

## COMPARING THE QUALITY OF HOUSEHOLD AGE DISTRIBUTION FROM SURVEYS IN DEVELOPING COUNTRIES: DEMOGRAPHIC AND HEALTH SURVEY VS MULTIPLE INDICATOR CLUSTER SURVEY

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**Abstract.** This paper focuses on the quality of household age distribution from two surveys in developing countries. Age and sex data serve as the base population for the estimation of demographic parameters (fertility, mortality, etc.) and other socio-economic indicators. The ultimate objective is to evaluate the age and sex data from two surveys to determine the one with better age and sex reporting that may provide quality base populations for the estimation of demographic parameters and socioeconomic indicators. Algebraic methods were applied to the data retrieved from the Demographic and Health Surveys (DHS) and Multiple Indicator Cluster Surveys (MICS). The overall results show that the quality of data from the two surveys is poor. It is observed that age and sex data from the Nigerian DHS appear to be better than that of MICS while in Bangladesh, Malawi, and Nepal the reverse is the case based on the Joint Scores (JS). The result further shows that Malawi with high literacy respondents had better JS than the other countries indicating that the level of education may be one of the determinants of the quality of age and sex data. Therefore, it is recommended that care and caution should be taken during data collection to reduce the effect of misreporting of age and the usual practice of eliciting vital records of the respondents such as age from the head of the household instead of birth certificates should be discouraged. More importantly, evaluation of age and sex data from different surveys should be done before usage to ascertain the survey with a better quality of data without always presuming that one survey is of better quality than the other.

**Keywords:** age and sex data, age misreporting, accuracy index, base population, survey.

### 1. Introduction

Age and sex data have become an integral part of demographic analysis since they serve as the base in the estimation of demographic parameters and other socio-economic indicators. For effective planning, policy formulation and implementation of programmes, age and sex data are very important to any nation. Data evaluation helps to expose the degree of errors in demographic data for possible correction or adjustment. The direct methods of estimating demographic parameters or vital rates depend largely on the quality of the reported age and sex data (Teklu, 1989). Adequate knowledge of the degrees of errors present in a survey's data serves as an aid for improving future surveys.

Data on age and sex are among the important items collected and analyzed during surveys in developing countries. There are two major kinds of errors often observed in age and sex data from developing countries, namely, content and coverage errors. While coverage errors are often caused by the enumerators in the field (such as omission, duplication, inability to locate enumerations areas, etc.), most of the content errors are largely attributed to the respondent's inability to give accurate and reliable information to the enumerators which often affects the outcome of the survey (Ramachandran, 1989; Nwogu, 2006, 2011). Of all the content errors, age misreporting is a recurring error often observed in most age and sex data from developing countries. The classes of age misreporting include: (i) age exaggeration; (ii) age shifting across critical age boundaries and (iii) digit preference. These errors affect the quality of the age and sex data so severely that in the long run they may distort the estimates of the demographic parameters derived from the data (Ramachandran, 1989).

Different authors have investigated the quality of age and sex data from developing countries (Ekanem, 1972; Bekele, 2006; Nwogu 2006, 2011; Dahiru and Dikko, 2013; Ohaegbulem, 2015; Bello, 2017). Nwogu (2006) opined that in all the census and survey data on age and sex in Nigeria between 1963 and 2003, the smallest value of the UN joint score was 45.9 (obtained in 2003 from the Nigerian Demographic and Health Survey). The United Nations joint scores improved from 38.52 in the 2006 Nigerian census to 34.72 in the 2008 Nigerian Demographic and Health Survey

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(Nwogu, 2011). Ohaegbulem (2015) found that the UN joint scores for the 1991 Nigerian census was 54.83, compared to the 2006 joint score of 38.52. Consequently, all of the observed UN joint scores for the censuses and surveys show that the quality of the age and sex data were poor. United Nations (1955) joint score index adjudges survey data by age and sex to be reliable if the joint score index is  $< 20$ , usable with adjustment if in the range of  $(20 \leq JS < 40)$ , deficient and requiring massive adjustment if in the range of  $(40 \leq JS \leq 60)$  and grossly erroneous and risky to utilize for any inference if greater than 60. Bekele (2006) evaluated the quality of age and sex data from two Ethiopian population and housing censuses in 1984 and 1994. He observed that the quality of the age and sex data deteriorated in the second census against the expectation of significant improvement.

The age and sex data from four countries (Bangladesh, Nigeria, Malawi, and Nepal) was used to illustrate, compare and measure the current quality of age and sex data from surveys in developing countries. The most widely demographic and health related surveys often conducted in developing countries are (i) Demographic Health Surveys (DHS) and (ii) Multiple Indicator Cluster Surveys (MICS). Bangladesh has conducted seven rounds of DHS (with the most recent being the 2014 Bangladesh Demographic Health Survey) and four rounds of MICS. Also, Nigeria has conducted six rounds of DHS (the 1981/82 NFS, 1990, 1999, 2003, 2008 and 2013) and four rounds of MICS (1999, 2007, 2011 and 2016–17) respectively ([dhsprogram.com/data/available-datasets.cfm](http://dhsprogram.com/data/available-datasets.cfm); [mics.unicef.org/surveys](http://mics.unicef.org/surveys)). For Malawi, the number of DHS in place is five while the MICS rounds are only three so far. Nepal has conducted four rounds of DHS and five rounds of MICS.

There appears to be no recent study that has compared the quality of reported age and sex data from these two different surveys which may guide policy makers and researchers on the appropriate data for estimating demographic parameters in developing countries. Therefore, the ultimate objective of this work is to evaluate the age distribution data to determine the survey with better quality of age and sex data which may provide improved base populations for estimating demographic parameters and socio-economic indicators in developing countries. The specific objectives of this work are to evaluate age data in single years and the age and sex data by five-year age groups.

## 2. Methodology

Age and sex data from the two major surveys (DHS and MICS) regularly conducted in developing countries were retrieved from the final reports of each survey selected for the study. The reports were downloaded from the DHS program website ([dhsprogram.com/data/available-datasets.cfm](http://dhsprogram.com/data/available-datasets.cfm)) and UNICEF website ([mics.unicef.org/surveys](http://mics.unicef.org/surveys)) respectively. The two surveys collect similar information at different times. The questionnaires from the two surveys collect information on Household Population and Housing Characteristics, Marriage and Sexual Activity, Fertility Preferences, Family Planning, Infant and Child Mortality, Reproductive Health, Child Health, Nutrition of Children and Women, Malaria, HIV/AIDs-Related issues, Adult and Maternal Mortality, Female Genital Cutting etc. The sampling design used by the surveys involves stratification. Census Enumeration areas (EAs) are randomly selected and enumerators visit the households in the EAs to obtain the required information. The target population has similar characteristics. Four countries, namely Bangladesh, Nigeria, Malawi, and Nepal, were purposively selected for the present study. Malawi and Nepal are *low income* economies while Bangladesh and Nigeria are *low-middle income* economies ([datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups](http://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups)). Malawi is a landlocked country in South-East Africa with about 18 million inhabitants, while Nepal is also a landlocked country, in South Asia with about 26.4 million people (United Nations, 2019; Government of Nepal 2012). The other two, *low-middle income* economies, are Bangladesh with about 162.9 million people (United Nations, 2019) and Nigeria with about 140.4 million inhabitants according to their 2006 census (Federal Republic of Nigeria, 2010). The idea is to gain insight on the current quality of reported age distributions from major surveys in the developing countries. The two most recent rounds of DHS and MICS in each of the countries selected were used to gain insight on the quality of age and sex data in developing countries. For Bangladesh, the age and sex data for the 2011 and 2014 Bangladesh DHS (National Institute of Population Research and Training, Mitra & Associates and ICF International, 2016, 2013) and the 2006 and 2012–13 MICS were considered (Bangladesh Bureau of Statistics, United Nations Children's Fund, 2014, 2007). Nigeria has conducted six rounds of DHS but for the purpose of this study the 2008 and 2013 Nigeria DHS were adopted (National Population Commission, Federal Republic of Nigeria and ICF Macro, 2014, 2009) while out of the four rounds of MICS conducted so far the 2011 and 2016–17 MICS were selected, respectively (National Bureau of Statistics and United Nations Children's Fund, 2017, 2011). For Malawi, the 2010 and 2015–16 (National Statistical Office [Malawi] and ICF Macro, 2017, 2011) and the 2006 and 2013–14 MICS were included in the study (National Statistical Office [Malawi] and United Nations Children's Fund 2015, 2008). Finally, the 2011 and 2016 DHS (Ministry of Health and Population [Nepal] and ICF International Inc. 2017, 2012), and the 2010 and 2014 MICS from Nepal were used for the comparison (Central Bureau of Statistics, 2015, 2012).

Whipple's index (WI) and Myer's index (MI) were used to measure the degree of errors in the age data in single years. The methods assume that: (i) the population is equally distributed among all end-digits and (ii) the population is linearly distributed over some ages. For the age and sex by five-year age groups, the United Nations (1955) Joint Score (JS) was used for the joint evaluation of data by age and sex. Section 2.1 is devoted to methods for evaluating age data in single years, while section 2.2 considers methods for evaluating the age and sex data in five-year age groups.

### 2.1. Evaluation of Age Data in Single Years

*Whipple's index* (WI) is an index of preference or avoidance of the end digits 0 and 5 in the age range 23–62 years. The summary index of preference for each end-digit is the percentage of the one-tenth of the total population aged 23–62 years reported at ages ending with the digits 0 or 5, and one-fifth of the total population aged 23–62 years reported at the ages ending with the digits 0 and 5. It is expressed algebraically:

for the end digit 0 as

$$WI(0) = \frac{(P_{30} + P_{40} + P_{50} + P_{60})}{\frac{1}{10} ({}_{62}P_{23})} \times 100, \quad (1)$$

for the end digit 5

$$WI(5) = \frac{(P_{25} + P_{35} + P_{45} + P_{55})}{\frac{1}{10} ({}_{62}P_{23})} \times 100, \quad (2)$$

for the end digits 0 and 5

$$WI(0,5) = \frac{(P_{25} + P_{30} + P_{35} + P_{40} + P_{45} + P_{50} + P_{55} + P_{60})}{\frac{1}{5} ({}_{62}P_{23})} \times 100, \quad (3)$$

where  $P_x$  is the population reported as age  $x$  years in completed years, and  ${}_{62}P_{23}$  is the population reported as 23–62 under the above assumptions. The decision rule is that the closer the index for each end-digit is to 100, the lower the degree of preference for it and the better the quality of age reporting. On the other hand, the more the index deviates from 100 the higher the degree of preference for the end-digit.

**Table 1.** Decision rule for the Whipple's Index

Value of Whipple's Index	≤ 105	105 - 109.9	110 - 124.9	125 - 174.9	≥ 175
Interpretation	Highly accurate data	Fairly accurate data	Approximate data	Rough data	Very rough data

Source: United Nations (2013).

*Myer's Index* reveals degrees of preference or avoidance for each of the 10 digits, from 0 to 9. To obtain the blended population, the sums of numbers at all ages ending in each digit are calculated for ages 10 and above (10–59 years preferably in this study), and for ages 20 and above (20–69 years preferably in this study). Multiply the total population reported at ages with end-digits (0, 1, 2, ..., 9) in the age range 10–59 years with the coefficients 1, 2, 3, ..., 10 and the total population reported at ages in the age range 20–69 with the coefficient 9, 8, 7, ..., 0 (for digits 0, 1, 2, ..., 9) and adding the results gives the blended population for each digit (UN, 1955). In this study, population in the age range 10–69 years is used to compute the MI for the selected countries since it is assumed that population at that age range is linearly distributed and the end digits appear more realistic (Siegel and Swanson, 2004, p. 139–143; Ramachandran, 1989). For the population in the age range 10–69, the MI is defined as

$$MI = \sum_{i=0}^9 | \%B_i - 10 |, \quad (4)$$

where

$$B_i = (i + 1)P_{1i} + [10 - (i + 1)]P_{2i} \quad (5)$$

is the blended population reported at ages with the end digit  $i$ .  $P_{1i}$  is the total population reported at ages with end-digit  $i$  in the age range 10–69;  $P_{2i}$  is the total population reported at ages with end-digit  $i$  in the age range 20–69.

$$\%B_i = \frac{B_i}{\sum_{i=0}^9 B_i} \times 100 \quad (6)$$

and  $|\%B_i - 10|$  is the absolute value of the deviation of  $\%B_i$  from 10. MI can vary from 0 to 180. When there is no digit preference the MI is 0 and 180 when all ages are reported at a single digit. Sometimes, Myer's index is measured as half of the total absolute deviation of  $\%B_i$  from 10. In that case MI can vary from 0 to 90.

## 2.2 Evaluation of Age and Sex Data by Five-Year Age Groups

The populations by 5-year age groups can be evaluated graphically or algebraically. In this study, algebraic methods were used to evaluate the populations by 5-year age groups of the selected countries. United Nations (1955) proposed a single index for the joint evaluation of data on age and sex called UN Joint Score (JS). JS is calculated as a weighted sum of Age Ratio Score (ARS) and Sex Ratio Score (SRS) of the study population. It is expressed symbolically,

$$JS = ARSM + ARSF + 3 \times SRS, \quad (7)$$

where ARSM is Age Ratio Score for Male, ARSF is Age Ratio Score for Female and SRS is Sex Ratio Score.

*Age Ratio.* According to Ramachandran (1989) for age group  $x$  to  $x+n$ , the Age Ratio is expressed algebraically as

$${}_nAR_x = \frac{{}_n P_x}{\frac{1}{4}({}_n P_{x-n} + 2{}_n P_x + {}_n P_{x+n})} \times 100 \quad (8)$$

where  ${}_n P_x$  is the population aged  $x$  to  $x+n$ . There are other versions of Age Ratio by United Nations (1955) but Ramachandran's modification is preferred when the digit preference/avoidance is highly pronounced as often observed in developing countries.

*Age Ratio Score.* The United Nations Age Ratio Score (ARS) which is the summary index for the deviations of age ratios from 100 is expressed algebraically for each sex as

$$ARS = \frac{I}{k-3} \sum_{i=2}^{k-2} |AR(i) - 100|, \quad (9a)$$

where

$$|AR(i) - 100| \quad (9b)$$

represents the difference between the age ratios and 100;  $k$  is the total number of age groups including the open-ended interval. Age ratio computation appears like moving averages, it does not have values for the first and last closed age groups. When the open ended age interval is not used in the calculation of the ARS, the denominator changes from  $k-3$  to  $k-2$ .

*Sex Ratio.* A summary index often used for the evaluation of sex data is the sex ratio score (SRS), defined as

$$SRS = \frac{I}{k-1} \sum_{i=1}^k |SR(i) - SR(i-1)|, \quad (10)$$

where  $SR(i)$  represents the sex ratio for  $i$ th age or age group;  $k$  is the total number of age groups and sex ratio (SR) generally is expressed as

$$SR = \frac{{}_5 M_x}{{}_5 F_x} \quad (11)$$

${}_5 M_x$  and  ${}_5 F_x$  are the number of males and females enumerated in a specific age group respectively.

**Table 2.** Decision rule for the United Nations age-sex accuracy index

UN accuracy index	< 20	$20 \leq JS < 40$	$40 \leq JS \leq 60$	$JS > 60$
Interpretation	Reliable	Usable with adjustment	Deficient and requires massive adjustment	Grossly erroneous and risky to utilize for any inference

Source: Nwogu and Iwueze (2009), p. 105–106. JS = Joint Score.

### 3. Results

Equations (1) through (6) were applied to the age and sex data in single years to calculate the degree of avoidance or digit preference present in the data. The WI for Nigeria in all the surveys as shown in Table 3 was higher than 175 indicating that the data are very rough while that of Bangladesh was slightly better in all the surveys. While the WI for males in Bangladesh appear to be very rough in both the DHS and MICS data, the female counterparts appear to be only rough. The WI for the female data from the two Bangladesh Demographic and Health Survey (2011 and 2014) appear to be better than their female counterparts in the Bangladesh Multiple Indicator Cluster Surveys (2006 and 2012–13) under consideration. For all the end digits in surveys from Malawi, the females' WI appears to be better than the male counterparts. Malawi WI for end digits 0 and 5 appears to be better in all the surveys when compared to that of Bangladesh and Nigeria. Table 4 shows that Myer's index from Bangladesh DHS for both sexes increased from 24 in 2011 to 25 in 2014, while in the multiple indicator cluster survey, the MI for both sexes decreased from 37 in 2006 to 26 in 2012–13 showing an improvement in the quality of the data. In Nigeria, it appears that there is no significant difference between the 2008 and 2013 NDHS in terms of MI (37 vs. 37) for both sexes while there is a slight decrease (improvement) in the MI for both sexes from 33 in 2011 NMICS to 30 in 2016–17 NMICS. Digit preference for 0 and 5 was above 150 in Nepal MICS and below 122 in the Nepal DHS for the WI.

**Table 3.** Whipple's index for Bangladesh, Nigeria, Malawi and Nepal for males (M), females (F) and both (B)

End Digit/Sex	NDHS 2008			NDHS 2013			NMICS 2011			NMICS 2016–17		
	M	F	B	M	F	B	M	F	B	M	F	B
0	214	195	204	204	188	196	229	195	211	207	215	211
5	205	204	205	211	207	209	188	185	186	182	182	182
0 and 5	210	199	204	207	197	202	209	190	199	194	199	197
	BDHS 2011			BDHS 2014			BMICS 2006			BMICS 2012–13		
	M	F	B	M	F	B	M	F	B	M	F	B
0	223	116	167	248	103	172	281	131	206	171	144	157
5	187	132	159	225	125	173	280	155	218	180	166	173
0 and 5	205	124	163	237	114	173	280	143	212	175	155	165
	MDHS 2010			MDHS 2015			MMICS 2006			MMDG 2013–2014		
	M	F	B	M	F	B	M	F	B	M	F	B
0	114	109	112	114	108	111	111	109	110	102	105	104
5	122	113	117	143	130	136	132	116	124	124	120	122
0 and 5	118	111	114	128	119	124	121	112	117	113	113	113
	NMICS* 2010			NMICS* 2014			NDHS*2011			NDHS* 2016		
	M	F	B	M	F	B	M	F	B	M	F	B
0	153	152	153	156	163	160	107	99	102	118	111	114
5	162	158	160	161	157	159	119	118	118	125	127	126
0 and 5	158	155	156	158	160	159	113	108	110	121	119	120

Note: NDHS= Nigeria Demographic and Health Survey, NMICS = Nigeria Multiple Indicator Cluster Survey, BDHS = Bangladesh Demographic and Health Survey, BMICS = Bangladesh Multiple Indicator Cluster Survey, MDHS= Malawi Demographic and Health Survey, MMICS = Malawi Multiple Indicator Cluster Survey, MMDG = Malawi Millennium Development Goals End-line survey.

The United Nations Joint Scores (JS) were computed using equations (7) through (11). Table 5 shows, that the JS were consistently high in all the surveys under study. The JS for BDHS increased from 44.76 in 2011 to 52.61 in 2014 while there is a slight decrease in the JS from 41.25 in 2006 BMICS to 39.77 in 2013–12 BMICS. For Nigeria, the JS in

both surveys (DHS and MICS) ranges from 35.80 to 48.60 respectively. The JS for Malawi were equally high ranging from 38.94 to 56.82, indicating that overall the quality of data in all the surveys was poor. Nepal DHS recorded the highest JS signifying the poorest quality data among the surveys

**Table 4.** Myer's index for Bangladesh, Nigeria, Malawi and Nepal for males (M), females (F) and both (B)

Index/sex	BDHS 2011			BDHS 2014			MICS 2006			MICS 2012–13		
MI	M	F	B	M	F	B	M	F	B	M	F	B
	39	11	24	45	7	25	57	17	37	29	23	26
	NDHS 2008			NDHS 2013			NMICS 2011			NMICS 2016–17		
MI	M	F	B	M	F	B	M	F	B	M	F	B
	37	37	37	37	36	37	35	32	33	29	31	30
	MDHS 2010			MDHS 2015-16			MMICS 2006			MMDG 2013–2014		
MI	M	F	B	M	F	B	M	F	B	M	F	B
	9	7	8	11	11	11	11	11	11	5	6	6
	NMICS* 2010			NMICS* 2014			NDHS*2011			NDHS* 2016		
MI	M	F	B	M	F	B	M	F	B	M	F	B
	18	18	18	20	21	20	6	4	4	8	9	9

Note: Computation is restricted to 10–69 years. Other items are as defined in Table 3.

**Table 5.** Summary of indices measuring the accuracy of data for Bangladesh, Nigeria, Malawi and Nepal

Score/Survey	BDHS 2011	BDHS 2014	BMICS 2006	BMICS 2012–13
ARSM	3.31	4.75	4.40	3.53
ARSF	3.07	3.84	4.30	6.00
SRS	12.79	14.68	10.85	10.08
JS	44.76	52.61	41.25	39.77
	NDHS 2008	NDHS 2013	NMICS 2011	NMICS 2016–17
ARSM	4.24	3.84	5.31	4.58
ARSF	4.53	4.57	6.48	8.41
SRS	9.07	9.13	10.62	11.87
JS	35.97	35.80	43.65	48.60
	MDHS 2010	MDHS 2015–16	MMICS 2006	MMDG 2013–14
ARSM	4.06	3.55	3.74	5.01
ARSF	4.70	7.31	8.61	7.18
SRS	10.06	13.25	14.82	11.43
JS	38.94	50.61	56.82	46.48
	NDHS*2011	NDHS* 2016	NMICS* 2010	NMICS* 2014
ARSM	3.73	3.26	5.12	2.39
ARSF	4.31	3.12	6.54	6.83
SRS	19.44	19.53	14.63	14.13
JS	66.36	64.98	55.54	51.62

Note: Computation is restricted to 0–69 years. ARSM= Age Ratio Score for Male, ARSF= Age Ratio Score for Female, JS = Joint Score. Other items are as defined above.

#### 4. Discussion

This study has discussed the quality of age and sex data from Demographic and Health Surveys (DHS) and Multiple Indicator Cluster Surveys (MICS) in developing countries. The rationale is to propose an appropriate age and sex data source for estimating demographic parameters in developing countries which may guide researchers and policy makers.

The results of the study show that the quality of age and sex data in all the surveys is poor. The Whipple's Index (WI) for Nigeria in all the surveys was higher than 175 indicating that the data is very rough while those of Bangladesh and Malawi are slightly better. While the WI for males in Bangladesh appears to be very rough in both MICS and DHS data, their female counterparts appear to be only rough. The WI of Malawi females appear to be better than the male counterparts. The results of the Myer's index showed high preference for end-digits 0 and 5 in Bangladesh and Nigeria but moderate in Malawi surveys. Generally, Malawi WI for end-digits 0 and 5 appear to be better in all the surveys compared to the ones from Bangladesh and Nigeria. The end-digits 1, 3, 4, 7, 9 were avoided in all the surveys. These findings are consistent with the results of Ekanem (1972) and Nwogu (2006, 2011). The high percentage of 'no education' (ranging from 24.9% to 54.8% in all the surveys) among female respondents and poor percentage of 'no education' among the male respondents (ranging from 9.6% to 26.6% in all the surveys) for respondents from Bangladesh, Nigeria and Nepal appears to be one of the causes of the poor quality of age and sex data in those countries (Bangladesh Bureau of Statistics, United Nations Children's Fund, 2014, 2007; National Institute of population Research and Training, Mitra & Associates and ICF International, 2016, 2013; National Population Commission, Federal Republic of Nigeria and ICF Macro. 2014, 2009; National Bureau of Statistics and United Nations Children's Fund. 2017, 2011; Ministry of Health and Population [Nepal] and ICF International Inc. 2017, 2012; Central Bureau of Statistics, 2015, 2012). This is common in developing countries, where there is a high number of illiterates who can barely read or write (especially in rural areas). The consequence of poor data is unreliable base populations used in the estimation of demographic parameters (fertility, mortality, migration etc.) and socioeconomic indicators (such as employment) in that region. Malawi, with relative percentage of respondents with 'no education' (less than 16.0% in all the surveys) except for the 2006 MICS female respondents reported as 20.8%, appears to be an outlier, judging by the other three countries – hence the improved quality of age distributions observed in that country (National Statistical Office [Malawi] and ICF Macro. 2017, 2011; National Statistical Office [Malawi] and United Nations Children's Fund. 2015, 2008). Even at that, more rounds of DHS and MICS in the future may reveal if there is a consistent improvement as the literacy rate of respondents increases. Once it is established that such relationship is conclusive, it will help policy-makers in planning implementations, among others.

It is observed that the age ratios (ARs) of males and females aged 5–9 years were above 100 percent in all the surveys as shown in Tables 6 and 7. This may be as a result of over-reporting of the population in the 5–9 years age group or transfer of some of those aged 0–4 years into 5–9 years age group. The driving force of reporting some of those aged 0–4 years into their immediate neighboring age group has been attributed to the practice of parents declaring higher ages in order to register or enroll under-aged pupils into primary school (Ramachandran, 1989). This trend has persisted due to many reasons, such as financial pressure, inadequate post-natal time for nursing mothers who are gainfully employed, high maternal mortality ratio and high orphan-hood burden which puts pressure on parents and causes child health outcomes in most developing countries. For the surveys in Nigeria, the ARs of those aged 10–14 years are relatively below 100 percent while their counterparts in Bangladesh and Malawi were mostly above 100 percent. In all the surveys examined, the huge number of ARs in the age range 30–34 years was predominantly below 100 percent which may be attributed to high migration among that age range due to many factors such as seeking for quality education, better employment, medical tourism, movement to internally displaced camps or refugee camps outside the country of origin due to war or terrorism. The sex ratio (SR) of males aged 0–4 and 5–9 years were all above 100 percent indicating that males are higher than their female counterparts in those age groups while in the age range 20–29 years the SR of males were lower than 100 percent signifying that the female populations were higher than male counterparts in that age range in all the surveys under consideration.

In all the surveys under study, the UN Joint Scores (JS) were consistently above zero, the expected figure when the quality of the age and sex data is correctly reported. The JS for Bangladesh Demographic and Health Survey (BDHS) increased from 44.76 in 2011 to 52.61 in 2014 indicating that the quality of the data deteriorated instead of improving, however, there is a slight improvement in the quality of the data from Bangladesh Multiple Indicator Cluster Survey (BMICS) in that the JS decrease from 41.25 in 2006 to 39.77 in 2012–13. For Nigeria, while there is no significant improvement in the JS between the two Nigeria Demographic and Health Surveys (NDHS), 35.97 and 35.80 for 2006 and 2012–13, respectively, the JS from NMICS however increased from 43.65 in 2006 to 48.60 in 2012–13 showing that the quality of the data have worsened instead of the expected improvement. The JS for Malawi were equally high ranging from 38.94 to 56.82 in both the Malawi Multiple Indicator Cluster Surveys (MMICS) and Malawi Demographic and Health Surveys (MDHS), indicating that overall the qualities of data in all the surveys were poor. In Nigeria, it appears that the quality of age and sex data from the two successive NDHS is better than their NMICS counterparts, while in Bangladesh and Malawi the quality of age and sex data from MICS appears to be better than the data from Demographic and Health Surveys (DHS) based on the joint scores.

## 5. Conclusion

The level of education of the respondents in the surveys appears to be one of the causes of the poor quality of the age and sex data from Bangladesh, Nigeria and Nepal as the percentage of female respondents reported with 'no educa-

tion' in the three countries ranges from 24.9 % to 54.8% while that of the male respondents ranges from 9.6% to 26.6% in all the surveys as mentioned above. The improved Whipple's index of Malawi may be attributed to high literacy level among the respondents as the number of people reported with 'no education' was less than 16.0% in all the surveys except the 2006 MICS female respondents reported as 20.8%. Moreover, care and caution should be taken during data collection to reduce the errors often observed in the age and sex data from developing countries. It is important that issues about the training of field officers, good supervision, education of the populace, remuneration, and awareness campaigns should be taken seriously. The normal practice of extracting vital information of the household members from the head of the household should be discontinued. Information on vital records of each respondent should be elicited from birth certificates, baptismal cards, hospital cards etc.

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**NAMŲ ŪKIŲ AMŽIAUS PASISKIRSTYMO KOKYBĖS PALYGINIMAS  
BESIVYSTANČIŲ ŠALIŲ APKLAUSŲ TYRIMUOSE:  
DEMOGRAFINĖ IR SVEIKATOS APKLAUSA IR DAUGELIO RODIKLIŲ LIZDINĖ APKLAUSA**

**Chinonso O. Okoro**

**Santrauka.** Tiriama dviejų apklausų, vykdomų besivystančiose šalyse, namų ūkių amžiaus pasiskirstymo kokybė. Amžiaus ir lyties duomenys reikalingi vertinant demografinius parametrus (vaisingumą, mirtingumą ir t.t.) ir kitus socialinius ekonominius rodiklius. Tyrimo tikslas yra nustatyti, kurioje iš dviejų apklausų, Demografinės ir sveikatos (DSA) ar Daugelio rodiklių lizdinės (DRLA), pateikiami amžiaus ir lyties duomenys yra geresni. Gauti rezultatai rodo, kad abiejų tyrimų kokybė yra prasta. Remiantis jungtiniu indeksu (JI) Nigerijoje DSA duomenys yra geresni už DRLA duomenis, tuo tarpu Bangladeše, Malavi ir Nepale – atvirkščiai. Be to Malavi, kurioje raštingumo lygis lyginant su kitom minėtom šalim yra aukštesnis, turi geresnį ir JI. Tai rodo, kad išsilavinimas gali būti vienu iš veiksnių, įtakančių amžiaus ir lyties duomenų kokybę. Todėl rekomenduojama imtis priemonių, kad renkant duomenis išvengtų amžiaus iškraipymų, pavyzdžiui, vietoje gimimo liudijimo registruojant, kaip įprasta, šeimos galvos pateikiamą informaciją. Dar svarbiau prieš naudojant tyrimams apklausų duomenis nepasikliauti išankstine nuostata apie tų apklausų kokybę ir ją įvertinus iš jų pasirinkti geriausią.

**Reikšminiai žodžiai:** amžiaus ir lyčių duomenys, amžiaus iškraipymai, tikslumo indeksas, pirminė populiacija, apklausa

## Appendix 1

Table 7. Age and Sex Ratio Scores for Nigeria surveys

Age Group	AGE RATIO								SEX RATIO			
	NDHS 2008		NDHS 2013		MICS 2011		MICS 2016-17		NDHS 2008	NDHS 2013	MICS 2011	MICS 2016-17
	M	F	M	F	M	F	M	F				
0-4									102.1	101.6	103.7	102.2
5-9	102.3	103.1	105.4	105.4	103.4	102.9	103.4	102.1	102.4	102.3	101.7	103.3
10-14	101.0	98.8	99.8	97.6	98.0	101.2	102.4	105.7	105.4	103.6	96.8	98.5
15-19	94.1	93.5	94.4	95.5	99.4	91.3	96.4	89.3	98.2	93.4	106.3	109.4
20-24	94.7	97.3	93.5	94.8	93.2	96.9	92.6	96.0	85.0	83.4	80.6	87.9
25-29	104.4	109.0	102.2	108.3	96.6	107.0	96.6	102.1	81.2	77.0	67.4	76.1
30-34	98.0	95.0	100.0	95.4	104.4	99.7	102.1	102.6	94.2	91.8	85.9	81.6
35-39	101.8	100.0	101.1	102.4	99.0	96.9	98.9	97.9	101.1	94.1	95.8	91.1
40-44	97.1	97.0	97.4	94.2	101.6	100.3	103.2	102.4	102.5	103.8	101.1	100.9
45-49	101.2	95.1	105.4	100.6	92.9	89.4	95.1	81.3	104.1	102.0	102.8	113.6
50-54	100.2	109.2	90.5	104.0	110.9	118.1	106.0	126.3	80.5	78.8	89.9	71.7
55-59	88.7	93.5	101.2	93.9	87.6	85.1	91.9	82.7	85.5	105.3	106.6	103.2
60-64	112.6	103.3	106.5	105.5	110.2	107.4	109.4	106.9	117.7	111.2	125.4	118.9

Note: Computation is restricted to 0-69 years. Other items are as defined in Table 3.

Table 8. Age and Sex Ratio Scores for Malawi surveys

Age/Sex	AGE RATIO								SEX RATIO			
	MDHS 2010		MDHS 2015-16		MMICS 2006		MMDG 2013-2014		MDHS 2010	MDHS 2015-16	MMICS 2006	MMDG 2013-2014
	M	F	M	F	M	F	M	F				
0-4									95.9	97.4	97.8	102.0
5-9	103.6	103.4	104.1	103.8	102.2	102.6	105.3	104.9	98.1	97.0	95.4	99.1
10-14	103.8	105.1	106.6	110.8	104.1	106.7	103.5	108.2	99.9	95.7	94.3	94.5
15-19	96.6	89.3	96.5	84.3	90.5	79.9	96.9	87.1	110.9	117.0	107.6	112.8
20-24	92.9	98.2	96.4	105.8	97.0	111.5	93.1	98.5	88.3	83.9	75.6	89.1
25-29	101.5	105.5	94.2	95.3	103.8	99.6	96.2	100.2	83.5	80.4	94.6	82.6
30-34	99.0	97.5	97.8	101.6	101.1	98.6	104.9	104.9	93.8	79.7	107.0	90.1
35-39	104.7	99.7	106.2	102.8	98.9	95.8	100.4	98.1	104.1	93.4	116.2	101.5
40-44	90.5	92.5	98.0	95.1	95.5	96.2	99.6	95.2	95.4	101.0	113.2	111.0
45-49	100.4	97.0	94.3	85.8	98.8	83.5	92.0	88.5	91.4	99.6	112.3	102.0
50-54	98.3	106.8	98.1	115.1	93.0	120.4	104.5	112.8	74.0	65.1	56.8	77.2
55-59	96.4	94.4	99.4	92.3	105.4	90.7	90.3	90.0	82.6	82.4	85.9	78.6
60-64	108.6	104.2	99.6	99.3	102.1	106.4	109.6	112.5	87.5	81.9	75.7	79.2

Note: Computation is restricted to 0-69 years. Other items are as defined in Table 3.