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Patterns of Digit Preference and Avoidance in the Age Statistics of Some Recent African Censuses: 1970–1986

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Abstract: This study uses single-year age data to examine the accuracy of age reporting and the patterns of digit preference in African censuses conducted in the 1970s and 1980s. Our analyses reveal that age misreporting is more pronounced among females than males; among rural than urban residents; and among Western than Southern African countries. However, the general pattern of digit preference and avoidance tends to be similar for different segments of the population. Adult literacy rate showed a significant negative effect on age misreporting.

Key words: African censuses; digit preference; socioeconomic correlates.

1. Introduction

Age is an important classificatory variable in demographic analysis, and age data are important for evaluating patterns of fertility and mortality and for making reliable population estimates and projections. In addition, socioeconomic characteristics such as income, education, occupation, labour force participation, and contraceptive use may be expected to vary with age. It is therefore essential to have valid and reliable age data in order to carry out any meaningful socioeconomic or demographic analyses of a population. But quite often, the demographer finds him/herself carrying out these analyses using age data that are full of inadequacies or errors.

Inadequacies in age statistics may arise from two main sources. The first is the failure to report any age at all. The second and more common is the failure to report age correctly. Age misreporting may arise from a number of sources including ignorance of correct age; a tendency to understate at some ages while exaggerating at other ages; a general tendency to overselect at some ages ending in certain digits, such as 0 or 5, while avoiding ages ending in other digits such as 1 or 9; and intentional falsification of age reporting for a variety of reasons - social, economic, political or individual motives. With data from less developed nations, particularly Africa, there is the additional complication that birth records may not be readily available to cross-check reported ages with actual dates of births in the absence of an effective compulsory registration system. Because of the high illiteracy level in these societies, age is often calculated on the basis of historical events, such as tribal or village wars; important celebrations (Independence Day, Republic Day, Christmas Day); natural

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disasters (flood, famine, death of a prominent member of the society); and farming calendar (brushing, felling of trees, weeding, harvesting). Memory recall is therefore part of the cultural heritage of these societies; in cases where there is a memory lapse or failure, misstatement of age often occurs. In other instances, ages of a substantial number of respondents are provided by enumerators or heads of households, whose estimates of ages have been observed to be inaccurate. These estimates have been based on physical appearance, biological relationships, etc., such as, the weaning of a child or his or her first walking and a guessed age at marriage. A methodological analysis of the age data of the 1963 population census of Sierra Leone by Gilbert (1963), for example, estimated that roughly half of the reported ages, 20–24 and over, and one-third of the total ages were provided by enumerators and other third parties such as heads of households. Some studies have also found errors in ages imputed by enumerators. For instance, in a comparison of ages stated in transcripts of tape recordings of the 1973 population census of Gambia interviews with the ages recorded by enumerators on the questionnaires, Gibril (1979) detected that one-quarter of the reported ages of respondents was either over- or under-stated by enumerators.

Other studies have attributed errors in age reporting to differences in socioeconomic factors (Thomas 1972); over-enumeration due to political reasons (Ebigbola 1973); and to transport and communication problems (Amungo 1976).

The tendency of enumerators or respondents to report certain ages at the expense of others is called age heaping, age preference, or digit preference. Nagi, Stockwell and Snavely (1973) presented analysis of digit preference and avoidance in the age statistics of some African censuses taken between 1957 and 1966. In this paper we supplement that article by presenting additional data on this phenomenon for recent African censuses taken since 1970, paying particular attention to sex and urban-rural variations, and to identifying some of the socioeconomic correlates of the indexes of preference using a multiple regression technique.

2. Data and Methodology

This study utilizes single-year-of-age data for some recent African censuses taken since 1970, published in the United Nations Demographic Year Books (1979, 1983).

Several techniques (Whipple's index, Myers's index, Bachi index, Carrier index, and Ramachandran index) have been used to measure the extent of digit preference or avoidance in the age statistics of national censuses (Shryock and Seigel 1973). Of these, the Myers's index (Myers 1940) is the most widely used and will be reported here. The Myers's index has the additional advantage in that it can be used to test the Turner Hypothesis of digit preference. Briefly, the Myers's method involves computing an index of preference under the assumption that in completely accurate age data the number of persons with age ending in each of the terminal digits in the "blended" population will be equal to 10% of the total "blended" population. If the proportion at any given digit exceeds 10% (i.e., a positive deviation) it indicates overselection of ages ending in that digit (i.e., digit preference). If the proportion is less than 10% (i.e., a negative deviation), it indicates underselection of ages ending in that digit (i.e., digit avoidance). The index of preference is the aggregate measure of digit preference and avoidance which is calculated as one-half of the sum of the absolute deviation scores from 10% for

each of the ten terminal digits. Thus, an index of preference of 0.0 would indicate that none of the population would have to be redistributed throughout the age groups to yield a "perfect" distribution, an index of 9.5 indicates that 9.5% of the population must be redistributed. The Myers's method uses the technique of blending, which is a method of applying weight to the given digit distribution to take into account the fact that in an unblended population mortality and fertility operate to produce a terminal digit distribution in which digit 1 is more likely than higher digits because not all persons survive to reach the higher age and persons who are born start at the lowest digit.

3. Results

3.1. Age heaping in African censuses

Table 1 presents the indexes of preference and each specific terminal digit deviation for 41 African and 13 non-African censuses taken since 1970. There is a substantial variation in the extent of age heaping in these censuses. Indexes range from as low as 0.0 for Seychelles to a high of 41.0 for Niger. The degree of inaccuracy in age reporting is greatest for Western African countries (mean = 20.0, median = 20.0), and least for Southern (mean = 6.0, median = 6.0) and Eastern (mean = 7.0, median = 7.0) African countries, with Central (mean = 11, median = 12) and Northern (mean = 14, median = 11) African nations in between.

Table 1 also reveals that age heaping is characteristic of both men and women, but tends to be slightly more pronounced for women, with the differences greater for Western than other African nations. Some indication of the relative accuracy of age statistics in African censuses may be obtained by considering the indexes of preference for censuses of some non-African nations. Indexes are presented for 13 nations in Europe, Asia, South and Central America, and the West Indies. Stockwell and Wicks (1974) suggest that an index of 3.0 would be a reasonable cut-off point to separate out countries whose statistics may be considered generally accurate and relatively free from bias. Of the 13 non-African nations considered, the countries of Europe, Hong Kong, Uruguay, Puerto Rico, Trinidad and Tobago, and Singapore have index values less than 3.0, compared to 6 in Africa (Seychelles, Mauritius, Reunion, Rodrigues, Sao Tome and Principe, and Tunisia). Kuwait and Bolivia, each has an index of 8.0, while Nepal exhibits an index value of 25.0.

Rural-urban variations in the accuracy of age reporting are also examined. Indexes for 10 African countries are presented in Table 2. These indexes clearly suggest that the extent of age misreporting is greater in rural than urban areas, a result that agrees with findings in Mexico (Stockwell 1965) and the Philippines (Stockwell and Dixon 1966). Among the rural populations, indexes range from 6.0 in Rwanda to 23.0 in Mali, while among the urban populations, the range is from 4.0 in Madagascar and South Africa to 16.0 in Benin. Within each place category, inaccuracies in age reporting are more pronounced for women than men. However, urban women exhibit lesser degree of inaccuracies than their rural counterparts.

3.2. Patterns of digit preference

Patterns of digit preference and avoidance in age statistics can be explained in terms of Turner's hypothesis. Stanley Turner (1958) formulated the hypothesis that non-rectangularly distributed terminal digits follow a ranking of preference and avoidance, with persons tending to over-report those digits that are multiples of the

Table 1. Patterns of digit preference and indexes of preference for some African censuses 1970–86

Sub-region Country	Terminal digit deviation (Both sexes)										Index of preference		
	0	5	2	8	4	6	3	7	1	9	Both sexes	Male	Female
Northern Africa													
Libya, 1973	5	4	−2	−2	1	−3	−1	−1	−2	−1	11	7	15
Morocco, 1971	18	8	3	−1	−4	−2	−5	−5	−4	−6	28	23	33
Tunisia, 1984	0	−0	−0	−0	0	−1	1	−0	−0	1	2	2	3
Western Africa													
Benin, 1979	10	8	1	1	−4	−3	−3	−3	−4	−3	20	18	21
Burkina Faso, 1975	16	9	−3	−3	−5	−4	−3	1	−5	−3	25	24	26
Gambia, 1973	18	7	−2	−0	−4	−2	−4	−3	−5	−4	25	23	27
Gambia, 1983	16	8	−2	0	−4	−2	−4	−3	−5	−4	24	22	26
Ghana, 1970	10	4	0	1	−2	−1	−3	−3	−6	−3	15	14	16
Ghana, 1984	9	5	1	1	−2	−1	−3	−3	−4	−3	16	14	17
Guinea-Bissau, 1979	16	6	−2	1	−4	−2	−4	−2	−6	−1	22	20	23
Liberia, 1974	8	4	−1	3	−2	−2	−3	−3	−3	−1	14	14	15
Mali, 1976	15	6	−2	0	−4	−1	−4	−2	−4	−4	21	18	23
Mauritania, 1977	13	2	−2	−2	−2	3	−4	−3	−3	−3	19	16	20
Niger, 1977	28	13	−4	−3	−7	−6	−6	−1	−8	−7	41	39	43
Sao Tome & Principe, 1981	−1	−1	0	0	−0	0	−0	0	1	−0	2	2	2
Senegal, 1976	7	2	−1	−0	−2	4	−2	−2	−2	−3	13	11	15
Sierra Leone, 1974*	15	7	−2	2	−4	−2	−5	−4	−5	−2	22	22	25
Togo, 1970	6	5	1	2	−3	−2	−3	−2	−4	−0	14	14	14
Central Africa													
Cameroon, 1976	11	6	−2	−1	−4	−2	−2	−2	−3	−3	17	15	19
Central African Rep, 1975	5	9	−3	−1	−4	−0	−1	1	−3	−2	13	11	16
Congo, 1984	1	1	0	−0	2	1	−2	−1	−1	0	5	4	5
Equatorial Guinea, 1983	8	1	−1	0	−2	−1	−1	−1	−3	−2	10	7	12
Eastern Africa													
Burundi, 1979	6	2	−1	0	−1	−2	−2	−1	−2	−1	9	7	11
Comoros, 1980	20	5	−2	−0	−4	−3	−4	−3	−6	−4	26	25	27
Kenya, 1979	5	2	−1	−0	−1	−1	−2	−1	−1	0	7	6	8

Madagascar, 1974–75	5	5	−2	−0	−2	−1	−1	−1	−2	−2	10	8	12
Malawi, 1977	4	2	−1	1	−2	−1	−2	−0	−2	1	8	7	9
Mauritius, 1972	−0	0	0	1	0	−0	−1	1	−0	−0	2	2	3
Mauritius, 1983	0	−0	−0	0	−1	−0	0	0	−0	1	1	1	1
Reunion, 1982	0	0	−0	0	−0	0	−1	0	−0	1	2	2	2
Rodrigues, 1972	0	0	0	0	−0	−1	−0	0	1	−0	2	2	2
Rwanda, 1978	2	−1	−0	5	−1	1	−1	−2	−1	−1	7	5	7
Seychelles, 1977	0	−0	−0	0	−0	0	0	0	0	0	0	0	0
Tanzania, 1978	7	5	−0	3	−1	−1	−3	−3	−4	−2	15	13	17
Zambia, 1974	3	1	1	1	1	1	−2	−2	−2	−1	7	6	7
Southern Africa													
Botswana, 1971	3	0	0	1	−1	0	−2	−1	−1	0	5	5	5
Botswana, 1981	3	1	0	0	−1	−0	−1	−1	−1	0	4	4	4
South Africa, 1970	6	1	0	1	−1	−0	−2	−2	−2	−1	8	7	9
South Africa, 1980	4	1	0	0	−1	−0	−1	−1	−2	−1	7	5	8
Swaziland, 1976	3	1	−0	2	−1	0	−2	−2	−3	−0	7	7	7
Swaziland, 1986	3	1	0	2	−1	0	−1	−2	−2	−1	6	6	6
Non African Nations													
Belgium, 1981	0	−0	−0	0	−0	0	−0	0	0	0	1	1	1
Bolivia, 1976	5	2	−0	1	−1	1	−2	−2	−3	−2	10	8	11
Hong Kong, 1981	1	−0	0	0	−0	−1	0	−0	0	0	1	2	1
Kuwait, 1980	5	4	−0	−0	−1	−1	−1	−1	−2	−2	8	8	8
Nepal, 1981	14	10	1	1	−4	−3	−5	−5	−4	−5	25	24	26
Norway, 1980	0	−0	0	−0	0	−0	0	−0	−0	−0	1	1	1
Puerto Rico, 1980	0	0	−0	−0	0	−0	−0	0	−0	0	1	1	1
Scotland, 1981	0	−0	−0	0	0	−0	0	0	0	0	1	0	1
Singapore, 1980	1	−1	0	−0	−0	−0	0	−0	1	0	2	2	2
Sweden, 1980	0	−0	0	−0	0	0	0	0	−0	−0	0	0	1
Switzerland, 1980	0	−0	−0	0	0	0	−0	0	−0	0	0	0	0
Trinidad & Tobago, 1980	1	1	−0	−0	0	−0	−0	−0	−1	0	2	2	2
Uruguay, 1975	1	0	0	0	0	−0	0	−0	−1	−0	2	1	2

A positive sign indicates overselection; a negative sign, underselection. All calculations were made by the authors using data presented in Table 26 of the 1979 and 1983 U.N. Demographic Yearbooks, and data from UN-ECA, Addis Ababa, Ethiopia.
*Data for the 1974 Census of Sierra Leone is adapted from Table 7.1 (Thomas 1983).

divisions of the base of the number system, while underreporting those digits which are not multiples of the base of the number system. Given a base 10 number system, the following rank order of digit preference and avoidance would be expected to occur: 0 (most preferred); 5; 2,8; 4,6; 3,7; and 1,9 (most avoided). Turner's hypothesis has been tested on census data from different countries (Stockwell 1965; Stockwell 1966; Stockwell and Dixon 1966; Nagi, Stockwell, and Snavely 1973; Stockwell and Wicks 1974; Wicks and Stockwell 1975; Weller, Serow, and Bailey 1987; Mukherjee and Mukhopadhyay 1988) using Myers's method.

Table 1 depicts the general pattern of digit preference and avoidance. For convenience, the terminal digits have been arranged in the order of preference hypothesized by Turner. An examination of Table 1 reveals that ages ending in digit 0 are selected far more often than ages ending in 5, the second most preferred digit; followed by digits 8 and 2, respectively. The remaining digits exhibit the general pattern of underselection with the greatest avoidance occurring at ages ending in digit 1. There are, however, a few notable exceptions that need comments. For instance, digit 9, which is generally underselected is over-selected in Reunion. Botswana, Kenya, Malawi, and Libya also exhibit a slight preference for ages ending in 9. Mauritius, on the other hand, reveals a slight preference for ages ending in 8 while 0 (generally most preferred) is avoided.

The differences between the sexes and between urban and rural areas, respectively, are illustrated by Table 2. The general

Table 2. Myers's index of preference, by urban (U) and rual (R) residence and by sex for some African censuses 1970–86

Country	Census year	Total		Male		Female	
		U	R	U	R	U	R
Madagascar	1974–75	4	11	3	10	4	13
South Africa	1970	4	13	5	12	4	13
Rwanda	1978	5	6	4	6	6	7
Zambia	1974	6	8	6	7	6	8
Libya	1973	8	14	5	10	12	19
Cameroon	1976	9	21	7	19	11	27
Central African Rep	1975	10	15	8	13	12	18
Liberia	1974	12	16	11	16	12	16
Mali	1976	12	23	10	20	14	24
Benin	1979	16	22	13	21	19	23
Average digit		9	15	7	13	10	17
0		4	8	3	7	5	9
5		3	5	2	4	3	5
2		−0	−1	−0	−1	−0	−1
8		−0	0	0	0	0	0
4		−1	−2	−1	−1	−2	−2
6		−0	−1	−0	−1	−0	−1
3		−1	−2	−1	−2	−1	−3
7		−1	−2	−1	−2	−2	−2
1		−2	−3	−2	−3	−2	−3
9		−1	−2	−1	−2	−1	−2

Computed by authors from data presented in Table 26 of the 1979 and 1983 Demographic Yearbooks of the United Nations.

pattern is similar for urban and rural populations. The trend is a strong preference for digits 0 and 5, followed by digits 2 and 8; and a dislike for the remaining digits. This pattern holds even when controlled for sex. We found the same patterns in sex variation for the other African countries.

3.3. *Socioeconomic factors affecting age heaping*

In traditional societies, age plays a significant role in determining a person's readiness for initiation into 'secret' societies, marriage, and payment of local or head tax. In these circumstances, there is a strong motivation to inflate or reduce reported ages, and where there is an absence of effective and compulsory registration system, these errors may go undetected. In addition to errors associated with cultural importance attached to age, errors in age statistics have also been linked to a country's overall level of modernization. Components of modernization which have been shown to affect errors in age data include education, urbanization, and labour force participation (Stockwell 1965; Nagi et al. 1973; Mukherjee and Mukhopadhyay 1988).

One of the objectives of this paper is to examine some of the socioeconomic factors which may influence age misreporting in African censuses, using multiple regression analysis. The data for this part of the analysis are obtained from the World Bank Development Report (World Bank 1979, 1981). Gross national product (GNP) per capita (in US dollars) is used to measure economic development. Percentage of urban population is chosen to measure the level of urbanization. Percentage of the population of working age (15-64 years) and the percentage of the labour force in agriculture are used as measures of labour force participation. Adult literacy rate is selected to measure education because this variable seems to be more closely related to the overall level of educational attainment in a country than enrollment in either secondary or higher education. Besides, there is a direct relationship between illiteracy and underdevelopment, identified through its effects on malnutrition, poor health, and high infant mortality.

The results of correlation and multiple regression analyses with index of preference as the dependent variable ($N = 27$) are presented in Tables 3 and 4 respectively. Observe first the correlates of the

Table 3. Correlation matrix of indexes of preference with selected socioeconomic variables

	GNP	% Literate (Adult)	% Working age (15–64)	% Labour force in agriculture	% Urban
% Literate (Adult)	0.67				
% Working age (15–64)	0.55	0.86			
% Labour force in agriculture	−0.78	−0.84	−0.77		
% Urban	0.67	0.75	0.74	−0.85	
Total index	−0.55	−0.83	−0.68	0.62	−0.58
Male index	−0.54	−0.83	−0.66	0.62	−0.57
Female index	−0.55	−0.82	−0.68	0.62	−0.58

Source: Compiled and calculated by the authors from data presented in Tables 1, 19 and 20 of the 1979 and 1981 World Development Reports by the World Bank (Oxford University Press).

independent variables (Table 3). The index of preference is highly correlated with each of the independent variables. For males and females, there is a strong positive correlation between the index of preference and the percentage of labour force engaged in agricultural activities; and a strong negative correlation with adult literacy and the proportion of the population of working age. Urbanization and GNP per capita also exert negative but comparatively weak effects on the index of preference. Turning to the correlations between independent variables, we note that urbanization is positively correlated with adult literacy rate and GNP per capita but negatively related to the percentage of labour force in agriculture. Table 4 presents the independent effects of adult literacy, GNP, urbanization, percentage of the population of working age, and the proportion of labour force in agriculture on the index of preference. Adult literacy is the only statistically significant variable and exerts a negative influence on the index of preference. Urbanization, proportion of labour force in agriculture, and GNP per capita exhibit negative effects, while the percentage of the population of working age positively affect the index of preference. These five variables account for nearly 75% of the variation in the indexes of preference.

3.4. *Conclusions*

This study has examined digit preference and avoidance in the age statistics of African censuses taken in the 1970s and 1980s, using single-year-age data. In this respect, our analysis can be regarded as an extension of the study by Nagi et al. (1973). Our findings point to a substantial number of inaccuracies in the age reporting of African censuses. The degree of inaccuracy is greatest for Western African and least for Southern African countries. Age heaping is characteristic of both men and women, but tends

Table 4. Regression results (showing t-values) of selected socioeconomic variables on indexes of preference

Variable	Total	Male	Female
GNP	−0.001	−0.001	−0.001
	(−0.54)	(−0.42)	(−0.65)
% Literate (Adult)	−0.274*	−0.266*	−0.286*
	(−4.06)	(−4.43)	(−3.68)
% Working age (15–65 years)	0.143	0.220	0.070
	(0.43)	(0.72)	(0.18)
% Labour force in agriculture	−0.091	−0.087	−0.103
	(−1.25)	(−1.35)	(−1.23)
% Urban	−0.024	−0.025	−0.024
	(−0.36)	(−0.43)	(−0.31)
R^2	0.72	0.73	0.70
F	11.0	11.5	9.9
N	27	27	27

*Significant at 0.01 level

Source: Compiled and calculated by the authors from data presented in Tables 1, 19 and 20 of the 1979 and 1981 World Development Reports by the World Bank (Oxford University Press).

to be slightly more pronounced for women. This is consistent with the results obtained by Nagi et al. (1973). Comparing our indexes of preference (censuses in the 1970s and 1980s) with those obtained by Nagi et al. (censuses in the 1960s) for censuses taken in the two time periods, we find that inaccuracies in age reporting seem to lessen with the passage of time. For instance, in the majority of cases, censuses taken in the 1970s and 1980s exhibit fewer inaccuracies than those conducted in the 1960s. This reduction seems to be greater for men than women.

Rural-urban differences in age misreporting are also examined. The indexes of preference suggest that age misreporting is greater for rural than for urban places. Within each place of residence category, female age data are less accurate than male age statistics. However, urban women showed fewer inaccuracies than their rural counterparts. Thus, it would seem that the general pattern of age misreporting in these censuses is much more of a rural phenomenon than an urban one.

Although the tendency for heaping at a particular digit is much stronger among females than males, the general pattern of digit preference and avoidance tends to be the same for both sexes. In general, males and females exhibit a strong preference for ages ending in digits 0 and 5, and a strong dislike for those ending in digits 3 and 1, even when controlled for place of residence.

In an attempt to explain the wide range of variations in the indexes of preference, a multiple regression analysis is performed with indicators of modernization as explanatory variables. The results indicate that adult literacy level exerts a statistically significant negative influence on the index of preference. Level of urbanization and GNP per capita also show negative effects, although their coefficients are not significantly different from zero.

Our results indicate the occurrence of serious errors in age data of African censuses. Age is an important variable in statistical analyses essential for development planning. It is therefore important that every effort should be made to improve the quality of age data in Africa. We have shown that adult literacy level, other things being equal, reduces errors in age data. Some studies (Ohadike 1987) have shown a positive correlation between the level of socioeconomic development (defined in terms of literacy and white-collar jobs) and the quality of age reporting and recording, while others (Uner 1983; Mukherjee and Mukhopadhyay 1988) have reported striking differences in age reporting between those who have gone to school and those who have not. Knowledge of exact age seems to be widespread among the educated. The illiterate population, on the other hand, may not know their exact ages or dates of birth, and when asked to volunteer such information they will guess or give rough estimates. Such estimates give rise to errors in age data.

With respect to Africa, there is a wide disparity in the rate of illiteracy among the subregions of the continent. According to UNESCO, in 1985, West Africa has the highest regional rate of illiteracy (63%), with a difference of 46% when compared with the lowest rate in Southern Africa; North Africa has 57%, East Africa 55%, and Central Africa 46% (Anyadike 1989). But the most visible variation in the rates is between men and women. In most parts of Tropical Africa, females do not have equitable access to education and virtually everywhere males are given priority for education (McNamara 1977). For instance, in 1985, the illiteracy rate in Togo was 59% for men and 72% for women; and in Nigeria 58% and 67%, respectively. The cultural

perception that young girls should marry and bear children rather than go to school provides some explanation for the low level of female education in these societies.

The disparities in the level of illiteracy between men and women; and among the subregions of Africa, other things being equal, probably account for the observed differentials in the accuracy of age reporting in the continent. But other things are in fact not equal. There is a wide variation in coverage of birth registration in the continent. If birth registration does not exist or is unsatisfactory, the respondent's literacy which can be acquired later in life, will not provide him/her with correct information on his/her age. In a study of civil registration coverage in 50 African countries, Makannah (1980) noted that birth registration coverage of at least 90% occurred in 7 countries, 20–60% occurred in 9 countries, and coverage was incomplete in 34 countries. Societies with better coverage of birth registration also tend to have low indexes of preference. For instance, countries such as Tunisia, Sao Tome and Principe, Mauritius, Reunion, and Seychelles where at least 90% of births and deaths registration have occurred (Makannah 1980) have also exhibited low indexes of preference. Thus, registration of births will also guarantee against errors in age reporting. In addition, efforts should be made to improve the data collection procedures through the use of historical calendar and identification cards; the careful selection and training of field staff; and the type of questions on age (social and culturally based) included in the census questionnaires (Makannah 1990).

Finally, we note that some countries apply smoothing to age data which makes comparisons of digit preference between countries less reliable. However, information on the extent to which this is done in individual census data is not supplied by the data source.

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