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Multivariate Statistical Analysis of basic indicators of Human Development Index and Human Poverty Index for Nigerian States, 2006-2009.

Ewere F. and Osunde I. O.
Department of Mathematics,
University of Benin, Benin City, Nigeria

Abstract

The Human Development Index (HDI) is a summary measure used around the world that indicates the level of development of a country. The HDI incorporates the main factors of human life such as health, education and income. Deprivation in these areas of human life is measured by calculating Human Poverty Index (HPI). This paper describes multivariate statistical techniques to analyze the different indicators used in the calculation of HDI and HPI for all 36 states of Nigeria, including the Federal Capital Territory (FCT) Abuja. Factor analysis is used to identify those indicators which have high influence on HDI and HPI and cluster analysis is used to separate the 36 states, including the FCT, Abuja into two groups.

1.0 Introduction

The concept of HDI occupies great importance since it covers both economic and social factors of human development. The HDI is now mostly used to evaluate human development in a state or country and for comparison among states and countries. The origins of the HDI are to be found in the **United Nations Development Programme's** (UNDP). These were devised and launched by Haq [1] and he had the explicit purpose: "to shift the focus of development economics from national income accounting using the Gross Domestic Product Per Capita (GDP) an indicator of the average standard of living of individual members of the population (an increase in GDP per capita signifies national growth), to people centred policies. The HDI takes into account three basic dimensions of human development, namely, longevity, knowledge and decent standard of living. Longevity is measured by life expectancy at birth, knowledge is measured by a combination of the adult literacy rate and the combined primary, secondary, and tertiary gross enrolment ratio and standard of living by GDP per capita (PPP US$). Here PPP stand for **Purchasing Power Parity** and is a criterion for an appropriate exchange rate between currencies when a representative basket of goods in two different countries cost the same. The three indices are calculated for longevity, knowledge and decent standard of living and HDI is calculated as average of these three indices.

The HPI for developing countries measures human deprivations in the three dimensions of human development as HDI i.e. longevity, knowledge and a decent standard of living. Deprivation in longevity is measured by calculating the percentage of people not expected to survive to age 40 years; deprivation in knowledge is measured by the percentage of adults who are illiterate; deprivation in a decent standard of living is measured by three variables: the percentage of people not having sustainable access to safe drinking water source; the percentage of people without access to health services and the percentage of children below the age of five who are underweight. Human poverty index for selected high-income **Organization for Economic Co-operation and Development** (OECD) countries includes social exclusion, in addition to the three dimensions in HPI for developing countries.

Nigeria is officially known as the Federal Republic of Nigeria and comprises of 36 states plus a Federal Capital Territory (FCT) known as Abuja. Nigeria is known as the most populous black nation in the world. Nigeria is divided into six geo-political zones; North-east, North-west, North-central, South-east, South-west, and south-south (Figure 1). There are also 774 constitutionally recognized Local Government Areas (LGAs) in the country. The total geographical area of Nigeria is 923,768 square kilometres. According to the Census conducted by the NPC in 2006 from March 21st – 27th, the total population of Nigeria is 140,431,790 with a population growth rate of 1.935%, birth rate is put at 35.51 births/1,000 population (2009 est.) and death rate put at 16.06 deaths/1,000 population (August 2009 est.). More details about Nigeria can be found on Wikipedia [10].

Corresponding author: ***Ewere F.,*** E-mail: fredman4real@yahoo.com, Tel.: +2348058504893

2.0 Data Source

The data sets used in this paper was obtained from the National Population Commission (NPC) of the 2006 Population and Housing Census conducted from March 21st – 27th 2006, but published in February 2009, see [5] and [6]. Other sources of data are from various studies carried out by the UNDP in collaboration with the National Bureaus for Statistics (NBS) and other non-governmental and humanitarian organisations, MDGs and of course economic development committees set up by the Nigerian government to look into various methods for economic development since 2007.

Data set on age groups, sex and educational status was obtained from the 2006 census publication released in 2009 titled Priority Tables for the 2006 National Census by the National Population Commission (NPC). Data set containing information on the distribution of regular households by main source of water supply for domestic use was also obtained from the NPC Priority Reports for the 2006 Population Census.

Data set containing information on the GDP per capita in US Dollars – 2007, all of "The Nigerian Development Report" of the UNDP 2008-2009 [9], where also sources of data used in this paper. Other sources of data used in this work are as listed in the references.

3.0 Methodology

This section describes multivariate statistical techniques to analyze the different indicators used in the calculation of HDI and HPI. Initially, factor analysis is performed for the indicators used in the calculation of HDI and also for those used in HPI. With help of cluster analysis using different indicators used in the calculation of HDI and HPI, all the 36 states and FCT are divided into two groups. The analysis will be performed using the statistical software SPSS version 16, which is specifically dedicated for statistical analysis and data interpretation.

3.1 Factor analysis

Factor analysis was first introduced nearly 100 years ago by psychologist Spearman [7] to define and measure intelligence. The main purpose of factor analysis is to identify a few underlying, but unobservable, random quantities called factors that explain the pattern of correlation within a set of observed variables. In large data sets we often use factor analysis for data reduction to identify a small number of factors that explain most of the variance and covariance in the data set. Factor analysis try to identify such groups that within the group all the variables are highly correlated but relatively independent or less correlated with variables in other groups. Each group of variables represents a single underlying structure or factor which is responsible for the observed correlation within the variables in that group. More details can be found in Johnson and Wichern [2,3].

3.1.1 Factor analysis methods

In factor analysis the two most popular methods of parameter estimation are the principal component analysis (and the related principal factor) method and the maximum likelihood estimation method. In our analysis we use principle component analysis as this analysis technique allow us for the extraction of as many significant factors as possible from our data set. This method explains the covariance structure in terms of just a few common factors.

3.1.2 Calculations and Results

In the first factor analysis we use four indicators; Gross enrolment (GE), Adult literacy (AL), Life expectancy (LE), Per capita income (PCI). These indicators are those occurring in calculation of HDI. To reduce the influence of extreme values of the indicators, they were standardized before used in factor analysis. Standardization of variables is a very useful technique and provides a lot of simplification. It reduces the influence of high values of variables on the results. By standardizing all the values of a variable are scaled in between a smaller range and all the values are laying around their mean value. Also it is easier to handle variables for which the mean is zero and for which the variance is one. Standardization is a simple procedure in which we subtract each value from its mean and divide by its standard deviation.

In Table 1, all 4 components (factors) would be needed to explain 100% of the variance in the data. The Eigen values measure the amount of variation in the total sample accounted for by each factor. Since all the variables were standardized, we can use the conventional criterion of stopping when the initial Eigen value drops below 1.0. Here only 2 of the 4 factors were actually extracted in this analysis. These two account for **77%** of the variance in the data. The extracted two factors have the following matrix form in Table 1.

Table 1: Component Matrix for HDI

	Component	
	1	2
AL	.940	.213
GE	.934	.218
LE	-.193	.793
PCI	.387	-.649

And it can be written in the form

Factor 1 = 0.94ZAL + 0.93ZGE – 0.19ZLE + 0.39ZPCI

Factor 2 = 0.21ZAL + 0.22ZGE + 0.79ZLE – 0.65PCI

From Factor 1 above, we can observe that ZAL and ZGE are the maximum contributors in the calculation of this factor, while in the Factor 2, ZLE is the maximum contributor. These results also show the correlation structure between these variables as shown in Table 2 .

Table 2: Extraction of Factors for HDI

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.943	48.569	48.569	1.943	48.569	48.569
2	1.144	28.592	77.160	1.144	28.592	77.160
3	.775	19.387	96.548			
4	.138	3.452	100.000			

Table 3 shows the correlation coefficients among GE, LE, PCI and AL. Here we can see that correlation coefficient between GE and AL is very high, Pearson's r = 0.860 (p=0.000). This indicates a strong linear relationship between GE and AL. This result shows that increase in GE is more dependent on increase in AL than in any other indicator used in the calculation of HDI.

Table 3: Bivariate Correlation among HDI Indicators

		AL	GE	LE	PCI
Z Score: AL	Pearson Correlation	1	.860**	-.041	.193
	Sig. (2-tailed)		.000	.811	.253
	N	37	37	37	37
Z Score: GE	Pearson Correlation	.860**	1	-.066	.153
	Sig. (2-tailed)	.000		.696	.365
	N	37	37	37	37
Z Score: LE	Pearson Correlation	-.041	-.066	1	-.211
	Sig. (2-tailed)	.811	.696		.209
	N	37	37	37	37
Z Score: PCI	Pearson Correlation	.193	.153	-.211	1
	Sig. (2-tailed)	.253	.365	.209	
	N	37	37	37	37

**. Correlation is significant at the 0.01 level (2-tailed).

In a second factor analysis we consider another set of indicators, percentage of people not expected to survive to age of 40 years (NETA40), percentage of adults who are illiterate (AI), the percentage of people without access to adequate drinking water facility ($P3_1$) and the percentage of people without access to health services (P3). These indicators are those occurring in calculation of HPI. These variables were standardized before factor analysis was performed.

Having all these 4 variables in analysis, using the conventional criterion of stopping when the initial Eigenvalue drops below 1.0. This time around, only **1** of the **4** factors was actually extracted in the analysis (Table 5), which accounts for **66%** of the variance of the data.

Factor 1 = 0.98ZP3 + 0.87ZPAI + 0.78ZP3$_1$ – 0.55ZNETA40

Table 4: Component Matrix for HPI

	Component
	1
P3	.982
AI	.874
P31	.781
NETA40	-.549

Table 5: Extraction of Factors for HPI

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.640	65.990	65.990	2.640	65.990	65.990
2	.857	21.419	87.409			
3	.504	12.591	100.00			
4	.137	3.419	100.000			

Extraction method: Principal Component Analysis

The correlation matrix between the variables given in Table 6, tell us that there are three significant inverse correlation between AI and NETA40 with Pearson's r = -0.422 (p=0.009), $P3_1$ and NETA40, with Pearson's r = -0.201 (p=0.232) and P3 and NETA40, with Pearson's r = -0.381 (p=0.020) showing moderate inverse relationship between AI and NETA40, $P3_1$ and NETA40 and P3 and NETA40. Also, we observe correlation coefficient among AI and $P3_1$, AI and $P3_1$ and P3 and $P3_1$ shown in Table 6. Here we can see that the correlation coefficient between AI and $P3_1$ with Pearson's r = 0.431 (p=0.008), AI and P3 with Pearson's r = 0.880 (p=0.000) and finally P3 and $P3_1$ with Pearson's r = 0.808 (p=0.000) is high. That is, the strength between AI and $P3_1$, AI and P3 and P3 and $P3_1$. This shows that increase in AI is dependent on increase in P3and $P3_1$.

Table 6: Bivariate Correlation among HPI Indicators

		NETA40	AI	P31	P3
Z Score:NETA40	Pearson Correlation	1	-.422**	-.201	-.381*
	Sig. (2-tailed)		.009	.232	.020
	N	37	37	37	37
Z Score: AI	Pearson Correlation	-.422**	1	.431**	.880**
	Sig. (2-tailed)	.009		.008	.000
	N	37	37	37	37
Z Score: P31	Pearson Correlation	-.201	.431**	1	.808**
	Sig. (2-tailed)	.232	.008		.000
	N	37	37	37	37
Z Score: P3	Pearson Correlation	-.381*	.880**	.808**	1
	Sig. (2-tailed)	.020	.000	.000	
	N	37	37	37	37

3.2 Cluster Analysis

The term cluster analysis was first used by Tryon [8]. It encompasses a number of different algorithms and methods for grouping objects of similar kind into respective categories. In many areas, researchers are always interested in finding ways to organize the data in meaningful structure to obtain important information. Cluster analysis is an exploratory data analysis tool which sorts the data into groups in a way that the degree of association between objects is maximal within a group and minimal among the groups. In other words, cluster analysis simply discovers structures in data without explaining why they exist.

A structure of natural grouping is an important exploratory technique for the data. These groups can be used for assessing dimensionality, identifying outliers and suggesting interesting hypothesis concerning relationship.

3.2.1 Cluster analysis methods

Hierarchical and Partitional clustering are the two basic methods used for clustering. These two methods are divided into subtypes and different algorithms for finding the clusters. Partitional clustering attempts directly to decompose the data set into a set of different clusters. In Partitional clustering a common method for clustering is K-mean clustering. In this method all n observation are partitioned into K cluster in which each observation belong to the cluster with the closest mean. The K-mean method will produce exactly K different clusters of greatest possible distinction. More details about cluster methods can be found in Kaski [4].

3.2.2 Calculation and Results

In our analysis we carried out K-mean Cluster analysis with all the indicators used for HDI and HPI. We observed that the largest values of per capita income and life expectancy are highly affecting cluster sizes. The final cluster centres are given in Table 7.

Table 7: Cluster Centres

	Cluster	
	1	2
NETA40	.305	.302
P31	.6396	.7216
P3	.4224	.5310
GE	.705	.577
LE	48.630	50.103
PCI	3687.72	593.61
AL	.7503	.6086

The cluster analysis groups all the states and Federal Capital Territory of Nigeria into two groups, first group with 6 states and second group with 30 states and Abuja, the FCT. The following groups in Table 8 shows states in these two clusters.

Table 8: Cluster Group of the 36 states and the FCT, Abuja.

GROUP 1

Akwa-Ibom (2,4) Bayelsa (3,11) Delta (5, 10) Lagos (4, 7) Rivers (1, 13) Zamfara (16, 29)

GROUP2

Abia (7, 5) Adamawa (34, 30) Anambra(22, 12) Bauchi(36, 32) Benue(15, 24) Borno(32, 36) Cross-River(11, 2) Ebonyi(27, 23) Edo (20, 17) Ekiti(9,1) Enugu(13, 9) Gombe(30, 27) Imo(8, 6) Jigawa(24, 31) Kaduna(23, 20) Kano(21, 19) Katsina(14, 22) Kebbi(33, 37) Kogi(28, 21) Kwara(25, 26) Nasarawa(12, 18) Niger(17, 33) Ogun(29, 16) Ondo(6, 14) Osun(18, 8) Oyo(19, 15) Plateau(31, 25) Sokoto(26, 34) Taraba(35, 28) Yobe(37, 35) FCT(10, 3)

The figures in bracket show the HDI and HPI rankings respectively of the different states in Nigeria, including the FCT.

It can be observed from the above two groups that the 6 states in group 1 are among the 10 top ranks states according to HDI. Only Zamfara in this group is ranked 16 in HDI. Looking at this cluster we can observe or state that most of the states in this group are the developing and rich states of Nigeria. Hence it seems that this cluster/group tells us about the rich or developing states of Nigeria.

Table 9: ANOVA for 7 Indicators from HDI and HPI

	Cluster		Error			
	Mean Square	df	Mean Square	df	F	Sig.
NETA40	.000	1	.001	35	.018	.895
P31	.034	1	.019	35	1.775	.191
P3	.059	1	.016	35	3.637	.065
GE	.082	1	.050	35	1.642	.208
LE	10.911	1	7.007	35	1.557	.220
PCI	4.813E7	1	465780.766	35	103.324	.000
AL	.101	1	.040	35	2.522	.121

From Table 9, we observe that all the Indicators except for PCI are statistically insignificant. So, we decided to carry out a cluster analysis for the indicators of HDI and HPI Separately and Tables 10 and 11 show that 2 of the 3 indicators from HPI appear statistically significant and only 1 of the 4 from HDI is significant.

Table 10: ANOVA for 4 indicators from HDI

	Cluster		Error			
	Mean Square	Df	Mean Square	df	F	Sig.
PCI	4.813E7	1	465780.766	35	103.324	.000
AL	.101	1	.040	35	2.522	.121
GE	.082	1	.050	35	1.642	.208
LE	10.911	1	7.007	35	1.557	.220

Table 11: ANOVA for 3 Indicators from HPI

	Cluster		Error			
	Mean Square	df	Mean Square	df	F	Sig.
P3	.388	1	.007	35	56.287	.000
P31	.489	1	.006	35	81.199	.000
NETA40	.007	1	.001	35	5.421	.026

Hence we conclude that to divide these 36 states into two clusters, we only need the indicators (P3, $P3_1$, and PCI) that are statistically significant shown in Tables 10 and 11.

4.0 Conclusion

Multivariate statistical techniques have been used to analyze the main indicators used in the calculation of HDI and HPI for Nigerian states, including the FCT, Abuja. In our first analysis we perform factor analysis for the indicators used in the calculation of HDI and find that there are two factors that explain 77% variation in the data. We observe that the indicator (GE and AL) are strongly correlated. In our second analysis we perform factor analysis for the indicators used in the calculation of HPI. We observe that one of the four factors explain 66% variation in the data. Using cluster analysis for 7 indicators from HDI and HPI, we divide all the 36 states and Abuja, the FCT into two clusters. The first cluster consists of 6 states and the second cluster consists of 30 states and Abuja, the FCT. We observe that 5 states in group 1 are among the 10 top rank states according to HDI. We observe that most of the states are developing and substantially rich in the first cluster. We conclude that the first cluster represent the developing or substantially rich states of Nigeria. ANOVA table for these 7 indicators shows that not all indicators from HPI and HDI are statistically significant. We can conclude that to divide these 36 states of Nigeria, including Abuja, the FCT into two clusters, we only need certain indicators from both HDI and HPI.

Appendix: Tables A1 to A4 constitute the data used for the analysis

Table A1: Education, Health and Income Indices along HDI for 36 States and Abuja (FCT) of Nigeria

Rank	Name of State	Education Index	Health Index	Income Index	Human Development Index
1	Rivers	0.847	0.333	0.660	0.6132
2	Akwa-Ibom	0.812	0.392	0.608	0.6040
3	Bayelsa	0.731	0.408	0.665	0.6014
4	Lagos	0.878	0.375	0.541	0.5979
5	Delta	0.788	0.447	0.525	0.5866
6	Ondo	0.777	0.425	0.472	0.5580
7	Abia	0.884	0.458	0.235	0.5256
8	Imo	0.897	0.425	0.236	0.5192
9	Ekiti	0.856	0.500	0.192	0.5161
10	FCT Abuja	0.758	0.358	0.418	0.5114
11	Cross River	0.743	0.483	0.300	0.5088
12	Nasarawa	0.550	0.433	0.418	0.4669
13	Enugu	0.845	0.458	0.188	0.4969
14	Katsina	0.523	0.458	0.383	0.4547
15	Benue	0.588	0.375	0.445	0.4695
16	Zamfara	0.355	0.408	0.558	0.4405
17	Niger	0.390	0.483	0.472	0.4485
18	Osun	0.803	0.483	0.101	0.4623
19	Oyo	0.738	0.450	0.172	0.4533
20	Edo	0.788	0.367	0.198	0.4509
21	Kano	0.538	0.433	0.321	0.4307
22	Anambra	0.891	0.358	0.082	0.4438
23	Kaduna	0.593	0.367	0.326	0.4286
24	Jigawa	0.456	0.375	0.384	0.4050
25	Kwara	0.611	0.433	0.194	0.4128
26	Sokoto	0.266	0.425	0.451	0.3808
27	Ebonyi	0.675	0.383	0.114	0.3906
28	Kogi	0.710	0.383	0.064	0.3856
29	Ogun	0.521	0.467	0.151	0.3796
30	Gombe	0.437	0.400	0.210	0.3488
31	Plateau	0.588	0.333	0.111	0.3441
32	Borno	0.265	0.458	0.278	0.3337
33	Kebbi	0.235	0.433	0.271	0.3129
34	Adamawa	0.492	0.358	0.123	0.3243
35	Taraba	0.476	0.392	0.058	0.3085
36	Bauchi	0.383	0.408	0.085	0.2920
37	Yobe	0.268	0.408	0.160	0.2787

Table A2: P1, P2, P3 and HPI for 36 States and Abuja (FCT) of Nigeria

Rank	Name of State	Percentage of People not expected to Survive to Age 40	Percentage of Adults Who are Illiterate	Percentage of People Deprived From Decent Standard of	Human Poverty
1	Ekiti	0.272	0.1314	0.2017	0.2168
2	Cross River	0.240	0.2046	0.2223	0.2232
3	FCT Abuja	0.252	0.2022	0.2269	0.2288
4	Akwa-Ibom	0.300	0.1223	0.2112	0.2336
5	Abia	0.306	0.1086	0.2073	0.2348
6	Imo	0.323	0.0859	0.2045	0.2427
7	Lagos	0.324	0.1055	0.2148	0.2466
8	Osun	0.295	0.1816	0.2383	0.2472
9	Enugu	0.299	0.1916	0.2453	0.2530
10	Delta	0.305	0.1826	0.2438	0.2536
11	Bayelsa	0.300	0.2246	0.2623	0.2659
12	Anambra	0.358	0.0924	0.2252	0.2686
13	Rivers	0.361	0.1082	0.2346	0.2732
14	Ondo	0.323	0.2132	0.2681	0.2754
15	Oyo	0.309	0.2487	0.2789	0.2811
16	Ogun	0.330	0.2369	0.2835	0.2885
17	Edo	0.355	0.2067	0.2809	0.2933
18	Nasarawa	0.279	0.3074	0.2932	0.2936
19	Kano	0.296	0.3369	0.3165	0.3174
20	Kaduna	0.316	0.3210	0.3185	0.3185
21	Kogi	0.364	0.2628	0.3134	0.3188
22	Katsina	0.306	0.3518	0.3289	0.3299
23	Ebonyi	0.360	0.3109	0.3355	0.3368
24	Benue	0.314	0.3597	0.3369	0.3380
25	Plateau	0.347	0.3522	0.3496	0.3495
26	Kwara	0.327	0.3707	0.3489	0.3498
27	Gombe	0.274	0.4569	0.3655	0.3801
28	Taraba	0.241	0.4786	0.3599	0.3843
29	Zamfara	0.238	0.4883	0.3634	0.3900
30	Adamawa	0.325	0.4482	0.3866	0.3930
31	Jigawa	0.342	0.4396	0.3908	0.3948
32	Bauchi	0.271	0.5288	0.3999	0.4259
33	Niger	0.241	0.5801	0.4106	0.4527
34	Sokoto	0.305	0.5809	0.4430	0.4699
35	Yobe	0.240	0.6523	0.4460	0.5023
36	Borno	0.265	0.6605	0.4628	0.5134
37	Kebbi	0.303	0.6497	0.4764	0.5152

Table A3: Indicators used for Human Development Index

Name of State	Adult Literacy (% aged 15 & above)	Gross Enrolment	Life Expectancy at Birth	Per Capita Income ($)
Abia	0.8720	0.907	52.48	407.75
Adamawa	0.4965	0.483	46.48	209.34
Akwa-Ibom	0.8536	0.729	48.52	3,813.01
Anambra	0.8809	0.912	46.48	163.14
Bauchi	0.3847	0.380	49.48	166.82
Bayelsa	0.7489	0.696	49.48	5,388.02
Benue	0.6197	0.526	47.5	1,434.43
Borno	0.2617	0.272	52.48	529.52
Cross River	0.7721	0.686	53.98	604.58
Delta	0.7982	0.767	51.82	2,325.23
Ebonyi	0.6701	0.684	47.98	197.68
Edo	0.7790	0.805	47.02	327.62
Ekiti	0.8445	0.880	55	316.56
Enugu	0.8360	0.862	52.48	307.67
Gombe	0.4508	0.408	49	352.35
Imo	0.8906	0.909	50.5	412.32
Jigawa	0.4678	0.432	47.5	996.01
Kaduna	0.6054	0.568	47.02	707.00
Kano	0.5607	0.493	50.98	683.76
Katsina	0.5385	0.492	52.48	994.28
Kebbi	0.2381	0.228	50.98	508.50
Kogi	0.7153	0.699	47.98	147.01
Kwara	0.6071	0.620	50.98	320.21
Lagos	0.8770	0.879	47.5	2,554.98
Nasarawa	0.5530	0.543	50.98	1,226.65
Niger	0.3782	0.415	53.98	1,687.79
Ogun	0.7434	0.076	53.02	247.28
Ondo	0.7652	0.801	50.5	1,688.34
Osun	0.7953	0.818	53.98	183.07
Oyo	0.7324	0.749	52	280.29
Plateau	0.6166	0.532	44.98	194.57
Rivers	0.8631	0.814	44.98	5,210.69
Sokoto	0.2712	0.257	50.5	1,488.98
Taraba	0.4844	0.458	48.52	141.78
Yobe	0.2561	0.292	49.48	261.00
Zamfara	0.3608	0.343	49.48	2,834.38
FCT Abuja	0.7807	0.712	46.48	1,215.61

Table A4: Indicators used for Human Poverty Index

Name of State	Percentage of People Not Expected To Survive to Age 40 Years (P1)	Adult Illiteracy (% Aged 15 and above) P2	Percentage of People Without Access to Safe Drinking Water ($P3_1$)	Percentage of Under Weight Children Under 5 years of Age ($P3_2$)	P3 = Average of $P3_1$ and $P3_2$
Abia	0.306	0.1086	0.4583	0.4524	0.4554
Adamawa	0.325	0.4482	0.7490	0.6970	0.7230
Akwa-ibom	0.300	0.1223	0.6256	0.4842	0.5549
Anambra	0.358	0.0924	0.6225	0.4477	0.5351
Bauchi	0.271	0.5288	0.8387	0.7915	0.8151
Bayelsa	0.300	0.2246	0.7590	0.4930	0.6260
Benue	0.314	0.3597	0.9152	0.7274	0.8213
Borno	0.265	0.6605	0.6057	0.7537	0.6797
CrossRiver	0.240	0.2046	0.7477	0.5094	0.6286
Delta	0.305	0.1826	0.7529	0.5038	0.6284
Ebonyi	0.360	0.3109	0.7720	0.5888	0.6804
Edo	0.355	0.2067	0.5510	0.5001	0.5256
Ekiti	0.272	0.1314	0.7639	0.4537	0.6088
Enugu	0.299	0.1916	0.6965	0.4650	0.5808
Gombe	0.274	0.4569	0.7551	0.7696	0.7624
Imo	0.323	0.0859	0.6444	0.4663	0.5554
Jigawa	0.342	0.4396	0.5633	0.7963	0.6798
Kaduna	0.316	0.3210	0.799	0.7580	0.7785
Kano	0.296	0.3369	0.7352	0.7646	0.7499
Katsina	0.306	0.3518	0.8142	0.8229	0.8186
Kebbi	0.303	0.6497	0.8725	0.7979	0.8352
Kogi	0.364	0.2628	0.7083	0.7443	0.7263
Kwara	0.327	0.3707	0.6685	0.6874	0.6780
Lagos	0.324	0.1055	0.3818	0.4996	0.4407
Nasarawa	0.279	0.3074	0.7973	0.7559	0.7766
Niger	0.241	0.5801	0.7269	0.7856	0.7563
Ogun	0.330	0.2369	0.4663	0.5562	0.5113
Ondo	0.323	0.2132	0.8337	0.5019	0.6678
Osun	0.295	0.1816	0.7745	0.4707	0.6226
Oyo	0.309	0.2487	0.8398	0.5057	0.6728
Plateau	0.347	0.3522	0.8640	0.6777	0.7709
Rivers	0.361	0.1082	0.5091	0.4702	0.4897
Sokoto	0.305	0.5809	0.8187	0.7990	0.8089
Taraba	0.241	0.4786	0.8706	0.7377	0.8042
Yobe	0.240	0.6523	0.7256	0.7472	0.7364
Zamfara	0.238	0.4883	0.8095	0.7989	0.8042
FCT Abuja	0.252	0.2022	0.3719	0.6194	0.4957

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