, or lower, rate was warranted. Increases in displacement, evidence of village destruction, and/or reports of attacks, were assumed as indicators of violence and therefore higher mortality clustered around periods of large-scale displacement.

We then examined regions and/or time periods with data gaps and estimated mortality rates derived from regions that were judged to have experienced similar levels of conflict based on secondary evidence. For example, data on mortality for North Darfur during 2003 and early 2004 was extremely limited, however, levels of displacement (Figure 7: Affected population in Darfur (Sept 2003 - Jan 2005)) village destruction (Figure 5: Map of Darfur showing affected areas, IDP location and survey sites (March 2005)) and area of origin of refugees in Chad<sup>22</sup> indicated that the patterns of conflict and violence in the North were analogous to West Darfur. Therefore, mortality survey data from West Darfur was used as a basis for estimating mortality rate estimates in North Darfur for this period.

### 5.2.2.3 Secondary factors used in determining mortality rate estimates

#### ◆ *Trends in Mortality Survey Data*

Disaggregated data from mortality studies with longer recall periods and larger sample sizes were also analyzed for trends in mortality rates to assist in determining estimates for larger geographic regions and time periods.

Data collected on the month of arrival during October 2003 - March 2004 in three internally displaced persons camps (Niertiti, Murnei and Zalingei)<sup>23,24</sup> indicate the periods of highest displacement (October 2003-January 2004) and the high number of deaths clustered around months of peak arrivals, particularly violent deaths. (Figure 8-Figure 9)

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<sup>19</sup> Human Rights Watch. "Darfur Destroyed: Ethnic Cleansing by Government and Militia Forces in Western Sudan" HRW Index No.: A1606, May 7, 2004 <http://hrw.org/reports/2004/sudan0504/>

<sup>20</sup> Human Rights Watch. "Darfur in Flames: Atrocities in Western Sudan" April 2, 2004 <http://hrw.org/reports/2004/sudanO404/>

<sup>21</sup> UN Resident Coordinator for Sudan Sitreps, UN Weekly Humanitarian Roundups, UNICEF Sitreps, WFP Emergency Reports, WFP Weekly Sitreps, IRIN Reports (March- May 2004)

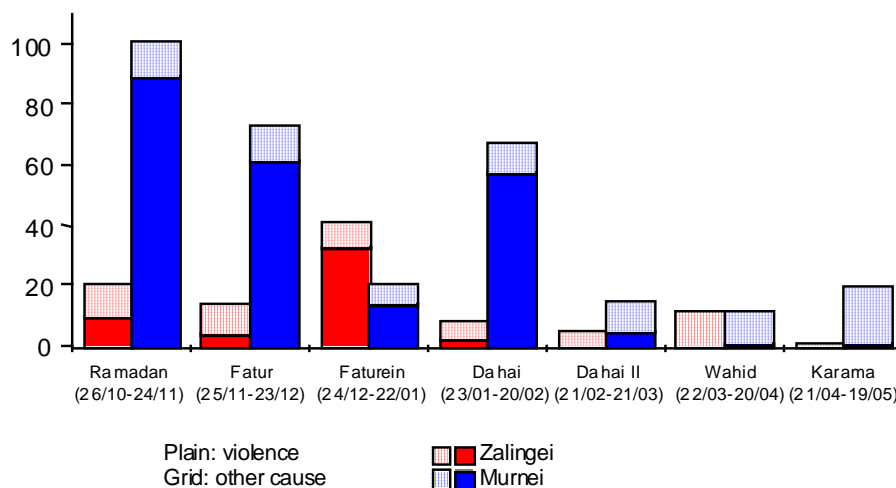
<sup>22</sup> US State Department. "Documenting Atrocities in Darfur." September, 2004

<sup>23</sup> Epicentre, MSF. "Health Assessment in Emergencies: Murnei & Zalingei, West Darfur, Sudan" June 2004

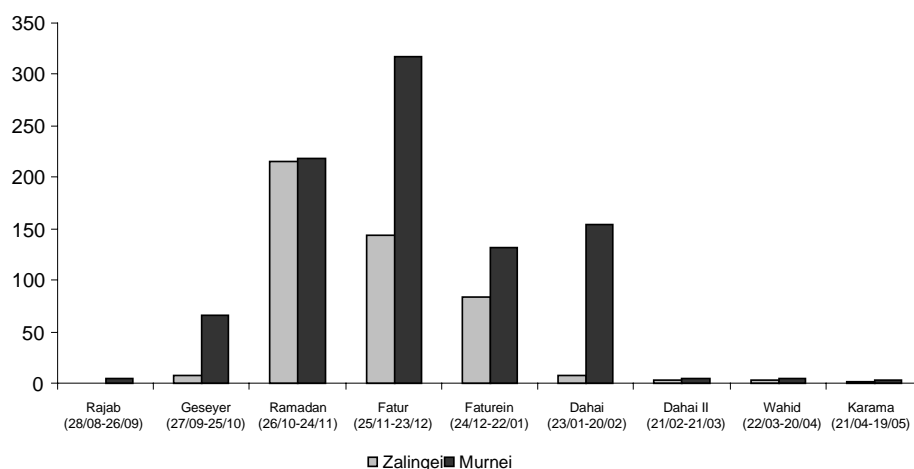
<sup>24</sup> Epicentre. "Health and Nutrition Assessment: Niertiti, West Darfur" June 2004

Data from these surveys also indicates that deaths, especially those caused by violence, decreased significantly after arrival to the camps.

**Figure 8: Number and cause of death in Zalingei and Murnei camps from 26/10/03 to 19/05/04 (MSF/Epicentre, 2004)**



**Figure 9: Arrivals per month in Zalingei and Murnei camps from 28/08/03 to 19/05/04 (MSF/Epicentre, 2004)**



While disaggregated monthly sample sizes are too small to be statistically significant, UNHCR/CDC data on mortality from refugee camps in Chad also indicates that the highest number of deaths occurred during the time period of November 2003 -February 2004, decreasing beginning in March 2004.<sup>25</sup>

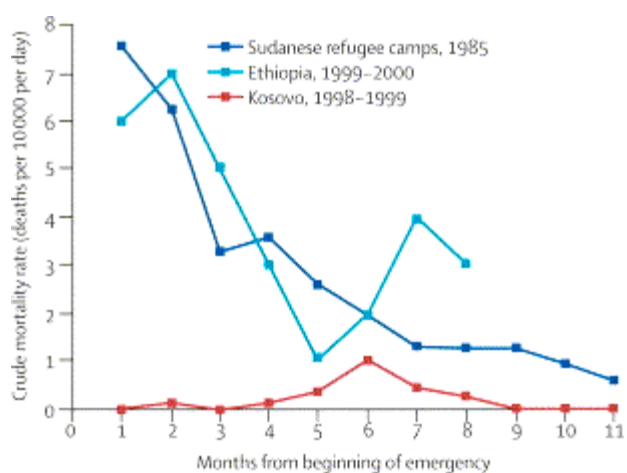
◆ **Historical data**

<sup>25</sup>Centers for Disease Control. “Emergency Nutrition and Mortality Surveys Conducted Among Sudanese Refugees and Chadian Villagers, Northeast Chad” June 2004. Unpublished data

We also examined historical trends of mortality rates among displaced populations to determine when mortality rates were likely to peak and diminish in response to humanitarian interventions and therefore assist in guiding our estimates. Previous studies suggest the evolution of mortality rates could be expected to gradually return to normal levels four to six months after an effective humanitarian response.<sup>26</sup> Exceptions, such as Ethiopia in 1999-2000 where mortality rates increased following aid interventions, were a result of widespread outbreaks of infectious diseases, in this case measles.<sup>27</sup> (Figure 9)

The absence of large-scale infectious disease outbreaks such as measles and diarrhoeal disease and their associated mortality, across greater Darfur, likely contributed to lower mortality rates than previously projected.<sup>28</sup>

**Figure 10: Mortality rate trends in selected displaced populations<sup>29</sup>**



Application of this historical trend to the Darfur crisis is not uncomplicated due to the plodding nature of gearing up an effective aid intervention and the progression of the conflict to certain regions, particularly the South. Nevertheless, taken individually, the regions of Darfur were found to generally follow historical patterns with the exception of

<sup>26</sup> Salama P, Spiegel P, Talley L, Waldman R. “Lessons learned from complex emergencies over past decade.” *Lancet* 2004;364(9447):1801-13.

<sup>27</sup> Centers for Disease Control. “Mortality During a Famine --- Gode District, Ethiopia” *MMWR* April 20, 2001 / 50(15); 285-8 July 2000

<sup>28</sup> USAID. “Projected Mortality Rates in Darfur, Sudan 2004 – 2005.” [http://www.usaid.gov/locations/sub-saharan\\_africa/sudan/cmr\\_darfur.pdf](http://www.usaid.gov/locations/sub-saharan_africa/sudan/cmr_darfur.pdf)

<sup>29</sup> Spiegel PB, Salama P. War and mortality in Kosovo, 1998-99: an epidemiological testimony. *Lancet* 2000; 355: 2204-09.

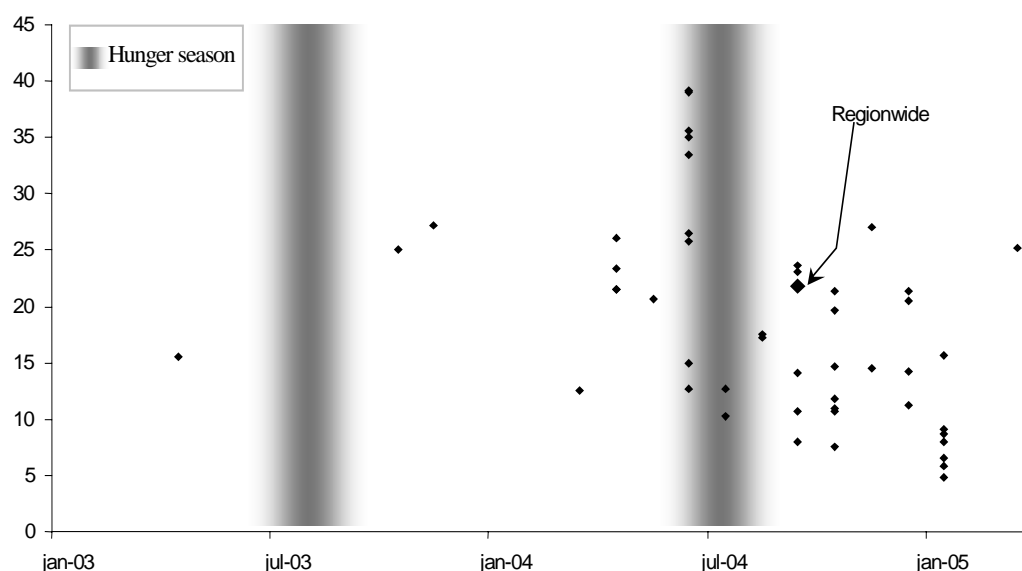


South Darfur, which has been a mixture of continuing sporadic conflict and new displacement coinciding with progressively more effective humanitarian assistance.<sup>30,31</sup>

◆ **Nutrition Levels**

Malnutrition levels (measured among children 6 months to 5 years of age) and mortality rates have a robust correlation but are also highly influenced by other factors such as disease outbreak.<sup>32</sup> Nonetheless, malnourished children are generally used as a proxy for the health status of the population and were therefore used as a secondary indicator to guide mortality rate estimates across time periods.<sup>33</sup> More than thirty nutrition surveys were conducted in Darfur and eastern Chad since early 2004, covering refugee, displaced, resident, and mixed populations. These show global acute malnutrition (GAM) rates generally declining over time since spring of 2004. Six surveys completed in early 2005 all showed GAM levels below 10%, indicating an improved overall health situation. (Figure 11: Global Acute Malnutrition in Darfur region (Jan 2003 – March 2005))

**Figure 11: Global Acute Malnutrition in Darfur region (Jan 2003 – March 2005)**



<sup>30</sup> Friedman C, Spiegel P. West Timor mission report, Jan 24-Mar 2, 2000. Kupang: United Nations High Commissioner for Refugees and Centers for Disease Control and Prevention, 2000

<sup>31</sup> Salama P, Assefa F, Talley L, Spiegel P, Van Der Veen A, Gotway C. Malnutrition, measles, mortality, and the humanitarian response during a famine in Ethiopia. JAMA 2001; 286: 563-71.

<sup>32</sup> Centers for Disease Control. Famine-Affected, refugee, and displaced populations: recommendations for public health issues. MMWR 1992; 41(No. RR-13)

<sup>33</sup> UN Standing Committee on Nutrition. "5th Report on the World Nutrition Situation (RWNS)" March 2004

**Table 4: Nutrition surveys conducted in Darfur and refugee camps in Chad from CE-DAT database (April 2000 - January 2005)**

| Location                         | Start of the survey | End of the survey | GAM (%) | Conducted by                                                              |
|----------------------------------|---------------------|-------------------|---------|---------------------------------------------------------------------------|
| <b>Darfur region</b>             | Sep 2004            | Sep 2004          | 21.8    | CDC, WFP                                                                  |
| <b>North Darfur</b>              |                     |                   |         |                                                                           |
| El Laeit, El Tweisha (IDPs)      | Apr 2000            | May 2000          | 19.5    | Save The Children-UK                                                      |
| El Laeit, El Tweisha (residents) | Apr 2000            | May 2000          | 13      | Save The Children-UK                                                      |
| El Fasher                        | Mar 2001            | Apr 2001          | 26.1    | Save The Children-UK                                                      |
| Entire state                     | Mar 2001            | Apr 2001          | 23.4    | Save The Children-UK                                                      |
| Al Malha                         | Feb 2002            | Feb 2002          | 18.5    | Save The Children-UK                                                      |
| Al Malha                         | Apr 2002            | Apr 2002          | 18.5    | Save The Children-UK                                                      |
| Al Malha                         | Nov 2002            | Nov 2002          | 19.5    | Save The Children-UK                                                      |
| Al Malha                         | Apr 2003            | Apr 2003          | 15.5    | Save The Children-UK                                                      |
| Al Malha                         | Oct 2003            | Oct 2003          | 25      | Save The Children-UK                                                      |
| Kutum                            | Mar 2004            | Mar 2004          | 12.6    | Save The Children-UK                                                      |
| Al Malha                         | Apr 2004            | Apr 2004          | 26.1    | Save The Children-UK                                                      |
| Abu Shok                         | Jun 2004            | Jun 2004          | 39      | ACF-F                                                                     |
| Al Malha                         | Jun 2004            | Jun 2004          | 33.4    | Save The Children-UK                                                      |
| Kabkabiya                        | Aug 2004            | Aug 2004          | 17.5    | MSF, Epicentre                                                            |
| Serif Umra                       | Oct 2004            | Oct 2004          | 14.7    | MSF, Epicentre                                                            |
| Abu Shok                         | Nov 2004            | Nov 2004          | 27      | ACF-F                                                                     |
| <b>West Darfur</b>               |                     |                   |         |                                                                           |
| Mukjar, Wade Saleh               | Apr 2004            | Apr 2004          | 21.5    | MSF-H                                                                     |
| Zalingei                         | Apr 2004            | Apr 2004          | 23.4    | MSF, Epicentre                                                            |
| Murnei                           | May 2004            | May 2004          | 20.6    | MSF, Epicentre                                                            |
| El Geneina                       | Jun 2004            | Jun 2004          | 25.8    | MSF, Epicentre                                                            |
| Habilah                          | Aug 2004            | Aug 2004          | 17.2    | MSF, Epicentre                                                            |
| Azirri, Sanidadi, Um Tagouk      | Sep 2004            | Sep 2004          | 8.0     | CIEDRS, World Relief                                                      |
| Fur Baranga                      | Jan 2005            | Jan 2005          | 6.6     | Save The Children-US                                                      |
| <b>South Darfur</b>              |                     |                   |         |                                                                           |
| Kalma                            | Sep 2004            | Sep 2004          | 23.6    | MSF, Epicentre                                                            |
| Kass                             | Sep 2004            | Sep 2004          | 14.1    | MSF, Epicentre                                                            |
| Muhajiria                        | Sep 2004            | Sep 2004          | 10.7    | MSF, Epicentre                                                            |
| Nyala                            | Sep 2004            | Sep 2004          | 23.6    | ACF                                                                       |
| Ed Daein                         | Mar 2005            | Mar 2005          | 25.2    | UNICEF, Tearfund, MOH Sudan, Sudan Social Development Organization (SUDO) |
| <b>Chad</b>                      |                     |                   |         |                                                                           |
| Tine                             | Nov 2003            | Nov 2003          | 27.2    | MSF-B                                                                     |
| Bahai, Cariari                   | Jun 2004            | Jun 2004          | 39.2    | CDC, UNHCR, CNNTA                                                         |
| Iridimi, Touloum, Kounoungo      | Jun 2004            | Jun 2004          | 35.6    | CDC, UNHCR, CNNTA                                                         |
| Iridimi, Touloum                 | Oct 2004            | Oct 2004          | 19.6    | MSF-B                                                                     |
| Oure Cassoni                     | Dec 2004            | Dec 2004          | 20.5    | ACF                                                                       |
| Treguine                         | Dec 2004            | Dec 2004          | 11.3    | ACF                                                                       |
| Bredjing, Farchana               | Jan 2005            | Jan 2005          | 8       | MSF-H                                                                     |
| Mile                             | Jan 2005            | Jan 2005          | 15.6    | ACF                                                                       |
| Djabal                           | Feb 2005            | Feb 2005          | 15.6    | ACF                                                                       |
| Goz Amir                         | Feb 2005            | Feb 2005          | 10.1    | ACF                                                                       |

High prevalence of infectious diseases, a contributing factor to increased mortality among malnourished populations, have so far been forestalled and likely suppressed associated mortality during the hunger season of 2004. Increased humanitarian assistance has undoubtedly had a positive impact on malnutrition rates, but the poor harvest of 2004 is likely to result in a longer and more severe hunger season this year leading to increasing malnutrition rates and a progressively more vulnerable population in the coming months.

#### **5.2.2.4 High and Low CMR Estimates**

##### **◆ *High Estimate***

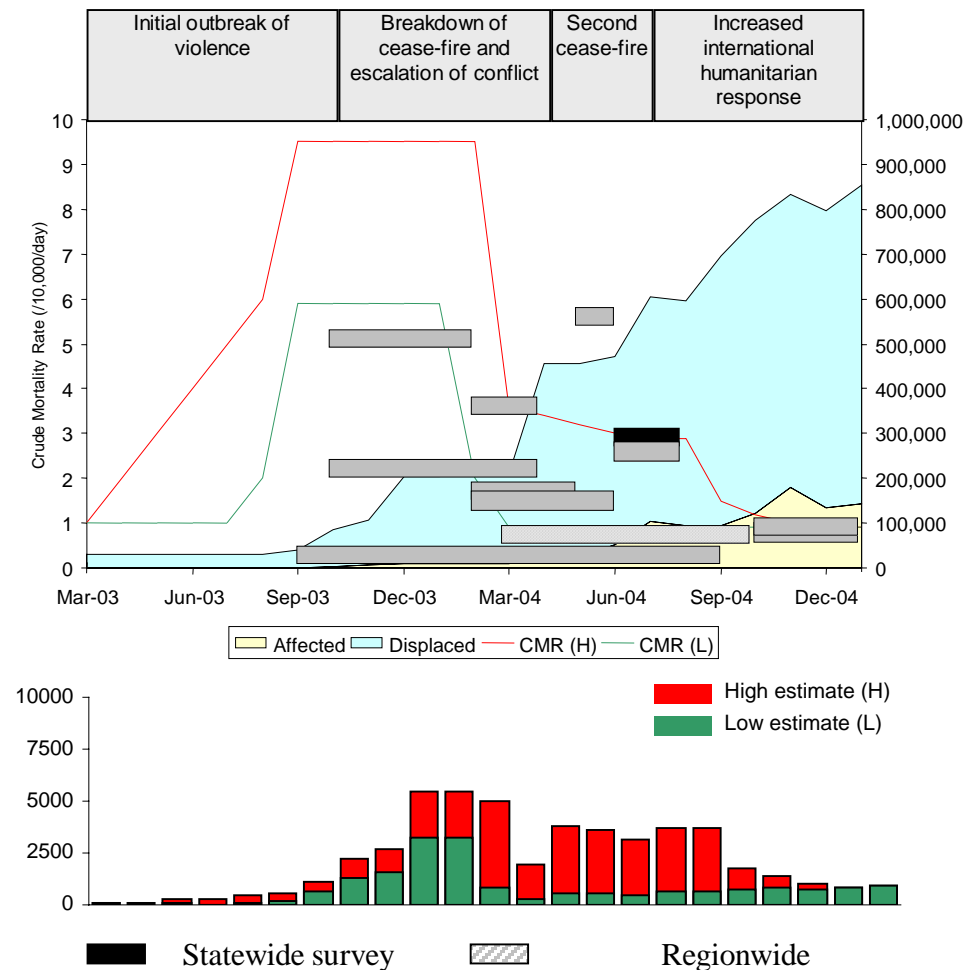
A 'high' estimate of crude mortality was used to assume a worst-case scenario for each region and month. In this case higher mortality rates from camps or settlements were generalized to a larger population. In some cases higher mortality rates from one region were applied to another area lacking reliable mortality data based on evidence indicating similar levels of conflict. Higher CMRs representing specific stages of longer survey recall periods were used to capture elevated rates during village and flight periods. Significant inaccessible populations were also assumed to be worse off and reflected in a higher CMR estimate for that period/region. If there was conflicting mortality data for a period or region, the higher rate was used. Corroborating evidence of displacement, destruction of villages, reports of attacks or disease outbreaks were used to adjust estimates higher than available survey data in some cases.

##### **◆ *Low Estimate***

A "low" estimate of CMR was also applied to each Darfur state by month assuming a best-case scenario. Site-specific mortality was not necessarily assumed to be applicable to the broader population and a lower rate or average of available rates was used. If there were conflicting mortality rates for an area or time period the lower rate was used.

### 5.2.2.5 CMR estimation by phases of the conflict

**Figure 12: Mortality in West Darfur (Mar 2003 – Jan 2005)**

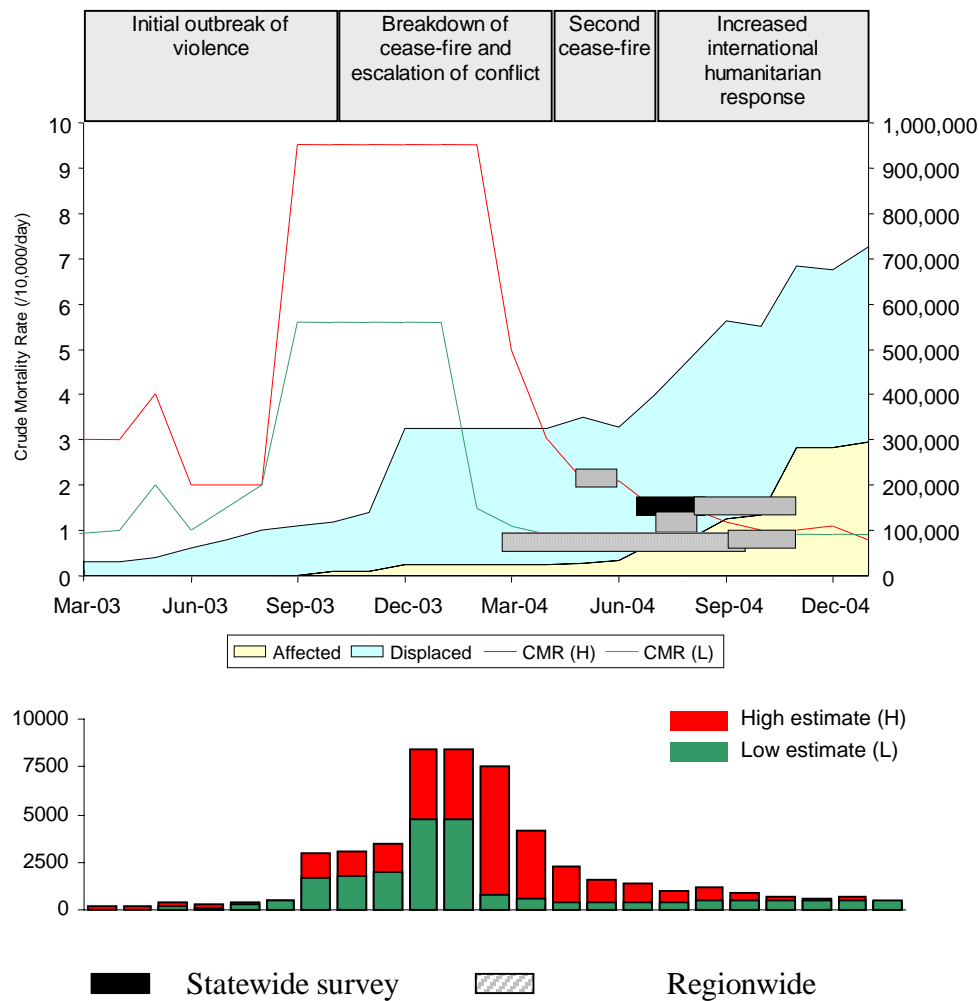


#### ◆ *Initial outbreak of violence (March-September 2003)*

There is no reliable mortality data and only limited affected population data from March 2003 until September 2003. Based on reports of attacks during this period and a UN assessment<sup>34</sup> a high (3/10000/day) and low (1/10000/day) CMR estimate was applied to North and West Darfur populations. Populations were assumed to have incrementally increased from March 2003 to the UN estimates of September 2003 of 300,000.<sup>35</sup> Higher estimated rates were applied to North Darfur based on larger numbers of displaced and more numerous incidents of fighting. Reporting indicates violence began to escalate prior to the initial cease-fire of September 2003. Although estimates for this period are the most speculative, the range of CMR estimates are believed to be sufficiently wide to capture a plausible mortality rate for this phase.

<sup>34</sup> “UN Greater Darfur Special Initiative” September 15, 2003

**Figure 13: Mortality in North Darfur (Mar 2003 – Jan 2005)\***



\* As the above graph indicates mortality data for North Darfur was extremely limited prior to April 2004. Estimation of extremely high CMR rates for the late 2003 through early 2004 was done so based on high CMRs found by MSF/Epicentre in West Darfur during this period. Application of these mortality rates to the affected North Darfur population was considered justified due to comparable displacement and village destruction patterns.

◆ ***Breakdown of cease-fire/escalation of conflict (October 2003-March 2004)***

All available data indicates that this period was the most violent period of the conflict with elevated CMRs throughout large parts of North Darfur, West Darfur and in refugees fleeing to Chad. Three Médecins Sans Frontières (MSF) mortality surveys conducted in West Darfur provided the most extensive information on this period and were therefore utilized as the primary basis for CMR estimation<sup>36</sup>. While overall CMRs from these three surveys ranged from 1.5 –3.4/10,000/day the higher “village and flight”

<sup>35</sup> “UN Greater Darfur Special Initiative” September 15, 2003

period mortality rates (Low 5.9/10,000/day and High 9.5) were applied to both North and West Darfur during this phase in an effort to capture the fullest extent of mortality, particularly violent deaths. The overall UNHCR/CDC mortality rates (Low-1.56/10,000/day and High-2.57/10,000/day (Including missing family members)) were used as a constant for the refugee population in Chad for the entire recall period of November through June. Mortality rate estimates for South Darfur begin to increase at the end of this phase as the first major attacks in the region were reported and displacement began to increase.

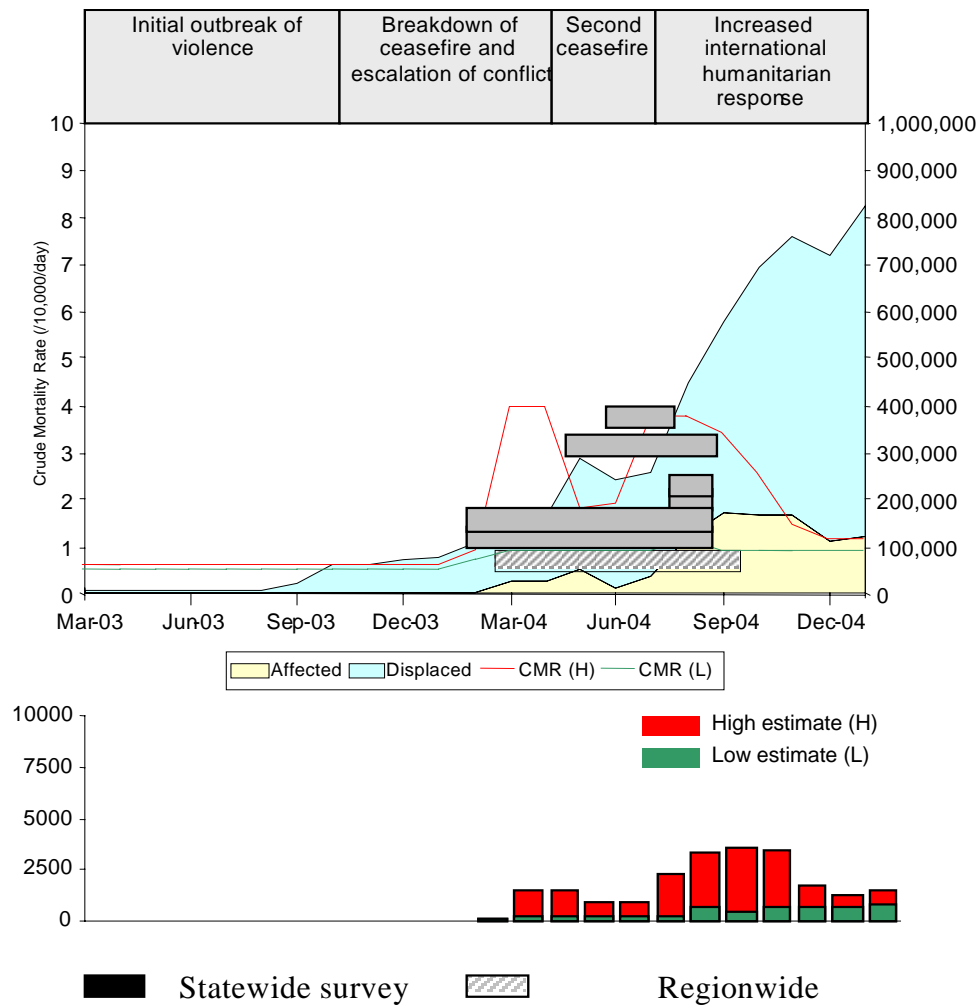
◆ ***Second cease-fire agreement (April-June 2004)***

Data on mortality rates became increasingly available after April as restrictions on access to the region eased. Most mortality surveys were representative of individual or small numbers of displaced settlements or camps, but two surveys covered broader populations within Darfur. WHO conducted two mortality surveys of displaced populations in West and North Darfur with a two month recall period, June 15 - August 15, 2004 and WFP/CDC conducted a Darfur-wide nutrition and mortality survey of both displaced and non-displaced conflict affected populations. The recall period for the WFP/CDC survey covered a longer period, February -September 2004. The WHO CMR rates for North and West Darfur were used for the high estimates for the June-August time frame. Various surveys indicated more elevated high CMR estimates in South Darfur during summer and fall 2004. (Figure 14: Mortality in South Darfur (Mar 2003 – Jan 2005)) The WFP/CDC rate was used as the basis for the low estimate for displaced populations, adjusted slightly upwards based on other evidence, for all three states during the seven-month recall period. Multiple surveys, malnutrition levels, historic trends and reports from the UN indicate gradually decreasing mortality rates, dropping below emergency thresholds in late 2004 and early 2005.

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<sup>36</sup> Depoortere E, Checchi F, Broillet F, Gerstl S, Minetti A, Gayraud O, et al. "Violence and mortality in West Darfur, Sudan (2003-04): epidemiological evidence from four surveys." *Lancet* 2004;364(9442):1315-20.

**Figure 14: Mortality in South Darfur (Mar 2003 – Jan 2005)**



Differences between the WHO and WFP/CDC mortality rates are noteworthy and represent a discrepancy that cannot be easily explained but can be viewed in the following context. The WHO and WFP/CDC surveys represent different populations and time periods and therefore cannot be directly compared. The WHO CMR for North Darfur (1.5/10000/day) and West Darfur (2.9/10000/day) represented displaced populations but not non-displaced affected populations. Despite the fact that it was representative of a total of 881,154 IDPs (North Darfur-382,626 West Darfur-489,528) for a two month recall period, a higher CMR of 2.6/10000/day (after factoring in a survey of a single camp in South Darfur, 74,658) was assumed representative of the entire affected Darfur Population of 1.8 million (displaced and non-displaced) for a period of over seven months. The WFP/CDC nutrition/mortality survey (CMR 0.72/10,000/day; GAM 21.8%) was representative of the 1.4 million affected (displaced and non-displaced) persons in Darfur (excluding

refugees in Chad) and resulting mortality rates were applied to this population for the seven month recall period of the survey.

#### **5.2.2.6 Affected resident population (non displaced)**

We assumed non-displaced affected resident populations to have slightly lower mortality rates than displaced population due to lower exposure to violence as well as more retained resources and coping strategies. The only major survey of both displaced and non-displaced affected populations indicated lower CMR among non-displaced affected population<sup>37</sup>. For non-displaced affected populations we used 0.8 of the CMR for displaced population.

#### **5.2.2.7 Population Estimate.**

We used the UN humanitarian profile monthly population estimates (separated by displaced and affected populations) for each Darfur state from September 2003 till January 2005. No source of reliable information was available for affected populations prior to September 2003, so an incremental increase from March 2003 was assumed. For Chad, UNHCR data for spontaneous settlement and camp data was used.

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<sup>37</sup> CDC. WFP. "Emergency Nutrition Assessment of Crisis Affected Populations Darfur Region, Sudan." August-September 2004  
<http://www.cdc.gov/nceh/ierh/Research&Survey/DarfurNutritionReport.pdf>

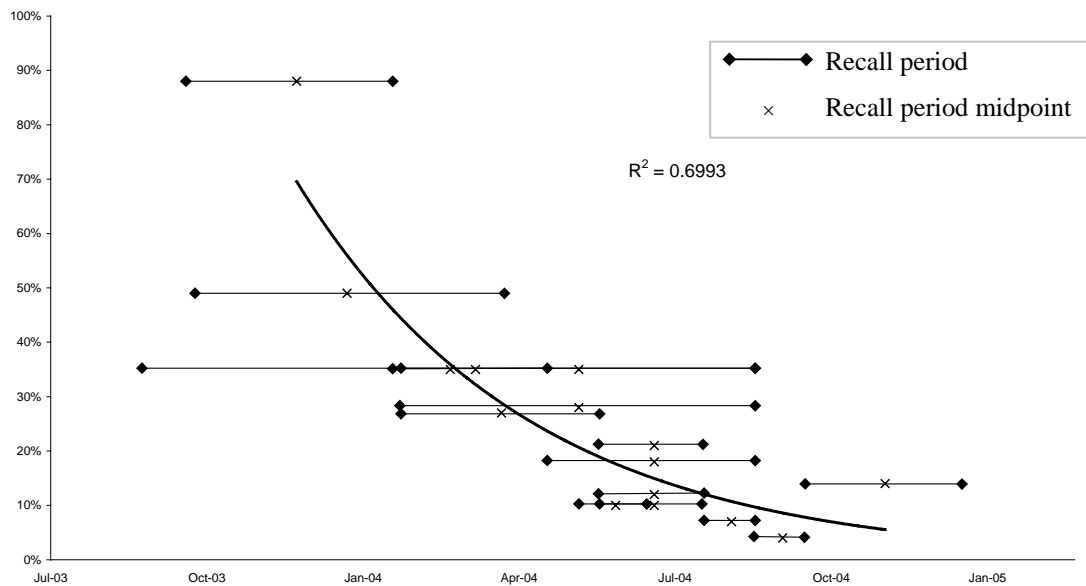


## 6 Results

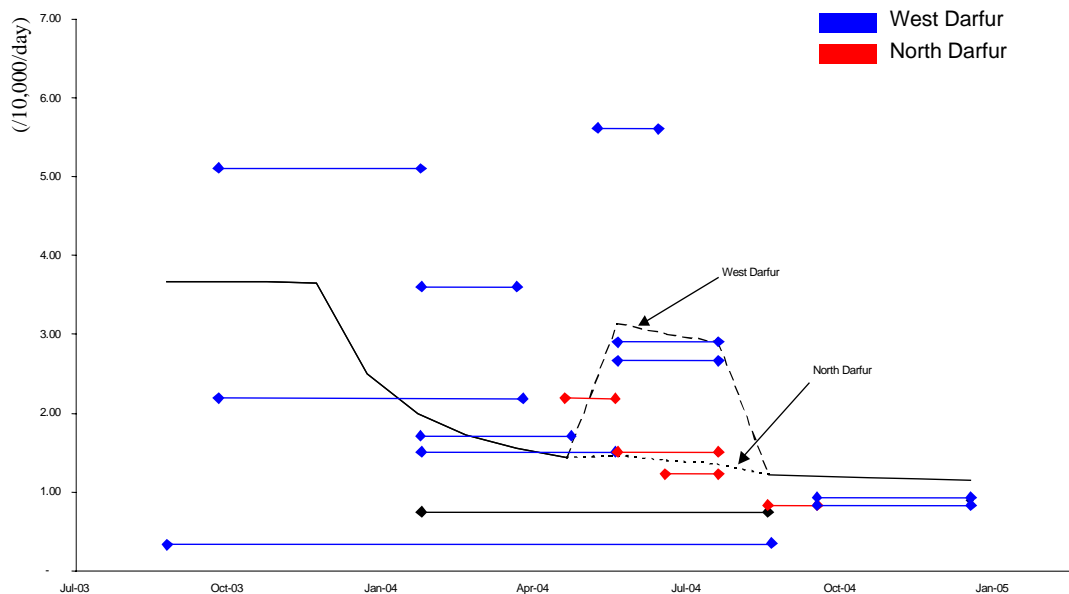
### 6.1.1 Method 1

The regression showed a high level of correlation ( $R^2=0.6993$ ). (Figure 15)

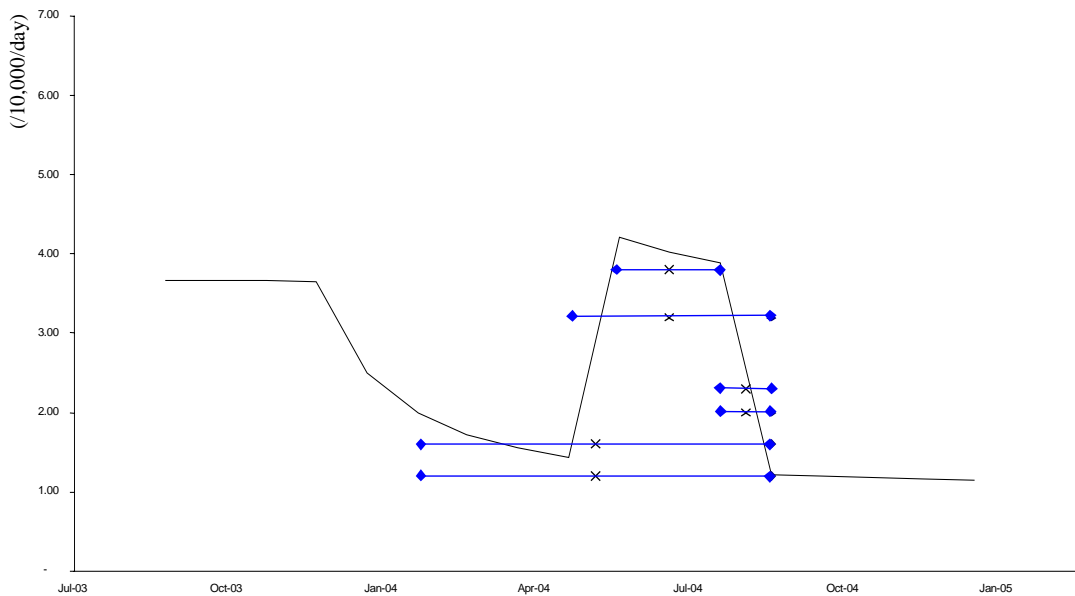
**Figure 15: Proportion violence related deaths in North and West Darfur (Dec 2003 - Sep 2004)**



**Figure 16: Crude Mortality Rate for North and West Darfur (Sep 2003 – Jan 2005)**

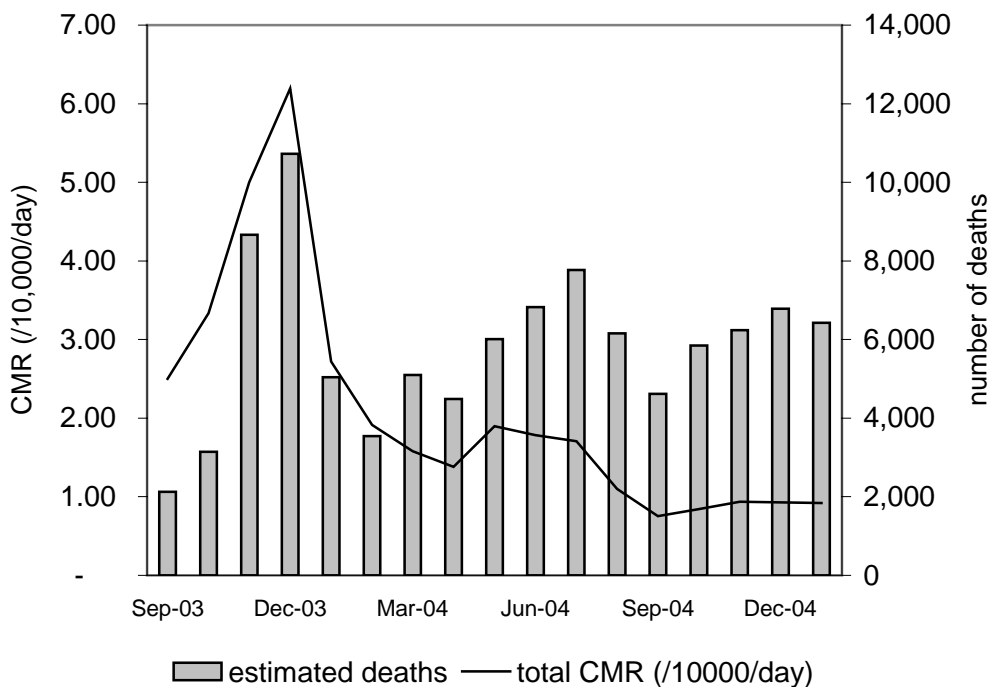


**Figure 17: Crude Mortality Rate for South Darfur (Sep 2003 – Jan 2005)**



Applying the approximated crude mortality rates (Figure 16-Figure 17) to the affected population as mentioned in the Humanitarian Profile from September 2003 until January 2005, we arrive at a total estimated number of deaths of 121,582. This is the number of people that died during this period in Darfur. It does not take refugees into account. Figure 18 shows the calculated monthly CMR and number of deaths.

**Figure 18: Estimated number of deaths and CMR (September 2003 – January 2005)**



There are  $\pm$  200,000 refugees in Chad, accounting for approximately 10% of the affected population within Darfur (2,300,000). Assuming that these refugees present comparable rates of mortality, we can add 10% to our subtotal arriving at 133,740 deaths for September 2003 – January 2005 (Table 5).

We excluded the number of those who would have died without the war in any using an expected death rate of 0.3/10,000/day (UNICEF 2003). This number was subtracted from the  $\pm$  134,000, which gave us **118,142**. These deaths may be attributed directly as a consequence of the war.

Using the rates of violence-related mortality we calculated through regression analysis, we estimate the number of violence-related deaths to be  $\pm$  35,000.

As mentioned before, these figures do not take into account:

- the number of people killed before September 2003
- deaths from isolated areas with high violence rates in South Darfur after September 2004

***Table 5: Summary table of total and excess deaths among affected population in Darfur***

|                                                                      |                       |
|----------------------------------------------------------------------|-----------------------|
| <i>Total number of deaths in Darfur (Sep 2003 - Jan 2005)</i>        | <i>121,582</i>        |
| <i>Total number of excess deaths in Darfur (Sep 2003 - Jan 2005)</i> | <i>107,402</i>        |
| <i>Addition of 10 % for refugees in Chad</i>                         | <i>10,740</i>         |
| <i>Total number of excess deaths (Sep 2003 - Jan 2005)</i>           | <b><i>118,142</i></b> |

### 6.1.2 Method 2

Based on the application of ‘low’ and ‘high’ CMR monthly estimates to UN population figures for each region it is estimated that 98-181,000 people have died since March 2003 to January 2005 in the conflict-affected area of Darfur and eastern Chad. Excluding an expected “normal” base mortality total of 35,000 deaths for this population, 63-146,000 “excess” deaths can be attributed to violence, disease, and malnutrition because of the conflict during this period.

Figure 19 displays the monthly breakdown of total and excess death estimates.

**Figure 19: Total deaths and excess deaths in Darfur and the Chad Refugee Camps. High and low estimates, March 2003 – January 2005**

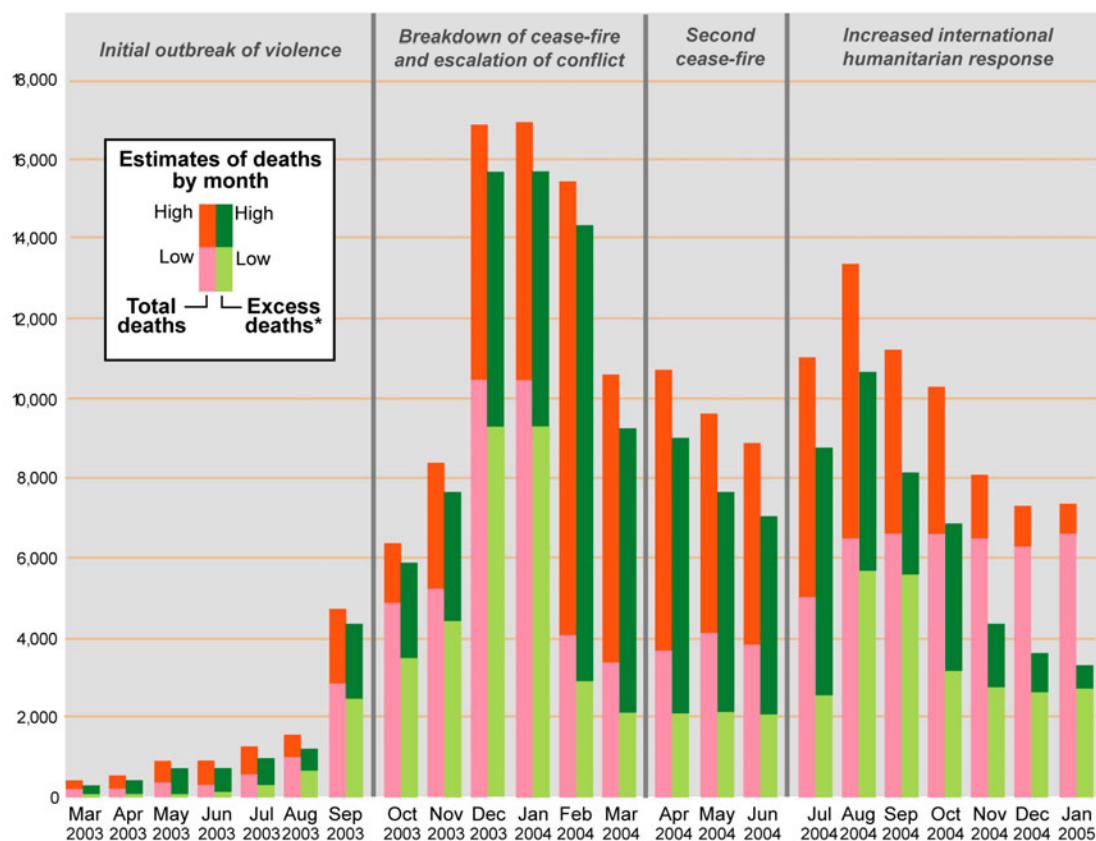
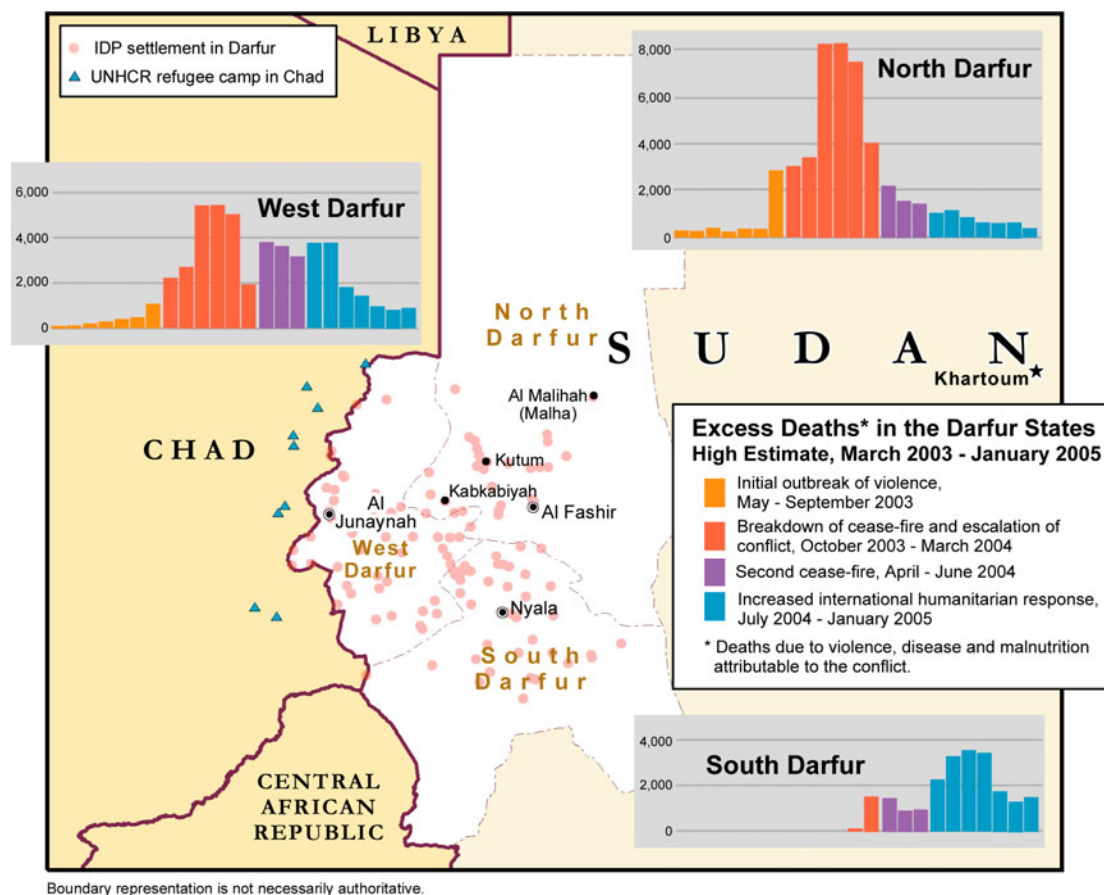


Figure 20: Upper bound estimates of excess deaths by Darfur state by month. Death estimates for populations in Chad refugee camps are not represented in this graphic.



### 6.1.3 Summary

Table 6: Estimated total and excess mortality figures based on different methods

|                         | Method 1<br>Sep 03–Jan 05 | Method 2<br>(low est.)<br>March 03–Jan 05 | Method 2<br>(high est.)<br>March 03–Jan 05 |
|-------------------------|---------------------------|-------------------------------------------|--------------------------------------------|
| Total number of deaths  | 134,000                   | 98,000                                    | 181,000                                    |
| Excess number of deaths | 120,000                   | 63,000                                    | 146,000                                    |
| Deaths due to violence  | 35,000                    | -                                         | -                                          |

## 7 Discussion

We have attempted to go beyond simply calculating deaths, by uniformly extrapolating rates derived from limited populations and/or time periods to the total Darfur population and duration of the conflict. Instead, these two methods endeavoured to use every reliable available estimate along with contextual information to arrive at the soundest possible approximation of the reality for various periods and geographic locations.

There are several limitations to our estimations.

First, the variability of mortality across the vast Darfur region as well as the variability in different periods of the year is far from completely captured in our estimates. The design effect for surveys representing state or Darfur-wide populations indicate that mortality was significantly clustered. We attempted to account for this by estimating an average rate for the state, or in the State Department method, by estimating upper and lower bounds by region. Both methods attempt to capture this variability down to the state and month levels, increasing the accuracy of the study.

Second, biases regarding under- or over-estimations are worth examining.

In the first of the two methods, we have systematically retained the higher values when multiple rates were available for a specific area at a specific time. In certain circumstances, this could lead to over-estimations. The State Department method estimated the lower and upper bounds of a range of plausible deaths and should be viewed in this light.

There has been much debate over inaccessible populations and how to represent them in mortality estimates. The Humanitarian Profiles of the UN Office in Darfur includes affected populations, in secure and insecure areas. Our estimations of mortality rates have been applied to both these accessible and inaccessible communities and they are therefore captured in our estimates.

Finally, some of the surveys used in these analyses used recall periods that were limited largely to the time that populations were in IDP camps. This could be a source of underestimation of deaths, particularly during earlier periods of the conflict.

Third, the issue of the denominator and its validity.

The estimations of affected population could have been lower than in reality, or experienced a lag in identification by aid organizations, particularly when the international presence in Darfur was still limited. This again is a potential source of underestimation. If the number of affected was assumed to be 20 percent higher for the September 2003 – August 2004 period in North and West Darfur and through October 2004 for South Darfur, approximately 5,000 – 19,000 total deaths and 4,000 - 18,000 excess deaths could be added to the total estimate. This is one of the important reasons why rates are a more reliable and valid indicator than absolute numbers, which will vary according to the denominator used.

UN population estimates are primarily based on WFP figures for food rations. In the more recent stages of the conflict, they are likely inflated in some areas due to double registration or registration of non-affected populations. This will result in overestimation of recent deaths. A WFP re-registration exercise is currently underway and will provide more accurate information in the near future. UNHCR has lowered its registered refugee population in Chad by nearly 30,000 after similar verifications were conducted. Initial WFP re-registration numbers show a slight decrease in the overall affected population.

The CRED method covered September 2003 to January 2005 and does not include deaths that occurred before September 2003 or deaths since January 2005. The State Department method does not include deaths after January 2005. If high and low CMR estimates for January are applied to UN population estimates for February-April, the range for total deaths and excess deaths would reach 118,000 - 205,000 and 70,000 – 157,000 respectively since February 2003.

The surveys utilized in our estimates, although statistically and epidemiologically sound, have their own limitations that are therefore present in our calculations. For example, “missing persons” is vaguely defined here and in all complex emergency situations. Family members may be temporarily away, left behind or have gone and some may have died. It is very difficult in sample survey situations to correctly assess the contribution of this category to total deaths. Sample household surveys also do not account for deaths of whole families.

A final methodological issue is related to the use of baselines. Excess deaths can only be calculated against a “normal” threshold. The lower this threshold is, the higher the excess deaths are. Method 1 (CRED) compared the Infant Mortality Rate and >5 mortality rate from the UNICEF Multiple Cluster Survey (MICS 2000) in Darfur to national averages of that year. The UNICEF Darfur regional survey values were not significantly different from the national values and hence the national CMR of 11/1000/year or 0.3/10000/day was used as a baseline. Method 2 (State Department) used the WHO regional Sub-Saharan baseline of 0.5/10 000/day to calculate its excess deaths. This difference in baseline mortality results in a higher number of estimated deaths in method 1 (CRED), relative to the lower estimates of method 2 (State). Failure of many other estimates to account for baseline mortality results in total death estimates being tens of thousands higher than a more accurate count that only includes deaths attributable to the conflict.

Mortality in Darfur, like in most other complex emergencies today, is largely caused by infectious diseases and malnutrition, not direct violence. A well-known study in the Democratic Republic of Congo estimated from a direct household survey, that 200,000 out of 1.7 million excess deaths were attributable to acts of violence. The majority was due to the war-related collapse of the region’s health infrastructure and of the delivery of health and nutrition services.<sup>38</sup> Population surveys in Somalia determined that 4 to 11% of deaths over ten months during 1992-93 were caused by war-related trauma.<sup>39</sup>

Both CRED and State Department estimates demonstrate enormous loss of life in the Darfur population. Overall deaths also do not reflect the sum-total of the widespread sexual violence against girls and women and torture since much of these did not terminate in death. Our approaches taking into account a wide variety of surveys undertaken by professional staffs specialised in statistical and epidemiological methods, are most likely the nearest approximation to the truth possible based on current available information.

Violence related deaths have occurred over short intervals and generally in concentrated areas as indicated in the map (Figure 5: Map of Darfur showing affected

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<sup>38</sup> Burnett Institute, International Rescue Committee. (2004). "Mortality in the Democratic Republic of Congo: Results from a Nationwide Survey."

<sup>39</sup> Toole, M. J. (2000) “Displaced persons and war” in Levy, B. S. & V. W. Sidel, eds., 197-212. War and Public Health. Washington, DC: APHA



areas, IDP location and survey sites (March 2005)). Separating out the two broad causes of death not only helps to understand the pattern of the war but also provides very useful indicators for operational approaches in that region. High violence-related death rates indicate the need for surgical interventions, blood transfusions and other trauma-related health care. On the other hand, high CMRs without high violence-related deaths will require services for children, including nutritional and vaccination programmes. The non violence-related mortality suggests that the period from May-July is a very vulnerable period for people in Darfur. Loss of livelihoods has a tremendous effect on a delicate situation, as was the case in Darfur before the conflict.

### **Conclusion**

Today, the people of Darfur are some of the very poorest in the world. Among these, a third have been driven from their homes or live amidst terror, aggression and violence. As the conflict continues, the proportion of the conflict-affected population will continue to grow.

The international humanitarian community must be prepared for a period of increasing mortality in the coming months, due more to hunger and health-related causes than to violence.

The light rainy season of 2004 may have helped to save lives in the camps, but its negative impact on the harvest will be felt throughout Darfur in the coming months. Food stocks from the 2004 harvest are estimated to be only 20-50% of those of previous years and are becoming exhausted, creating increased food insecurity and malnutrition and possible new displacements as rural populations travel in search of food.

Mortality levels are likely to increase among resident populations as well when food shortages spread to rural areas. Substantial new arrivals caused by food shortages will overwhelm already overstretched humanitarian services, increasing the risk of disease outbreaks and causing mortality rates to spike again.

The interruption of traditional livestock and grain trading mechanisms has debilitated the local economy, further deepening vulnerability and the risk of “aid pull” displacement.

Though fighting calmed down in recent months, general lawlessness—and resulting attacks on aid workers—are rising. Further deterioration of the security situation or increased direct targeting of humanitarian workers, resulting in a significant interruption of aid access, would be disastrous to the Darfur population in the precarious months ahead.

## 8 Abbreviations

|        |                                                                    |
|--------|--------------------------------------------------------------------|
| ACF-F  | Action Contre la Faim (French section)                             |
| CDC    | Centers for Disease Control and Prevention                         |
| CIEDRS | Center for International Emergency, Disaster, and Refugee Studies  |
| CMR    | Crude Mortality Rate                                               |
| Epiet  | European Programme for Intervention Epidemiology Training          |
| IDP    | Internally Displaced Person                                        |
| JEM    | Justice and Equality Movement                                      |
| MICS   | Multiple Indicator Cluster Survey                                  |
| MSF    | Médecins Sans Frontières                                           |
| MSF-H  | Médecins Sans Frontières (Dutch section)                           |
| SCF-US | Save the Children Fund (US section)                                |
| SLM/A  | Sudan Liberation Movement/Army                                     |
| U5MR   | Under 5 Mortality Rate                                             |
| UN     | United Nations                                                     |
| UNHCR  | United Nations High Commissioner for Refugees                      |
| UNICEF | United Nations International Children's Emergency Fund             |
| UNOCHA | United Nations Office for the Coordination of Humanitarian Affairs |
| WFP    | World Food Program                                                 |
| WHO    | World Health Organization                                          |

## 9 Acknowledgements

We would like to thank to the Bureau of Population, Refugees and Migration for generously supporting the CEDAT project. We would also like to thank Dr. Evelyn Depoortere for insights into the Darfur situation and RNIS/NICS for the excellent work they are doing, especially Dr. Claudine Prudhon.

The cartography in this report has benefited enormously from the work done by Humanitarian Information Unit.

Finally we are also grateful to the following humanitarian aid agencies that have taken the trouble of undertaking statistically sound surveys in extremely difficult circumstances and sharing their results for further analysis.

|         |                   |              |
|---------|-------------------|--------------|
| ACF-F   | Epicentre         | UNHCR        |
| CDC     | Epiet             | UNICEF       |
| CIEDRS  | MSF               | WFP          |
| CNNTA   | SCF-UK and SCF-US | WHO          |
| Concern | Tearfund          | World Relief |

## Clarifications

p. 11:

*The conflict between the government and two rebel groups in Darfur began in February 2003 when the Sudan Liberation Movement/Army (SLM/A) and the Justice and Equality Movement (JEM) carried out the first major attack against a government airport in North Darfur.*

Although the conflict started in February, the El Fasher airport attack occurred on April 25<sup>th</sup> 2003.

p. 13:

Since the MICS survey cited covered the non-rebel held part of Sudan, the country figures in Table 2 reflect the situation in the northern part of the country.

p. 17:

Figure 5 relied on Humanitarian Information Unit (HIU) maps containing information on confirmed damaged or destroyed villages. There is no complete assessment of destroyed villages but the HIU maps are the most comprehensive information (and only georeferenced source) available. The effort to confirm destroyed villages by commercial imagery were most intense prior to summer of 2004 when destruction was the most widespread and international access was the most limited. Destruction of villages in South Darfur has undoubtedly occurred, however at later stages and to a somewhat lesser extent than North and West Darfur. Information on South Darfur village destruction was available due through numerous sources, press, UN, NGO, AU etc. as they had greater access from mid 2004 on and these reports (and patterns) were used in the analysis. These reports have not, however, been systematically collected and georeferenced in a way that lends to being represented fully on the map.

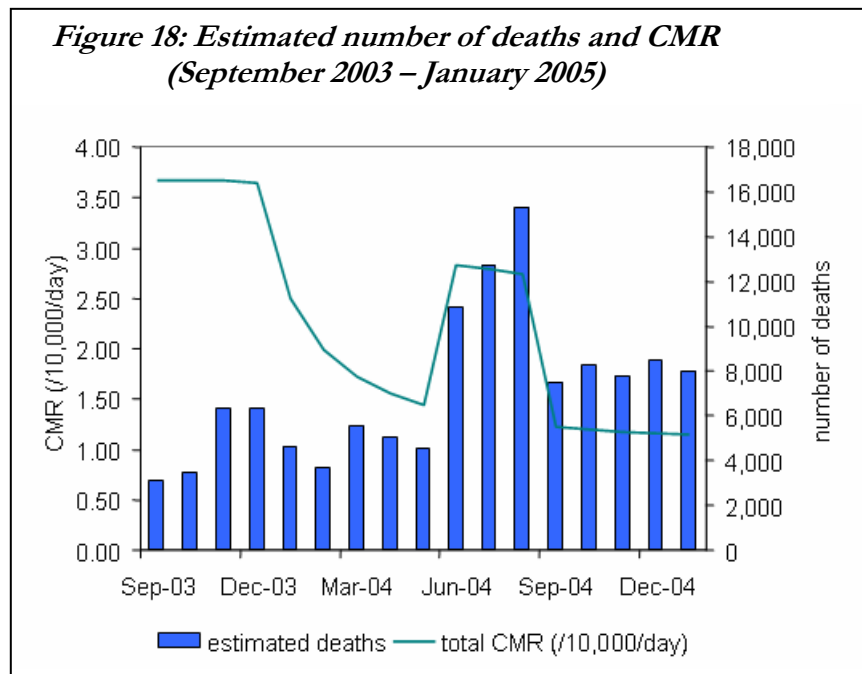
p. 34:

*Applying the approximated crude mortality rates (Figure 16-Figure 17) to the affected population as mentioned in the Humanitarian Profile from September 2003 until January 2005, we arrive at a total estimated number of deaths of 121,582. This is the number of people that died during this period in Darfur.*

It should be clarified that 121.582 is the number of people of the affected population that died during that period

p. 34, Figure 18:

Due to an oversight, this chart was not updated with additional survey data received by CE-DAT. Please consult the revised version of figure 18.



p. 43:

Dr. Evelyn Depoortere is an epidemiologist at Epicentre.