STILLBIRTHS RATE IN NIGERIA

What is it?

When was it high?

Where is it predominant?

A Stillbirth Data Report from 2014 to 2023

By

(SPEED Project)

Improving Nigeria's Capacity to Use Data of Registered Stillbirth for Decision-Making

Supported by:
The Global Grants Program
Bloomberg Philanthropies Data for Health Initiative

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Executive Summary

This report is a documentation of the analysis of the Federal Ministry of Health & Social Welfare (FMoH) 2014 to 2023 stillbirth data reported on the District Health Information System (DHIS2), being the second output of the Global Grant Program (GGP)-Bloomberg Philanthropies Data for Health Initiative funded SPEED Project implemented by international research center of excellence (IRCE) at the institute of human virology, Nigeria (IHVN).

The national stillbirth registers were extracted, collated and analysed against main indicators (livebirth & stillbirth) and other variables related to pregnancy and delivery outcomes, with the aim of evaluating the stillbirths' rate, spatial variation and trends in Nigeria, and recommending the potential policy interventions to reduce preventable stillbirths in Nigeria.

The report reveals that stillbirth burden is predominant in Nigeria, and twice above Every Newborn Action Plan (ENAP) and the sustainable development goal (SDG) target of twelve per thousand total births. Stillbirth majorly clustered in the northwestern part of the country, with highest burden in Zamfara and Katsina states. Though the preventable macerated stillbirth is more frequent in the southern part of the country, with highest burden in Delta.

This report further provides the country trends and projection of stillbirths. Nigeria experienced one of the highest occurrences of stillbirths in the year 2015 with gradual haphazard decline and incline till the year 2023. While most states may achieve the ENAP/SDG target on/before 2030, it's concerning that fifteen states may not achieve this target until 2073. While it was nationally projected that the target may be achieved by 2027, Nigeria will however require a multisectoral approach to strengthen interventional strategy to reduce stillbirths' burden and achieve the expected target across the states by the year 2030.

SPEED Project Team

IHVN-IRCE Team

1. Oghome Emembo
2. Oyewole Oyedele
3. Temitayo Lawal
4. Edward Kombu
5. Kazeem Ayodeji
6. Margaret Kojusola
7. Funmi Dacosta
8. Lilian Akhigbe
9. Mercy Ehimegbe
10. Victoria Etuk
11. Dr. Nifarta Andrew
12. Dr. Evaezi Okpokoro

FMoH M&E Team

1. Dr. Anthony Adoghe
2. Mr. Bisong Abe
3. Mrs. Abosede Osindehinde
4. Mr. Oge Ajirioghene
5. Mrs. Adagi Jonathan Hannah
6. Mrs. Joy A. Deshi

NPHCDA M&E Team

1. Dr. Gabriel Adayi
2. Dr. Uzoma Ekpundu
3. Ms. Dimkpa Tonye Lilian

Contributors to the Report

1. Oghome Emembo:	Design, data sourcing, preliminary/final report & review
2. Oyewole Oyedele:	Design, data sourcing/quality management, preliminary/final analysis, preliminary/final report & review
3. Temitayo Lawal:	Data management, data quality, cleaning, preliminary/final analysis, visualization & preliminary report
4. Edward Kombu:	Data management, data quality, preliminary analysis & visualisation
5. Kazeem Ayodeji:	Data management & preliminary analysis
6. Mr Bisong Abe:	Data sourcing/pulling, data quality management, & data review
7. Mrs Abosede Osindehinde:	Data sourcing/pulling, data quality management, & data review
8. Mr. Oge Ajirioghene:	Data sourcing/pulling, data quality management, & data review
9. Mr. Nwagbara Eberechi:	Data sourcing/pulling, data quality management, & data review
10. Ms. Joy Deshi:	Data sourcing/pulling, data quality management, & data review
11. Mrs. Hannah Adagi Jonathan:	Data sourcing/pulling, data quality management, & data review
12. Dr. Alexander Bitrus Dachung:	Data quality management & review
13. Dr. Zarah Zambuk:	Data quality management & review
14. Dr. Gabriel Adayi:	Data quality management & review
15. Margaret Kojusola:	Coordination of data review
16. Funmi Dacosta:	Data administration & communication
17. Lilian Akhigbe:	Data entry & cleaning
18. Mercy Ehimegbe:	Data entry & cleaning
19. Victoria Etuk:	Design & data management
20. Dr. Nifarta Andrew:	Design, data analysis review and coordination
21. Dr. Evaezi Okpokoro	Design, final report review and coordination

Acronyms and Abbreviations

UNICEF: United Nations Children's Fund

WHO: World Health Organization

FMoH: Federal Ministry of Health & Social Welfare

NPHCDA: National Primary Healthcare Development Agency

IRCE: International Research Centre of Excellence

IHVN: Institute of Human Virology, Nigeria

SBR: Stillbirth Rate

DHIS2: District Health Information System version 2

LMICs: Lower-Middle Income Countries

M&E: Monitoring and Evaluation

GGP: Global Grants Program

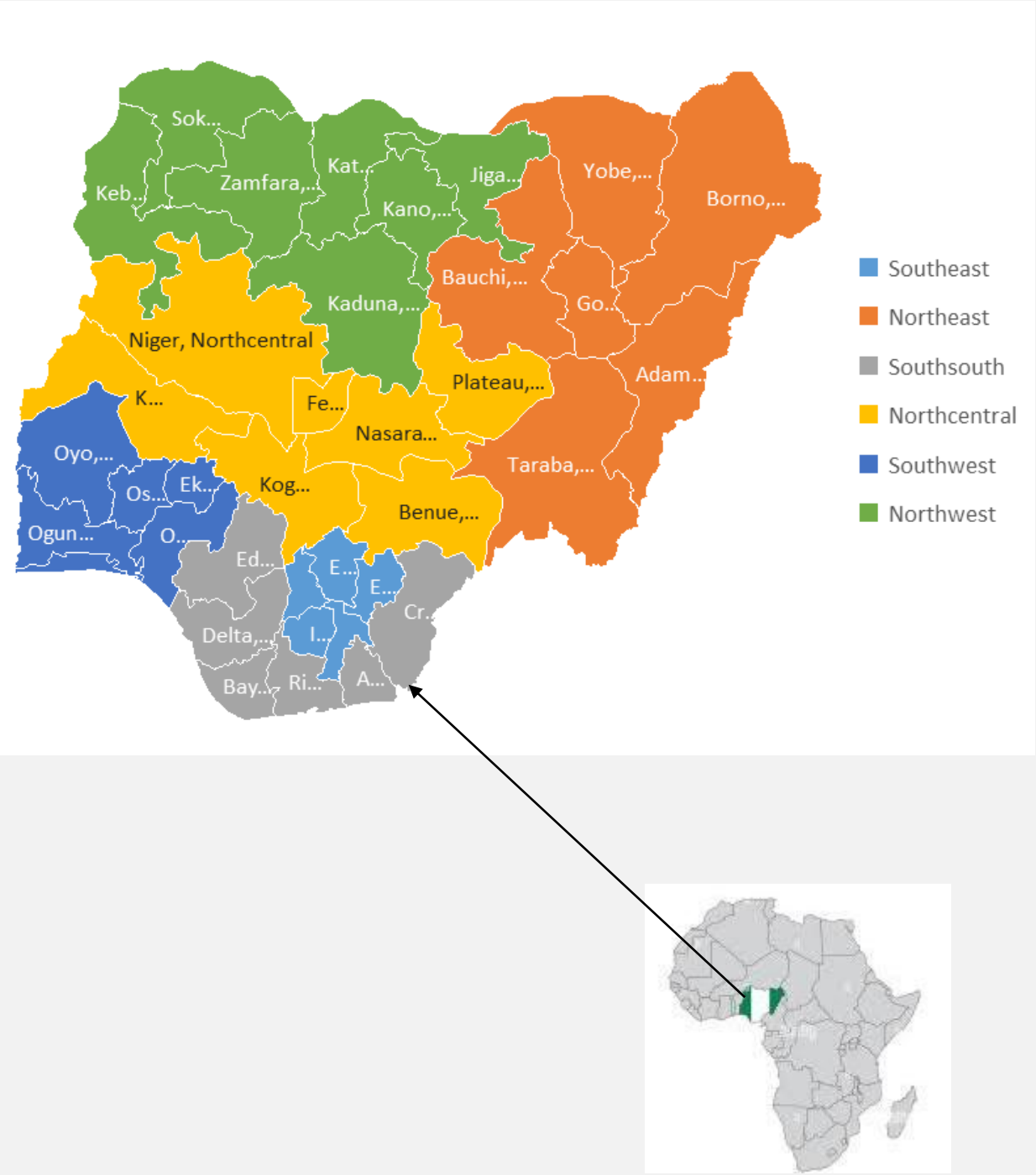
GIS: Geographical Information System

ENAP: Every Newborn Action Plan

SDG: Sustainable Development Goal

CI: Confidence Interval

Map of Nigeria



1.0 Background

Stillbirth is typically defined by WHO as death of foetus after 28 weeks of pregnancy, with a weight of 1000g or more (1). In 2023, the UNICEF estimated the global stillbirth rate (SBR) as 14.3 per 1000 total births, with a high rate found in India, Pakistan, Nigeria, Democratic Republic of Congo, Ethiopia and Bangladesh, and the six countries accounted for about 50% of the world stillbirth burden in 2020 (2,3). Despite the high SBR, the global focus to reduce stillbirths burden remain poor especially in low and middle-income countries (LMICs) (4).

1.1 About Stillbirth in Nigeria

In Nigeria, the Federal Ministry of Health (FMoH), reported that Nigeria has the second highest rate of stillbirths in the world with 42.9 per 1,000 births in 2020 (5). However, it should be noted that this estimate was derived as a ratio of total livebirth, and not a rate of stillbirth per 1000 total births. Stillbirth is a major component of international health and in 2014, every newborn action plan (ENAP) and the sustainable development goal (SDG) has set a target of achieving national stillbirth rate of 12 or less per 1000 total births by 2030 (6).

However, population-level data on stillbirth are rarely available, and studies either reported a derived sub-national estimate, hospital data or employed a predictive analysis to report stillbirth rates (7–10). Highlighting the need for reliable estimates to inform programming, research, and policy which underscore the progress towards the target. Hence, we analyse national stillbirth registers collected and reported on the approved and recognized district health information system version 2 (DHIS2) to report and forecast stillbirth rate in Nigeria.

1.2 Primary Objective

The primary objective is to conduct a comprehensive data analysis and review of national and subnational stillbirth occurrences using predefined indicators to guide best practices/policies in reducing stillbirth rates in Nigeria.

1.3 Secondary Objective

- To provide a stillbirth data analytics and visualization that provide insight into supporting decision-making and planning in Nigeria.
- To disseminate a comprehensive data report on rate, distributions and trends of stillbirth occurrences between 2014 and 2023 in Nigeria.

2.0 Methodology

2.1 Indicator Definition and Computation

2.1.1 Stillbirth

According to WHO, stillbirth occur when a baby is born with no signs of life or foetal death at 28 weeks or more of gestation (1).

Stillbirth rate is therefore the number of babies born with no sign of life or foetal deaths at 28 weeks or more of gestation, per 1000 total births for a given period

$$\text{Stillbirth rate} = \frac{number\ of\ stillbirths}{total\ number\ of\ births\ (including\ Stillbirths\ and\ Livebirth)}\ X\ 1000$$

2.1.2 Livebirth

According to WHO, a livebirth is defined as the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy, which after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles.

Livebirth occurs when a foetus exits the mother showing any definite sign of life such as voluntary movement, heartbeat or pulsation of the umbilical cord for however brief a time and regardless of whether the umbilical cord or placenta are intact.

Livebirth = Total Birth – Stillbirth

2.1.3 Total Birth

Total birth is meant to include all births irrespective of duration and outcome of birth. This includes both the livebirth and stillbirth defined above.

Total birth = Livebirth + Stillbirth

2.2 Design and Population

The study is analytical retrospective cross-sectional (longitudinal) in design. The study population are women of childbearing age (15 – 49 years) with records of stillbirth reported at a health facility within the state of residence between 2014 and 2023 in Nigeria.

2.3 Data Extraction and Management

Data was extracted from the DHIS2 national instance managed by the FMoH. The FMoH routinely collects and collate births data including stillbirths across the health facilities in Nigeria. The de-identified aggregated records of stillbirths entered on the DHIS2 between 2014 and 2023 were extracted, managed, cleaned and prepared for analysis. Stillbirth data

was map with livebirths to generate total births. Arithmetic errors were verified and corrected. Outliers were flagged, queried and corrected by FMoH. Data quality as regards completeness was also assessed and missing stillbirth data were dropped from the analysis.

2.4 Method of Analysis

Stillbirth rate was computed and reported per 1,000 total births as defined under 2.1.1. Stillbirth rate in the 10-year review period (2014 – 2023) was computed by dividing the number of stillbirths by the total number of births in the review period per 1000.

Stillbirth rate in the population was disaggregated by the region (northcentral, northeast, northwest, southeast, southwest and south-south). For daily or longer timeframes, the number of stillbirths was aggregated and used as an index. Since each birth is an independent event, the number of stillbirths over the period of interest follows a Poisson-binomial distribution, with the variance equivalent expected value computed form the probability of stillbirth. As such, the aggregate represents an estimate of the risk of stillbirth experience by a mother (for each independent birth) over the period of interest. Furthermore, an epidemiological times series approach was employed to investigate the trend of stillbirth over the 10-year review period, both at national and sub-national level, with an estimated forecast of stillbirth rate.

The dataset was further aggregated per state to assess the spatial variation of the stillbirth occurrence using the optimized hotspot analysis to identify states with high spatial clustering. Statistically significant hotspots will be regions with a high expected value or prevalence of stillbirth between 2014 and 2023. The spatial analysis was further conducted per year to visualize the stillbirths spread change over time. All data management and statistical analysis were carried out in Excel, STATA and R programming language and GIS tool for mapping.

3.0 Result Summary I – Descriptive Analysis

3.1 Total Livebirth per State

The total livebirths in each state in Nigeria from 2014 to 2023 is shown in table 3.1. The highest total livebirths were reported in Kaduna state, with 131,171 average total livebirths in the ten years period. This was followed by Bauchi state with average total livebirths of 116,419, while the least total livebirths (an average of 4,715) was reported from Bayelsa state. There is a yearly increase in total livebirths with the least and highest occurrences in 2014 and 2023 respectively.

Table 1: Total Live Births per State between 2014 and 2023 in Nigeria

State	Year										Overall (Average)
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
Abia State	10064	9101	12611	13628	14824	20358	16951	18438	18881	15803	15066
Adamawa State	34442	49867	104310	136389	107482	107397	92161	107143	113307	119183	97169
Akwa-Ibom State	9762	10505	13348	12089	7421	7239	8441	10413	11000	9940	10016
Anambra state	24860	28895	24624	21613	26968	32467	27557	27010	27565	30504	27207
Bauchi State	50905	62611	71623	85272	106120	132916	144426	141668	174452	194188	116419
Benue State	27032	28418	26176	25281	19631	28176	20765	25140	31751	34886	26726
Borno State	1542	58	5667	29537	54584	78208	145800	86927	89014	99060	59040
Bayelsa State	4852	5523	3724	2691	3886	6160	4723	4109	5063	6415	4715
Cross River State	22097	20235	21502	24250	31603	32539	32852	32750	33429	35873	28713
Delta State	23314	12387	16937	19561	24117	38512	41534	46067	49231	48910	32057
Ebonyi State	17092	18918	18968	16352	16645	15869	21531	23871	25887	30103	20524
Edo State	19324	12604	16128	15630	15671	16779	15252	16011	16031	19722	16316
Ekiti State	10876	10823	8646	8490	6568	8000	6817	6903	7215	9184	8353
Enugu State	19341	23800	14113	21166	18494	15449	13653	11843	11831	18264	16796
Federal Capital Territory	26404	30271	26465	33217	35014	33430	34620	46339	48512	50624	36490
Gombe State	29559	38446	47579	58453	60733	77863	75380	70454	73305	74825	60660
Imo State	10607	11290	16778	14507	14445	15667	13540	12072	13278	10358	13255
Jigawa State	55429	54409	50170	59982	81550	99282	100217	106042	141502	181097	92968
Kaduna State	79955	79455	92620	96845	111047	141260	151521	168330	185949	204719	131171
Kebbi State	17707	17282	26906	29673	39111	65843	82637	82518	92566	103994	55824
Kano State	60351	55120	83463	81082	88208	89848	101119	128453	155263	153840	99675
Kogi State	14575	16505	17010	23400	29025	33233	18331	10048	17830	27583	20754
Katsina State	43782	45782	61058	68131	90159	103849	98476	107381	107549	106136	83231
Kwara State	11518	2966	11992	15496	14216	22358	19362	20439	20740	21977	16107
Lagos State	109261	111865	108395	106450	110415	103065	90043	76868	84601	93346	99431
Nasarawa State	22318	36143	42276	58569	53589	57276	46644	50598	59688	71018	49812
Niger State	36000	36608	44877	49484	59981	71500	76418	81587	92906	110982	66035
Ogun State	34388	25647	27873	41581	35649	40989	34077	29522	28854	32551	33114
Ondo State	34454	46672	54645	63502	37785	34105	31673	28904	25415	22899	38006
Osun State	18913	8831	18334	17166	19852	20936	23603	25234	26747	28573	20819
Oyo State	67200	66586	61898	61088	56753	63983	61170	58343	62813	66017	62586
Plateau State	11267	6939	10694	12904	12319	18314	17112	16678	21108	22034	14937
Rivers State	12197	9056	15379	17482	16084	18189	15170	15785	17478	16318	15314
Sokoto State	20082	17938	20225	28874	43105	63379	61760	56576	99011	105123	51608
Taraba State	8243	7571	15856	21023	20965	37808	38000	24135	28134	37459	23920
Yobe State	9578	16218	23448	37341	39766	79300	95243	62803	84866	102001	55057
Zamfara State	25328	24106	25519	26819	29629	29373	31431	30018	33888	37156	29327
Overall (Average)	27963	28634	34104	39325	41985	50296	51622	50471	57748	63586	44574

3.2 Total Stillbirths per State

Table 3.2 presents the total stillbirths per state between 2014 and 2023. Highest total stillbirths were reported from Katsina state with an average of 4504. This was followed by 3384 average total stillbirths reported from Bauchi state, while the least average total stillbirths of 105 were reported from Ekiti state. Also, there is an increase and decrease in yearly stillbirths' total reported with least (841) and highest (1247) occurrences in 2014 and 2023 respectively.

Table 2: Total Still Births per State between 2014 and 2023

State	Year										Overall (Average)
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
Abia State	179	168	177	213	243	337	386	331	302	197	254
Adamawa State	842	839	1090	1588	1279	1338	1120	1021	1382	1430	1193
Akwa-Ibom State	273	413	443	448	292	220	253	382	361	324	341
Anambra state	478	447	433	268	416	477	524	421	424	537	443
Bauchi State	2573	3337	2562	2759	3412	3644	3538	3738	4187	4081	3384
Benue State	777	745	689	614	480	688	524	659	530	660	637
Borno State	28	2	66	3295	1063	1336	1556	1825	1301	1671	1215
Bayelsa State	79	119	65	57	73	166	156	188	140	117	116
Cross River State	486	450	480	469	431	471	416	481	410	384	448
Delta State	474	315	431	547	667	1022	1107	1226	1169	1166	813
Ebonyi State	413	563	518	372	441	347	551	581	511	730	503
Edo State	253	263	206	207	176	164	180	193	158	344	215
Ekiti State	130	146	112	124	92	113	73	91	57	109	105
Enugu State	458	1481	227	400	420	226	178	156	109	214	387
Federal Capital Territory	459	638	535	471	649	607	924	942	1176	1021	743
Gombe State	1108	10669	1422	1811	1746	2425	1966	1435	1761	1756	2610
Imo State	232	189	322	198	265	273	265	260	235	149	239
Jigawa State	2966	2279	1924	2332	2478	3433	3685	3160	4187	3449	2990
Kaduna State	2040	1854	1748	1796	2007	1964	2153	2272	3004	2737	2158
Kebbi State	1088	874	849	1102	1482	2114	1826	2945	2702	3102	1809
Kano State	3590	2994	3497	2788	3123	2705	2846	2183	2533	2791	2905
Kogi State	311	280	344	423	399	364	275	286	248	243	318
Katsina State	2177	2555	5242	4633	5498	4447	5281	5219	5222	4760	4504
Kwara State	169	59	164	106	143	313	301	364	309	307	224
Lagos State	2161	1825	2312	1938	3248	1680	1311	1274	1352	1488	1859
Nasarawa State	573	606	508	773	724	555	929	827	926	908	733
Niger State	1100	1111	1255	1167	1145	1249	1726	1591	1495	1790	1363
Ogun State	433	283	303	574	433	425	439	330	292	437	395
Ondo State	634	898	325	570	517	472	461	499	392	308	508
Osun State	147	64	106	111	130	155	287	172	206	289	167
Oyo State	1007	939	840	816	664	2066	839	836	1027	985	1002
Plateau State	170	118	186	220	226	444	328	343	398	309	275
Rivers State	351	244	457	391	365	383	331	380	388	365	366
Sokoto State	750	639	1259	1359	2153	1932	1939	1951	2280	2815	1708
Taraba State	315	290	572	1727	945	986	913	394	654	518	732
Yobe State	287	360	686	1283	1500	1549	1243	1545	1645	1574	1168
Zamfara State	1589	1364	1243	1535	1722	1612	1603	1742	1700	2039	1615

Overall (Average)	841	1093	909	1068	1110	1155	1147	1142	1221	1247	1094

3.3 Stillbirth Rate per 1000 Total Births

The table 3.3 below presents the stillbirth rate per total births between 2014 and 2023. Stillbirths rate is highest in Zamfara state with 53 per 1000 total births. This was closely followed by Katsina state with stillbirths' rate of 52 per 1000 total births. Overall, stillbirth rate is 24 (22.8 – 25.2) per 1000 total births between 2014 and 2023 in Nigeria. SBR was highest in 2015 (37 per 1000 total births) and continue to decrease with lowest SBR (20 per 1000 total births) in 2023.

Table 3.3 Stillbirths Rate per 1000 Total Births between 2014 and 2023

State	Year										Overall (Average)	Rank
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023		
Abia	18	19	14	16	17	17	23	18	16	13	17 [15.4, 18.6]	24
Adamawa	24	17	11	12	12	13	13	10	13	12	13 [11.7, 14.3]	33
Akwa-Ibom	28	38	33	36	38	30	30	36	32	32	33 [28.2, 39.8]	4
Anambra	19	16	18	13	16	15	19	16	16	18	17 [15.4, 18.6]	24
Bauchi	49	51	35	32	32	27	24	26	24	21	29 [26.3, 31.7]	9
Benue	28	26	26	24	24	24	25	26	17	19	24 [21.9, 24.1]	14
Borno	18	34	12	101	20	17	11	21	15	17	21 [12.4, 27.6]	18
Bayelsa	17	22	18	21	19	27	32	44	27	18	25 [21.0, 25.0]	14
Cross River	22	22	22	19	14	15	13	15	13	11	16 [14.5, 17.5]	27
Delta	20	25	25	28	27	26	26	26	24	24	25 [23.8, 26.2]	11
Ebonyi	24	29	27	23	26	22	25	24	20	24	24 [22.7, 25.3]	12
Edo	13	21	13	14	12	10	12	12	10	18	13 [12.1, 15.9]	31
Ekiti	12	14	13	15	14	14	11	14	8	12	13 [12.1, 13.9]	33
Enugu	24	59	16	19	23	15	13	14	10	12	23 [18.3, 27.7]	14
FCT	18	21	20	14	19	18	26	20	24	20	20 [18.8, 21.2]	18
Gombe	37	218	30	31	28	31	26	20	24	23	42 [30.2, 53.8]	3
Imo	22	17	19	14	19	18	20	22	18	15	18 [16.6, 19.4]	22
Jigawa	51	41	37	38	30	34	36	29	29	19	32 [29.0, 33.0]	7
Kaduna	25	23	19	19	18	14	15	14	16	14	17 [15.3, 18.7]	24
Kebbi	58	49	31	36	37	32	22	35	29	29	32 [28.7, 35.3]	6
Kano	57	52	41	34	35	30	28	17	17	18	29 [20.3, 35.7]	10
Kogi	21	17	20	18	14	11	15	28	14	9	16 [13.6, 16.4]	29

Katsina	48	53	80	64	58	42	51	47	47	43	52 [47.7, 54.3]	2
Kwara	15	20	14	7	10	14	16	18	15	14	14 [12.8, 15.2]	31
Lagos	20	17	21	18	29	17	15	17	16	16	19 [17.2, 20.8]	21
Nasarawa	26	17	12	14	14	10	20	17	16	13	15 [13.9, 16.1]	29
Niger	30	30	28	24	19	18	23	20	16	16	21 [18.1, 21.9]	18
Ogun	13	11	11	14	13	11	13	12	11	14	12 [11.3, 12.7]	36
Ondo	19	19	6	9	14	14	15	17	16	14	14 [12.0, 14.0]	33
Osun	8	8	6	7	7	8	13	7	8	11	8 [7.08, 8.92]	37
Oyo	15	14	14	14	12	32	14	15	17	15	16 [13.0, 19.0]	27
Plateau	15	17	18	17	19	24	19	21	19	14	19 [17.6, 20.4]	22
Rivers	28	27	29	22	23	21	22	24	22	22	24 [22.0, 26.0]	12
Sokoto	37	35	59	45	48	30	31	34	23	27	33 [29.3, 36.7]	5
Taraba	37	37	35	76	44	26	24	17	23	14	30 [26.2, 33.8]	8
Yobe	30	22	29	34	37	20	13	25	20	16	21 [18.9, 23.1]	17
Zamfara	60	54	47	55	55	53	49	55	48	53	53 [51.2, 54.8]	1
Overall	30 [28.3, 30.2]	37 [36.8, 37.7]	26 [25.0, 26.9]	27 [25.9, 27.8]	26 [24.9, 26.8]	23 [21.6, 23.4]	22 [18.7, 20.6]	23 [20.8, 22.7]	21 [19.8, 21.6]	20 [18.3, 20.1]	24 [22.8, 25.2]	

Figure 3.1 shows decreasing patterns of SBR across the state. Zamfara and Katsina reported the highest SBR with 53 and 52 stillbirths per 1000 total births respectively, while SBR was lowest in Osun with 8 per 1000 total births. Nationally, SBR was 24 per 1000 total births.

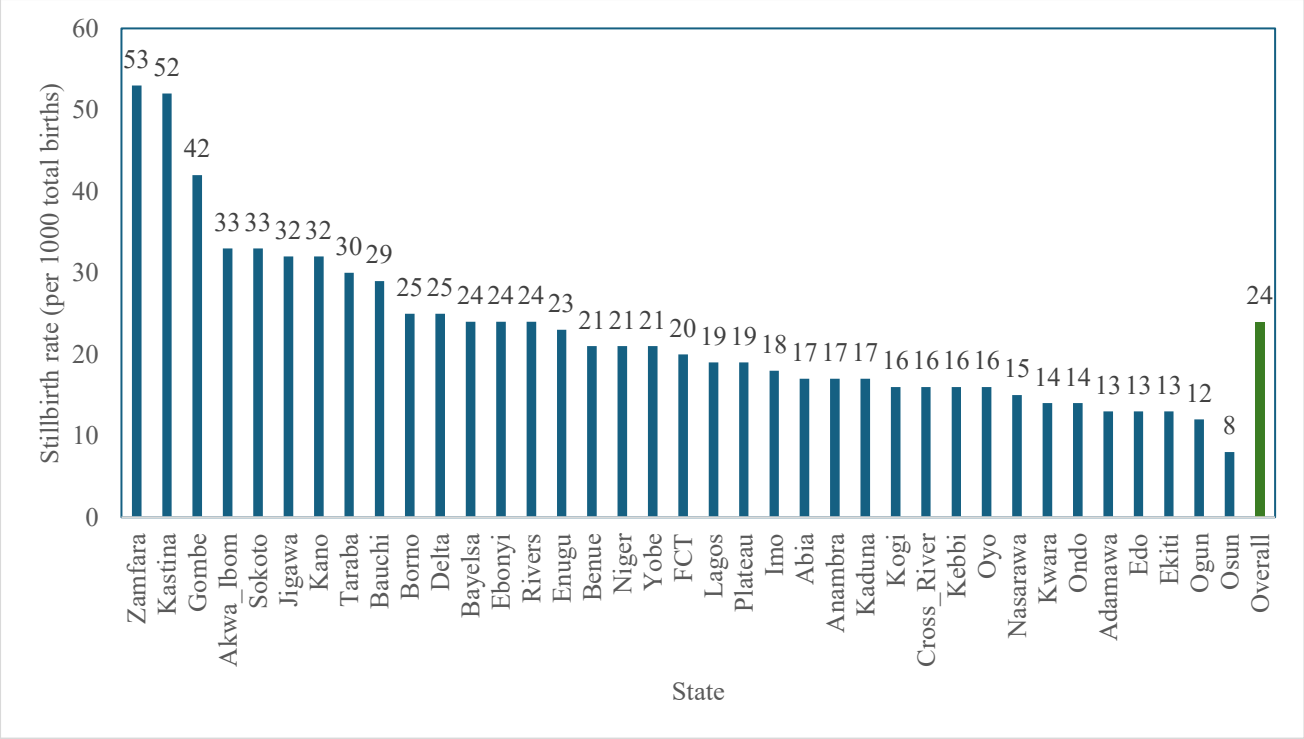


Figure 3.1: Stillbirth Rate per 1000 Total Births across State in Nigeria

3.4 Regional Variation in Stillbirth Rate

Regional variation in SBR between 2014 and 2023 was presented in table 3.4. Overall, SBR was highest in northwest (34 per 1000 total births), and lowest in southwest (16 per 1000 total births).

Table 3.4: Regional Variation in Stillbirth Rate between 2014 and 2023

Geopolitical Zone	Year										Overall (Average)
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
North-central	24	23	21	17	17	16	22	20	18	16	19
North-east	37	82	24	33	25	22	18	20	20	18	30
North-west	45	41	42	39	37	30	30	28	26	24	34
South-east	22	31	19	17	20	17	21	19	16	18	20
South-south	21	26	24	23	20	20	21	23	20	20	22
South-west	17	16	15	14	19	18	14	14	14	15	16

Figure 3.2 shows the yearly distribution of SBR across the region from 2014 to 2023. SBR was consistently highest in the northwest compared to other regions, excepts for the year 2015.

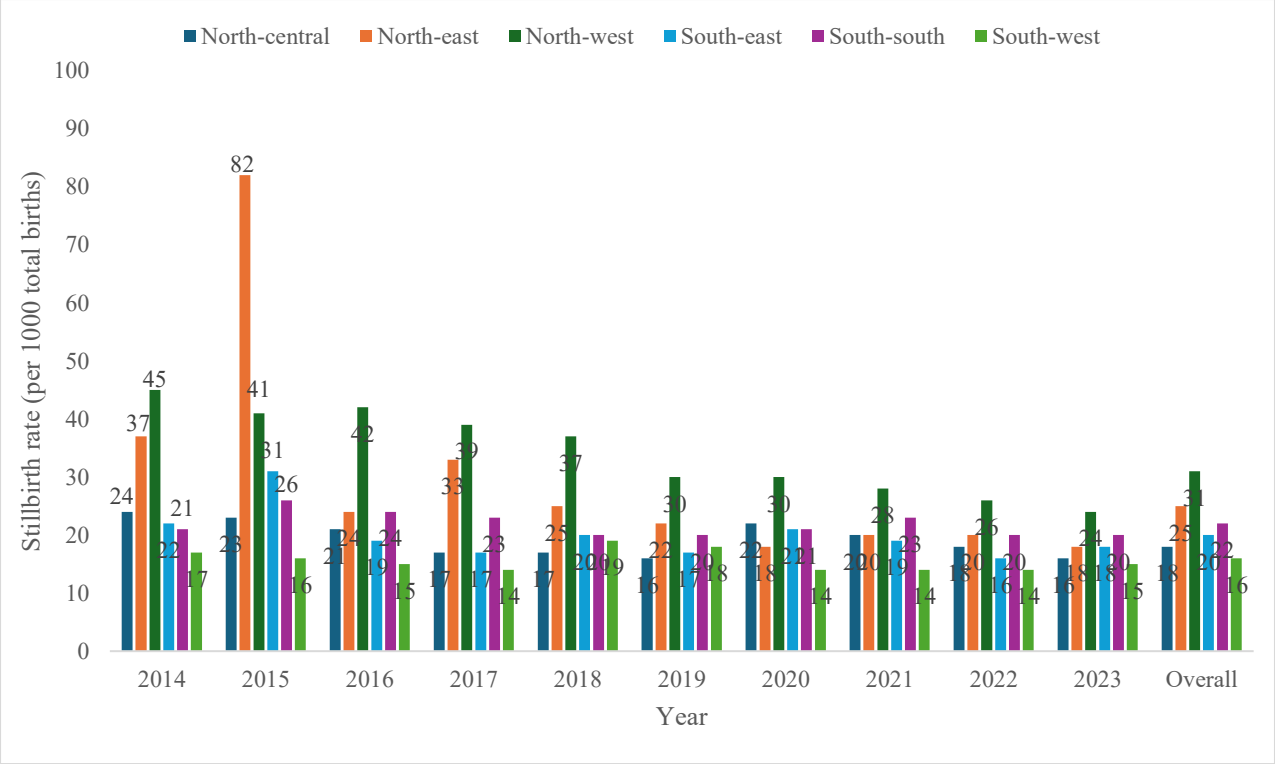


Figure 3.2: Regional Variation in Stillbirth Rate between 2014 and 2023

3.5 Proportion of Fresh Stillbirths by State and Region

The percentage of fresh stillbirth type were presented in table 3.5 by state and in 3.6 by the region. Fresh stillbirth is more frequent in Niger, with 58% of stillbirth a fresh type and

closely followed by FCT (57%). Highlighting the 51% highest proportion from northcentral across the region. Fresh stillbirths are less frequent in Ekiti, with only 31% of stillbirths fresh.

Table 3.5: Percentage of Fresh Stillbirth by State between 2014 and 2023

State	Year										Overall (95% CI)
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
Abia	32	24	42	38	42	40	42	90	66	66	39 [36.0, 42.0]
Adamawa	31	33	28	32	43	43	95	58	57	55	37 [34.6, 39.4]
Akwa-Ibom	41	29	39	48	42	39	52	57	53	63	45 [41.1, 48.9]
Anambra	57	66	56	62	46	56	87	62	68	56	55 [52.1, 57.9]
Bauchi	33	22	45	44	42	41	83	48	46	46	39 [36.8, 41.2]
Benue	49	51	47	52	56	49	62	76	66	61	50 [46.7, 53.3]
Borno	39	50	29	26	58	70	69	70	58	73	48 [43.5, 52.5]
Bayelsa	56	50	51	42	67	54	63	49	67	71	53 [48.7, 57.3]
Cross River	44	45	47	45	45	43	47	41	52	47	47 [44.5, 49.5]
Delta	42	29	25	26	43	40	63	49	48	53	35 [32.2, 37.8]
Ebonyi	44	47	50	57	57	50	48	75	50	49	51 [48.4, 53.6]
Edo	44	29	61	42	35	40	71	62	66	48	46 [42.0, 50.0]
Ekiti	42	25	24	15	13	35	18	80	74	70	31 [27.8, 34.2]
Enugu	27	21	47	31	19	42	98	64	58	53	40 [36.3, 43.7]
FCT	51	46	46	65	66	61	86	57	57	54	57 [53.9, 60.1]
Gombe	34	59	37	42	41	35	80	52	49	47	39 [36.6, 41.4]
Imo	33	59	31	48	51	48	97	50	35	50	46 [42.6, 49.4]
Jigawa	39	43	59	54	61	64	75	60	71	70	56 [53.4, 58.6]
Kaduna	43	45	61	100	51	45	89	54	58	44	50 [47.3, 52.7]
Kebbi	34	33	29	42	40	41	52	62	39	31	40 [37.1, 42.9]
Kano	29	38	36	46	46	52	59	58	48	52	44 [41.1, 46.9]
Kogi	48	51	44	41	42	44	46	53	58	62	45 [42.1, 47.9]
Katsina	45	35	36	54	51	56	78	58	54	53	47 [44.2, 49.8]
Kwara	30	41	53	43	32	27	43	67	70	67	41 [36.8, 45.2]
Lagos	37	41	37	39	37	42	42	99	55	54	41 [39.1, 42.9]
Nasarawa	40	42	55	62	63	85	72	65	64	60	56 [52.0, 60.0]
Niger	40	48	54	62	75	69	82	60	62	59	58 [53.9, 62.1]
Ogun	45	45	43	43	43	41	36	95	63	65	44 [41.2, 46.8]
Ondo	44	27	20	43	59	64	43	55	47	47	43 [39.4, 46.6]
Osun	31	23	23	33	44	45	44	85	83	71	42 [37.3, 46.7]
Oyo	37	33	37	35	45	14	70	66	65	59	37 [34.6, 39.4]
Plateau	52	53	37	51	64	42	48	88	67	64	48 [44.7, 51.3]
Rivers	42	37	53	50	43	45	37	77	57	58	46 [43.0, 49.0]
Sokoto	18	46	34	42	35	39	39	77	50	53	38 [35.3, 40.7]
Taraba	48	40	33	25	39	41	84	66	62	57	39 [36.0, 42.0]
Yobe	39	38	44	36	36	43	97	52	53	56	42 [39.1, 44.9]
Zamfara	57	50	49	59	42	58	49	99	48	45	50 [48.1, 51.9]
Overall	43	43	44	45	48	48	46	30	43	44	45 [43.2, 28.8]

Table 3.6: Percentage of Fresh Stillbirth by Region between 2014 and 2023

Geopolitical Zone	Year										Overall (95% CI)
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
North-central	49	51	47	52	56	49	62	76	66	61	51 [49.6, 52.4]
North-east	31	33	28	32	43	43	95	58	57	55	40 [38.8, 41.2]
North-west	39	43	59	54	61	64	75	60	71	70	46 [44.9, 47.1]
South-east	32	24	42	38	42	40	42	90	66	66	46 [44.5, 47.5]
South-south	41	29	39	48	42	39	52	57	53	63	45 [43.6, 46.4]
South-west	42	25	24	15	13	35	18	80	74	70	40 [38.7, 41.3]

Proportion of Macerated Stillbirths by State and Region

Table 3.7 and 3.8 presents the macerated stillbirths by state and region respectively. As high as 67% of stillbirths in Delta state were macerated. Overall, macerated stillbirths (contributed to 60% of stillbirths) are more frequent in Nigeria than fresh stillbirths, with northeast and southwest contributing equal proportion of 60% compared to other regions in Nigeria.

Table 3.7: Percentage of Macerated Stillbirth by State between 2014 and 2023

State	Year										Overall (95% CI)
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
Abia	68	76	58	62	58	60	58	10	34	35	61 [59.0, 65.0]
Adamawa	69	67	72	68	57	58	54	42	43	45	63 [61.6, 66.4]
Akwa-Ibom	59	71	61	52	58	61	48	43	47	37	55 [52.1, 59.9]
Anambra	43	34	44	38	54	44	13	38	32	44	45 [43.1, 48.9]
Bauchi	67	78	55	56	58	59	17	52	55	54	61 [59.8, 64.2]
Benue	51	49	53	48	44	51	38	24	35	40	50 [47.7, 54.3]
Borno	61	50	71	75	42	30	31	30	42	27	52 [48.5, 57.5]
Bayelsa	44	50	49	58	33	46	37	51	33	29	47 [43.7, 52.3]
Cross River	56	55	53	55	55	57	53	59	48	53	53 [51.5, 56.5]
Delta	58	71	76	74	57	60	37	51	52	47	67 [63.2, 68.8]
Ebonyi	56	53	50	43	44	50	53	25	50	52	49 [47.4, 52.6]
Edo	56	72	39	85	65	60	29	38	34	52	56 [51.0, 59.0]
Ekiti	58	75	76	69	87	66	82	20	26	30	60 [66.8, 73.2]
Enugu	73	79	53	66	81	58	23	37	42	47	60 [57.3, 64.7]
FCT	49	54	54	35	33	39	14	43	43	46	43 [40.9, 47.1]
Gombe	66	94	63	58	59	65	20	48	51	54	61 [59.6, 64.4]
Imo	67	41	69	53	49	52	30	50	65	50	54 [51.6, 58.4]
Jigawa	61	57	41	46	39	37	25	40	29	30	44 [42.4, 47.6]
Kaduna	58	55	39	45	49	55	11	46	42	56	50 [48.3, 53.7]
Kebbi	66	67	72	58	60	59	48	38	61	69	60 [58.1, 63.9]
Kano	71	62	64	54	54	48	41	42	52	48	56 [54.1, 59.9]
Kogi	52	49	56	59	58	56	55	47	42	38	55 [53.1, 58.9]
Katsina	55	66	64	46	49	45	22	43	46	47	53 [51.2, 56.8]
Kwara	70	59	47	57	69	74	58	33	30	33	59 [55.8, 64.2]
Lagos	63	59	63	61	63	58	58	79	45	46	59 [58.1, 61.9]
Nasarawa	60	58	45	38	37	15	27	35	36	40	44 [41.0, 49.0]
Niger	60	52	47	39	25	31	19	40	38	41	42 [38.9, 47.1]
Ogun	55	55	57	57	58	60	64	55	37	36	56 [54.2, 59.8]
Ondo	56	73	80	57	41	36	57	45	53	53	57 [54.4, 61.6]
Osun	69	77	77	67	56	56	56	15	18	29	58 [54.3, 63.7]
Oyo	63	68	63	65	55	86	30	34	35	42	63 [61.6, 66.4]
Plateau	48	47	63	50	36	58	52	12	33	36	52 [49.7, 56.3]
Rivers	58	63	47	50	57	55	63	23	43	42	54 [52.0, 58.0]
Sokoto	82	54	66	59	65	61	61	23	50	48	62 [60.3, 65.7]
Taraba	52	60	67	75	61	59	16	34	39	43	61 [59.0, 65.0]
Yobe	61	62	56	64	64	57	34	48	48	45	58 [56.1, 61.9]
Zamfara	43	50	51	51	58	42	51	14	52	55	50 [49.1, 52.9]
Overall	57	57	56	55	52	52	54	70	60	67	61 [59.0, 65.0]

Table 3.8: Percentage of Macerated Stillbirth by Region between 2014 and 2023

Geopolitical Zone	Year										Overall (95% CI)
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
North-central	51	49	53	48	44	51	38	24	35	40	49 [48.6, 51.4]
North-east	69	67	72	68	57	58	54	42	43	45	60 [59.8, 62.2]
North-west	61	57	41	46	39	37	25	40	29	30	54 [53.9, 56.1]
South-east	68	76	58	64	58	60	58	10	34	35	54 [53.5, 56.5]
South-south	59	71	61	52	58	61	48	43	47	37	55 [54.6, 57.4]
South-west	58	75	76	85	87	66	82	20	26	30	60 [59.7, 62.3]

4.0 Result Summary II – Spatial Analysis

4.1 Spatial Distribution of Stillbirth in Nigeria

Figure 4.1 shows the spatial distribution of stillbirths in Nigeria. There is clustering of high stillbirths' occurrence (>24 per 1000 total births) in the northwest (Sokoto, Zamfara, Katsina, Kano and Jigawa) and some part of the northeastern (Bauchi, Gombe and Taraba) Nigeria. Most of the states presented a stillbirth rate of 12-24 per 1000 total births while only Osun and Ogun reported a stillbirth rate less than the targeted 12 per 1000 total births.

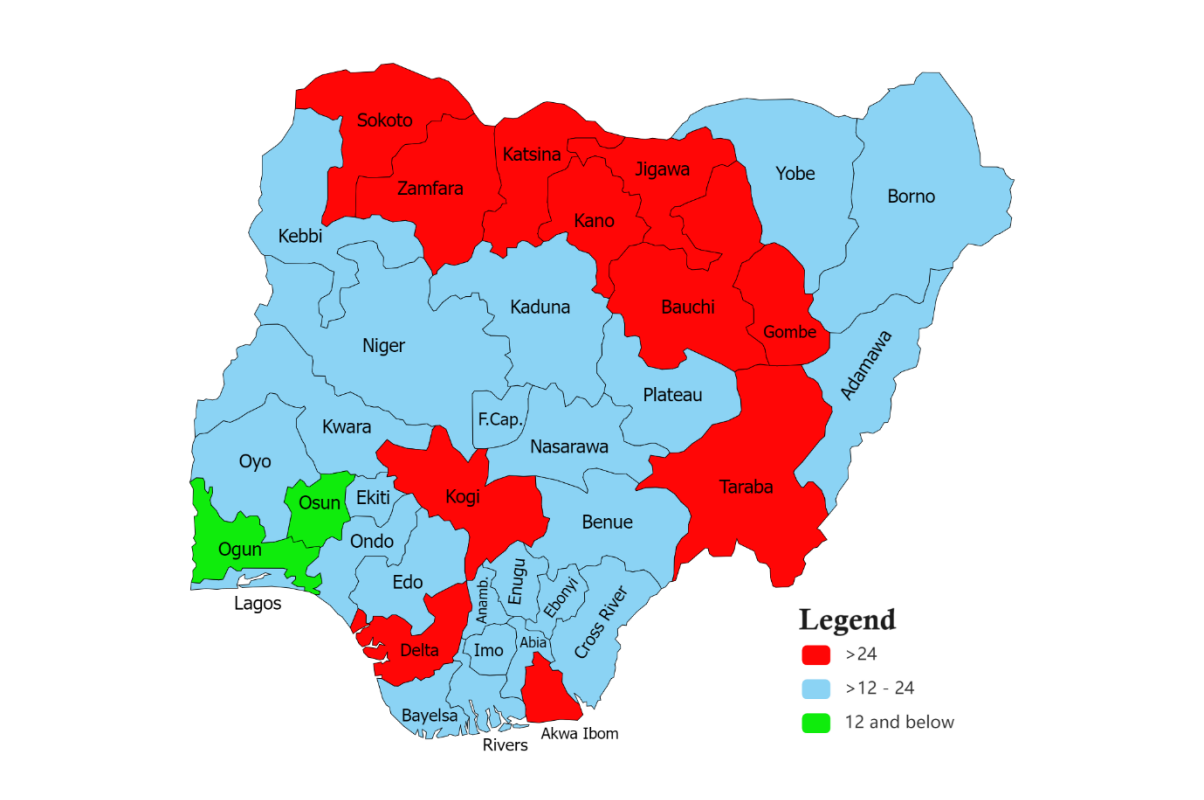


Figure 4.1: Spatial Distribution of Stillbirth Rate in Nigeria, 2014 – 2023.

4.2 Yearly Variation in Spatial Distribution of Stillbirth in Nigeria

Figure 4.2.1 to 4.2.10 shows the yearly change in pattern of stillbirths' occurrence between 2014 and 2023. While17 states (Sokoto, Zamfara, Katsina, Kano, Jigawa, Yobe, Niger, Kaduna, Bauchi, Yobe, Gombe, Nasarawa, Kogi, Taraba, Bayelsa, Rivers, Akwa-Ibom) of the 37 Nigerian states reported stillbirth rate above 24 per 1000 total births as of 2014, the stillbirth rate continues to reduce till only 5 states (Sokoto, Zamfara, Kano, Kogi, Akwa-Ibom) reported stillbirth rate above the 24 per 1000 total births in the year 2023.

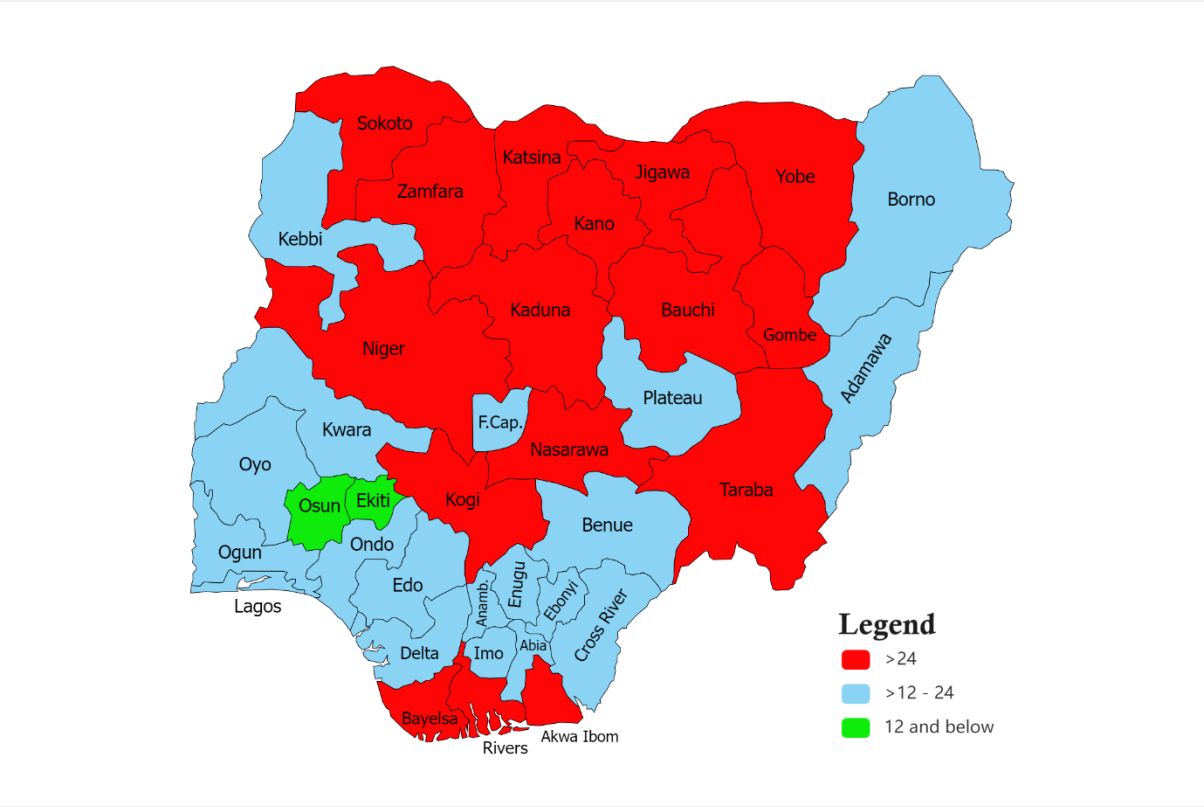


Figure 4.2.1: Spatial Distribution of Stillbirth Rate in Nigeria in 2014

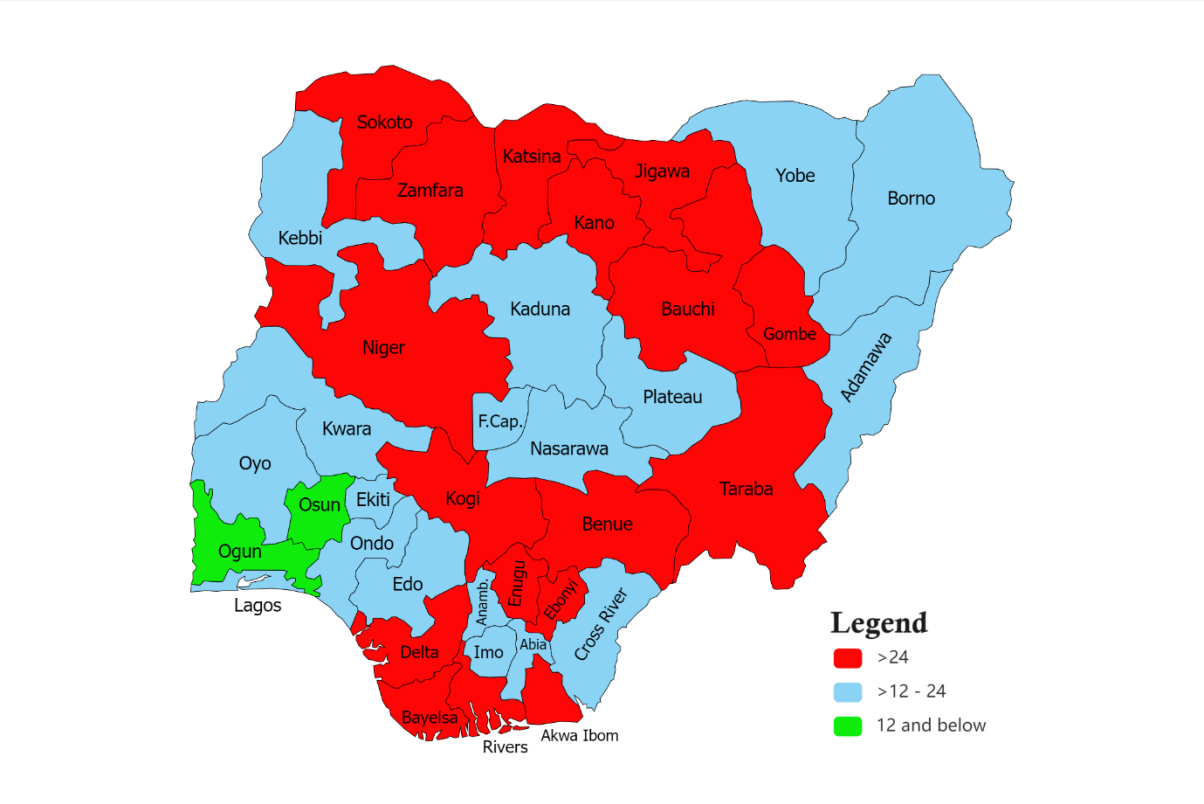


Figure 4.2.2: Spatial Distribution of Stillbirth Rate in Nigeria in 2015

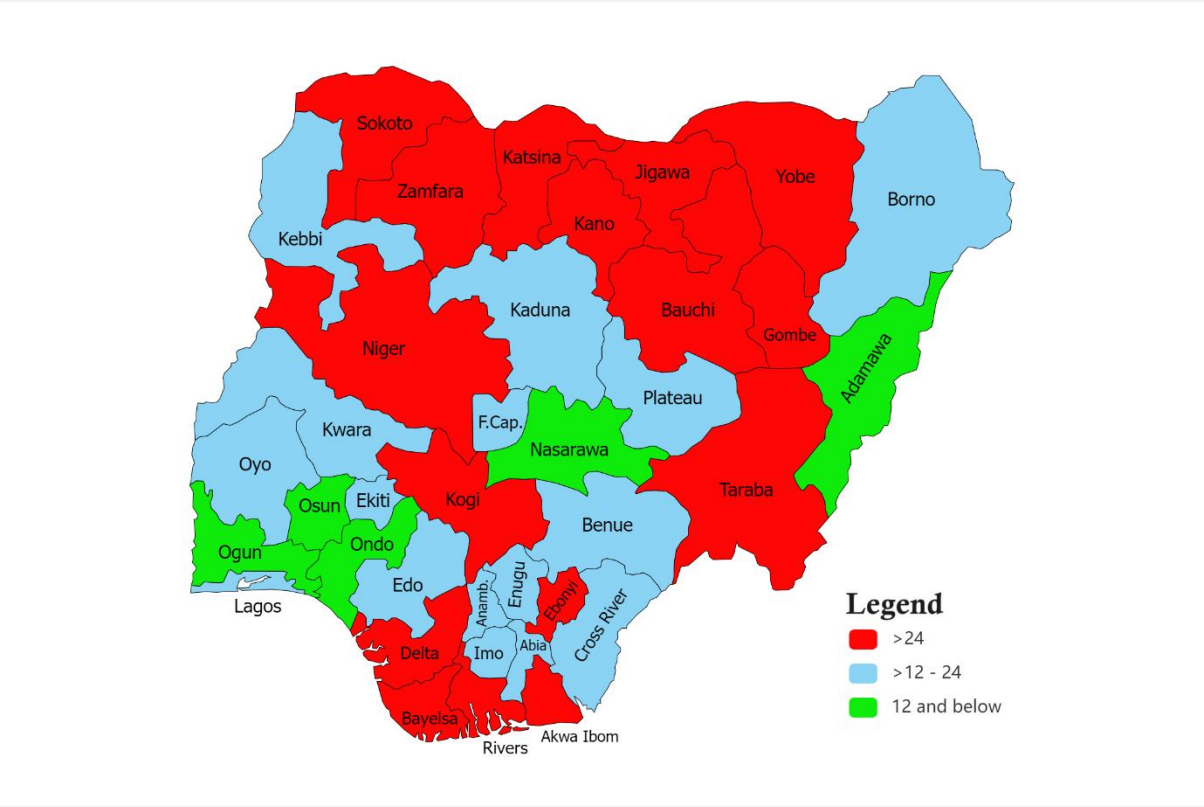


Figure 4.2.3 Spatial Distribution of Stillbirth Rate in Nigeria in 2016

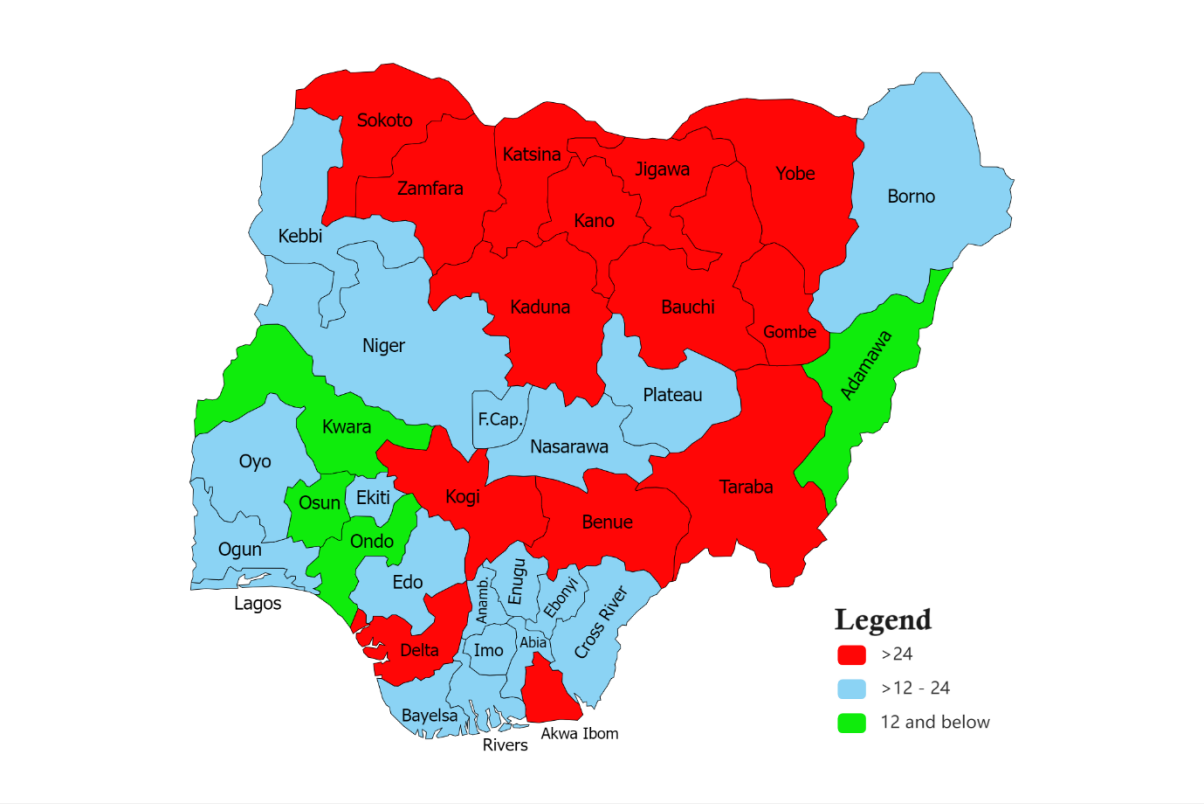


Figure 4.2.4 Spatial Distribution of Stillbirth Rate in Nigeria in 2017

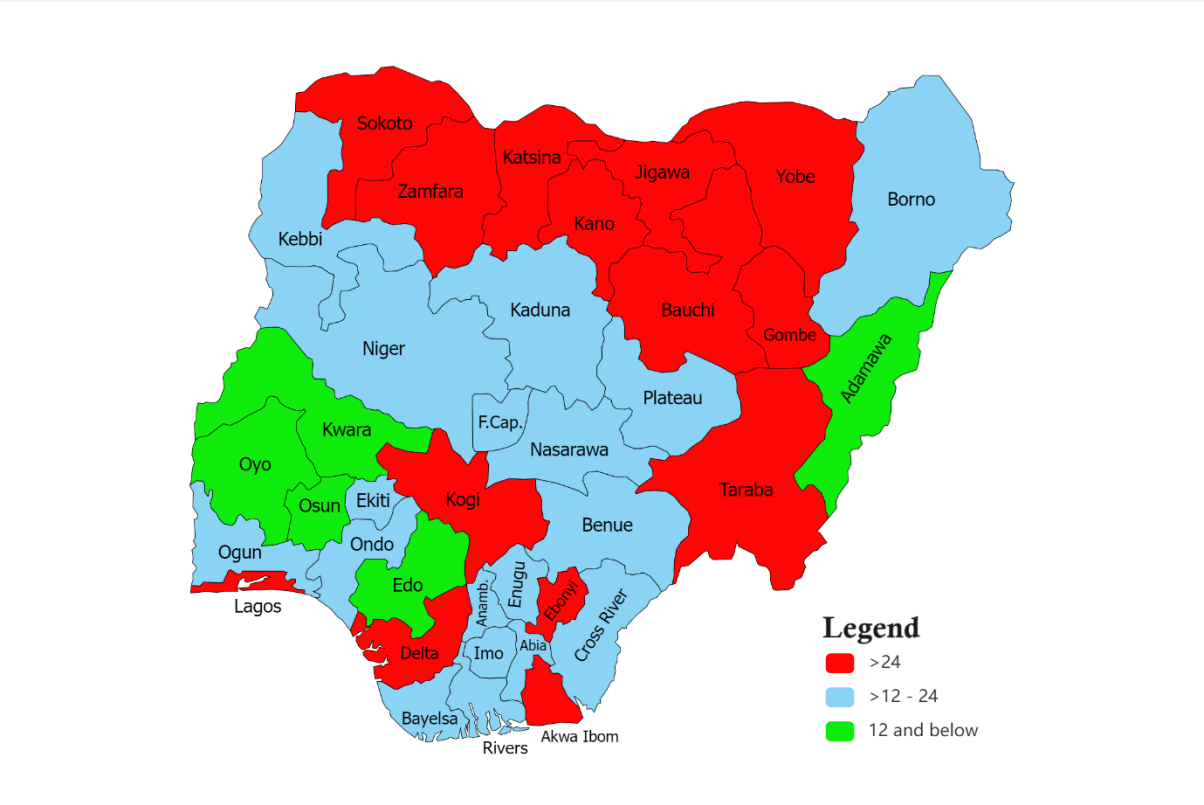


Figure 4.2.5 Spatial Distribution of Stillbirth Rate in Nigeria in 2018

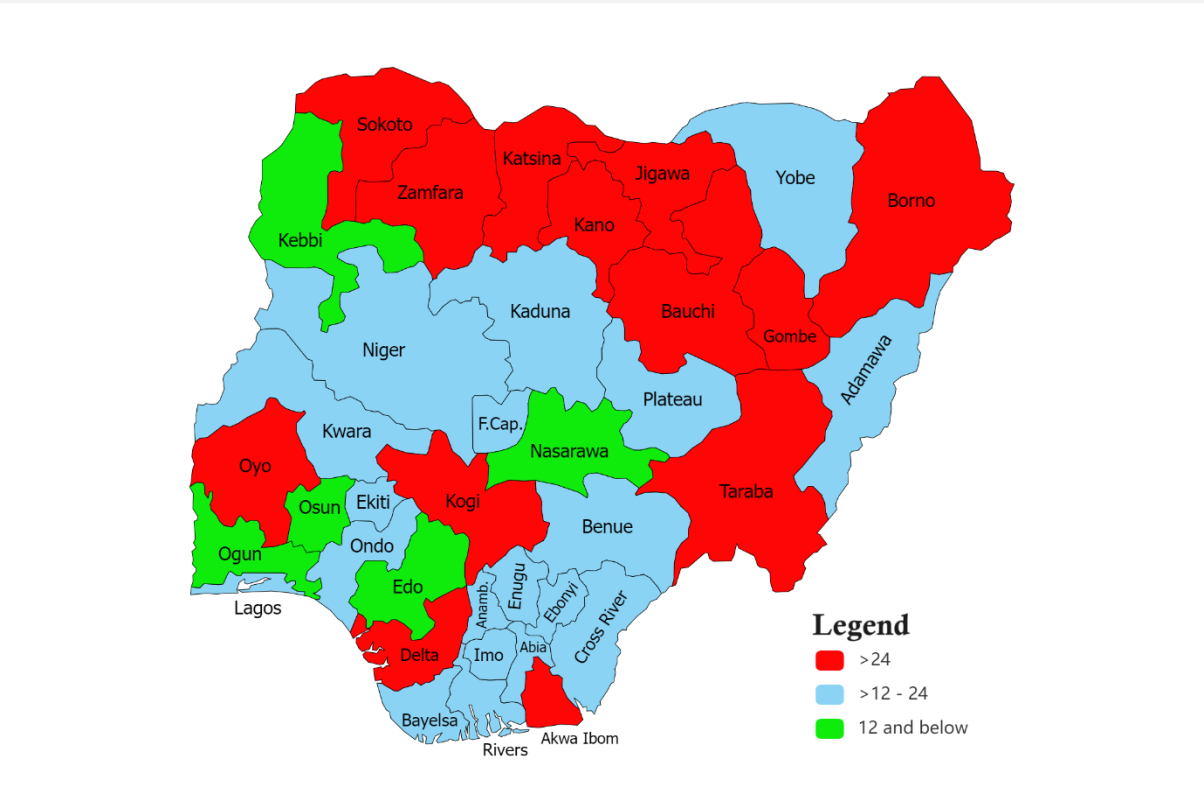


Figure 4.2.6 Spatial Distribution of Stillbirth Rate in Nigeria in 2019

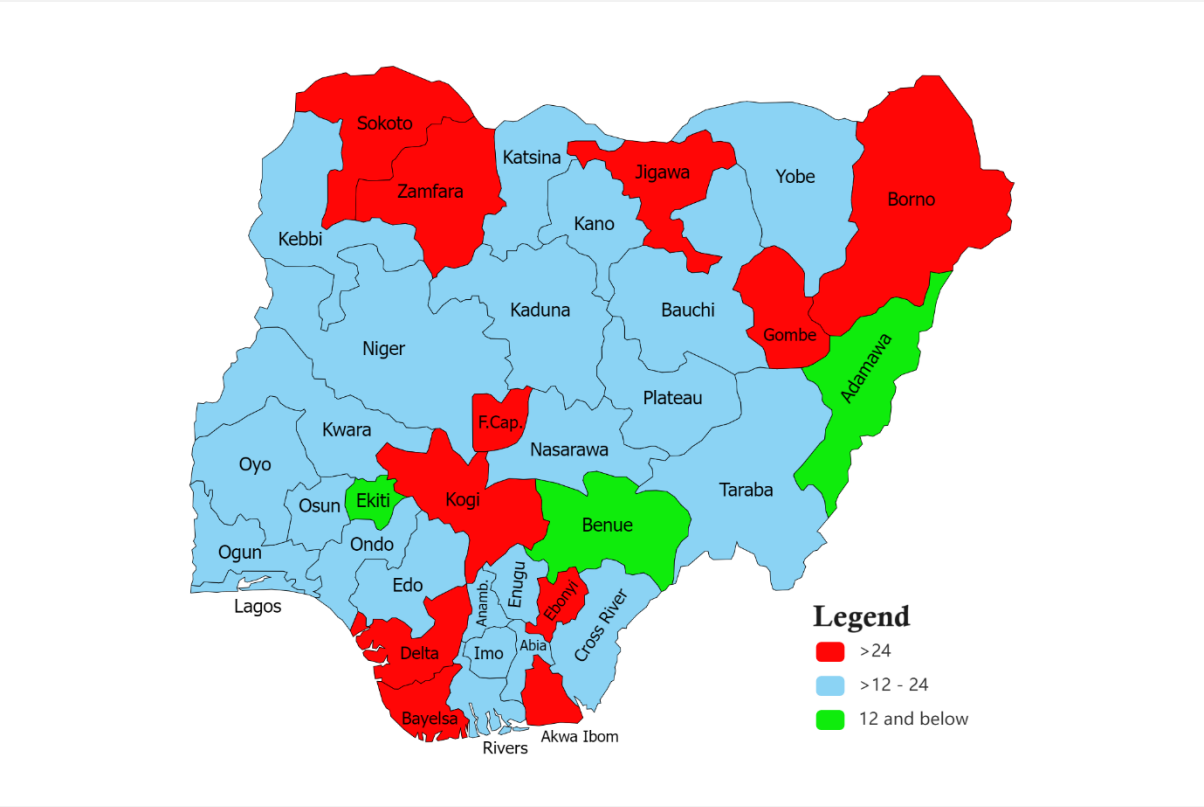


Figure 4.2.7 Spatial Distribution of Stillbirth Rate in Nigeria in 2020

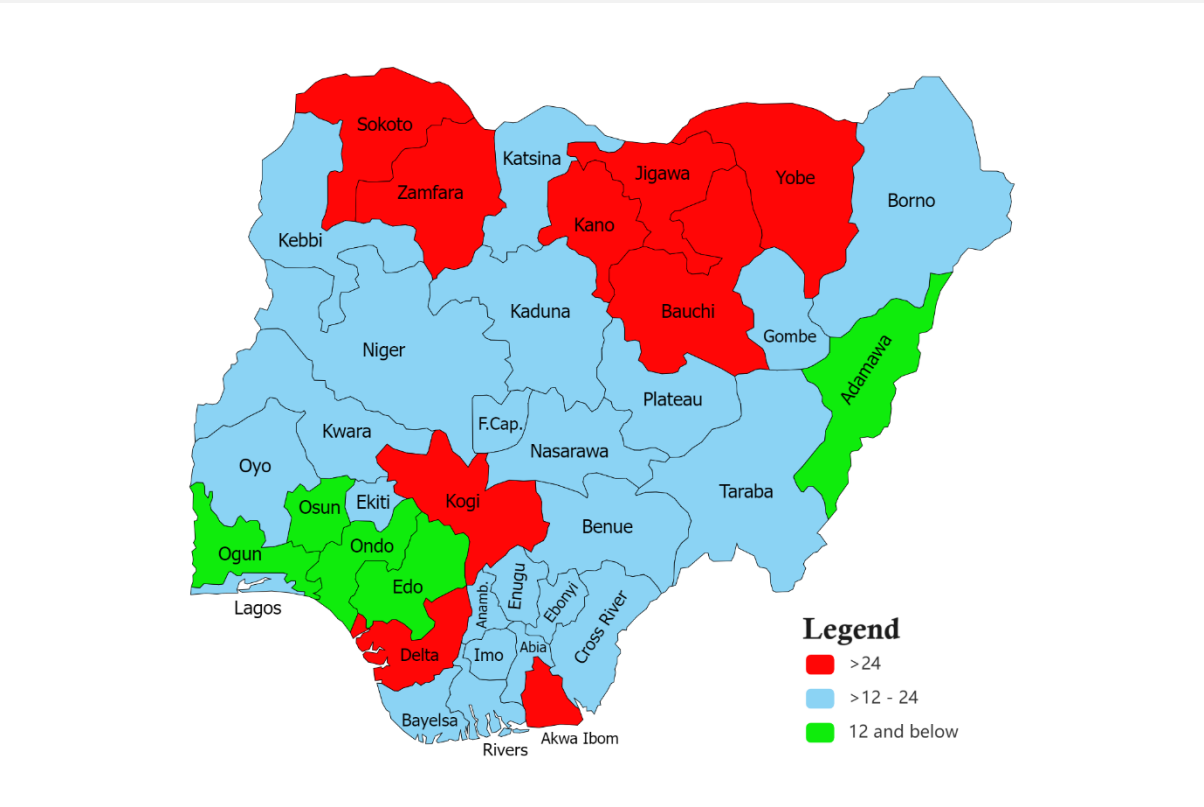


Figure 4.2.8 Spatial Distribution of Stillbirth Rate in Nigeria in 2021

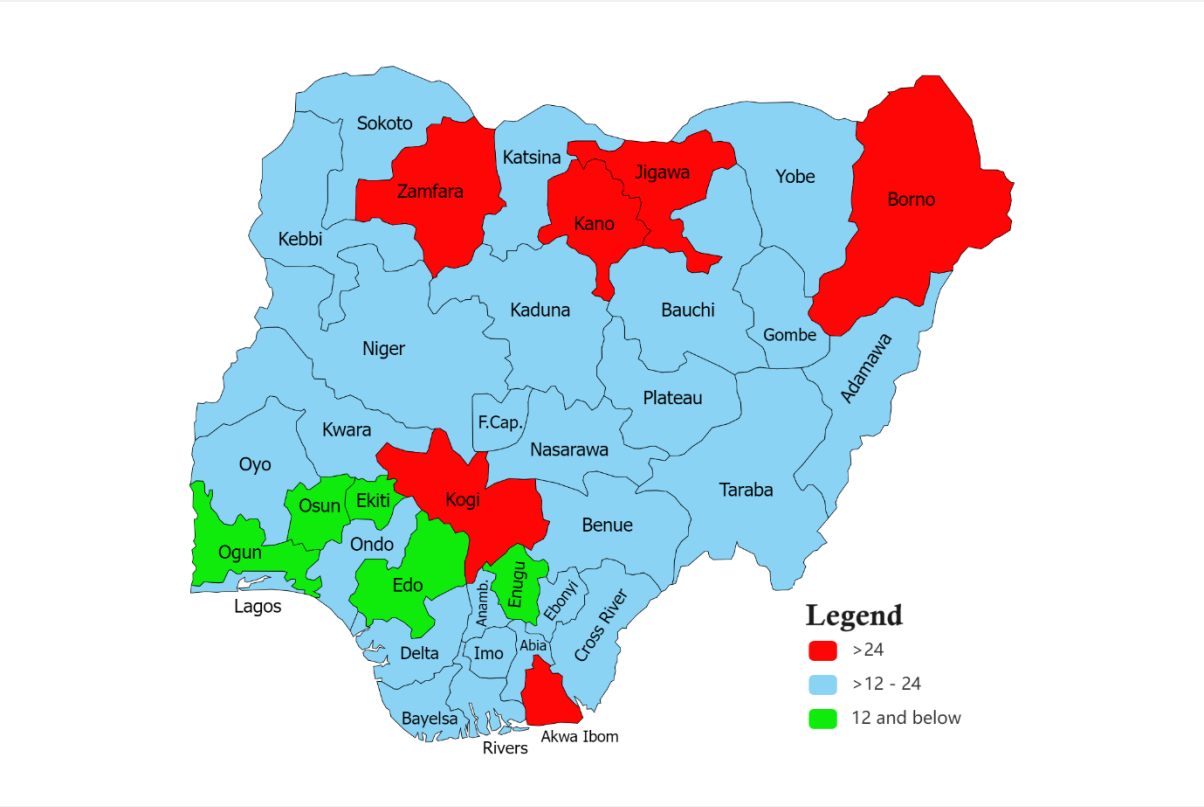


Figure 4.2.9 Spatial Distribution of Stillbirth Rate in Nigeria in 2022

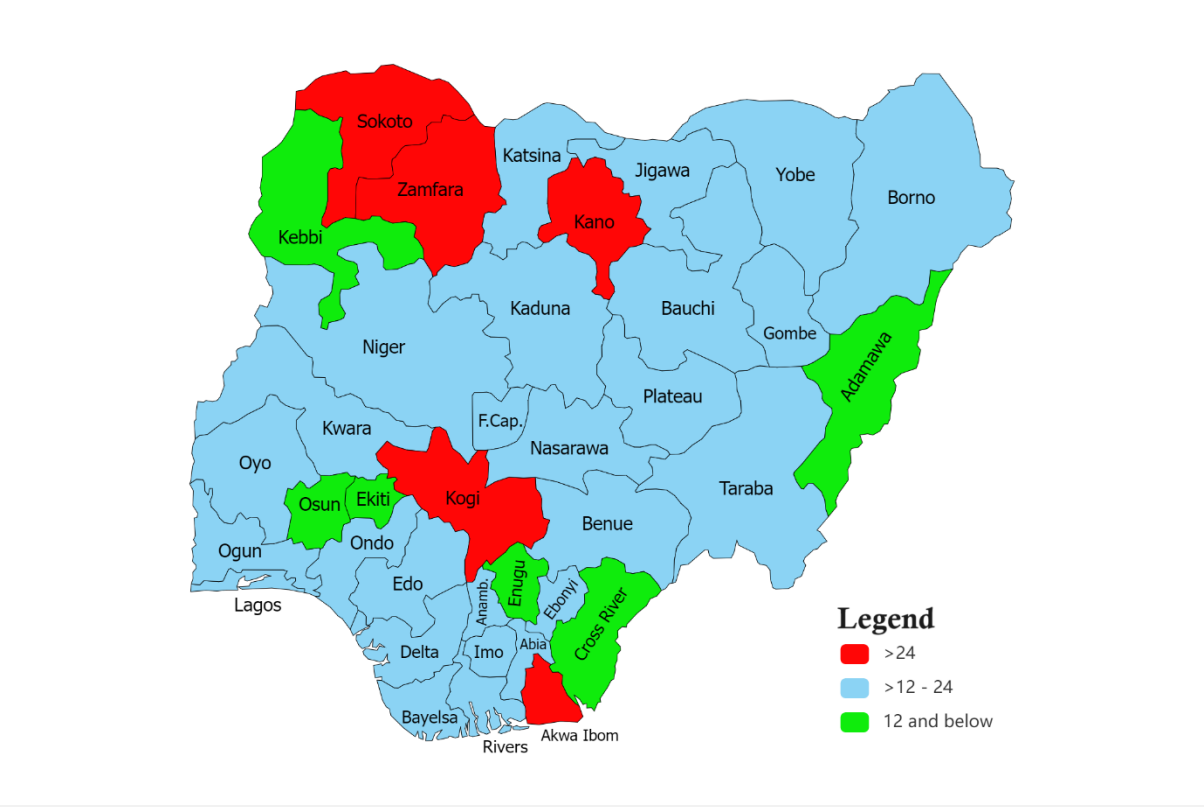


Figure 4.2.10 Spatial Distribution of Stillbirth Rate in Nigeria in 2023

5.0 Result Summary III – Trend Analysis

5.1 Trends in Stillbirth Rate between 2014 and 2023

Figure 5.1 shows the trends in stillbirth rate between 2014 and 2023. Stillbirths increase from 30 per 1000 in 2014 to 37 per 1000 in 2015 with a sharp decline to 26 per 1000 in 2016, followed by a steady decline to 20 per 1000 in 2020 and constant decline in 2023.

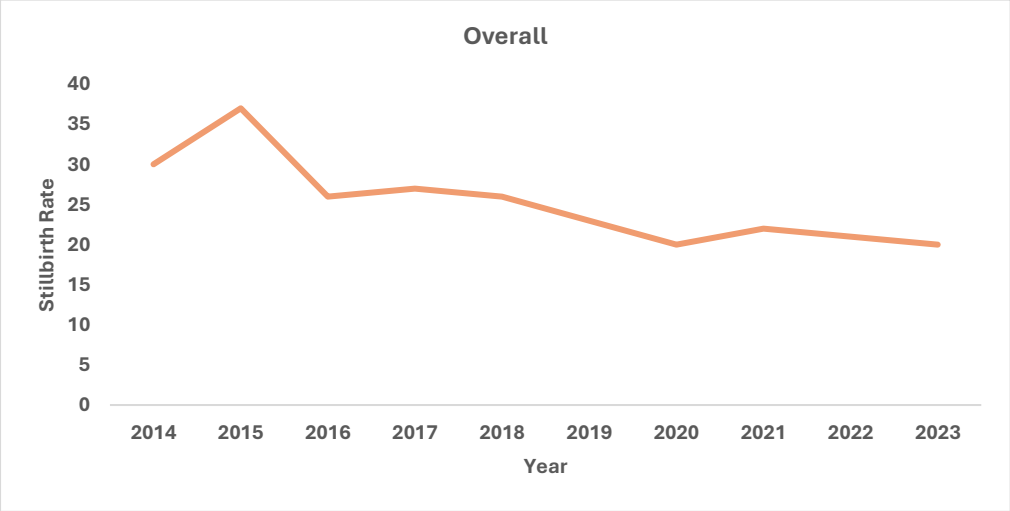


Figure 5.1: Trends in Stillbirth Rate between 2014 and 2023

Figure 5.2 shows the trend forecast of stillbirths based on the ENAP/SDG 2030 stillbirths' target. The trends shows that stillbirth occurrences are declining in Nigeria and will likely reach the target point of 12 per 1000 total births by the year 2027 if intensive reduction efforts are sustained.

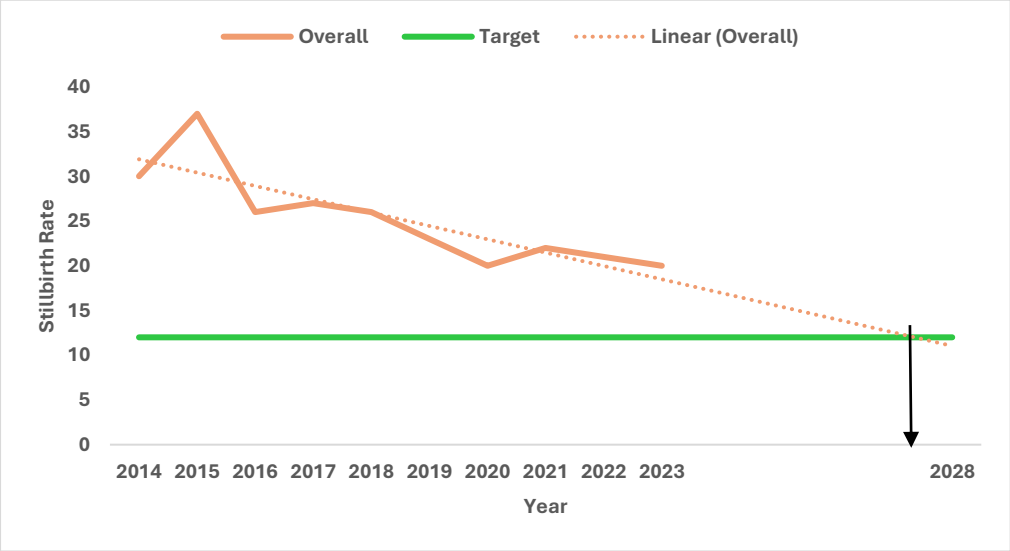


Figure 5.2: 2030 SDG/ENAP Forecast of Stillbirth Rate in Nigeria

5.3 2030 National and State-level Forecast of Stillbirth Rate in Nigeria

Table 5.3 below presents the country projection of stillbirth ENAP/SDG target. While 22/37 states may reach the 12 per 1000 stillbirth target by 2030, 15/37 states may achieve the target after the year 2030. Highlighting need for targeted intervention in those states.

Table 5.3: Projected Time to Reach 2030 ENAP/SDG Target by States

State	Year	Rank
Cross River State	2023	1st
Ekiti State	2023	1st
Kebbi State	2023	1st
Adamawa State	2024	4th
Benue State	2024	4th
Edo State	2024	4th
Enugu State	2024	4th
Gombe State	2024	4th
Osun State	2024	4th
Kaduna State	2025	10th
Katsina State	2025	10th
Nasarawa State	2025	10th
Niger State	2025	10th
Ogun State	2025	10th
Taraba State	2025	10th
Bauchi State	2026	16th
Jigawa State	2027	17th
Yobe State	2027	17th
Lagos State	2029	20th
Bayelsa State	2030	21st
Kano State	2030	21st
Sokoto State	2030	21st
Ondo State	2031	24th
Rivers State	2036	25th
Kogi State	2039	26th
Ebonyi State	2047	27th
Abia State	2053	28th
Imo State	2053	28th
Akwa-Ibom State	>2073	30th
Anambra state	>2073	30th
Borno State	>2073	30th
Delta State	>2073	30th
Federal Capital Territory	>2073	30th
Kwara State	>2073	30th
Oyo State	>2073	30th
Plateau State	>2073	30th
Zamfara	>2073	30th
National	2027	

15 States projected to reach the ENAP/SDG stillbirth target after 2030

Figure 5.3.1 to 5.3.37 shows the trends forecast of stillbirth and the estimated 95%CI till year 2030 across the 37 states in Nigeria. Most of the states with high stillbirths' rate shows a declining trend pattern while few state shows a likely increase pattern in stillbirth trends.

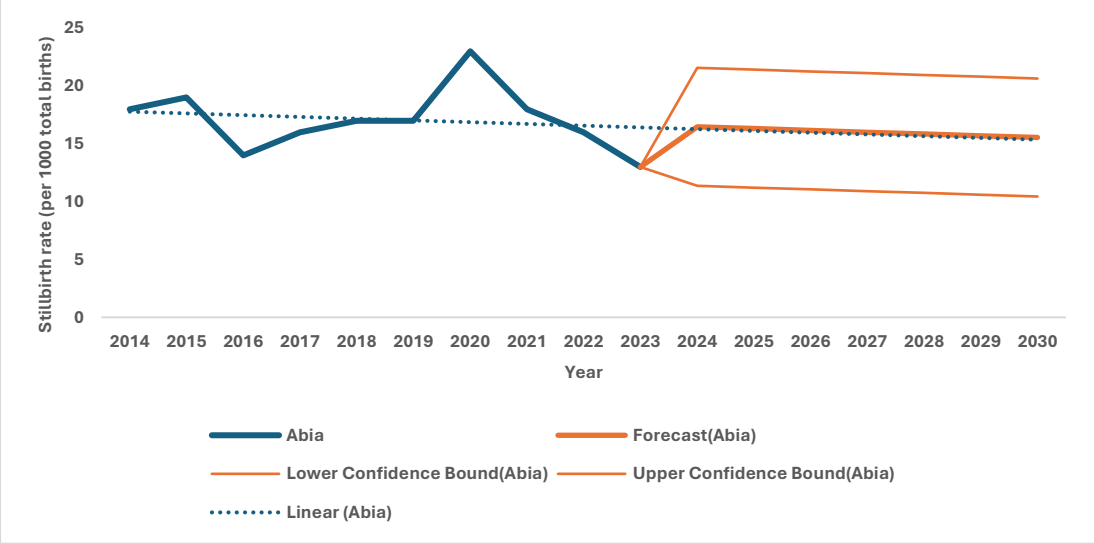


Figure 5.3.1: Trends Forecast of Stillbirth Rate in Abia

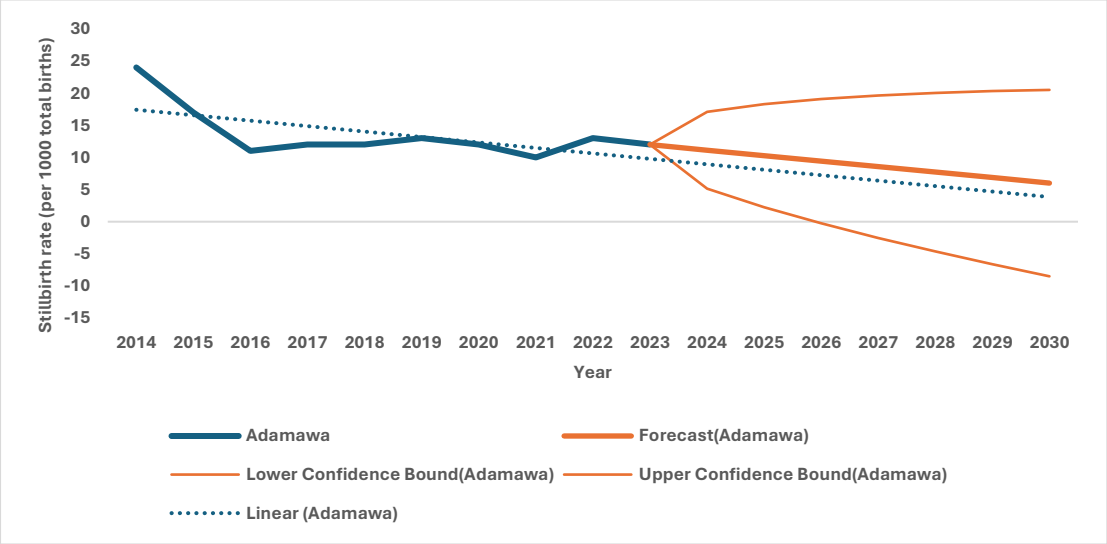


Figure 5.3.2: Trends Forecast of Stillbirth Rate in Adamawa

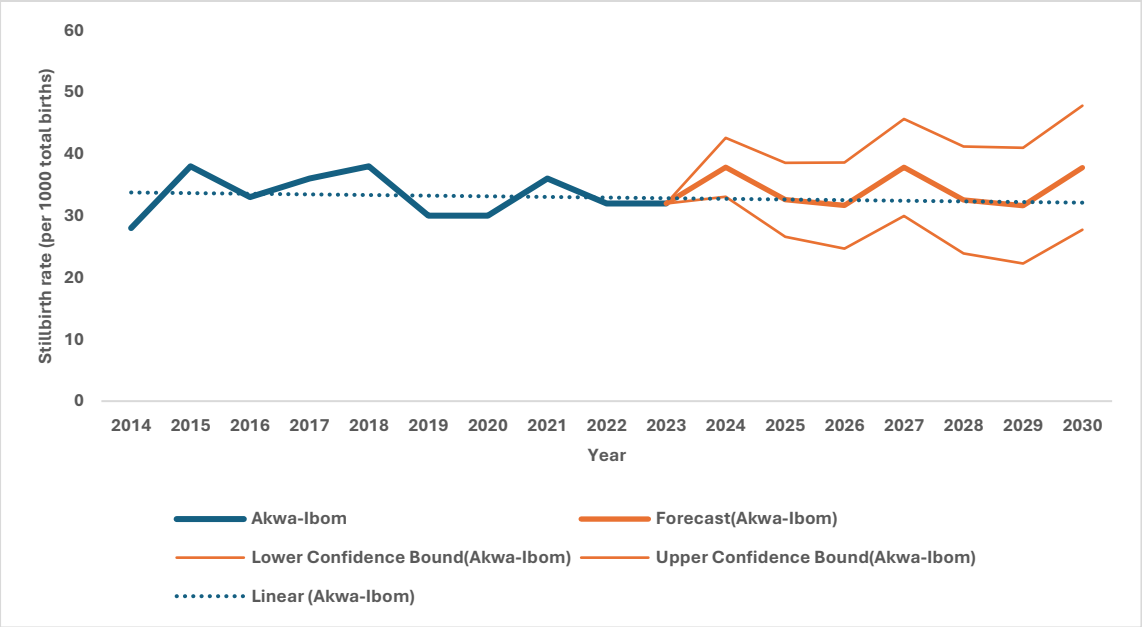


Figure 5.3.3: Trends Forecast of Stillbirth Rate in Akwa-ibom

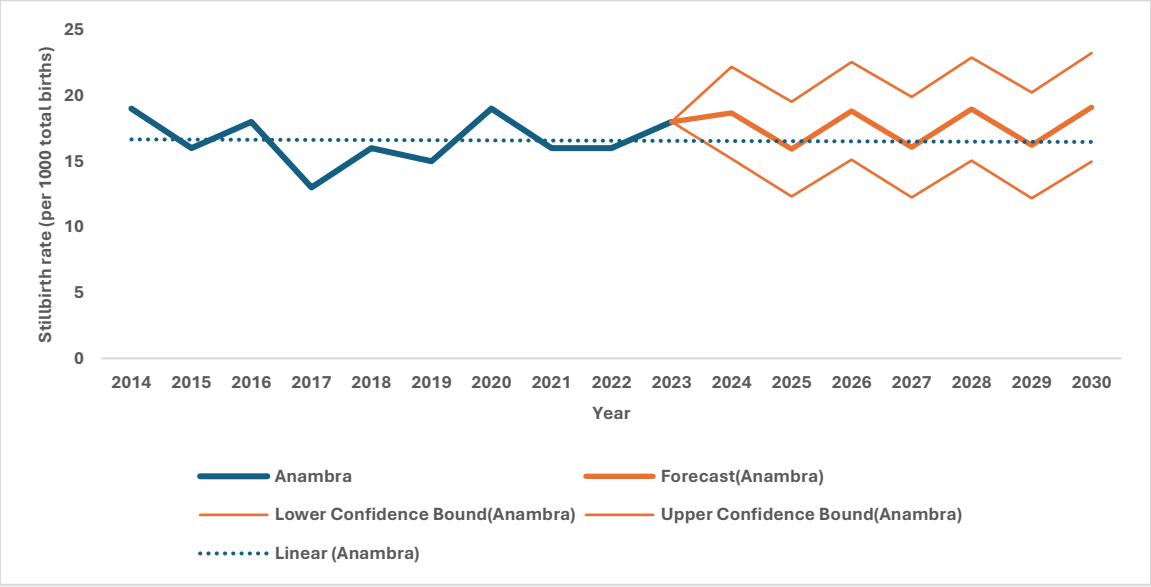


Figure 5.3.4: Trends Forecast of Stillbirth Rate in Anambra

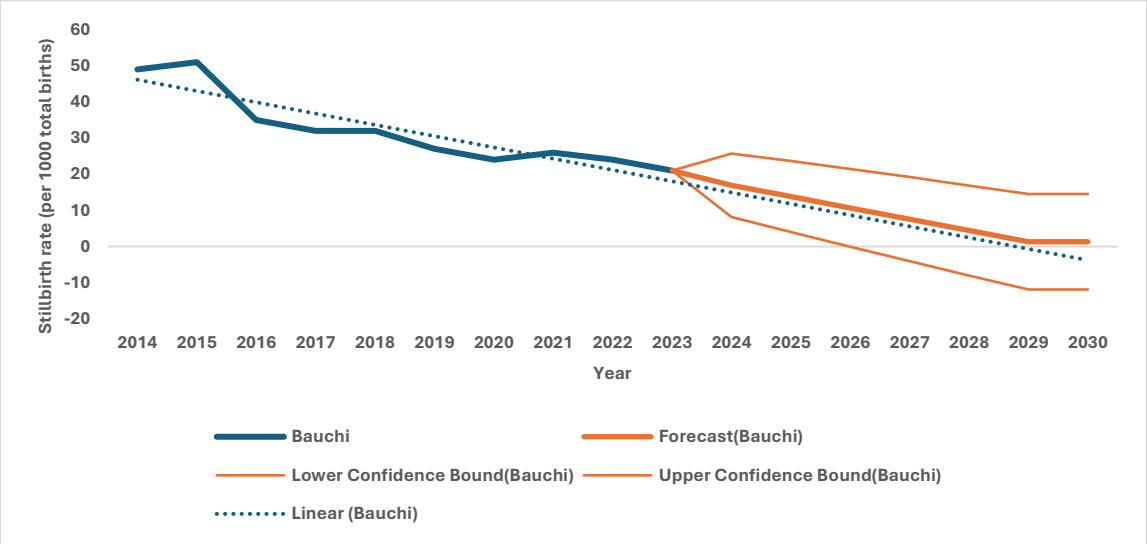


Figure 5.3.5: Trends Forecast of Stillbirth Rate in Bauchi

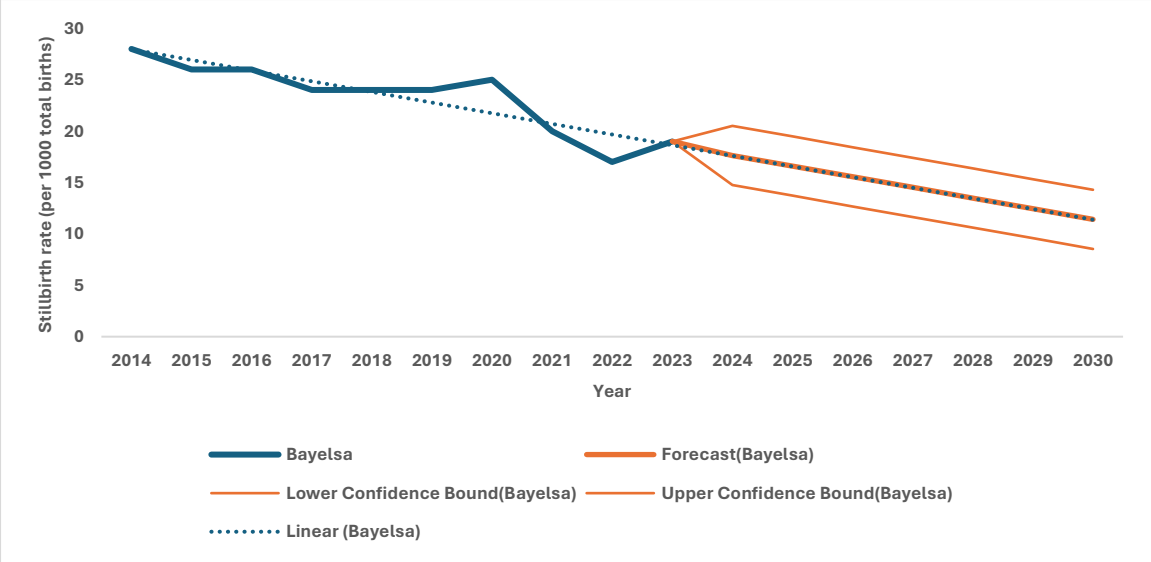


Figure 5.3.6: Trends Forecast of Stillbirth Rate in Bayelsa

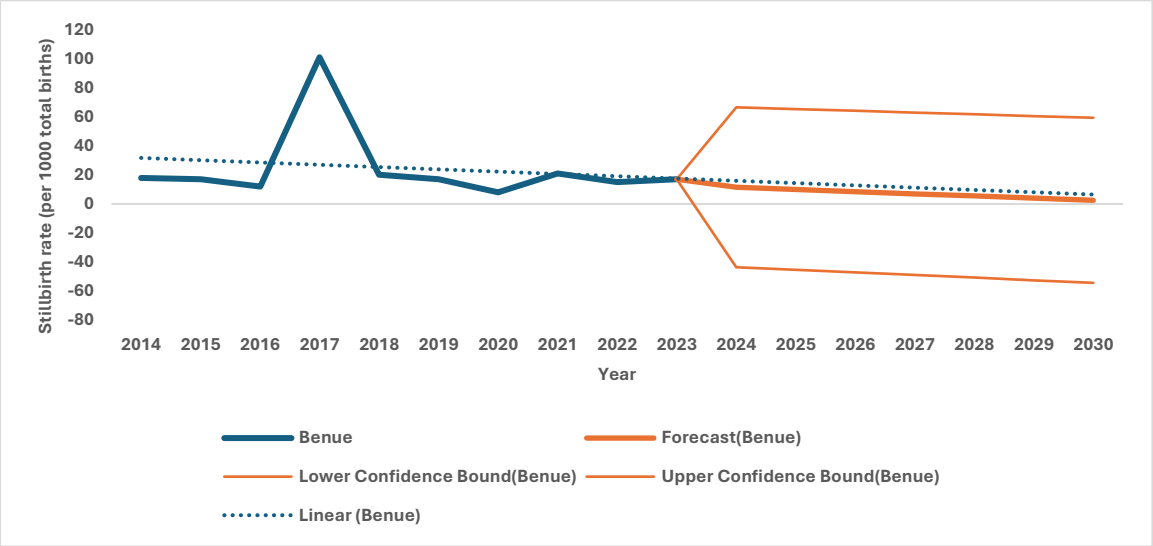


Figure 5.3.7: Trends Forecast of Stillbirth Rate in Benue

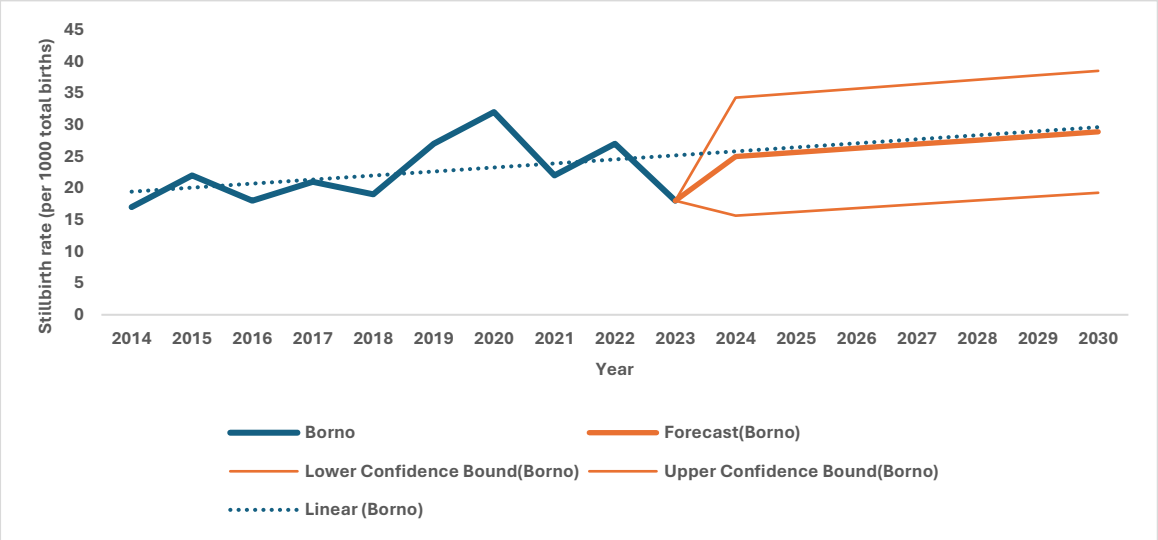


Figure 5.3.8: Trends Forecast of Stillbirth Rate in Borno

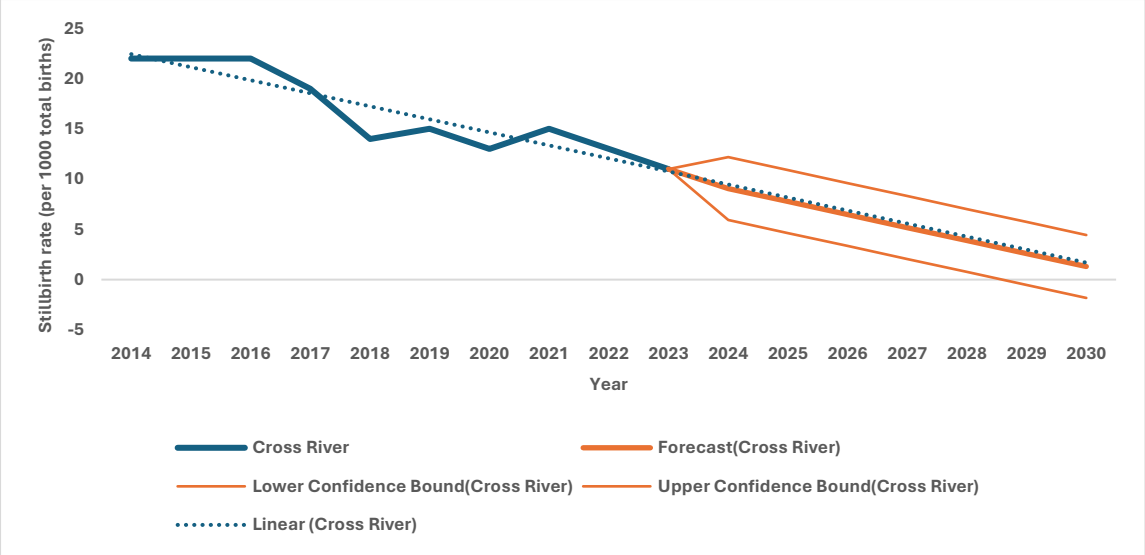


Figure 5.3.9: Trends Forecast of Stillbirth Rate in Cross River

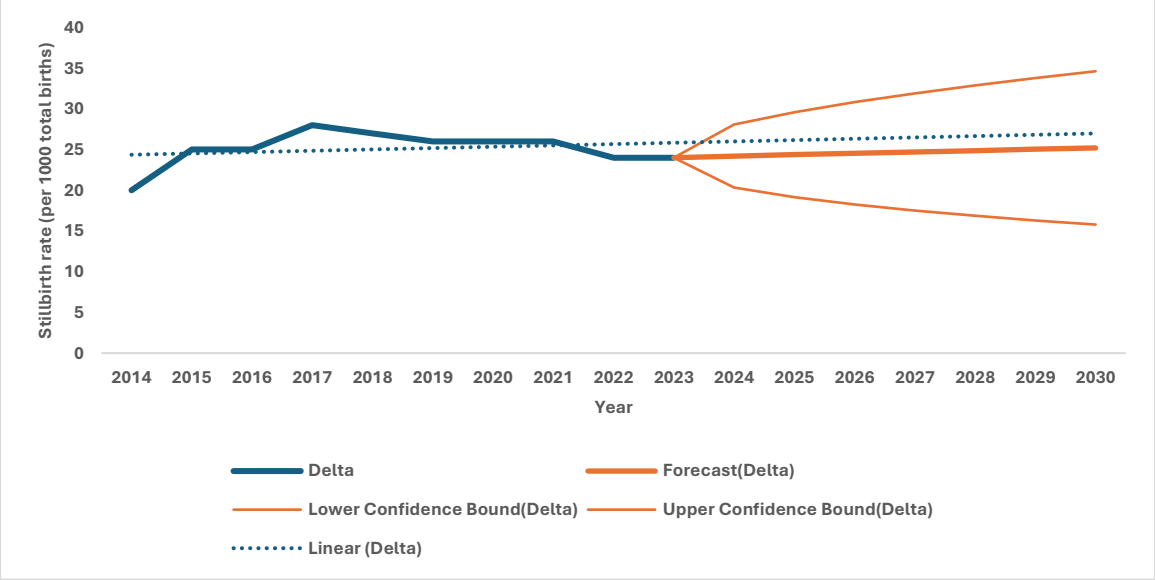


Figure 5.3.10: Trends Forecast of Stillbirth Rate in Delta

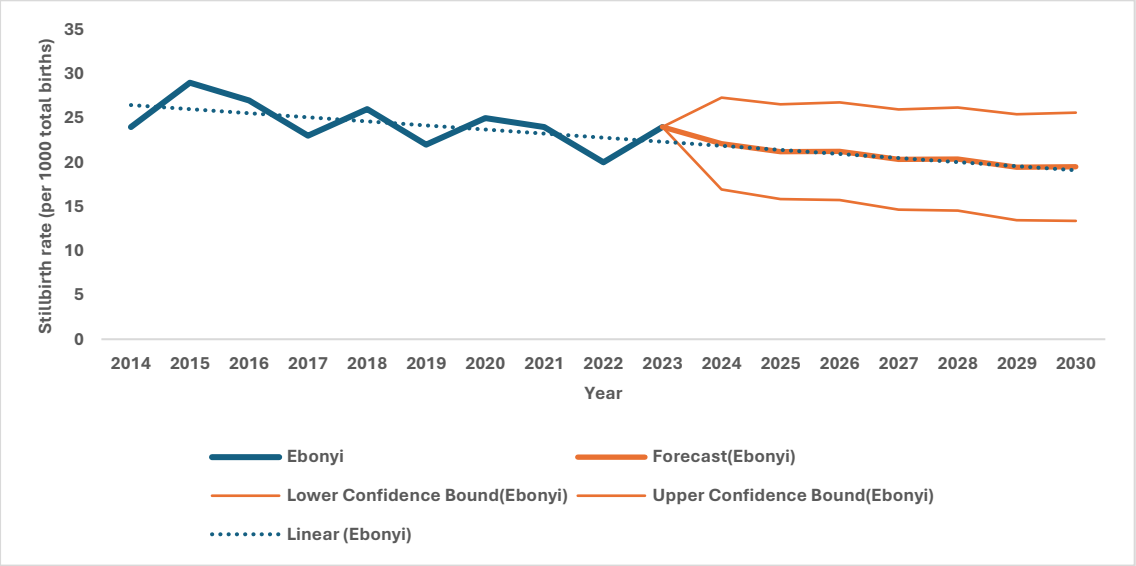


Figure 5.3.11: Trends Forecast of Stillbirth Rate in Ebonyi

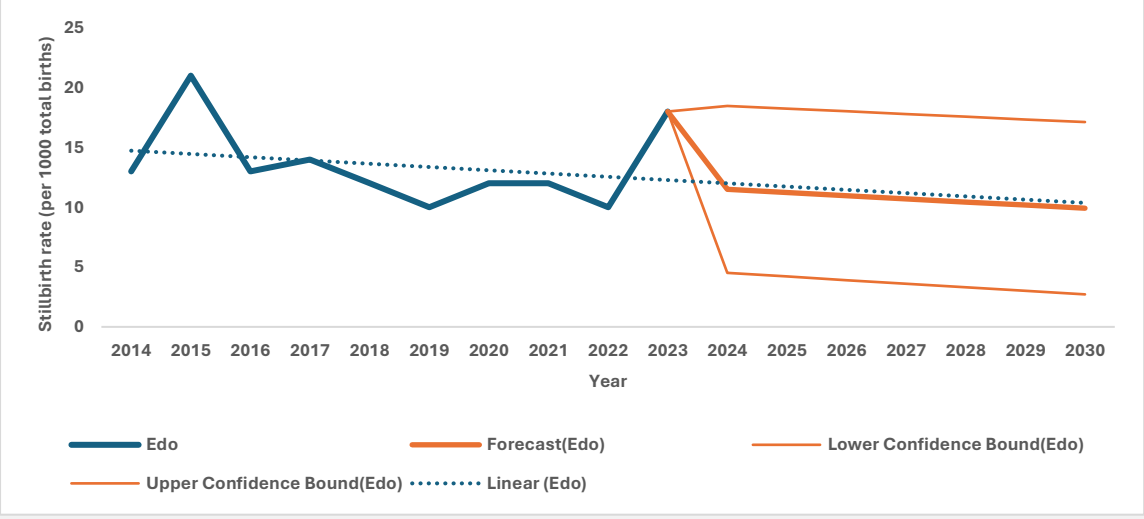


Figure 5.3.12: Trends Forecast of Stillbirth Rate in Edo

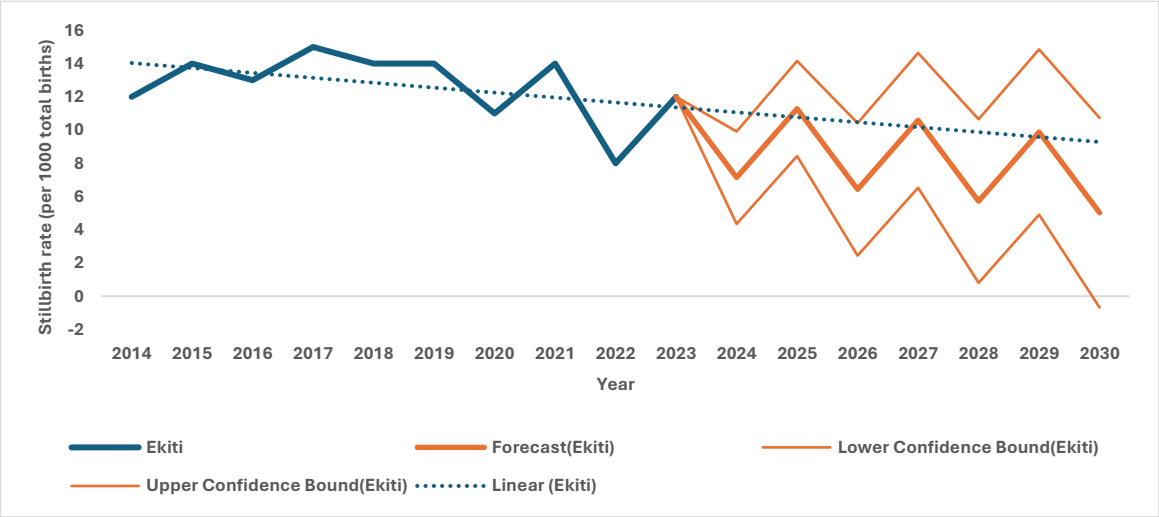


Figure 5.3.13: Trends Forecast of Stillbirth Rate in Ekiti

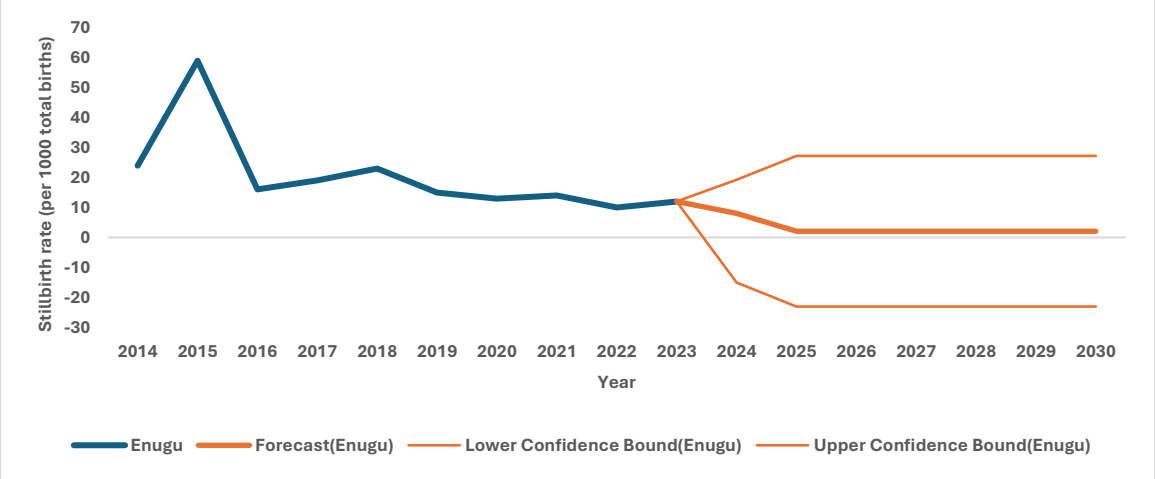


Figure 5.3.14: Trends Forecast of Stillbirth Rate in Enugu

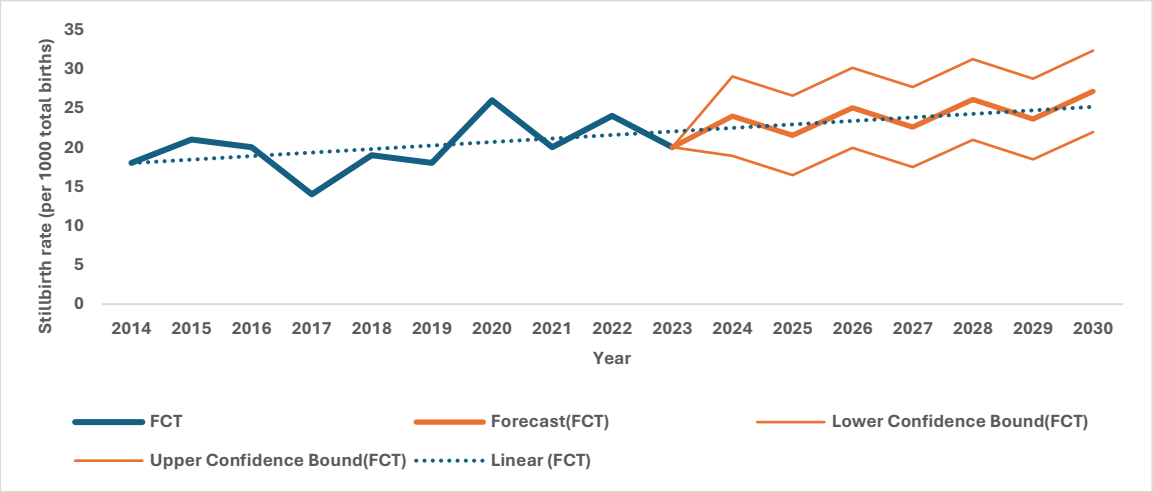


Figure 5.3.15: Trends Forecast of Stillbirth Rate in FCT

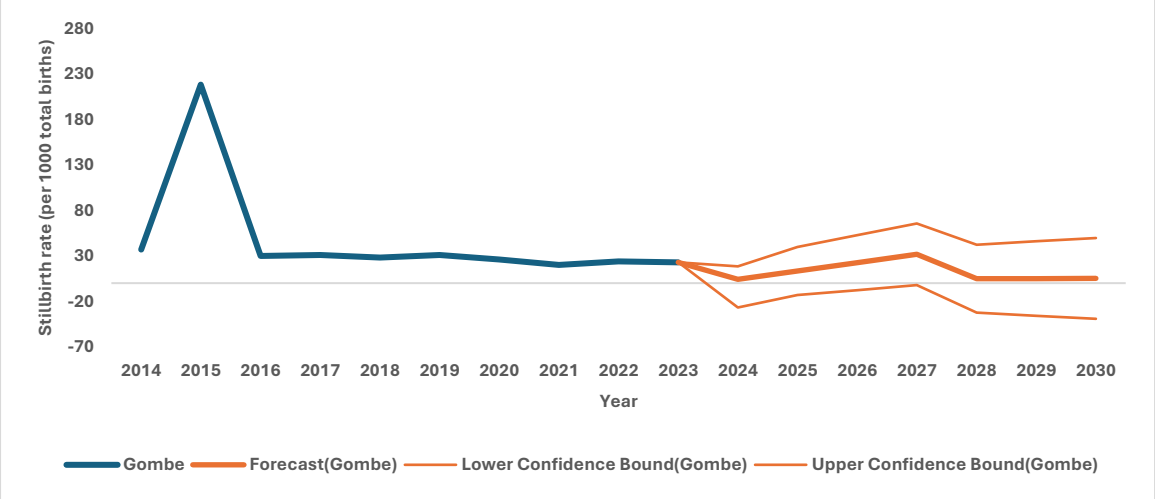


Figure 5.3.16: Trends Forecast of Stillbirth Rate in Gombe

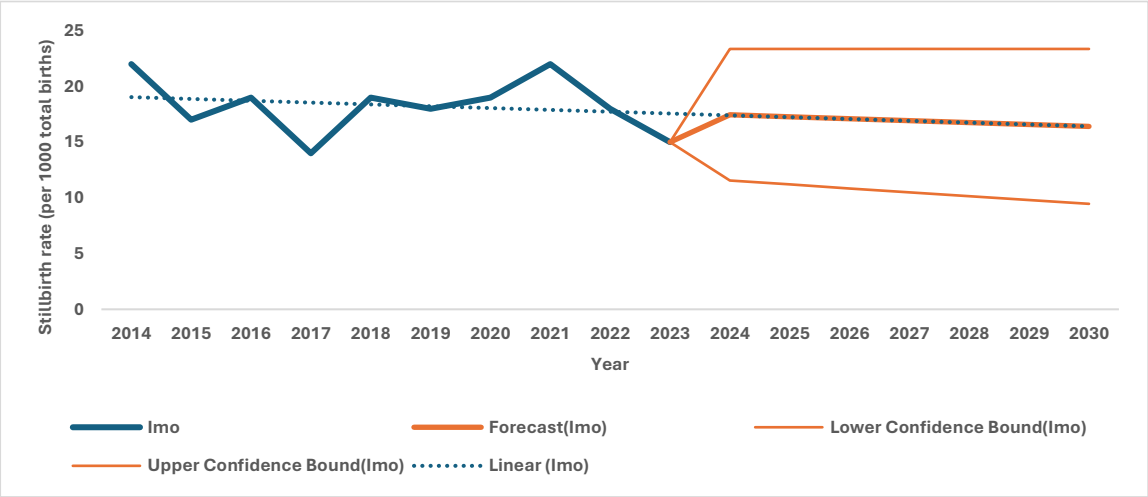


Figure 5.3.17: Trends Forecast of Stillbirth Rate in Imo

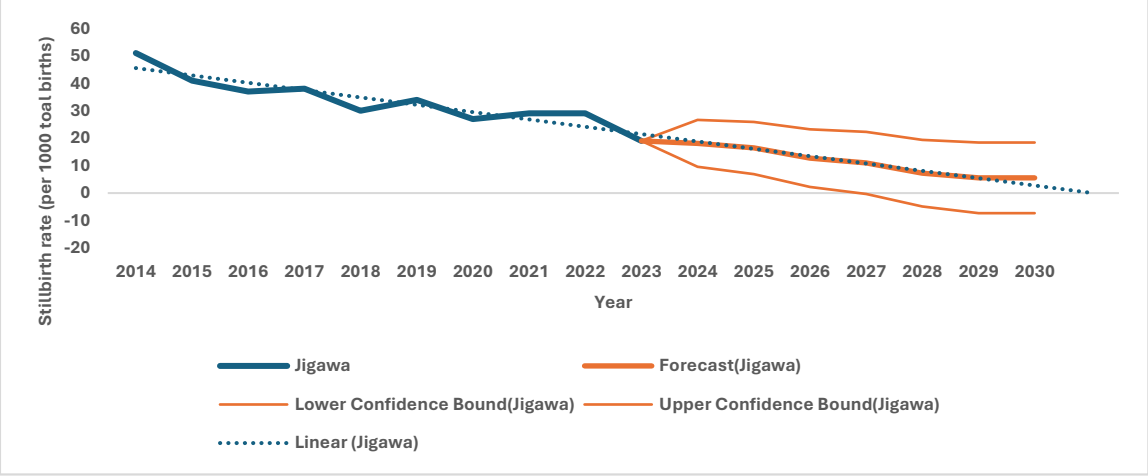


Figure 5.3.18: Trends Forecast of Stillbirth Rate in Jigawa

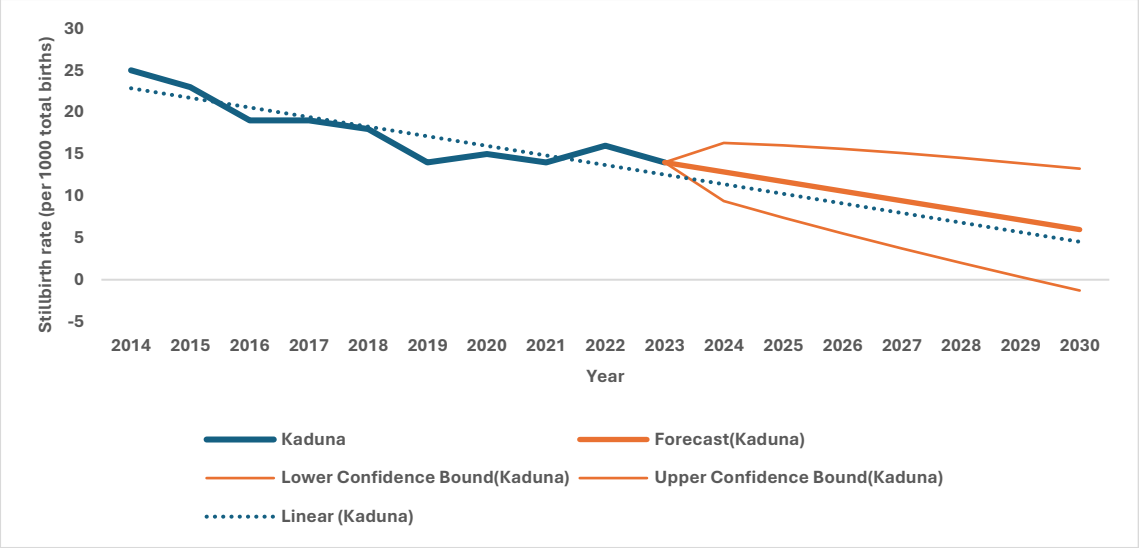


Figure 5.3.19: Trends Forecast of Stillbirth Rate in Kaduna

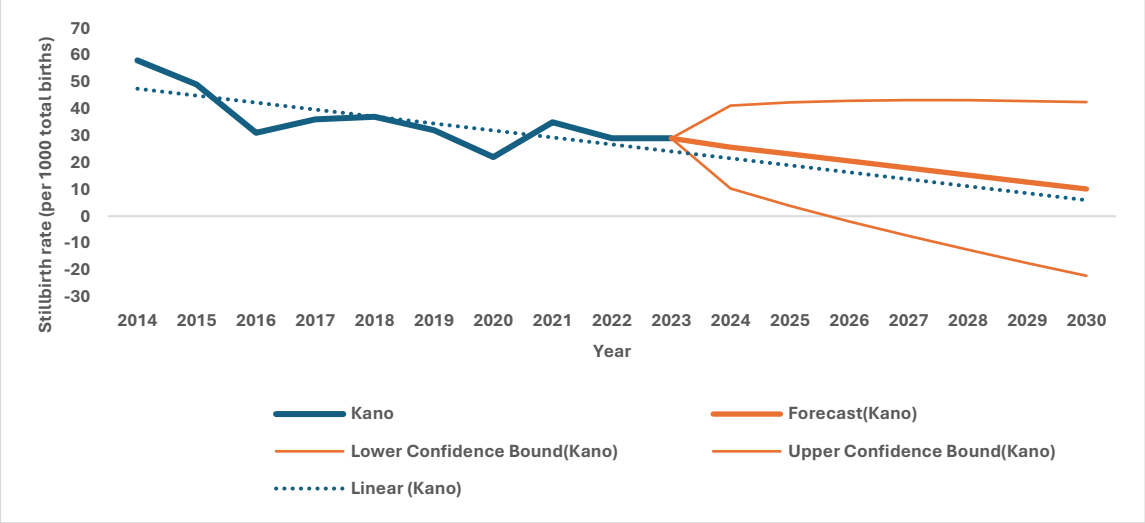


Figure 5.3.20: Trends Forecast of Stillbirth Rate in Kano

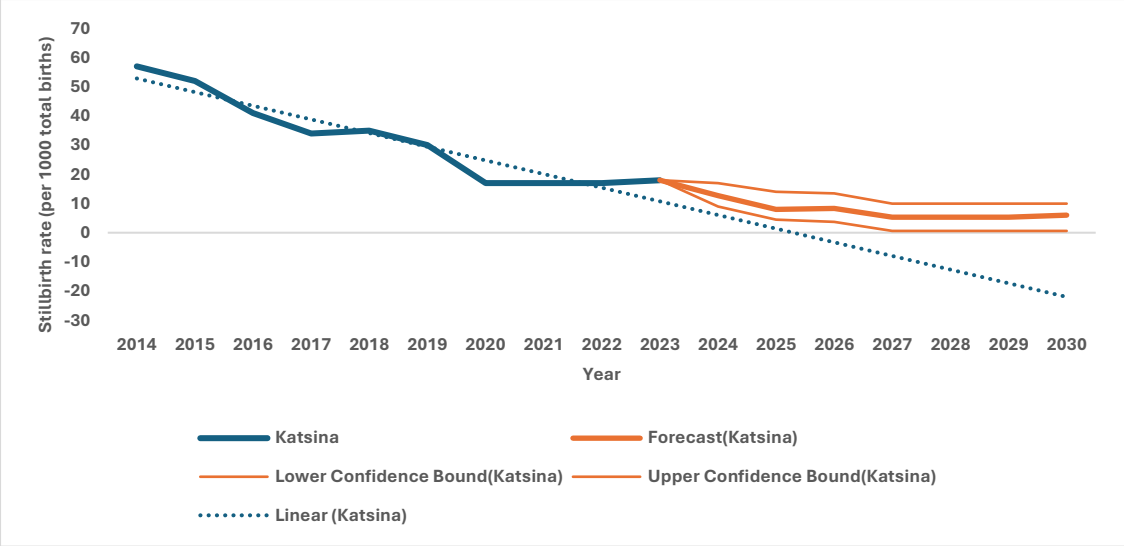


Figure 5.3.21 Trends Forecast of Stillbirth Rate in Katsina

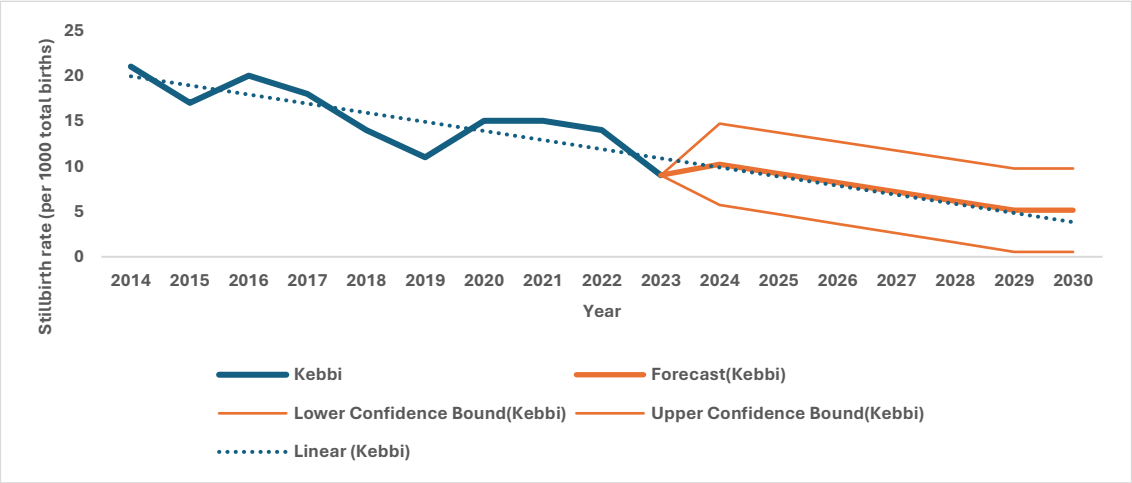


Figure 5.3.22: Trends Forecast of Stillbirth Rate in Kebbi

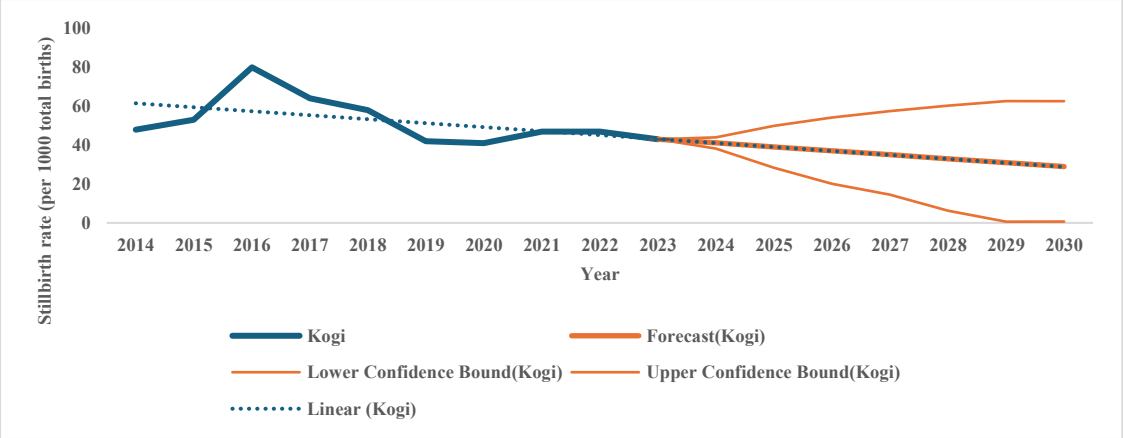


Figure 5.3.23: Trends Forecast of Stillbirth Rate in Kogi

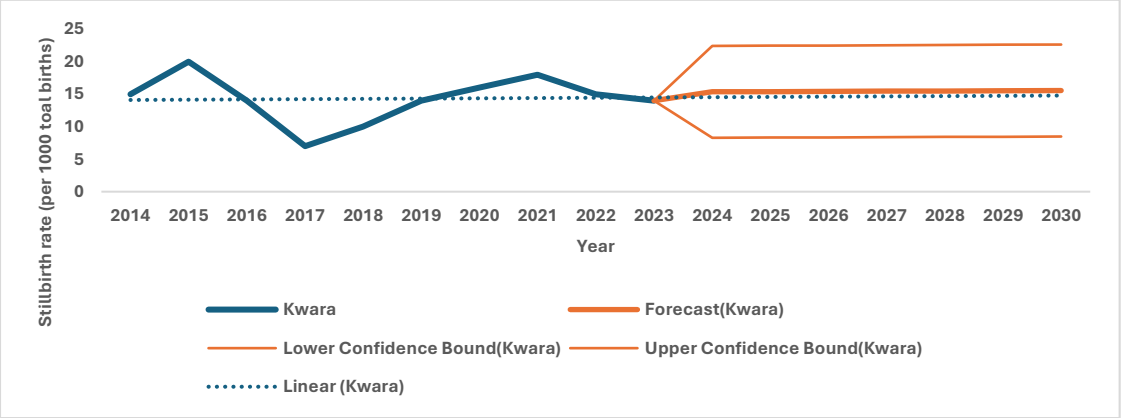


Figure 5.3.24: Trends Forecast of Stillbirth Rate in Kwara

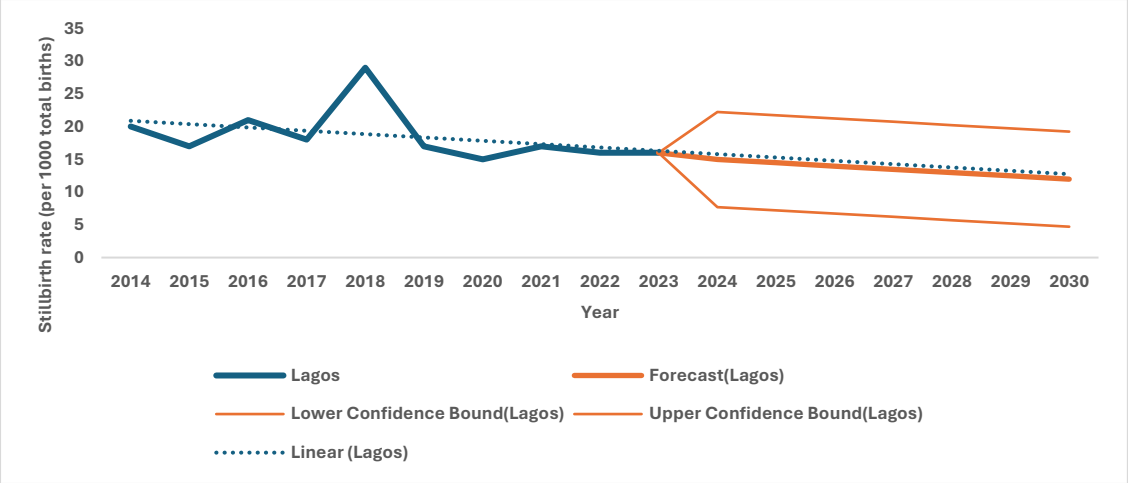


Figure 5.3.25: Trends Forecast of Stillbirth Rate in Lagos

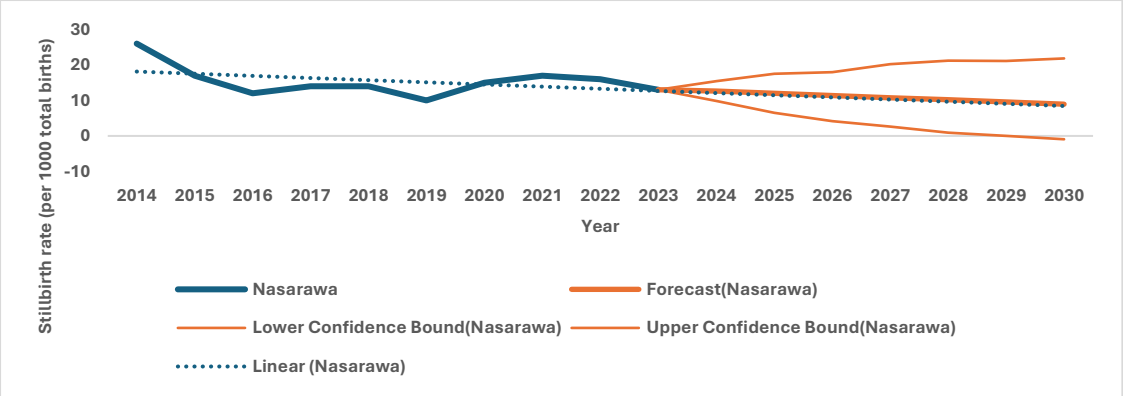


Figure 5.3.26: Trends Forecast of Stillbirth Rate in Nasarawa

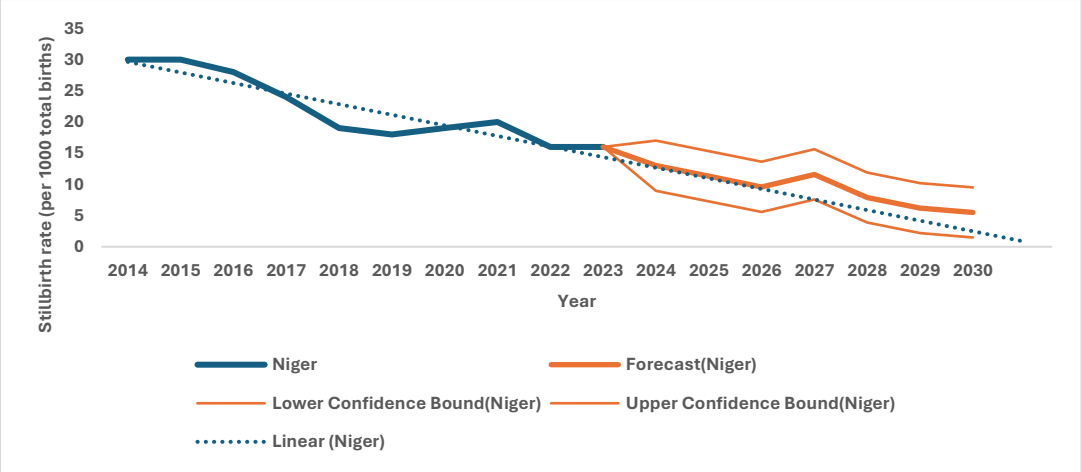


Figure 5.3.27: Trends Forecast of Stillbirth Rate in Niger

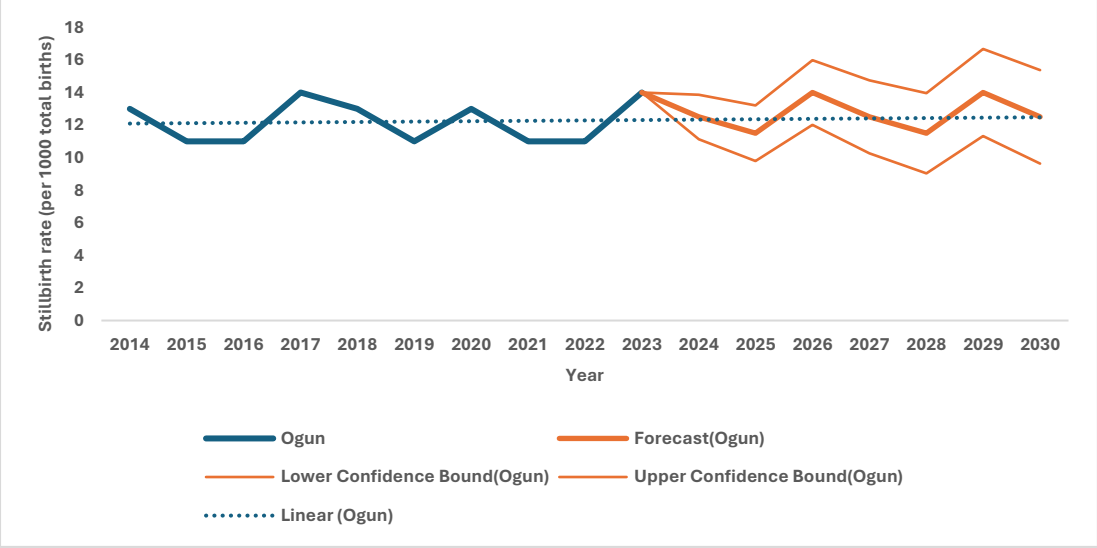


Figure 5.3.28: Trends Forecast of Stillbirth Rate in Ogun

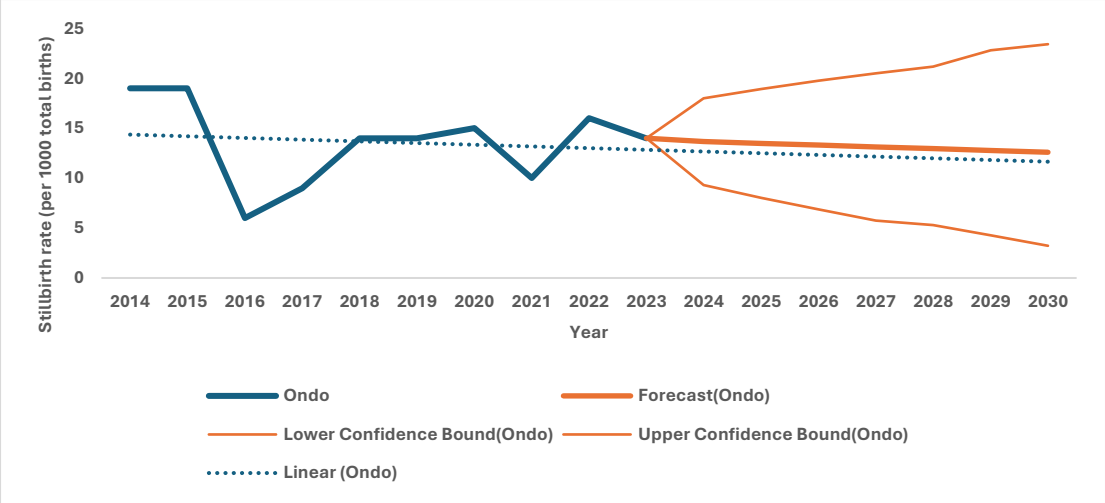


Figure 5.3.29: Trends Forecast of Stillbirth Rate in Ondo

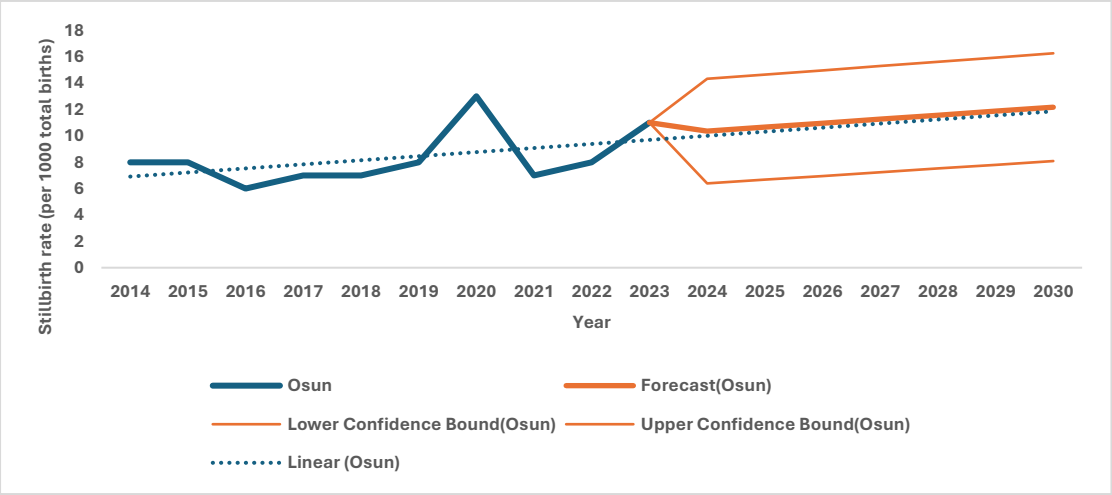


Figure 5.3.30: Trends Forecast of Stillbirth Rate in Osun

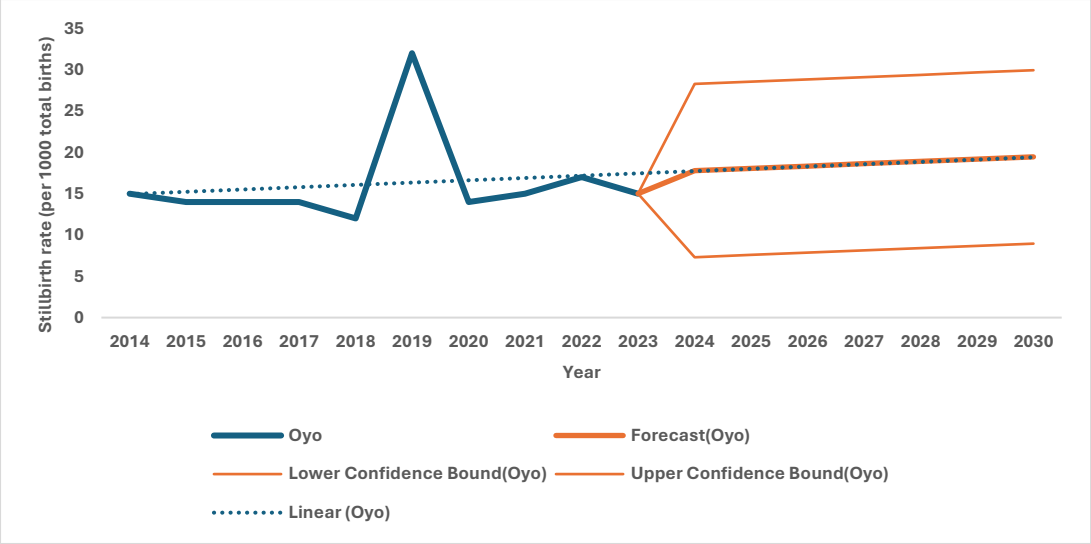


Figure 5.3.31: Trends Forecast of Stillbirth Rate in Oyo

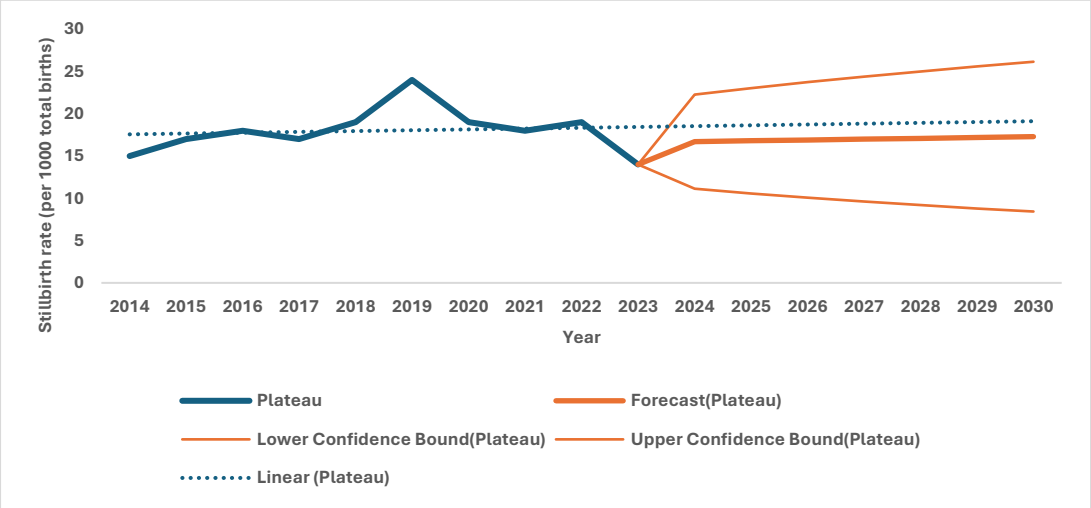


Figure 5.3.32: Trends Forecast of Stillbirth Rate in Plateau

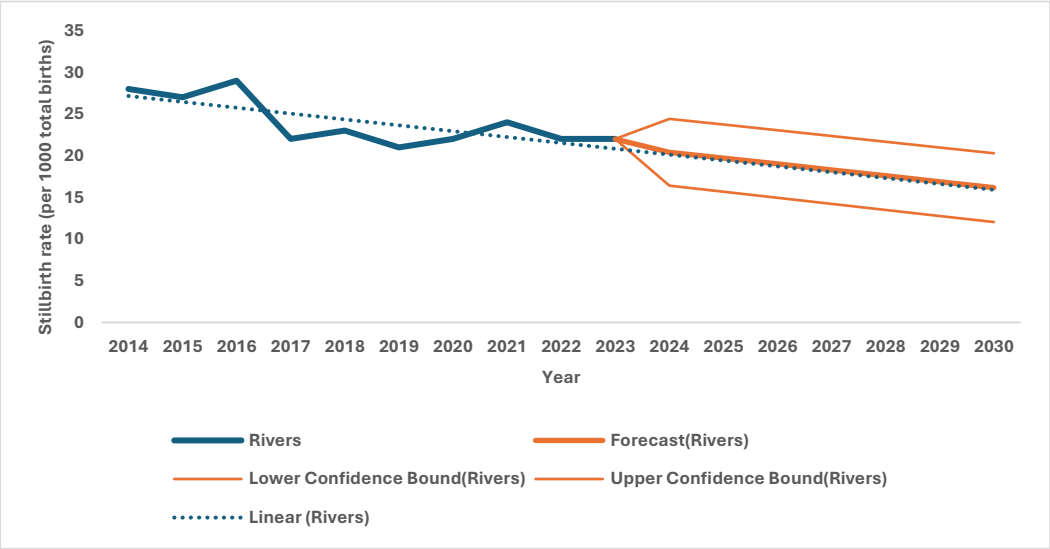


Figure 5.3.33 Trends Forecast of Stillbirth Rate in Rivers

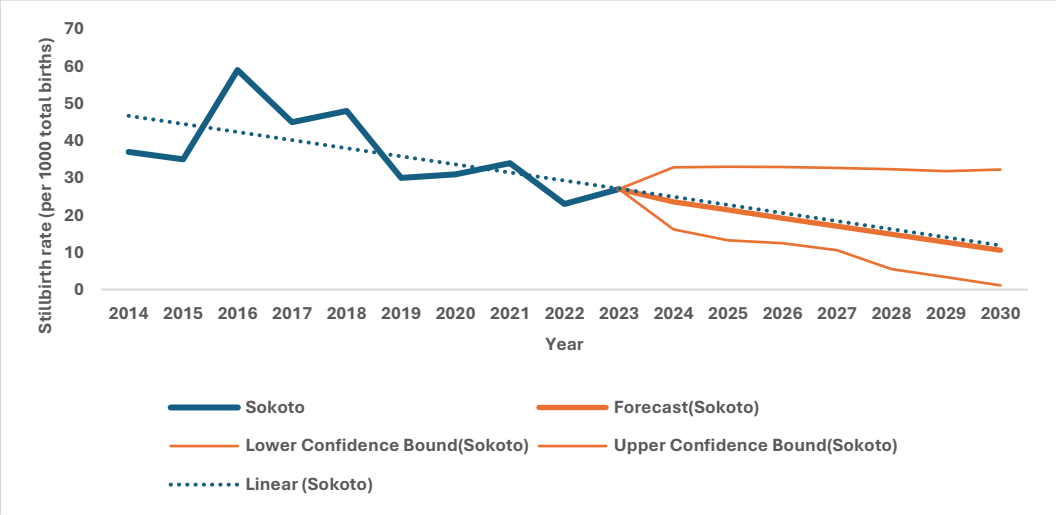


Figure 5.3.34 Trends Forecast of Stillbirth Rate in Sokoto

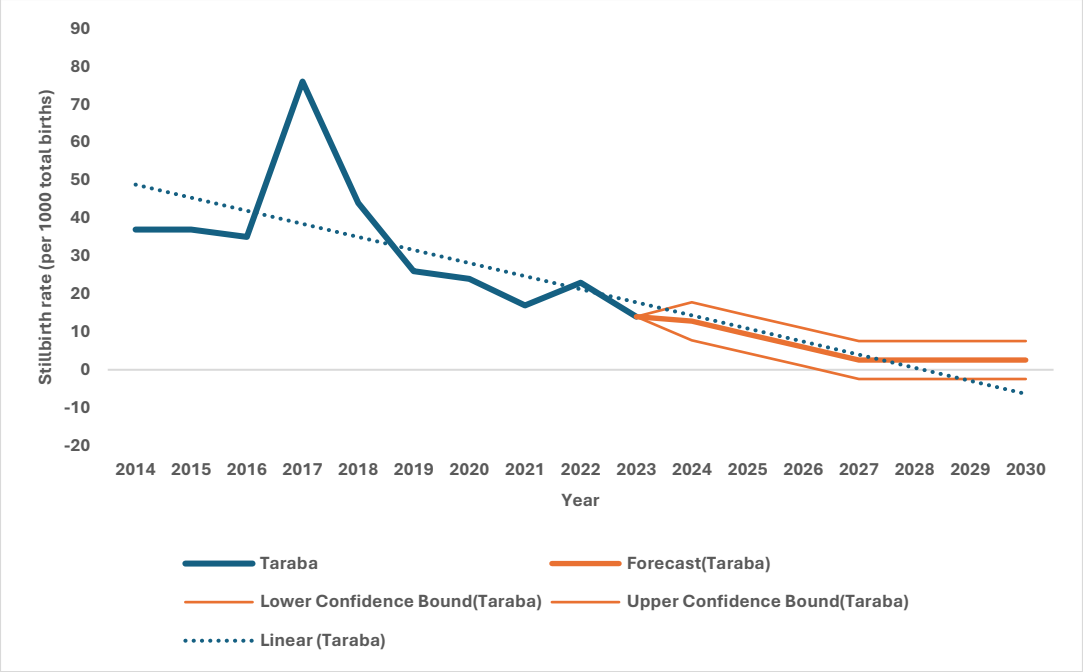


Figure 5.3.35 Trends Forecast of Stillbirth Rate in Taraba

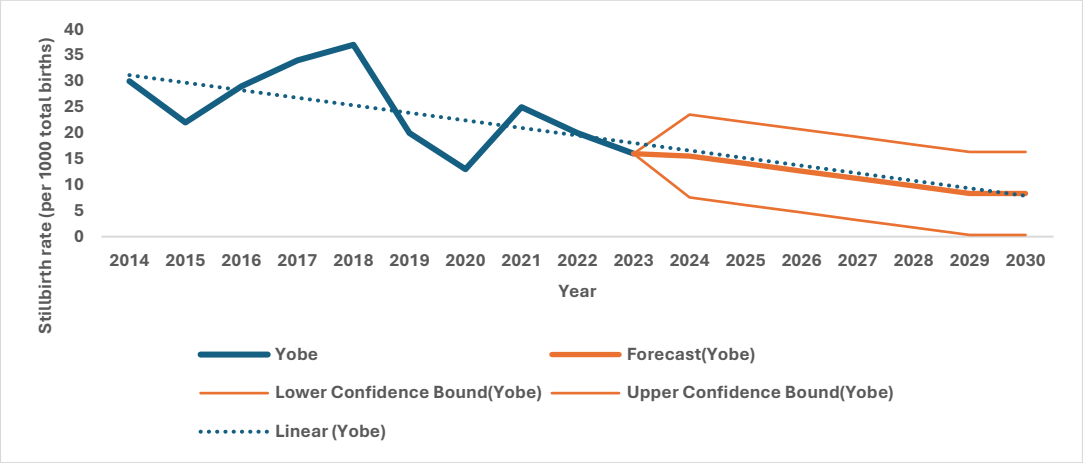


Figure 5.3.36 Trends Forecast of Stillbirth Rate in Yobe

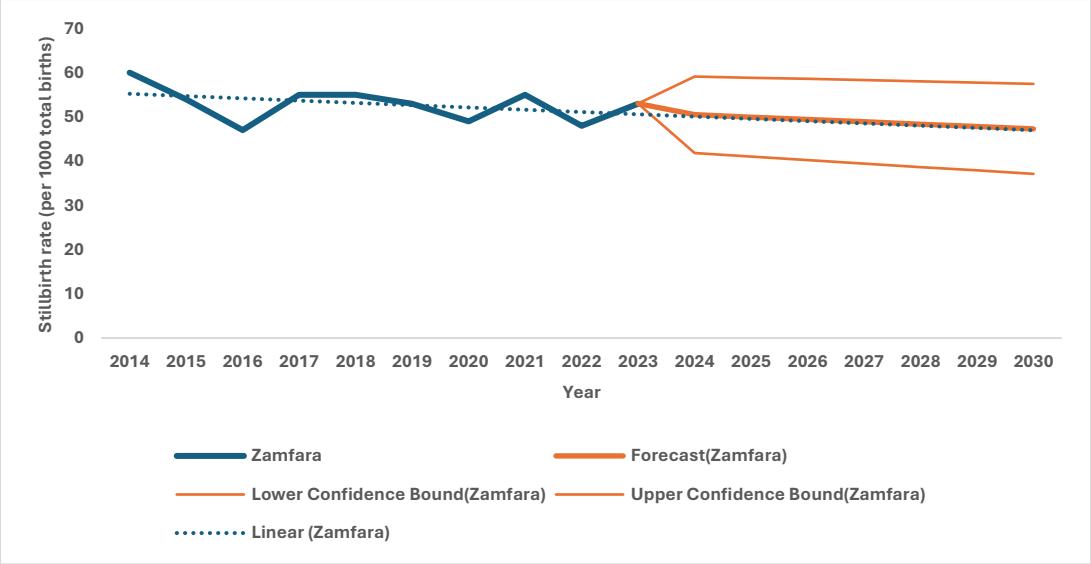


Figure 5.3.37 Trends Forecast of Stillbirth Rate in Zamfara

6.0 General Summary

6.1 Summary of Results

A total of 16,492,013 livebirths was reported between 2014 and 2023 across the 37 states in Nigeria, and not fewer than 404,305 stillbirths had occurred in this period. The largest livebirths population of 1,164,181 was reported from Kaduna while the smallest livebirth population of 47,146 was reported from Bayelsa. Majority of the stillbirths occurred in Katsina while the fewest occurred in Ekiti.

Stillbirth burden is currently 24 per 1000 total births in Nigeria and it's more than twice the national estimate in Zamfara and Katsina, and below the ENAP/SDG target in Osun. Stillbirth is generally high in the northwestern states with an overall SBR of 34 per 1000 total births in the region. Majority (three-fifth) of stillbirths that occurred in Nigeria were macerated, with highest burden in Delta state.

Stillbirths' incidence clustered majorly in the northwest and three northeastern states in Nigeria. The rate of stillbirths' occurrence decreases over time and was highest in 2015 with steady decline in 2023. Stillbirths' trends exhibit a declining pattern across the state, and Nigeria may achieve the 2030 ENAP/SDG target of 12 per 1000 total births by year 2027 if sustainable interventional efforts to reduce stillbirths are strengthened. Notably, fifteen of the thirty-seven Nigerian states may not achieve the stillbirths target by 2030. Hence, multisectoral approach is required to drive data use and bridge policy gap towards implementing interventional strategy to reduce stillbirth rate in Nigeria.

6.2 Observed Limitations and Strengths

6.2.1 Observed Limitations

The analysis of stillbirths' rate was based on total deliveries reported at the health facility (majorly primary healthcare centres) and not the total deliveries in the country. Secondary data exploration was limited to the aggregate-based stillbirth data reported per health facility on the DHIS2, which restrict inference that could have been achieved with case-based data.

6.2.2 Observed Strengths

Longitudinal design of the stillbirth data, with regards to 10 years period (2014 to 2023) of assessment of stillbirth in Nigeria enhance the consistency and reliability. The largeness of the ten-year collated stillbirth data and representation across the subnational improve the generalizability of the stillbirth data report, with potential application to the target population.

7.0 Acknowledgements

The IHVN-IRCE SPEED Project is grateful to the leadership of the Federal Ministry of Health & Social Welfare (FMoH& SW), for the support and commitment to the success of the SPEED Project from inception till closeout. This data report resulted in approved potential policy proposals and evidence-based programmatic responses from the leadership of the FMoH & SW. This shows commitment to improving the health outcomes of babies in Nigeria.

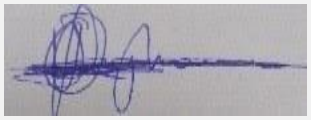
We specifically deeply appreciate the FMoH & SW Departments of Health Planning Research & Statistics, Family Health and Information & Communication Technology for contributing in no small measure to the achievement of the SPEED project objectives.

We thankfully acknowledge the National Primary Health Care Development Agency (NPHCDA) for the encouragement and participation in the SPEED project implementation activities to ensure that primary health care and community perspective to stillbirth data were appropriately captured.

Lastly, we are extremely grateful to the leadership of the International Research Centre of Excellence, and the data unit as well for the unrivalled support and team spiritedness we enjoyed throughout our "stillbirth data sojourn".

We look forward to more opportunities to implement data-driven solutions for the improvement of maternal and newborn health in Nigeria.

Signed,



Mrs. Oghome Emembo
Principal Investigator, IHVN-IRCE SPEED Project

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*Contributed equally as first author
^Contributed as senior authors

Appendix A

Table A: Total Number of Fresh Stillbirth per State, 2014 – 2023

State	Year										Average (95% CI)
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
Abia	58	41	75	80	102	134	163	297	199	129	9 [7.9, 10.1]
Adamawa	262	277	302	514	551	569	1060	588	786	784	35 [31.5, 38.5]
Akwa-Ibom	112	121	171	214	122	85	132	217	192	204	12 [10.8, 13.2]
Anambra	274	297	243	166	192	266	458	262	288	299	20 [18.2, 21.8]
Bauchi	844	721	1156	1217	1435	1510	2945	1796	1907	1874	97 [88.4, 106]
Benue	381	377	321	320	269	335	324	502	347	399	26 [23.8, 28.2]
Borno	11	1	19	840	615	941	1074	1283	755	1218	49 [39.6, 58.4]
Bayelsa	44	60	33	24	49	90	98	92	94	83	5 [4.4, 5.6]
Cross River	215	203	227	209	194	204	194	197	212	180	18 [17, 19]
Delta	199	92	107	144	287	413	700	606	561	617	20 [17, 23]
Ebonyi	182	267	261	213	249	173	262	435	256	354	19 [17.2, 20.8]
Edo	111	75	125	86	61	66	127	120	104	165	8 [7.2, 8.8]
Ekiti	55	37	27	19	12	39	13	73	42	76	4 [3.6, 4.4]
Enugu	125	306	107	124	80	94	174	99	63	113	12 [10.2, 13.8]
FCT	236	296	246	307	429	369	798	540	671	547	28 [26, 30]
Gombe	375	626	520	763	715	853	1568	749	858	816	56 [51.6, 60.4]
Imo	77	111	101	94	134	131	257	129	83	74	9 [8.3, 9.7]
Jigawa	1158	983	1136	1249	1506	2179	2749	1886	2961	2404	118 [110, 126]
Kaduna	868	841	1069	1788	1026	891	1917	1229	1740	1205	78 [73.6, 82.4]
Kebbi	369	289	242	465	598	862	957	1819	1065	960	46 [41.3, 50.7]
Kano	1038	1126	1261	1285	1441	1405	1687	1260	1221	1450	103 [95.3, 111]
Kogi	150	143	150	172	169	161	125	151	143	150	13 [11.8, 14.2]
Katsina	979	881	1910	2513	2813	2468	4125	3003	2836	2540	158 [143, 173]
Kwara	51	24	87	46	45	83	128	245	216	207	6 [5.3, 6.7]
Lagos	794	748	848	758	1203	708	556	1264	741	806	67 [58.2, 75.8]
Nasarawa	229	255	278	478	456	473	676	538	594	545	30 [27, 33]
Niger	436	532	672	718	861	865	1407	959	923	1052	56 [51.5, 60.5]
Ogun	194	127	130	247	184	172	158	312	185	282	15 [13.5, 16.5]
Ondo	277	242	65	246	305	301	198	274	184	146	20 [17.8, 22.2]
Osun	45	15	24	37	57	69	126	146	170	204	5 [4.5, 5.5]
Oyo	373	305	308	286	300	285	585	553	664	576	26 [24.3, 27.7]
Plateau	89	63	69	111	144	187	156	301	268	199	10 [9, 11]
Rivers	147	90	243	194	156	173	121	294	222	212	14 [12.6, 15.4]
Sokoto	135	295	423	564	762	748	752	1500	1140	1478	46 [41.7, 50.3]
Taraba	151	116	190	434	367	401	768	260	402	297	25 [21.7, 28.3]
Yobe	113	138	304	465	537	664	1201	800	863	873	34 [29.7, 38.3]
Zamfara	906	684	605	755	724	938	780	1718	812	922	64 [60.4, 67.6]
Overall	29 [25.9, 32.1]	29 [26.3, 31.7]	33 [29.3, 36.7]	41 [36.6, 45.4]	44 [38.9, 49.1]	46 [41.3, 50.7]	37 [33.2, 40.8]	12 [10.5, 13.5]	21[20.8, 21.2]	20[19.8, 20.2]	37 [35.7, 38.3]

Appendix B

Appendix B – Total Number of Fresh Stillbirth per Region, 2014 – 2023

Geopolitical Zone	Year										Average
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
North-central	1572	1690	1823	2152	2373	2473	3614	3236	3162	3099	1719 [1201, 2238]
North-east	1756	1879	2491	4233	4220	4938	8616	5476	5571	5862	3207 [2287, 4128]
North-west	5453	5099	6646	8619	8870	9491	12967	12415	11775	10959	6247 [4227, 8268]
South-east	716	1022	787	677	757	798	1314	1222	889	969	684 [484, 885]

South-south	828	641	906	871	869	1031	1372	1526	1385	1461	759 [540, 977]
South-west	1738	1474	1402	1593	2061	1574	1636	2622	1986	2090	1373 [959, 977]