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The Trends and Burden of Mental Disorders in South Sudan

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Abstract
This article examined the trends and burden of mental disorders in South Sudan, including their prevalence across states and administrative areas and their contribution to mortality. A retrospective analysis of secondary data from the South Sudan National Demographic Health Information System (DHIS) was conducted using non-communicable disease (NCD) records. Mental disorder cases had been diagnosed by medical personnel and classified according to the Diagnostic and Statistical Manual of Mental Disorders (DSM). Exploratory Data Analysis (EDA), particularly descriptive statistical methods, was used to analyse and visualise the data, with R statistical software (R Markdown) supporting trend and burden assessments. The findings showed that approximately 3,000 of every 100,000 reported NCD cases were related to mental disorders, while 5 per cent of NCD-related deaths were associated with these conditions. Among every 100,000 people visiting health facilities, 19,397 had experienced mental disorders, with women exhibiting a higher prevalence than men. A notable number of cases were also reported among children under five years of age. Furthermore, mental disorder cases increased at an estimated average rate of 32% over the preceding three years. The study concluded that mental disorders represent a substantial component of the NCD burden in South Sudan. The findings provide valuable evidence to inform data-driven interventions, health planning, surveillance, monitoring, and evaluation of mental health programmes. They also offer practical guidance for policymakers, health planners, and programme managers seeking to strengthen mental health services and interventions in South Sudan.

Keywords: Descriptive statistical analysis, health planning and management, mental disorders, South Sudan, trends and burden of diseases.

1.0 INTRODUCTION

Mental health is a stable state of physical, psychological (mental), and social well-being of a person, but not just the absence of disease (Ndetei, 2014). Maintaining a healthy lifestyle is easier than fighting chronic illness while trying to become healthy (Agarwal A, 2016). The social well-being includes the level of happiness, peace of mind, ability to meet the demands of life, relationships with others, self-satisfaction, families or friends, our desires, ideas, ambitions, and social cohesion within or between the communities. It is unavoidable not to encounter disappointments, disagreements, hurts, anger, hunger, rejections, grief, guilt, anxiety, stress and depression. These encounters affect the state of mental disorders. Psychological dimension is expressed by tension, uneasiness, apprehension and irritability (Panagiotakopoulos, 2010). With the affected mental state, the individuals lost their ability to work, study or make any sound decision; therefore, paying attention to mental disorders restored the abilities for an individual to remain productive economically, socially and health wise. Several factors accelerated the occurrence of mental disorders, including:

1) Genetic mutation – People with genetic disorders that affect the function of the brain can have mental disorders. 2) Pharmaceutical – Some medicines have genetic effects that can cause mental disorders. 3) Poverty: Low – income: hardship led to stress, depression and suicide. These problems led to a lack of self-confidence and an inability to meet the needs. 4) Diseases – some diseases cause psychological damage that causes mental disorders. 5) Violence, Conflicts and War – any breakdown in the social system, respect for life, torture, abuses, killings, etc., inflicted a more traumatic impact on the lives of human beings. People who experienced these social breakdowns developed some mental disorders such as post-traumatic stress disorder, grief, alcohol and drug abuse, depression or suicide. 6) Exposure to toxic chemicals – people who are exposed to toxic chemicals that affect human growth can have cases of mental disorders. This includes the poor exploration of minerals such as petroleum products and gases. 7) Poor environments – Any unconducive environment affects the psychological growth of the human being, these include exposure to unhygienic areas, unhealthy sounds, poor ventilation etc. 8) Failure of social institutions such as family, loss of loved ones etc. 9) Consumption of harmful drugs and substance abuse– Under any influence, the misuse of drugs such as alcohol, cocaine, heroin etc. causes mental disorders. 10) Religion: When a person becomes religious, possessive of spiritual belief, thinking about religion, practices closing his/her mind about other aspects of life, and his/her mental state changes.

Due to several causative factors highlighted above, it is prudent to gather statistics relating to mental disorders. The population approach to handling mental disorders is used to improve coverage, outcomes and coordination of interventions to treat mental disorders, prevent associated impacts, prevent mental disorders from arising and promote mental wellbeing and resilience (Campion et al., 2022). A better understanding of the unmet mental health needs can only be done through the conduct of an assessment (Campion et al., 2017). The results facilitated effective advocacy and programming of the intervention programme in dealing with mental disorders (Campion et al., 2018).

The trends and burden of mental disorders in South Sudan have not been examined; there are significant signs of high mental disorders prevalences in South Sudan, which is affecting individual and community growth and development. Lack of data and studies, especially about the trends and burden, undermines planning and interventions. Therefore, this study aims to investigate the prevalence of mental disorders among non-communicable diseases, the proportions of reported cases and deaths by state/administrative areas, gender, and inpatients/outpatients per year.

The rationale of this study is to provide statistical evidence on the trends and burden of mental disorders in South Sudan in order to support data-driven health interventions and policy formulation. Currently, there is limited statistical information available on mental disorders in the country. The study seeks to determine the trends and burden of mental disorders among non-communicable diseases (NCDs) by gender, age, admission status, and states/administrative areas in South Sudan. It also aims to evaluate the proportion of mental disorders among NCDs and measure the magnitude of deaths associated with mental disorders.

Mental disorders present a significant public health burden, according to data from the Global Burden of Disease (GBD) from 1990 to 2021. Mental disorder cases have been on an upward trend from 13 per cent to 18 per cent, with the highest number in Central Sub-Saharan Africa (Fan et al., 2025). According to the WHO, in 2021, 1 in every 7 people (1.1 billion) globally had mental disorders (WHO, 2025). There are 10.8 mental hospital beds and 71.8 admissions per 100,000 population globally (WHO Atlas, 2020). This figure is low (1.9 mental hospital beds and 14.3 admissions per 100,000 population) for middle – income countries such as Sub-Saharan Africa. Mental disorders account for at least 18 per cent of the global disease burden (Campion et al, 2022). According to the global estimates of prevalence of mental disorders by the WHO, the proportion of the global population with depression in 2015 is estimated to be 4.4 per cent, with the estimated prevalence of 5.1 per cent among females and 3.6 per cent among males. The global number of deaths due to suicide in 2015 was 788,000 people. It is estimated that the suicide rate is 5 per 100,000 population among females in low-and-middle-income countries of the Eastern Mediterranean and the American Region, and 20 per 100,000 population among males in high-income and low-and middle – Income countries of the African, European and South-East Asian Regions.

In examining the trends and burden, it is estimated that 1.17 billion (95% uncertainty interval 1.06 – 1.31) prevalent cases of mental disorders globally in 2023, equivalent to an age-standardised prevalence rate of 14210.7 cases (12849.5 – 15940.1) per 100,000 population (Damian, 2026). Mental disorders are increasingly recognised as a major contributor to the burden of global disease, especially higher prevalence among the young population, accounting for 5.1 per cent in 2019 (Wei, 2025). The gap in the South Sudan health system is the lack of statistical examination of the trend and burden of mental disorders.

In conflict – affected and fragile settings such as Sub-Saharan Africa, mental health is a major concern due to increases in poverty and trauma events. There is always a rising tide of mental disorder in fragile settings due to factors such as economic change, political and social violence, cultural disruptions and dislocation from home by economic forces (Amoran et al., 2012). There is a

high burden of mental disorders in the population affected by conflicts, a study in Uganda has shown (Fiona et al., 2019). In conflicts and war-related countries such as Congo, violence and traumatic events are highly prevalent among the refugees and self–settlers, such as anxiety disorders, post –traumatic stress disorder (PTSD) and depression. With a 95 per cent confidence interval, 73 per cent of the Congolese living in the Uganda Refugee Camp in 2019 met the symptom criteria for post–traumatic stress disorder (Familiar et at., 2021). The table below provides statistics about mental disorders, prevalence, and burden.

Table 1: Prevalence and Burden of Depression and Anxiety Disorders in East Africa Countries

COUNTRY	PREVALENCE*				HEALTH LOSS/DISEASE BURDEN**			
	Depressive Disorders		Anxiety Disorders		Depressive Disorders		Anxiety Disorders	
	Total cases	% of population	Total cases	% of population	Total Years Lived with Disability (YLD)	% of total YLD	Total Years Lived with Disability (YLD)	% of total YLD
Burundi	448,822	4.2%	323,003	3.0%	83,625	9.9%	30,197	3.6%
Democratic Republic of the Congo	2,871,309	3.8%	2,113,267	2.8%	519,491	5.9%	194,080	2.2%
Kenya	1,952,981	4.4%	1,375,341	3.1%	360,776	8.3%	127,454	2.9%
Rwanda	425,516	3.8%	358,986	3.2%	76,205	7.5%	33,342	3.3%
South Sudan	**529,011**	**4.4%**	**369,254**	**3.1%**	**96,566**	**7.5%**	**33,856**	**2.6%**
Uganda	1,747,769	4.6%	1,070,004	2.8%	332,539	10.5%	99,558	3.1%
United Republic of Tanzania	138,939	4.1%	1,551,036	3.0%	393,870	8.6%	143,867	3.1%

Source: (World Health Organization, 2015).

South Sudan has been in prolonged wars and conflicts for decades; these wars and conflicts have subjected the population to abject poverty and poor health conditions. The recurrence of conflicts is associated with unhealed trauma. The treated prevalence of severe mental disorder (per 100,000 population) is 6.17 per cent (WHO, 2017), and the Suicide mortality rate (per 100,000 population) is 3.9 per cent (WHO, 2022). The current health expenditure in South Sudan is 6.04 per cent (World Bank, 2019), and the population with household expenditures on health of> 10 per cent and >25 per cent of total household expenditure or income are 13.4 per cent and 4.0 per cent, respectively (WHO, 2022). This indicates poor intervention in the health sector; mental health is under-supported. An improvement of public mental health resulted in improved health, education, social and economic wellbeing and resilience of an individual or a society (Campion et al, 2022). The table below provides statistics about mental disorders, prevalence, and burden.

2.0 METHODOLOGY

This study utilised a retrospective descriptive observational design where secondary data from the national DHIS database was used to assess trends and burden of mental disorders. This design was

suitable since the data best represented various geographical areas in the country. The data source was South Sudan's National Ministry of Health, collected via its National Demographic Health Information System (DHIS) tool; therefore, it may have faced incompleteness, missing data or reporting bias. The aggregated data was reported monthly nationwide from health facilities across the country's ten states and three administrative areas. A sample of 72,414 reported cases out of a total of 2,191,164 reported cases at the health facilities was studied. The data were collected between 2020 and 2022. The samples were stratified into two classifications, mental disorders cases and non–mental disorders, and the whole stratum of mental disorders was selected for study. Mental disorder cases were defined as clinically diagnosed conditions recorded in the DHIS database according to DSM classification guidelines. The study included all reported NCD cases from health facilities across South Sudan. The primary outcome variable was the presence of a mental disorder (yes/no). Covariates included gender, geographic location (state or administrative area and rural or urban), age, death cases, and admission status (inpatients or outpatients).

The primary outcome measures included: (1) proportion of mental disorder cases, (2) temporal trends from 2020 to 2022, and (3) distribution of cases by gender and geographic region. These measures were summarised using descriptive statistics and visualised to assess the patterns and trends. An exploratory data analysis (EDA) was performed on the dataset. These statistical analyses included the use of descriptive statistics, regression models, and data visualisations using R statistical software. The Ministry of Health provided permission for data access and formal ethical clearance to use the data for this study.

3.0 FINDINGS AND DISCUSSION

Trends and Burden of Mental Disorders among the NCDs

This section presents statistical analysis of NCDs, the prevalence of mental disorders by gender, age categories, and admission status per state/administrative areas in South Sudan. A simple linear regression model presents data trends.

Statistical Analysis of NCDs

Over the past three years, from 2020 to 2022, there were 2,191,164 reported NCDS cases in South Sudan, with the annual cases as follows: 2020 (618,527, 28%), 2021 (745,891, 34%) and 2022 (826,746, 38%). The annual proportions of mental disorders were 2020 (2.9%), 2021 (3.1%) and 2022 (3.8%). Table 2 presents the statistical overviews of NCDS and mental disorders reported cases per states/administrative areas of South Sudan.

Table 2: Proportion of Mental Disorders among the NCDs

States/ AA	2020				2021				2022			
	MD[1]	NMD[2]	Total		MD[1]	NMD[2]	Total		MD[1]	NMD[2]	Total	
			%	N			%	N			%	N
Abyei	0.0	100.0	100	78	0.0	0.0	00	0	0.0	0.0	100	93
CES	2.0	98.0	100	68,134	2.6	97.4	100	111,023	2.2	97.8	100	115,739
EES	6.0	94.0	100	70,858	5.9	94.1	100	94,809	10.9	89.1	100	99,143
Jonglei	1.0	99.0	100	29,875	2.3	97.7	100	22,651	2.1	97.9	100	48,127
Lakes	2.3	97.7	100	50,386	1.9	98.1	100	66,612	1.3	98.7	100	59,082
NBGS	2.7	97.3	100	66,048	6.6	93.4	100	67,494	7.9	92.1	100	51,896
Pibor	4.2	95.8	100	237	2.4	97.6	100	1,273	1.2	98.8	100	6,946
Ruweng	5.2	94.8	100	10,325	1.0	99.0	100	22,311	3.7	96.3	100	27,249
Unity	1.1	98.9	100	77,362	1.8	98.2	100	87,929	2.8	97.2	100	105,669
UNS	4.0	96.0	100	14,304	0.8	99.2	100	23,810	3.0	97.0	100	44,889
Warrap	5.0	95.0	100	50,334	3.1	96.9	100	86,146	2.3	97.7	100	92,646
WBGS	2.4	97.6	100	97,924	2.4	97.6	100	40,070	2.5	97.5	100	67,480
WES	2.6	97.4	100	82,662	2.6	97.4	100	121,763	2.6	97.4	100	107,787
Total	**2.9**	**97.1**	**100**	**618,527**	**3.1**	**96.9**	**100**	**745,891**	**3.8**	**96.2**	**100**	**826,746**

*MD[1] stands for Mental Disorders.
* NMD[2] stands for non-mental Disorders.
* Abbreviations: CES = Central Equatoria State, EES = Eastern Equatoria State, NBGS = Northern Bahr el Ghazal State, UNS = Upper Nile State, WBGS = Western Bahr el Ghazal State and WES = Western Equatoria State.

Descriptives statistics about mental disorders and non-mental disorders of the NCDs are presented in table 3 and table 4 below. The confidence intervals were computed at 95 per cent significance level.

Table 3: Statistical Analysis of NCDs and Mental Disorders Reported Cases Per Year

NCDs	Year	Mean	Std error	std dev	kurtosis	Skewness	Confidence Level (95.0%)	
							Lower Limit	Upper Limit
Mental disorders	2020	1371	340.0227	1225.969	1.073076	1.042713	705	2037
	2021	1803	500.9319	1806.136	-0.109255	0.911565	821	2785
	2022	2396	772.5329	2785.407	7.636024	2.545450	882	3910
Non-Mental disorders	2020	46208	8989.9186	32413.61	-1.358974	-0.205410	28588	63828
	2021	55573	11129.7542	40128.90	-1.369552	0.064169	33759	77387
	2022	61200	10306.3099	37159.93	-1.065107	-0.192460	41000	81400
Total	2020	47579	9226.3502	33266.08	-1.373853	-0.220800	29495	65663
	2021	57376	11512.2282	41507.93	-1.415490	0.047461	34812	79940
	2022	63596	10704.0363	38593.95	-1.121100	-0.215530	42616	84576

The large standard error is due to small samples which lead to high variation. Std error = Std deviation/√(13).

Table 4: Statistics Analysis of Mental Disorders and Non-Mental Disorders NCDs Reported Cases per State

State	NCDs type	Mean of 3 years cases	Standard Error	Standard Deviation	Confidence Level (95.0%)	
					Lower limit	Upper limit
Abyei Area	Mental disorders	0	0	0	0	0
	Non–mental disorders	57	9.609	34.6458	38	76
Central Equatoria	Mental disorders	2252	147.196	530.7230	1963	2541
	Non–mental disorders	96047	4908.91	17699.327	86426	105668
Eastern Equatoria	Mental disorders	6876	664.549	2396.0643	5573	8179
	Non–mental disorders	81394	2466.99	8894.8565	76559	86229
Jonglei	Mental disorders	603	68.8528	248.2522	468	738
	Non–mental disorders	32948	2470.9	8908.9699	28105	37791
Lakes	Mental disorders	1041	50.1203	180.7114	943	1139
	Non–mental disorders	57653	1555.52	5608.4891	54604	60702
Northern Bahr el Ghazal	Mental disorders	3430	280.369	1010.8862	2880	3980
	Non–mental disorders	58383	1764.35	6361.4532	54925	61841
Pibor Area	Mental disorders	41	7.01937	25.3087	27	55
	Non–mental disorders	2778	688.133	2481.0988	1429	4127
Ruweng Area	Mental disorders	587	74.4073	268.2793	441	733
	Non–mental disorders	19375	1647.07	5938.5929	16147	22603
Unity	Mental disorders	1772	207.939	749.7345	1364	2180
	Non–mental disorders	88548	2545.02	9176.1881	83560	93536
Upper Nile	Mental disorders	711	113.484	409.1709	489	933
	Non–mental disorders	26957	2921.42	10533.330	21231	32683
Warrap	Mental disorders	2446	48.3055	174.1680	2351	2541
	Non–mental disorders	73930	4406.72	15888.655	65293	82567
Western Bahr El Ghazal	Mental disorders	1680	137.461	495.6238	1411	1949
	Non–mental disorders	66811	5432.33	19586.544	56164	77458
Western Equatoria	Mental disorders	2700	101.404	365.6156	2501	2899
	Non–mental disorders	101370	3711.73	13382.845	94095	108645

Empirical First-Order Model of Mental Disorders Data: Trends and Burden

This simple linear model of mental data fitting presents a snapshot of the trend of mental disorder problems in South Sudan. The regression statistical summary [1] of the model is provided below (Table 5), and the residuals are shown in Figure 1. The high R^2 value (R2 =0.99) is likely inflated and should not be interpreted as strong evidence of a predictive trend due to limited data points (very few observations - only 3 years). This model is purely for descriptive purposes, not for inferential.

Table 5: Linear Model Output Statistics

SUMMARY OUTPUT						
	Coefficients	**Standard Error**	**t Stat**	**P-value**	**Lower 95%**	**Upper 95%**
Intercept	-1.3E+07	1221666	-11.0012	0.0577	-28962499.31	2082971
Year	6662	604.4857	11.0209	0.0576	-1018.719469	14342.72

RESIDUAL OUTPUT			PROBABILITY OUTPUT		
Observation	**Predicted Number of Mental Disorders Reported Cases**	**Residuals**	**Standard Residuals**	**Percentile**	**Number of Mental Disorders Reported Cases**
1	17476	349	0.57735	16.66666667	17825
2	24138	-698	-1.1547	50.00000000	23440
3	30800	349	0.57735	83.33333333	31149

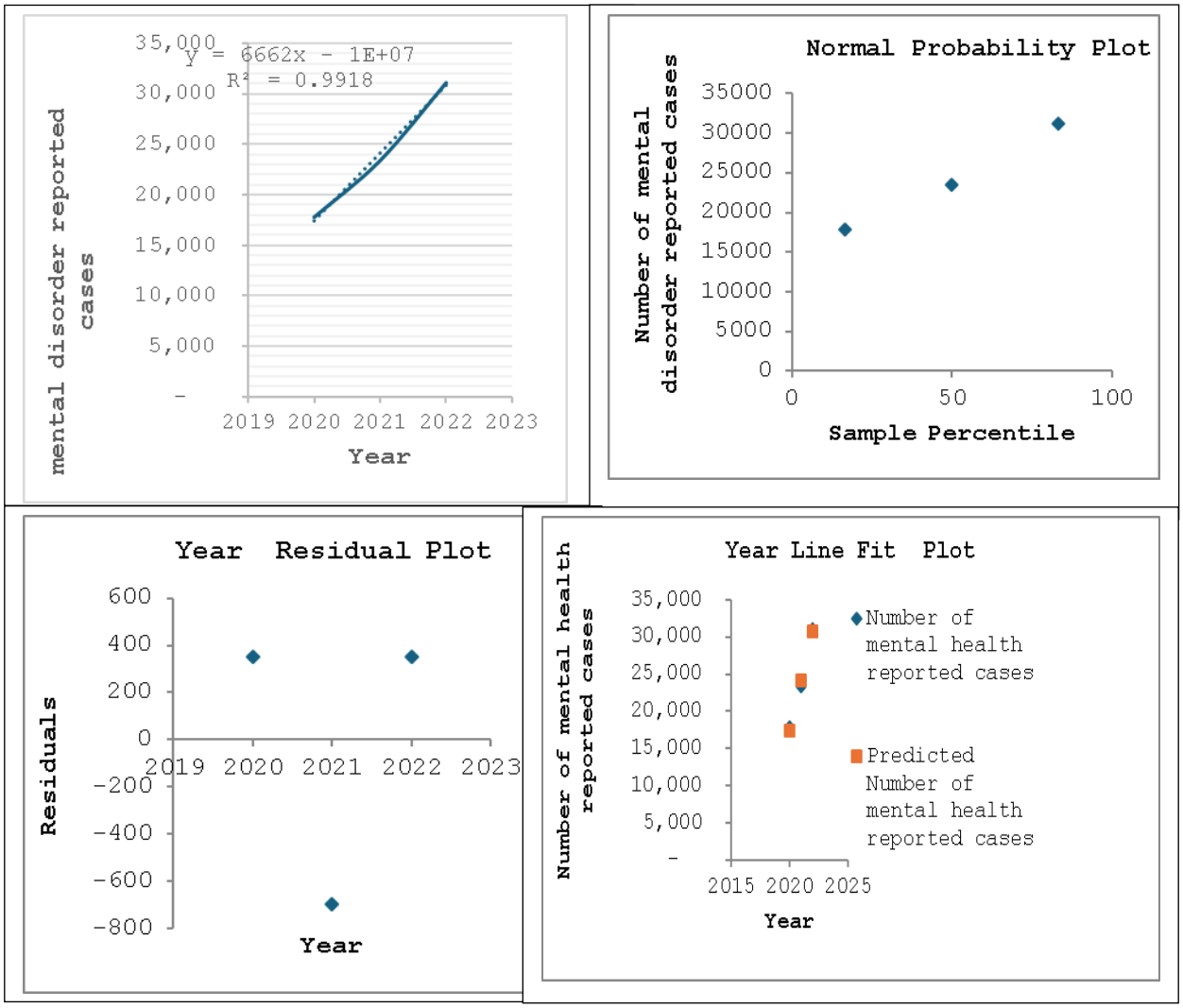

Figure 1: Simple Linear Mental Disorders Data Fitting and Residual Plots

NCDs Reported Cases by Gender

The annual statistical distributions of NCDs by gender for each state/administrative area are presented in Figure 2 below.

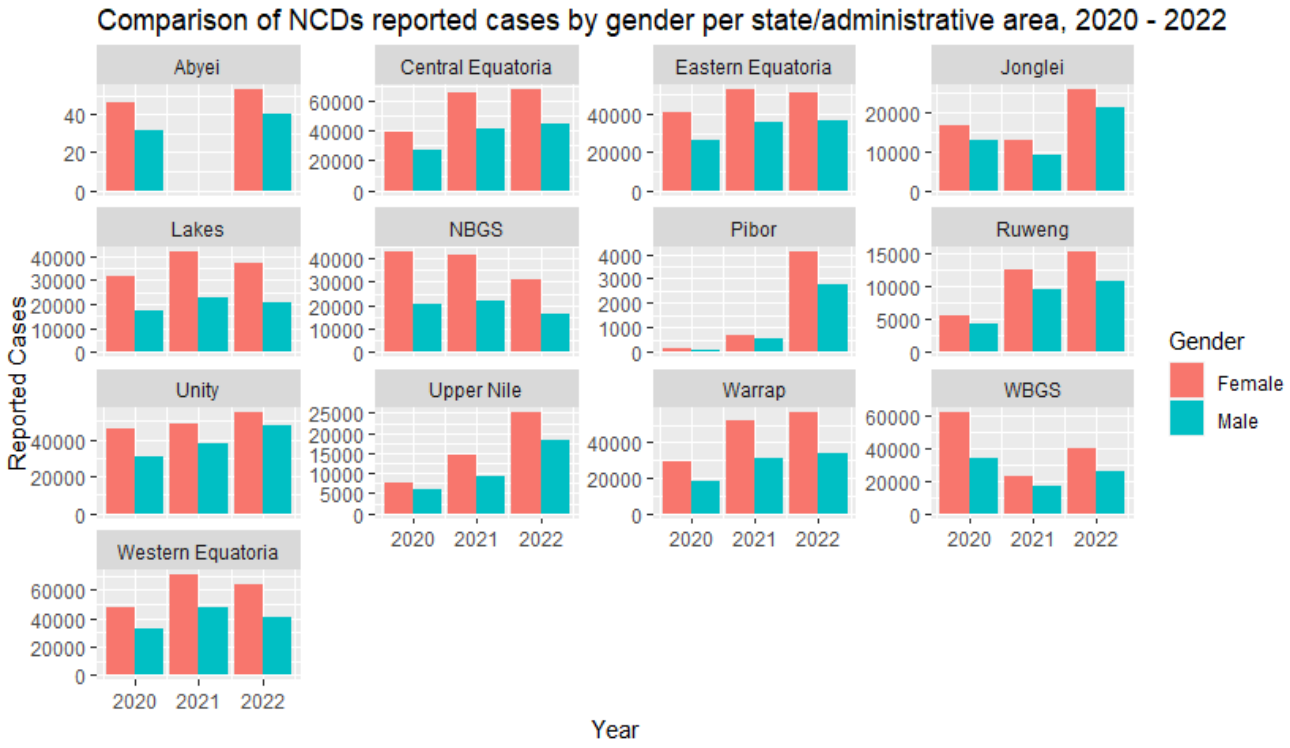

Figure 2: Comparison of NCDs-Reported Cases by Gender per State/Administrative Area (AA), 2020–2022

NCDs Reported Cases by Age

The analysis of NCDs by age, consisting of two age categories, "under 5 years[2]" and over 5 years[3], is presented in Figure 3 below.

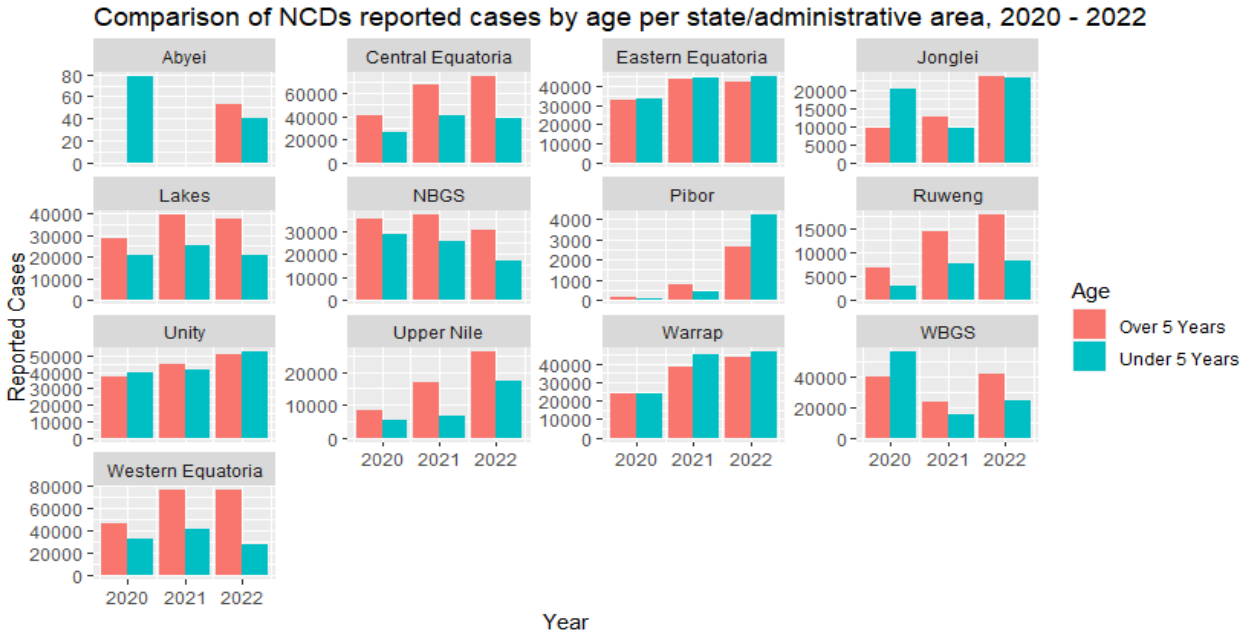

Figure 3: Comparison of NCDs-Reported Cases by Age per State/Administrative Area

NCDs Reported Cases by Admission Status

This section looks at the overview of the South Sudan NCDs reported cases by admission status, i.e. inpatient vs outpatient cases (Table 6).

Table 6: Comparison of NCDs-Reported Cases by Admission Status per State/Administrative Area (AA), 2020–2022

State/AA	2020				2021				2022			
	Inpatients	Outpatients	%	N	Inpatients	Outpatients	%	N	Inpatients	Outpatients	%	N
Abyei	0.0%	100.0%	100%	78	0.0%	0.0%	100%	0	0.0%	100.0%	100%	93
CES	0.4%	99.6%	100%	68134	0.3%	99.7%	100%	111023	0.3%	99.7%	100%	115739
EES	0.5%	99.5%	100%	70858	0.5%	99.5%	100%	94809	0.8%	99.2%	100%	99143
Jonglei	0.1%	99.9%	100%	29875	0.2%	99.8%	100%	22651	0.5%	99.5%	100%	48127
Lakes	1.0%	99.0%	100%	50386	0.8%	99.2%	100%	66612	0.7%	99.3%	100%	59082
NBGS	0.9%	99.1%	100%	66048	0.9%	99.1%	100%	67494	1.3%	98.7%	100%	51896
Pibor	3.8%	96.2%	100%	237	0.8%	99.2%	100%	1273	0.1%	99.9%	100%	6946
Ruweng	1.6%	98.4%	100%	10325	0.5%	99.5%	100%	22311	3.1%	96.9%	100%	27249
Unity	0.4%	99.6%	100%	77362	0.3%	99.7%	100%	87929	0.3%	99.7%	100%	105669
Upper Nile	0.1%	99.9%	100%	14304	0.1%	99.9%	100%	23810	0.1%	99.9%	100%	44889
Warrap	0.4%	99.6%	100%	50334	0.1%	99.9%	100%	86146	0.3%	99.7%	100%	92646
WBGS	0.1%	99.9%	100%	97924	0.1%	99.9%	100%	40070	0.1%	99.9%	100%	67480
WES	0.4%	99.6%	100%	82662	0.3%	99.7%	100%	121763	0.5%	99.5%	100%	107787
Total	**0.5%**	**99.5%**	**100%**	**618527**	**0.4%**	**99.6%**	**100%**	**745891**	**0.6%**	**99.4%**	**100%**	**826746**

Evaluating the significance of Mental Disorders among the NCDs

Statistics of Reported Mental Disorders Cases

Table 7: Annual Statistics of Reported Mental Disorders Cases per State/Administrative Area

State/Administrative Area	2020	2021	2022
Abyei Administrative Area	0 (0.0%)	0 (0.0%)	0 (0.0%)
Central Equatoria	1,394 (7.8%)	2,863 (12.2%)	2,498 (8.0%)
Eastern Equatoria	4,257 (23.9%)	5,581 (23.8%)	10,789 (34.6%)
Jonglei	290 (1.6%)	526 (2.2%)	993 (3.2%)
Lakes	1,136 (6.4%)	1,240 (5.3%)	746 (2.4%)
Northern Bahr el Ghazal	1,762 (9.9%)	4,453 (19.0%)	4,075 (13.1%)
Pibor Administrative Area	10 (0.1%)	31 (0.1%)	81 (0.3%)
Ruweng Administrative Area	525 (3.0%)	229 (1.0%)	997 (3.2%)
Unity	819 (4.6%)	1,552 (6.6%)	2,946(9.5%)
Upper Nile	573 (3.2%)	202 (0.9%)	1,357 (4.4%)
Warrap	2,536 (14.2%)	2,639 (11.3%)	2,162 (6.9%)
Western Bahr el Ghazal	2,383 (13.4%)	955 (4.1%)	1,703(5.5%)
Western Equatoria	2,130 (11.9%)	3,169 (13.5%)	2,802 (9.0%)
Total	**17,825 (100%)**	**23,440 (100%)**	**31,149 (100%)**

Figure 4 below presents the annual percentage of reported mental disorder cases by gender and admission status.

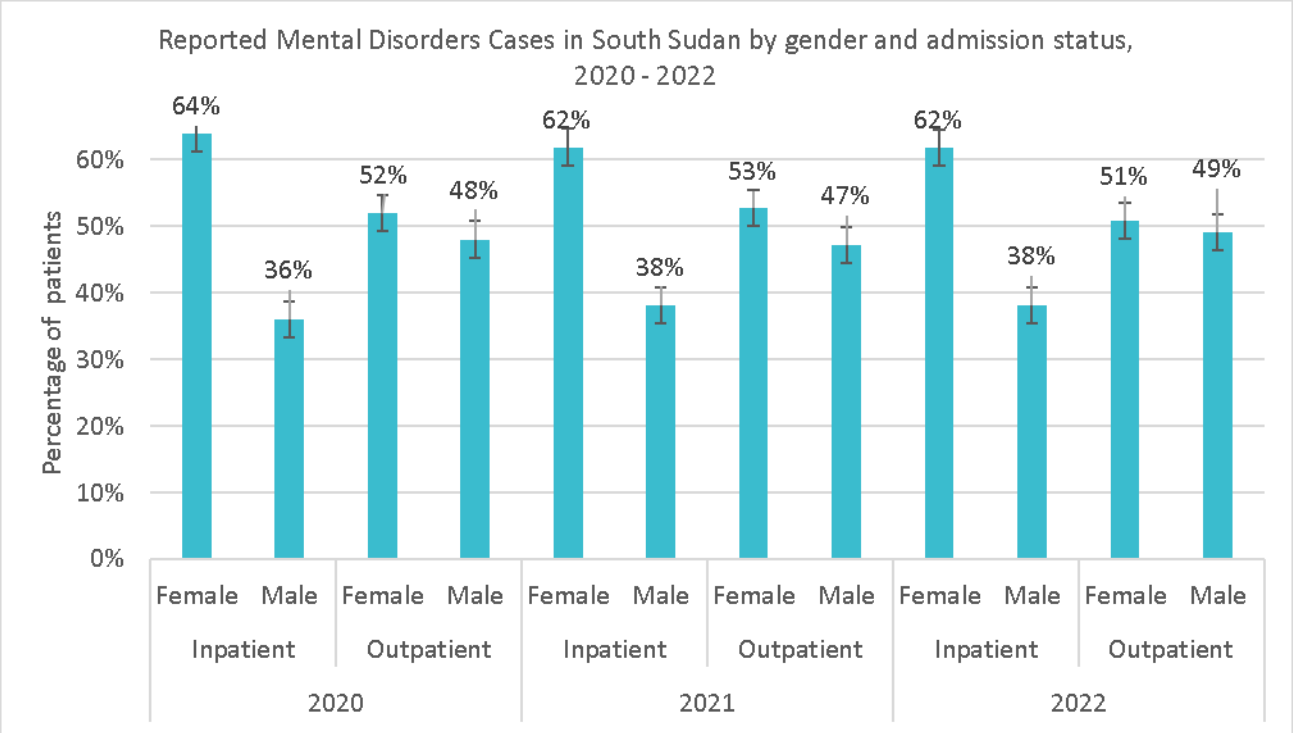

Figure 4: Comparison of Mental Disorder Inpatients and Outpatients

Proportion of Mental Disorders Versus Other NCDs

This section presents statistics for the proportion of mental disorders reported out of the NCDs reported. The proportion of mental disorders reported among the NCDs for the years 2020, 2021 and 2022 is (2.9%, 3.1% and 3.8%) respectively (Figure 5).

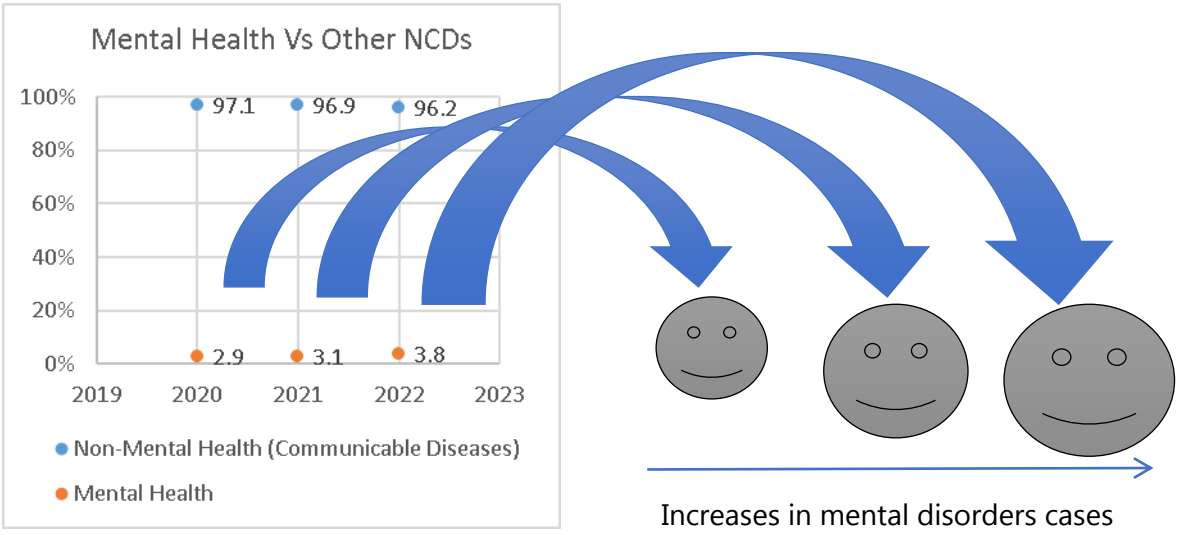

Figure 5: Mental Disorders vs Other Non-Communicable Diseases

Magnitude of Deaths Associated With Mental Disorders

This section provides statistical results about the magnitude of deaths associated with mental disorders in South Sudan.

NCDs Reported Deaths

The total reported NCD deaths (N = 4,090) in South Sudan over the past three years, with each annual case as follows: 2020 (n = 1,488, 62% female), 2021 (n = 1,084, 56% female) and 2022 (n = 1,518, 49% female).

NCDs Reported Death Cases by Gender

Table 8: Annual Reported Death Cases by Gender per State/Administrative Area

State/AA	2020				2021				2022				Total	
	F	M	%	N	F	M	%	N	F	M	%	N	%	N
Abyei	0%	0%	100%	0	0%	0%	100%	0	0%	0%	100%	0	0%	0
CES	46%	54%	100%	253	46%	54%	100%	263	52%	48%	100%	432	23%	948
EES	51%	49%	100%	154	49%	51%	100%	194	52%	48%	100%	196	13%	544
Jonglei	50%	50%	100%	36	86%	14%	100%	183	17%	83%	100%	233	11%	452
Lakes	86%	14%	100%	346	62%	38%	100%	169	63%	37%	100%	193	17%	708
NBGS	73%	27%	100%	64	52%	48%	100%	42	43%	57%	100%	110	5%	216
Pibor	0%	0%	100%	0	50%	50%	100%	4	50%	50%	100%	2	0%	6
Ruweng	67%	33%	100%	3	67%	33%	100%	6	71%	29%	100%	14	1%	23
Unity	59%	41%	100%	458	36%	64%	100%	55	56%	44%	100%	136	16%	649
Upper Nile	70%	30%	100%	23	75%	25%	100%	8	94%	6%	100%	54	2%	85
Warrap	63%	37%	100%	49	49%	51%	100%	51	54%	46%	100%	61	4%	161
WBGS	39%	61%	100%	28	0%	0%	100%	0	0%	100%	100%	2	1%	30
WES	42%	58%	100%	74	41%	59%	100%	109	54%	46%	100%	85	7%	268
Total	**62%**	**38%**	**100%**	**1488**	**56%**	**44%**	**100%**	**1084**	**49%**	**51%**	**100%**	**1518**	**100%**	**4090**

NCDs Reported Death Cases by Age

This section provides a comparison of NCDs reported death cases by age categories, specifically, under 5 years old vs over 5 years old. There were no reported deaths from the Abyei Administrative Area.

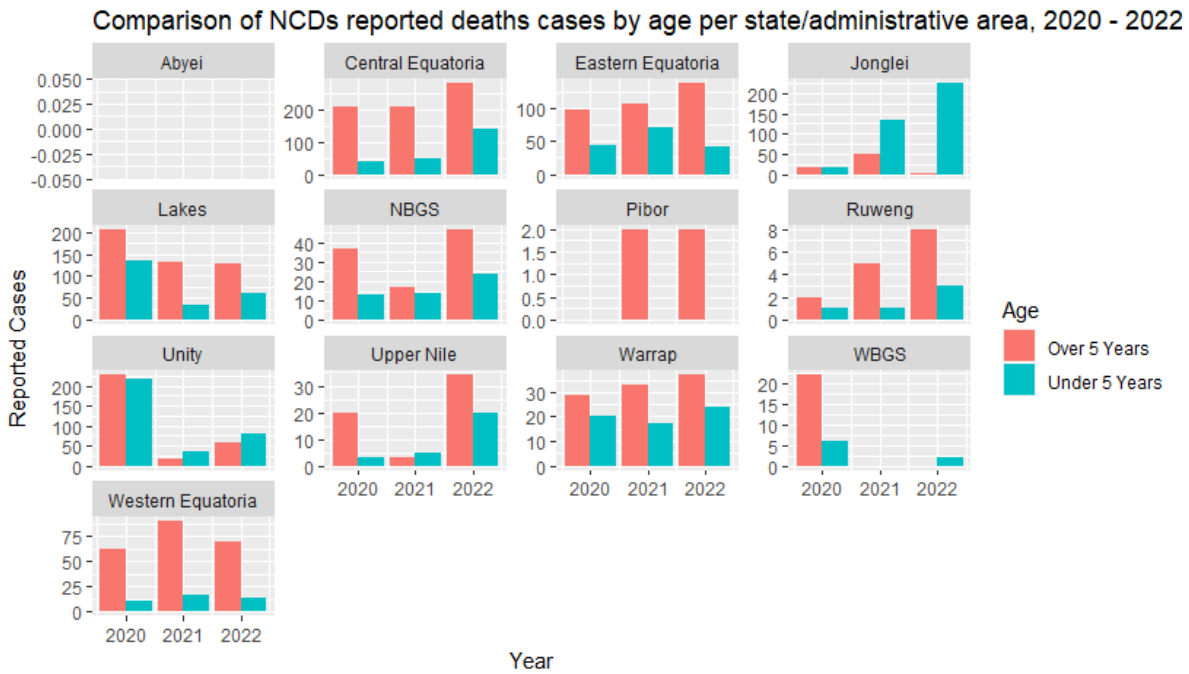

Figure 6: Comparison of NCDs-Reported Death Cases by Age per State/Administrative Area (AA), 2020–2022

NCDs Reported Death Cases Distributions by Admission Status

All the NCDs reported death cases from 2020 to 2022 were inpatients (Figure 7). In 2020 (n = 2,813, 52.9% died), 2021 (n = 2,931, 37.0% died) and 2022 (n = 4,548, 33.4% died).

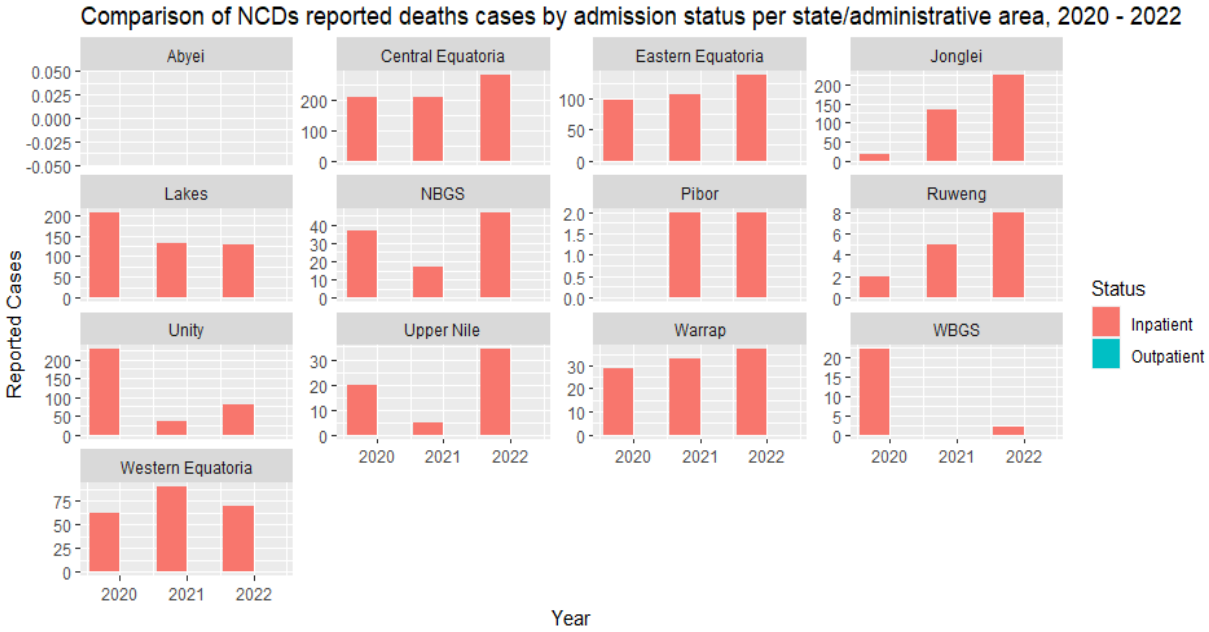

Figure 7: Comparison of NCDs-Reported Death Cases by Admission Status per State/Administrative Area (AA), 2020–2022

Mental Disorder Deaths Versus Other NCD Deaths

The annual mental disorders proportion reported deaths from the NCDs and the total reported deaths from 2020 (n% = 6%), 2021(n% = 4%) and 2022 (n% = 6%). The annual mental disorders death cases by state (Table 9).

Table 9: Proportion of Mental Disorders Deaths Among the NCDs

State/AA	2020				2021				2022			
	MD	NMD	%	N	MD	NMD	%	N	MD	NMD	%	N
Abyei	0%	0%	100%	0	0%	0%	100%	0	0%	0%	100%	0
CES	2%	98%	100%	253	2%	98%	100%	263	3%	97%	100%	432
EES	7%	93%	100%	154	8%	92%	100%	194	8%	92%	100%	196
Jonglei	100%	0%	100%	36	0%	100%	100%	183	3%	97%	100%	233
Lakes	1%	99%	100%	346	2%	98%	100%	169	2%	98%	100%	193
NBGS	22%	78%	100%	64	26%	74%	100%	42	42%	58%	100%	110
Pibor	0%	0%	100%	0	50%	50%	100%	4	0%	100%	100%	2
Ruweng	0%	100%	100%	3	0%	100%	100%	6	21%	79%	100%	14
Unity	3%	97%	100%	458	2%	98%	100%	55	0%	100%	100%	136
Upper Nile	0%	100%	100%	23	0%	100%	100%	8	0%	100%	100%	54
Warrap	0%	100%	100%	49	2%	98%	100%	51	0%	100%	100%	61
WBGS	0%	100%	100%	28	0%	0%	100%	0	0%	100%	100%	2
WES	3%	97%	100%	74	2%	98%	100%	109	2%	98%	100%	85
Total	**6%**	**94%**	**100%**	**1488**	**4%**	**96%**	**100%**	**1084**	**6%**	**94%**	**100%**	**1518**

Note: MD = Mental disorder and NMD = Others NCDs

Discussion

The study provides mental disorders trends and burden statistics in South Sudan's states/administrative areas. Mental disorders account for 3.3 per cent of the NCDs burden in South Sudan. Annually, the cases of mental disorders are estimated to be increasing by 32 per cent. According to the Kenya Psychiatric Association, 1 in 4 (i.e 25%) Kenyan experiences mental disorders annually. Globally, mental disorders account for at least 18 per cent of global disease burden (Campion, 2022; Campion and Knapp, 2018), and they also account for a third of disease burden in the UK (Campion, 2017). The increasing trends of mental disorders in South Sudan require national attention since these disorders affect the psychological, social, political, economic, and biological well-being of a person. The adverse effects of mental disorders hinder individuals and community productivity. It is good to note that a low-cost physiological wearable can derive direct measures of a person's internal state and future (Bone, 2017). Countries like South Sudan, which have been in conflict for many decades, suffer from mental disorders. The recurrence of conflicts is generally associated with post–traumatic stress disorder (PTSD).

The states known to be experiencing frequent conflicts have higher numbers of mental disorders. Cases of mental disorders are higher (> 60%) among women compared with men; other studies have shown that women are highly affected mentally during war and conflict (Fitzgerald, 2002). All the reported cases were inpatients, a vital statistic to understand the magnitude of the cases that require clinical management/hospitalisation at the health facilities and those that require home management. Health education to communities aids better understanding and health care provisions (Cervinskas,1984). The highest inpatient cases were reported in Pibor Administrative Area, Ruweng Administrative Area, Lakes State, Eastern Equatoria and Northern Bahr el Ghazal State.

In evaluating the significance of mental disorders, out of every 100,000 people who visit health facilities, 19,397 people are found to have experienced mental health disorders. The cost of mental disorders in terms of human suffering is sad, especially in low–income countries, but interventions promote health welfare. The coverage of interventions to prevent mental disorders is essential to prevent a sustainable reduction in the burden of mental disorders (Campion, 2018). The total annual deaths reported NCD death cases in South Sudan in 2020, 2021, and 2022 are 1,488 (62.0% female, 38.0% male), 1,084 (55.5% female, 44.5% male) and 1,518 (49.5% female, 50.5% male), respectively. These statistics still show that most of the NCD-related deaths are among the female population.

These statistics are useful to influence the healthcare business (Chen, 2014). States/administrative areas prone to conflicts have a high number of deaths from mental disorders, and most of the deaths occur among women compared with men. The exposure of women to traumatic events contributes to high death rates among the female population. Limited facilities and involvement of the population in health activities are limited. Therefore, open participation of the community in mental disorders programmes is a requirement (Cervinskas et al., 1984) for better intervention results.

A significant number of NCD deaths occurred among children under 5 years old in South Sudan. The study found significant (an average of 40%) cases of mental disorders among children under 5 years. The average annual proportion of deaths under 5 years from the total NCD deaths is 37.43 per cent. The extreme proportion of the NCDs under 5 years of death cases was in Jonglei State, Unity State and Warrap State. Entirely, the reported NCD death cases in Western Bahr el Ghazal State and Jonglei State were all under 5 years; this implies potential data reporting gaps/quality were only under 5 years NCD deaths were being reported. Since 2020, the cases of NCD deaths among children under 5 years have progressively increased annually.

All the NCD-related death cases from 2020 to 2022 were inpatients. In 2020, out of 2,813 NCD-admitted cases, 1,488 (52.9%) died. Similarly, in 2021, out of 2,931 NCDs admitted cases, 1,084 (37.0%) died, and in 2022, out of 4,548 NCDs admitted cases, 1,518 (33.4%) died. These death proportions are highly underestimated because most of the deaths might be occurring outside the health facilities and due to a lack of health facilities, poor diagnostic services and specialised medical doctors across the States and Administrative Area health facilities.

The key strength of this study is the use of national medical report data, the reported cases, which were diagnosed and assessed by medical professionals before they were entered into the DHIS tool data system. Therefore, the key strength is the use of comprehensive and routine data from all the health facilities nationwide. However, this data has its own limitations, including incompleteness and inaccuracy. The study design inherited limitations associated with the DHIS system.

Policy Implication

The study significantly provides policy options and underlying policy implications. Statistical analysis provides the burden imposed by mental disorders among NCDs; therefore, calls for reviews of the current mental disorders programme are imminent. These implications include an increasing number of mental disorders practitioners, establishment of mental disorders facilities, an increase in health budgetary and investment in mental disorders statistics. A combination of demographic variables and clinical symptoms can be useful for early identification and treatment of mental disorders (Iniesta, 2016). Mental disorders'

statistical findings have important policy implications, indicating the need to prioritise the detection and treatment of mental disorders in young people, to upscale treatment services in low – and middle–income environments, and to coordinate the health policy response with other relevant agencies to reduce the incidence and improve the outcomes of mental disorders among the vulnerable (Dan, 2017). The unattended redress of mental disorders problems has a long-term effect on community and individual prosperity, productivity and recurrence of conflict.

4.0 CONCLUSION AND RECOMMENDATIONS

Conclusion: Research on non-communicable diseases, especially public mental disorders, is crucial. This exploratory data analysis provides overwhelming, vital statistical information that will make people understand the magnitude of mental disorders in the community. In South Sudan, health services are underfunded by the government, leaving international development partners to provide more basic health services. The annual budget is always less than 7 per cent, and the country has inadequate health resources (health facilities and professionals). This problem is far worse when it comes to mental disorders.

The mental disorders data presented in the demographic health information system (DHIS) had some data gaps, some important variables are capture in the data collection tool, these variables include medicated history of the patients (such as duration of sickness, medicines provided, other medical history etc), economic activities, employment status of the patients, income, marital status, household size, number of specialist mental disorders professionals in each health facility around the country etc.

The data present an increasing trend of mental disorders cases in South Sudan; this increasing trend is contextually believed to be associated with persistent conflicts in the country. Among the NCD cases, 3.3 per cent are mental disorder cases. This presents a significant disease burden. Every year, about 19,397 out of 100,000 people who visit health facilities experience a mental disorder, based on the records from the health facilities. Most cases of NCDs are in women (> 60% of NCDs reported are in women). The prevalence of mental disorders is higher among females compared to males. This implies that women are highly exposed to the causative factors of mental disorders. There is a significant number of cases of mental disorders among children under 5 years. There are critical incidents where the patients are admitted for special care and management. The annual increment in the number of mental disorders is 32 per cent. Due to this increase in the number of mental disorders, there is an increase in the number of substances and drug abuse, acute stress and other mental disorders. There is equal prevalence of mental disorders across the states and administrative areas in South Sudan. The states with the higher number of mental disorders are Eastern Equatoria, Warrap, Western Bahr el Ghazal, Western Equatoria and Northern Bahr el Ghazal. Mental deaths reported occurred among the inpatients; the study found that out of 100 inpatients, 10 are likely to die. Therefore, mental disorders are a burden in South Sudan.

Recommendations: Based on the findings of this study, the following recommendations are proposed to strengthen mental health interventions, improve policy responses, and address the growing burden of mental disorders in South Sudan.

Institutions responsible for providing public mental health services should enhance the use of statistical evidence in decision-making, policy formulation, and the implementation of intervention programmes, given the significant contribution of mental disorders to the burden of non-communicable diseases (NCDs). The study also highlights inadequacies in the resources allocated to mental health services;

therefore, legislative action is needed to address resource gaps and strengthen mental health interventions. Since mental disorders constitute a substantial burden among NCDs, public awareness initiatives should be intensified through the dissemination of statistical information and evidence on mental health trends and impacts. Furthermore, conflict has been identified as a major factor contributing to the persistent rise in mental disorder cases and reduced community productivity in South Sudan. As a result, greater investment in socio-economic programmes aimed at addressing post-traumatic disorders and supporting recovery is strongly recommended. Finally, the observed disparities in the impact of mental disorders between men and women underscore the need for gender-responsive mental health intervention programmes that address the specific needs and vulnerabilities of each group.

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Authors Contributions Declaration
ABM led the conceptualisation, methodology, formal analysis, and initial drafting of the manuscript. TKKK contributed to the methodology and provided overall supervision. DMN offered subject-matter expertise in mental disorders and contributed to the manuscript's critical revision. SWL supervised the work and reviewed the manuscript. ZMSM supervised the statistical methodology, guided the interpretation of results, and provided critical revisions to enhance the academic rigour of the paper. All authors reviewed and approved the final version of the manuscript.

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The research had no external funding but was self-financed.

Conflict of Interest Statement
The authors have no conflict of interest in this study.

Declarations
This section provides ethical approval, consent to participate and consent to publish.

Ethical Approval
The dataset was provided by the South Sudan National Ministry of Health; the data was anonymised and approved for use. The protocol was approved by the Health Research Ethics Board in accordance with the health research ethics guidelines, standards and regulations. The data handling was in accordance with the standards set up in the South Sudan Code of Conduct for official statistics. Clinical trial number: Not applicable.

Consent to Participate
Informed consent was obtained from all individual participants included in the study by the Ministry of Health; however, this study uses anonymised secondary administrative data.

Consent to Publish
The participant has consented to the submission of the case report to the journal.

Data Availability Statement

Data availability, yes, the data used is public data and can be shared with anyone who has an interest in using it.

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