KANO STATE CONTRIBUTORY HEALTHCARE MANAGEMENT AGENCY

Actuarial Report for Healthcare Contributory Benefit Package

EXECUTIVE SUMMARY

In 2016, the Kano State government signed into law, a bill that establishes the Kano State Contributory Healthcare Management Agency (KSCHMA) with the overall goal of ensuring all residents of the state have access to quality and affordable healthcare services with financial and social risk protection. The state of health of citizens within the state has been a serious concern to some stakeholders and patriots in the state. Hence after several appeals and meetings, the Minimum Health Benefit Package (MHBP) emerged as the state healthcare contributory benefit package. Although a free medical programme was run by the previous administration which has been tagged "a non-sustainable programme". The sole objective of the agency is to provide affordable and quality health care services to all residents.

We have been contracted to actuarially cost the state health benefit package called Minimum Health Benefit Package (MHBP), and this product is expected to be:

- Affordable
- Of high quality
- Sustainable by government

This report gives the actuarially estimated risk premium for covering the medical cost under each benefit package for both individuals and households. MHBP considers four (4) scenarios under this Contributory Healthcare Benefit Package.

Scenario I – Basic Minimum Package (BMP): these are the service entitlements of all enrollees into the KSCHMA for paying the mandated premium charges. It covers the primary, and secondary and referral services under the package.
Scenario II – Basic Minimum Package + HIV/AIDS: this covers the BMP plus HIV/AIDs.
Scenario III – Basic Minimum Package + TB: this covers the BMP plus TB.
Scenario IV – Basic Minimum Package + Family Planning Services: this covers the BMP plus family planning services.

The projected cost per person covers one person irrespective of age and gender whilst the projected cost per household covers a family of six (6) which include 2 parents and four children under the age of 18. Where a family size is greater than 6, we have also provided the cost of additional family member(s) to the plan.

The premium under the various scenario also includes other costs to the scheme such

as administrative costs, marketing costs and contingency costs in addition to the risk premium.

We have assumed administrative costs to be 15%, marketing costs to be 7% and contingency margin to be 8%. All these costs are percentages of the risk premium and are valued in Naira. There will also be a separate initial registration fee of N350 for every potential enrollee. We recommend a household discount for this registration fee of between 20-30%

This actuarial report uses the service data provided. The service data contains information about utilization of each ailment in the benefit package across the 44 local governments in the state.

Service data collated and validated by another state scheme in Nigeria was also used in our actuarial calculations. We relied on the Kano State population projections supplied to forecast growth and changes in demographic patterns. We have used in our costing the price list supplied to us by HFG and recent ones within our reach. Where pricelists are not provided, we have used pricelists of similar schemes within our reach.

We understand this is a new scheme for the residents and the service data from various hospitals across the state helped us to a large extent. However, there were lots of limitations to the data which necessitated the use of external data to supplement the analysis. Hence we recommend that going forward, experience data be collated appropriately, and such data should be granular to consider factors like age, the salary of the sponsor, sex, sponsor's employer class, etc. for future experience and premium review and analysis.

The tables below present the summaries of the total premiums to be charged for an individual and a family of 6 for all scenarios. The assumed exposures for general ailments, HIV and TB, are 25%, 40%, and 50% respectively. These exposure levels are considered appropriate given the dense population of the state.

Individual rates

Themes	Scenario I	Scenario II	Scenario III	Scenario IV	
BMP Per Annum	9,369.36	9,369.36	9,369.36	9,369.36	
HIV/AIDs		256.76			
Tuberculosis			322.40		
Family Planning				99.76	
Administration cost @ 15%	1,405.40	1,443.92	1,453.76	1,420.37	
Marketing cost @ 7%	655.86	673.83	678.42	662.84	
Contingency loading @ 8%	749.55	770.09	775.34	757.53	
Total Cost per Annum	12,180.17	12,513.96	12,599.29	12,309.86	
Reimbursement method	Cost				
Capitation	7,064.27				
Fee-for-Service	2,305.09				

Family rate

Themes	Scenario I	Scenario II	Scenario III	Scenario IV	
BMP Cost per Annum	56,216.16	56,216.16	56,216.16	56,216.16	
HIV/AIDs		1,540.56			
Non-Drug Resistant TB			1934.40		
Family Planning				598.56	
Administration cost @ 15%	8,432.42	8,663.51	8,722.58	8,522.21	
Marketing cost @ 7%	3,935.13	4,042.97	4,070.54	3,977.03	
Contingency loading @ 8%	4,497.29	4,620.54	4,652.05	4,545.18	
Total Cost per Annum	73,081.00	75,083.74	75,595.73	73,859.14	
Reimbursement method	Cost				
Capitation	42,385.62				
Fee-for-Service	13,830.54				

Having computed the estimated premiums as shown in the table above, we recommend for each scenario, rounded premiums. This will ease computations, cash transactions and also allow for extra safety margins in the premium rates.

The rounded figures are below:

N12,200 and **N73,100** for individual and household rates under Scenario I
N12,510 and **N75,100** for individual and household rates under Scenario II
N12,600 and **N75,600** for individual and household rates under Scenario III
N12,310 and **N73,890** for individual and household rates under Scenario IV

There is also an additional registration fee of N350 per enrollee, subject to household discount.

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1. Introduction

USAID and Health Finance Governance via Abt Associates have contacted us to carry out a detailed actuarial analysis for Kano State Contributory Healthcare Benefit Package. The Agency provides for a basic minimum benefit package in addition to HIV, TB and Family planning services.

1.1 Scope of Works

The reported health insurance premiums for the Scheme consist of:

- Pure premium for that covers the medical elements.
- Administrative costs
- Marketing costs
- Contingency margin

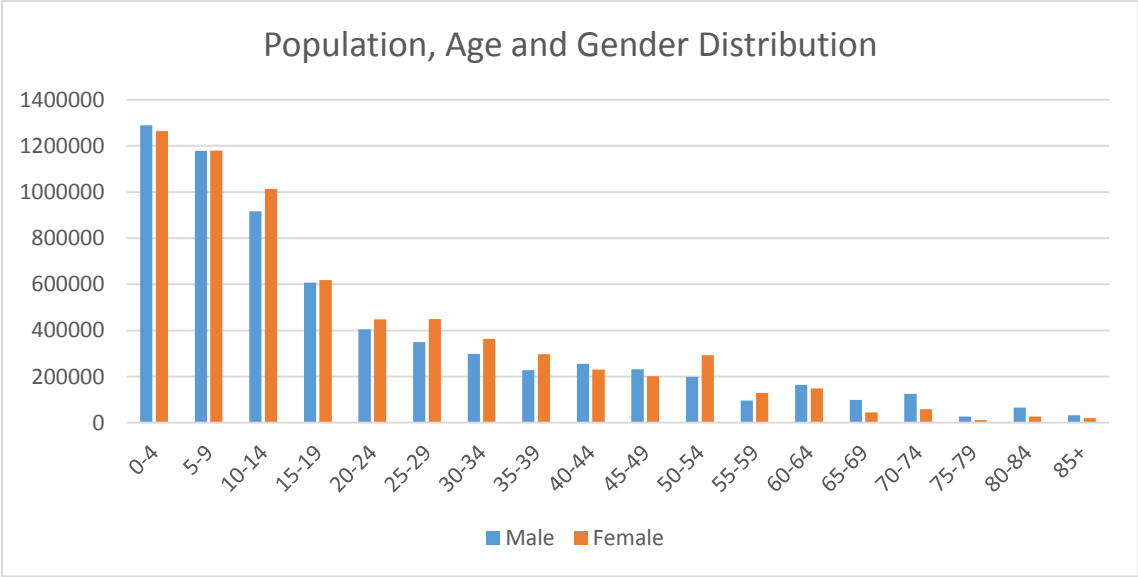
This premium has been calculated for all scenarios we were instructed to consider. The scenarios are

Scenario I – Basic Minimum Package (BMP)
Scenario II – Basic Minimum Package + HIV/AIDS
Scenario III – Basic Minimum Package + TB
Scenario IV – Basic Minimum Package + Family Planning Services

1.2 Target Market

The objective of Kano State Contributory Healthcare Benefit package is to provide an affordable and, in the long run, a sustainable health insurance package for its residents.

The population of Kano State as at December 2017 sits around 13 million as advised in the projected population figures supplied. This is also supported by the Multiple Indicator Cluster Survey (MICS) carried in 2016-2017. The scheme is to be rolled out primarily for the state workers, market women and children.



As the full population demographics were not completely described in the population data provided to us, we have adopted some assumptions in order to estimate exposed population.

1.3 Actuarial Data and Limitations

Actuarial Data

The service data provided comprises of encounter/utilization statistics data from Kano state government healthcare facilities across the forty four local government areas (LGAs). After reviewing the service data, we realized the information is not adequate to give a credible result.

Some of the inadequacies we discovered are below:

- The encounter entries were only supplied for the 2015/2016.
- Scanty or no utilization/encounter entries for some age groups
- Scanty or no utilization/encounter entries for some periods
- Some diagnoses were advised as "**not indicated** "and hence could not be included in the analysis.

However, we have sourced for additional data available within our reach to obtain a more realistic result. In sourcing for additional data, we have allowed for similar demographic characteristics, utilization patterns, customer behaviors and propensity to use health insurance. We have also relied on some secondary data

obtained through a recent survey on Kano State Health Plan such as the **Multiple Indicator Cluster Survey**.

We have also made an informed decision to ensure that our assumptions are truly reflective of the Kano State demography. For instance, the data supplied on HIV/AIDS for the costing has been used prudently while taking cognizance of the recent reduction of the HIV/AIDS prevalence in Kano State. We are fully aware that HIV/AIDS prevalence in this state has dropped from 2.8% to 1.3%. This was obtained from survey conducted by the National AIDS and Reproduction Health Survey Plus (NARHS-Plus). This organization is responsible for monitoring HIV and AIDS epidemic and behavior driving the epidemic in Nigeria. In view of the above, we have adjusted the historical data appropriately to allow for the fall in prevalence.

To account for other missing members of the population who will not have been captured in the given data, we believe the contingency margin built into the pricing will allow for such deficiencies.

Similarly, in pricing the Tuberculosis, we endeavored to be insightful about the underlying the costing exercise by seeking publicly available information as it relates to Kano State. Tuberculosis in this state has been a common disease with about 29,371 incidences. However, only 26% of this was reported.

Due to the high incidence of this disease in Kano, we have obtained an additional data to that supplied to increase the precision of the costing and reduce random fluctuation that may arise from the inadequacy of data.

To perform a trend analysis in the future, we advise the collation of relevant data such as geographical location, stage of infection, duration of drugs, occupation/socio-economic status, etc.

We have also used recent costs of drugs/treatments in our possession as well as the ones supplied by Abt Associates.

1.4 Limitations and use of this report

This report was prepared solely for Abt Associates for the purpose of advising on an appropriate price of the benefits of the Kano State Contributory Healthcare Benefit Package. The results in this report are reasoned estimates based on scanty and inadequate data which were supplemented with external data.

The data problems and the adjustments made thereon may mean that the adjusted data may not fully represent the exact characteristics and utilization patterns of the Kano State population. Even if the data was an exact representation of the current population and past utilization data, they may not fully represent future demography and expected scheme experience.

Thus, in no event will the actuarial Consultants be held liable for any decisions made or actions taken by the Kano State Government, its agents or any third party in reliance of the information contained in this report. The Consultants recommend the user of this report to be aided by its own actuary or other qualified professionals when reviewing this report.

2. Source of Data

2.1 Description of Data Source

2.1.1 This KHS benefit package is a relatively new health insurance cover to be rolled by Kano State for its residents. HFG provided us with a service data collated from healthcare facilities across Kano State. The data used covers the period from 2015 to 2017 thus representing a sizeable database.

2.1.2 We have checked for inconsistent patterns, random fluctuations and errors in the data to ensure our estimates are not overly distorted by past or exceptional experiences that are no longer relevant and some one-off socio economic and demographic factors.

2.1.3 The utilization rates were generally obtained using the encounter data together with the exposure data which was obtained from the Census data supplied. The cost of encounter as advised was also adopted in arriving at the estimated price. However, the supplied data had some limitations, for instance; the encounter data was not split into capitation and fee-for-service. In view of these deficiencies, we have relied on our prior experience with health insurance schemes, available and validated data of other schemes within our reach to come up with a likely split of the encounter data into capitation and fee-for-service while assuming that experience would be similar between the two classes.

2.1.4 There are 240 healthcare facilities in the state as in the date provide to us. The distribution is as follow:

Type of facility	Actual Number
Primary Healthcare facilities	155
Secondary Healthcare facilities	37
Private Healthcare facilities	48
Total	240

2.1.5 The following number of facilities reported encounter data for HIV/AIDs:

Facilities reporting:	Actual Number
PMTCT	590
HTC	3,832
ART	32,000

The next section describes the distribution of the data

3. Benefit Package & Design

The benefits included in the proposed Scheme which include primary, secondary and tertiary care are listed below:

Classification	Diseases/Clinical Conditions
Maternal, Neonatal and Child Health (MNCH) services	Ante-natal and post-natal care
	Child care
	Delivery Services
Emergency & Obstetric Care	Management of Preterm labour & Premature rupture of membranes Detection and management of hypertensive disease in pregnancy Management of antepartum and postpartum hemorrhages Caesarean Section Management of Intra Uterine Foetal Death Management of Puerperal Sepsis Instrument Deliveries High Risk Deliveries/ Multiple Pregnancy Manual Vacuum Aspiration (MVA) Uterine Evacuation Bartholin Cystectomy Hysterectomy Myomectomies Ovarian Cystectomy Management of Ectopic Gestation Pap- Smear
Management of Non-Communicable diseases	Sickle Cell Diabetes and Hypertension Cardiovascular Conditions Severe Anaemia Dialysis
Health Care Services	Antenatal Care
	Family planning
	HIV/AIDS and STIs
	Infections
	Vitamin A Supplementation
	Consultation
	Immunisation
	Dental Care
	Pediatrics
Surgeries	Laparotomy for any Cause Intestine resection and anastomosis Appendectomy Male Circumcision Hernia Repair Hydrocelectomy Management of Testicular Torsion Thyroidectomy Management of Fractures Fine Needle/Excisional Biopsy Drainage of Simple Polydactyl Other surgical related treatments
Internal Medicine	Malaria Ear, Nose and Throat Infection Respiratory Tract Infection Urinary Infection

	Helminthiasis Schistosomosias Bee and Scorpion Sting/ Dog / Snake Bite excluding antivenom Screening Referral for Diabetes Mellitus Sickle Cell Management Arthritis and Other Musculoskeletal disease Minor Allergic Condition
Basic Laboratory Investigation	Routine laboratory investigations Widal Test Urinalysis Packed Cell Volume Random Blood Sugar/fasting blood Sugar Pregnancy Test
Eye & Dental Care	Conjunctivitis Allergic Ailments Simple Contusion, Abrasion etc Amalgam Filling Simple Tooth Extraction
Ear, Nose and Throat Care	Antral Wash out Foreign Body Removal Surgical Operation
Infections & Infestations	Management of severe Malaria Management of Meningitis and Septicemia Management of Typhoid Fever Management of complicated Respiratory Tract Infections
Radiology	X-ray of Chest, Abdomen, Skull and Extremities Dental X-ray Abdominopelvic USS Doppler USS CT Scan Fluoroscopy Contributory Barium Meal/Enema Contributory Upper and Lower GI Endoscopy Contribution Small Parts

4. Exposure Data

HFG supplied the Kano State population categorized by Local Government Area, LGA. The projections and percentage of each Kano Local Government Area (KLGA) to the total population of Kano State up until 2018 are presented below.

Table 2.2.1 Exposure Population by Local Government Area

LGA	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Ajingi	185,820	191,952	198,286	204,830	211,589	218,571	225,784	233,235	240,932	248,883	257,096
Albasu	202,910	209,606	216,523	223,668	231,050	238,674	246,550	254,687	263,091	271,773	280,742
Bagwai	173,772	179,507	185,430	191,550	197,871	204,401	211,146	218,114	225,311	232,747	240,427
Bebeji	201,529	208,180	215,050	222,146	229,477	237,050	244,873	252,953	261,301	269,924	278,831
Bichi	295,689	305,447	315,527	325,939	336,695	347,806	359,284	371,140	383,388	396,039	409,109
Bunkure	182,356	188,374	194,590	201,011	207,645	214,497	221,576	228,888	236,441	244,243	252,303
Dala	446,872	461,619	476,853	492,589	508,844	525,636	542,982	560,900	579,410	598,531	618,282
Dambatta	221,920	229,244	236,809	244,623	252,696	261,035	269,649	278,548	287,740	297,235	307,044
Dawakin-Kudu	240,510	248,447	256,646	265,115	273,864	282,901	292,237	301,881	311,843	322,134	332,764
Dawakin-Tofa	264,505	273,233	282,250	291,564	301,186	311,125	321,392	331,998	342,954	354,272	365,962
Doguwa	161,324	166,647	172,147	177,827	183,696	189,758	196,020	202,488	209,170	216,073	223,204
Fagge	212,167	219,169	226,401	233,872	241,590	249,563	257,798	266,306	275,094	284,172	293,550
Gabasawa	225,214	232,647	240,324	248,255	256,447	264,910	273,652	282,682	292,011	301,647	311,601
Garko	173,402	179,124	185,035	191,141	197,449	203,965	210,696	217,649	224,831	232,251	239,915
Garum-Mallam	124,309	128,412	132,649	137,027	141,549	146,220	151,045	156,029	161,178	166,497	171,992
Gaya	214,502	221,581	228,893	236,446	244,249	252,309	260,635	269,236	278,121	287,299	296,780
Gazewa	300,993	310,925	321,186	331,785	342,734	354,044	365,728	377,797	390,264	403,143	416,447
Gwale	386,349	399,099	412,269	425,874	439,928	454,445	469,442	484,934	500,936	517,467	534,544
Gwarzo	196,331	202,809	209,502	216,416	223,557	230,935	238,556	246,428	254,560	262,961	271,638
Kabo	164,148	169,565	175,161	180,941	186,912	193,080	199,452	206,034	212,833	219,856	227,112
Kano-Municipal	390,048	402,919	416,216	429,951	444,139	458,796	473,936	489,576	505,732	522,421	539,661
Karaye	150,894	155,873	161,017	166,331	171,820	177,490	183,347	189,397	195,647	202,104	208,773
Kibiya	145,909	150,724	155,698	160,836	166,144	171,627	177,290	183,141	189,185	195,428	201,877
Kiru	282,545	291,869	301,501	311,450	321,728	332,345	343,312	354,642	366,345	378,434	390,923
Kumbotso	315,836	326,259	337,025	348,147	359,636	371,504	383,763	396,428	409,510	423,023	436,983
Kunchi	118,466	122,375	126,414	130,586	134,895	139,346	143,945	148,695	153,602	158,671	163,907
Kura	154,302	159,394	164,654	170,088	175,701	181,499	187,488	193,675	200,067	206,669	213,489
Madobi	145,789	150,600	155,570	160,704	166,007	171,485	177,144	182,990	189,028	195,266	201,710
Makoda	237,320	245,151	253,241	261,598	270,231	279,148	288,360	297,876	307,706	317,860	328,350
Minjibir	228,137	235,666	243,443	251,476	259,775	268,348	277,203	286,351	295,800	305,562	315,645
Nasarawa	636,699	657,710	679,414	701,835	724,996	748,921	773,635	799,165	825,537	852,780	880,922
Rano	155,196	160,318	165,608	171,073	176,719	182,551	188,575	194,798	201,226	207,866	214,726
Rimin-Gado	111,820	115,510	119,322	123,260	127,327	131,529	135,870	140,353	144,985	149,769	154,712
Rogo	243,021	251,041	259,325	267,883	276,723	285,855	295,288	305,032	315,099	325,497	336,238
Shanono	150,040	154,992	160,106	165,390	170,848	176,486	182,310	188,326	194,541	200,960	207,592
Sumaila	270,679	279,611	288,838	298,370	308,216	318,387	328,894	339,748	350,959	362,541	374,505
Takai	216,345	223,484	230,859	238,478	246,347	254,477	262,874	271,549	280,510	289,767	299,330
Tarauni	236,218	244,013	252,066	260,384	268,977	277,853	287,022	296,494	306,278	316,385	326,826
Tofa	104,291	107,732	111,288	114,960	118,754	122,673	126,721	130,903	135,222	139,685	144,294
Tsanyawa	168,259	173,811	179,547	185,472	191,593	197,915	204,446	211,193	218,162	225,362	232,799
Tudun-Wada	247,289	255,450	263,880	272,588	281,583	290,875	300,474	310,390	320,633	331,214	342,144
Ungongo	394,457	407,474	420,921	434,811	449,160	463,982	479,293	495,110	511,449	528,327	545,761
Warawa	137,427	141,962	146,647	151,486	156,485	161,649	166,984	172,494	178,187	184,067	190,141
Wudil	197,613	204,134	210,871	217,830	225,018	232,444	240,114	248,038	256,223	264,679	273,413
Kano	10,013,224	10,343,660	10,685,001	11037606	11,401,847	11,778,108	12,166,786	12,568,289	12,983,135	13,411,578	13,854,062

Table 2.2.2 Exposure Distribution from 2012 to 2018 by Local Government Area

LGA	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Ajingi	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%
Albasu	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Bagwai	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%
Bebeji	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Bichi	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Bunkure	1.8%	1.8%	1.8%	1.8%	1.8%	1.8%	1.8%	1.8%	1.8%	1.8%	1.8%
Dala	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%
Dambatta	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%
Dawakin-Kudu	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%
Dawakin-Tofa	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%
Doguwa	1.6%	1.6%	1.6%	1.6%	1.6%	1.6%	1.6%	1.6%	1.6%	1.6%	1.6%
Fagge	2.1%	2.1%	2.1%	2.1%	2.1%	2.1%	2.1%	2.1%	2.1%	2.1%	2.1%
Gabasawa	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%
Garko	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%
Garum-Mallam	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%
Gaya	2.1%	2.1%	2.1%	2.1%	2.1%	2.1%	2.1%	2.1%	2.1%	2.1%	2.1%
Gazewa	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Gwale	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%
Gwarzo	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Kabo	1.6%	1.6%	1.6%	1.6%	1.6%	1.6%	1.6%	1.6%	1.6%	1.6%	1.6%
Kano-Municipal	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%
Karaye	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
Kibiya	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
Kiru	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%
Kumbotso	3.2%	3.2%	3.2%	3.2%	3.2%	3.2%	3.2%	3.2%	3.2%	3.2%	3.2%
Kunchi	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%	1.2%
Kura	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
Madobi	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
Makoda	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%
Minjibir	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%	2.3%
Nasarawa	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%	6.4%
Rano	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
Rimin-Gado	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%
Rogo	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%
Shanono	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
Sumaila	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%
Takai	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%
Tarauni	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%
Tofa	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Tsanyawa	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%
Tudun-Wada	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Ungongo	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%
Warawa	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%
Wudil	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Kano	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

5. Encounter Data

The data comprises of different ailments attended to at state hospitals, and health centers over a three years period (2015 – 2017). Although, the data supplied was scanty and we have a sizeable number of these without diagnosis, it has been complemented with other available and validated data.

The encounter data supplied is devoid of enrollee's age or gender and hence, we couldn't conduct a further analysis of the data. We have grouped the ailments under the two major modes of reimbursement; Capitation and Fee-For-Service for all the years mentioned above. We achieved this by using external medical experts to map the observed encounters to the diseases and clinical conditions provided under the proposed benefit package.

We have treated the diagnosis and treatment of communicable diseases and donor funded benefits (HIV/AIDS and Tuberculosis) separately. We describe, in separate sections (Sections 9 and 10), the encounter data provided for HIV/AIDs and TB.

Table 5.1 TB Case Distribution from 2013 to 2017 by mode of detection

Year	Number of Cases	Bacteriological	Clinical
2013	6,436	3,683	2,753
2014	6,023	3,346	2,677
2015	5,621	3,182	2,439
2016	7,593	5,019	2,484
2017	7,531	5,844	1,687

Table 5.2 TB Case Age Distribution from 2013 to 2017 with number of successful treatments

Year	Number of Cases	<=14 years	>14 years	Number of Successful Treatments
2013	6,436	592	5,844	5,890
2014	6,023	487	5,536	5,510
2015	5,621	408	5,213	4,822
2016	7,593	591	7,002	6,656
2017	7,531	606	6,925	-

** This was supplied without any entry.*

6. Actuarial Assumptions and Methodology

We have built our pricing model as described below:

6.1 Assumptions

The available data would on its own lead to unreasonable results, hence, we supplemented with external data. In selecting external data, we considered the characteristics of Kano State population and that of the external data to ensure adequate similarities and consistencies. The credibility split between own and external data is 40%/60% respectively.

We have also made assumptions for the exposure to be 25% of the estimated population and an average family size of 6

6.2 Capitation Cost

Under a capitation arrangement, the program pays a provider a specified amount per enrollee in advance on a regular basis, in return for performing specified services.

In calculating the capitation cost, we have used the cost of treatment data we received from the client and also supplemented it (where necessary) with some treatment costs from one of our existing clients' data. We have multiplied each diagnosis encounter for low risk/high demand services with the assumed treatment cost to obtain the total capitation cost each year.

6.3 Fee- For- Service

Under a fee-for-service (FFS) arrangement, the program reimburses a provider after a service has been delivered. Here, the provider will submit a claim which may be vetted by an independent medical expert to ascertain the reasonability of the claimed cost against the diagnosis.

Similar to the case above, we have also used fee-for-service costs, and multiplied each diagnosis encounter for medium-high risk/low demand services. Case rates supplied were also used.

6.4 Reimbursement structure

The proposed package under the package will use a combination of capitation and FFS reimbursements as shown below:

Themes	Reimbursement Type	Capitation	FFS
Maternal, Noe-natal and Child Health	Capitation	Primary Secondary Tertiary	
Emergency and Obstetric Care	Capitation + FFS	Primary Secondary Tertiary	Primary
Non-Communicable Disease	Capitation + FFS	Primary Secondary	Primary Secondary
Healthcare Services	Capitation	Primary	
Surgery	Capitation	Primary Secondary Tertiary	
Internal Medicine	Capitation + FFS	Primary Secondary	Secondary
Basic Laboratory Investigation	Capitation	Primary Secondary	
Eye & Dental Care	Capitation	Primary Secondary	
Ear, Nose and Throat Care	Capitation	Primary Secondary	
Infections and Infestations			
Radiology	Capitation		

6.5 Administrative Cost

An assumption of **15%** was made and this is as a percentage of all benefits under each scenario. This is to cover solely the administrative processes of the Agency.

6.6 Marketing Expense

We anticipate the spending on advertising and announcements to the public on this Agency to be initial and will gradually fade off over time. This is necessary as the more enrollees, the more stable the cost of administering the package is expected to be. We assumed this to be **7%** of the total benefits under each scenario. In arriving at this rate, we have assumed a fixed marketing cost and spread it over the number of potential enrollees.

6.7 Contingency Margin

In the event that the actual utilisation and the emerging cost of treatment differ from our projections, we have included a contingency margin of **8%** of premium p.a. This margin will cover data errors, changes in experience from period which data covers to periods which premiums will apply and other adverse experiences.

6.8 Premium

This is sum of the following elements

- the Capitated fee
- Fee-For-Service charges
- Other benefits such as HIV, TB and Family Planning Services
- Administrative cost,
- Marketing expenses and the Contingency Margin

7. Results

The original results show the average treatment cost, utilization and hence premium per enrollee per month for each of the diagnoses observed in the data. However, the table below shows the groupings of each diagnosis in line with the benefit package provided to us.

In arriving at the results, we have assumed that only 25% of Kano State residents were exposed throughout the year period. However we ran sensitivity analysis (in the next section) to understand the discrepancies between premiums estimated considering 20% and 50% exposures.

Table 7.1 (a) Utilization Rates per Encounter grouped by Themes

Themes	Utilisation/1000
Maternal, Neo-natal and Child Health	190.9
Emergency and Obstetric Care	147.3
Non-Communicable Disease	1,853.3
Healthcare Services	561.3
Surgeries	9.78
Internal Medicine	819.4
Basic Laboratory Investigation	26.5
Eye & Dental Care	74.7
Ear, Nose & Throat Care	13.5
Infections & Infestations	104.9
Radiology	1.34

Benefit Packages

The table below shows the costing for each different benefit packages. The packages are described in the scenarios below:

Scenario I – Basic Minimum Package (BMP)
Scenario II – Basic Minimum Package + HIV/AIDS
Scenario III – Basic Minimum Package + TB
Scenario IV – Basic Minimum Package + Family Planning Services

Table 7.2.1 (a) Total premium per person (per month and per annum)

Themes	Scenario I	Scenario II	Scenario III	Scenario IV	
Maternal, Neonatal & Child Care	21.20	21.20	21.20	21.20	
Emergency & Obstetric Care	216.91	216.91	216.91	216.91	
Non-Communicable diseases	110.05	110.05	110.05	110.05	
Surgeries	106.77	106.77	106.77	106.77	
Healthcare Services	10.30	10.30	10.30	10.30	
Treatment of Infections & Infestation	153.24	153.24	153.24	153.24	
Basic Laboratory Investigations	11.27	11.27	11.27	11.27	
Internal Medicine	73.69	73.69	73.69	73.69	
Eye & Dental Care	20.19	20.19	20.19	20.19	
Ear, Nose &Throat Care	42.91	42.91	42.91	42.91	
Radiology	14.25	14.25	14.25	14.25	
BMP Cost per Month	780.78	780.78	780.78	780.78	
BMP Per Annum	9,369.36	9,369.36	9,369.36	9,369.36	
HIV/AIDs		256.76			
TB Testing			42.67		
Drug sensitive TB			29.59		
Drug resistant TB			250.14		
Total cost of adding TB			322.40		
Family Planning				99.76	
Administration cost @ 15%	1,405.40	1,443.92	1,453.76	1,420.37	
Marketing cost @ 7%	655.86	673.83	678.42	662.84	
Contingency loading @ 8%	749.55	770.09	775.34	757.53	
Total Cost per Annum	12,180.17	12,513.96	12,599.29	12,309.86	
Reimbursement method	Cost				
Capitation	**7,064.27**				
Fee-for-Service	**2,305.09**				

Table 7.2.1 (b) Total premium per household (per month and per annum)

Themes	Scenario I	Scenario II	Scenario III	Scenario IV	
Maternal, Neonatal & Child Care	127.20	127.20	127.20	127.20	
Emergency & Obstetric Care	1,301.46	1,301.46	1,301.46	1,301.46	
Non-Communicable diseases	660.30	660.30	660.30	660.30	
Surgeries	640.62	640.62	640.62	640.62	
Healthcare Services	61.80	61.80	61.80	61.80	
Infections & Infestation	919.44	919.44	919.44	919.44	
Basic Laboratory Investigations	67.62	67.62	67.62	67.62	
Internal Medicine	442.14	442.14	442.14	442.14	
Eye & Dental Care	121.14	121.14	121.14	121.14	
Ear, Nose &Throat Care	257.46	257.46	257.46	257.46	
Radiology	85.50	85.50	85.50	85.50	
Total Cost	4,684.68	4,684.68	4,684.68	4,684.68	
Cost per Annum	56,216.16	56,216.16	56,216.16	56,216.16	
HIV/AIDs		1,540.56			
TB Testing			256.02		
Drug sensitive TB			177.54		
Drug resistant TB			1,500.84		
Total cost of adding TB			1,934.40		
Family Planning				598.56	
Administration cost @ 15%	8,432.42	8,663.51	8,722.58	8,522.21	
Marketing cost @ 7%	3,935.13	4,042.97	4,070.54	3,977.03	
Contingency loading @ 8%	4,497.29	4,620.54	4,652.05	4,545.18	
Total Cost per Annum	73,081.00	75,083.74	75,595.73	73,859.14	
Reimbursement method	Cost				
Capitation	**42,385.62**				
Fee-for-Service	**13,830.54**				

Additional Family Member

There will be instances where family size will be greater than 6. In such situations, additional family members may be allowed.

It is expected that lives will be independent and so will morbidity rates (except for hereditary sicknesses). Regardless, in order to recognize the independence of lives

and hence independence of morbidity rates, it is recommended that the cost of an additional family member in excess of 6 be discounted,

The recommended discount to be applied is 7.5% of the individual rate for the additional family member. This shall be paid together with the family rate.

8. Sensitivity Analysis

This section gives the individual and household total premium rates for this product considering variations in a range of factors that were assumed in calculating the premium rates. This is important because assumptions are based on past experience and professional judgements, which may be different from the actual turnout of events.

Sensitivity analysis helps to determine the most significant factors that affect the premium rates and hence require special consideration in arriving at the decisions as to the premium rates.

The following factors were tested.

- Data credibility – in this exercise, we have assigned a weight of 40% to the data provided to us and 60% to external data. The test is to ascertain the impact of assigning a higher weight to the data provided to us or vice versa.
- Exposure – exposure is the proportion of the population who will be enrolled in the Scheme. Initially, the package may be attractive to those more likely to receive care hence there may be some adverse selection and higher payout at the initial phase of the Scheme. Overtime, given the marketing cost, it is expected that more residents will enroll. The effect of this may mean that utilization will reduce and hence cost per enrollee.
- Family size – We have assumed a family size of 6. This is used purposely to reflect the high population density of Kano State.
- Increase in cost of care – this is to ascertain the effect of inflation or rising cost of care compared to those we have used in arriving at the results
- Increase in utilization – this is to determine the impact of an increase in utilization or encounter for each benefit. Utilization or encounter rates may rise for various reasons which may include a higher level of insurance awareness, lower health awareness, epidemics, outbreaks, etc.

Risk Factor	Actual Assumption	Shock tested	% Effect on Cost	New Premium
Data credibility	40% own data/60% external data	50% own data / 50% external data	+9%	10,212.60
		30% own data / 70% external data	-2%	9,181.97
Exposure	25% of population	20% of population	+24%	11,618.01
		50% of population	-51%	4,590.99
Family size	6	7	+17%	10,969.15
Increased cost of care		20% increase in the average cost of care	+20%	11,243.23
Increased utilization		20% increase in incidence rate	+20%	11,243.23

From the above table, it will be seen that the most important factor is the exposure of the population. The cost of the Agency may see a significant reduction if there are more enrollees whose demography balances those of the existing population most likely to enroll. There may also be an increase in cost if enrolment level is lower than expected. However, the impact on the premium rates as a result of changes in exposure is non-linear. This means that a 1% change in exposure will not necessarily lead to a 1% change in the scheme cost due to other factors in operation.

Inflation of cost of care and a higher utilization are also important assumptions that need to be monitored closely. A spike in these risk factors may result in a proportionate increase in Agency cost.

This sensitivity analyses the impact of changes in risk factors in isolation. An important point to note is that simultaneous adverse movements in these risk factors may result in the actual cost exceeding expected costs by a much higher percentage.

9. Focus 1: HIV/AIDs

In this section, we provide additional information on the cost computation of HIV/AIDs in Kano State. The client supplied additional encounter data for this computation. We subdivided the data into Antiretroviral Therapy (ART), HIV Testing and Counseling (HTC) and Preventing Mother to Child Transmission (PMTCT).

The tables below show the encounter data by year:

ART			
	2015	**2016**	**2017**
Total	28,819	29,388	32,000

Number of Positive HCT			
	2015	**2016**	**2017**
Total	1,645	5,606	3,832

Assumptions

In costing the HIV/AIDs benefit, we have made the following assumptions:

- The HIV/AIDS data supplied is inadequate to carry out the costing exercise, hence we relied on other sources within our reach.
- Projection period: we projected the data we received over a three-year period to 2018 to allow us capture trends in the population data and reflect same in utilization and cost statistics.
- Cost of treatment or testing: we did not receive cost data for pricing the HIV/AIDS, hence we assumed cost data from Lagos State data available to us.
- Medical inflation: we have assumed medical inflation of 6% over the projection period
- Exposure data: for the purpose of this computation, we have assumed exposure to be 40% of the entire population of Kano State. This assumption allows for unreported cases including people who do not know they live with the disease. We arrived at the exposure level by considering the relative encounter rate of the state compared to other states and Schemes.
- Contingency loading: We have not specifically loaded this benefit for contingencies. However, HIV/AIDs benefit has been included in the total cost before loading for contingencies.

The following tables show the modular costing within each sub-category and the overall additional premium for HIV/AIDs:

ART	
Total cost for module - ART (including viral load test)	*174.48*
Breakdown of ART modular cost	
• *ART (1st Line of Defense)*	*154.59*
• *ART (2nd Line of Defense+ salvage)*	*13.89*
• *ART (Viral Load Test)*	*6.01*

HTC	
Total cost for module - HCT (counselling not covered)	*29.55*
Breakdown of HCT modular cost	
• *HTC (General population test)*	*26.98*
• *HTC (Confirmatory test)*	*2.57*

PMTCT	
Total cost for module - PMTCT (excluding testing for pregnant women)	*52.73*
Breakdown of PMTCT modular cost	
• *PMTCT (Drugs for mother)*	*35.34*
• *PMTCT (Drugs for infant)*	*11.78*
• *PMTCT (EID test for infant)*	*5.61*

Total cost for HIV/AIDS cover	256.76
Breakdown of HIV/AIDS cost of cover	
• *HTC*	*29.55*
• *ART*	*174.48*
• *PMTCT*	*52.73*

Exposure variation

Assumed exposure	20%	50%	75%	100%
% Expected change in cost	+60.9%	-13.6%	-31.7%	-40.8%
New Premium	413.13	221.84	175.37	152.00

The above table shows the expected impact on the cost of the HIV/AIDs benefit if the assumed exposure changes.

10. Focus 2: Tuberculosis

In this section, we provide additional information on the cost computation of Tuberculosis (TB) in Kano State. The client supplied encounter data of children with ages 0-14 and the different registered TB cases in 2013-2017. Though, the information supplied was inadequate, we have used this with other external data and made assumptions.

We have used the population split to estimate the treatment and tested encounters for older ages (ages above 14). We also grossed this split by the encounter data originally provided to us for the years 2015 – 2017.

In costing the TB benefit, we have made the following assumptions:

- Cost of treatment or testing: we did not receive cost data, hence we assumed cost data from Lagos State data available to us.
- Exposure data: for the purpose of this computation, we have assumed exposure to be 50% of the entire population of Kano State. This assumption allows for unreported cases including people who do not know they live with the disease. We consider the 50% as an appropriate exposure level by virtue of the high incidence rate in the state compared to other states and Schemes.
- Contingency loading: We have not specifically loaded this benefit for contingencies. However, TB benefit has been included in the total cost before loading for contingencies.

The table below shows the utilization, unit cost and expected cost subdivided into GeneXpert test. Sputum test and TB treatment. This subdivision is based on our experience with similar external schemes.

Exposure assumption	**50%**		
Sub-classification	**Utilisation Rate**	**Unit Cost**	**Expected Cost**
GeneXpert Test			
0-14	0.00146	3,600	5.26
>14	0.00759	3,600	27.33
Sputum Tests			
Test I	0.00224	1,500	3.36
Test II	0.00224	1,500	3.36
Test III	0.00224	1,500	3.36
Drug Susceptible TB Cases			
0-14	0.00056	7,200	4.03

Exposure assumption	**50%**		
Sub-classification	**Utilisation Rate**	**Unit Cost**	**Expected Cost**
>14	0.00355	7,200	25.56
Drug Resistant TB Cases			
All ages	0.00049	510,480	250.14
Total Cost			**322.40**

Exposure variation

Assumed exposure	25%	75%	100%
% Expected change in cost	+100%	-33%	-50%
New premium	644.8	216.01	161.20

The above table shows the expected impact on the cost of the TB benefit if the assumed exposure changes.

11. Conclusions and Recommendations

11.1. We have considered the data provided to us and have supplemented with external data where necessary

11.2. We have estimated the individual and family cost of the package as shown in section 7 above.

11.3. We have also provided the assumptions that should be monitored closely in our sensitivity analysis section (Section 8)

11.4. As regards the Family Planning Services benefit, scanty data was received. However, we have complemented this with other available data to enable us to cost this benefit.

11.5. The premiums we provided are indicative, and the client should apply reasonable judgements based on affordability, margins for error, the expected level of external funding, etc in setting the final premium for the package.

11.6. We recommend that going forward, data must be collected in the right format at the appropriate level of granularity to enable the experience of the Scheme to be properly monitored.

12. Addendum

12.1. The Consultant anticipates that the client may want to understand the impact of discounts on the premiums calculated in the previous sections. Hence, an investigation has been conducted to show how and where discounts in the BMP may be derived.

12.2. In conducting the investigation, 3 major assumptions underlying the premium computation have been considered, namely; exposure, cost of care and utilization.

12.3. Although these investigations have been indicated in the sensitivity analysis in section 8, we will attempt to provide actual cost implications.

12.4. We have not varied exposures as we believe this is already realistic and may not be reasonable to vary further. Also, this assumption is very sensitive to risk and hence not suitable to use as a discount driver. It is important to note that higher enrolment and hence increased exposure may reduce the cost of the Agency and vice versa.

12.5. The following table provides variations in the cost of care and incidence rates underlying the pricing of the BMP.

*Individual reduction in cost of care and utilisation rates	5%	10%	15%
Revised premium (approx.)	8,900.89	8,432.42	7,963.95
**Combined reduction in cost of care and utilisation rates	5% each	***10%/5%	10% each
Revised premium (approx.)	8,455.84	8,010.80	7,589.18

**Individual reduction means a 5% reduction in either cost of care or utilization would have the same effect on the premium.*

***Combined reduction means if both cost of care and utilization rates are simultaneously reduced*

****This is the combined effect of a 10% reduction in cost of care and 5% reduction in utilization rates.*

12.6. From the table above, it will be observed that there is a linear relationship between the reduction rate on either the cost of care or the utilization rates and the impact on premium. This means that a 1% increase or decrease in either cost of care or utilization rate will lead to a 1% increase or decrease in the premium rate.

12.7. We recommend, from the point of sustainability, that the government of Kano State applies caution in choosing an appropriate rate of premium for the package.

12.8. We also recommend that the experience of the Scheme be closely monitored, and perhaps and annual review until experience stabilizes.