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MULTIDIMENSIONAL POVERTY ANALYSIS FOR NIGERIA

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ABSTRACT

Poverty reduction has been a major policy goal of government in Nigeria since the early 1980s. Various policy reforms have been implemented aimed at achieving this goal. Though recent World Bank study suggests that poverty level has declined in the 2003-2013 decade than official estimates suggest, evidence from both sources rely on money-metric measure of poverty. However, poverty is now widely recognised to be multidimensional. Therefore, to have a fuller understanding of what has been happening to poverty level in Nigeria, it is more useful to go beyond money-metric measure of poverty. This paper, therefore, undertakes multidimensional poverty analysis for Nigeria using dataset from Demography and Health survey of 2013, estimates of multidimensional poverty index were obtained. Results show that, based on education, health and living standard dimensions of wellbeing, poverty incidence is still quite high in Nigeria. At a time when government since 2016 has adopted the sustainable development goals (SDGs) as a development strategy, the approach with better design of poverty reduction policies in Nigeria and these dimensions constitute distinct elements in the SDGs.

Keywords: Multidimensional, Poverty, Deprivation, Sustainable Goals (Sdgs), Development, Wellbeing.

INTRODUCTION

Since the mid-1980s, reducing poverty has become a major policy concern for an increasing number of governments and donor agencies. This concern emerged from observed undesirable effects of certain economic reform programmes. However, while recognizing the renewed interest in the subject, it must be appreciated that concern about poverty and the need to reduce it has existed throughout history.

Poverty exists when a person falls below a level of economic well-being considered to constitute a reasonable minimum, either in some absolute sense or by the standards of a given society. World Bank (1990) noted that 'poverty alleviation is what economic development is all about'. Poverty reduction is to be understood broadly, manifestations of which include income poverty, malnutrition, mortality, illiteracy, social exclusion, vulnerability. As is shown below, this observation reflects the evolution of perspectives on the concept of well-being and the objective of economic development.

A recent report by the World Bank (2015) on Millennium Development Goals (MDGs) indicates that extreme poverty has been declining in all regions of the world with the exception of Sub-Saharan Africa (SSA). The evidence from Figure 1 is that, but for SSA, extreme poverty has been decreasing in all other regions of the world. This is despite the fact that the region recorded two decades of growth resurgence that began in the mid-1990s, a growth that has turned out to be non-inclusive growth. With the collapse in crude oil price on the international market in 2015, a major source of the growth in key countries of the region like Nigeria, the picture becomes dimmer. Thus, the issue of poverty, its dimensions, underlying indicators and policies required to address it should receive greater attention of researchers than ever before as poverty is now widely recognised to be multidimensional (Ferreria, 2011).

Poverty analysis has come to be seen to involve two problems, namely, the 'identification problem', which involves identifying who are poor, and how poor they are, and the 'aggregation problem', which involves determining how much poverty there is, that is, deciding how do we aggregate individual indicators of well-being into a single measure of poverty?

In order to reduce poverty, governments would need to first understand, measure, and characterize poverty in a given historical and geographical context. This requires properly defining the poor, knowing their degree of poverty, their characteristics, and causes of their poverty. From this, it becomes possible to understand what strategies may be required to address the situation. Over the years, views on virtually all of these have undergone some refinements.

This paper reviews the various approaches currently in use in economic analysis of poverty and household living standards. This is done by tracing the evolution of the concept of poverty in the history of economic thought, and how this has affected approaches to its measurement as well as strategies considered necessary for its reduction. A particular value addition is to draw attention to a hitherto unexplored approach to poverty analysis in Nigeria, namely, multidimensional poverty analysis, and how the approach might aid design of poverty reduction policies in Nigeria, especially in the context of sustainable development goals which the government adopted in 2016.

Thus, section two provides a review of approaches to measurement of poverty. Section three presents multidimensional poverty concept and the methodology of measurement. Section four presents its application to Nigeria, and section five concludes the paper.

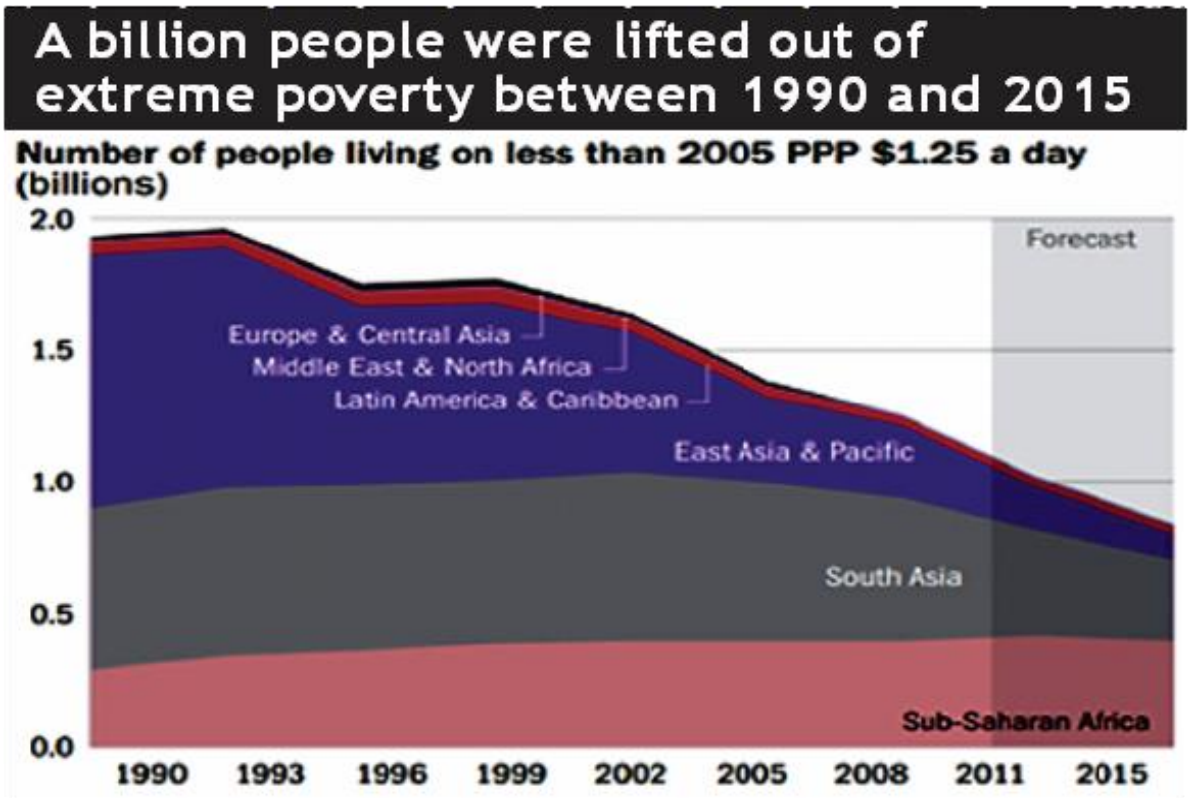


Fig.1: Comparative Regional Poverty Levels

Source: World Bank PovcalNet

CONCEPT AND MEASUREMENT OF POVERTY

Concept of Poverty

The concept of poverty has been variously defined in the literature, particularly since the 1970s (Aigbokhan, 1999, 2016). Each of the various approaches emphasizes different dimensions of well-being. Among the various dimensions considered in the literature, a distinction could be made between those approaches which focus on living standards and those which focus on the rights and opportunities of individuals. The former are frequently used by economists who generally emphasize the real consumption of goods and services (Aigbokhan, 2000a; Canagarajah, Ngwafon and Thomas, 1997; Greer and Thorbecke, 1986; World Bank, 1990). The latter favours a broader social vision and emphasizes the 'right' and 'opportunities' and 'capability' of individuals in terms of their access to resources and their potential consumption (Sen, 1981, 1985, 1987).

The latter dimension has its root in the view that well-being may not be determined by actual consumption alone, but also by 'opportunities' for consumption. In this view, income may be a better measure of opportunities than actual consumption, provided savings are positive. The reverse is true when savings are negative. However, as Lipton and Ravallion (1993) note, the 'opportunities' approach does not make a compelling case for preferring either income or consumption as the welfare indicator.

The non-welfarist idea of 'rights' also influences the choice of well-being indicator. The attainment of the right to participate in society depends crucially on income, and particularly on cash income. But the component of income matters. For example, transfer income from the state with some stigma (mean tested) may not enhance one's ability to participate in society (Atkinson, 1989). The standard of living approach is more popular in developing countries, hence consumption is commonly used as the welfare indicator, while 'opportunities' and 'rights' are popular in developed countries literature. Since the 2000s, however, this has been increasingly applied to developing countries. Sen (1981) has specified two requirements which a concept of poverty should fulfil. The first concerns a criterion of who should be the focus of concern. The specification of a poverty line may fulfil only a part of this requirement. The poor are those who fall below a specified poverty line. But, according to Sen (1981), there is more to poverty analysis than this. Since poverty is a characteristic of the poor rather than of the non-poor, that concept of poverty should be related to the interest of the poor. The second requirement is that the concept should include (i) a method of identifying a group of people as poor (identification problem) and (ii) a method of aggregating the characteristics of the set of poor people into an overall image of poverty (aggregation problem).

Measurement of Poverty

The various approaches to defining poverty have a bearing on approaches to measurement of poverty. A number of these have been reviewed in Aigbokhan (1999 and 2016). Of particular interest to this paper is the capabilities and entitlement approach, which gained currency in the literature since the mid-1980s.

The Entitlement approach focuses on the ability of people to command food through the legal means available in the society. Four forms of entitlements are defined. These are trade-based entitlement, which is entitlement to own what one gets by trading; production-based entitlement, which is entitlement to own what one gets by arranging production, using one's owned resources; own-labour-based entitlement, from ownership of one's labour power, the trade-based and production-based entitlements arising from it; inheritance and transfer entitlement, which is entitlement to own that is willingly given to one by another who legitimately owns it (Sen, 1981). The Capabilities approach, which has its roots in the rejection of the 'welfarist' paradigm, was first discussed by Sen (1980), then Sen (1985, 1987), following criticisms of the earlier version, the current version is discussed in Sen (1993, 1994).

The approach considers that the objectives of public policy can be seen to be the enhancement of the capability of people to undertake valuable and valued 'doings and beings'. A person's capability is defined as a set of functioning bundles, representing the various alternative 'beings and doings' that a person can achieve with his or her economic, social, and personal characteristics. In other words, attainment of these capabilities should be an important basis for assessing the quality of life or well-being (Sen, 1993). As would become clear in section 4, this approach formed the basis of the multidimensional poverty analysis.

MULTIDIMENSIONAL POVERTY MEASURES: METHODOLOGY

The multidimensional poverty index (MPI) is an index of acute multidimensional poverty. It reflects deprivations in rudimentary services and core human functions for the population. That is, it is understood as a person's inability to meet simultaneously minimum international standard indicators related to the MDGs/SDGs and to core functioning.

Over the past decade, interest in multidimensional poverty measures has been growing. Drawing inspirations from Armatya Sen's conceptual works (1980, 1981, 1985), and following the pioneering works of Bourguignon and Chakravarty (2003) and Tsui (2002), the academic literature has grown, with a special issue of the Journal of Economic Inequality 9 (3) 2011 dedicated to it.

Multidimensional poverty analysis has also moved into policy debate. For example, in 2009, Mexico's National Council for the Evaluation of Social Policy adopted a MPI as the country's official policy measure, and Colombia in 2011 followed suit by adopting a poverty reduction strategy focused on five dimensions (Ferreria, 2011, p. 2). Except for Alkire and Santos (2010), little or no interest has been shown on the Nigerian experience.

Multidimensional Poverty Measures

There are essentially two methods to measure poverty, namely, the direct method and the indirect method or income approach (Sen 1981, 1997, 1999). The indirect method uses monetary poverty measurements (income, expenditure or consumption data). The indirect method determines whether people's income fall below the poverty line. The direct method shows whether people satisfy a set of specified basic needs, rights, or functioning (functioning derive from Sen's capability approach).

International poverty comparisons used income poverty measures since Ravallion, Datt and van de Walle (1991), which developed into dollar-a-day, and was revised to $1.25-a-day measure by Chen and Ravallion (2010).

Some limitations associated with the income approach:

(i) The pattern of consumption behaviour may not be uniform. As such, attaining the poverty line level of income does not guarantee that a person will meet his / her minimum needs (Sen 1981, p. 28).
(ii) Different people may face different prices, thus reducing the accuracy of the poverty line (Sen 1981, p. 28). However, Foster, Greer and Thorbecke (1984) attempt to address this weakness.
(iii) People's conversion factors differ, that is, the ability to convert a given amount of income into certain functioning varies across age, gender, location and physical ability.
(iv) Affordable quality services, such as water, education, health are not provided through the market (Bourguignon and Chakravarty, 2003, p. 26).
(v) It does not satisfactorily address the issue of intra-household distribution of income. Adult equivalence attempts to address this (Aigbokhan, 2000b).
(vi) Participatory studies indicate that people who experience poverty describe their state comprising deprivations in addition to low income (Narayan, 2000).

The MPI has a similar spirit to that which motivated the development of the dollar-a-day measure. For example, it has an underlying concept of absolute poverty. The dollar-a-day aimed to qualify "the extent of absolute poverty, interpreted as inability to attain consumption levels which would be deemed adequate in only the poorest countries" (Ravallion et al 1991, p. 345). The MPI aims to quantify acute poverty, interpreted as a person's inability simultaneously internationally comparable standards in indicators related to MDGs/SDGs and core functioning (Alkire and Santos, 2013, p. 6). The two concepts are complements. Though both concepts are useful in assessing poverty, while dollar-a-day/$1.25-a-day identify those who do not have the income usually required to meet certain needs, the MPI identifies those who actually fail to attain the accepted minimum needs or functioning. Hence, MPI complements the income poverty analysis by bringing information from a different perspective, a focus on actual deprivation.

Methodology

As a measure, the MPI has the mathematical structure of one member of the class of the family multidimensional poverty measures proposed by Alkire and Foster (2007, 2009, and 2011). This member is M_0 or Adjusted Headcount Ratio. M_0 measures poverty in d dimensions across a population of n.

In a single dimensional analysis, people are identified as poor as long as they fail to meet a threshold called the "poverty line". In multidimensional poverty analysis based on a counting approach, as with the adjusted headcount ratio, M_0, a person is identified as poor or non-poor in two steps.
First step: a person is identified as deprived or not in each indicator, subject to a deprivation cut-off. The deprivation cut-off is denoted by z_j for indicator j. Thus, a person i is deprived in any indicator j if $x_{ij} < z_j$. We assign a deprivation status score g_{ij} to each person in each dimension based on the deprivation status. If a person i is deprived in indicator j, then g_{ij}=1, and g_{ij} = 0 otherwise.

Second step uses the weighted deprivation status scores of all d indicators to identify the person as poor or not. An overall deprivation score $C_i \in (0, 1)$ is computed for each person by summing the deprivation score by their corresponding weights, such that $C_i = \sum_{j=1}^{d} w_j \, g_{ij}$

A person is identified as poor if $C_i \geq$ k, where $k^{\lambda}(0, 1)$, and non-poor otherwise. The deprivation score of all n persons are summarised by vector c. After identifying the set of poor and their deprivation scores, we obtain the adjusted headcount ratio, M_0.

The focus axiom requires that while measuring poverty the focus should remain only on those identified as poor. This enables us to obtain the censored deprivation score vector c(k) from c, such that c_i(k) = c_i if $c_i \geq$ k and c_i(k) = 0, otherwise. Then, M_0 is equal to the average of censored deprivation score:

$$M_0 = \frac{1}{\text{n}} \sum_{j=1}^{d} C_i \, (k) \qquad (1)$$

Properties of the Adjusted Headcount Ratio:

One of the properties of M_0 is its decomposability. First, it can be decomposed into incidence of poverty, H, and intensity of poverty, A.

$$M_0 = \frac{q}{n} \times \frac{1}{q} \sum_{j=1}^{d} c_i(k) = H \times A \qquad (2)$$

Where q is the number of poor. Thus, a certain reduction in M_0 may be achieved either by reducing H or by reducing A.

Second, M_0 can be decomposed into subgroups, say m groups. That is, weighted average of the values of m groups, with population shares as weights,

$$M_0 = \sum_{\Lambda=1}^{m} \frac{n\Lambda}{n} M_0 (X^{\lambda}) \qquad (3)$$

Where X^{λ} is the achievement matrix.

n^{λ} is the population

$m_o (X^{\lambda})$ is the adjusted headcount ratio of subgroup Λ

The result gives the contribution of each subgroup to overall poverty, which depends on the poverty level of the subgroup and its population share.

M_0 is an average of the censored headcount ratios of indicators weighted by their relative weights. The censored Headcount ratio (H) of an indicator is the proportion of the population that is multi-dimensionally poor and is simultaneously deprived in that indicator.

Let say the censored H of indicator j by h_j , then

$$M_0 = \sum_{j=1}^{d} w_j h_j = \sum_{j=1}^{d} w_j \left[\frac{1}{n} \sum_{i=1}^{n} g_{ij}(k)\right] \qquad (4)$$

Where $g_{ij}(k) = g_{ij}$, if $c_i \geq$ k, and $g_{ij}(k) = 0$ otherwise.

To obtain A, by dividing both sides of the relationship H, we have

$$\text{A} = \frac{M_0}{h} = \sum_{j=1}^{d} \frac{w_j h_i}{\text{H}} = \sum_{j=1}^{d} w_j h_j^P \qquad (5)$$

Where h_j^P is the proportion of poor people deprived in indicator j. The contribution of such indicator, j to M_0, ϕ_j is given by

$$\phi_j = w_j \frac{h_i}{M_0} = w_j \frac{\lambda^p}{A}$$

Finally, the MPI is the product of H and A, that is, MPI= H x A, which means that MPI inherits the features of M_0.

The MPI, with its features of M_0, also shares the features of the class of poverty indices developed by Foster, Greer and Thorbecke (1984). It is thus useful in measuring poverty gap (M_1) and severity of poverty (M_2).

M_1= HAG, (6)

It is defined as Adjusted Poverty Gap across all dimensions in which poor persons are deprived.

G = $[g^1(k)]/g^1\ [g^0(k)]$ (7)

Where G is the average poverty gap.

Similarly, M_2 = HAS,

Where S is the average severity of poverty index, estimated as

S = $[g^2(k)]/[g^0(k)]$ (8)

Dimensions, Indicators and Unit of Analysis

The potential dimensions that a poverty measure might reflect include education, health, and living standards (which would include income, housing, services, assets and infrastructure), work, empowerment, the environment, social relationships, and culture. The MPI uses three dimensions, namely, education, health and standard of living.

Indicators

For education, two indicators are commonly used, namely, whether someone in the household has five years of education, and whether all children of school age are attending school. Years of schooling provides a rough proxy of basic educational skills, in the absence of information on educational achievements and quality of education. School attendance is used to indicate whether children are exposed to a learning environment. A household is considered to be non-deprived if at least one member has five years of schooling, and a household is considered deprived if a child is not in school.

For health, nutrition and death of a child are used as indicators. Under-nutrition indicates functioning failure, which may have life-long effects in terms of physical development and vulnerability to health threats. A household is considered to be deprived in nutrition if a member is undernourished. Death of a child, which is preventable, is a health functioning failure.

For standard of living, six indicators are selected, namely, safe drinking water, improved sanitation, use of clean cooking fuel, electricity, flooring materials, and ownership of some basic consumer goods (typically, radio, mobile telephone, television, motorcycle, refrigerator and furniture).

MPI methodology as proposed by Alkire and Foster (2011) has attracted some criticisms. First is that it pays insufficient attention to the trade-offs between different dimensions of wellbeing when aggregating across them (Ravallion, 2011). Second, that there is arbitrariness in various decisions required in constructing a multidimensional poverty measure. Third, it ignores all household information above the deprivation thresholds for those households that are not deprived in that dimension (Thorbecke, 2011).

The first criticism could be addressed by testing for substitutability and complementarities between dimensions, and the second by testing for robustness to different decisions (Ferriera, 2011; Thorbecke, 2011). However, it is admitted that in a multidimensional setting the relationships among all dimensions under consideration are complex, that from an operational standpoint it would be a tedious task to estimate all the trade-offs and complementary relations between pairs of dimensions (Thorbecke 2011, p. 486).

For this paper, robustness tests were carried out on MPI estimates to changes in the poverty cut-offs and for substitutability between pairs of dimensions and changes in choice of indicators.

The attraction of MPI derives from the observation that the indicators as Alkire and Foster methodology provide scalar estimates of poverty that could be used by policy makers in the allocation of funds to reduce poverty in an efficient and equitable way. Hence, these indicators, notwithstanding their shortcomings, fulfil important functions (Thorbeck 2011, p. 486).

APPLICATION TO NIGERIA

Data Used

Data used for the analysis is from the Demographic and Household Survey (DHS) conducted jointly by the National Population Commission and National Bureau of Statistics in 2013. The surveys which have been conducted five yearly since 2003, follow internationally standardized guidelines, and as such are of high quality data set. The sample size of the 2013 survey is 38,522 households.

Estimation

Poverty Cut-off

The poverty cut-off, k, reflects the share of the weighted indicators in which a person must be deprived in order to be considered to be multidimensionally poor.

The poverty cut-off selected for this study is the value of 30, that is, k = 30. With k = 30, a household has to be deprived in at least the equivalent of 30% of the weighted indicators, that is, 2 – 4 indicators. Thus, a household is multidimensionally poor if the weighted indicators in which the household is deprived sum up to 30%.

Indicator Weights

The MPI weights reflect the normative assessment that achievements in education, health and living standards are roughly equal in intrinsic value. Having roughly equal weights across dimensions is considered to ease the interpretation of the index for policy purposes (Alkire and Santos, 2013, p. 19). For this reason, the weights are equally distributed across dimensions (1/3 each) and within dimensions across indicators, as shown in Table 1.

Table 1: Dimensions, Indicators and Weights of the MPI

Dimension	Indicator	Deprived if …	Relative Weight
Education	Years of schooling	No household member has completed five years of schooling	16.67%
	Child attendance to school	Any school-aged child is not attending school	16.67%
Health	Mortality	Any child has died in the family	16.67%
	Nutrition	Any child or adult for whom there is nutritional information is malnourished	16.67%
Living standard	Electricity	Household has no electricity or generating set	5.56%
	Sanitation	Household sanitation facility is not improved (flush toilet, pit toilet latrine or ventilated improved pit latrine) or improved but shared with other households.	5.56%
	Source of drinking water & time to get to water source	Household does not have access to safe drinking water (Piped water, piped into dwelling, piped to yard/plot, public tap/standpipe, tube well water, tube well or borehole, dug well (open/protected), protected well) or safe drinking water is more than 30 minutes walking from home, roundtrip.	5.56%
	Main floor/wall/roof materials	Household has: natural, earth/sand, dung, rudimentary, wood planks or palm/bamboo floor; **OR** natural, no walls, cane/palm/trunks, dirt, rudimentary, bamboo with mud, stone with mud, plywood, cardboard, reused wood, metal/zinc walls; **OR** natural, no roof, thatch/palm leaf, rudimentary, rustic mat, palm/bamboo, wood planks or cardboard roof.	5.56%
	Cooking fuel	Household does not use any of the following cooking types: Electricity, LPG, Natural gas, Biogas, Kerosene	5.56%
	Assets	Household does not own more than one of: radio, television, landline phone, cell phone, bicycle, motorcycle, refrigerator, cable television, air conditioner, computer, electric iron or fan, and does not own a car, truck, drawn cart or motorboat	5.56%

Source: Adapted from Alkire & Santos (2010, 2013).

RESULTS

Table 3 presents the MPI headcount incidence of poverty (H) and intensity of poverty (A) estimates by state. It is observed that national MPI is 0.317. For the urban areas it is 0.194 and for the rural areas it is 0.402. These translate to 31.7%, 19.4% and 40.2% of the population respectively being multidimensionally poor. Thus, multidimensional poverty is almost twice as high in the rural areas. The same pattern is depicted for H and A. This pattern is consistent with that depicted for income poverty in Nigeria, as shown in Appendix Table 1(a). Table 2 reports on MPI obtained for selected Sub-Sahara African countries, including Nigeria by summer (2011).

Table 2: Comparable MPI Estimates

	Survey	Year	MPI	Multid. Headcount Ratio	Miltid. Poverty Intensity	MPI Poor (million)	Total Sample Size	%Sample size used
Nigeria	DHS	2003	0.407	0.635	0.579	93.37	35,269	96.0
Kenya	DHS	2003	0.296	0.601	0.493	22.53	36,687	96.5
Benin Rep.	DHS	2006	0.412	0.718	0.574	5.83	89,371	94.1
Sub-Saharan Africa		2007	0.374	0.647	0.577	455.5	703.7 million	-

Source: Summer, A. (2012) "Where do the Poor Live?", World Development 40 (5) 865 – 877 reported in Alkire & Santos (2013).

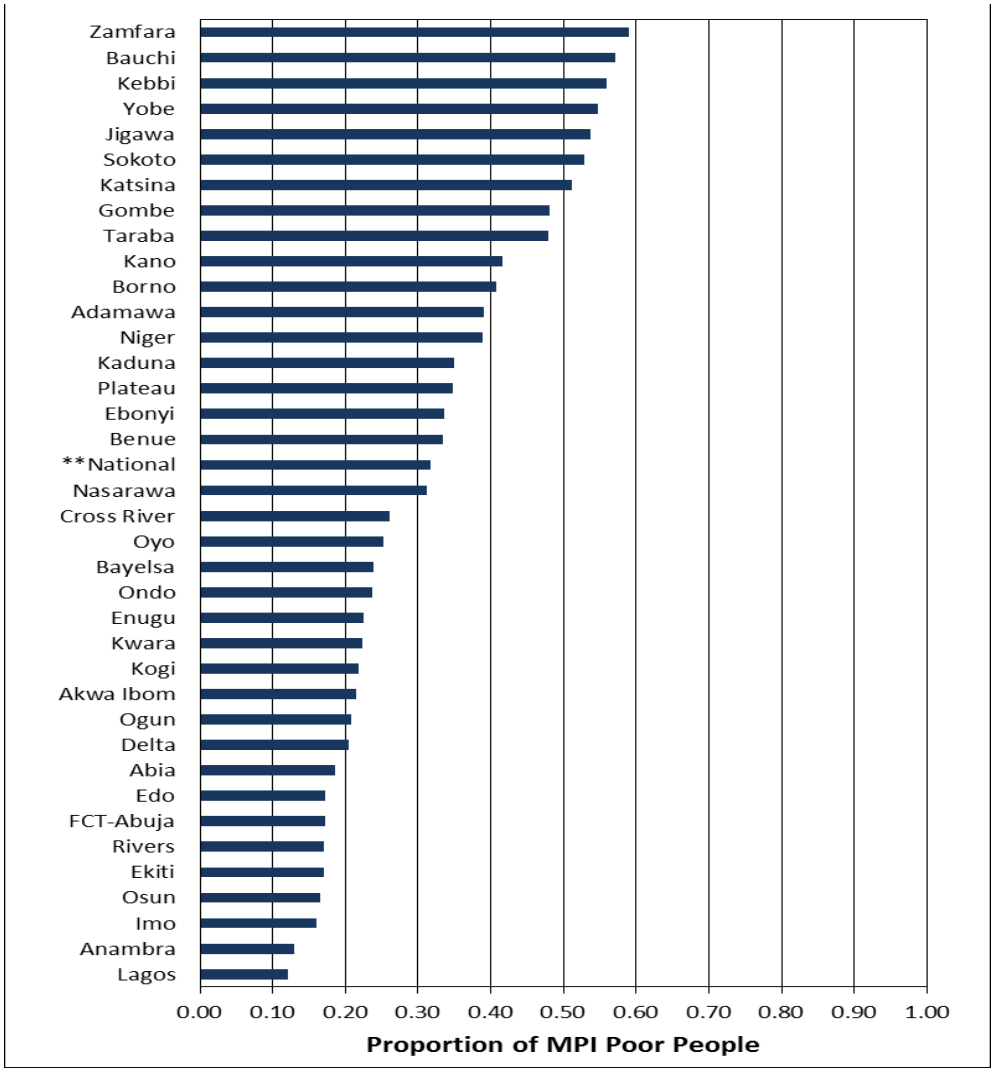
Incidence of poverty and intensity of poverty are both much higher than MPI. By State, Zamfara has the highest MPI, while Lagos has the lowest, followed by Anambra. In all, eight states plus FCT-Abuja out of thirty six have MPI values lower than the national average. These are Lagos, Anambra, Abia, Akwa Ibom, Bayelsa, Cross River, Edo, Delta, Ekiti, Enugu, Imo, Kogi, Kwara, Ogun, Ondo, Osun, Oyo and Rivers. The same pattern obtains for H and A across the States. National average value for H is 0.596 (59.6%). All the States in the North East and North West and three in the North Central zones have values higher than the national average. Only Ebonyi in the Southern zones has value higher than the national average

Table 3: Estimates of MPI, H and A at K=30% for States (sorted by MPI)

	H	A	MPI
Zamfara	0.923	0.639	0.590
Bauchi	0.920	0.620	0.571
Kebbi	0.898	0.623	0.559
Yobe	0.910	0.602	0.548
Jigawa	0.921	0.583	0.537
Sokoto	0.905	0.585	0.529
Katsina	0.872	0.586	0.511
Gombe	0.833	0.578	0.481
Taraba	0.819	0.586	0.480
Kano	0.765	0.545	0.417
National Rural	0.720	0.559	0.402
Borno	0.786	0.519	0.408
Adamawa	0.733	0.533	0.391
Niger	0.705	0.550	0.388
Plateau	0.639	0.544	0.348
Benue	0.650	0.515	0.335
Kaduna	0.654	0.533	0.349
Ebonyi	0.671	0.502	0.337
National	0.596	0.531	0.317
Nasarawa	0.609	0.513	0.312
Cross River	0.525	0.497	0.261
Oyo	0.516	0.489	0.252
Bayelsa	0.485	0.493	0.239
Ondo	0.495	0.480	0.237
Kwara	0.476	0.470	0.224
Kogi	0.467	0.468	0.219
Enugu	0.482	0.466	0.225
Akwa Ibom	0.443	0.486	0.216
Ogun	0.460	0.452	0.208
Delta	0.431	0.475	0.205
National Urban	0.418	0.464	0.194
Abia	0.408	0.455	0.186
Rivers	0.371	0.461	0.171
Ekiti	0.382	0.445	0.170
FCT-Abuja	0.366	0.470	0.172
Osun	0.376	0.439	0.165
Edo	0.383	0.451	0.173
Imo	0.362	0.445	0.161
Anambra	0.293	0.444	0.130
Lagos	0.282	0.429	0.121

Figure 2 presents graphically the ranking by State, from the highest value of MPI for Zamfara to the lowest value for Lagos. Of the seventeen States with MPI higher than the national average, only Ebonyi is in the southern zone. Three are in the North Central zone (Benue, Niger and Plateau). Others are in the North East and North-West zones.

Fig 2: Estimates of MPI by States



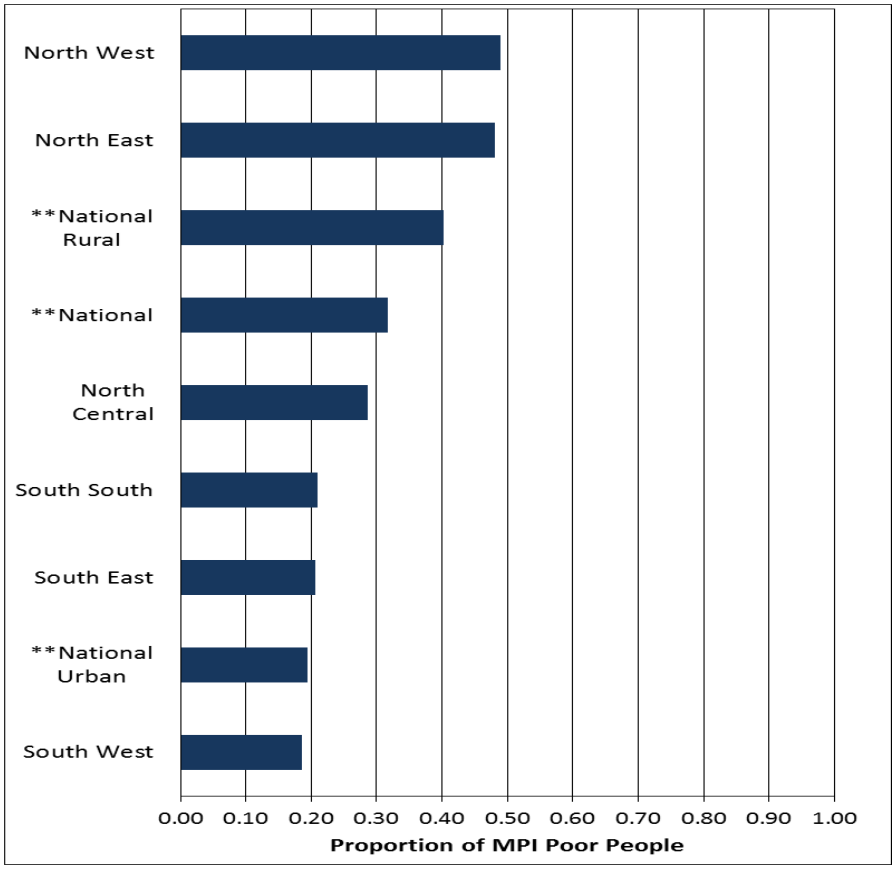
By geographical zones, Table 4 shows that MPI value is higher than the national average for North-East and North-West zones with 0.481 and 0.490, while the South West has the lowest MPI of 0.185, followed by the South East with 0.207, South South with 0.210 and North Central with 0.286.

Table 4: Estimates of MPI, H and A at K=30% for Geographical Zones

	H	A	MPI
North West	0.839	0.584	0.490
North East	0.834	0.577	0.481
National	0.596	0.531	0.317
North Central	0.560	0.511	0.286
South South	0.439	0.479	0.210
South East	0.443	0.468	0.207
South West	0.405	0.457	0.185

Figure 3 is the graphical presentation of the ranking. Again, the pattern is consistent with that of income poverty as depicted in Appendix Table 1 (b), with North East and North West recording highest level of poverty, although income poverty was the highest in the North East since 2003/2004.

Fig 3: Estimates of MPI by Geographical Zone



What is the superiority of MPI over income poverty, if both depict the same pattern? The superiority lies in the fact that MPI offers wider policy choices. While income poverty relies on unidimensional policy response, multidimensional poverty offers multidimensional policy choices. By depicting simultaneous deprivation in various dimensions of human development,

namely education, health and standard of living, it makes it possible to identify which dimension(s) contributes more to poverty and should be targeted in order of importance. In this respect, analysis of dimensional contributions to MPI is illuminating.

Contribution to Dimensions to MPI

Table 5 presents contribution of the three dimensions. There are three percentages, adding horizontally to 100%. It is observed that deprivation in living standard dimension contributes most to MPI. Except for the urban areas where education contributes the highest, both at the national and in the rural areas, living standard is the dimension to target. Across the States the living standard dimension generally dominates, contributing between 30 and 45 percent, except for Lagos where it contributes less than 20 percent, followed by FCT Abuja and Ekiti State where it contributes around 28 percent. It is instructive that the two states contain respectively the commercial and administrative capital cities and facilities are therefore relatively in higher availability than in other states and cities.

By zone, it contributes between 32.3 percent in the South-West and 42.7 percent in the North-East and North-Central. This suggests that states in these zones have relatively lower access to assets which constitute indicators of living standard than in other zones.

Fig. 4 and Fig 5 present graphically the contributions of the dimensions. Education ranks second in terms of contribution. That the standard of living dimension contributes highest to MPI may, however, to some extent be due to the implicit higher weight of the dimension. While all dimensions explicitly have equal weights, the effective weight of each dimension also depends upon the dimensional cut offs and resulting headcounts of poor people. The standard of living variables have a greater incidence of deprivation overall than education or health, hence their implicit weight is greater than 33.3%

ROBUSTNESS OF THE MPI

Robustness tests were carried out to assess sensitivity of estimated MPI to changes in choice of indicators and poverty cut-offs; that is, how changes in selected parameters affect MPI values. Tests that could be done were limited by information available in the dataset used. Choice of the poverty cut-off affects estimated MPI value. In this paper, K=30 was used in the analysis. Estimated MPI is lower than analysis in which K=20 is used (see Appendix 2). That is, the higher the poverty cut off the lower the MPI value. This is consistent with income-metric poverty analysis where the higher the income poverty line the lower the poverty headcount.

Table: 5 Percentage contributions to MPI by Dimensions for States and Geographical Zones

	MPI	Education	Health	Living Standards
Zamfara	0.590	39.12	18.88	41.99
Bauchi	0.571	39.05	19.18	41.76
Kebbi	0.559	41.38	16.34	42.29
Yobe	0.548	44.36	13.19	42.44
Jigawa	0.537	42.46	18.92	38.61
Sokoto	0.529	42.59	19.02	38.39
Katsina	0.511	40.76	20.31	38.93
North West	0.490	41.09	20.10	38.81
Gombe	0.481	40.53	18.73	40.74
Taraba	0.480	33.48	19.75	46.77
North East	0.481	39.85	17.42	42.73
Kano	0.417	40.14	25.03	34.83
National Rural	0.402	38.12	18.46	43.42
Borno	0.408	45.29	9.95	44.76
Adamawa	0.391	37.38	22.78	39.84
Niger	0.388	40.83	19.07	40.10
Plateau	0.348	34.89	18.06	47.05
Benue	0.335	34.46	16.41	49.12
Kaduna	0.349	41.62	19.75	38.63
Ebonyi	0.337	34.07	19.68	46.25
National	0.317	39.49	21.28	39.22
Nasarawa	0.312	36.33	22.24	41.44
North Central	0.286	38.35	20.97	40.68
Cross River	0.261	35.26	20.96	43.78
Oyo	0.252	41.19	23.36	35.44
Bayelsa	0.239	36.30	23.97	39.73
Ondo	0.237	36.71	22.39	40.91
Kwara	0.224	42.70	27.72	29.58
Kogi	0.219	38.41	19.90	41.69
Enugu	0.225	36.81	20.70	42.49
Akwa Ibom	0.216	34.69	27.97	37.34
Ogun	0.208	39.36	23.34	37.30
South South	0.210	36.86	24.42	38.72
South East	0.207	36.37	23.72	39.91
Delta	0.205	39.26	25.33	35.41
National Urban	0.194	42.87	28.24	28.89
South West	0.185	41.60	26.14	32.26
Abia	0.186	36.70	25.95	37.36
Rivers	0.171	37.16	23.09	39.76
Ekiti	0.170	43.35	27.88	28.78
FCT-Abuja	0.172	43.24	29.13	27.63
Osun	0.165	44.31	25.34	30.36
Edo	0.173	38.99	25.57	35.44
Imo	0.161	36.31	28.04	35.65
Anambra	0.130	40.42	29.52	30.05
Lagos	0.121	45.82	35.31	18.87

To test for sensitivity to indicator choice, correlation analysis was carried out. Variants of MPI were estimated by excluding one indicator at a time and then appropriately adjusting the weight of the dimension from which the indicator was dropped so that weights still summed to 1 across all the three dimensions. Both Spearman Rank and Kendall Tau-b correlation analysis were performed to compare the rankings of National Regions (zones), Urban and Rural and States on the variants to MPI.

As results in Table 6 show, the correlation between MPI based on all 10 indicators and any of the variant MPI is 70.8900, for both the Spearman Rank and Kendall Tau-b correlations. The correlation coefficients are statistically significant (P<.0001). This demonstrates lack of evidence of significant changes in rankings of national regions (zones), urban, rural and states by variants of MP.

CONCLUSION

The multidimensional poverty analysis represents effort to better understand the underlying dimensions of poverty in Nigeria. It shifts attention from non-dimensional measurement of poverty, notably income poverty, to include other important dimensions of poverty. It represents the development of new national poverty measures. MPI enables identification of high impact indicators on poverty by providing answer to the question "which dimension contributes most to poverty and should be so treated in policy choices?" MPI also has potentials for tracking the sustainable development goals (SDGs). Seven of its ten indicators are directly linked to the SDGs and three indirectly. Education and health indicators, and sanitation, safe drinking water, clean cooking fuel as indicators of living standard are all directly linked to SDG indicators.

Our results show that the poor is deprived in a number of dimensions simultaneously. A high proportion of poor people suffer health and educational deprivations. While MPI may suggest that measured poverty is not as high as income poverty estimates, its dimensional components, specifically, headcount ratio (H) is significantly higher.

Poverty incidence (H) is much higher in the northern zones. This is a pointer to where interventions may need to be focused if national multidimensional poverty is to be reduced.

Rural versus urban differentiation is also noticeable. MPI is almost twice as high in the rural areas. More poor people live in poverty in the rural areas. This also indicates where targeted interventions may be directed.

Analysis by state and geopolitical zones also shows marked differentiations, highest in the North East and North West zones as is the evidence on income poverty depicted in Appendix Table 1(b).

Analysis of dimensional contributions is insightful. Results show why "one policy fixes all" may not work in tackling the poverty problem in Nigeria.

As the country seeks, like most developing countries, to make rapid progress in the Global Agenda 2030 on the SDGs, MPI analysis provides insights into which policy choices might be effective.

Fig 4: Contribution by Dimension to MPI by State

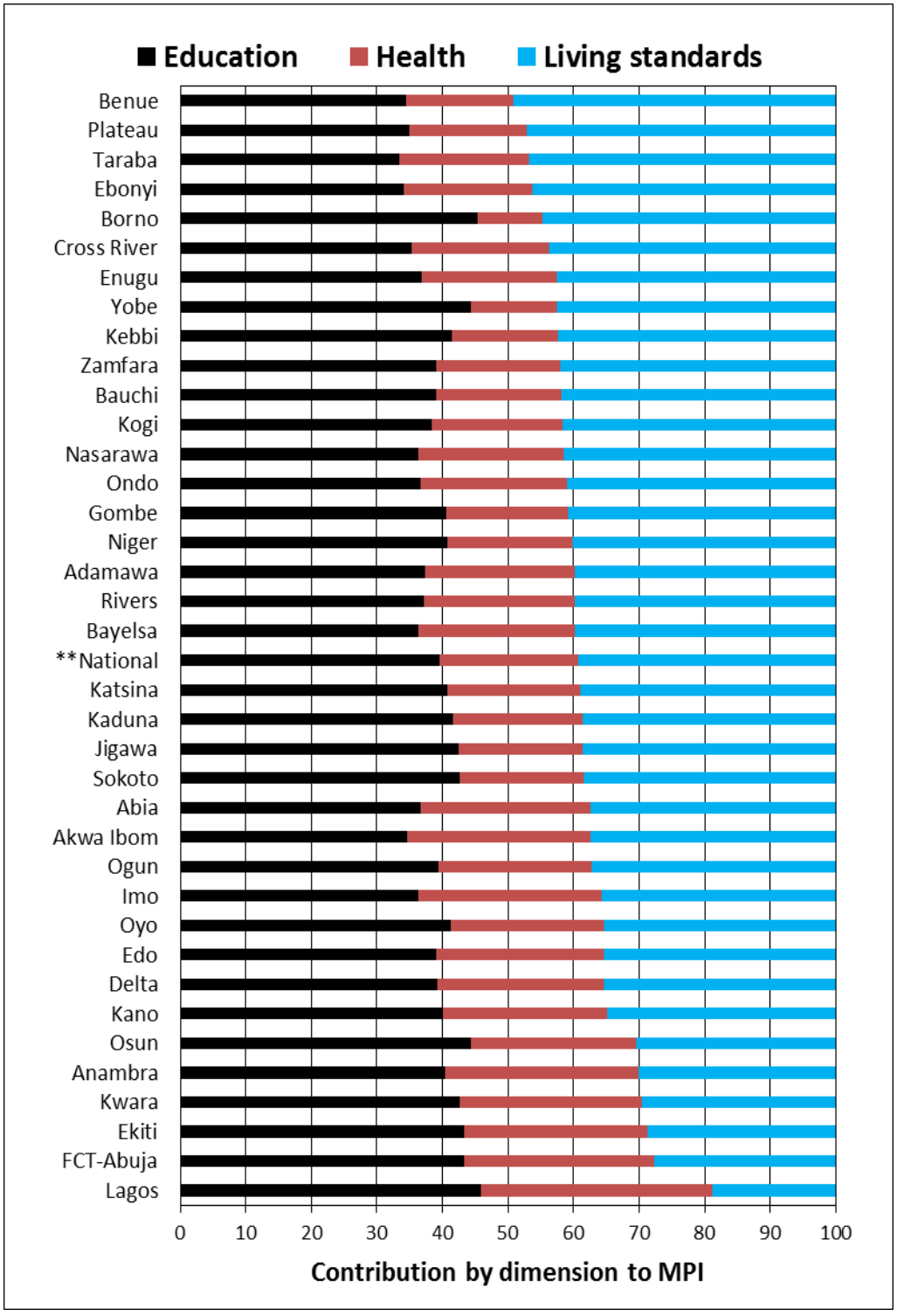


Fig. 5: Contribution by Dimension to MPI by Zone

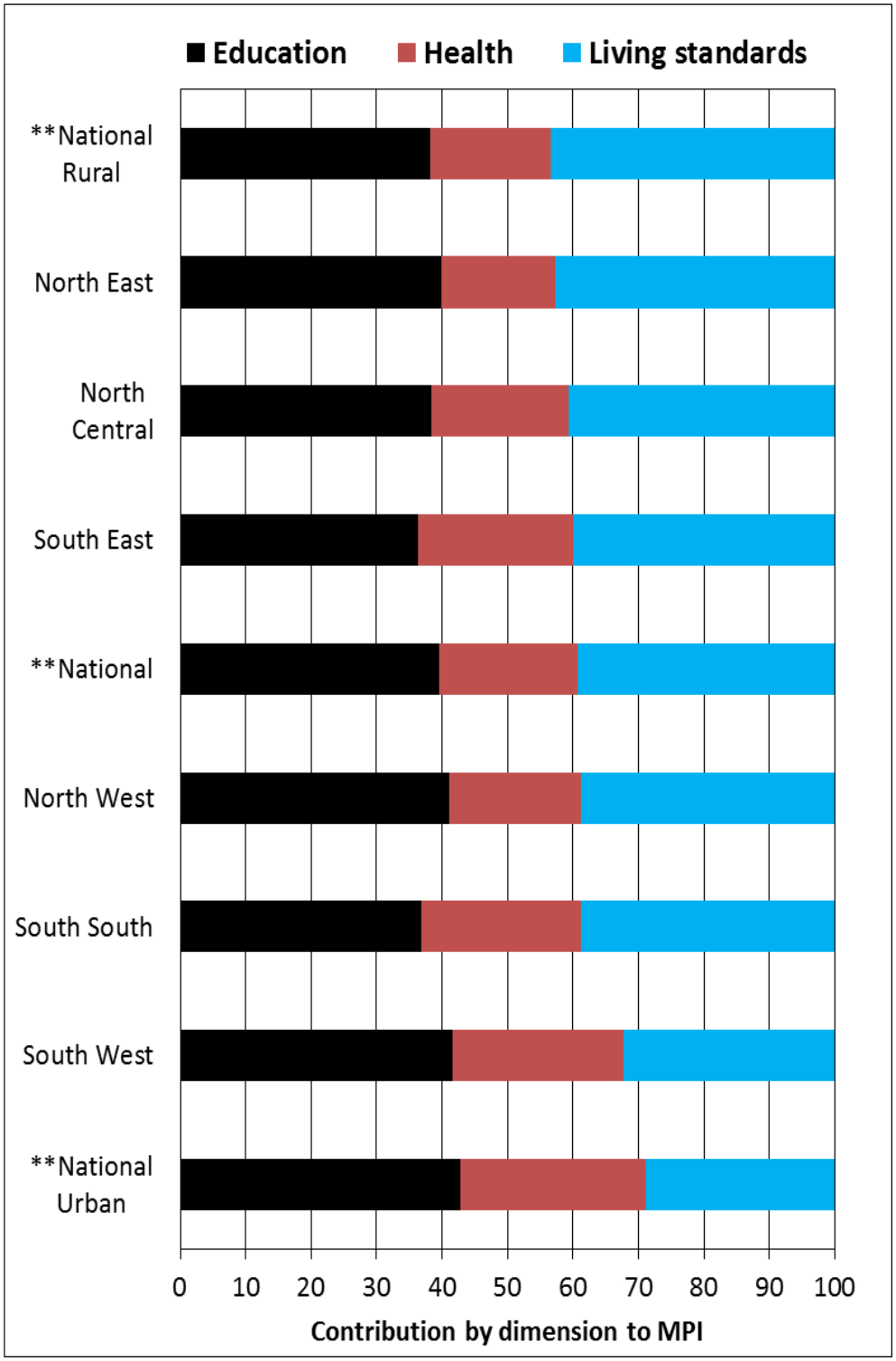


Table 6: Correlation coefficients between MPI based on 'leave-out-one-indicator-at-a-time' Estimations

	All	Chdb	Yrsh	Mort	Nutr	Asse	Elec	Lloo	Fuel	Sani	Wate
Spearman Rank Correlation Coefficients†											
All	1										
Chdb	0.9810	1									
Yrsh	0.9777	0.9482	1								
Mort	0.9906	0.9725	0.9805	1							
Nutr	0.9787	0.9682	0.9439	0.9557	1						
Asse	0.9969	0.9815	0.9772	0.9915	0.9730	1					
Elec	0.9953	0.9820	0.9734	0.9933	0.9693	0.9970	1				
Lloo	0.9932	0.9841	0.9697	0.9914	0.9684	0.9970	0.9979	1			
Fuel	0.9944	0.9827	0.9769	0.9953	0.9679	0.9954	0.9942	0.9941	1		
Sani	0.9981	0.9785	0.9769	0.9859	0.9843	0.9948	0.9921	0.9898	0.9906	1	
Wate	0.9925	0.9821	0.9657	0.9878	0.9711	0.9947	0.9964	0.9959	0.9891	0.9899	1
Kendall Tau-b Correlation Coefficients†											
All	1										
Chdb	0.9053	1									
Yrsh	0.8918	0.8164	1								
Mort	0.9382	0.8783	0.8957	1							
Nutr	0.8957	0.8783	0.8184	0.8377	1						
Asse	0.9691	0.9053	0.8879	0.9459	0.8879	1					
Elec	0.9633	0.9111	0.8744	0.9478	0.8744	0.9710	1				
Lloo	0.9498	0.9130	0.8686	0.9382	0.8686	0.9691	0.9749	1			
Fuel	0.9536	0.9092	0.8879	0.9575	0.8686	0.9652	0.9517	0.9536	1		
Sani	0.9787	0.8995	0.8821	0.9169	0.9053	0.9556	0.9459	0.9362	0.9362	1	
Wate	0.9478	0.9111	0.8628	0.9169	0.8744	0.9517	0.9652	0.9594	0.9285	0.9304	1

†Coefficients are all statistically significant ($P<.0001$)All: Included all indicators; Chdb: Excluded Child Attendance to School Indicator; Yrsh: Excluded Years of Schooling Indicator; Mort: Excluded Mortality Indicator; Nutr: Excluded Nutrition Indicator; Asse: Excluded Assets Indicator; Elec: Excluded Electricity Indicator; Lloo: Excluded Floor Indicator; Fuel: Excluded Cooking Fuel Indicator; Sani: Excluded Sanitation Indicator; Wate: Excluded Water Indicator.

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Appendix Table 2: Estimates of MPI, H and A at K=20.

	H	A	MPI
Zamfara	0.967	0.622	0.601
Bauchi	0.969	0.601	0.583
Kebbi	0.963	0.597	0.575
Yobe	0.964	0.582	0.561
Jigawa	0.971	0.566	0.550
Sokoto	0.959	0.566	0.543
Katsina	0.949	0.560	0.531
North West	0.922	0.554	0.511
Gombe	0.933	0.543	0.506
Taraba	0.924	0.548	0.506
North East	0.924	0.545	0.504
Kano	0.880	0.506	0.445
National Rural	0.851	0.511	0.435
Borno	0.879	0.491	0.431
Adamawa	0.870	0.488	0.425
Niger	0.828	0.506	0.418
Plateau	0.812	0.481	0.390
Benue	0.862	0.451	0.388
Kaduna	0.801	0.482	0.386
Ebonyi	0.860	0.446	0.383
National	0.754	0.472	0.356
Nasarawa	0.766	0.458	0.351
North Central	0.749	0.444	0.333
Cross River	0.719	0.430	0.309
Oyo	0.689	0.430	0.296
Bayelsa	0.676	0.425	0.287
Ondo	0.677	0.417	0.282
Kwara	0.680	0.405	0.276
Kogi	0.698	0.394	0.275
Enugu	0.679	0.403	0.274
Akwa Ibom	0.638	0.413	0.264
Ogun	0.680	0.386	0.262
South South	0.637	0.407	0.259
South East	0.643	0.399	0.257
Delta	0.628	0.404	0.253
National Urban	0.617	0.394	0.243
South West	0.612	0.387	0.237
Abia	0.590	0.390	0.230
Rivers	0.608	0.378	0.229
Ekiti	0.607	0.375	0.227
FCT-Abuja	0.590	0.384	0.227
Osun	0.611	0.366	0.224
Edo	0.561	0.386	0.216
Imo	0.566	0.374	0.212
Anambra	0.522	0.358	0.187
Lagos	0.487	0.352	0.171