PRINT: ISSN 0970-9274 ONLINE: ISSN 2456-6608
J Hum Ecol, 44(1): 29-37 (2013)
DOI: 10.31901/24566608.2013/44.1.04

Pro-Poorness of Households' Access to Safe Drinking Water in Rural and Urban Nigeria

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KEYWORDS Safe Drinking Water. Pro-Poor Policy Index. Anti-Poor. Fuzzy Set

ABSTRACT Enhancing households' access to safe drinking water is a development objective that is universally embraced. This study analyzed the extent of pro-poorness of households' access to safe drinking water in the geopolitical zone, states and rural/urban areas in Nigeria. The data used were the demographic and health surveys of 1999, 2003 and 2008. Fuzzy set approach was used to aggregate welfare attributes before computing the pro-poor policy indices (PPPI). Results show that access to safe drinking water was largely anti-poor in rural areas, while it is pro-poor in urban areas. In the urban areas, Enugu and Zamfara states had the worst results (anti-poor). States with speedy water programme interventions Adamawa, Bauchi, Borno, Nasarawa, Niger, Ondo, Osun, Anambra, Enugu and Imo. It is was concluded that meeting the MDG target on safe water is daisy for Nigeria and a steady and consistent effort in addressing problems related is required.

INTRODUCTION

Although progress assessment in 2010 shows that global access to clean drinking water has rapidly increased with 89 percent coverage and the MDG target on access to safe water already reached, there are about 780 million people that were yet to secure direct access to clean and safe drinking water. It is however pathetic to realize that majority of the people without access to safe drinking water are in sub-Saharan Africa (SSA), where only 61 percent coverage was attained in 2012 (UNICEF/WHO 2012; Salaam-Blyther 2012). Also, in many SSA, despite several rural development programmes that were implemented in the last few decades, the distribution of social services is perfectly skewed towards urban dwellers.

Some countries in sub-Saharan Africa (SSA) implemented some economic reforms under the Poverty Reduction Strategy Papers (PRSPs) with direct focus on increasing expenditures on water programmes (Kasirye 2010). However, the percentage of households with access to safe water was just 55 percent in 2005 (UNDP 2006). The attention that is given by health and development professionals to ensuring better access of the poor to social services is commendable due to its direct linkage with production of a policy environment which favours human development. Pertinent issues that are related to how much of the dividends of economic development programmes reaches the poor have become the concerns of development policy makers since the 1990s (Kakwani et al. 2004). It has also become evident that economic programmes that are required for human development cannot be effective where distribution of basic social services like water and electricity are concentrated among a segment of the population. This is always the case in many African countries where rural areas are neglected in many social and economic development issues.

The interrelationship between access to safe water and households' health makes supply of improved drinking water an important public policy. This is particularly important in SSA where persistent policy failure has adversely affected investment in health facilities and human capital development. Specifically, outbreak of diseases like cholera and other waterborne diseases not only raises emergency health threats in many SSA, but seriously challenges the competence of primary healthcare service delivery and portends a depletion of vital resources which could have been channeled into other areas of economic development. For instance, diarrhea which is a waterborne disease annually kills about 2.2 million people (UNEP 2002). It had also been estimated that in developing countries, 1.8 million people (with children under the age of five accounting for about 90 percent) die every year due to waterborne diseases. Also, diarrhea is responsible for about one out of five deaths among infants in developing countries, while 88 percent of the cases of

diarrhea results from unsafe water supply, inadequate sanitation and poor hygiene. This problem has been compounded by poor sanitary conditions which in tandem with inadequate water access aggravates the burden of disease morbidity (MDG Monitor 2008; UNICEF and WHO 2012).

In Nigeria, access to safe and clean water stagnated over the years, even after signing the MGDs. Although some progress had been made since attainment of national independence in 1960, the present state of access to safe water in many Nigerian cities and villages is deplorable. About 30 percent of urban households were supplied with underground pipes in 1995 (Onokerhoraye 1995), but national coverage had since improved though with urban households faring better. Despite government's recent efforts at improving households' access to safe water, only 47 percent of the population had access to improved water sources in 2008. Some parts of the country, especially rural areas and urban slums, are therefore hot spots for outbreak of waterborne diseases. This paper seeks to assess the extent of pro-poorness of safe water programmes in Nigeria.

MATERIALS AND METHODS

The Data

The data used in the study were collected as the 1999, 2003 and 2008 Demographic and Health Surveys (DHS) data. Comprehensive methods for collecting the data had been presented in several publications (Demographic and Health Survey (NDHS) 1999, 2003, 2008). Specifically, there were 7919 households in 1999 survey, 7684 households in 2003 and 34070 in 2008.

Computation of Non-income Welfare Indices

Fuzzy set method was used to compute composite welfare indicator as proposed by Zadeh (1965). The coding method was such that $0 \leq x_{ij} \leq 1$ and x_{ij} needs not to be compulsorily 0 or 1 when there are many categories of the j^{th} indicator and the household possesses the attribute with some intensity. The weighted average of x_{ij} defines the multidimensional welfare index of a household, $\mu_B(a_i)$, is defined:

$$= \qquad 1$$

Where w_i is the weight attached to the j-th attribute.

The weight measures the intensity of deprivation with respect to X_j. As proposed by Cerioli and Zani (1990), this can be expressed as:

$$w_j = \log[\sum_{i=1}^{n} g(a_i) / \sum_{i=1}^{n} x_{ij} g(a_i)] \qquad \geq 0 \qquad 2$$

Pro-poor Policy Index (PPPI)

The approach of Kakwani and Son (2006) was used to compute the Pro-Poor Policy Index which policy was defined as the ratio of the actual proportional benefits received due to policy change to the benefits received when every gets equal share. This can be expressed as:

$$\lambda = \frac{1}{\bar{b}\,\eta\theta} \int_0^z \frac{\partial P}{\partial x} b(x)\, f(x) d(x)$$

Where $\eta = \frac{1}{\theta}\int_0^z \frac{\partial P}{\partial x} f(x)d(x)$ is the absolute elasticity of poverty. The larger the value of , the better the program. However, when $\lambda>1$ ($\lambda<1$) the program is pro-poor (anti-poor).

RESULTS AND DISCUSSION

$\sum_{j=1}^{m} x_B w_j / \sum_{j=1}^{m} w_j$

Construction of Non-income Indices of Welfare

Fuzzy set method was used to construct indices of welfare for each of the households using some welfare attributes. The selected attributes are presented in Tables 1a, 1b and to 1c. Table 1a shows that in 1999 data, telephone and ownership of canoes/boat/camel had highest weights of 1.7405 and 1.5237, respectively. In 2003 data, however, Table 1b reveals that ownership of donkey and ownership of canoe had the highest weights of 1.4195 and 1.4259, respectively. In the 2008 data, highest weights were reported for ownership of air conditioner and computer with 1.7485 and 1.6154, respectively. Also, computed average composite welfare indices decreased from 0.1931 in 1999 to 0.1851 in 2003 and 0.1762 in 2008. These indices are actually non-comparable due to differences in the attributes that were used in computing them. The idea behind this however is to exhaust all attributes that could be found in each data set. This really does not invalidate our decomposition since each of the pro-poor policy indices was computed by simulation methods in each of the cross sectional data.

Table 1a also shows the relative importance of the attributes in terms of contributions to overall non-income welfare index. It shows that type of toilet, access to electricity and fan had the highest contributions to welfare indicator in 1999. In 2003, Table 1b shows that fan, share toilet, bicycle, education and cooking fuel accounted for the highest shares in the composite welfare indicator. In 2008, ownership of fan, television and toilet had the highest contributions to composite welfare indicator.

Table 1a: Selected attributes for computing composite welfare indicator from 1999 DHS

Attributes	*Weights*	*Absolute contributions*	*Relative contributions*
Source of drinking water	0.2348	0.0085	4.42
Time to get to water source	0.3528	0.0098	5.06
Type of toilet facility	0.5067	0.0098	5.10
Main floor material	0.2044	0.0080	4.12
Main wall material	0.2979	0.0094	4.85
Main roof material	0.1591	0.0069	3.56
Room per person	1.2760	0.0042	2.18
Type of salt used for cooking	0.1112	0.0054	2.78
Main source of light	0.2309	0.0085	4.38
Type of kitchen facility	0.2896	0.0093	4.80
Type of bathing facility	0.2932	0.0093	4.82
Has electricity	0.3389	0.0097	5.02
Has radio	0.2036	0.0079	4.12
Has television	0.5820	0.0095	4.92
Has refrigerator	0.8054	0.0079	4.07
Has bicycle	0.6220	0.0093	4.80
Has motorcycle	0.8669	0.0073	3.80
Has car	1.1068	0.0054	2.80
Has telephone	1.7405	0.0020	1.02
Donkey/Horse/Camel	1.4669	0.0031	1.62
Canoe/Boat/Ship	1.5237	0.0028	1.47
Hold accommodation	0.2052	0.0080	4.13
Highest educational level	0.2031	0.0079	4.11
Gas cooker	1.3118	0.0040	2.07
Electric iron	0.6022	0.0094	4.86
Electric fan	0.4984	0.0099	5.11
Total	16.0342	0.1931	100.00

Source: Author's computation

Pro-poorness Assessment

Water is an essential resource for human existence. Therefore, access to clean water is a fundamental human right which every Nigerian is entitled to. The water sector budgetary allocation by the Federal Government between 1999 and 2007 was over N357.86 billion to provide safe drinking water. How that might have contributed to poverty reduction is what is to be examined in this section. In Tables 2, 3 and 4, the results of pro-poor policy indices for urban and rural and combined households are presented, respectively.

Table 1b: Selected attributes for computing composite welfare indicator from 2003 DHS

Attributes	*Weight*	*Absolute contribution*	*Relative contribution*
Source drinking water	0.3664	0.0105	5.66
Source of cooking water	0.3540	0.0104	5.63
Type of toilet facility	0.3683	0.0105	5.67
Main floor material	0.1752	0.0078	4.20
Cooking fuel	0.4093	0.0106	5.73
Iodized salt	0.0430	0.0026	1.40
Education	0.4717	0.0106	5.72
Room per person	0.9903	0.0067	3.64
Electricity	0.2889	0.0099	5.34
Radio	0.1365	0.0066	3.58
Television	0.5150	0.0105	5.65
Refrigerator	0.7564	0.0088	4.76
Bicycle	0.4788	0.0106	5.71
Motorcycle	0.8046	0.0084	4.53
Car ort ruck	1.0169	0.0065	3.51
Telephone	1.2568	0.0046	2.50
Share toilet	0.4623	0.0106	5.73
Bed net	0.9729	0.0069	3.72
Gas cooker	1.3832	0.0038	2.06
Electric iron	0.5117	0.0105	5.66
Electric fan	0.4318	0.0106	5.74
Donkey	1.4195	0.0036	1.94
Canoe	1.4259	0.0036	1.92
Total	15.0393	0.1851	100.00

Source: Author's computation

In the North West zone, Table 2 shows that access to safe drinking water was largely pro-poor (>1) in urban areas between 1999 and 2008 with both incidence and depth measures of poverty. In the rural areas, Table 3 shows that access to safe drinking water was not pro-poor in 2003 based on poverty depth (1). Table 4 also reveals that in the combined households, access to safe water was also largely pro-poor in either of the measures of poverty. Among the states that are in North West zone, in the urban households, Table 2 shows that access to safe drinking water was not pro-poor in Kaduna, Kano and Zamfara in 2003. In 2008, access to safe drinking water was also not pro-poor in urban Zamfara. Table 3 shows that access to safe drinking water among rural households in 2003

and 2006 was not pro-poor but some improvements were found in 2008 across most of the states. Specifically, in Zamfara state, access to safe drinking water was not pro-poor in 1999, 2003, and 2008. In Table 4 which shows the results for combined households across the states, access to safe water was largely pro-poor but access was not pro-poor in Kebbi state in 2003.

Table 1c: Selected attributes for computing composite welfare indicator from 2008 DHS

Attributes	*Weights*	*Absolute contributions*	*Relative contributions*
Distance of drinking water	0.2213	0.0062	3.50
Distance of non-distance water	0.2248	0.0062	3.53
Time to water	0.3266	0.0071	4.06
Toilet	0.4131	0.0074	4.20
Electricity	0.3411	0.0072	4.10
Radio	0.1383	0.0047	2.65
Television	0.4524	0.0074	4.21
Refrigeration	0.8625	0.0055	3.12
Bicycle	0.6237	0.0069	3.91
Motorcycle	0.6001	0.0070	3.97
Car/Truck	1.1253	0.0039	2.22
Main floor	0.2204	0.0062	3.50
Main wall	0.2231	0.0062	3.52
Main roof	0.1290	0.0045	2.53
Share toilet	0.5345	0.0072	4.11
Cooking fuel	0.4000	0.0074	4.19
Bed net	0.7382	0.0063	3.55
Iodized salt	0.0421	0.0018	1.01
Location of water	0.7608	0.0061	3.48
Kitchen	0.6253	0.0069	3.90
Mobile phone	0.3420	0.0072	4.10
Cart	1.4961	0.0022	1.26
Boat	2.3202	0.0005	0.29
Land	0.1855	0.0056	3.19
Bank account	0.5785	0.0071	4.02
Cable TV	1.3566	0.0028	1.57
Generating set	0.8079	0.0058	3.31
Air conditioner	1.7485	0.0014	0.82
Computer	1.6154	0.0018	1.03
Electric iron	0.5414	0.0072	4.10
Fan	0.4344	0.0074	4.21
Room per person	0.1547	0.0050	2.85
Total	20.5837	0.1762	100.00

Source: Author's computation

The result with respect to urban households' access to safe drinking water is expected because urban dwellers are averagely better off in terms of income, and are able to provide safe water for themselves by digging wells, drilling boreholes, and buying packaged bottle or sachet. It also implies that poor households are going to benefit tremendously from government's efforts to provide drinking water in many urban areas. In rural areas, however, majority of the households depend on water from unimproved sources. It was reported by the Kaduna State Government Ministry of Water Resources (undated) that about 80 percent of the households in rural Kaduna obtain drinking water from hand-dug wells which are sometime located within the house yards. However, due to their proximity to latrines and shallowness, the water is sometimes contaminated. It was also noted that some rural communities get their drinking water from streams, rivers and ponds. The fact that rural households do not always have the resources to provide improved water for themselves explains why their improved water coverage is always very low. It should be emphasized that due to poor maintenance, the condition of water infrastructure in rural and urban Nigeria is appalling.

Table 2 shows that in the urban North East zone, access to safe drinking water was pro-poor in 1999 and 2008, but not pro-poor in 2003 (based on the two measures of poverty). In rural North East, Table 3 reveals that access to safe drinking water was not pro-poor in 1999, but largely pro-poor afterwards, especially with respect to poverty incidence. In the combined household data, access to safe drinking water in North East was pro-poor with respect to poverty incidence between 1999 and 2008. Across the individual states in the urban North East zone, Table 2 shows that there was no consistent results based on poverty incidence and depth. Specifically, access to safe drinking water was not pro-poor in Gombe and Taraba states in 1999, and it was not pro-poor in Adamawa state in 2003. Access to safe drinking water was also not pro-poor in Gombe state in 2008. These findings show that access to safe drinking water in urban households in North East zone was fairly pro-poor across the time studied. Table 3 however shows what the situation was in the rural areas of North East zone. The results show that access to safe drinking water in rural Adamawa and rural Taraba states was not pro-poor with respect to poverty depth at any of the studied years. In Bauchi, access to safe drinking water was not pro-poor in 1999, 2003 and 2008. Specifically, only Yobe state showed pro-poorness of access to safe drinking water with respect to any of the pover-

ty measures across the years that were studied. For the combined households, Table 4 shows that access to safe drinking water was not pro-poor in Adamawa, Gombe and Taraba states. In addition, access to safe drinking water in Yobe and Borno states was slightly pro-poor.

In the North Central zone, Table 2 shows that access to safe drinking water was pro-poor in urban households between 1999 and 2008. However, the contrary was found for rural areas (Table 3) where most of the indices were less than one (anti-poor). In the combined household analysis in Table 4, none of the measures of poverty show pro-poorness in 1999 and 2008, while access to safe drinking water never shows pro-poorness with respect to poverty depth. At the state-level, Table 2 shows that in the urban areas, Kogi, Plateau and Benue had fewer number of the pro-poor policy indices being greater than one. This implies that water programmes in these

Table 2: Pro-poor policy indices for access to safe drinking water in Urban Nigeria (1999-2008)

State/Zone	*1999*		*2003*		*2008*	
	Incidence	*Depth*	*Incidence*	*Depth*	*Incidence*	*Depth*
North West	1.7803	1.2332	1.4338	1.1224	1.1228	1.2312
Jigawa	0.0000	1.3234	1.6117	1.3273	1.0000	1.2733
Kaduna	2.0000	1.3887	0.0000	0.3983	1.3333	1.2074
Kano	1.4884	1.0817	0.0000	0.0000	1.0000	1.3358
Katsina	1.0000	1.3336	-	-	1.2500	1.1950
Kebbi	0.0000	1.2214	1.3058	1.2271	1.5000	1.2841
Sokoto	0.0000	1.6988	1.0000	1.4586	1.0000	1.5442
Zamfara	0.0000	1.4039	0.0000	0.1287	0.0000	0.5509
North East	1.9644	1.1852	0.9939	0.7861	1.5777	1.1400
Adamawa	0.0000	1.1199	0.7892	0.5610	1.3333	0.9545
Bauchi	0.0000	1.7172	1.0000	2.1216	1.0000	1.2021
Borno	1.0029	1.1931	1.3671	0.9501	2.0000	1.1318
Gombe	0.0000	0.7599	1.5162	1.0553	0.6667	0.8348
Taraba	1.0000	0.9981	0.8532	1.2495	2.0000	0.5275
Yobe	3.0000	1.4245	0.0000	2.0752	3.5000	1.5027
North Central	1.0389	1.1745	1.1846	1.2283	1.2677	1.0165
Benue	1.0000	1.1048	0.0000	0.4536	1.3333	0.8665
Kogi	0.6667	1.1010	1.3991	1.2944	0.7500	0.9645
Kwara	3.1077	1.1885	1.2040	1.3868	1.8000	1.2515
Nasarawa	0.0000	1.3903	3.6481	1.2342	2.0000	1.4292
Niger	1.0000	1.3391	1.0000	0.6668	1.1667	1.1198
Plateau	1.0000	1.0913	1.0000	1.2252	0.0000	0.8624
FCT	0.5000	1.4452	2.0000	0.6935	1.0000	1.0976
South West	1.1299	1.2463	1.2372	1.3005	0.9719	1.2826
Ekiti	0.9882	0.4192	0.9799	0.8837	1.2000	1.1966
Lagos	0.9960	1.3563	0.2601	0.2959	1.2500	1.4627
Ogun	1.3280	1.3613	0.8852	0.9619	1.0000	1.2638
Ondo	1.0000	1.2396	1.7020	0.9816	1.2000	1.2074
Osun	1.0000	1.4435	0.0000	1.5577	1.1000	1.2322
Oyo	1.3356	1.3865	0.9861	0.8064	0.6923	1.2976
South South	1.8196	1.3125	1.2279	1.3935	1.1046	1.0961
Akwa- Ibom	1.5000	1.5368	1.0000	0.9772	1.0000	1.6206
Bayelsa	1.0000	0.9631	0.0000	2.1075	1.3333	0.2265
Cross River	0.0000	1.2780	1.0000	1.0642	0.8000	0.5911
Delta	0.0000	1.3444	2.0000	1.3395	1.3333	1.3958
Edo	2.9771	1.0446	1.6000	1.3652	1.0000	1.2737
Rivers	1.0000	1.6867	0.0000	1.6449	1.0000	1.3930
South East	1.1978	0.8976	2.5796	0.9405	1.1584	0.8969
Abia	1.0000	1.2997	3.9740	1.4573	1.1250	1.5100
Anambra	1.5000	1.1219	1.5299	1.0296	1.1000	0.9424
Ebonyi	2.0000	0.9123	1.0000	1.6745	1.0000	0.8090
Enugu	0.0000	0.7774	0.0000	0.8116	1.0000	0.4769
Imo	0.0000	1.7172	2.0000	1.5381	0.0000	1.6469
National	1.2787	1.1830	1.2965	1.1183	1.1179	1.1295

Source: Authors' computations

Table 3: Pro-poor policy indices for access to safe drinking water in Rural Nigeria (1999-2008)

State/Zone	*1999*		*2003*		*2008*	
	Incidence	*Depth*	*Incidence*	*Depth*	*Incidence*	*Depth*
North West	1.1939	1.1076	1.0859	0.9703	1.3224	1.0257
Jigawa	1.0000	1.3116	0.0000	0.0627	1.1579	1.3675
Kaduna	1.3404	1.1049	0.0000	0.4894	1.0000	0.7290
Kano	1.0000	1.2289	0.5670	0.8983	1.2857	1.1629
Katsina	1.2021	1.1226	0.2238	0.0818	1.1333	1.0332
Kebbi	1.5003	1.1158	0.0000	1.5577	0.9091	1.1263
Sokoto	2.0000	1.0101	0.8422	0.9302	1.1667	1.0337
Zamfara	0.9970	0.7788	1.0000	0.5582	0.7000	0.9145
North East	0.9970	0.9485	1.0930	0.7055	1.1794	0.4934
Adamawa	0.0000	0.5395	0.0000	0.1639	0.8000	0.6804
Bauchi	0.0000	0.9542	0.0000	0.9707	1.0000	0.9038
Borno	1.0000	1.1942	0.3810	0.6393	0.8182	0.9308
Gombe	1.9901	0.7301	1.3863	0.7495	1.0000	0.8102
Taraba	0.5000	0.8383	0.0000	0.0000	1.2500	0.3676
Yobe	1.0000	1.3299	1.2612	0.5005	1.4286	1.2003
North Central	0.7499	0.6786	0.9648	0.6082	0.2754	0.0845
Benue	0.2986	0.4441	1.0559	0.6907	0.6875	0.5479
Kogi	1.1641	1.0180	0.0000	0.3570	0.4167	0.3301
Kwara	1.0000	1.3267	1.2139	0.8924	1.0000	0.5834
Nasarawa	1.3133	0.8174	1.0000	0.8109	0.8667	0.5474
Niger	1.0000	0.5286	1.0000	0.8283	1.0000	0.7338
Plateau	1.0000	0.8789	1.7634	0.8030	1.1250	0.6301
FCT	0.0000	0.0000	1.0000	1.0278	1.1111	1.0247
South West	0.8197	0.5047	1.1129	0.4819	0.1410	0.0715
Ekiti	0.0000	0.1705	1.4312	1.2621	1.0909	0.6391
Lagos	1.0000	1.2415	0.0000	0.2576	1.2249	0.3869
Ogun	0.5000	0.2404	1.0541	0.9007	1.7273	0.5619
Ondo	0.5700	0.5605	0.9039	0.6975	1.0000	0.3910
Osun	1.1996	0.9338	0.3160	0.3165	1.2857	0.6391
Oyo	1.4898	0.4482	0.7770	0.5015	1.2857	0.7221
South South	0.5080	0.3703	0.4240	0.4943	0.2645	0.0297
Akwa- Ibom	0.2774	0.2552	1.0960	0.9639	1.0000	0.7719
Bayelsa	0.0000	0.8748	1.0000	1.1353	0.3333	0.2884
Cross River	0.4839	0.4248	1.4623	1.0466	0.2000	0.1496
Delta	0.6059	0.5841	0.0000	1.7182	1.3636	0.9323
Edo	0.0000	0.0935	0.9624	1.3636	0.3750	0.3008
Rivers	1.6580	0.6666	0.0000	0.0391	0.7857	0.9081
South East	0.6326	0.5369	0.7170	0.7925	0.1374	0.1962
Abia	1.0000	0.4062	1.0154	1.0720	0.7273	0.9877
Anambra	0.0000	0.2717	1.0000	0.9499	0.3333	0.7960
Ebonyi	2.0333	1.1117	1.0000	0.2550	1.3000	0.9243
Enugu	0.4918	0.3021	0.5619	0.2494	0.2727	0.4722
Imo	0.4515	0.5145	0.4668	0.9003	0.8667	0.7699
National	0.7874	0.7594	0.8575	0.7235	0.5928	0.3743

Source: Authors' computations

states were largely anti-poor. It should be noted that water programmes in urban Kwara state was pro-poor for all measures of poverty and across time. This impressive performance was closely followed by Nasarawa state. Table 3 shows that water programmes in rural areas of the states in North Central were anti-poor. It is only in rural areas of Kwara state that execution of water programmes was pro-poor in a good number of the years and poverty measures. None of the results for Kogi state was pro-poor across time and different poverty measures. Table 4 also shows that in the combined households, it was only in Kwara state that access to safe drinking water was pro-poor across all the years studied. Benue state did not have any of the result greater than one. This implies that water programme was anti-poor in all the years. This finding is closely applicable to Kogi, Nasarawa, Plateau and Niger states.

Table 4: Pro-poor policy indices for access to safe drinking water in rural and urban Nigeria (1999-2008)

State/Zone	*1999*		*2003*		*2008*	
	Incidence	*Depth*	*Incidence*	*Depth*	*Incidence*	*Depth*
North West	1.3444	1.1233	1.1872	0.9977	1.1128	1.0917
Jigawa	1.2559	1.3121	1.6803	1.2200	1.1393	1.3637
Kaduna	1.5739	1.1281	0.9188	0.9910	1.0951	0.8154
Kano	1.2156	1.1894	1.1373	0.9672	1.2012	1.1914
Katsina	1.1350	1.1481	1.3730	1.0497	1.1579	1.0517
Kebbi	1.5003	1.1216	1.0000	0.7957	1.0667	1.1388
Sokoto	2.6970	1.0840	1.1668	1.1123	1.1579	1.0443
Zamfara	1.2374	0.8048	1.3587	0.7980	0.5680	0.8942
North East	1.3674	0.9920	1.0637	0.7191	1.1310	0.8785
Adamawa	0.0000	0.6212	0.7892	0.2157	0.9231	0.7202
Bauchi	0.0000	0.9656	1.4041	0.7920	1.0000	0.9678
Borno	1.0018	1.1939	1.1758	1.1494	1.1642	0.9761
Gombe	1.9901	0.7329	0.0000	0.4797	0.9027	0.8125
Taraba	0.6112	0.8928	1.0000	0.4995	1.4425	0.3793
Yobe	1.8531	1.3532	1.0062	0.9137	1.9364	1.2633
North Central	0.8342	0.7515	1.0349	0.7033	0.9185	0.6400
Benue	0.3404	0.4753	0.8158	0.5321	0.7999	0.5800
Kogi	0.9032	1.0459	1.6117	0.4186	0.4993	0.4936
Kwara	1.6999	1.2592	5.1423	1.5910	1.5783	0.6806
Nasarawa	1.5714	0.8706	0.0000	0.3276	0.9881	0.6107
Niger	1.0000	0.6304	1.0836	0.9647	1.0575	0.7659
Plateau	1.0000	0.8958	1.1878	0.8669	1.1250	0.6560
FCT	0.1096	0.1188	1.0000	1.1765	1.0726	1.0567
South West	0.9853	0.7123	1.2042	0.8290	1.1344	0.7568
Ekiti	0.7628	0.2468	0.3223	0.2768	1.1435	0.7715
Lagos	0.9973	1.3139	1.3058	1.2435	1.2375	0.8609
Ogun	1.1048	0.5651	2.1002	0.9099	1.3790	0.6881
Ondo	0.7178	0.6629	1.0000	0.5623	1.0733	0.4921
Osun	1.1425	1.0141	1.1619	1.3644	1.1739	0.9108
Oyo	1.3994	0.7250	1.2687	0.8189	0.8889	0.8438
South South	0.6472	0.4523	0.6070	0.6101	0.8668	0.6732
Akwa- Ibom	0.3517	0.2968	0.3160	0.3444	1.0000	0.7861
Bayelsa	1.0000	0.8760	0.2238	0.0818	0.5000	0.2793
Cross River	0.4839	0.5007	0.5619	0.2710	0.3523	0.1976
Delta	0.6059	0.6161	1.2063	1.0239	1.3477	1.0373
Edo	2.9771	0.3157	0.2969	0.3046	0.7175	0.4322
Rivers	1.5261	0.8055	0.5746	1.0183	0.8519	0.9709
South East	0.7340	0.6160	1.2876	0.8400	0.8691	0.7808
Abia	1.0000	0.4630	1.0559	0.6448	0.8967	1.1017
Anambra	0.5354	0.3845	0.7378	0.7277	0.9409	0.9024
Ebonyi	2.0224	1.0394	1.1820	0.8829	1.2069	0.8992
Enugu	0.3415	0.4532	3.0138	1.0395	0.3374	0.4732
Imo	0.4515	0.5313	0.5670	0.8983	0.9494	0.7977
National	0.9360	0.8288	1.0053	0.8029	1.0139	0.8371

Source: Authors' computations

Table 2 reveals that in urban households in South West zone, access to safe drinking water was largely pro-poor in all the years and across the poverty measures. In the rural areas, Table 3 shows that access to safe drinking water was largely anti-poor. Similar results were found for the combined households in Table 4. Across the states in South West zone, Table 2 shows that access to safe drinking water in Ekiti state was not pro-poor in 1999 and 2003b but progress was made in 2008. Osun and Ondo states had the highest number of the urban pro-poor indices being greater than one. This implies that access to safe drinking water in these states was largely pro-poor. In rural areas, the results for Ondo state in Table 3 show that across the years studied, access to safe drinking water was anti-poor. Generally, states in the South West did not show pro-poor performance with respect to access to safe drinking water in the rural areas. In

the combined households' analysis in Table 4, the results show that access to safe drinking water was not pro-poor in many of the states in 1999 and 2003. However, in 2008, many of the states show pro-poorness with respect to access to safe drinking water. The states where access to safe drinking water was somehow pro-poor were Osun, Lagos and Ogun. The worst results were obtained for Ekiti and Ondo states.

In South South zone, Table 2 shows that urban households' access to safe drinking water was pro-poor. The computed pro-poor policy index was as high as 1.8196 in 1999. In rural areas, however, Table 3 shows that none of the access to safe drinking water was pro-poor in all the years. Similar results were found for the combined household where all the indices imply that access to safe drinking water was anti-poor. In the states, Table 2 shows anti-poor access to safe drinking water in urban areas of Cross Rivers and Balyesa states. Urban areas of Edo demonstrated more pro-poorness with respect to access to safe drinking water across the years that the data covered. In the rural areas, moreover, access to safe drinking water was anti-poor in almost all the states. Only a couple of the states show pro-poorness of access to safe drinking water in 2003 with respect to poverty depth. In the combined households, none of the indices of pro-poor policy index was greater than one in Akwa Ibom, Balyesa, Cross Rivers and Edo states. It was only in Delta and Rivers states that some of the indices were pro-poor.

In the South East zone, the results in Table 2 reveal that access to safe drinking water in urban areas was pro-poor with respect to poverty incidence in all the years. In rural areas, Table 3 shows that access to safe drinking water was not pro-poor in any of the years. Similar results were obtained in Table 4 for the combined households where only poverty incidence poverty measure was pro-poor in 2003. The state results in Table 2 revealed that access to safe drinking water in urban area was completely anti-poor in Enugu state across the years. Poor households in urban areas of Abia and Anambra states had access to safe drinking water. Table 3 reveals that in rural areas of South East zone, none of the indices was greater than one in Imo, Anambra and Enugu states, while only one was pro-poor in Anambra. Rural Ebonyi state showed some element of pro-poorness in access to safe drinking water with respect to poverty incidence in 1999 and 2008. In the combined households results shown in Table 4, it was only in Ebonyi state that access to safe drinking water was pro-poor. None of the indices for Imo state and Anambra showed any pro-poorness.

In the analysis for Nigeria as a whole, Table 2 shows that urban households' access to safe drinking water was pro-poor in all the results. However, in rural areas, Table 3 reveals that in Nigeria's rural areas, access to safe drinking water was largely anti-poor. In the combined rural and urban data for Nigeria, access to safe drinking water was not pro-poor in 1999 for any of the poverty measures. It was however pro-poor in 2003 and 2008 only for poverty incidence measure of poverty.

CONCLUSION

Access to safe drinking water is vital for enhancing welfare of households in Nigeria. This paper analyzed the extent of pro-poorness of households' access to safe drinking water in Nigeria using three sets of DHS data. The results identified rural areas as critical hot spots for safe water programmes and interventions. Also, Enugu and Zamfara states had the worst result for urban households safe drinking water. These states were therefore classified as hotspot for speedy water programme interventions. In rural areas, Adamawa, Bauchi, Borno, Nasarawa, Niger, Ondo, Osun, Anambra, Enugu and Imo were hotspots for speedy interventions. In the combined results, many states in south-south and south east had many of the indices being less than one (anti-poor). It is therefore unlikely that Nigeria will reach the MDG goals of reducing by half the percentage of households without access to safe drinking water. The study points at the need for a steady and consistent effort in addressing problems related to accessing safe drinking water.

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