<u>Data by sex as a diagnostic and detective tool in population analysis</u>

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1. <u>Introduction</u>

One of the most important attribute of a population is sex. Along with age it constitutes the two basic inborn characteristics of a population. Other socio economic psychological, physical and biological characteristics like education, economic activity, marital status, fertility, household structure and pattern, housing needs, migration , food requirements, health and mortality are not only highly correlated but are also only meaningful when considered in conjunction with age and sex. Therefore it is recommended by United Nations and other national and international institutions and organizations that every population data collection , compilation, analysis, interpretation, utilization and dissemination should be by age and sex.

UN however lament in the recent " Principles and recommendations for Population and Housing Censuses" that , " Cross classification by sex tend to be suppressed when cross tabulations become complex, with multiple variables. In order to satisfy one basic condition for gender statistics, which is that all details on individuals should be presented by sex, it is strongly stressed that sex should be considered the overriding variable in all tables irrespective

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of the medium of storage or dissemination. This disaggregation by gender should be provided in all publications, data bases and computer printouts of census tables on individuals".(UN , 1998)

It has also become important in the context of gender concerns that population data should distinguish between male and female in order to address issues pertaining to the sexes for effective program management, monitoring and implementation of projects and policy formulation.

There are instances where including question on sex is considered not important or necessary when it is felt that such information may not add to the analysis or where there is strong inertia or apathy for gender concerns. For instance, there is a wrong notion that since males and females constitute equal proportion among a population, there is no need for obtaining the information , especially in the presentation of data. An argument in the same vein is that a lot of publication space is saved by presenting information only for the total population.

For instance, as recently as the late 1980s, at the conference of local statisticians, planners and other data users on preparation for the 1990 census of Zambia, similar issues were raised. (Ramachandran, 1988) It took quite some effort to convince that not all characteristics will have the neat fifty-fifty pattern , and as a matter of fact , the very *raison de etre* for delineating 'sex' was to highlight the peculiarities and specificities. Another more convincing argument was that the pattern by sex could be used as an

effective tool in detecting errors and biases in data and even for data adjustment as illustrated by some of the examples given below.

In this paper important uses of gender disaggregated data as essential to detect errors, biases and problems in data and carry out necessary adjustments and as diagnostic tool in population analysis are brought out.

2. <u>Detecting and estimating coverage errors</u>

One of the most wide spread problem in obtaining gender statistics pertains to not reporting or wrong reporting. Due to cultural or other reasons, there are instances in developing countries where persons of one sex or the other are either not reported or are deliberately misreported. For instance, in some societies children of one sex are considered more important and this results in either omission of such children because of fear of the ' evil eye' or in deliberate misreporting of sex to protect these children. On the other hand, children of one sex may not be considered as important and may even be considered as a burden and a curse, and may be deliberately left out of the count. In the Indian sub continent female births are seldom registered and there is significant variation over various parts of the region. The high sex ratio at other ages have also indicated the higher female mortality peculiar to South Asia and in parts of Arab countries.

In certain cultures like those in some Arab and Asian countries, females of nubile age are hidden from the

enumerators. Young adult males are not reported where there are ' poll tax' , ' head tax' or ' military conscription' as has been noted in colonial times in Africa and Asia. These errors and biases get reflected in the sex ratio and thereby become effective detective tools in data correction and adjustment.

Another type of hiding was detected from the analysis of the 1955 census of Republic of Korea. (Kim and Im, 1960/61) . There was sudden fall in sex ratio from 102 in 1949 to around 100 in 1955 and was more drastic for specific age=sex groups. Assuming that the sex ratio of the cohort of 1949 aged 19-33 will hold good for 1955 and that female enumeration is more or less complete, the estimated number of males aged 25-39 missing in 1955 came to 414 thousand . Further analysis put the missing number to be as high as 550 thousand. Thus it seemed that around half a million – mostly young adult males – were missing in the 1955 census. Considering the sex and age groups involved, it was conjectured that this must be the military population. Accordingly. a letter to Director of Statistics, Republic of Korea got the reply quoted verbatim below which confirmed our conjecture.

" The military population of the Republic of Korea is a top secret. However, your estimate is correct. How did you arrive at it "

A similar pattern of sex ratio was noted while analyzing the 1966 census of Iran, based on which around half a million army men were estimated as missing. (Ali and

Ramachandran, 1971). This enigma was cleared during a personal visit to Teheran when it was admitted that the military was not included for security reasons.

Another instance of missing young adult males was noted in the 1968 census of Tanzania. (Tenende, 1973). Around 200000 men aged 20-39 seemed missing and they were presumed as the military. However, government informed that their military is very small and had been counted. Also there did not seem to be any possibility of hiding because there was no poll tax, head tax etc to discourage counting. The matter remained unclear till it was clarified by ILO, who stated that field enquiries brought out that these men were the migrant workers in the camps of sisal plantations not covered by census enumerators (Ramachandran 1974).

In another context a different type of omission (under reporting) was detected through sex ratio analysis. In the 1970 census of Ghana the sex ratio of the population was 98 and had fallen from its value of 102 in 1960. This change in sex composition was attributed to the exodus of aliens consequent on the promulgation of the Alliance Compliance Order of 1969. Since aliens in Ghana were not only males but also females, in order to arrive at an estimate of the number who might have left the country, other techniques like age ratio , survival ratio, growth rates were applied which indicated an estimated exodus of between 500 to 800 thousand . This analysis formed part of a paper prepared for presentation at a workshop organized by ECA and Regional Institute for Population Studies , Ghana . (de Graft Johnson and Ramachandran, 1972).

However, the government which had another much lower figure of around 200 thousand felt that the higher estimate would be an embarrassment (especially in view of Ghana's stand as a champion of Pan Africanism) and wanted the authors (a) to revise the figures in line with the much lower official statistics (b) prove the figures derived or (c) withdraw the paper. An answer was needed within a month.

The matter was looked at very carefully and it was clear that the official figure (based on border statistics) was too low and would be inconsistent with other information available. Accordingly, Directors of Statistics of the seven neighbouring countries – Dahomie, Ivory Coast, Mali, Niger, Nigeria, Togo and Upper Volta – were approached for data pertaining to entries into their countries from Ghana during the specific periods. Data received from five countries was matched with corresponding information from Ghana which indicated that for every one person reported as having exited the Ghanaian border to that country, there were 2 to 5 reported as having entered that country. A valid explanation of this phenomenon is that under the critical conditions existing in Ghana during the difficult period of the Aliens Compliance Order, the primary focus of the expellees was to get out fast (most of the borders are quite porous) and not to worry about filling forms etc., but at the point of entry every effort was made to register their names etc. to ensure that they would not face further difficulties. This finding was presented to the government which was accepted. In fact, the workshop

was chaired by no less than the Commissioner for Planning of the Ghanaian government.

Here also, sex ratio played a crucial role in identifying and quantifying the exodus and made the magnitude of the problem clear to government and jolted them from their false impression which seemed favourable to them.

A recent sensational information, which was treated as state secret by government pertains to the 1997 census of Iraq. Whereas the 1987 census indicated a sex ratio of 106 males per 100 females, the so far suppressed data from 1997 census showed a male deficit with only 99 males per 100 females. The estimated missing number of males could be more than three quarter of a million and this could be war casualties, victims of violence exiles. (Barringer, 2003).

3. Detecting errors arising from specification of sex

Mauritius is one of the very few countries in Africa which has an excellent statistical system and high quality population data. An analysis of age-sex data and its consistency with other data sets from Ministry of Health, Immigration Department etc. indicated a peculiar sex ratio problem . (Mauritius, 1987).

Table 1. Balance equation for 1972 – 1983 by sex for total population (inclusive of non Mauritians) and for Mauritians and foreign population.

Population, births, deaths, arrivals	Total Population	Mauritian Population	Foreign Population

and departures, 1972-83	Male	Female	Male	Female	Male	Female
Enumerated Pop. in 1972, P_0	413580	412619	410696	409979	2884	2640
Births ,1972-83, B	126186	121944	126186	121944	0	0
Deaths, 1972-83, D	41433	31001	41433	31001	0	0
Arrivals, 1972-83, A	908066	674062	207859	119517	700207	554545
Departures, 1972-83, E	935937	688624	229816	142468	706121	546156
Expected Population 1983, P*	470462	489000	473492	477971	-3030	11029
Enumerated Pop. in 1983, P_1	481368	485495	478814	483010	2554	2485
Deficit/Excess, P1 – P*	**10906**	**-3505**	**5322**	**5039**	5584	-8544

Expected Population, $P^* = P_0 + B - D + A - E$

In the above we note a curious situation whereby, the equation more or less balanced for the two sexes together for the total and foreign population, but for each sex separately, there were excess for males and deficit for females. For the foreign population there is excess of 5584 for males and deficit of 8544 for females and for the Mauritian population there was excess of 5322 males and 5039 females. The picture depicted by Mauritian population is more in tune with the known under enumeration for both sexes in the earlier census of 1972.

This raised the question why the immigration/emigration data indicated such opposing pattern. It was noticed that in the arrival/departure forms, there was no explicit question on sex - like male/female - but was to be inferred from the title- Mr, Ms, Mrs etc. Looking at the completed forms brought out that in quite a few cases, this column was not filled up and at coding stage the sex was inferred from the name. Whereas, Mauritian names are familiar to the coders and therefore there may be less chance of misclassification, foreign names may bring forward wrong classification – which was actually confirmed by excluding foreigners in the analysis.

With such excellent data system, it was felt that further improvement could be easily achieved by suitable modification of the arrival/departure forms by inserting a column on sex - male / female - instead of the title. This matter was taken up with concerned authorities but unfortunately the attempt to modify the forms failed as it was informed that the forms can be amended only under an Act of Parliament and it was not considered of sufficient importance to do that. Therefore the errors continue.

If there is problem in not specifying sex, an instance where specification of sex, brought in problem was seen in the 1975 census of Somalia. Whereas there was male preponderance among the population at almost all ages, there was a drastic shortage of males among the ever born children. (Ramachandran, 1981).

It was difficult to comprehend why male children were not reported pertaining to the question on children ever born. This matter was looked into by scrutinizing the raw data from census questionnaires and it struck when in the column on fertility, male children seemed to be not reported or recorded. A closer look at the form (in Somali language) gave the reason for this anomaly. On top of the column dealing with fertility, there was an instruction to enumerators that this column was only for ' *females'*. Therefore, enumerators recorded only female children in a large number of cases. Apparently, this error was not detected at field checking, data entry or analysis stage.

4. <u>Detecting errors in recording of sex</u>

Even though there may be a specific question pertaining to sex, there are instances where the enumerator does not feel the necessity to fill up the column on sex as it is felt that this could be inferred from the name.

Analysis of the 1970 census data of the Philippines indicated a sudden perceptible change in sex ratio of the population from 102 males per 100 females in 1960 to 98 in 1970.(Engarcia 1971).

Philippines has a census history of several decades prior to 1970 and generally the data are reasonably acceptable by Asian standards and no sex bias has been noted. In 1970, the sudden fall in sex ratio which was also pervasive over all ages, raised doubts about the data and at the same time ruled out migration and mortality as the cause. Therefore, it was clear that there was either male under enumeration or female over enumeration. If   female enumeration is considered to be correct, the male and thereby the total population would increase.

Experience with past censuses and other statistical data would not tally with such massive omission and would contradict estimated fertility –mortality levels. Therefore, the only possibility seemed that *males have been converted into females*. This may look preposterous but that seemed to be the only possibility under the circumstances. It was enigmatic when there was no previous evidence of any sex

bias in reporting. So why have large number of males been reported as females?

After much thinking, it was clear that this may have something to do with the types of names for males and females in the country. It is well known that several Filipino names are similar but differ only in respect of the last syllable. For instance, generally male names end in ' o ' and female names end in ' a ' . Many names also are similar but differ only in the last letter to distinguish the sex like for instance: Basilio/Basilia, Francisco/Francisca, Mario/Maria. This was the first clue. The next clue was in the way Filipinos write the letters ' o ' and ' a '. Whereas the letter ' o ' has an upward moving tail, the letter ' a ' has a downward moving tail. While writing names in the field, chances are that many "o's" are written similar to " a's " and when the sex of the person is not recorded (because it is obvious to the enumerator from the name) the coder in the office has to interpret the sex of the individuals from the recorded names . This conjecture was verified and confirmed by Kim Yun who was UN Adviser at that time to the Census Office in Manila. Accordingly, the total enumeration was accepted and split by sex using information from 1960 census. The 1980 and subsequent censuses confirmed this.

It may be mentioned that while analyzing the 1973 census of Sudan similar error was noted because Arabic names for males and females are similar but for an additional " a " for females. For instance, Suhail/Suhaila, Hussain/Hussaina, Abid/Abida, Mahmud/Mahmuda. Also it must be

remembered that in Arabic (which is used for recording in the forms) the female name only has an additional vertical line " l " at the end of the name which may be missed while writing hurriedly in the field. So one reason for apparent male predominance in such societies could be due to this kind of error. (Ramachandran, 1977).

5. Detecting coding problems

Even though sex data may be included in data collection and reported and recorded , another type of error at data capture stage occurring at coding has been detected through sex ratio. For processing data, it is necessary to code the information. Usually code 1 is given for male and 2 for female. In several African/Arabic countries the numbers 1 and 2 seem similar while writing. The only difference between 1 and 2 is in the curvature in number 2 and angularity in number 1. In the haste for coding data (there is incentive for completing larger numbers of forms) it is noted that angularity is easier than curvature and as such it is observed that females may be coded as male. This may be another reason for observed male excess in such societies. In order to avoid this situation, Economic Commission for Africa recommended code 1 for male and 3 for female and this was followed in a large scale sample survey in Zambia carried out jointly by ECA and Zambia (Ohadike, 1980).

6. Sex ratio as a diagnostic tool

A recent phenomenon noted in China, Korea, India and other countries with strong male preference and successful fertility reduction programmes is the drastic increase in sex ratio brought out by selective abortion, foeticide, neglect of female babies etc. Though direct estimates are difficult to get, indirect estimates could be gauged by studying sex ratios. There is consensus that sex selective abortion accounts for very high number of missing daughters, particularly in Confucian Asia including China, Taiwan, Korea and Hong Kong where fertility is low and abortion and ultra sound testing are widely available. In contrast, a combination of pre natal and post natal strategies perpetuate the discrimination against daughters in India. (Das Gupta and Bhat 1997, Sudha and Raja 1999 and Unisa et al 2002). Increasing sex ratios in some countries of Asia have attracted considerable attention over the past decade and counts of world's missing daughters are estimated by recourse to sex ratio, to range from 60 to 100 million as of the early 1990's. (Sen 1990 and Coale 1991).

Sex ratio analysis also has become a valuable tool in recent years for studying and implementing family planning/fertility regulation programs. For instance, it has been noted that willingness to adopt family planning is related to sex composition of the couples' children , sex ratio of surviving children, sex of last birth, sex of child death etc. Even interval between births is noted to be correlated with the sex of the last birth, survival status and sex of previous births etc. Sex ratio analysis also could bring out existence of hateful and shameful practices like abortion of suspected female pregnancies, female infant

and child neglect and consequent higher mortality and other sex selective practices.

In China, South Korea and other East Asian countries because of vigorous family planning and strong male preference, there has been a consistent fall in average number of children born and high sex ratios clearly highlight the phenomenon. Over the years, there has been a negative correlation between average parity and sex ratio which eloquently bring out the sex selectiveness.(Zeng et al, 1993 and Gu and Roy, 1995

Table 2. Sex Ratio at Birth (SRB) by Parity- China, 1990s

Parity	1	2	3	4
Sex Ratio at Birth	105	120.9	124.6	171.7

Table 3. Total Fertility Rate (TFR) and Sex Ratio at Birth (SRB) : 1980s-and 1990s- East Asia

China				
Year	1980	1983	1986	1989	1992
TFR	2.24	2.42	2.42	2.55	2.00
SRB	107.4	107.9	112.3	113.9	114.2
Taiwan				
Year	1983	1986	1989	1991	
TFR	2.16	1.68	1.68	1.72	
SRB	106.7	107.2	108.6	110	
Rep. of Korea				

Year	1982	1984	1987	1990	
TFR	2.7	2.1	1.6	1.6	
SRB	106.9	108.7	109.9	116.9	

Another recent phenomenon of a declining sex ratio noted in developed countries has been attributed to some morbid conditions affecting male sperms. Sex ratio has been utilized as a sentinel marker for evidence of broad reproductive injury in humans as can be noted from the following data showing significantly decreased male births in industrialized countries. This has been attributed to pollution, occupational, environmental exposures etc. resulting in testicular cancer and other male reproductive hazards. (Davis et al, 1995)

Country, Period	Difference in Male Proportion at Birth
Canada, 1970-90	.0022
USA, 1970-90	.001
Denmark, 1960-95	.002
Netherlands, 1950-94	.003

7. Conclusion and recommendations

There are several channels and avenues for errors and biases to creep into data pertaining to sex and it should be the endeavour of all concerned to be aware of these possibilities and not only be prepared but be vigilant and pro active.

Gender statistics are not only useful and necessary for effective programming, monitoring, management and implementation of population related activities, data by sex also provide powerful analytical tool for detection and needed adjustment of data and should be fully utilized.

Through the simple technique of sex ratio we have illustrated that high sex ratios at birth are mostly data errors, military secrets are unraveled, dimension of violence and atrocities are exposed, socio – cultural practices are brought out and general laxity and weaknesses in data compilation are highlighted.

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