FAMINE EARLY WARNING SYSTEMS NETWORK TECHNOLOGY SUPPORT CONTRACT (FEWS NET TSC)

SUMMARY OF COUNTY POPULATIONS IN SOUTH SUDAN

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INTRODUCTION

The extent of internal displacement in South Sudan is substantive and increasing. Recent reports have documented increasing displacement since December 2013, to numbers over 1.3 million at present.1 That a tenth of the South Sudan population may take shelter in villages and counties different from their previous residence from one year ago also means that original population estimates for internal regions of South Sudan are quickly becoming outdated. An estimation of current county population counts is needed to assess food insecurity and appropriate regional strategies for responding to this crisis.

This report presents the county population distributions reported by the South Sudan census in 2008, the WorldPop population estimates for 2010 and 2015 that are based on UN estimates, LandScan population distributions according to the US Census Bureau's International Programs Division for 2011 and 2012, and finally, the UN approved county population totals, as estimated for mid-year 2014. The UN approved figures are used for this study, though the alternative numbers are presented in case they provide useful reference. In some cases, there are significant differences among the sources.

Accounting methods for population redistribution require information about internal migration (internally displaced persons, IDPs) and international migration (refugees from conflict and food insecurity), but the information needed is more than just county totals. Instead, to understand the nature of population movement, information about migrant origins and destinations is needed. I am amazed that in the face of conflict and with the task to manage very large populations with immediate needs that under-resourced program officers are able to collect and produce reports regarding origin-destination information. Many OCHA, IOM, and UNHCR locations summarize and share detailed origin-destination data, often from nearly complete samples of populations living within camps. It comes as no surprise, though, that information is spotty and quite different in availability and quality by camp, site, county, and destination country for refugees.

It is impossible to produce county net migration totals that are consistent in quality and confidence across South Sudan. My approach has been to document carefully all known information, and to point out where assumptions and missing data make net migration estimates less certain, or even unknown. First, county population estimates from a variety of sources are presented. Known internal and international distress migration counts are reported. Last, net migration values are estimated for each county, organized by state. Values and methods in this report will be updated as new information becomes available, and shared in subsequent reports.

[1] *The Economist*. 2014. Catastrophe Looms. 24 May, 2014. http://www.economist.com/news/middle-east-and-africa/21602750-if-civil-war-persists-grave-famine-may-be-inevitable-catastrophe-looms

COUNTY POPULATION ESTIMATES FOR SUDAN

Prior to the current conflict, a number of data sets provided estimates of the likely growth and change in South Sudan, following the 2008 census. WorldPop[2], a recently developed population database, provides high resolution population distributions for South Sudan based on UN population estimates for 2010 and 2015. These data are distributed across the landmass, based on a number of other variables that influence where people live, such as land cover data and information on settlements. The South Sudan WorldPop data is available at a 100 m^2 resolution, and the 2015 estimates are available at a 1 km^2 resolution. LandScan[3], a geographic data set of population estimates for every 1 km^2 area on the globe, is based on population estimates produced by the US Census Bureau's International Program[4], and several other auxiliary datasets that help describe population distributions, such as urban settlements, night lights imagery, land use and land cover information, as well as information about terrain (elevation, slope, and proximity to coastal areas). These data can be aggregated to the county level, and are reported in Table 1 for 2010, 2011, 2012, and 2015 (because of their high resolution, these data could also be provided for villages, available upon request). For planning purposes, UN approved county population estimates were generated based on the 2008 census data, by applying a constant growth rate, as well as adding populations returning home to counties in South Sudan.

Table 1 is provided to illustrate some of the differences that can arise from different estimation techniques. The UN values are shown last, out of temporal order, because those are the values that are being used. No 2014 estimates have been published by LandScan or WorldPop, but mid-year populations could be calculated based on either measures, using regional growth rates. It is useful to note that the starting point (or the population counts before considering net migration) can be substantively different. Often the differences among the estimates are larger than the net migration estimates, which again gives a sense of the uncertainly of the estimated values, even when migration is considered.

[2] http://www.worldpop.org.uk/
[3] http://web.ornl.gov/sci/landscan/
[4] http://www.census.gov/population/international/data/mapping/subnational.html

Table 1. Estimates for South Sudan County Populations

Census Data (2008), WorldPop (2010, 2015), LandScan (2011, 2012), and UN Approved Estimates (2014)

STATE	NAME	SS2008	WP2010	LS2011	LS2012	WP2015	UN2014
Central Equatoria	Juba	372,413	371,205	427,675	481,255	528,544	492,966
Central Equatoria	Kajo-Keji	196,422	193,079	225,423	253,671	272,878	265,385
Central Equatoria	Lainya	89,315	93,444	102,702	115,549	132,662	143,181
Central Equatoria	Morobo	103,603	98,533	116,517	129,327	136,413	188,324
Central Equatoria	Terekeka	140,396	137,278	161,675	181,935	195,018	176,029
Central Equatoria	Yei	201,443	206,060	231,202	259,388	294,972	260,723
State Total:		1,103,592	1,099,600	1,265,194	1,421,125	1,560,488	1,526,608
Eastern Equatoria	Budi	99,199	99,533	112,472	126,546	141,506	112,513
Eastern Equatoria	Ikotos	84,649	74,359	96,712	108,840	107,072	127,233
Eastern Equatoria	Kapoeta East	163,997	168,809	208,329	230,469	240,403	185,117
Eastern Equatoria	Kapoeta North	103,084	102,631	117,577	132,319	146,527	115,934
Eastern Equatoria	Kapoeta South	79,470	76,852	91,634	103,096	109,765	91,158
Eastern Equatoria	Lafon/Lopa	106,161	61,368	121,194	136,475	86,583	130,959
Eastern Equatoria	Magwi	169,826	171,832	192,396	216,417	245,674	201,044
Eastern Equatoria	Torit	99,740	107,069	114,965	129,260	152,296	138,268
State Total:		906,126	862,452	1,055,279	1,183,422	1,229,827	1,102,227
Jonglei	Akobo	136,210	132,141	157,474	176,578	188,273	170,211
Jonglei	Ayod	139,282	143,895	160,224	180,291	205,460	168,951
Jonglei	Bor South	221,106	227,472	254,833	286,742	325,643	282,205
Jonglei	Canal	99,068	100,033	113,996	128,253	142,551	119,752
Jonglei	Duk	65,588	67,381	75,510	84,968	95,443	116,810
Jonglei	Fangak	110,130	111,681	126,285	142,104	159,893	157,422
Jonglei	Nyirol	108,674	118,781	124,604	140,200	168,797	134,394
Jonglei	Pibor	148,475	154,251	171,159	192,334	219,406	168,675
Jonglei	Pochalla	66,201	65,803	72,005	80,749	94,153	84,599
Jonglei	Twic East	85,349	82,561	97,806	110,053	117,806	122,735
Jonglei	Uror	178,519	184,974	205,686	231,427	264,325	201,811
State Total:		1,358,602	1,388,973	1,559,582	1,753,699	1,981,750	1,727,564
Lakes	Awerial	47,041	49,090	54,304	61,085	70,333	57,080
Lakes	Cueibet	117,755	119,853	135,731	152,721	171,516	174,464
Lakes	Rumbek Centre	153,550	232,197	176,247	198,303	330,992	235,054
Lakes	Rumbek East	122,832	73,273	138,746	156,131	105,757	185,554
Lakes	Rumbek North	43,410	39,483	50,027	56,297	56,847	53,320
Lakes	Wulu	40,550	47,635	48,154	54,182	68,055	72,320
Lakes	Yirol East	67,402	82,582	76,659	86,254	117,978	119,393
Lakes	Yirol West	103,190	70,288	121,166	136,337	100,953	158,658
State Total:		695,730	714,401	801,034	901,310	1,022,432	1,055,844
Northern Bahr el Ghazal	Aweil Centre	41,827	58,488	49,174	55,547	87,394	106,523
Northern Bahr el Ghazal	Aweil East	309,921	299,846	353,806	398,384	431,148	529,098
Northern Bahr el Ghazal	Aweil North	129,127	142,807	146,303	164,515	206,227	267,215
Northern Bahr el Ghazal	Aweil South	73,806	70,482	88,968	96,885	100,235	144,638
Northern Bahr el Ghazal	Aweil West	166,217	180,445	192,775	216,977	234,997	296,946
State Total:		720,898	752,069	831,026	932,308	1,060,002	1,344,421
Unity	Abiemnhom	17,012	22,025	19,393	21,754	31,683	23,369
Unity	Guit	33,004	19,393	38,669	43,510	38,436	46,862
Unity	Koch	74,863	80,725	83,821	94,205	115,691	132,779
Unity	Leer	53,022	56,003	61,624	69,343	79,520	113,720
Unity	Mayendit	53,783	63,915	63,679	71,746	91,282	79,009
Unity	Mayom	120,715	129,863	138,494	155,843	185,773	176,826
Unity	Panyijiar	50,723	52,259	58,250	65,548	74,465	74,734
Unity	Pariang	82,443	81,864	95,233	107,082	117,272	218,381
Unity	Rubkona	100,236	119,368	114,464	128,801	158,885	204,766
State Total:		585,801	625,414	673,627	757,832	893,008	1,070,446
Upper Nile	Baliet	48,010	70,623	55,185	62,144	102,762	60,412
Upper Nile	Fashoda	36,518	33,438	41,827	47,046	47,524	41,785
Upper Nile	Longochuk	63,166	112,900	72,816	81,974	162,036	79,681
Upper Nile	Luakpiny/Nasir	210,002	198,972	241,638	271,871	283,397	248,111
Upper Nile	Maban	45,238	44,375	52,393	58,958	63,719	185,863
Upper Nile	Maiwut	79,462	83,738	90,542	100,381	120,843	100,213
Upper Nile	Malakal	126,483	126,781	145,651	163,885	182,700	147,465
Upper Nile	Manyo	38,010	36,924	44,965	50,368	52,618	62,766
Upper Nile	Melut	49,242	51,148	56,391	63,385	73,620	57,208
Upper Nile	Panyikang	45,427	25,425	52,275	58,800	33,193	51,040
Upper Nile	Renk	137,751	143,102	157,397	177,361	204,853	176,018
Upper Nile	Ulang	85,044	84,488	101,644	113,498	120,030	106,440
State Total:		964,353	1,011,914	1,112,724	1,249,671	1,447,296	1,317,001
	Abyei region	52,883					124,394
Warrap	Gogrial East	103,283	101,395	119,998	135,036	144,706	142,190
Warrap	Gogrial West	243,921	218,481	277,400	315,068	311,870	320,287
Warrap	Tonj East	116,122	124,049	133,808	150,542	179,737	132,384
Warrap	Tonj North	165,222	173,876	188,907	212,571	247,388	208,119
Warrap	Tonj South	86,592	89,287	99,998	112,512	121,827	108,454
Warrap	Twic	204,905	209,168	235,756	264,878	298,720	343,414
State Total:		972,928	916,256	1,055,867	1,190,607	1,304,249	1,379,242
Western Bahr el Ghazal	Jur River	127,771	99,541	147,187	165,585	142,329	198,324
Western Bahr el Ghazal	Raga	54,340	48,859	54,000	62,164	70,514	85,984
Western Bahr el Ghazal	Wau	151,320	174,612	174,346	196,118	249,343	232,908
State Total:		333,431	323,011	375,533	423,867	462,186	517,216
Western Equatoria	Ezo	80,861	79,968	88,703	99,557	113,365	102,462
Western Equatoria	Ibba	41,869	41,886	48,029	54,036	59,867	47,808
Western Equatoria	Maridi	82,461	81,629	94,480	106,293	116,347	100,252
Western Equatoria	Mundri East	48,318	60,229	55,635	62,599	85,452	58,872
Western Equatoria	Mundri West	33,975	43,539	38,743	43,601	61,436	53,559
Western Equatoria	Mvolo	48,134	50,953	55,412	62,336	73,196	59,484
Western Equatoria	Nagero	10,077	11,030	11,509	12,952	15,405	15,505
Western Equatoria	Nzara	65,712	69,836	75,399	84,792	99,151	73,802
Western Equatoria	Tambura	55,365	55,146	61,429	69,040	78,384	72,235
Western Equatoria	Yambio	152,257	147,361	174,817	196,781	209,825	186,590
State Total:		619,029	641,578	704,156	791,987	912,426	770,568
National Total:		**8,260,490**	**8,335,668**	**9,434,022**	**10,605,828**	**11,873,665**	**11,811,137**

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KNOWN DISTRESS MIGRATION COUNTS AND NET MIGRATION ESTIMATES

REFUGEES

County of origin data for South Sudan refugees in Uganda are extremely detailed.[5] Origins for refugees in Ethiopia are qualitative. For example, it is known that refugees are from Upper Nile State. Also FEWS NET trip reports mention interviews with people from Bor, Akobo, Ayod, and Nyior from Jonglei State, Maiwut, and Nasir from Upper Nile, and also reports of people coming from Guit and Koch of Unity. No information on county of origin for Kenya or Sudan has been identified.

To benefit from the quality of Ugandan refugee information, a simple OLS regression model was constructed, so that the rate of refugees from each county to Uganda was predicted using average distance to Uganda (in hundreds of kilometers), county population density (persons per km^2), number of conflict events recorded in ACLED (Armed Conflict and Location Event Data Project)[6] for 2014 by county, and number of fatalities recorded in ACLED, also for 2014 by county, up through July. The model explained 46 percent of the variation in refugee rates. The coefficients for the model were applied to distance data for Kenya, Ethiopia and Sudan, and proportional rates were applied to current (July 14) total estimates of refugees to those states (Ethiopia: 212,962, Kenya: 86,553, and Sudan: 82,715).[7]

INTERNAL DISPLACEMENT

Internal displacement is another major source of population redistribution by county. In a handful of counties, very high quality survey data provides county of origin information for nearly a complete sample of refugees living in camps. At this point though, not enough information exists to construct a county-by-county origin-destination migration matrix, which is ideal for best estimating population redistribution. Instead, catchment areas were generated for each IDP site, by creating Thiessen polygons (Figure 1).

[5] Areas of origin for newly arrived refugees in Uganda. http://data.unhcr.org/SouthSudan/regional.php
[6] http://www.acleddata.com/
[7] "South Sudan Emergency – Regional Overview Map," http://data.unhcr.org/SouthSudan/regional.php

Figure 1. Thiessen Polygons for IDP Sites in South Sudan (n = 238)

Catchment Areas for IDP Sites, Used to Calculate In and Out-Internal Migration

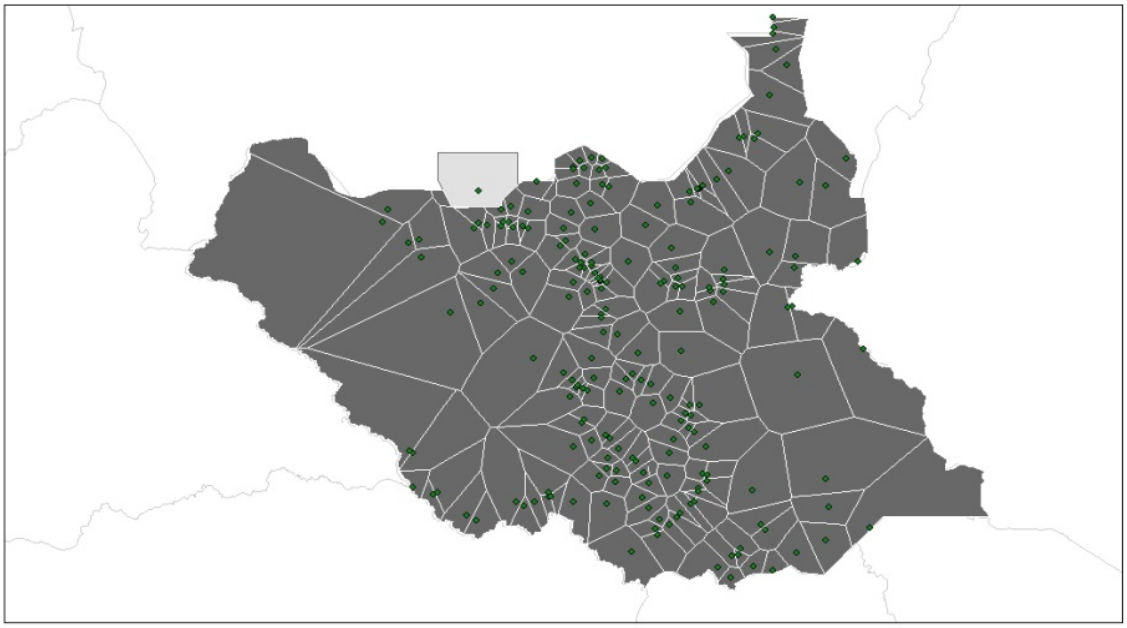
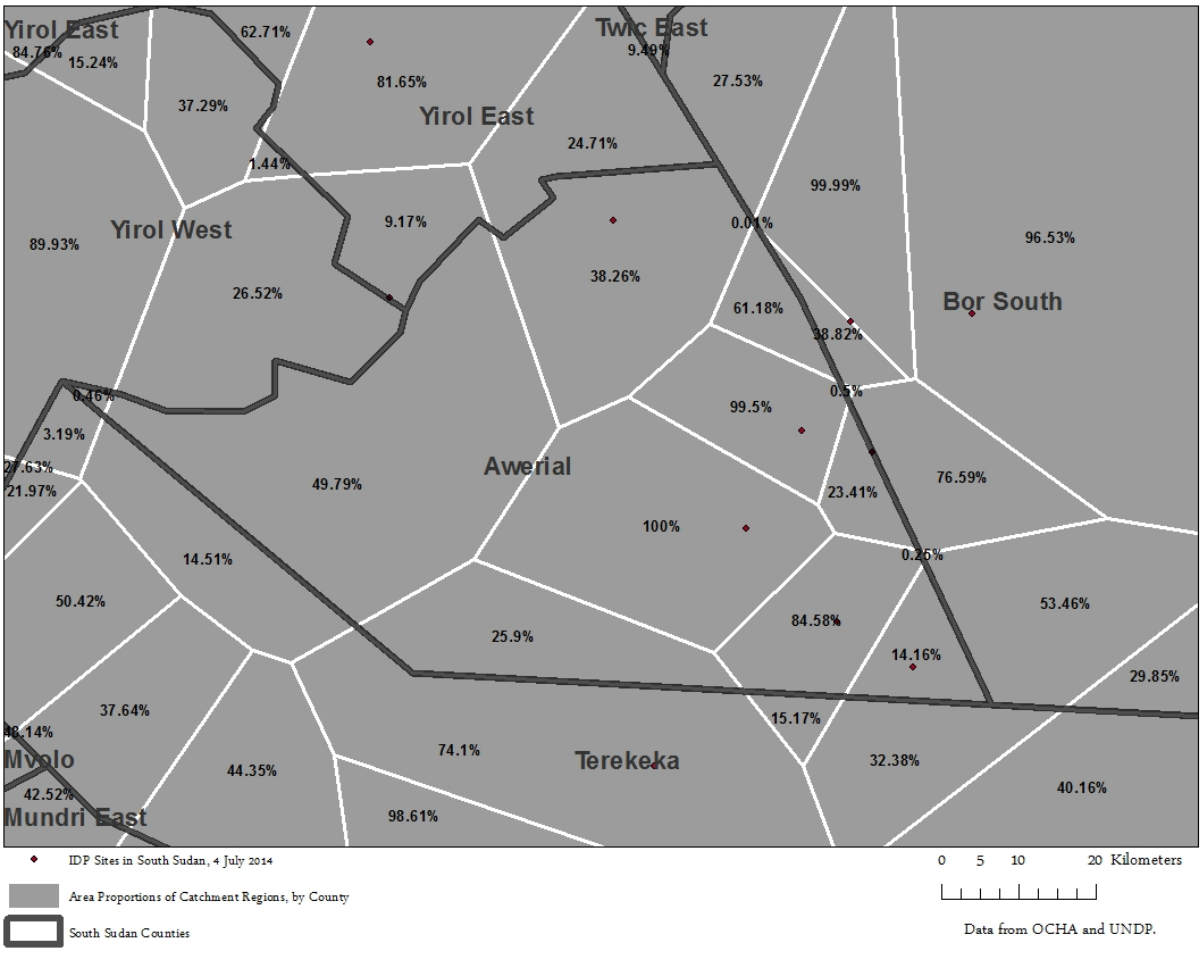


Figure 2. Proportions of Catchment Areas for Awerial County in South Sudan



Area proportions of regions intersecting catchment areas and county boundaries were calculated (Figure 2). The proportion of the catchment area falling outside the camp's county was used to calculate the proportion of IDP populations that were actually in-migrants to the county (Equation 1, where j corresponds to the IDP site, also see Figure 3), as opposed to internally displaced persons residing within their county of origin (Equation 2 and Figure 4). Equations 1 and 2 were calculated for each IDP site, then totaled for each county.

Equation 1. $InMigration_j = \text{IDPcount}_j \times \left(1 - \frac{catchment\ area\ (km\hat{}2)\ within\ county\ of\ IDP\ site}{total\ catchment\ area\ (km\hat{}2)}\right)$

Equation 2. $IntlMigration_j = \text{IDPcount}_j \times \frac{catchment\ area\ (km\hat{}2)\ within\ county\ of\ IDP\ site}{total\ catchment\ area\ (km\hat{}2)}$

In-migrant counts were set equal to out-migrant counts for nearby counties falling within the catchment areas. Out-migrants, were distributed according to the proportions of each county areas falling within the catchment area of IDP site located in neighboring counties (Equation 3 and Figure 5). Outmigration polygons were selected and totaled for each county.

Equation 3. OutMigration = $IDPcount_j$ x $\frac{catchment\ area\ (km\hat{}2)\ within\ \ county, with\ outside\ county\ IDP\ site}{total\ catchment\ area\ (km\hat{}2)}$

Figure 3. Proportions of Catchment Areas Use to Calculate Internal In-migration to Awerial County

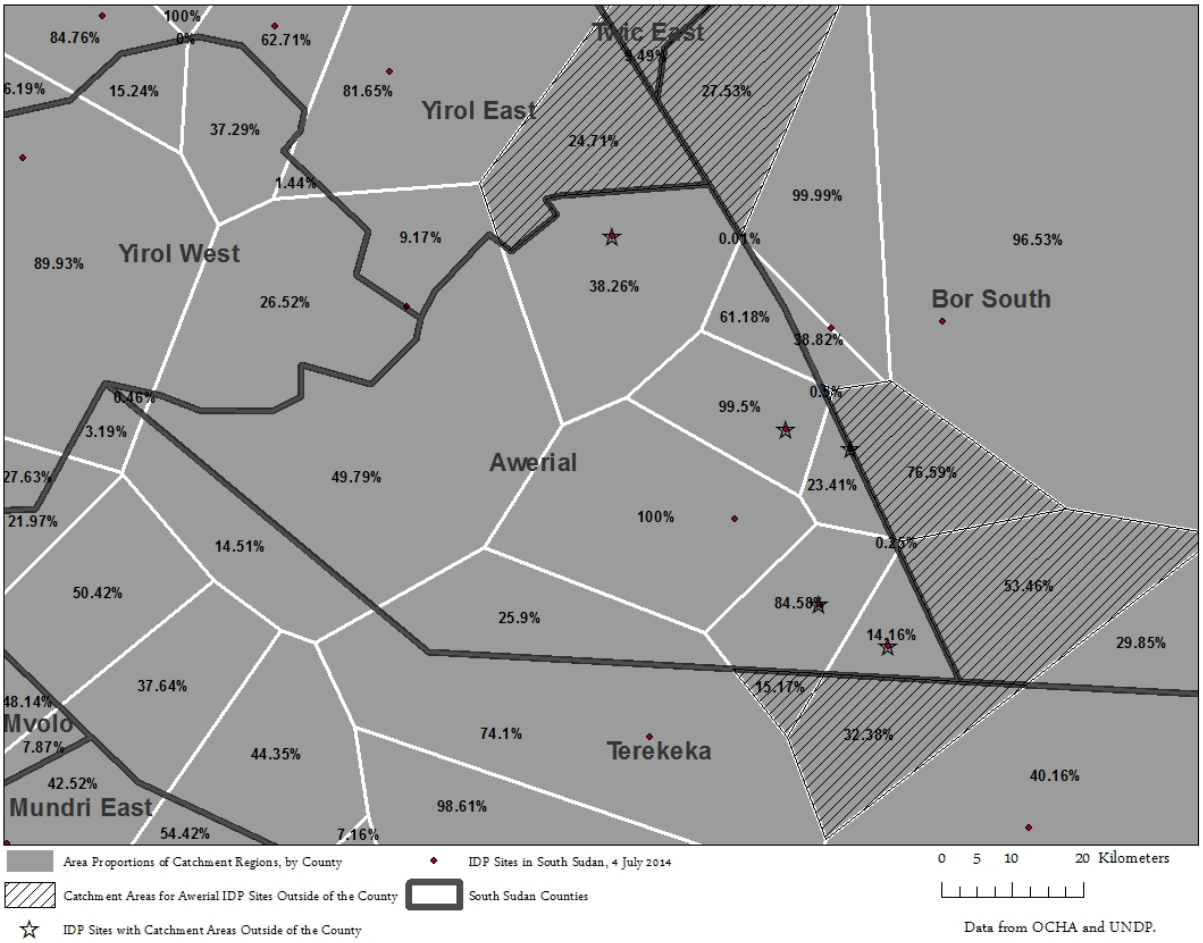


Figure 4. Proportions of Catchment Areas Use to Calculate Internal Displacement within Awerial County

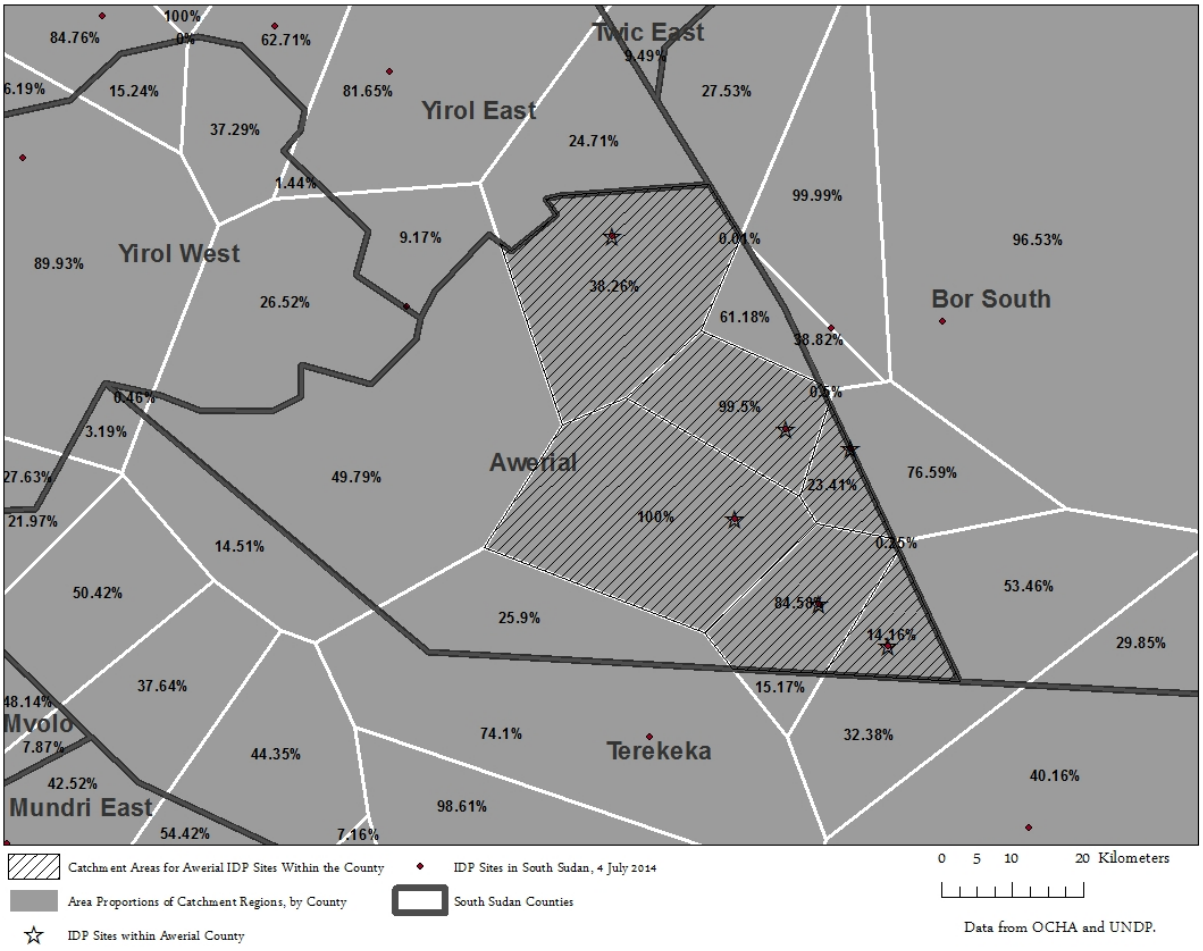
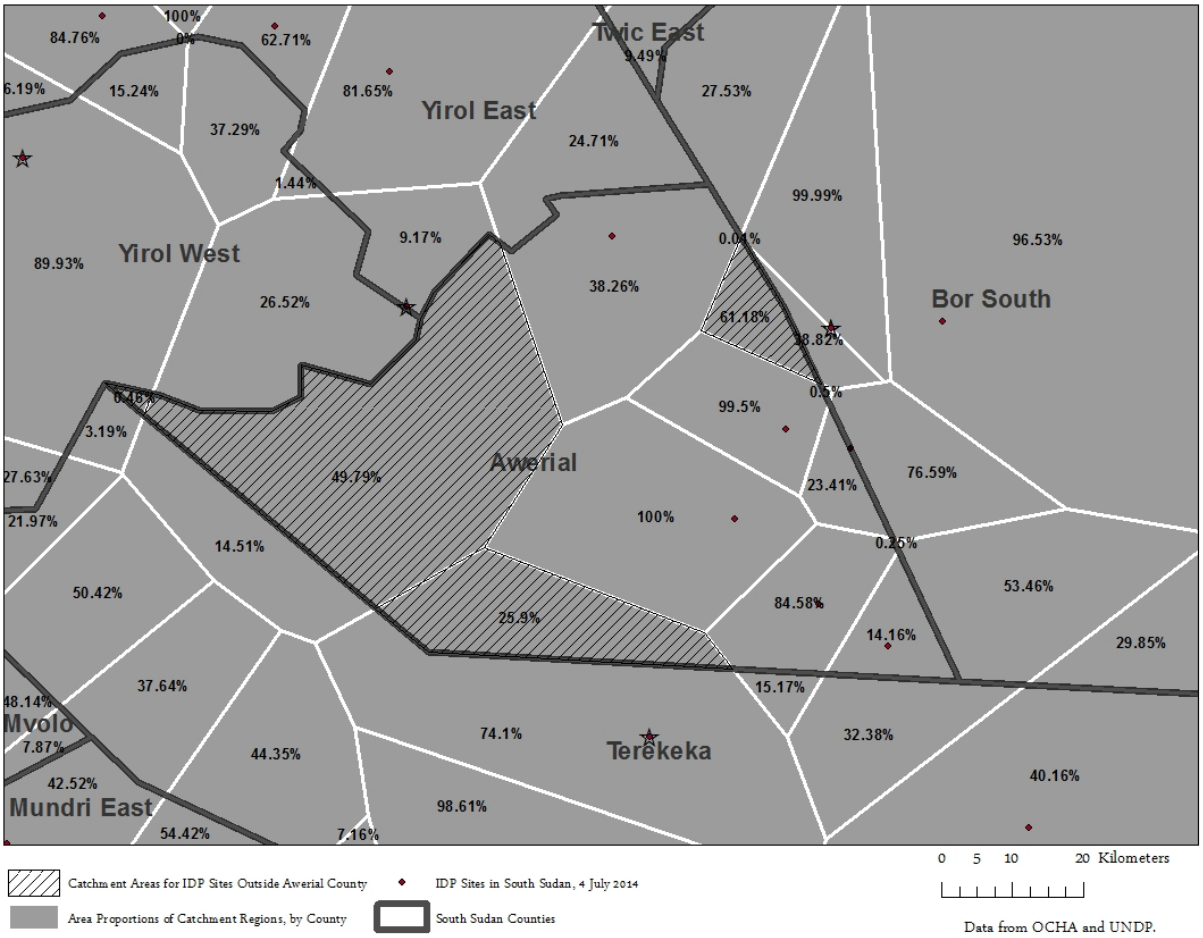


Figure 5. Proportions of Catchment Areas Use to Calculate Internal Out-migration from Awerial County



NET MIGRATION

Net migration counts for each county can be calculated by combining refugee estimates and internal displacement estimates (in-migration$_{\text{withinSSudan}}$ – out-migration$_{\text{withinSSudan}}$ – refugees$_{\text{outsideSSudan}}$). Table 2 sets out the estimated refugees leaving each county, by destination country, total refugees per county, internally displaced in and out-migrants, and finally, estimated 2014 mid-year population totals, adjusted from UN endorsed numbers to include changes due to refugees and internal displacement. In addition to the net migration numbers that were generated from the catchment model, manual, ad hoc in and out-migration adjustments were made based on seven, detailed sample data sets. These changes are documented in the data set.

Table 2. Refugee Estimates and Internal Displacement Estimates by County, and Change in Estimated Populations

SUMMARY OF COUNTY POPULATIONS IN SOUTH SUDAN

STATE	NAME	UN2014	IDP	Ref_UG	NumConflicts	Deaths	ETRef	KERef	SDRef	InMig	OutMig	2014EstRevised	InMigRevision	OutMigRevision	2014ManualRevision	PctDiff from UN2014
Central Equatoria	Juba	492,966	44,657	8,088	57	75	7372	3590	2478	5,624	2,039	475,023			475,023	-3.6%
Central Equatoria	Kajo-Keji	265,385	-	711	1	0	671	492	212	-	645	262,654			262,654	-1.0%
Central Equatoria	Lainya	143,181	-	120	0	0	1371	754	468	37	8	140,497			140,497	-1.9%
Central Equatoria	Morobo	188,324	-	101	0	0	0	150	0	-	7	188,066			188,066	-0.1%
Central Equatoria	Terekeka	176,029	18,303	18	5	11	2529	1166	864	13,688	1,995	183,145			183,145	4.0%
Central Equatoria	Yei	260,723	68	368	7	0	1957	1011	680	31	0	256,738			256,738	-1.5%
Central Equatoria	***TOTALS:***	**1,526,608**	**63,028**	**9,406**	**70**	**86**	**13,900**	**7,163**	**4,702**	**19,381**	**4,693**	**1,506,125**	**-**	**-**	**1,506,125**	**-1.3%**
Eastern Equatoria	Budi	112,513	-	24	1	0	1937	1220	606	-	343	108,383			108,383	-3.7%
Eastern Equatoria	Ikotos	127,233	3,096	12	0	0	1560	1041	482	2,886	0	127,024			127,024	-0.2%
Eastern Equatoria	Kapoeta East	185,117	-	2	0	0	2141	1283	675	-	1,993	179,023			179,023	-3.3%
Eastern Equatoria	Kapoeta North	115,934	-	5	1	0	2160	1173	681	-	1,673	110,242			110,242	-4.9%
Eastern Equatoria	Kapoeta South	91,158	-	3	1	19	1414	972	428	-	72	88,269			88,269	-3.2%
Eastern Equatoria	Lafon/Lopa	130,959	-	32	0	0	2177	1128	699	-	8,229	118,694			118,694	-9.4%
Eastern Equatoria	Magwi	201,044	4,370	3,192	3	0	1734	1050	554	1,504	16	196,002			196,002	-2.5%
Eastern Equatoria	Torit	138,268	-	667	8	11	2571	1430	831	-	804	131,965			131,965	-4.6%
Eastern Equatoria	***TOTALS:***	**1,102,226**	**7,466**	**3,937**	**14**	**30**	**15,694**	**9,297**	**4,956**	**4,389**	**13,130**	**1,059,601**	**-**	**-**	**1,059,601**	**-3.9%**
Jonglei	Akobo	170,211	57,849	1,105	6	3	3165	1127	1054	16,907	26,269	154,398			154,398	-9.3%
Jonglei	Ayod	168,951	110,790	666	5	60	3056	1116	1180	16,239	20,225	158,948			158,948	-5.9%
Jonglei	Bor South	282,205	70,248	64,769	74	506	12046	5579	4060	14,635	10,844	199,541	18,748	25,856	192,433	-31.8%
Jonglei	Canal	119,752	-	318	1	0	2208	646	949	-	17,445	98,186			98,186	-18.0%
Jonglei	Duk	116,810	25,000	135	28	75	5232	2202	1853	2,326	14,655	95,059			95,059	-18.6%
Jonglei	Fangak	157,422	53,709	731	2	0	2212	678	980	23,468	4,845	171,444			171,444	8.9%
Jonglei	Nyirol	134,394	44,729	194	0	0	2414	739	924	4,967	17,756	117,334			117,334	-12.7%
Jonglei	Pibor	168,675	-	1,363	0	0	2517	1120	799	-	43,745	119,131			119,131	-29.4%
Jonglei	Pochalla	84,599	-	105	1	40	2949	1181	946	-	11,732	67,686			67,686	-20.0%
Jonglei	Twic East	122,735	26,468	130	1	5	2290	862	826	13,808	1,134	131,300		17,664	113,636	-7.4%
Jonglei	Uror	201,811	46,699	419	7	183	4196	1677	1447	28,547	13,309	209,310		3,794	205,516	1.8%
Jonglei	***TOTALS:***	**1,727,565**	**435,492**	**69,935**	**125**	**872**	**42,285**	**16,927**	**15,018**	**120,897**	**181,960**	**1,522,337**	**18,748**	**47,314**	**1,493,771**	**-13.5%**
Lakes	Awerial	57,080	101,414	55	1	0	2212	949	772	5,003	5,375	52,720	48,694		101,414	77.7%
Lakes	Cueibet	174,464	3,910	164	6	67	2452	970	975	3,065	234	172,735			172,735	-1.0%
Lakes	Rumbek Centre	235,054	14,320	101	24	57	3857	1636	1424	5,708	72	233,672			233,672	-0.6%
Lakes	Rumbek East	185,554	3,945	31	7	114	2791	1156	1041	1,269	1,604	180,200			180,200	-2.9%
Lakes	Rumbek North	53,320	-	220	6	164	3456	1404	1319	-	5,841	41,080			41,080	-23.0%
Lakes	Wulu	72,320	-	18	0	0	1787	728	712	-	1,176	67,899			67,899	-6.1%
Lakes	Yirol East	119,393	12,889	106	0	0	2013	774	746	6,387	984	121,157			121,157	1.5%
Lakes	Yirol West	158,658	1,272	62	4	4	2152	885	792	328	2,280	152,815			152,815	-3.7%
Lakes	***TOTALS:***	**1,055,843**	**137,750**	**757**	**48**	**406**	**20,720**	**8,502**	**7,781**	**21,761**	**17,566**	**1,022,278**	**48,694**	**-**	**1,070,972**	**1.4%**
Northern Bahr el Ghazal	Aweil Centre	106,523	-	21	1	0	1368	402	739	-	44	103,949			103,949	-2.4%
Northern Bahr el Ghazal	Aweil East	529,098	-	99	1	1	628	0	525	-	6,483	521,363			521,363	-1.5%
Northern Bahr el Ghazal	Aweil North	267,215	-	63	0	0	814	100	602	-	9	265,627			265,627	-0.6%
Northern Bahr el Ghazal	Aweil South	144,638	-	24	0	0	702	60	514	-	142	143,196			143,196	-1.0%
Northern Bahr el Ghazal	Aweil West	296,946	108	12	5	3	1093	250	675	101	0	295,017			295,017	-0.6%
Northern Bahr el Ghazal	***TOTALS:***	**1,344,420**	**108**	**219**	**7**	**4**	**4,605**	**812**	**3,055**	**101**	**6,678**	**1,329,152**	**-**	**-**	**1,329,152**	**-1.1%**
Unity	Abiemnhom	23,369	2,000	0	1	0	1854	533	940	603	365	20,279		3,063	17,216	-26.3%
Unity	Guit	46,862	-	463	6	22	2642	896	1156	-	26,760	14,945			14,945	-68.1%
Unity	Koch	132,779	39,140	228	7	259	3955	1557	1558	13,258	613	138,126		1,186	136,940	3.1%
Unity	Leer	113,720	33,300	347	13	51	2856	1055	1138	10,384	507	118,200		2,868	115,332	1.4%
Unity	Mayendit	79,009	21,000	0	6	5	2396	850	992	13,740	9,124	79,387			79,387	0.5%
Unity	Mayom	176,826	41,539	790	32	207	5606	2333	2168	11,858	4,712	173,075		10,306	162,769	-7.9%
Unity	Panyijiar	74,734	54,767	583	27	208	5779	2493	2076	25,286	1,570	87,519		987	86,532	15.8%
Unity	Pariang	218,381	18,240	32	15	210	4427	1716	1815	1,436	629	211,198			211,198	-3.3%
Unity	Rubkona	204,766	55,521	886	43	419	7793	3351	2910	27,869	1,368	216,328	3,950	19,571	200,707	-2.0%
Unity	***TOTALS:***	**1,070,446**	**265,507**	**3,329**	**150**	**1,381**	**37,308**	**14,784**	**14,753**	**104,434**	**45,649**	**1,059,057**	**3,950**	**37,981**	**1,025,026**	**-4.2%**
Upper Nile	Baliet	60,412	9,825	0	16	13	4040	1469	1576	-	41,370	11,957			11,957	-80.2%
Upper Nile	Fashoda	41,785	38,640	207	1	0	2336	667	1092	30,747	23,182	45,048			45,048	7.8%
Upper Nile	Longochuk	79,681	-	1,404	0	0	2566	766	1004	-	5,755	68,186			68,186	-14.4%
Upper Nile	Luakpiny/Nasir	248,111	20,027	0	19	1	3954	1419	1414	18	2,048	239,293			239,293	-3.6%
Upper Nile	Maban	185,863	-	0	6	70	3302	1115	1377	-	3,357	176,712			176,712	-4.9%
Upper Nile	Maiwut	100,213	9,562	0	3	3	2764	879	991	4,783	1	100,362		398	99,964	-0.2%
Upper Nile	Malakal	147,465	58,918	1,135	55	66	5448	2156	2104	36,175	69	172,728	17,109	45,783	144,054	-2.3%
Upper Nile	Manyo	62,766	-	0	12	34	3392	1152	1612	-	11,883	44,727			44,727	-28.7%
Upper Nile	Melut	57,208	23,297	0	14	0	3570	1237	1549	9,516	2,133	58,235	17,835	1,095	74,975	31.1%
Upper Nile	Panyikang	51,040	5,000	0	14	10	3618	1300	1466	3,050	16,637	31,069			31,069	-39.1%
Upper Nile	Renk	176,018	13,500	107	22	52	4295	1582	1942	99	9,979	158,212	16,566	2,929	171,849	-2.4%
Upper Nile	Ulang	106,440	-	0	1	0	2620	800	945	8,711	832	109,954		91	109,863	3.2%
Upper Nile	***TOTALS:***	**1,317,002**	**178,769**	**2,853**	**163**	**249**	**41,905**	**14,542**	**17,072**	**93,098**	**117,246**	**1,216,483**	**51,510**	**50,296**	**1,217,697**	**-7.5%**

CONCLUSIONS

There are numerous limitations to the approaches discussed here: some due to data constraints and some due to methodology. First, the initial approved UN estimates may vary substantively from expected mid-2014 population, based on comparisons from several other sources, including WorldPop (based on UN estimates), LandScan, and the US Census. Second, all approaches stemming from UN approved estimates do not apply a changing growth rate (e.g. changes in both fertility and mortality in the past year), which also may have a substantive impact on county populations. Newer returnee information, with counts of in-migrant populations returning from Sudan to South Sudan, are available from UNHCR, but have not yet been changed in the UN endorsed estimates.

Refugee data by county of origin is spotty, and the approach used here could be improved with better measures of distance, or accessibility of refugee camps, and with better methodology, such as geographically weighted regression. Refugee estimates also need to be reviewed with the assistance of knowledgeable field staff. IDP data are also incomplete. The methodology used here will be improved in future rounds of this report by adopting a more nuanced approach to better understand probable IDP movements in counties with limited data, though sample data from more than seven counties will be needed to make a modelling approach, as opposed to an ad hoc correction, feasible.

Maps:
South Sudan County Population Estimates Based on Modelled Internal Migration and Refugee Counts: http://bit.ly/VnE03U (click counties for comparison with WorldPop and LandScan figures, and scroll to bottom of each pop-up to compare UN-2014 Estimates with the Modelled Estimates)