TOWARDS A BASELINE:
BEST ESTIMATES OF SOCIAL INDICATORS FOR SOUTHERN SUDAN

NEW SUDAN CENTRE FOR STATISTICS AND EVALUATION

in association with UNICEF

unicef

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FOREWORD

On the threshold of peace, the people of the Sudan, particularly the war-affected communities, face formidable social problems but tremendous opportunities. The real test in the post-conflict period is how to devote our efforts to address these social problems as one of our commitments that we have set for ourselves during the liberation struggle and to join the international community in its war against poverty and deprivation.

An accurate description of the scale of these social problems - and the resources needed to tackle them - is a prerequisite for managing expectations and development in the post-conflict Sudan. Until now, we only knew we had a mountain to climb. This publication produced by the New Sudan Centre for Statistics and Evaluation, which I am delighted to recommend to you, gives us for the first time, a map of that mountain. Some of the statistics provided in this publication are appalling. Others merely confirm what we already suspected.

Children are always ill, with malaria and diarrhoea as their biggest killers. One out of every four newborns will die before reaching age five. Alarmingly one out of every five children suffers from moderate or severe wasting. More than one million kids, particularly girls, are out of school and only one out of every 50 children attending school finishes primary education, and this is even worse among girls. The chance of a woman dying in pregnancy or childbirth is one in nine.

These statistics clearly highlight the enormous social problems faced by the war-affected communities and pose real and strenuous challenges. Armed with credible and well-presented statistics and analysis, the SPLM and its partners in development look forward to an era of unprecedented progress and development for a brighter future. In addition we will scale up our support for capacity building in statistics in order to assess our efforts and commitments in addressing these social problems as well as knowing how far we have come and how far we have to go to meet the Millennium Development Goals.

Dr John Garang de Mabior
Chairman and C-in-C, SPLM/A

PREFACE

The New Sudan Centre for Statistics and Evaluation (NSCSE) was established by the SPLM in early 2003 with a mandate to develop the necessary capacity to become the professional source and effective provider of official statistical information for the SPLM-controlled areas. Its main aim is to facilitate the evidence-based decision making process in public and private sectors. With the positive momentum of the Sudan peace process, the demand for reliable baseline social indicators becomes increasingly important for the future government of Southern Sudan, government of National Unity, development partners, donors and civil society.

In the light of this potential demand for reliable baseline social indicators, the NSCSE with support from UNICEF Operation Lifeline Sudan undertook in October 2003 to review, evaluate and compile all existing data in order to refine baseline data on basic social indicators. This endeavor was also undertaken to clearly understand the situation we seek to address not only in post-conflict Southern Sudan but also in Sudan as a whole. The resulting data provided in this publication presents our best estimates and represent as well a statistical starting point for post-conflict Sudan, particularly Southern Sudan.

The objective of this publication is to present and evaluate existing information and data on as many social indicators as possible and if necessary, to make model-based assumptions about important missing indicators. Because many deductive estimates were necessary, this publication can be considered a scenario-based set of estimates. In cases where conflicting data exists, the reasons behind the choice of the preferred data are explained and discussed.

In addition to serving as a baseline for future planning and prioritizing, the data presented in this publication has been presented in such a way that it can also be used to evaluate the impact of one of the largest and longest ever humanitarian aid operations: Operation Lifeline Sudan (OLS). It also provides for the first time comparable estimates of social indicators for various regions of Sudan. It undoubtedly provides a basis for monitoring and setting realistic targets for achieving the Millennium Development Goals.

This publication reflects the cumulative and rich data collected by many organisations operating in Sudan and we have tried to acknowledge these sources throughout the document. As our potential client and future user of our products, it is to our best interest to serve you and we hope this publication goes some way toward satisfying your needs.

Dr Luka Biong Deng
Executive Director
New Sudan Centre for Statistics and Evaluation

EXECUTIVE SUMMARY

General Context:

1. Southern Sudan covers an area of about 640,000 square kilometers and includes stretches of tropical and equatorial forests, wetlands including the Sudd swamps, savannah and mountains. It is entirely within the Nile basin and shares borders with four countries. Southern Sudan is culturally, geographically and religiously diverse and well endowed with natural resources, including water, wildlife, forest, oil and minerals.

2. Since the independence of Sudan in 1956, southern Sudan has been a battleground for two civil wars (1955-1972, 1982-now) that resulted in egregious suffering, loss of life and opportunities, widespread poverty and food insecurity. This publication is the first attempt to assess in terms of social indicators the costs of civil war in the Sudan, particularly in southern Sudan, the most affected region of the country. The term SOSUS (**So**uthern **Su**dan **S**PLM areas) is used in this document to refer to the part of southern Sudan controlled by the SPLM/A, excluding the three areas of Abyei, Nuba mountains and southern Blue Nile. The term SOSUS does not include data for Government of Sudan (GoS)-held areas in the south, particularly the "garrison towns". Use of the labels "northern Sudan" or "southern Sudan" as well as any other labels or boundaries do not imply acceptance or endorsement of any political position but simply reflect how the data were collected and organized for this exercise.

Population:

3. The population of SOSUS is estimated to be 7.5 million in 2003. This population is expected to grow by as much as 4.5 million in the next six years as a result of returnees coming back (both refugees and internally displaced people) and the high natural population growth (almost 3% a year). This will cause a major drain on resources.

4. The SOSUS population is the youngest in the world. At 21%, SOSUS equals the highest proportion of under fives of any country. SOSUS has a high fertility rate (the total fertility rate is at 6.7) and a high crude birth rate (50.5 per 1,000 people). However, SOSUS has a low proportion of adults in the population as a result of the civil war and famine.

Primary Education:

5. SOSUS children have the least access to primary education in the world. Its net enrolment ratio in primary school (20%) is the worst in the world and second to the latest official figures for Afghanistan in terms of gross enrolment ratio in primary school (23%). Equally SOSUS has the lowest ratio of female to male enrolment (35%). In other words, only one out of every five children of school age is in class and around three times more boys than girls are at school.
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6. In terms of primary school completion, SOSUS has the lowest rate worldwide (2%) while only Afghanistan under the Taliban performed worse in terms of female primary completion rate (0.8%) compared with male primary completion rate (3%). This suggests that only one out of every 50 children finishes primary school. With a population of 7.5 million, only 500 girls finish primary school each year while 2,000 boys finish. The share of cohort reaching grade 5 (28%) is the least in the world.

7. SOSUS is second only to Niger in terms of adult literacy rate (24%), adult female illiteracy rate (88%) and youth literacy rate (31%). This suggests that at least three out of every four adults are illiterate and about one of every ten female adults is literate.

8. The teacher-pupil ratio (one teacher for every 33 pupils) is better than other countries in the region but far less than that of the rest of Sudan. However, only 7% of the teachers are trained in the sense of having received at least one year of pre-service training. Of the 93% of teachers having received less than a year of training, half (50%) of teachers had no training at all and the other half have received from two weeks to a few months of in-service training. So the "teacher"-pupil ratio does not reflect this reality and may be misleading. To underscore discrimination against women, only 7% of the teachers are female.

9. Massive investment in the education system is needed in Southern Sudan. Only 1,600 schools exist for the 1.6 million children of school age, only 10% of the classrooms are in permanent buildings, 80% of the children have no bench to sit on and only one third of the schools have access to latrines and half have access to safe clean water.

Child and Maternal Mortality:

10. SOSUS has high rates of infant mortality (150 per 1000 live births), under five mortality (250 per 1,000) and under five deaths as a percentage of total deaths (57%). This means that one out of every four newborns will die in SOSUS before reaching the age of five. Children in SOSUS are three times more likely to die than those in the rest of the Sudan. However, these figures and many others in this publication would undoubtedly be even worse if it were not for the efforts of humanitarian agencies and particularly, the Operation Lifeline Sudan consortium.

11. The maternal mortality ratio in SOSUS (1,700) is almost three times that of the rest Sudan and the lifetime risk of dying in pregnancy or childbirth (one in nine) is among almost four times that of the rest of Sudan. This is a result of poor women's health coverage combined with high fertility. Contrary to demographic expectations and despite the impact of war on the male population, SOSUS is paradoxically witnessing a novel demographic phenomenon with more elderly men than women.

Child and Women's Health:

12. The prevalence of diarrhea among under fives in SOSUS (45%) is exceptionally high and the prevalence of acute respiratory infection (ARI) (30%) and fever (malaria) (61%) are the highest rates among the peer countries. Also the prevalence of malaria in SOSUS is almost four times higher than the level in the rest of Sudan. Children are always getting sick.

13. The percentage of pregnant women immunized against tetanus in SOSUS (16%) is the lowest in the world as is the proportion of one-year-old children immunized against DPT (18%) and TB (21%). The level of immunization against measles in SOSUS (25%) is among the lowest rates in the world and less than half of the level in the rest of Sudan (67%).

14. The proportion of births attended by skilled health staff in SOSUS (5%) is not only the lowest in the world but it is almost thirteen times less than the level in the rest of Sudan. Also the antenatal care coverage (16%) and contraceptive prevalence rate (<1%) in SOSUS are the lowest in the world. The maternal mortality rate is very high as a result. The limited access to health services is highlighted by the fact that there is one medical doctor for every 100,000 persons in SOSUS. Despite the absence of any public sector social programmes, Operation Lifeline Sudan (OLS) has booked successes in guaranteeing a minimum level of health services and the annual polio campaigns have produced very good coverage.

Water and Sanitation:

15. The level of access to an improved water source (27%) and sanitation facilities (16%) in SOSUS are low compared to the peer country groups and are respectively more than three and four times lower than the level of access in the rest of Sudan.

Nutrition:

16. The level of under five children suffering from wasting in SOSUS (21.5%) is the highest in the world and suggests that one out of every five children suffers from moderate or severe wasting. The prevalence of general malnutrition (48%) and severe malnutrition (21%) among the under-five children in SOSUS is almost three times higher than in the rest of Sudan.

17. About one third of the population does not even use salt at all, however of those who do, most use iodized salt, thanks to OLS. The overall level of consumption of iodized salt in SOSUS (40% of households) is still lower than in the surrounding countries, except Sudan.

18. The level of Vitamin A supplementation among children in SOSUS (16%) was amongst the worst in the world and almost six times lower than the level in the rest of Sudan. However, the inclusion of Vitamin A in the polio campaigns has improved the rate significantly.

Child Rights:

19. The proportion of children who work in their households in SOSUS (58%) is higher than in the neighboring countries and four times higher than the level in the rest of Sudan.

20. There is virtually no birth registration in SOSUS, this being just one example of the wholesale neglect of children's rights.

Economy:

21. The Gross National Income per capita in SOSUS is estimated to be less than $90 US per year and makes SOSUS alongside the poorest countries in the world. SOSUS income is about four times lower than the level of the rest of Sudan.

22. The proportion of the population earning less than one dollar a day in SOSUS is around 90%, putting SOSUS among the poorest regions in the world.

ACKNOWLEDGEMENTS

INTRODUCTION

With peace near, hopes are high for improvements in health, water and education services in southern Sudan. Donors are on standby to provide large-scale assistance to help Sudan's expected transition. Therefore, it is all the more important to clearly understand the situation that needs to be addressed. The data presented in this publication are estimates arrived at after a thorough review of available information and models. These should enable authorities, as well as external and local actors, to set meaningful goals and choose effective strategies to achieve them.

This document consists of three main tables of statistics with an explanatory narrative describing the process that led to the development of the estimates. There is also an annotated list of sources and some further annexes. The main tables present the baseline situation in 2003, or the most recent year for which data is available. A wide range of demographic, health, nutrition, education and other socio-economic indicators are presented in the tables. Most numbers are based on adjusted survey results but other data are based on models or indirect estimates. While the tables list exact numbers, these should generally be interpreted as 'middle of the range' figures.

- Table 1: Indicators for Millennium Development Goals (MDGs) and additional social indicators for SPLM-controlled areas of southern Sudan. The table compares southern Sudan figures to neighboring countries (peer group) and global extremes.

- Table 2: Social indicators for SPLM-controlled areas of southern Sudan, the rest of Sudan and Sudan as a whole.

- Table 3: SPLM-controlled areas of southern Sudan social indicators, best estimates, type of estimate and sources.

The term SOSUS (**So**uthern **Su**dan **S**PLM areas) is used in this document to refer to the part of southern Sudan controlled by the SPLM/A, excluding the three areas of Abyei, Nuba mountains and southern Blue Nile. It does not include data for Government of Sudan (GoS)-held areas in the south, particularly the "garrison towns". Use of the labels "northern Sudan" or "southern Sudan" as well as any other labels or boundaries do not imply acceptance or endorsement of any political position but simply reflect how the data were collected and organized for this exercise. When northern Sudan is referenced, figures often include data from southern garrison towns.

The Nuba Mountains, Abyei and Southern Blue Nile remain problematic as they have been excluded from most surveys. In the tables, their estimated population is included in the "non SOSUS" category. However, indicators for the three areas are not expected to differ very significantly from those of SOSUS.

The development of these tables started with a focus on benchmarking. Southern Sudan is, of course, part of Sudan, but the information about indicators for Sudan in international publications like the World Bank's World Development Indicators (WDI), UNDP's Human Development Report (HDR) and UNICEF's State of the World's Children (SOWC), normally exclude the southern part of the country, due to lack of data. As a result, the social indicators for Sudan in those publications do not reflect the situation in the south. Only some model estimates include the whole of Sudan. However, a great deal is known about the social indicators in neighboring countries. Southern Sudan borders Chad, Central African Republic (CAR), Democratic Republic of Congo (DRC), Uganda, Kenya and Ethiopia. Indicators for these "peer group" countries are reflected in Table 1 as the benchmark for southern Sudan.

To give perspective on the SOSUS and peer group data, the most extreme global number is also listed in Table 1. Sudan's neighbors are not without their problems, but southern Sudan appears to

have the "mother of all problems". Table 1 presents a useful picture of where SOSUS stands, how it is doing relative to its peer group, and where progress is most urgently needed.

The total population estimate of SOSUS (7.5 million) is based on projected census results and confirmed by National Immunization Days for polio (NIDs) data. Projections are made for likely population growth, including returnees, which could add another 4.5 million within six years. The Crude Birth Rate (CBR) estimate is based on the under five population and an infant mortality regime. Other demographic indicators could then be selected and/or confirmed, based on model assumptions for Sudan as used by the UN Population Division. Based on relations between demographic variables and also between non-demographic variables, primary estimates have been made, checked, adjusted, re-checked and presented. Table 3 summarizes the types of estimates. The information obtained from surveys like the Multiple Indicator Cluster Survey and the Sentinel Site Surveys, often required adjustment to compensate for lack of coverage. This document presents adjusted survey numbers, which may often be different from published figures.

Further into the process, the focus switched to comparing SOSUS indicators to the north as a whole and to northern states based on the 2000 MICS2 (*22). Table 2 summarizes the data. National averages are estimated based on population weights. Therefore, for the first time in years we offer estimates for the whole of Sudan which take into account the reality of southern Sudan.

From December 2003 to March 2004, several meetings and consultations were held to discuss the findings of this effort. Based on those discussions and new information, many minor adjustments were made. A very important finding was that our estimated under five population (based on analysis of census data) matched the 2003 National Immunization Days (NIDs) under five population almost exactly. The similarity between two completely different estimates gives a strong confirmation that we are closer than ever before to understanding the demographic structure of southern Sudan. The information about the areas not covered by any survey helped to improve the quality of the estimates.

Sources are referred to in the text as follows (*13) = refer to source 13.

TABLE 1: SOCIAL AND DEVELOPMENT INDICATORS FOR SOSUS, SUDAN AND PEER GROUP

1.1 SUMMARY AND HIGHLIGHTS

GOAL	MDG 1: Eradicate extreme poverty and hunger	MDG 2: Achieve universal primary education	MDG 3: Promote gender equality and empower women	MDG 4: Reduce child mortality	MDG 5: Improve maternal health		MDG 6: Combat HIV/AIDS, malaria and other diseases			MDG 7: Ensure environmental sustainability			MDG 8: Develop a Global Partnership for Development
INDICATOR	Prevalence of child malnutrition (weight / age) % of under 5, 2001	Education: primary completion rate, %, 2001	Ratio female to male enrolment in primary and secondary school, %, 2000	Under five mortality rate, per 1000, 2001	Maternal mortality per 100,000 live births, estimates, 1995	Births attended by skilled health staff, % of total, 2000	Prevalence of HIV, males % ages 15-24, 2001	Prevalence of HIV, females % ages 15-24, 2001	Incidence of tuberculosis per 100,000 people, 2000	Carbon dioxide emissions per capita MT, 1999	Access to improved water source, % of population, 2000.	Access to improved sanitation facilities, % of population, 2000	Fixed line and mobile phone subscribers, per 1000 people, 2001
SOSUS	48	2	35	250	1700	5	1.1	3.1	325	0.0	27	15	1<
Sudan	11	46	102	94	1500	86	1.1	3.1	193	0.1	75	62	18
Chad	28	19	56	200	1500	16	2.4	4.3	274	0.0	27	29	4
C.A.R	23	19	61	180	1200	44	5.8	13.5	445	0.1	70	25	5
D. R. Congo	xx	40	80	205	940	61	2.9	5.9	320	0.0	45	21	3
Uganda	23	65	89	124	1100	39	2.0	4.6	351	0.1	52	79	17
Kenya	22	63	97	122	1300	44	6.0	15.6	484	0.3	57	87	30
Ethiopia	47	24	68	172	1800	6	4.4	7.8	397	0.1	24	12	5
Niger	40	20	67	265	920	16	0.9	1.5	256	0.1	59	20	2
Afghanistan	xx	8	50	257	820	9			321	0.0	13	12	2
Extreme value (non-SOSUS)	48	8	50	316	2300	6	17.4	39.5	757	33.0	13	12	2
Extreme Country	Bangladesh	Afghanistan	Yemen	Sierra Leone	Rwanda	Ethiopia	Lesotho	Swaziland	Botswana	U.A.E.	Afghanistan	Ethiopia/ Eritrea	Niger
Worst of all	SOSUS	SOSUS	SOSUS			SOSUS						SOSUS	SOSUS
MAIN SOURCE	WDI	WDI	WDI	WDI/ SOWC	WDI/HDR	WDI/ HDR	WDI	WDI	WDI	WDI	WDI/HDR	WDI/HDR	WDI

1.2 POPULATION

	Area ('000 sq km)	Population		Age Composition							Life Expectancy			
		Total population, thousands, 2001	Rural, % of total, 2001	Proportion population under five, 2001	Population (thousands) under five, 2001	Proportion population under 18, %, 2001	Population (thousands) under 18, 2001	Population, ages 0-14 years, in % of total, 2001	Population ages 65+, in % of total, 2001	Annual number of births, 1000s, 2001	Life expectancy at birth in years, 2000-2005	Life expectancy at birth, in years, 2001	Life expectancy at birth, in years, male, 2001	Life expectancy at birth, in years, female, 2001
SOSUS	640	7,514 (2003)	98	21%	1,578	53%	3,982	49.0	1.6	380	42	42	42	42
Sudan	2506	31,800	63	15%	4,770	46%	14,628	39.9	3.5	1,113	55.6	58	57	59
Chad	1284	8,135	76	19%	1,542	53%	4,313	49.6	3.0	399	44.7	48	47	50
C.A.R	623	3,782	58	16%	615	50%	1,877	42.3	3.5	144	39.5	43	42	43
D. R. Congo	2345	52,522	xx	20%	10,340	56%	29,197	47.6	2.6	2,521	41.8	45	45	46
Uganda	241	24,023	85	20%	4,858	56%	13,496	49.0	1.9	1,225	46.2	43	43	43
Kenya	580	31,293	66	15%	4,770	51%	15,867	43.0	2.7	1,095	44.6	46	46	47
Ethiopia	1104	64,459	84	18%	11,469	52%	33,331	46.0	2.8	2,836	45.5	42	41	43
Niger	1267	11,277	79	21%	2,375	56%	6,351	49.0	2.4	632	46.2	46	44	48
Afghanistan	652	22,474	78	17%	3,928	50%	11,219	43.7	2.8	1,079		43	43	43
Extreme value (non-SOSUS)			94	21%		56%		49.6	1.9		32.4	37	36	38
Extreme Country	n/a	n/a	Rwanda	Niger	n/a	Niger	n/a	Chad	Uganda	n/a	Zambia	Sierra Leone	Sierra Leone	Botswana
Worst of all	n/a	n/a		SOSUS	n/a.		n/a		SOSUS	n/a				
MAIN SOURCE	WDI	SOWC	SOWC /HDR		SOWC		SOWC	WDI	WDI		HDR2003	WDI	WDI	WDI

1.3 FERTILITY

INDICATOR	Total Fertility Rate, births per woman, 2001	Total Fertility Rate, 2001	Crude Birth Rate, per 1000 people, 2001	Crude Birth Rate, 2001	Teenage Birth Rate, 2001	Crude Death Rate, 2001	Crude Death Rate, 2001	Annual number of deaths (thousands), 2001, based on SOWC	Natural Growth Rate of population, 2001, based on SOWC
SOSUS	6.7	6.7	50.5	50.5	230	22	22	165	2.85%
Sudan	4.5	4.6	34	35	56	11	11	350	2.4%
Chad	6.3	6.7	45	49	182	16	19	155	3.0%
C.A.R	4.7	5.0	36	38	124	20	19	72	1.9%
D. R. Congo	6.1	6.7	45	48	210	17	17	893	3.1%
Uganda	6.1	7.1	45	51	179	18	18	432	3.3%
Kenya	4.3	4.3	35	35	100	15	13	407	2.2%
Ethiopia	5.6	6.8	43	44	143	20	20	1,289	2.4%
Niger	7.2	8.0	50	56	205	20	20	226	3.6%
Afghanistan	6.8	6.8	48	48	151	21	22	494	2.6%
Extreme value (non SOSUS)	7.2	8.0	50	56	210	25	25		3.6%
Extreme Country	Niger	Niger	Niger, Somalia	Niger	D.R. Congo	Sierra Leone	Sierra Leone	n/a	Niger
Worst of all			SOSUS		SOSUS			n/a	
MAIN SOURCE	WDI	SOWC/ HDR	WDI	SOWC	WDI	WDI	SOWC	SOWC	SOWC

1.4 CHILD AND MATERNAL MORTALITY

INDICATOR	Child Mortality					Maternal Mortality						
	Infant mortality rate, per 1000 live births, 2001	Yearly number of infant deaths (thousands) 2001	Under five mortality rate, per 1000, 2001	Yearly number of under five deaths, 1000s, 2001	Under five deaths as % of total, 2001	Maternal mortality ratio, 1995, model	Maternal mortality ratio, adjusted, 2000	Maternal mortality ratio reported, 1985-2001	Yearly maternal deaths (based on adjusted ratio), 2000	Lifetime risk of dying in pregnancy or childbirth	Lifetime risk of dying in pregnancy or childbirth : 1 in:	Maternal deaths as proportion of total
SOSUS	150	57	250	95	57%	1700	1700	865	6,452	11.4%	9	3.9%
Sudan	64	71	94	105	30%	1500	590	550	6,567	2.7%	37	1.9%
Chad	117	47	200	80	52%	1500	1100	830	4,385	7.4%	14	2.8%
C.A.R	115	17	180	26	36%	1200	1100	1100	1,581	5.5%	18	2.2%
D. R. Congo	129	325	203	512	57%	940	990	950	24,958	6.6%	15	2.8%
Uganda	82	100	141	173	40%	1100	880	510	10,782	6.2%	16	2.5%
Kenya	78	85	122	134	33%	1300	1000	590	10,953	4.3%	23	2.7%
Ethiopia	114	323	171	485	38%	1800	850	870	24,108	5.8%	17	1.9%
Niger	156	99	265	167	74%	920	1600	590	10,104	12.8%	8	4.5%
Afghanistan	165	178	257	277	56%	820	1900	xx	20,496	12.9%	8	4.1%
Extreme value (non SOSUS)	165		284		57%	2300	2000	1800	n/a	12.9%	8	4.5%
Extreme Country	Sierra Leone	Sierra Leone	Sierra Leone		D.R. Congo	Rwanda	Sierre Leone	Sierra Leone	n/a	Afghanistan	Afghanistan	Niger
Worst of all					SOSUS							
MAIN SOURCE	SOWC 2004		SOWC 2004			WDI	SOWC 2004	HDR				

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1.5 CHILD HEALTH AND VACCINATIONS

INDICATOR	Child Health						Vaccinations			
	Diarrhea prevalence, children under 5, two week period. 2000, %	ORT use rate (%), 1994-2002	ARI prevalence, %,children under five, 2000	% of children with ARI treated at health post, 2000	Tetanus vaccination, % of pregnant women, 96-00	% immunized 2002, pregnant women tetanus	One year olds immunized against measles (%), 2001	One year olds immunized DPT,%, 2001 (SOSUS DPT 2+)	One year olds immunized against Polio, 2001, % (SOSUS Polio 2+)	One year olds immunized against TB (%) 2001
SOSUS	45%	0	30	42%	16	16	25	18	30	21
Sudan		13	5	57	55	35	67	46	47	51
Chad		36	12	22	24	39	36	27	24	44
C.A.R		34	10	32	6	63	29	23	22	38
D. R. Congo		11	11	36	10	44	46	40	42	57
Uganda		xx	23	65	38	50	61	60	60	81
Kenya		30	20	57	51	60	76	76	73	91
Ethiopia		xx	24	16	17	24	52	56	57	76
Niger		38	12	27	41	36	51	31	30	49
Afghanistan						34		44	45	
Extreme value (non SOSUS)		4	39	14	5	24	19	23	22	34
Extreme Country		Senegal, Rwanda	Haiti, Botswana	Botswana	D.R. Korea	Ethiopia	Equatorial Guinea	CAR	CAR	Equatorial Guinea
Worst of all						SOSUS	SOSUS	SOSUS		SOSUS
MAIN SOURCE		SOWC	SOWC	SOWC	WDI	SOWC	HDR	WDI	SOWC	HDR

1.6 OTHER HEALTH INDICATORS

INDICATOR	Women's Health					Access					
	Births attended by skilled health staff, % of total, 2000	Pregnant women receiving pre natal care, %, 2000	Antenatal care coverage, %, 1995-2002	Contraceptive Prevalence Use, women (any) 1990-2001	Contraceptive Prevalence Rate, %, 1995-2002	HIV/AIDS adult prevalence rate (15-49 years), end 2001	Malaria cases per 100.000, 2000	% under five sleeping under a bednet, 2000	% under five sleeping under a treated bednet, 2000	Children under five with fever treated ,%, 1999-2002	Physicians, per 100,000 people 1990-2002
SOSUS	5	16	16	<1%	<1%	2.6	>50000	36		36	1
Sudan	86	54	60	10	7	2.6	13934	24	8	50.2	25
Chad	16	30	42	4	8	3.6	197	27	1	31.9	3
C.A.R	44	67	62	15	28	12.9	2207	31	2	68.8	4
D. R. Congo	61		68		31	4.9	2960	12	1	45.4	7
Uganda	39	87	92	15	23	5	46	7	0	60	5
Kenya	44	95	76	39	39	15	545	17	3	64.5	14
Ethiopia	6	20	27	8	8	6.4	556	1	0	3	3
Niger	16	30	41	8	14	xx	1693	17	1	48	4
Afghanistan	12		37		5		937				
Extreme value (non SOSUS)	6	0	27	4	4	39	75386	1		3	1
Extreme Country	Ethiopia	Liberia, Somalia, Swaziland	Ethiopia	Chad	Sierra Leone	Botswana	Guinea	Ethiopia	n/a	Ethiopia	Burundi
Worst of all	SOSUS		SOSUS	SOSUS	SOSUS			SOSUS	n/a		SOSUS
MAIN SOURCE	SOWC2004	WDI	SOWC2004	WDI	SOWC2004	SOWC		SOWC2004	SOWC2004	HDR	HDR

1.7 NUTRITION, CHILD RIGHTS AND ECONOMY

INDICATOR	Nutrition							Child and Womens' Rights			Economy		
	% of under fives (1995-2001) suffering from wasting (w/h) moderate & severe	Prevalence of under five child malnutrition, underweight, weight/age, 1995-2001	% of under fives (1995-2001) suffering from underweight (weight/age), severe	Prevalence of under five child malnutrition, stunting, height/age, 1995-2001	Exclusive breastfeeding, % children under 6 months, 1995-2001	Consumption of iodized salt, % households, 1987-2002	Vitamin A supplementation,% of children 6-59 months, 2000	Proportion of children(5-14) in households who are working, 1999-2001	Level of birth registration, 1999-2001 (%)	Female Genital mutilation/ cutting 1998-2002 (women 15-49 years), %	Gross National Income per capita, $, 2002	Poverty, Population below one dollar a day, %,1995-2001	Fixed/mobile phone subscribers, per 1000, 2001
SOSUS	21.5	48	21	45	>30	40	16	58y	0	2<	90<	>90%	1<
Sudan	xx	17	7	34	13	1	99	13	64	90	350	xx	18
Chad	12	28	10	28	10	58	99	57	25	45	220	xx	4
C.A.R	9	24	6	39	17	87	100	56	73	36	260	67%	5
D. R. Congo	13	31	9	38	24	72	93	28	34	xx	90	xx	3
Uganda	4	23	5	39	65	95	42	34	4	xx	250	82	17
Kenya	6	23	7	37	5	91	90	25	63	38	360	23	30
Ethiopia	11	47	16	52	55	28	65	xx	xx	80	100	81.9	5
Niger	14	40	14	40	1	44	92	65	46	5	170	61.4	2
Afghanistan	25	48	xx	52	xx	xx	70	xx	10	xx	250	xx	2
Extreme value (non SOSUS)	25	60	18	60	1	0	7	65	4	99	90	82.3	2
Extreme Country	Afghanistan	DPR of Korea	India	DPR of Korea	Niger	Cuba	Syria	Niger	Uganda	Guinea	D.R. Congo	Nicaragua	Niger
Worst of all	Second	Second	SOSUS						SOSUS		SOSUS	SOSUS	SOSUS
MAIN SOURCE	SOWC	SOWC/ HDR2003	SOWC	SOWC/ HDR2003	SOWC/ WDI	WDI	WDI	SOWC 2004	SOWC 2004	SOWC 2004	SOWC 2004	WDI/ HDR	WDI

1.8 EDUCATION

INDICATOR	Primary completion rate, %, 1995-2001	Primary completion rate, male, %, 1995-2001	Primary completion rate, female, %, 1995-2001	Share of cohort reaching grade 5, %, 1999-2000	Share of cohort reaching grade 5, male, %, 1999-2000	Share of cohort reaching grade 5, female, %, 1999-2000	Average years of school, 2000	Gross enrolment ratio primary school, % 2000	Net enrolment ratio primary school, % 2000	Gross enrolment ratios, females as % male, primary, 1995-1999	Ratio of female to male enrolment in primary & secondary school %, 2000
SOSUS	2	3	0.8	28	30	22	1	23	20	36	35
Sudan	47	xx	xx	87	86	88	2.1	55	46	86	102
Chad	19	29	9	53	58	48	xx	73	58	61	56
C.A.R	19	xx	xx	xx	xx	xx	2.5	75	55	66	61
D. R. Congo	40	45	34	xx	xx	xx	3	47	33	90	80
Uganda	65	xx	xx	xx	xx	xx	3.5	136	109	88	89
Kenya	63	xx	xx	71	70	73	4.2	94	69	99	97
Ethiopia	24	36	12	64	64	64	xx	64	47	67	68
Niger	20	24	16	74	76	71	1.0	35	30	67	67
Afghanistan	8	15	0	xx	xx	xx	1.7	15	xx	9	50
Extreme value (non SOSUS)	8	15	0	33	41	17	0.9	15	30	9	56
Extreme Country	Afghan.	Afghan.	Afghan.	Liberia	Guinea Bissau	Liberia	Mali	Afghan.	Niger	Afghan.	Chad
Worst of all	SOSUS	SOSUS		SOSUS	SOSUS			Second	SOSUS		SOSUS
MAIN SOURCE	WDI	WDI	WDI	HDR	WDI	WDI	WDI	WDI	WDI/HDR	SOWC 2004	WDI

1.9 EDUCATION: TEACHERS AND LITERACY

INDICATOR	"Trained" teachers in primary, % of total, 2000 (pre-service / in service)	Primary pupil teacher ratio, pupils per teacher, 2000	Adult illiteracy rate, male, %, 2001	Adult illiteracy rate, female, %, 2001	Youth (15-24 years) illiteracy rate, male, %, 2001	Youth (15-24 years) illiteracy rate, Female, %, 2001	Youth (15-24 years) literacy rate, %, 2001	Adult literacy rate, %, 2001
SOSUS	51	33	63	88	54	84	31	24
Sudan	62	27	30	52	17	27	78	57
Chad	37	71	47	64	25	38	68	54
C.A.R	xx	74	39	63	23	39	68	46
D. R. Congo	xx	26	26	48	11	24	83	67
Uganda	45	59	22	42	14	27	79	67
Kenya	97	30	11	23	4	5	95	82
Ethiopia	70	55	52	68	38	50	56	39
Niger	84	42	76	91	67	86	24	16
Afghanistan	xx	43						36
Extreme value (non SOSUS)	35	43	76	91	67	86	24	16
Extreme Country	Guinea Bissau	D.R. Congo	Niger	Niger	Niger	Niger	Niger	Niger
Worst of all			Second	Second	Second	Second	Second	Second
MAIN SOURCE	WDI		WDI	WDI	WDI	WDI	HDR2003	SOWC

TABLE 2: INDICATORS FOR SOSUS, THE REST OF SUDAN AND SUDAN OVERALL

	SOSUS	Rural North	GoS Urban South	Northern Sudan overall	Northern Sudan Extreme	All Sudan estimate*	Sudan official data 2001
Area ('000 square km)	640			1866		2506	2506
POPULATION							
Total Population, thousands, 2003	7,514		1000	27,000		34,514	31,800
Proportion population under five,%, 2003	21%			16%		17%	15%
Population (thousands) under five, 2003	1,578			4,320		5,897.94	4,770
Proportion population under 18, %, 2003	53%			51%		51.4%	46%
Population (thousands) under 18, 2003	3,982			13,770		17,752	14,628
Population (thousands) under 15, 2003	3,682			12150		15,832	
Population, ages 0-14 years, in % of total, 2003	49.0			45		46%	39.9
Population ages 65+, in % of total, 2003	1.6%			2.8%		2.5%	3.5
DEMOGRAPHY							
Annual number of births, thousands, (pop*CBR), 2003	380			1,026.0		1,405.5	1,113
T.F.R per women, 2000-2005	6.7			5.3		5.7	4.6
Crude Birth Rate, 2003	50.5			38.0		40.7	35
Crude Death Rate, 2003	22			13.3		15.2	11
Annual number of deaths (thousands), 2003	165			359		524.4	350
Natural Growth Rate of Population, %, 2003	2.85%			2.5%		2.55%	2.4%
Rural population, % of total, 2003	98%	100	0%	60%		69%	63
MORTALITY							
IMR direct estimate, 2000		68	93	68	101		
IMR indirect Brass Method estimate, 2000	150			82		100	64
Yearly number of infant deaths (thousands), indirect estimate	57			84		141	71
U5MR, direct estimate, 2000		105	123	104	172		
U5MR, indirect estimate, 2000	250			132		164	94
Yearly number of under five deaths, thousands, 2003,	95			135		230	105
Under five deaths as proportion of total, %, 2003	57%			38%		44%	30%
Life expectancy at birth, in years, 2001	42			53		50.6	55
MATERNAL MORTALITY							
Maternal Mortality Ratio, 2000	1700			590		873	590
Maternal Mortality Ratio reported, 1985-2001	865			509			550
Yearly Maternal Deaths	6,452			6,053		12,505	6,567

	SOSUS	Rural North	GoS Urban South	Northern Sudan overall	Northern Sudan Extreme	All Sudan estimate*	Sudan official data 2001
Lifetime risk of dying in pregnancy or childbirth	11.4%			3.1%		5.0%	2.7%
Lifetime risk of dying in pregnancy or childbirth : 1 in:	9			32		20	37
Maternal deaths as proportion of total deaths	3.9%			1.7%		2.4%	1.9%
Births, 1000s, 2003	380			1,053		1,433	1,113
CHILD HEALTH							
Diarrhoea prevalence, children under 5, two week period. 2000, %	45	29	25	28	40	32	
ORT use rate (%),children under five, 2000	30	34	49	37	25	35	13
ARI prevalence, %,children under five, 2000	30	18	14	17		20	5
% of children with grave coughing/ ARI treated at health post,2000	42			62		58	57
Fever prevalence,%, children under five, 2000	61	25	37	21	46	30	
Malaria cases per 100.000, 2000	>50,000 (e)			25,000			13,934
% under five sleeping under a bednet, 2000	36		34	24		27	
% under five sleeping under a treated bednet, 2000			13.4	7.5			
Children under five with fever/malaria treated ,%, 2000	36.0	42		50	35	47.0	50.2
IMMUNIZATION							
One year olds immunized against measles (%), 2000	25	45	55	51	26	44	67
One year olds vaccinated, DPT2+, %, 2000	18	46		56	23	46	
One year olds immunized, DPT (3) (%), 2000, SOSUS 2003	8	34		44	12	34	46
One year olds vaccinated, Polio 2+, %, 2000	30	58		66	31	56	
One year olds immunized against polio, %, 2000		39		45	17		47
OLS: % under five population vaccinated for Polio, 2003	95						
BCG: One year olds immunized against TB (%) 2000	21	57	74	65	35	53	51
OLS: One year olds immunized against TB (%) 2003	24						63
HIV/AIDS AND TB							
Prevalence of HIV, Males % ages 15-24, 2003	1.1			1.1		1.1	1.1
Prevalence of HIV, Females % ages 15-24, 2003	3.1			3.1		3.1	3.1
Prevalence of HIV, adults, 2003	2.6			2.6		2.6	2.6
Incidence of tuberculosis per 100,000 people, 2002	325			188		218	193

	SOSUS	Rural North	GoS Urban South	Northern Sudan overall	Northern Sudan Extreme	All Sudan estimate *	Sudan official data 2001
MATERNAL HEALTH							
Tetanus Vaccination, % of pregnant women protected, 2000, Sosus TT1+	**16**	35	55	**46**	30	**39**	55
Births attended by skilled health staff, % of total, 2000	**5**		64	**57**	32	**43**	86
Births attended by trained staff, % of total, 2000	**17**		84	**87**	57	**68**	
Antenatal care received during last pregnancy (trained), 2000	**16**	61	90	**70**	29	**56**	60
Contraceptive Prevalence Use, women (any) 90-01	**<1%**			**7**			7
Female circumcision, % ever married women.2000	**<2%**		7%	**91%**		**83**	90
WATER							
Access to an improved watersource, % of population, 2000.	**27**	47	61	**60**	26	**53**	75
Use of safe water source, % of population, 2000	**21**						
Access to improved sanitation facilities, % of population, 2000	**15**	46	48	**60**	36	**50**	62
NUTRITION							
Prevalence of Global Acute malnutrition, wasting, w/h, 2003/2001	**21.5**	16.9		**16**	22.5	**17**	
Prevalence of Severe Acute malnutrition, weight/height, 2003/2001	**4.5**	3.7		**4**	5.9	**4**	
Infants who received at least 12 months of continous breastfeeding,%,2000	**80**	83.5	73	**83**		**82**	85/75
Consumption of iodized salt, % households, % households, 2000	**40**	0.4	0.5	**0.6**	3.6	**9**	1
Vitamin A supplementation,% of children 6-59 months, 2000.	**16**	40	34	**44**	17	**38**	99
Vitamin A supplementation,% of children 6-59 months, 2002	**60%**						
Vitamin A supplementation,women after delivery, 2000.	**6**	16	29	**22**	12	**19**	
EDUCATION							
Primary completion rate, %, 2002 (Sosus 8 years).	**1.9%**						47
Share of cohort reaching grade 5, %, 2002/2000	**28%**	69	96	**78**	5	**61**	87
Share of cohort reaching grade 5, Male, %, 2002/ 2000	**30%**			**77**		**60**	86
Share of cohort reaching grade 5, Female, %, 2002/2000	**22%**			**79**		**62**	88
Average years of schooling, 2002	**1**						2.1
Gross enrolment ratio primary school, % 2002	**23%**						55
Net enrollment attendance ratio primary school, % 2000	**20**	35	57	**47**	28	**41**	46

	SOSUS	Rural North	GoS Urban South	Northern Sudan overall	Northern Sudan Extreme	All Sudan estimate *	Sudan official data 2001
Gross enrolment ratios, females as % male, primary, 2000	**36**	94	100	**95**	82	**82**	86
Ratio of female to male enrolments in prim. and sec. school %, 2002	**35**						102
LITERACY							
Adult literacy rate , total, 1998/2000	**24**	46	53	**59**	49	**51**	58
Adult illiteracy rate, Male, %, 1998/ 2000	**63**			**31**		**38**	30
Adult illiteracy rate, Female, %, 1998/2000	**88**			**50**		**58**	52
Youth (15-24 years) illiteracy rate, Male, %, 2002/2000	**54**			**19**		**27**	17
Youth (15-24 years) illiteracy rate, Female, %, 2002/ 2000	**84**			**30**		**42**	27
Youth (15-24 years) literacy rate, %, 2002/ 2000	**31**			**75**		**65**	78
CHILD RIGHTS							
Proportion of children(5-14) in households who are working.%,2000	**58**	24	5	**17**	55	**26**	13
Level of birth registration, %, 2000	**0**	45	57	**59**	32	**47**	64
OTHER							
Carbon dioxide emissions per capita metric tons, 2003	**0.0**						0.1
Fixed line and mobile phone subscribers, per 1000 people, 2001	**1<**						18
Physicians, per 100.000 people 2002/2000	**1**			**17**		**14**	25
Poverty, population below one dollar a day, %., 2003	**>90%**						xx
Gross National Income per capita, $, 2001	**90<**						350

* Estimated indicators for Sudan overall are unofficial estimates taking into account weighted figures from both areas and do not imply official UN or UNICEF endorsement.

Notes:
SOSUS= Southern Sudan SPLM/A area
Rural North = non urban Northern Sudan
MICS Urban South = GOS garrison towns in Southern Sudan
Northern Sudan = Sudan minus south
Northern Sudan extreme = highest/ lowest non-Southern State value
All Sudan estimate = weighted average column 1 + column 3
Official Sudan = Sudan data in World Bank, UNDP, UNICEF statistics

TABLE 3: SOSUS SOCIAL INDICATORS

Indicator	SOSUS median value	Notes	Source(s)
3.1 DEMOGRAPHY			
Total population, thousands, 2003	7,514	Deductive estimate based on census projections and NID 2003 excluding the three areas, future returnees and GoS areas	UN PD & NID 2003
Proportion population under five, 2003	21%	Deductive estimate based on survey results and Population Models	SSS, MICS 99, UN PD
Population (thousands) under five, 2003	1,578	Proportion times total and NID 2003	NID 2003
Proportion population under 18, %, 2003	53%	Deductive estimate based on survey results and Population Models	SSS, MICS 99, UN PD
Population (thousands) under 18, 2003	3,982	Proportion times total	
Population (thousands) under 15, 2003	3,682	Proportion times total	
School age population, %	21%	Deductive estimate based on survey results and Population Models	SSS, MICS 99, UN PD
School age population, thousands	1578		
Population, ages 0-14 years, in % of total, 2003	49.0	Deductive estimate based on survey results and Population Models	SSS, MICS 99, UN PD
Population ages 65+, in % of total, 2003	1.6%	Estimate based on survey results	SSS 2003
Annual number of births, thousands, 2003	380	Proportion times CBR	
TFR per women, 2000-2005	6.7	Deductive estimate based on census projections and assumptions	UN PD
Crude Birth Rate, 2003	50.5	Deductive estimate based on under five population, U5MR	NID, UN PD
Crude Death Rate, 2003	22	Deductive estimate based on census projections and assumptions	UN PD
Annual number of deaths (thousands), 2003	165	Proportion times total	
Natural Growth Rate of Population, %, 2003	2.85%	Difference between CBR and CDR	
Rural population, % of total, 2003	98%	Deductive estimate based on NSCSE	NSCSE
3.2 MORTALITY			
Infant Mortality Rate, per 1000 live births, 2003	150	Deductive estimate based on population model & health analysis	UN PD, MICS, WDI
Yearly number of infant deaths (thousands)	57	IMR times births	
Under five mortality rate, per 1000, 2003	250	Deductive estimate based on population model, health analysis	UN PD, MICS, WDI
Yearly number of under five deaths, thousands, 2003	95	U5MR times births	
Life expectancy at birth, in years, 2003	42	Deductive estimate based on UN population model, survey-population compostion results	UN PD, SSS
3.3 MATERNAL MORTALITY			

Indicator	SOSUS median value	Notes	Source(s)
3.4 CHILD HEALTH			
Diarrhea prevalence, children < 5, two week period. 2000, %	45	Estimate based on adjusted survey, MICS 99	MICS 99
ORT use rate (%),children under five, 2000	30	Estimate based on adjusted survey, MICS 99	MICS 99
ARI prevalence, %,children under five, 2000	30	Estimate based on adjusted survey, MICS 99	MICS 99
Children with serious cough/ AR I treated at health post, %, 2000	42	Estimate based on adjusted survey, MICS 99	MICS 99
Fever prevalence,%, children under five, 2000	61	Estimate based on adjusted survey, MICS 99	MICS 99
Malaria cases per 100.000, 2000	>50000 (e)	Deductive estimate based on WHO report	WHO
% under five sleeping under a bednet, 2000	36	Estimate based on adjusted survey, MICS 99	MICS 99
Children < 5 with fever/malaria treated ,%, 2000	36	Estimate based on adjusted survey, MICS 99	World Bank
3.5 MORTALITY CAUSES			
Malaria Mortality Proportion (<5), 2003	26%	Estimate based on Model	Lancet
Pneumonia Mortality Proportion (<5), 2003	19%	Estimate based on Model	Lancet
Diarrhea Mortality Proportion (<5), 2003	22%	Estimate based on Model	Lancet
Neonatal Deaths, 2003	22%	Estimate based on Model	Lancet
Other Deaths Proportion (<5), 2003	11%	Estimate based on Model	Lancet
3.6 IMMUNIZATION			
One year olds immunized against measles (%), 2000	25	Estimate based on adjusted survey, MICS 99	MICS 99
Under fives immunized against measles, %, 2002	24	Estimate based on OLS reports and population estimate	UNICEF OLS
One year olds vaccinated, DPT2+, %, 2000	18	Estimate based on adjusted survey, MICS 99	MICS 99
One year olds vaccinated, DPT1, %, 2003	16	Estimate based on OLS reports and population estimate	UNICEF OLS
One year olds immunized against DPT(3), % ,2003	8	Estimate based on OLS reports and population estimate	UNICEF OLS
One year olds vaccinated, Polio 2+, %, 2000	30	Estimate based on adjusted survey, MICS 99	MICS 99
OLS: % under five population vaccinated for Polio, 2003	95	Estimate based on OLS reports and population estimate	UNICEF OLS
BCG: One year olds immunized against TB (%) 2000	21	Estimate based on adjusted survey, MICS 99	MICS 99
OLS: One year olds immunized against TB (%) 2003	24	Estimate based on OLS reports and population estimate	UNICEF OLS

Indicator	SOSUS median value	Notes	Source(s)
3.7 HIV/AIDS AND TB			
Prevalence of HIV, Males % ages 15-24, 2003	1.1	Deductive estimate based on UNAIDS report	UNAIDS
Prevalence of HIV, Females % ages 15-24, 2003	3.1	Deductive estimate based on UNAIDS report	UNAIDS
Prevalence of HIV, adults, 2003	2.6	Deductive estimate based on UNAIDS report	UNAIDS
Incidence of tuberculosis per 100000 people, 2002	325	Estimate based on health statistics	UNICEF Health Report
3.8 MATERNAL HEALTH			
Percentage of deliveries not at a health facility, 2000	95%	Estimate based on adjusted survey, MICS 99	MICS 99
Tetanus Vaccination, (TT1+), % of pregnant women, 2000	16	Estimate based on adjusted survey, MICS 99	MICS 99
Tetanus Vaccination, (TT1+), % of WCBA, 2002	23	Estimate based on OLS reports and population estimate	UNICEF OLS
Tetanus Immunization, (TT3), % of WCBA, 2002	16	Estimate based on OLS reports and population estimate	UNICEF OLS
Births attended by skilled health staff, % of total, 2000	5	Estimate based on adjusted survey, MICS 99	World Bank
Births attended by trained staff, % of total, 2000	17	Estimate based on adjusted survey, MICS 99	MICS 99
Antenatal care during last pregnancy (trained staff), %, 2000	16	Estimate based on adjusted survey, MICS 99	MICS 99
Contraceptive Prevalence Use,%, women (any) 2000	<1%	Deductive estimate based on NSCSE/ WB data	World Bank/ NSCSE
Female circumcision, % ever married women.2000	<2%	Deductive estimate based on NSCSE/ WB data	World Bank/ NSCSE

Indicator	SOSUS median value	Notes	Source(s)
3.9 WATER			
Access to an improved water source, % of population, 2000.	27	Estimate based on adjusted survey, MICS 99	MICS 99
Use of safe water source, % of population, 2000	21	Estimate based on adjusted survey, MICS 99	MICS 99
Access to improved sanitation facilities, %, 2000	15	Estimate based on adjusted survey, MICS 99	MICS 99
3.10 NUTRITION			
Global Acute malnutrition, wasting, w/h, %, 2003	21.5	Deductive estimate based on nutrition Reports	UNICEF OLS, World Bank
Severe Acute malnutrition, weight/height, %, 2003	4.5	Deductive estimate based on nutrition Reports	UNICEF OLS
% of under fives underweight, moderate & severe, w/a, 2003	48	Estimate based on correlation with wasting indicator	SOWC
% of under fives underweight, severe, w/a, 2003	21	Estimate based on correlation with wasting indicator	SOWC
% of under fives stunted, moderate & severe, h/a, 2003	45	Estimate based on correlation with wasting indicator	SOWC
Infants who received at least 1 year of breastfeeding,%	80	Estimate based on adjusted survey, MICS 99	MICS 99
Consumption of iodized salt, % households, 2000	40	Estimate based on adjusted survey, MICS 99	MICS 99
Vitamin A supplementation, % of children 6-59 months, 2000	16	Estimate based on adjusted survey, MICS 99	MICS 99
Vitamin A supplementation, % of children 6-59 months, 2002	60%	Estimate based on OLS reports	UNICEF OLS
Vitamin A supplementation, women after delivery, %, 2000.	6	Estimate based on adjusted survey, MICS 99	MICS 99
3.11 EDUCATION			
Primary completion rate, %, 2002 (SOSUS 8 years).	1.9%	Deductive estimate based on Education statistics, pop. estimate	SBA
Primary completion rate, male, %, 2002	3.0%	Deductive estimate based on Education statistics, pop. estimate	SBA
Primary completion rate, female, %, 2002	0.8%	Deductive estimate based on Education statistics, pop. estimate	SBA
Four year of school completion rate, %, 2002	18%	Deductive estimate based on Education statistics, pop. estimate	SBA
Four year of school completion rate, male, %, 2002	28%	Deductive estimate based on Education statistics, pop. estimate	
Four year of school completion rate, female, %, 2002	9%	Deductive estimate based on Education statistics, pop. estimate	
Average years of schooling, 1999-2001	1	Deductive estimate based on Education statistics	SBA
Gross enrolment ratio primary school, % 1999-2002	23%	Deductive estimate based on Education statistics, pop. estimate	SBA
Gross enrolment ratio primary school, % 2003	25%	Deductive estimate based on Education statistics, pop. estimate	EDSU
Net enrolment attendance ratio primary school, %, 1999-2002	20	Deductive estimate based on Education statistics, pop. estimate	SBA
Gross enrolment ratio, females as % male, primary, 1999-2001	36	Estimate based on Education statistics	SBA
Ratio female to male enrolments in schools %, 99-01	35	Estimate based on Education statistics	SBA

Indicator	SOSUS median value	Notes	Source(s)
3.12 LITERACY			
Adult literacy rate, total,%, 1998	24	Estimate based on survey	World Bank
Adult illiteracy rate, Male, %, 1998	63	Estimate based on survey	World Bank
Adult illiteracy rate, Female, %, 1998	88	Estimate based on survey	World Bank
Youth (15-24 years) illiteracy rate, Male, %, 1999-2002	54	Deductive estimate based on Education statistics	WBA
Youth (15-24 years) illiteracy rate, Female, %, 1999-2002	84	Deductive estimate based on Education statistics	WBA
Youth (15-24 years) literacy rate, %, 1999-2002	31	Deductive estimate based on Education statistics	WBA
3.13 CHILD RIGHTS			
Children (5-14) in households who are working, %,2000	58	Estimate based on adjusted survey, MICS 99	MICS 99
Level of birth registration, %, 2003	0%	Estimate based on SITAN	SITAN
3.14 OTHER			
Proportion female teachers, 2002	7%	Estimate based on Education Statistics	SBA
Population not using salt, %, 2000	36%	Estimate based on survey	MICS 99
Carbon dioxide emissions per capita, MT, 2003	0.0	Deductive estimate	World Bank
Telephone subscribers, per 1000 people, 2003	1<	Deductive estimate	World Bank
Physicians, per 100.000 people 2002	1	Estimate based on Health Report	UNICEF OLS
Poverty, population below one dollar a day, %, 2003	>90%	Deductive estimate	SOWC

Abbreviations:
MICS 99 = Progress of Regions, Multiple Indicator Cluster Survey Results 2000
SOSUS = Southern Sudan SPLM/A area
UN PD = United Nations Population Division, DESA, World Population Prospects: the 2002 revision
SBA = School Baseline Assessment Report Southern Sudan, UNICEF/AET
SOWC = State of the World's Children, UNICEF
SSS = Sentinel Site Survey
WCBA = Women of Child Bearing Age
World Bank = Sudan Health Status Report
Also see the Annotated Sources

CHAPTER 1. POPULATION

A) TOTAL POPULATION

Introductory Summary

Our best estimate for the SOSUS population in 2003, based on census projections and migration assumptions, is approximately 7.5 million, up from 5.5 million in 1993. This population is expected to grow by as much as 4.5 million in the next six years as a result of returnees coming back (both refugees and internally displaced people) and the high natural population growth (almost 3% a year).

Meanwhile, the latest SPLM figures suggest a rapid increase of the population in SPLM areas outside SOSUS (Nuba, Southern Blue Nile and Abyei) as the peace negotiations progressed in 2003 and 2004. According to SPLM information in early 2004, there were 700,000 people in SPLM-controlled areas of Nuba, 500,000 in Southern Blue Nile and 60,000 in Abyei. However, in the tables in this document, lower figures collected earlier in the research phase were used as follows: SPLM controlled parts of Nuba Mountains (280,000 people), southern Blue Nile (125,000) and Abyei (around 35,000) appear within figures referring to the "rest of Sudan".

Our 2003 population estimate based on the WHO/UNICEF Polio National Immunization Days (NIDs) is also 7.5 million for SOSUS. The NIDs campaign is a door-to-door operation that targets all children under five years of age in southern Sudan, but does not include GoS-controlled areas such as the garrison towns. Total population is calculated by assuming that the under five population represents 21% of the total population

The 1993 census estimate is based on 1983 census results and population growth assumptions as used by the United Nations Population Division (*11). The last national census was done in 1983; the 1993 census excluded SOSUS. Therefore, the 1993 projected population (26.7 million) based on the 1983 results minus the population found in the 1993 census (21.2 million) gives the estimate for the SOSUS population: 5.5 million in 1993.

This 5.5 million population figure for 1993 is then projected towards 2003, based on our natural growth rate of 2.85% (Crude Birth Rate minus Crude Death Rate), resulting in a 7.5 million estimate for 2003 after migration. The 2003 population estimate for Sudan as a whole is 34.5 million. Therefore, the estimate for the "rest of Sudan" is 27 million.

The SOSUS population can, however, reach almost 10 million if one includes the southern garrison towns and when refugees and IDPs return home. At the moment, the IDP population in SOSUS represents almost 20% of the total population. When IDPs from the north and refugees now living in neighboring countries return to southern Sudan, the total (then ex-) IDP/refugee population could be around 3.2 million, or about one-third of the population.

Total Population Estimates
Estimating the population of SOSUS is not an easy task. The situation is highly fluid with large refugee and IDP streams, unknown numbers of war deaths and inconsistent area definitions. Counting a semi-nomadic population is always complicated as the men and boys are often away with their cattle. Population estimates for the south differ enormously. In the popular documents, 10 million seems to be a favorite number. In more serious documents, a figure of 5 million is often mentioned. According to this analysis of available information, the truth may lie in the middle.

SOSUS MICS-99: "Progress of the Regions, MICS Results"
The SOSUS MICS 99 also resulted in a population estimate of 5 million. The SOSUS MICS 99 was a tremendous effort to establish a comprehensive picture of the fluid population in southern Sudan.

It is obvious, however, that the MICS did not succeed in capturing the whole picture[1]. The problem lies not so much with the sample framework, but in the fact that estimating the whole population of an area based on a sample is always a high-risk adventure -- add the security dangers and other complicating factors in southern Sudan, and it becomes a mission impossible. However, the MICS itself makes the accurate assessment that it covered 70-80% of the population residing in southern Sudan. Based on our "best estimate", we can now see that the 5 million total population found does indeed represent 75% of the total population of 6.6 million at that time (end of 1999). The end of this chapter discusses further how we can make use of the SOSUS MICS 99 data.

NIDs Population Estimates
The most commonly used population estimate for SOSUS is based on the 2002 and 2003 WHO/UNICEF Polio National Immunization Days (NIDs). The 2002 total population estimate for SPLM territory was 8.1 million based on an under five population of 1.5 million. The 2003 total population estimate is 9.6 million with an under five population of 1.67 million. The basic problem with the NIDs total population estimate used up until December 2003 was the absence of a sound motivation for the selection of the all-decisive under five proportion. In the 2002 NIDs tables, two different estimates are used. In the preliminary 2003 tables, an unrealistic proportion of 17% is used. In this document, we will recommend the use of 21%.

The principle is simple: Assuming that the under five population is on average 21% of the total population, one can then estimate the total population *if* all children under five have been counted. The method depends entirely on the choice of proportion for the under five population. At the end of this chapter, after all demographic aspects come together, we will review the reasons for using this proportion.

The 2003 NIDs under five population excludes the government-held towns in southern Sudan but includes part of the Nuba Mountains, Southern Blue Nile and Abyei. The total NIDs under five population for all SPLM-controlled areas is 1,671,000 and the SOSUS under five population is 1,578,000. This number coincides almost exactly with our first estimate for the under five population.

Using a proportion of 21%, NIDs reveals a total population in SPLM-controlled areas of 7.957 million (including parts of Nuba, Southern Blue Nile and Abyei), and a total SOSUS (SPLM-controlled areas of Bahr el Ghazal, Equatoria and Upper Nile) population of 7.514 million.

According to experts, the 2003 NIDs was a very complete count. Assuming that the number of children under five who were not found is approximately equal to the number of children counted who are actually older than five, NIDs data provides a key demographic figure: the under five population. Besides giving the total population figure (confirmed by the census method), the under five population figure also provides the CBR estimate and consequently will help to determine other demographic variables.

Garrison Towns
Although frequently mentioned in the literature, population estimates for towns such as Juba, Wau, Torit and Malakal, are never given. In the draft World Bank document, Southern Health Status Report ((*9)), the total population of the garrison towns is estimated at 1.5 million by the Government of Sudan. One has to assume that this number includes the 300,000 IDPs living in and around the garrison towns. Another document from UNICEF/World Bank (*32) cites 500,000 as the estimated population of the garrison towns, and other key informants mention the same total. We have used a median estimate of a population of 700,000 in the garrison towns, plus an

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[1] According to the Progress of regions: Multiple Indicator Cluster Survey results (SOSUS MICS 99) (*16): "The study's statistical population was defined as all households in southern Sudan deemed to be accessible in terms of internal security. Government garrison towns and their environs were recognized as not of scope for the survey. Insecurity and access denials made it impossible to visit certain locations in southern Sudan. This report reflects data from only those locations that were accessible and only in rebel held areas. It is thought that 70-80% of the population residing in southern Sudan is covered by the survey".

IDP population of 300,000.

Refugees and Internally Displaced Persons (IDP)
The number of refugees and IDPs and their origins and destination is key information for estimating the present and future population of SOSUS.

At the end of 2000, the IDP situation for Sudan was as follows (*26): 4.5 million Sudanese uprooted, including an estimated 4 million IDPs and some 500,000 Sudanese living as refugees and asylum seekers (while refugees from Eritrea and Ethiopia still live in Sudan). Of the 4 million displaced persons in Sudan, 1.8 million were presumed to live in and around Khartoum, including 700,000 IDPs from SOSUS. Another 500,000 IDPs, including 350,000 from SOSUS, were living in central Sudan and the transitional zone (Nuba Mountains). And 300,000 were living in and around government-held towns in southern Sudan. In SPLM-controlled areas, the number of IDPs was estimated at 1.4 million. Only 700,000 IDPs lived in camps. We can assume that 400,000 of the 500,000 Sudanese refugees living in CAR, DRC, Uganda, Kenya and Ethiopia are from SOSUS.

The latest information on the status of IDPs is found in the OCHA map of August 2002, which counts 4.3 million IDPs. The numbers differ only slightly from the year 2000, with 800,000 reported in central Sudan, compared to 500,000 in 2000. Insecurity around the oil fields and the conflict in Darfur are the source of the latest displacements in 2002 and 2003.

It seems that most of the displaced person streams had settled by 1993 (census year) after the first 10 years of war and the 1992 famine. According to a GoS publication, there were already 1.8 million refugees living in the Khartoum area by 1993.

The most recent IDP survey shown in Box 1 (*13), confirms that only 16% of the IDPs around Khartoum arrived in the last 10 years.

Assumptions and Conclusions Concerning Refugees, IDPs and Returnees
In the following table, generally accepted 2002 estimates for the total refugee and IDP population and those originating from SOSUS are outlined. The recent Care/IOM survey cited above (*13) gave the surprising result that most IDPs living around Khartoum are from Kordofan and that only 40% are from SOSUS. However, the SOSUS IDPs are far more willing to return home (90%). Our estimate is that the 400,000 refugees living in neighboring countries will return if a peace agreement is signed. The urban south population in the garrison towns will once again be considered part of the south. The IDPs in central Sudan will tend to return, as they have stayed close to their home region. The Khartoum IDPs are expected to return en mass as well. The table below therefore also outlines the potential increase in SOSUS total population in the months following a peace agreement.

2002 SOSUS IDP/Refugee Population Situation

	Total	SOSUS Origin	Potential SOSUS
Refugees	500,000	400,000	400,000
IDP Urban South	300,000	300,000	300,000
IDP Khartoum	1,800,000	700,000	500,000
IDP SOSUS	1,400,000	1,400,000	
IDP other	800,000	600,000	600,000
Total IDP/refugee	4,800,000	3,400,000	**1,800,000**
Garrison towns			700,000
Total potential increase in SOSUS			**2,500,000**

According to UNICEF and SPLM officials, IDPs and refugees started to return to southern Sudan in 2003 as the peace negotiations progressed. An estimated 200,000 have already returned during 2003 and are therefore included in our estimate of 7.5 million total population. So the total potential extra population in 2004 is 2.3 million.

Box 1: Sudan Internally Displaced Persons, Demographic, social-economic profiles for return and reintegration planning activities, Khartoum IDP households

by CARE and IOM (*13)

According to the introduction, this "is a carefully calculated sampling analysis of a representative proportion of the IDP households in Khartoum camps. It represents all IDPs in Khartoum." The document later states that "the sample represents 330,000 IDPs; it excludes other concentrations of IDPs but the process was done at random." However, given the fact that migrants from the same region tend to live near each other and that the IDPs from the south face more discrimination, it is quite possible that the results are not entirely representative.

A surprising result of the study is that only 40% of the IDPs come from the south. The majority are from South Kordofan (31.5%) and Greater Darfur (15%). Only 19% come from Bahr el Ghazal, 10% from Equatoria and 11% from Upper Nile. The ethnic mix confirms the results: the Dinkas (not all live in the south) make up 25%, the Nuba 21% and the Arab 14%. The Nuer only accounted for 2.3% of IDPs.

Most of the IDPs arrived many years ago; only 16% have lived less than 10 years in Khartoum. A third of the sample cited employment as the reason for coming to Khartoum (showing that this may be normal rural-urban migration as in any country). Another third gave security as the principal reason for moving. Two-thirds of the people expressed their desire to return, of which another two-thirds stated that they would like to return immediately (the authors express their doubt about this number, assuming that most families would explore the situation first). The response from the IDPs originating from the south was significantly higher. Ninety percent of the Bari, Nuer, Dinka and Achal IDPs expressed a desire to return home and return immediately.

It is interesting to note that 56.6% of the IDP population is under 20 years of age. This translates to about 52% under 18 years and 18% under five years (adjusted). Only 2.8% of the population is older than 60 years. The gender breakdown is fairly even at 51% male and 49% female.

The total SOSUS population could increase over a very short period of time (depending on the speed of return) from 7.5 million to 9.8 million by including the potential SOSUS population and this excluding the natural growth.

Census Based Population Estimates

Method 1. The UN Population Division data (*11 and see Annex 2) shows that the Sudan 1993 census resulted in a population estimate of 21.2 million. However, the population of the south was excluded from that census, with the exception of the GoS-controlled areas.

The 1983 (July) population based on the 1983 census, including the south, was 20.9 million. Using the population growth estimates as presented in the World Population Prospects 2002 revision for the1983-1993 period (*11), this 20.9 million in 1983 would have grown to 26.7 million people in 1993. The estimate for the 1993 SOSUS population is therefore based on the difference of the two results: 26.7 -21.2 = 5.5 million.

Our 2003 estimate for SOSUS is based on the 5.5 million population in 1993, projected forward with the natural growth rate of 2.85% (CBR=50.5 and CDR=22). This projected total is 7.3 million for 2003[2]. In 2003, 200,000 people returned to the south, bringing the total population to 7.5 million. In our initial analysis, a Crude Death Rate of 20 was used. Because of the 1998 famine, among other reasons, the CDR has been raised to 22.

Method 2. Applying the UN Population Division decade growth rates (see Annex 2) to the 1953 southern Sudan population estimate of 2,783,000, this translates into a 1983 southern Sudan population estimate of 6 million. The 1983 census result for southern Sudan was also 6 million.

This 6 million, with the same natural growth rate as above (2,85%) would give a 10.47 million population in 2003. That includes the garrison towns, the refugees and IDPs. In other words, this estimate is 670,000 higher than our 9.8 million, but has to be adjusted for the war and especially the 1988, 1992, and 1998 famines (*42). It seems very realistic to assume 670,000 excess deaths (above the already high number of deaths according to the CDR of 22) in relation to the multiple disasters affecting SOSUS.

Therefore, based on three different calculation methods, the 2003 population estimate of 7.5 million remains consistent. The 7.5 million estimate is also within the 6-8 million range proposed by the World Bank (*9).

CDR and War Deaths
In the paragraphs above we found that two census-based estimates resulted in the same total if we assumed 670,000 excess deaths for SOSUS (above the already high number of deaths according to the CDR of 22) in relation to the disasters of war and famine that have converged on southern Sudan.

It is remarkable that until this publication, the population of southern Sudan remained unknown while the number of war deaths is known. Nearly every publication mentions 1.5 million to 2 million war deaths. For several years, this number has remained the same, although it has recently been criticized by Johnson in "The Root Causes of Sudan's Civil War" (*7).

While war deaths clearly took place in central Sudan as well, the southern Sudanese population has born the brunt of the conflict. The question begged by the statistics is the definition of "war death". The outrageously high Maternal Mortality and Infant Mortality are also partly a result of the war. The high CDR of 22 is likewise a reflection of this extreme situation.

With the 670,000 reduction in the total population estimate, and a very high CDR, we believe our estimates have accounted for the effects of the horrible human tragedy that has and is taking place in southern Sudan.

1993-2003 Population Development
The total population of SOSUS in recent years:
1993= 5.5 million
1999= 6.5 million
2000= 6.7 million
2001= 6.9 million
2002= 7.1 million
2003= 7.3 million + returnees = 7.5 million

2003-2010 Population Development

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[2] As was shown in the discussion of IDPs, almost all migration took place before 1993, so the census method as applied could be used.

To facilitate planning, we have included a forward projection of the population based on the assumptions that the garrison towns will be part of the south in a post-peace agreement scenario, that the 2.3 million IDPs/refugees will return gradually, and that the population growth will stay in the same range (2.85%), adding almost 300,000 people a year.

Forward projection of SOSUS population growth[3]:
2003= 7.5 million
2004= 9.4 million
2005= 10.1 million
2006= 10.6 million
2007= 11.0 million
2008= 11.4 million
2009= 11.7 million
2010= 12 million

North/South Population Proportion
- In 1953, the south (with 2.7 million) represented 27.1% of the total 10.2 million population.
- In 1983, the south (with 6.0 million) represented 28.7% of the total 20.9 million.
- In 1993, SOSUS, (with 5.5 million) represented 20.5% of the total 26.7 million, a consequence of migration streams, mortality and the exclusion of the garrison towns.
- In 2003, SOSUS, (with 7.5 million) represented 21.7% of the total 34.5 million
- In 2010, the south (with a potential 12 million) could represent 28% of the total 42 million population, once IDPs and refugees have returned and the population of the garrison towns is included.

Note: The northern Sudan population figure in Table 1 is based on the official 2001 estimate for Sudan, as given in SOWC.

B) POPULATION COMPOSITION

The population composition is very important, as it tells us a great deal about many demographic indicators. Due to high fertility and high mortality rates, a large proportion of the SOSUS population is very young. Before looking at the survey results, it is helpful to review the estimates for SOSUS based on population models, representing standard relations between some indicators and population structure. The following estimates are also based on the peer group (Table 1):

Initial estimates of population composition by age group:
0-14 = approximately 47%
Under 18 = approximately 52%
Under five = approximately 19%
Women of childbearing age (15-49) = approximately 23%.
65 and above = 2-3%
The male/female proportion is almost 50/50.

Survey results
These already high estimates do not coincide with the SOSUS MICS 99 and the 2001 and 2003 Sentinel Site Surveys, which have even higher proportions.

	SOSUS MICS 99	Sentinel Site Survey 2001	Sentinel Site Survey 2003

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[3] As the projections include assumptions for a certain fertility and mortality regime it should be obvious that in reality this estimate was done after the analysis of the several demographic variables that will be discussed later.

Under 5	25%	25%	25.6%
Under 10			42%
Under 15		51%	51%
Under 18	58%	56%	55.5%

What is the best way to deal with these results? After 20 years of war, famines and migrations, we should be cautious about disbelieving strange results. Given the extreme and prolonged circumstances and the isolation of Sudan, anything could be possible. Nevertheless, the results of the SOSUS MICS 99 are extraordinary. About 45% of the overall population is male and 55% female. Only 42% of the total population are above 18 and in some regions only 34% of the population are adults, an extremely low percentage.

The Sentinel Site Surveys, which concentrate on the most accessible regions of Lakes and Western Equatoria, found only minimal difference between male and female proportions. In the IDP studies, more males than females were found. In the Sudan 2000 MICS2, the proportion of males to females is almost one on one.

A "normal" male/female proportion for SOSUS (without war, based on the peer group) would be a slightly higher overall number of males -- the reverse of western societies. This trend is normally most marked in the lower age groups (because more boys than girls are born), but in both SOSUS and Sudan as a whole it appears in the highest age group as well – again, very different from western societies. This phenomenon was found in the Sentinel Sites Surveys and the Sudan 2000 MICS2.

Thus, the SOSUS MICS 99 is the only study with an uneven gender distribution. The fact that only 30% of all males are above 18 years of age is the result of many (about 500,000) uncounted men. In a classic war (WWI) the loss of men is normal. In this era, everyone is a victim of war. So where are southern Sudan's men? A large number of men are in the rebel army, others may not have been counted due to nomadic lifestyle, migration or death. If the missing 500,000 related simply to a measurement problem in MICS, then the under five proportion would have been 23% and the under 18 proportion would be 54%.

The 2003 Sentinel Site Survey is the first survey to show results for the 65 and older population that are even lower than the model 2% estimate: 1.6% of the population is 65 years and older (2.3% male and 0.7% female).

Population Structure Observations
Nothing is more relative than proportions. Based on the results mentioned above, we can conclude that the adult population is partly missing and as a consequence the proportions for the young population will be very high. However, the population is so young in the survey results that we have to assume the effect of temporary migration. As our tables show estimates in the middle of the range, the figures are slightly lower than those found in the MICS and Sentinel Site Surveys. This was done to adjust for the effects of temporary migration. It is obvious that all surveys suffered from problems with the definition of "household members" and that there are problems with determining age. These are a few of the problems encountered that diminish the possible use of the survey results.

Temporary migration does not affect all age groups in the same way. Children may migrate for education opportunities, and women and children may migrate because of safety concerns (*43). For this reason, it is possible to have different results between surveys.

It is interesting to note that according to the IDP study, 56.6% of the IDP population is under 20 years of age (translates into 52% under 18 years) and 18% of the population is under five (adjusted). Only 2.8% of the population is above 60 years. The gender breakdown is broadly even

with 51% male and 49% female. According to the 2000 MICS2, the under five population in the north is 16% of the total population. Knowing that 40% of the IDP population comes from the south, one can estimate the under five population in the south to be 21%. (60% of 16% for those from the north, and 40% of 21% for those from SOSUS, averages at 18%)

Based on the above analysis, the final SOSUS population composition estimates used in the tables are as follows:
Proportion under 15 years old: 49%
Proportion under 18 years old: 53%
Proportion under five years old: 21%
Proportion 65 years and older: maximum of 2%, estimate is 1.6%
(Here we assume that the Sentinel Site Survey number is correct. The adjustments are for the other categories).

For education planning purposes:
- 5-9 year old population is approximately 16%
- 10-14 year old population is approximately 12%
- School-age population, 7-14 years, is 21% (12% plus 16% minus 7%)
- 10 year old population is 2.7%
- 14 year old population is 1.8%

The famines in 1988, 1992 and 1998 have influenced the population composition, so we cannot use the above given proportions for future years without analysis. The 10-14 year old population in 2003 is low because of the 1992 famine, while the 1998 famine translates into a lower population for the 5-9 year old category.

The analysis of the under five proportion includes all elements: total population, fertility and mortality.

C) DEMOGRAPHIC VARIABLES

Fertility: The Crude Birth Rate (CBR)
The CBR is based on the under five population. The SOSUS under five population is estimated at 1.578 million in 2003. A simple cohort model, assuming a certain mortality regime, translates the under five population into a corresponding number of annual births. **For SOSUS, this is 380,000 births per year** (see Annex 3 for explanation of the method -- the number of births is 0.24 times the under five population with SOSUS mortality).

There is an odd relationship between the estimates of the total population and the CBR based on the under five proportion. The higher the total population, the lower the CBR -- thus a contradiction: the higher the total population, the less growth that created that population. The following data demonstrate that a certain "flipping point" exists, in this case around the 21%. The resulting CBR is thus 50.5

Under five population %	Total population in millions	Crude Birth Rate per 1,000 population	Growth Rate %
16	9.8	38.5	1.7
17	9.3	40.9	1.9
18	8.7	43.3	2.1
19	8.3	45.8	2.4
20	7.9	48.2	2.6
21	**7.5**	**50.5**	**2.85**
22	7.1	53	3.1
23	6.8	55.5	3.35
24	6.5	57.8	3.6
25	6.3	60	3.8

If we assumed that the under five population was 25% of the total, this would result in a CBR of 60 (never seen) and a growth rate of 3.8%, while the population would total only 6.3 million. If the under five population is 17%, this results in a CBR of 41 and a growth rate of 1.9%, but an unrealistic total population estimate of 9.3 million. All evidence points towards the 7.5 million total population figure, and thus the CBR of 50.5.

It is interesting to observe that the use of the CBR per 1,000 women for the SOSUS MICS 99 numbers results in a CBR of 98 per 1,000 women. This translates into a CBR of almost 50 per 1,000 population (see Annex 1).

As a result of the relative absence of the adult population and due to the fertility practice, the CBR of SOSUS will be among the highest in the world. A CBR of 50.5 per 1,000 seems to be a realistic estimate.

The official estimate for Sudan is a CBR of 35. Based on the 2000 MICS2 (see Box 3, on the northern Sudan population) one can calculate a CBR of 38 for northern Sudan and a CBR of 40.7 for the whole of Sudan.

Total Fertility Rate (TFR)
The fertility estimates (TFR) of all countries surrounding southern Sudan have recently been raised by the UN Population Division (see "Progress Since the WSC" (*4)). Instead of about six children, the best estimate is now seen as seven children for many surrounding countries, based on several new Demographic Health Surveys[4].

Given the population status in SOSUS and the pressure to replace people killed during the war and famines, there is little reason to expect lower rates in SOSUS.

Nevertheless, the official estimate for northern Sudan is much lower. Although upgraded from 4.4, it is still only at 4.6 (see Table 1). The UN Population Division (*11) uses 4.9 for the whole country for 2000-2005, based on the 5.3 figure found for northern Sudan during the 1993 census (and the 1992-1993 Sudan Maternal and Child Health Survey) and a decline in fertility afterwards[5]. However, there seems to be no proof of this fertility decline. The World Bank's Sudan Health

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[4] As a consequence, the World Bank, UNDP and UNICEF present three different sets of values (see Table 1). The UNICEF figures are the most up to date, but this demonstrates how difficult it is to reach agreement among the agencies.

[5] The Sudan Demographic and Health Survey 1989/1990 is the study with the lowest estimate: "Fertility has declined sharply in Sudan, from the average of six children in the Sudan Fertility Survey (SFS 1980) to five children in this Sudan DHS survey".

Status Report of 2003 (*9) shows a stagnant situation for the north. In that same World Bank report, the 1985-1999 estimate for the TFR of northern Sudan is 5.9, compared with 6.1 for the period 1975-1989. However, the population structure of the north as found in the 2000 MICS2 does not support such a high TFR. There is little reason to use any estimate other than the 5.3 found during the 1993 census.

For SOSUS, with its rural population and the amazingly high proportion of children in the population, our best estimate for TFR is around 6.7 children despite the war and famine and despite the fact that many men are absent in SOSUS.

A very rough but interesting way to estimate the TFR is to assume that 25% of the population (women of childbearing age 15-49 years) 'produce' 5% of the population (CBR of 50 means births account for 5% of the total population). For each woman, this means one child every five years; or in 35 years, a total of seven children. This is a very rough method, but nevertheless shows that a TFR estimate of 6.7 is realistic.

The use of model information
The table with the set of indicators and assumptions underlying the total population estimates of "The 2002 World Population Prospects, the 2002 revision for Sudan, with aids" (*11), was an extremely useful instrument (see also Annex 2). The model 1970-1975 indicator assumptions for Sudan coincided almost exactly with our first "approximations" of those indicators for 2000-2005 SOSUS. This provided confirmation that our estimates were on track. Only slight fine-tuning has been necessary. The CBR estimate was adjusted and all related demographic variables changed accordingly, slightly increasing to a level that now represents the 1965-1970 assumptions (*11). The new model assumptions are:

Demographic variable	Model assumption	Final estimate
CBR	47.3	50.5
TFR	6.6	6.7
CDR	20.7	22
Life expectancy (Ex)	43.6	42
Infant mortality Rate	139.4	150
Under 5 Mortality Rate	232.8	250

Teenage Birth Rate
Teenage birth rate is defined as the number of births per 1,000 women aged 15-19 years. Based on the peer group figures and the fact that unmarried 18 year old girls are seen as 'old maids' in southern Sudan (*8), our best estimate is a teenage birth rate of at least 200.

Maternal Mortality Ratio
The 2000 MICS2 and Safe Motherhood Survey 1999 (*22) found a Maternal Mortality Ratio of 509 per 100,000 births in the north and 763 in the urban south, based on the Sisterhood Method (reference period 1985-1990). The 1989/1990 Sudan DHS (*12) in the north, using a direct estimate, reported 552 maternal deaths per 100,000 births for the period 1983-1989. The indirect estimate for the Maternal Mortality Ratio is 537 (1,977).

Some older studies found a Maternal Mortality Ratio of 865 in war-affected areas, instead of the 550 reported in Sudan (*8). The World Bank reports 845 based on health center records in one location in southern Sudan (*9).

In recent years, UNICEF, WHO and UNFPA came up with much higher revised estimates for the Maternal Mortality Ratio. The 2004 SOWC adjusts the numbers once again (see Table 1). The values given are now around 1,000 for the peer group with Niger (1,600) and Sierra Leone (2,000)

at the highest end. The new estimate for Sudan is 590 (SOWC 2004) compared to 1,500 in the 2003 SOWC.

Given the high fertility in SOSUS, the fact that women start bearing children at a very young age, and the low maternal health coverage, the best estimate for SOSUS is a Maternal Mortality Ratio of about 1,700 deaths per 100,000 births (170 times higher than Europe). In the World Bank document (*9) a correlation between maternal mortality and birth attendance is shown. Their mortality estimate based on a birth attendance of 6% is 1,500.

Therefore, with 380,000 births per year, one can estimate the number of yearly maternal deaths in at 3.8 x 1,700 = 6,452 maternal deaths each year. This translates into another more shocking figure: one out of every nine women will die as a consequence of pregnancy or delivery. A southern Sudanese woman's lifetime risk of dying in pregnancy or childbirth is 11%.

Life Expectancy (Ex)
With so many deaths of men, women and children, it seems natural to expect a very low Life Expectancy (Ex) for SOSUS. The world's lowest figures at the moment occur in the southern African countries that are affected by AIDS. A good estimate for southern Sudan seems to be around 42, which coincides with the "model" estimate (*11) and also compares well with the neighboring countries. However, it is fair to say that in recent years, such as during the famine of 1998, the Life Expectancy has been lower.

A Life Expectancy of 42 means a very young population with a median age of 15-16 years and an under 18 population higher than 50%. Survival to age 65 happens only for 25% of all newborn babies. There are conflicting data about differences in survival of women and men in SOSUS. Women seem to have less chance of survival in southern Sudan, the reverse of the human biological trend.

The official Sudan life expectancy estimate is 56 (other estimates are 58), with the standard model higher estimate for women. However, northern population results like the 2000 MICS2, also find a higher proportion of elderly man. At the same time, that proportion is so low that a Life Expectancy of 56 is an unrealistic one. Our best estimate for northern Sudan is a life expectancy of 53 years (see Box 3).

Crude Death Rate (CDR)
The CDR for SOSUS is on average about 22 per 1,000 in recent years. This estimate coincides with the above-mentioned "model" estimate (*11) and is 10% higher than the comparable peer group countries (see Table 1). The CDR is 2 points (14,000 deaths a year) higher due to continued fighting and the 1998 famine (*44). At 22 per 1,000, the CDR in SOSUS is higher than the CDR in Niger, which has an even higher Infant Mortality Rate but has no war.

Sudan's official CDR is 11 -- half the estimate for SOSUS. However, our CDR estimate for the north is 13.3 and our estimate for the whole of Sudan is 15.

Natural Population Growth Rate for SOSUS excluding migration is 50.5 (CBR) minus 22 (CDR) = 2.85% per year. In the near future this rate may increase as the CDR, in the absence of war and famine, could drop faster than the CBR.

The growth rate for Sudan according to the official data is 35 (CBR) minus 11 (CDR) = 2.4%. We will use a 2.5% growth rate for the medium variant for the whole Sudan.

Rural Population
Excluding the garrison towns, SOSUS is an almost totally rural society: 98% rural.

Under Five Mortality Rate and Infant Mortality Rate (U5MR and IMR)

The SOSUS MICS 99 and Sentinel Site Surveys show enormously high prevalence of common diseases in southern Sudan like malaria, diarrhea and ARI. Children are almost constantly ill and, malnutrition remains a major problem in SOSUS. In addition to common illnesses, SOSUS hosts many relatively rare diseases such as Kala Azar. Combined with the limited presence of a health service infrastructure, one can expect a very high IMR and U5MR.

Some new studies such as the Demographic Health Surveys, WDI 2003 (*1), give data on the situation of the poorest of the poor (the poorest quintile) in other African countries listing extreme IMR data for Kenya (103), Niger (130), Uganda (110) and Mozambique (188).

Our best estimates for SOSUS, based on Population Division model data (*11), are IMR = 150 and U5MR = 250. This means that IMR is higher than in Ethiopia, but lower than in Afghanistan and some other countries. By coincidence, the SOSUS estimates are almost the same as those for Somalia (IMR = 141 and U5MR = 238). The IMR estimate of about 150 is more than double the official Sudan estimate of 65. **An U5MR of 250 means that one out of every four children will die before the age of five.** Every year, 57,000 infants and 38,000 children between one and four years of age die, totaling 95,000 under five deaths per year.

It is very interesting to compare this with results for northern Sudan, where direct mortality estimates from the 2000 MICS2 (*22) are:
- Northern Sudan: IMR = 68 and U5MR = 104
- Blue Nile: IMR = 101 and U5MR = 172
- Urban south: IMR = 93 and U5MR = 123

The above-mentioned estimates are based on the direct method, which is known to underestimate mortality. According to the Sudan Health Status Report (*9, pg. 52), "the U5MR and IMR in northern Sudan are estimated at respectively 105 and 68 per 1,000. These are direct estimates from births and deaths histories collected by the 1999 SMS, with 1995-1999 as the reference period." The report adds that "indirect estimates based on responses to simple questions to mothers about the total number of children born and the total number who died [the so called Brass method] are somewhat higher. The indirect estimates for U5MR and IMR are 132 and 82 respectively with 1995-1999 as the reference period."

Applying the more robust Brass method, the IMR/U5MR estimates are 20-25% higher than estimates arrived at via the direct method. The advantage of the direct method is the ability to measure neonatal and post neonatal mortality. The disadvantage is that people prefer not to speak about the subject (resulting in under-estimation) and the reference period is complicated (causing heaping). By applying the adjusted number and thus correcting for the under-estimation of the direct method, the most extreme results in the 2000 MICS2 are for Blue Nile with IMR = 121 and U5MR = 215. Although the reference period is 1995-1999, there is no reason to assume that the rates have changed recently.

Our SOSUS estimates are thus about 20% higher than the worst state situation in the north. In light of all the other data, we can agree with the opinion as expressed in the ODI report (*27): "One health practitioner asserted that U5MR indicators are better than in some poor but politically stable countries like Niger."

Conclusion: IMR and U5MR in SOSUS are very high but not the highest in the world because of the humanitarian food and health interventions that take place.

The under five proportion = 21%
In the first versions of this document, the under five proportion estimate fluctuated between 20 and 22%. In the final version, we are recommending the use of 21% based on existing evidence.

As stated in the discussion of population composition, in a more normal situation with high mortality and high fertility one can expect an under five proportion of about 19%. If many adults have been killed in the past, that percentage will automatically rise because it is a proportion. The same holds true for migration movements among the older population. A drop in their numbers means a higher proportion for the younger population. There are of course limits; all newborns must have had a mother and a father.

The total population estimate found by using the census method is equal to the NIDs population estimate if we use 21% for the under five population. The fact that two totally different methods point to the same conclusion is confirmation enough. An alternative census method, starting in 1953 also leads to the same conclusion. In northern Sudan the under five population represents 16% and the IDP population has an 18% under five proportion. Knowing the weights of the IDP population (north is 60%) one can estimate the southern under five population is 21%.

In the discussion of CBR, we demonstrated that the relation between total population, population growth and CBR pointed towards an under five proportion of 21% (with the high infant mortality regime). Proportions under 20% lead to unrealistic total population estimates of over 8 million.

Box 3: 2000 MICS2 North Sudan: Population

In 2004, the UN Population Division will re-run Sudan data based on new information. Therefore, for this study, we decided to use different assumptions for fertility and mortality indicators for the projected populations in Table 2. The biggest difference is a slightly higher natural growth rate, the result of a higher fertility pattern that is partly offset by a higher mortality rate.

The following paragraphs present population structure based on 2000 MICS2, demographic indicators and total population estimates with four scenarios.
A) Population structure

The 2000 MICS2 presents an age structure that is a delight for a demographer. The preference for 10 digits and 5 digits and also for age 18 is exactly as described in the handbooks. The under 18 population is slightly under-estimated because of the preference for the 18 digit:
17 years = 2,600
18 years= 4,038
19 years = 2,024

The adjusted under five population is 16%, translating into a CBR of around 36-38. The under 18 population is 51% as opposed to the 46% listed in official data. The under 15 population is 45% (the World Bank's Sudan Health Status Report (*9) uses 43%, based on a higher fertility rate that is not consistent). The population over 65 is only 2.8%, an expression of a very high mortality regime in the past and a corresponding relatively low Life Expectancy. The data compares well with the IDP population (*13): 52% are under 18 years old and 2.8% are 60 years and older.

The survey found overall more females than males. However, there were 2,650 (3.6%) men aged 65 and above compared to 1.506 (2%) women aged 65 and above. For the under five population, slightly more boys (11,359) were found than girls (11,322). This coincides perfectly with earlier observations. The under five group is smaller than the 5-9 age group. The same phenomenon has been found in any census and does not reflect lower fertility.

B) Demographic Indicators
Based on the CBR estimate of 38 and a TFR of 5.3 (mentioned by the Population Division), and while keeping the 1990-1995 estimates constant because of no improvements in data (see World Bank Report (*9)) the assumptions are:
TFR = 5.3
CBR = 38
CDR = 13.3
Ex = 52.9 years
IMR = 93

The population composition does not support a higher TFR. The 2000 MICS2 found a lower IMR of 82, but the limited 65 years and above population means that the Life Expectancy (Ex) estimate might be correct.

C) Total Population

Medium Scenario:
Based on the above-mentioned assumptions, a medium scenario results in 38 (CBR) minus 13 (CDR) = 2.5% natural growth. Applying a 2.5% growth rate to the 1993 population of 21.2 million results in a 27.2 million population in 2003. From this we subtract the 200,000 IDPs who returned to SOSUS in 2003, giving us a total population of 27 million.

The total 2003 population for Sudan as a whole is 27 million plus 7.5 million = 34.5 million. This figure is close to the Population Division estimate.

High Scenario:
40 (CBR) minus 12 (CDR) = 2.8% growth rate. Applying a 2.8% growth rate to the 1993 population of 21.2 million results in a 2003 population of 28 million. To reach the official estimate of 29.5 million (see WB*9), the growth rate had to be a staggering 3.3%.

Proportions over 22% lead to unrealistic birth rates of more than 55 per 1,000.

The highest under five proportion in the world is 21% in Niger, a country with a TFR of 8.8. No other country has such a high under five proportion. At 21%, southern Sudan joins Niger with the highest under five proportion in the world, without having the highest fertility rate, but because of the absence of the adult population.

Population distribution and SOSUS MICS 99 adjustments
This section takes a closer look at the regional population distribution, which is the key to making

adjustments (new weightings) in the data.

One of the many challenges in outlining clear demographic data is that the administrative regions in southern Sudan are constantly changing, making comparisons more complicated. Designations like Lakes and Jonglei, which were used as major regional categories in the 1999 MICS, are now incorporated into larger regional divisions. In the 2003 UNICEF Situation Analysis (*8), UNICEF used the SPLM administrative structure with southern Sudan divided into three main regions: Bahr el Ghazal, Upper Nile and Equatoria. The 2003 NIDs data had to be adjusted because some subdivisions of Jonglei (Bor, Pibor and Pochalla) are included in Lakes. Geographical distribution of total population according to various studies show enormous differences:

Region	NIDs 2002	FAO	MICS 1999	2001 Sentinel Site Survey	2003 Sentinel Site Survey	NIDs 2003
Bahr el Ghazal	30%		37%	21%		29%
Lakes	18%		19%	35%		18%
Bahr el Ghazal region	**48%**	**40%**	**56%**	**56%**	**48%**	**47%**
Upper Nile			6%	8%		
Jonglei			6%	6%		
Upper Nile region	**25%**	**30%**	**12%**	**14%**	**25%**	**28%**
Western Equatoria	11%		15%	25%		
Eastern Equatoria	17%		16%	5%		
Equatoria region	**28%**	**30%**	**31%**	**30%**	**27%**	**25%**

The 2001 Sentinel Sites Survey suffered many problems; the geographical distribution was just one of them. However, the survey's regional distribution is the same as the SOSUS MICS 99, proving that comparing regional averages is not enough. The regional distribution of the 2003 Sentinel Sites Survey is very close to the NIDs 2003 distribution, however that does not exclude the possibility that the survey was conducted in the more accessible areas with better service coverage.

By comparing the SOSUS MICS 99 data with WHO/UNICEF NIDs population estimates, it is obvious that Upper Nile and Jonglei were vastly under-represented in the MICS. Given a 2003 total population of 7.5 million and 1999 population of 6.6 million, we can compare the SOSUS MICS 99 with a re-projected 1999 NIDs. The following table shows which areas were not covered by the MICS and approximately how much of the population was missed[6].

	SOSUS MICS 99	1999 NIDs
Bahr el Ghazal	1,877,000	1,924,000
Lakes	973,000	1,199,000
Upper Nile and Jonglei	685,000	1,850,000
Western Equatoria	783,000	637,000
Eastern Equatoria	804,000	1,004,000
TOTAL	**5,055,000**	**6,600,000**

The bulk of the missing population is in Upper Nile and Jonglei and in some parts of Lakes and Eastern Equatoria. The SOSUS MICS 99 concentrated for obvious reasons in the more accessible and therefore better-serviced parts of southern Sudan and the method used actually caused an over-representation of Western Equatoria (for many indicators, Western Equatoria figures are the best in the south).

Based on discussions with experts in the areas not covered, we can determine a method for adjusting many of the indicators. We will assume that the missing population is in a worse situation

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[6] In the table we used a constant factor (1/.21) for the total population. That factor is an average and there may be regional differences.

than the population that was found. The missing population may be IDPs, or may be living in areas without humanitarian aid, without medical assistance, etc. Adjustments have been made per indicator, analyzing the data for Upper Nile and Jonglei. For some indicators, such as disease prevalence, no adjustment was made to an indicator. In other cases, such as health care coverage, we assumed that the whole population with coverage was found. We also assume that the 1.6 million not found had no coverage at all. In other words, the MICS denominator should be 6.6 million and not 5 million, so we must multiply the indicator by 0.75 (5/6.6 =.075). Even then, we can assume that the estimate will be at the high end of the range because of the higher numbers for Western Equatoria.

The following chapters are largely based on SOSUS MICS 99 results. However, as already discussed, the survey had several problems. Not finding the whole population was only one of the problems. Even after adjustments, some MICS results, such as the wasting results, are so strange that they will be excluded (we assume problems with conducting interviews). In general, the SOSUS MICS 99 may not be the best survey, but is nevertheless all we have at our disposal. With the adjustments explained above, the data has improved significantly.

CHAPTER 2. HEALTH

A. CHILD HEALTH

Child morbidity and treatment
Morbidity rates in SOSUS as used by OLS are based on data registered in medical centers and on OLS health system information called "Health Posts Visit Rates".

Based on the UNICEF's Overview of the Health Situation in Southern Sudan (*14) and updated figures provided by the author, Dr. Richer, the 2003 figures for under five morbidity are as follows:
- Malaria 27%
- Diarrhea 14%
- ARI 10%

The SOSUS MICS 99, the 2000 MICS2 and the Sentinel Site Surveys have measured the incidence/ prevalence of diarrhea, ARI and malaria. While using the data, one must be aware of seasonal differences and methodological problems (how respondents define age or the "two week" period). Information may be used for comparison purposes.

Prevalence of diarrhea

SOSUS:
According to the SOSUS MICS 99, 45% (unadjusted) of children under five had diarrhea in the 15 days prior to the investigation. This is an extremely high percentage. The range is 37% (Upper Nile) to 52% (Western Equatoria). The 2001 Sentinel Sites Survey, which concentrated even more in the areas with better social service coverage (and for that reason will give the minimum estimate) found 34%. The 2003 Sentinel Sites Survey found a diarrhea prevalence of 25%.

North:
In the 2000 MICS2, 28% of the children under five had diarrhoea -- 29% in rural areas and 25% in the urban south. The worst rate was found in Blue Nile, with 40% prevalence.

The 1989/1990 Sudan DHS (*12) results show that 30% of children under five in the north had diarrhea in the two weeks preceding the survey. This is remarkably consistent with the 2000 MICS2 figure found 10 years later.

Comments:
Diarrhea prevalence among children under five is 50% higher in SOSUS than in the north.

ORS/ORT use
SOSUS:
According to the SOSUS MICS 99, 37% (range 25-65%) of the children who had diarrhea were given Oral Rehydration Salts (ORS) or sugar and salt solutions (defined as ORT). Our best estimate for ORS/ORT use is 30%, based on the assumption that the people without health care coverage (and without salt) will not be able to use ORS/ORT.

The 2001 Sentinel Sites Survey did find a 42% use of ORS. So within the accessible and better serviced areas of SOSUS, ORS is known and has a surprisingly high level of use. The level of use is the same as in the peer group.

The 2003 Sentinel Site Survey found an impressive ORS/ORT use of 60%. However, experts who know the situation on the ground believe that even 30% is a very high estimate.

North:
The 2000 MICS2 tables (*22) estimate ORS use in the north at 27%. ORS/ORT use is 10% higher at 37%. In the urban south the ORT coverage is at 49% (*23). The lowest ORT use is in Western Darfur with 25%. Coverage in the rural north 34%.

The 1989/1990 Sudan DHS results showed that in the north, 29% of children under five with diarrhea were treated with a solution prepared from ORS packets, and 8% with a homemade salt and sugar solution. Together this makes an ORS/ORT coverage of 37%, which is once again remarkably consistent with the number 10 years later.

Comments:
It is noteworthy that the SOSUS level of use is similar to the rural north values.

Health assistance for children with diarrhea
An even more surprising 33% of the SOSUS children with diarrhoea were treated at a health facility (SOSUS MICS 99 adjusted figure -- original number is 42%, range is 25-70%). While this shows the significant impact of OLS interventions, even the adjusted numbers should be treated with caution. In SOSUS MICS 99 terms, around 240,000 children (based on a population of 5 million) visited a health facility in the two weeks before the survey. This would mean more than 6 million health facility visits in a year for diarrhea. Since diarrhea accounts for 14% of all health visits, this translates into more than 40 million health facility visits each year. In other words, the MICS data are very soft, even assuming no diarrhoea at older ages.

Acute Respiratory Infection (ARI)

SOSUS:
Almost 45% of the children under five (not adjusted, range 38-58%) had a cough within the 15 days prior to the investigation. According to the SOSUS MICS 99, "This reflects high morbidity which is almost 2.5 times higher morbidity than in rural communities in other developing countries." Two-thirds of the children with a cough also had breathing problems, so the prevalence/incidence of ARI is around 30%.

North:
The Sudan 2000 MICS2 (*22) found 17% of the children with ARI; 14% in the urban south (according to the document and table 25A); and 18% in rural north.

The 1989/1990 Sudan DHS results show that 48% of children under five in the north had a cough and 19% had ARI. Once again, these results are remarkably consistent with the number 10 years later.

Comments:
SOSUS prevalence is breathtakingly high.

Health assistance for children with ARI
SOSUS:
Of the serious cases an adjusted 42% of children did go to a health facility according to the SOSUS MICS 99 (unadjusted numbers are 170,000 or 55%). Once again, these are very high figures, translating into more than 4 million health facility visits each year. With ARI accounting for 10% of health facility visits, this totals 40 million visits per year.

North:
Health assistance in the north for ARI cases is 62% according to the 2000 MICS2 document (*23), and 57% according to the MICS web tables (*25).

Malaria

Malaria is *the* major health problem in Sudan. According to WHO (*29) malaria is holoendemic in the south (which means always present, always high and considerable immunity levels) and hyperendemic in the north. The burden of the disease is especially heavy in the south with huge areas of Sudd swamp.

According to WHO (*29), the prevalence rate is increasing and was as high as 250 malaria cases per 1,000 in the year 2000 in the north, although the official estimate (see Table 1) is 130 per 1,000 (or 13,000 per 100,000). The best estimate for SOSUS is at least 50,000 malaria cases per 100,000 or 500 per 1,000 population.

SOSUS:
According to the SOSUS MICS 99, an incredible 61% (unadjusted, range 55-75%) of children under five had a fever in the 15-day period prior to the investigation. The prevalence of fever among children under five is used as an indicator for malaria, although there are of course other possible causes.

North:
The corresponding figure for the north, according to the 2000 MICS2 tables (*22), is 21%. In the urban south, fever prevalence was 37%; 46% in Blue Nile State; 25% in the rural north.

Health assistance for children with malaria
SOSUS:
According to the SOSUS MICS 99, "around 42% (adjusted number) of the children under five who had a fever received medicine at a health facility". According to the World Bank (*9) -- who had access to the crude data and for that reason could analyze MICS question 12 – the proportion of children under five with fever who were treated with antimalarial drugs was 50% for the north and 36% in the south.

North:
The MICS-SMS tables (*22) list 22.7% of children under five receiving treatment. The figure from the web table (*25) is 50% and is also used by the World Bank. In the web table, the northern rural figure is 42% and North Darfur is 35%.

According to two WHO sources (*29) based on Ministry of Health information, 25-40% of total outpatient attendance and 32% of admissions in the north are malaria related.

Use of bed nets
SOSUS:
According to SOSUS MICS 99, 36% of all children sleep under nets (no adjustment needed, range 5-70%). There is no information available about treated bed nets.

North:
According to the 2000 MICS2 tables (*22), 23% of all children sleep under nets and 8% sleep under treated bed nets[7]. Urban south bed net use is listed at 33.6% and use of treated bed nets is 13% (*22).

Vaccination coverage
Due to a variety of definitions for indicators, comparing vaccination coverage becomes quite difficult. A child has not been "immunized" until he or she has received enough doses of a particular antigen. Only one dose is necessary to immunize a child against measles. Whereas

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[7] In the MICS text the description is "8% of those who use bed nets", or 8% of 25% = 2% of children sleep under treated bed nets. However, according to the MICS-SMS tables, the 8% is not of those who use nets but of the total population.

three doses of DPT are necessary to immunize a child.

According to the Overview of the Health Situation in Southern Sudan (*14 pg 40-41) there are both pulse and routine vaccination programmes in southern Sudan. The routine Expanded Programme on Immunization (EPI) in southern Sudan aimed to reach 30% of children under five with six main antigens in 2003. Coverage rates are however much lower than the target. Pulse campaigns, although much more expensive, are used to boost coverage in particular geographic areas. Results from both types of programmes will be combined.

BCG
SOSUS MICS 99 shows 28% of infants immunized with BCG (range 8-65%). There is no reason to assume that the population not found was vaccinated. The adjusted number is 21%.

The monthly UNICEF/OLS Southern Sudan monthly report (January 2004) lists 90,000 children under one year vaccinated in 2003, compared to 55,000 vaccinated during 2002. So 23.7% (90,000/380,000 births) of children under one year of age were immunized against TB in 2003.

2000 MICS2 web tables (*25) show BCG coverage of 64.5% in the north (urban 75% and rural 57%). Urban south coverage is 74% (*22). The lowest coverage is in Western Darfur at 35%.

DPT
According to SOSUS MICS 1999, 25% of infants were vaccinated with DPT2 (range 0% in Upper Nile to 58% in Equatoria). The adjusted number is 18%.

The Overview of the Health Situation (*14) lists DPT1 coverage at 7% for children under five years during routine immunization in 2002, with coverage falling off to less than 5% for DPT3.

According to the 2003 data for SOSUS (UNICEF OLS monthly report, January 2004) 15.6% (59,400/380,000) of children under one year received DPT1. DPT3 coverage for children under one is listed at 7.5% (28,400/380,000).

In the 2000 MICS2 web tables (*25), DPT 2 coverage for infants in the north is 56% (rural 46%). The lowest coverage is again in Western Darfur at 23%. Overall, 44% of children in the north received DPT3. DPT3 coverage in the rural north stood at 34%, compared to Western Darfur where only 12% of the one year olds were immunized.

Polio
Thirty percent of infants were vaccinated against polio (2 doses), according to the SOSUS 99 MICS: 72% in Western Equatoria, 62% in Eastern Equatoria, 35% in Jonglei, 28% in Lakes, 27% in Upper Nile, and 13% in Bahr el Ghazal. Polio vaccination has the best geographical distribution of all vaccines.

The Overview of the Health Situation (*14) describes massive polio campaigns which reached 1.3 million children out of an under five population of 1.5 million in 2002. This translates into coverage of over 80% in 2002. In 2003, the coverage was much higher. According to all sources, NIDs reached at least 95% of children under five years of age.

The last confirmed case of wild polio virus in southern Sudan was in April 2001.

The 2000 MICS2 web tables (*25) indicate polio 2 coverage in northern Sudan of 66%, compared to polio 3 coverage of and 45%. Polio 2 coverage was 58% in the rural north (39% for polio 3); the lowest coverage for polio 2 was found in Western Darfur at 31% (17% for polio 3).

Measles

The SOSUS MICS 99 gives an adjusted measles coverage for infants of 25% (34% original figure).

According to the Overview of the Health Situation (*14) measles coverage in children under five in 2002 stood at 24.3% (363,000/1,490,000) with 252,000 children reached through pulse campaigns and 111,000 children reached through routine immunization. Measles coverage in 2003 seems to be lower. Although the routine vaccination improved (reaching 164,000 children) the pulse campaigns only reached 90,000.

In 2003, the coverage achieved through routine immunization for children under one was 46,000/380,000 = 12%.

In the 2000 MICS2 (*25) measles coverage for the north is 51% overall. Coverage in the urban north is 62% and rural north is 45%. Urban south coverage is 55% and the lowest coverage is in Western Darfur with 26%.

Overall immunization
No figures are available for the proportion of children under five in SOSUS that have received all their vaccines, but the highest possible score is 5% (DPT3). In the north, 26.5% of children under five have received all their vaccines according to the 2000 MICS2.

Under Five Mortality Proportion
Based on an article in the Lancet *(Where and why are 10 million children dying every year, Lancet, June 2003, (*28))* it is possible to estimate the mortality rates for southern Sudan. The article explains that "the cause structure of deaths in children under five is determined by many environmental and behavioral factors that are often proxied by broad geographical groupings". Five groupings are constructed on the basis of the proportion of death for each major cause. SOSUS falls in group 2 where "malaria accounts for at least 10% but AIDS accounts for fewer than 10%, 20-26% of deaths are attributed to each of malaria, diarrhea, pneumonia and neonatal deaths". Malnutrition is an important underlying cause of mortality, however it is rarely the main reason.

By combining this model based information with the information on incidence of the diseases as mentioned above, we come to the following SOSUS under five mortality proportion estimates:

Malaria Mortality Proportion: 26%
Pneumonia Mortality Proportion: 19%
Diarrhea Mortality Proportion: 22%
Neonatal Mortality Proportion: 22%
Other Mortality Proportion: 11%

B.   MATERNAL HEALTH

Birth attendance
Millennium Development Goal #5 is to improve maternal health, as measured against the indicator "births attended by *skilled* health staff". In this indicator, the skilled health staff definition excludes trained traditional birth attendants (TBAs). However, the SOSUS MICS 99 used a different indicator: births attended by *trained* health staff, including the TBAs.

SOSUS MICS 99 found that 22% (range 5-65%) of births were attended by trained health staff, but this was for Equatoria only and has to be adjusted. Again, we can assume that the population not found has no coverage at all, so our best estimate is 17% for SOSUS.

Because the World Bank (*9) had access to the SOSUS MICS database, they were able to separate the categories and report that 6% of births were "attended by skilled health staff" in southern Sudan. After adjustment, this figure becomes 5%. This indicator is closely related to the high maternal mortality ratio.

The results of the 2000 MICS2, according to the tables document (web table data is missing), for "birth attendance by *skilled* health staff" in the north are as follows:

- Northern Sudan: births attended by midwife (44%), doctor (6%), health visitor (7%), total = 57%
- Urban south: births attended by midwife (16%), doctor (3%), health visitor (45%), total = 64%
- Most extreme state: Western Darfur (32%)

The *skilled* health staff attendance percentages in the peer group in Table 1 range from 10% in Ethiopia to 86% for Sudan, with Chad and Niger (16%) and Kenya, Uganda and CAR (all 40%) in the middles. For Sudan to have 86% coverage, we assume that TBAs must have been included in the "*skilled* health staff" category.

To enable a better comparison of north and south, we have added an indicator that includes trained TBAs. In northern Sudan, 87% of births were attended by "*trained* health staff" and 84% in the urban south, compared to 57% in Western Darfur.

Approximately 94% of all deliveries in SOSUS are done at home (the range is close to nil except in Equatoria). The adjusted value is 95%. No data is available for other countries.

Antenatal care
According to SOSUS MICS 99, an average of 21% of pregnant women received antenatal care (range from 0% in Bahr el Ghazal and Upper Nile to 63% Western Equatoria). After adjustment for the population not found, the figure is about 16% including trained TBA assistance. Because this figure correlates closely with the birth attendance percentage, we can likewise assume that approximately 5% of pregnant women received antenatal care under the official definition (from *skilled* health staff), not including care provided by TBAs.

The 1989-1990 Sudan DHS found 70% coverage in the north, including antenatal care provided by TBAs.

In the 2000 MICS2, the variable measured is neonatal care during last pregnancy. About 60% of the women in northern Sudan and 80% in the urban south had received antenatal care from skilled personnel in the last year (*22):

- Northern Sudan: midwife (15%), doctor (26%), health visitor (19%)
- Urban south: midwife (10%), doctor (4%), health visitor (66%)

In both the north and the urban south, 11% of women received neonatal care from a trained TBA. Thus the comparable percentage receiving care from health staff including TBAs is 70% in the north and 90% in the urban south. Coverage in the rural north was 50% (skilled health personnel) or 61% including trained TBAs. The lowest coverage (26%) was found in Western Darfur (or 29% including TBAs).

Tetanus Toxoid
The SOSUS MICS 99 estimates that 21% of pregnant women received the first dose of tetanus vaccination (TT1) during their last pregnancy. The adjusted number is 16% (range of 1-50%).

Routine and pulse vaccination campaigns in southern Sudan in 2002 and 2003 targeted women of childbearing age (15 to 49 years) as opposed to pregnant women only.

In 2002, 23% (370,000/1,600,000) of women of childbearing age were reached with TT1 during pulse campaigns (308,000) and routine immunization (62,000). Coverage for TT3 dropped to 15.5% (246,000/1,600,000) with pulse campaigns reaching 226,000 women and routine

immunization reaching 20,000 during 2002.

According to the 2000 MICS2 web tables, 46% of the women in northern Sudan (58% urban compared to 35% rural) were protected against neonatal tetanus, and 55% in the urban south. The lowest coverage (30%) was again in Western Darfur. The 1989-1990 Sudan DHS data (*12) shows 45% coverage for the north, almost identical to the 2000 MICS2.

Female Genital Mutilation (FGM)
The World Bank SHS (*9) reports an FGM prevalence of 91% in northern Sudan in the year 2000. The 1989-1990 Sudan DHS (*12) collected data on the prevalence of FGM reported that 89% of ever-married women had been circumcised.

The World Bank SHS (*9) states that "Female genital cutting is not common in Southern Sudan. A recent study in Juba, a large government held town in the south found that 7% of ever-married women were circumcised."

According to local experts, FGM is almost non-existent in SOSUS. However, it appears to be more widespread in SPLM-controlled areas of Nuba and Southern Blue Nile.

Contraceptive prevalence
In the countries neighboring southern Sudan, the percentage of women aged 15-49 using any form of contraception ranges from 4% (Chad), to 8% (Ethiopia), 10% (Sudan) and 15% (CAR). Given the population status, the Total Fertility Rate and the level of poverty, it is highly likely that contraceptive prevalence is almost non-existent in SOSUS. Local experts estimate prevalence below 1%.

According to the 2000 MICS2, "only 21% of currently married women have ever used a method of family planning and 7% are currently using a method" in northern Sudan. The 1989/1990 Sudan DHS (*12) found that about 25% of ever-married women in the north had ever used a contraceptive method and current use was 9% (6% modern and 3% traditional).

C.   OTHER HEALTH INDICATORS

HIV/AIDS
HIV/AIDS is an enormous threat for SOSUS considering the prevalence in neighboring countries. Danger is already looming in some border towns and the refugee camps. According to the latest results gathered (UNICEF internal monitoring document: HIV Prevalence Rates Southern Sudan 1997-2003), Yambio and Yei have prevalence of 4-7% and in refugee camps the prevalence is also above 5%. Until recently, the war has served to limit the spread of HIV/AIDS from neighboring countries. Prevention programmes are urgent. In 1999, an adjusted 60% of SOSUS adults had never heard about HIV/AIDS and 10% of those who had heard about the disease knew nothing about its relationship to unprotected sexual activity (SOSUS MICS 99).

The only estimate that exists for Sudan as a whole is a model estimate by UNAIDS of 2.6% seroprevalence in the adult population for the country as a whole (*31). In actual numbers, UNAIDS reported 410,000 adults infected, 30,000 children infected, 25,000 deaths in 2001, and 62,000 orphans in 2001. According to UNAIDS, an overall adult prevalence above 1% constitutes an epidemic that has spread beyond high-risk groups into the general population. Once prevalence has reached this stage, population movements and internal displacements caused by conflict or peace can easily generate a further spread of the disease.

Available data does not point to higher rates. In this document we recommend acceptance of the UNAIDS model data (prevalence among males age 15-24 is 1.1%, and 3.1% among females in the same age group). Southern Sudan acts as a geographical buffer between northern Sudan and the

nearby high-risk countries. HIV/AIDS is a great threat in the border towns but in Upper Nile the incidence is near zero. With the return of refugees and IDPs, rates are likely to increase in the near future.

According to the 2000 MICS2, knowledge about HIV/AIDS is likewise very limited in northern Sudan. Only 40% of women in the north have heard of AIDS (61% in urban areas and 28% in rural areas), while 67% of women in the urban south have heard of the disease. Only 10% of women have sufficient knowledge of the disease and protective measures. Condoms are not being used.

Tuberculosis
The incidence of Tuberculosis (per 100,000 people) is related to HIV prevalence. In countries with high HIV prevalence, the incidence is between 600 and 750. Incidence in the SOSUS peer group ranges from 350 (Uganda) to 397 (Ethiopia) and 484 (Kenya). Incidence in northern Sudan is 193 according to the World Bank World Development Indicators (*1) and 188 (less than 60,000 actual cases) according to the World Bank SHS (*9). The UNICEF Overview of the Health Situation (*14) estimates SOSUS prevalence of 325 per 100,000 or about 23,000 cases in 2002.

Health facilities and coverage
Although no MDG or even SOWC indicator exists for health facilities and health care coverage, this data is important for evaluating the impact of OLS and for future planning.

According to the UNICEF Overview of the Health Situation (*14), there were a total of 783 functional health facilities in all SPLM-controlled areas in early 2003. Excluding facilities in Nuba and Southern Blue Nile, there are 719 health facilities in SOSUS (45 hospitals or specialty clinics, 92 Primary Health Care Centres and 582 Primary Health Care Units). More than half of the facilities are in Equatoria.

The number of doctors is only one-tenth the number of facilities. According to the Overview of the Health Situation (*14), there are between 82 and 100 doctors in southern Sudan, equating to one doctor for every 70,000 people or 1-2 doctors for every 100,000 people. This figure is also used by the World Bank in Figure 3 of the Sudan Health Status Report (*9).

In several states in the north, the number is almost the same, although in Khartoum there are 35 doctors for every 100,000 people (*9). The official figure for the north is 25 doctors per 100,000 people.

Estimates for overall health coverage in SOSUS vary widely. The UNICEF Southern Sudan SITAN (*8) and other OLS documents suggest 30% coverage. Using a very different concept, the World Bank estimates that 60% of the population is "within reach" of health care.

The SOSUS MICS 99 reported surprisingly high coverage numbers (even after the adjustments) with 33% of diarrhea patients treated and 42% of ARI and fever patients treated. However, as discussed earlier in the section on child health, this would mean 40 million visits to health facilities each year. This translates into an unrealistic figure of 800,000 visits per week at the 700+ facilities, or 220 visits per day at each facility.

In this document, we have concluded that although the number of health visits is clearly exaggerated, (a normal process in an interview when parents want to make a good impression) we think that the coverage is quite accurate. The answer to the survey should be interpreted as "sometimes we go to the health facility". Using this response, it is safe to assume that about 40% of the child population has some kind of health care coverage. The vaccination coverage (measles) is 24%. Women's health coverage is the lowest at only 5-16%, making the high Maternal Mortality rates no surprise. Therefore, the highest health care coverage is for the sick child (parents make the effort to bring the child to health facility). The next highest coverage is for vaccination (reflecting more service effort than parental effort). The lowest coverage is for mothers, reflecting the

importance or lack thereof that is placed on women's health.

The SOSUS MICS 99 data also indicate that 1.6 million children (out of 1.2 million) had diarrhea, a cough or fever in the two-week period before the survey. Therefore, the average child had more than one disease (one and a third) in the two-week period before the survey.

CHAPTER 3. NUTRITION

Introduction
A benchmarking problem for nutrition analysis is that OLS uses a different malnutrition indicator (weight for height) than the indicators used by UNDP and World Bank to measure the Millennium Development Goals. Only UNICEF's SOWC has a measurement for weight for height or "wasting".

As explained in World Bank SHS (*9), three anthropometrics indicators for child malnutrition are commonly used:
1: The height for age ratio is an indicator for <u>chronic</u> malnutrition (stunting)
2: The weight for height ratio is an indicator of <u>acute</u> malnutrition (wasting)
3: The weight for age ratio is considered a composite indicator for <u>overall</u> malnutrition (underweight)

The nutrition situation in southern Sudan (particularly Bahr el Ghazal and Upper Nile) is measured by the GAM (Global Acute Malnutrition) and the SAM (Severe Acute Malnutrition), which are defined as (*14):

- The GAM ratio indicates the percentage of children with weight for height below 2 Z-scores or 2 standard deviations. It includes therefore the children considered under SAM.
- The SAM ratio indicates the percentage of children with weight for height below 3 Z-scores or 3 standard deviations.

In southern Sudan, surveys are done on children between 65 and 115 cm (recently changed to 110 cm), the accepted cut-offs for the 6 months to 5 year old age group. Although the child's age is asked, the inclusion criteria are the height measurements. In southern Sudan, a crisis requiring emergency interventions is defined as a GAM>15%, whereas in other countries a crisis is usually defined as GAM >10%.

The Mid Upper Arm Circumference (MUAC) of less than 125 mm in children aged 1-4 years, is another indicator of both severe and moderate acute malnutrition. This indicator is mostly used in emergency conditions to determine which children should be immediately fed as part of a rapid response.

The nutrition results in the SOSUS MICS 99 are so dubious that we recommend the information not be used. It appears that several things must have gone wrong with the measurements. Definitions vary throughout the document and results are non-comparable.

Because of the nature of OLS work in SOSUS, the choice to use GAM and SAM acute malnutrition/wasting indicators is understandable. There is a good monitoring system and a rich quantity of studies. The following discussion is based on the UNICEF Overview of the Health Situation (*14) and UNICEF's August 2003 update of the Nutritional Situation of Southern Sudan (*15).

Wasting
Malnutrition is on the increase in SOSUS in recent years. Most information that exists is gathered in Bahr el Ghazal and Upper Nile, and combined with the more limited information on Equatoria. Based on the various data, we arrived at a 2003 SOSUS estimate for GAM of 21.5% and SAM of 4.5%.

The World Bank Health document (*9 pg. 29) also gives a GAM of 21%.

Extremes: In the aftermath of the 1998 famine, the GAM reached 80% and SAM reached 48% in Ajiep, Gogrial County, Bahr el Ghazal (with mortality of 60 per 10,000 per day). In 2003, survey teams found GAM rates among under fives as high as 30% in Bahr el Ghazal and Upper Nile (with

an extreme value of 39%). SAM in 2003 ranged up to 6-8% in different areas of SOSUS. The national emergency benchmark is 15% GAM and 4% SAM. The average GAM in Bahr el Ghazal and Upper Nile increased from 20% in 2001 to 25% in 2003. If rates for Equatoria are included, the SOSUS average GAM in 2003 is 21.5%.

Acute malnutrition rates can vary dramatically from year to year, with seasonal fluctuations during each year (*15).

According to data for Ajiep, the GAM dropped from 80% in July 1998 to 48% in September 1998, 14.6% in January 1999 and 5.9% in July 1999. Such a drop it is quite possible if the war or drought conditions that generated acute malnutrition disappear. Wasting is an indicator of acute malnutrition. It is not an indicator of chronic malnutrition (low height for the age), which requires at least several years to improve.

Situation in the north
The World Bank's Sudan Health Status Report (*9) states that: "The prevalence of underweight children in Northern Sudan estimated from the 2000 MICS is 35%. (chronic, height for age) and 16% with acute malnutrition. It should be noted however that 50% of the children surveyed had problems with the data, so the results should be interpreted with caution."

The 2000 MICS2 (*23) uses only weight for height (wasting). In this document (and also in the MICS-SMS tables) the weight for height numbers are given as 11% GAM and 7% SAM. This is a very strange combination; in one state the results are GAM 11% and SAM 10%, meaning that almost all acute cases are severe. The corrected tabulation from the MICS tables on www.childinfo.org gives GAM of 15.7% and SAM of 3.8% -- a more normal relation between the two numbers, but nevertheless very high rates. As the World Bank states (*9), "the two numbers indicate a very high level of child malnutrition, independent of acute crisis drawing international attention."

Therefore, based on the 2000 MICS2, we have three sets of data:

	World Bank	2000 MICS 2 Document	2000 MICS2 Web tables	Rural	Extreme
Stunting (chronic)					
Height for age < 2 SD	36		40.7		
Height for age < 3 SD			14.7		
Underweight (overall)					
Weight for age < 2 SD	35		43.3		
Weight for age < 3 SD			23.7		
Wasting (acute)					
Weight for height < 2 SD	16	11	15.7	16.9	22.5
Weight for height < 3 SD	4	7	3.7	3.7	5.9

The most extreme situation in northern Sudan is again in Darfur, where rates are as bad as in southern Sudan.

International comparison
The height for age ratio is an indicator for chronic malnutrition (stunting), the weight for height ratio is an indicator of acute malnutrition (wasting) and the weight for age ratio is considered a composite indicator for overall malnutrition (underweight). All children whose ratios are below 2 standard deviations under the median of a reference population are considered malnourished. The reference population is normally the USA population (which explains the high rates in Asia). Children below 3 standard deviations are considered to be severely malnourished.

While it seems impossible to transform wasting data into other estimates, there are strong correlations between the various data. Our estimates are based on correlations from data in other countries:

- Overall malnutrition (underweight, weight/age) is 2.5 times the wasting/GAM number. Therefore, in SOSUS, overall malnutrition is about 48%.
- Severe underweight (weight/age) equals the wasting/GAM number. So SOSUS severe underweight is about 21%.
- Stunting (chronic malnutrition, height/age) equals the overall malnutrition (underweight) number, but needs a correction for the tallness of the SOSUS people. SOSUS chronic malnutrition is 45%.

Therefore, if we want to measure the percentage of malnourished children under five in SOSUS, we need to specify which malnutrition indicator we are using:

Overall (underweight) is 48% and severe underweight is 21%

Acute (wasting) is 21.5% and severe wasting is 4.5%

Chronic (stunting) is 45%

To track trends within SOSUS, we of course use the acute malnutrition indicator, or GAM and SAM more specifically. But for comparison purposes, we must often use overall malnutrition or chronic malnutrition.

Iodized salt

One indicator of absolute poverty is that according to the results of the SOSUS MICS 99, 35.6% (not adjusted) of the population does not use salt, but rather a kind of ash. However, of the 64.4% using salt, 63.6% use iodized salt, with the highest coverage in the poorest regions. Thanks to OLS interventions, about 40% (0.64*0.64) of the overall population uses iodized salt.

By contrast, in the north and in the southern towns where nearly the whole population uses salt, less than 1% use iodized salt. Therefore, in reference to World Summit for Children goal 14, the proportion of households consuming adequately iodized salt is 40 times higher in SOSUS than in the rest of Sudan.

Breastfeeding

Breastfeeding is another source of multiple misunderstandings. WSC goal 16 has three indicators (*30):

- exclusive breastfeeding rate (proportion of infants under 4 months),
- timely complementary feeding rate (for age group 6-9 months)
- continuous breastfeeding rate (proportion of children aged 12-15 months and 20-23 months who are breastfeeding).

The WDI indicator for exclusive breastfeeding uses the percentage of children under 6 months as does UNICEF SOWC. According to SOSUS MICS 99, 80% of all children are received more than 12 months continuous breastfeeding.

Some sources indicate that exclusive breastfeeding should be very high for the 0-4 months old children, particularly in southern Sudan where there seem to be no other options. However, the detailed information from the north shows that mothers start giving water and other liquids very early. According to the MICS-SMS tables, breastfeeding status for 12-15 months is 83% overall for northern Sudan, 73% in the urban south and 83.5% in the rural north. The World Bank (*9, pg 52) states that "only 8% is exclusively breastfed for the first six months in the North…The 1999 MICS (South) found that at least 70% of the children under six months are not exclusively breastfed."

So about 30% of infants under six months are exclusively breastfed in SOSUS.

Conclusion: Focus on weaning practices is important.

Vitamin A for Children
The indicator for WSC goal 15 is the proportion of the children aged 6-59 months who received a high dose vitamin A supplement in the last six months.

The SOSUS MICS 99 reported an average rate of 16.2% of children (MICS uses the designation 'infant' but the question was posed for children between 6-59 months) who had received Vitamin A (with a rather uniform distribution) in the six months before the survey.

According to the 2002 NIDs, more than 900,000 children received Vitamin A at least once during the year. This equates to about 60% of the under five population of 1,500,000. **In 2003, 88% of children under five (1,485,539) received Vitamin A.**

Within the peer group (including northern Sudan), Vitamin A coverage for children is listed at more than 70% of children 6-59 months receiving at least one Vitamin A supplement each year (*4).

In the 2000 MICS SMS99 tables (*22), 44% of children aged 6-59 received a high dose of Vitamin A supplement within the six months prior to the survey: urban north (51%), rural north (40%) and urban south (34%). The lowest value (17%) was found in South Darfur.

Vitamin A for Mothers
Coverage of Vitamin A for mothers is defined as the proportion of mothers who received a high dose Vitamin A supplement before the infant was eight weeks old.

According to the SOSUS MICS 99, overall coverage of women receiving Vitamin A after delivery is around 8% (adjusted 6%, range from 0.4% to 19%).

2000 MICS SMS99 tables (*22) found that about 19% of mothers in the north and 29% in the urban south received Vitamin A. Coverage was lowest in South Darfur (12.1%). The revised web tables show figures of 22% for the north overall, 27% for urban areas and 16% for rural areas.

CHAPTER 4. WATER AND SANITATION

The indicators "access to improved water source" and "access to improved sanitation facilities" are assigned different values among neighboring countries in a bewildering manner. Given the fact that SOSUS (as currently defined) has no urban center and that conflict is ongoing, it seems that the data used by the Dutch Government's OLS mission of about 20% water coverage and approximately 10% sanitation coverage could be true (see www.minbuza.nl for information on the mission). Survey results give higher figures, but after some adjustments the estimates are not far apart.

Water
The WSC goal 4 indicator for use of safe drinking water is defined as the proportion of the population who use any of the following types of water supply for drinking: piped water, public tap, borehole/pump, protected well, protected spring, rainwater. The World Bank measures "access" instead of use; the UNDP uses a "sustained access" indicator.

According to the SOSUS MICS 99, the source of drinking water during the dry season is 3% protected spring and 36% pump, for a total of 39%. This figure of 39% is also used by the World Bank (*9), however multiple answers to the MICS question were allowed and the total is greater than 115%. In the wet season, many people draw from unsafe water sources and only about 30% use safe water.

Once the MICS data are adjusted for the missing population, access to safe water is only 30%. So the *access* to safe water is an adjusted 30% for SOSUS, then corrected for multiple answers, resulting in 27%. Meanwhile, the *use* of safe drinking water is an adjusted 23%, and 21% after correction for multiple answers.

The 2001 Sentinel Sites Survey, in their non-representative survey, found that 32% of the population had access to protected water sources. The 2003 Sentinel Sites Survey recorded 46% access to safe water in SOSUS.

The data for the north are confusing. According to the World Bank (*9) based on the 2000 MICS2, 70% of northern households have access to safe water (80% urban and 60% rural). According to the 2000 Sudan MICS2 document (*23), 60% of the population has access (80% urban and 47% rural). The lowest coverage is in Blue Nile at 24%. In the urban south, 61% of the population has access to improved water sources. For the sake of comparison we will use MICS document data (*23) on access to safe water (excluding rainwater).

Sanitation
The WSC goal 5 indicator for universal access to sanitary means of excreta disposal is defined as the proportion of population who have within their dwelling or their compound: toilet connected to sewage system, use other flush toilet, improved/traditional pit latrine. The World Bank uses an "access" definition.

According to the SOSUS MICS 99 results, 29% of the population uses sanitary latrines. The adjusted number is 22% because the use of latrines is more evident in western Equatoria than in other regions.

The results of the SOSUS MICS 99 are confusing, probably due to the way the questions were framed:
- Question 1 -Type of latrine used:
- Question 2- Is this facility located within your compound, yes or no?

This means that the people in table 43 who do not have their own latrine (30%) have to be

excluded according to the definition given above. As a consequence, the SOSUS MICS 99 adjusted figure is 15% of the population using latrines.

The non-representative 2001 Sentinel Site Survey found that 25% of the population was using latrines. The 2003 Sentinel Site Survey shows, as usual, an improved situation with latrine coverage at 32%.

According to the 2000 MICS2-SMS tables (*22), 60% of the population in northern Sudan has access to sanitation facilities (80% urban and 46% rural). The urban south figure is 48%. The lowest coverage is found in Western Darfur at 36%. The revised web tables (*25) give an overall coverage of 65%.

CHAPTER 5. EDUCATION

Introduction

Education indicators for SOSUS reveal a terrible overall situation as well as a tremendous gender gap. Thanks to the School Baseline Assessment (SBA *19 and 34), education is the sector that we have the most information about. The data needed to develop the most important indicators are missing (for example, age by grade information) but the very consistent set of available data facilitates several indirect estimates.

We note that there seems to be no relation at all between the attendance found in the schools and pupil count of the SBA (*19 and 34) and the attendance found in MICS and Sentinel Site Surveys.

To avoid any confusion about indicator definitions, Box 4 outlines the various education indicators.

Box 4: Education Indicators: definitions and comments (*1 and *3)

Education Inputs
- • *Trained teachers in primary education:* the percentage of primary school teachers who have received the minimum organized teacher training (pre-service or in-service) required for teaching.
- • *Primary pupil/teacher ratio*: the number of pupils enrolled in primary school divided by the number of primary school teachers (regardless of their teaching assignment).

Participation in education
- • *Gross enrolment ratio (GER):* the ratio of the total enrolment (regardless of age) to the population of the age group that officially corresponds to the level of education given.
- • *Net enrolment ratio:* the ratio of children of official school-age (as defined by the national education system) who are enrolled in school to the population of the corresponding age group. A net enrolment above 100% is by definition impossible.

Education Efficiency
- • *Share of cohort reaching grade 5:* the percentage of children enrolled in the first grade of primary school who eventually reach grade 5.
- • *Primary completion rate*: the number of students successfully completing the last year of graduation from primary school in a given year divided by the number of children of official graduation age in the population.
- • *Average years of schooling*: the years of formal schooling received (on average) by population age 15 and above.
- • *Ratio of female to male enrolment in primary schools*: the ratio of female students enrolled in primary school to male students enrolled in primary school. (Not the percent girls of all girls divided by the percent boys of all boys).

Many other indicators exist, including drop out ratios or the percentage of children that never attended school.

The indicator "*Share of cohort reaching grade 5",* should not be used alone. For example, if only 20% of school-age children enter grade 1, but all finish grade 5, the proportion is 100%. This indicator is useful for analyzing the efficiency of the education system, drop out rates, etc.

The "*Primary completion rate*" indicator would be more useful, except that it depends in large part on the school duration. The SOSUS educational system uses 8 grades, while most other countries (peer group) use 4, 6 or 7 grades for primary school.

Official enrolment data are normally exaggerated, so UNICEF uses the survey indicator of attendance. The net and gross enrolment/attendance figures also depend on the duration of school. The longer it takes to complete primary school, the smaller the difference between gross and net enrolment because the bulk of the drop outs take place in early stages.

Results Based on School Baseline Assessment (*19 and 34)

The first SBA (1999-2001) was based on data from 1,096 schools and the 2003 SBA (done at the end of 2002) were based on 1,426 schools. One document (*10) mentions a total estimate of 1,700 existing schools in southern Sudan. However, as the second SBA explains, 100 of those schools are in the Nuba Mountains (the report has a set of data for the Nuba Mountains). So the estimated total number of schools in SOSUS is 1,600. Therefore, the first SBA missed 45% of the schools and the second SBA missed about 12.5%. In the 1999-2001 SBA, the average number of children per school was 208, increasing only slightly to 212 in the 2002 SBA. This proves that one can safely estimate the total number of children enrolled in 1999-2001 by adding 45% and the total number enrolled in 2002 by adding 12.5%.

Because the first SBA was done from 1999-2001, the denominator should on average be the year 2000 population.

Gross Enrolment

SBA 1999-2001: estimated school population is 45% above the one found = 331,000. School-age population (21% of 6.7 million) is 1,407,000. Gross enrolment is 23.3%. Net enrolment is 20% in 2000.

SBA 2002: estimated school population is 12.5% above the one found = 343,000. School-age population (21% of 7.1 million) is 1,491,000. Gross enrolment is 23% and the net enrollment is 20% in 2002.

The 2003-2004 estimate is 400,000 children in school. But the school-age population is now 1,575,000. So the new gross enrolment is 25.3%, showing steady improvement.

The figures are rather consistent and it will prove difficult to improve enrolment rates as the natural population growth and flow of returnees will increase the school-age population.

Net Enrolment

Initially, the net enrolment estimate was thought to be almost the same as the gross enrolment for several reasons:
- the eight-year system stimulates high drop out rates
- many schools are bush schools which do not offer the 8 grades
- the population above age 14 is limited (this group suffered three famines)

However, based on the feedback received, we have to assume a lower net enrolment. Given the fact that the average age of grade 1 students is high, and based on results from other studies (*35, 36, 37, 38, 39) that show a substantial number of students above age 14, one can assume that the difference between gross and net enrolment is relevant. This is however only true for boys. The girls' gross enrolment almost equals the net enrolment (they all drop out before reaching age 14), but sadly, because their presence is already limited, this does not influence the overall rates. The net enrolment for 2002 is 20%.

The overall ratio of female to male enrolment in primary education in 2000 was 35.9% (60,378/167,521). With only 21 secondary schools existing and 4,000 secondary school pupils, the ratio of female to male enrolment in primary and secondary education combined was around 35%. In 2002, the female to male enrolment in grade 1 was 41% (36,000/86,000). At the end of 2002, the overall female to male enrolment ratio had increased to 37.3% (83,000/222,000).

Note: when female students represents 25% of the total school population, the female to male ratio is 33% (25/75 or 1/3). For every one girl in school in SOSUS, there are almost three boys.

"Primary" Completion Rate

The primary completion rate estimate is the adjusted number of grade 8 students (2,971 in 2000) divided by the graduation-age population. The 14 year olds make up around 1.8% of the total population, at 120,000, giving us a primary completion rate in 2000 of 2.4% (3.8% for boys and 1% for girls).

With 127,800 14 year olds in 2002 and an adjusted 2,373 children that finished primary school the primary completion rate is only 1.9%. At these very low levels, the rate for boys (3%) is four times the rate for girls (0.75%).

While these are extremely low primary completion rates, we must remember that there are only about 1,600 schools in SOSUS and many of those are bush schools that do not follow the eight-year system. **It remains shocking that in a "country" with 7.5 million people, only about 500 girls finish primary education each year** (500 out of a cohort of 64,000).

The MDG "Achieve universal primary education" is measured by the primary completion rate indicator. The data ranges from 19% in Chad and CAR, to 24% in Ethiopia, and 63% in Kenya and Uganda. The official estimate for Sudan (see Table 1) is 46%. This is a strange result as the 2000 MICS2 indicates that only 47% of school-age children in the north are attending school and 78% of those who enter school reach grade 5.

Four Year Completion Rate
The eight-year school system is a recipe for disaster. To measure primary school retention, it is much better to use the four-year completion rate. Ten year olds make up 2.7% of the total population, for a total number of 180,900 in 2000 and 191,700 in 2002.

In 2000 an adjusted 34,400 children finished four years of primary school = 19% completion rate
In 2002 an adjusted 35,000 children finished four years of primary school = 18.2% completion rate
In 2002, 28% of the boys and 9% of the girls finished four years of primary school.

In other words, if southern Sudan defined "primary school" as grades 1-4 instead of 1-8, SOSUS would automatically have a much higher primary completion. The completion rates for boys at this stage in education are three times higher than for girls.

Cohort Reaching Grade 5
This indicator for school efficiency gives higher numbers because it is compared against the number of children entering school. In the absence of data to apply the cohort method, we use an indirect method. We assume that all children enrolled in grade 4 (34,000 in 2000) will finish their grade. The SBA data give an adjusted grade 1 enrolment of 127,000 children, which means that 28% of the children will reach grade 5. Because we are making a comparison within the educational system, the difference between boys and girls is smaller but still significant. Thirty percent of boys reach grade 5 compared to 22% of girls. The indirect cohort method is a dangerous one in the case of a rapidly growing school population. For that reason, only the 2000 results can be used.

Other SOSUS Indicators
- In 2002, only 10% of classrooms were permanent buildings made of brick or concrete, compared to 12% in 2000. Most classes meet in grass-thatched structures or under trees.
- Schools with access to safe water: 48% in 2002, 42% in 2000
- School with access to latrines: 32% in 2002, 30% in 2000
- School children without a bench to sit on: 80%

Schools in SOSUS are on average open for seven months each year. Pupils have limited access to textbooks. Until very recently, the number of textbooks in school met only 16% of the need (defined as two pupils sharing a set of books for four core subjects). However, coverage is improving

quickly, with UNICEF reporting that by the end of 2003 nearly 40% of the need was met.

Despite the increase in enrolment, **more than one million school-age children are not in school.**

Since the majority of children in SOSUS do not even join school, the *average years of schooling* indicator is between one and two years (closer to one).

Teachers
2000
Only 7% of teachers in SOSUS were women. And only 7% of all teachers had been formally trained -- received at least one year of college (pre-service) training. While 45% of teachers had received no training at all, 48% had received in-service training run by NGOs (from as little as two weeks, up to nine months). Therefore, about 55% of all teachers had received some kind of training.

2002
Totally untrained teachers represented 49% of total number of teachers in 2002. Only 6% of teachers had received pre-service training, but about 45% had some duration (1-9 months) of in-service training.

The pupil:teacher ratio (PTR) is 35:1
The pupils:class ratio is 45:1

To cope with the increasing numbers of school children, even more untrained teachers are used.

SOSUS MICS 99 Data
The SOSUS MICS 99 and the two Sentinel Site Surveys give such varied data, that we highly recommend the use of the SBA for tracking education indicators.

The SOSUS MICS 99 found an unadjusted gross enrolment of 36.7% (46% for boys and 27% for girls). However, this is for the ages 5-17, which is a poor choice of indicator. Their real SOSUS enrolment is much higher. MICS also found 640,000 pupils (almost double the 2000 SBA number) in a total population of 5 million. So the overall gross enrolment ratio for MICS should be above 50%.

Other information from the SOSUS MICS 99 is that drop out rates are fairly low, around 14%. Of those children not in school, 86% were never registered in school. A problem with this information is that it includes the five and six year olds who still need to register. Additionally, giving drop out rates for 16 year olds is useless, as someone who has potentially finished school is not a drop out. The SOSUS MICS 99 girls:boys ratio is 210,000/413,000 = 51%.

Sentinel Sites Surveys
The 2001 Sentinel Sites Survey had enormous difficulties, especially in coding the education sections. It gives enrolment figures of 58% for children aged 6-14 years old. The girl:boy ratio is almost 40:60. Around 75% of the children walk at least 30 minutes to reach school. Half of the children have no textbooks. The drop out rate is low for 6-14 years old, at only 7.6%.

The 2003 Sentinel Sites Survey offers an interesting combination of the household surveys plus a kind of school baseline assessment. In the 48 sites covered, the survey found 21 schools with a total enrolment of 3,565 boys and 1,488 girls. The average school has 240 pupils with 170 boys and 70 girls. Girls represent 29% of the overall school population (compared to 27% in SBA) and the overall girls:boys ratio is 41% (compared to 36% in SBA). The schools in the Sentinel Sites Survey selection are somewhat bigger (240 pupils versus the 208 average in the SBA) and better off -- 52% of teachers received in-service training, compared to the SBA average of 55%. The

pupil:teacher ratio is 25:1, (compared to the SBA average of 35:1). The study found a few bush schools, but overall 14% of schools had a permanent building, 47% of the school buildings need renovation and 38% are meeting in temporary buildings. More than 60% of the surveyed schools had latrines (compared to 30% in the SBA) and all schools have access to boreholes (compared to only 42% in the SBA).

In the 2003 Sentinel Sites Survey, the gross enrolment rate is 60% for boys and 50% for girls. The girls:boys ratio is 1,984/2,676 = 74%. Girls make up 42.5% of the school population. So within this survey we find the difference between the school-based and population-based surveys. The school-based female:male ratio is 41%, whereas the survey-based ratio is 74%.

The main problem of the survey appears to be that parents tend to tell interviewers that their children are in school, whether this is true or not. In particular, the girls who are reported to be in school cannot be found at the school.

In conclusion, while 2003 Sentinel Site Survey data may be representative for UNICEF focus areas with concentrated interventions, we recommend using the SBA data for an accurate overall SOSUS perspective.

Education in the north
The Sudan 2000 MICS2 web tables list a net enrolment of 47% for 5-12 year olds. Enrolment at age five is very low (4%) and only 20% at age six. The other five age groups (7-12 years) have an average enrolment of 60%.

Interestingly, there is almost no gender disparity in primary school indicators for northern Sudan. The overall net enrolment is 47% (48.2% male and 46.1% female). Net enrolment in rural areas of the north is 34.7% (35.8% male and 33.6% female). Urban south net enrolment is 57% and Southern Darfur net enrolment is 27.9%.

The overall ratio of female to male enrolment is 95% (94% in rural areas, 100% in urban south, and 82% in Southern Darfur). The overall percentage of the cohort reaching grade 5 is 78% (77% for boys and 79% for girls); 69% in rural areas and 96% in the urban south, but only 5% in Southern Darfur.

Literacy
There are huge gender disparities in literacy for SOSUS. The adult male literacy rate estimate is 37% (*9). The literacy rate among adult women is 10% or 12% according to the World Bank (*9). A look at school attendance data shows that this 1998 estimate will not improve quickly.

For northern Sudan, the World Bank estimates that 52% of women are literate, compared to 71% of men. The web table data (*25) are completely different from the MICS-SMS tables. Web tables show an overall adult literacy rate of 59% (69% male and 50% female) and 46% in rural areas. The youth (15-24 years) literacy in the north is higher, as it should be. According to the web tables, the overall youth literacy rate is 75% (81% for boys and only 70% for girls). The youth illiteracy rates are therefore 19% for boys and 30% for girls.

SOSUS youth literacy has to be an indirect estimated. Assuming that two years of schooling is sufficient to become literate, and assuming that the literacy situation was static, one can calculate a youth literacy rate (based on adjusted table 2.3 in SBA (*19)) of 31% (46% for boys and 16% for girls). This means that 54% of boys (aged 15-24) and 84% girls (aged 15-24) in SOSUS are illiterate.

CHAPTER 6. CHILD RIGHTS

This document does not discuss many of southern Sudan's child rights concerns such as abduction, child soldiers, early marriage, orphans and disability. Indicators for two child rights issues are included: child labor and birth registration.

Working children
According to SOSUS MICS 99, an unadjusted 67% of children aged 5-17 years old (61% of boys and 74% of girls) help with household domestic chores for at least half the day. Further, an unadjusted 58% of children aged 5-17 years old "work" (defined as helping with generation of household income at least half a day). The trend reverses with this category, with 61% of boys working and 53% of girls.

The SOSUS MICS 99 habit of giving gross figures is not helpful. The international indicator used by the World Bank is "children 10-14 years old in the labor force". This different age group is also used for the peer group data in Table 1. The UNICEF MICS Manual uses an age group of 5-14 years old, and this range is also used in the SOWC 2003. One may assume that the percentage of 5-17 year old children "working" will be higher than that for 5-14 year olds. Therefore, the situation in SOSUS seems fairly "normal" when compared to some countries in the peer group (56% in CAR and 65% in Niger).

In the 2000 MICS2 web table data (*25), 17% of children 5-14 years of age in the north are currently working (24% in the rural north, 5% in the urban south, and 55% in Blue Nile). These are obviously lower values than if the indicator had been for 5-17 year olds as in the SOSUS MICS 99.

Birth registration
According to the UNICEF 2003 Situation Analysis (*8) birth registration is non-existent in SOSUS. According to the 2000 MICS-SMS tables (*22), 59% of births in northern Sudan of children under five years have been registered (web table lists 64%). This ranges from 87% (urban north), 57% (urban south) and 45% (rural north), to a low of 32% in Western Darfur.

CHAPTER 7. OTHER INDICATORS

Although many other indicators used in the World Development Indicators report (*1) seem out of place in SOSUS, we have chosen several to include.

The indicator for MDG 7 "Protecting our common environment" is defined as carbon dioxide emissions per capita in metric tons: 0.0% for southern Sudan.

For MDG 8, the indicator used is fixed line and mobile phone subscribers per 1,000 people: the estimate is < 1 for southern Sudan.

Economy
Southern Sudan clearly has one of the least developed economies in the world. Making an estimate of the Gross National Income (GNI) per capita is complicated because of the oil (which does not benefit the population in the south) and the huge humanitarian aid operation. In similar situations, the GNI is around $100 per year (*1), but even this seems to be an over-estimate for southern Sudan. Our best estimate is a maximum of $90 per year. For comparison purposes, Norway has a GNI per capita of $36,500 per year, which means that the *daily* Norwegian GNI per capita is higher than the *annual* SOSUS GNI per capita.

A positive sign is that most of southern Sudan's peer group neighbors have recently experienced economic growth. For example, according to the Economist (3 January 2004), Chad's economy is expected to grow by 58% in 2004.

Poverty
With the estimated GNI, it is clear that poverty in southern Sudan is absolute. Table 1 gives information against the international poverty line defined as "percent of population with income below one dollar per day". Figures are 66% in CAR and 82% in Uganda and Ethiopia. Although these are the highest figures in the world, it is hard to believe that the SOSUS figure could be any less than 90%[8].

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[8] In a 2003 study (*45), Deng assesses the dynamics of poverty in southern Sudan and finds that the probability of households in the "war zone" entering the poverty group during the current civil war is almost one and the incidence of poverty reached as high as 100%.

ANNOTATED SOURCES

First documents consulted:
(1) World Development Indicators (WDI), 2003, World Bank
(2) Human Development Report (HDR), 2003, UNDP
(3) State of the World's Children (SOWC), 2003, UNICEF
(4) Progress Since the World Summit for Children - a statistical review, 2001, UNICEF
(5) World in figures, 2003, The Economist
(6) World Population Ageing 1950-2050, 2003, United Nations Population Division
(7) The Root Causes of Sudan's Civil Wars, 2003, Douglas H. Johnson
(8) UNICEF OLS Situation Analysis, September 2003 version

In the second phase, information from the UNICEF Multiple Indicator Cluster Surveys (MICS) 2000 and other studies was incorporated. The web sites www.unsudanig.org, www.childinfo.org, www.refugees.org and www.idpproject.org were very useful. The World Bank E-Library was most helpful.

(9) Sudan Health Status Report (SHS), August 2003, World Bank , by Francois Decaillet, Patrick D. Mullen and Moncef Guer.
- *Excellent document. They had access to both northern and southern Sudan MICS databases, enabling them to correct the data for some indicators.*

(10) Human Resource Development in Southern Sudan, April 2003, World Bank

(11) World Population Prospects: the 2002 revision, CD version, United Nations Population Division Department of Economic and Social Affairs (DESA).
- *The key document for all demographic indicators.*

(12) Sudan Demographic and Health Survey (DHS) 1989-1990

(13) Sudan Internally Displaced Persons: Demographic, social-economic profiles for return and reintegration planning activities, 2003, CARE and IOM

(14) Overview of the Health Situation in Southern Sudan 2002, 2003, UNICEF
- *Very complete, very useful document.*

(15) Update on the Nutrition Situation of Southern Sudan, August 2003, UNICEF

(16) Progress of Regions, Multiple Indicator Cluster Survey Results 2000. UNICEF
- *The Southern Sudan MICS, published in 2000 using 1999 data, was not a real MICS. It did not follow the guidelines of the MICS but rather used other definitions, different coding categories and other tables. The document is referred to hereafter as SOSUS MICS 99 to distinguish it from the MICS done in 2000 for the rest of Sudan. Despite observed weaknesses in the SOSUS MICS 99, many times it was the only source of information and thus proved useful. However, only adjusted figures are used for best estimates.*

(17) 2001 Sentinel Site Surveys, Sentinel Community Surveillance Project in Southern Sudan: The status of basic education, water and sanitation coverage, diarrhea prevalence and cost in Southern Sudan. July 2002, UNICEF
- *Was the first such study and can be considered an exercise.*

(18) 2003 Sentinel Site Survey, Sentinel Community Surveillance Project in Southern Sudan, 2003, UNICEF/NSCSE
- *Better executed, although apparently the survey over-represented the better serviced areas of southern Sudan. Non-representative results have been mentioned, but not used.*

(19) School Baseline Assessment Report Southern Sudan (SBA), May 2002, UNICEF and AET
- *Incorporated in the education chapter.*

(20) Special Report on Southern Sudan, May 1998, FAO

(21) Special Report on Southern Sudan, November 1996, FAO

The MICS done in the rest of Sudan has four documents with three sets of data:
(22) Multiple Indicators Cluster Survey 2000 and Safe Motherhood Survey 1999 Tables, Sudan, April 2001 (referred to as MICS-SMS tables), UNICEF

(23) Multiple Indicator Cluster Survey 2000 (the document, referred to as 2000 MICS2), UNICEF.

(24) Regional Statistical Report. Table: 12 Specific MICS2 surveys conducted for Southern Sudan presenting data for Sudan and Sudan Southern Sector, UNICEF

- "Southern Sector" here refers to the urban south

(25) SUDAN MICS2 Statistical Tables from www.childinfo.org. (referred to as MICS2 web tables).

- *The 2000 MICS 2 document (*23) is based on the MICS2-SMS tables. The web tables are improved tables and as a result the numbers are different. The regional report is again different. We have indicated in the text which document was used. Normally the cleaned up web tables are referenced. The web tables used standard tables and standard procedures, and addressed issues such as what to do with non-responds, missing values, etc. However, the latest web tables exclude the "southern sector", or urban south. Apparently this was done for good reasons: "The 2000 MICS in northern Sudan also surveyed households in three government-held towns in southern Sudan. Estimates from that data are not used in the World Bank Health Status report because of doubts about their representativeness (*9)". For our purposes, information about the urban south will be included in Table 2 for anecdotal purposes and is thus based on the MICS-SMS tables. It is important to note that the total values given for the 2000 MICS2 are the totals for the north only. The total is not based on combined north and urban south results.*

(26) IDP project. www.idpproject.org

(27) ODI assessment of Somalia and Southern Sudan, 2003, HPG background paper

(28) "Where and why are 10 million children dying every year?" June 2003, Lancet

(29) Sudan Malaria report (web), 2003, WHO

(30) MICS Manual, UNICEF

(31) Epidemiological Fact Sheets on HIV/AIDS, Sudan 2002 update (web), UNAIDS

Other sources:

(32) Sudan Social Indicators. Watching Brief for Sudan by Patrick D. Mullen (consultant), October 2001, World Bank

(33) Children's Rights in Sudan. A situation analysis. March 2003, Save the Children-UK

(34) School Baseline Assessment Report for Southern Sudan (SBA) September 2003, UNICEF/OLS and Africa Educational Trust

(35) Achieving Universal Primary Education, 2003, internal UNICEF document

(36) Education in Sudan: Building for Peace, 2003, internal UNICEF document

(37) Millennium Development Goals for South Sudan. Education Sector Analytical Report, 2003, UNICEF

- *internal UNICEF document*

(38) "Status of Girls' Education in Southern Sudan" December 2003, UNICEF

- *internal UNICEF document*

(39 Education Statistics 2000-2002 (draft), 2003, SPLM Secretariat of Education

(40) From Survival to Thrival. Situation Analysis of Children and Women in southern Sudan, 2001, UNICEF

(41) Throwing the Stick Forward, 2001, Mary Anne Fitzgerald, UNICEF/UNIFEM

(42) Famine in Sudan: Causes, Preparedness and Response: A political, social and economic analysis of the 1998 Bahr el Ghazal Famine, IDS Discussion Paper 369, Brighton: Institute of Development Studies, Deng, L 1999

(43) Confronting civil war: A comparative study of household assets management in Southern Sudan, IDS Discussion Paper 381, Brighton: Institute of Development Studies, Deng, L , 2002

(44) The Sudan Famine of 1998: Unfolding of the Global Dimension, IDS Bulletin 33 (4): 28-28, Deng, L, 2002

(45) "Are non-poor households always less vulnerable? The Case of Households Exposed to Protracted Civil War in Southern Sudan", NCSCE Paper Series 2, Rumbek: New Sudan Centre for Statistics and Evaluation, Deng, L, 2003.

ANNEXES

ANNEX 1: SOSUS MICS 99: the CBR per 1,000 women

Although the SOSUS MICS 99 had several observed failures, the survey nevertheless has the potential to offer useful information about the population structure and some demographic indicators such as the CBR. Based on the under five population found in the survey, we can estimate the CBR is 60 per 1,000 population -- unbelievably high. However, knowing that there were problems with the number of adult men found, we can use a simple trick to arrive at a better estimate. Normally the CBR per 1,000 women is double the CBR per 1,000 population. Or in other words, the CBR per 1,000 population is half the CBR per 1,000 women. The CBR per 1,000 women can be calculated at 98 and then results in a CBR per 1,000 population of 49, compared to our final estimate of 50.5.

ANNEX 2: World Population Prospects 2002: Sudan

The United Nations Department of Economic and Social Affairs, Population Division: The 2002 Revision of the " World Population Prospects" with aids, published in 2003 on CD (*11)

The 2002 revision for Sudan included only a few changes, mainly related to fertility. For the 1990-1995 period, a fertility level of 5.3 children per woman was used, based on the results from the 1992-1993 Sudan Maternal and Child Health Survey (which excluded SOSUS). A declining fertility trend starting in 1975 was used in the projections. However, the opinion exists that more adjustments should be made. The E (0) life expectancy estimates for females are too high relative to those for males. In the next revision, the adequacy of the past estimates should be reviewed. New fertility data needs to be incorporated.

The revision outlines a set of indicators and assumptions underlying the total population estimates. The demographic indicators used are the Total Fertility Rate, the Crude Birth Rate, the Crude Death Rate, Migration Rate, Growth Rate, Life expectancy (Ex), Infant Mortality Rate and the Q5 (U5MR).

The assumptions for the 2000-2005 period are as follows:
TFR = 4.9, CBR = 36.3, CDR =11.9, Ex = 55.6, IMR =77, Q5 =127.2

The growth rates used in the assumptions are as follows:
1955-1965	2.27%
1965-1970	2.44%
1970-1975	2.89%
1975-1980	2.96%
1980-1985	3.00 %
1985-1990	2.03%
1990-1995	2.38%
1995-2000	2.26%
2000-2005	2.47%

The yearly growth rate in this model is less than 2.5% for the 2000-2005 period. One might criticize or raise doubts about the results of the 1983 census, or the 1993 census, or the growth estimate used between 1983 and 1993. Perhaps the fertility rate was higher, but presumably the mortality rates were also higher, so the influence on the growth rate will be minimal. Perhaps the migration rates were lower. An important reminder: these are estimates.

ANNEX 3: Number of Births, derived from under five population

A simple model, based on 1,000 births, explains how to translate the under five population into the number of births.

1. Selects an IMR and U5MR, in this case 150 and 250. This means 150 deaths per 1,000 babies in the first year and 25 deaths per 1,000 children in the following years.
2. For every 1,000 babies born, 850 will reach age 1. So the average under one population is (1,000+850)/2 = 925.
3. For every 1,000 babies born, 825 will reach age 2. The average under two population is (850+825)/2= 837.5, etc.
4. So the total under five population in this cohort example is 4,125.
5. Conclusion: The number of births is 24% (1,000/4,125) of the under five population in SOSUS.

ANNEX 4: SOSUS age and gender distribution

Age distribution of under 18s at the end of 2003
Age distribution of SOSUS under 18s at the end of 2003. Note: we use "at the end of 2003" to show clear birth cohorts born per year, but to avoid confusion with the main report, we will use the average 2003 population. Given the population distribution, the under 15 and under 18 population will increase further, especially the 10-14 year group and thus the school age population.

Year of birth	Age	Proportion (%)	Population (1000s)	Notes
2003	0	4.7	352.5	
2002	1	4.3	322.5	
2001	2	4.1	307.5	
2000	3	4	300	Under five proportion 21%, total: 1,575,000
1999	4	3.9	292.5	
1998	5	3.4	255	
1997	6	3.3	247.5	
1996	7	3.2	240	
1995	8	3.1	232.5	5-9 years proportion 16%, total 1,200,000
1994	9	3	225	
1993	10	2.7	202.5	School age population 7-14: 21%
1992	11	2.5	187.5	
1991	12	2.5	187.5	
1990	13	2.2	165	10-14 proportion: 11.7% total 877,500
1989	14	1.8	135	
1988	15	1.5	112.5	
1987	16	1.4	105	
1986	17	1.4	105	
Total		**53**	**3975**	**Total under 18s**

SOSUS population by age and gender in 2003, by age groups

Based on model life tables and sentinel site surveys.

Age Group	Male	%	Female	%	Total	%
0-14	1867.5	49.7	1785.2	47.7	3652.5	48.7
15-49	1589.4	42.3	1807.6	48.3	3397.5	45.3
50-64	210.4	5.6	119.8	3.2	330	4.4
>64	90.2	2.4	29.9	0.8	120	1.6
	3757.5	**100**	**3742.5**	**100**	**7500**	**100**

Notes: Women of child bearing age: 24.1% of total. The proportion of over 65s is the lowest in the world; Niger has 2.4%.

SOSUS population distribution by gender per age group

Age Group	Male (%)	Female (%)
0-14	51.1	48.9
15-49	46.8	53.2
50-64	63.8	36.3
>64	75.2	25.0
	50.1	**49.9**

ABBREVIATIONS

AET	Africa Educational Trust
ARI	Acute Respiratory Infection
CAR	Central African Republic
CRC	Convention on the Rights of the Child
DHS	Demographic and Health Survey
DRC	Democratic Republic of Congo
EE	Eastern Equatoria
EPI	Expanded Programme of Immunization
FAO	Food and Agriculture Organization
GAM	Global Acute Malnutrition
GNP	Gross National Product
GOS	Government of Sudan
HIS	Health Information System
IDP	Internally Displaced Person
IOM	International Organization for Migration
MDG	Millennium Development Goals
MICS	Multiple Indicator Cluster Survey
MUAC	Mid Upper Arm Circumference
NIDs	National Immunization Days
NSCSE	New Sudan Centre for Statistics and Evaluation
OLS	Operation Lifeline Sudan
PHCC	Primary Health Care Center
PHCU	Primary Health Care Unit
RASS	Relief Association of Southern Sudan
SAM	Severe Acute Malnutrition
SBA	School Baseline Assessment
SPLA/M	Sudan People's Liberation Army/Movement
SRRA	Sudan Relief and Rehabilitation Association
WDI	World Development Indicators
WHO	World Health Organization
WSC	World Summit for Children