PRINT: ISSN 0972-0073 ONLINE: 2456-6802
Ethno Med, 7(3): 171-179 (2013)
DOI: 10.31901/24566772.2013/07.03.05

Mortality Level in the New South Africa: Looking for Causes

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KEYWORDS Life Expectancy. Brass Growth-Balance-Method. South Africa. Adjusted Data

ABSTRACT Mortality levels display the extent to which a country has advanced to take care of her citizens. Developed countries have lower mortality rates (high life expectancy) while developing countries have higher mortality rates (lower life expectancy). Knowledge about the level of mortality induces governments to take appropriate measures to improve all spheres of human life, economic, religious, social, and environmental. South Africa lacks quality data on mortality and fertility. This study adjusts the defective mortality data from the 10% sample of South African 2001 census and uses that to estimate mortality levels and factors influencing the level. Demographic and statistical analyses, including Brass growth balance method have been employed. The study produces the following results for the country: life expectancy of 52.5 years for females and 49.8 years for males, median age of 23 years, mean household size of 4 persons, annual population growth rate of 1.2 percent, literacy rate of 76 percent and mean household income of R3356 (about US$480).

INTRODUCTION

Background

A lot of things have changed in South Africa since the new democratic South Africa was born. Data collection has been standardised and there is one uniform census taken for the whole country. Until 1994 when the new democracy was born, the data collection was varied. While the white South Africans had formal censuses , the black South Africans did not have. Prior to democracy, the "censuses" conducted in the black South Africa were not conventional ones aimed at looking for social, economic and other variables needed for planning. Rather they were only meant to get the population size. When the new South Africa was born, the government decided to gather as much information as possible in order to know the true state of affairs about the people's needs so as to be able to plan for "better life" for the citizens of the whole country. The 1996 census was then conducted as the first democratic census in the country which was followed by another census conducted in 2001 of which the 10% sample is used in this study. The most recent census was conducted in October 2011 but mortality and fertility data from 2011 census are not yet available.

Though data on mortality and fertility in South Africa have been flawed (Dorrington et al. 2004), making it difficult for reliable analyses to be done on these topics, Kyei (1995, 2011, 2012) has found that the determinants of child mortality (aged 1 – 4 years) are not exactly the same as the determinants of under-five mortality (0 – 4 years) or determinants of infant mortality (0 year). While socio-economic factors like education of the mother, her marital status, employment of the father and the place of residence affect childhood mortality; for infant mortality, breastfeeding and ante-natal medical consultations are equally very important; and for child mortality, vaccination and availability of toilet in residence are very crucial.

The aim of this study is to examine the mortality level in South Africa as at 2001 using the 10% sample size of the South African 2001 census data and to look for some possible factors contributing to the level. Topic on mortality is particularly important to study because of its relevance and effects on the composition and structure of the population.

Economy

By UN classification, South Africa is a middle-income country with an abundant supply of resources (CIA 2007). According to the UN, the following sectors in the country are well developed: financial, communications, energy, and transport, plus a stock exchange that ranks among the top twenty in the world, and a modern infrastructure supporting an efficient distribution of goods to major urban centres throughout the region (CIA 2007; Wikipedia 2007). South Africa's per capita Gross Domestic Product (GDP), corrected for purchasing power parity, positions the

country as one of the fifty wealthiest in the world (Wikipedia 2007). In many respects, South Africa is developed; however, this development is significantly localised around four areas, namely Cape Town, Port Elizabeth, Durban, and Pretoria/ Johannesburg. Beyond these four economic centres, development is marginal and poverty still reigns despite Government strategies to eradicate it. Notwithstanding, key marginal areas are experiencing rapid growth. Such areas include: Mossel Bay to Plettenberg Bay; the Rustenburg area; the Nelspruit area; Bloemfontein; Cape West Coast; KZN North Coast amongst others (Fig. 1), (Wikipedia 2007).

Fig. 1. Map of South Africa
Source: Wikipedia 2007

Indicators of Sustainable Development

Chapter 40 of Agenda 21 of the United Nations Commission on Sustainable Development (CSD) calls for development of indicators for sustainable development for all countries (UN 2007). It requests nations, international governments and non-governmental organisations to develop concepts of indicators for development and that indicators should serve as benchmark for decision makers and planners in order to achieve sustainable development. Indicators like income, life expectancy, literacy rates, access to water and sanitation, adult education, growth rates, mortality rates, fertility rates, Consumer Price Index (CPI), Producer Price Index (PPI), CPIX, interest rates, and so on are to be considered very seriously. A study by Hirokawa et al. (2006) in Japan indicated that unemployed men showed increased mortality from all causes compared to white-collar workers. Female farmers and forestry workers showed reduced mortality from all causes compared to white-collar workers. Male farmers and forestry workers also showed reduced mortality from cardiovascular diseases compared to white-collar workers (Hirokawa et al. 2006).

Households/persons with low income do not have the means to access basic needs for healthy living. People with low paying jobs are more at risk of mortality because they do not earn enough to meet the expenses of adequate health care. It is common practice in most countries that as the income level increases, the number of people in these levels (lower social classes) decreases. A study on health-health quoted by Chapman and Hariharan (2004) concludes that if government requires that the private sector spend more than break-even cut-off, the risk of dying due to reduced health investment is increased by more than it would be reduced by the direct action of the health regulation. The study further suggests that the relationship between income and the probability of death is greater for poor people than for the rich. The non-linearity in the income-to-mortality linkage also implies that income transfers between income groups which are ignored in traditional cost-benefit analysis will affect the conclusions of health-health analysis significantly (Chapman and Hariharan 2004).

METHODOLOGY

Data Sources

The study uses the 10% sample of the South African census 2001 conducted by Statistics South Africa in 2001. The 10% sample data used were first evaluated using UN joint ratio score to determine the reliability and quality of the age-sex data. The data was found to have some significant errors, high undercount by age and sex (Table 1).

Methods/Analysis

The completeness of mortality data was done using Brass Growth Balance Method (BGBM). The mortality data were found to have been under-enumerated by a factor of 1.7, (Table 2), and were then adjusted accordingly. Demographic and statistical methodologies, including BGBM,

Table 1: UN method of evaluating age-sex data

Age group	*Sexes*		*Percentages*		*Sex ratio*	*Age ratio deviations %* $X_i - X_{i+1}$%		*Sex ratio deviations*
	Male	*Female*	*Male*	*Female*		*Male*	*Female*	
0-4	185765	186206			99.8			
5-9	204605	205236	102.8	102.2	99.7	2.8	2.2	0.1
10-14	212378	215605	103.3	103.1	98.5	3.3	3.1	1.2
15-19	206731	213138	108.7	107.8	97.0	8.7	7.8	1.5
20-24	168068	179922	94.3	94.8	93.4	5.7	5.2	3.6
25-29	149761	166246	101.2	102.6	90.1	1.2	2.6	3.3
30-34	127846	144189	96.4	95.5	88.7	3.6	4.5	1.4
35-39	115354	135577	101.8	104.9	85.1	1.8	4.9	3.6
40-44	98814	114189	101.3	98.8	86.5	1.3	1.2	1.5
45-49	79813	95563	98.1	101.6	83.5	1.9	1.6	3.0
50-54	63842	73949	101.8	98.0	86.3	1.8	2.0	2.8
55-59	45666	55316	90.4	87.0	82.6	9.6	13.0	3.8
60-64	37158	53219	103.9	109.6	69.8	8.9	9.6	12.7
65-69	25843	41800	91.1	95.4	61.8			8.8
70-74	19555	34436			56.8			
Score						4.4	4.9	3.9
Joint Score								21.0

Source: 10% Sample size of StatsSA, Census 2001

NB: **Codes for income**

1 = No income	**5**= R1601 –R3200/month	**9**=R25601- R51200/month
2 = R 1 – R400/month	**6**=R3201 – R6400/month	**10**=R51201-R102400/month
3 = R401 – R800/month	**7**=R6401 – R12800/month	**11**=R102401– R204800/month
4 = R801 – R1600/month	**8**=R12801- R25600/month	**12**=R204801 or more/month

Codes for school attendance

1 = No	**5**=Tertiary, Technikon
2 = Pre– school	**6**= University
3 =Regular school, (Grade1 to Grade12)	**10**=Adult education
4 = College, post-Grade 12	**11** = others

life table construction and modelling have been systematically employed.

Brass Growth Balance Method (BGBM)

This is an indirect method of estimating adult mortality. The method is based on the premise

Table 2: Brass method for evaluating the quality of mortality data - females

Age group x-x+4	*Reported female*		*Population exact age (x)N(x)*	*Cumulated*		*Ratios*	
	Population	*Deaths*		*PopulationN(x+)*	*DeathsD(x+)*	*N(x)/N(x+)*	*D(x+)/N(x+)*
0-4	186206	2449		1960687	17005		
5-9	205236	241	39144.2	1774481	14556	0.022	0.008
10-14	215605	181	42084.1	1569245	14315	0.027	0.009
15-19	213138	427	42874.3	1353640	14134	0.032	0.010
20-24	179922	1040	39306	1140502	13707	0.034	0.012
25-29	166246	1637	34616.8	960580	12667	0.036	0.013
30-34	144189	1550	31043.5	794334	11030	0.039	0.014
35-39	135577	1325	27976.6	650145	9480	0.043	0.015
40-44	114189	1065	24976.6	514568	8155	0.049	0.016
45-49	95563	890	20975.2	400379	7090	0.052	0.018
50-54	73949	727	16951.2	304816	6200	0.056	0.020
55-59	55316	575	12926.5	230867	5473	0.056	0.024
60-64	53219	797	10853.5	175551	4898	0.062	0.028
65-69	41800	802	9501.9	122332	4101	0.078	0.034
70-74	34436	909	7623.6	80532	3299	0.095	0.041
75+	46096	2390		46096	2390		

Source: 10% Sample size of StatsSA, Census 2001

that given a closed population where the information on age and death distribution have been correctly recorded, the number of people at a particular age can be expressed as a function of the growth rate at a particular age and over, the population at that particular age and the number of deaths of people of the given age. "[It is true that South Africa is not a closed population, especially after the new dispensation came into effect in 1994, many other African nationals have made South Africa their "home"; and it is equally noted above that there were errors in the data, and therefore the underlining assumptions of BGBM are not met. It is however believed that the method would still be able to give some clues as to the growth rate and the quality of the mortality data.] "

In mathematical notation, BGBM formula is given as,

$N(x) = r(x+)^{*} N(x+) + D(x+)$

where,

N(x) = number of people aged x
r(x+) = rate of growth aged x and over
N(x+) = population aged x and over
D(x+) = deaths in population aged x and over

From this, Brass developed an equation of a straight line using these variables such that the intercept on the vertical axis at the origin is the rate of growth and the slope is the reciprocal of the completeness of death registration. The coefficients of the equation can then be estimated using a number of techniques. The equation for BGBM method can be given as

$N(x)/N(x+) = r + (1/C)^{*} (D'(x+)/N(x+))$

where,

D'(x+) = reported number of deaths of people aged x years and over
1/C = degree of completeness of deaths recorded

This can simply be expressed as an equation of a straight line; $W = a + b^{*}V$, where N(x)/N(x+) = W; and (D'(x+)/N(x+) = V with a equals to r and b equals to 1/C, (ECA 1989: 64 - 70).

RESULTS AND DISCUSSION

Tables 3, 4 and 5 present summaries of results obtained. The expectation of life at birth for male population is 49.8 years and that of the female population is 52.5 years. The probability of a new-born dying in the first year (denoted by $_1q_0$) is 0.069 for boys and 0.067 for girls, and the probability for the same new-born dying in the first five years referred to as under-five mortality, denoted by $_5q_0$ is 0.102 for boys and 0.103 for girls.

The proportion of males in the total population is 47% and that of females is 53% resulting in a sex ratio of 90. The household size is found to be 4 and can be considered as comprising about 1.9 males and 2.1 females. The distribution by age suggests that the 4 persons per household consists of 1.3 persons below 15 years, 0.2 above 65 years and 2.5 persons between ages 15 and 65. This implies that households are composed of children and members of the economically active age group. Thus most households are likely to be composed of the nuclear family system, parent(s) and own children only.

Table 3: Life table for females, South Africa, 2001

Interval	*nMx*	*nQx*	*L(x)*	*nDx*	*nLx*	*T(x)*	*e(x)*
0	0.0702	0.0669	100000	6690	95317.0	5254841.7	52.5
1—4	0.0099	0.0390	93310	3638	364508.4	5159524.6	55.3
5—9	0.0020	0.0099	89672	891	446132.4	4795016.2	53.5
10—14	0.0014	0.0071	88781	631	442327.8	4348883.8	49.0
15—19	0.0034	0.0169	88150	1488	437028.6	3906556.0	44.3
20—24	0.0098	0.0480	86662	4156	422918.0	3469527.4	40.0
25—29	0.0167	0.0803	82506	6628	395958.0	3046609.4	36.9
30—34	0.0183	0.0874	75878	6630	362811.9	2650651.3	34.9
35—39	0.0166	0.0798	69247	5523	332428.7	2287839.4	33.0
40—44	0.0159	0.0763	63724	4859	306473.1	1955410.7	30.7
45—49	0.0158	0.0761	58865	4482	283118.9	1648937.6	28.0
50—54	0.0167	0.0802	54383	4362	261007.2	1365818.8	25.1
55—59	0.0177	0.0846	50020	4233	239520.2	1104811.5	22.1
60—64	0.0255	0.1197	45788	5480	215239.3	865291.3	18.9
65—69	0.0326	0.1508	40308	6078	186344.8	650052.0	16.1
70—74	0.0449	0.2017	34230	6906	153885.8	463707.2	13.5
75—79	0.0573	0.2506	27324	6847	119503.4	309821.5	11.3
80—84	0.0764	0.3206	20477	6564	85973.9	190318.1	9.3
85+	0.1691	0.5942	13913	8267	104344.2	104344.2	7.5

Source: 10% Sample size of StatsSA, Census 2001

Table 4: Life table for males, South Africa, 2001

Interval	*nMx*	*nQx*	*l(x)*	*nDx*	*nLx*	*T(x)*	*e(x)*
0	0.0716	0.0682	100000.0	6818.3	95227.2	4975604.5	49.76
1—4	0.0093	0.0366	93181.7	3407.7	364548.4	4880377.3	52.37
5—9	0.0020	0.0100	89774.0	893.3	446636.8	4515828.9	50.30
10—14	0.0015	0.0075	88880.7	664.1	442743.4	4069192.1	45.78
15—19	0.0031	0.0154	88216.6	1356.8	437691.0	3626448.7	41.11
20—24	0.0077	0.0378	86859.8	3280.9	426096.5	3188757.8	36.71
25—29	0.0135	0.0653	83578.8	5457.4	404250.7	2762661.3	33.05
30—34	0.0175	0.0838	78121.4	6549.1	374234.5	2358410.6	30.19
35—39	0.0195	0.0930	71572.3	6653.9	341226.9	1984176.1	27.72
40—44	0.0191	0.0911	64918.4	5917.2	309799.2	1642949.2	25.31
45—49	0.0228	0.1079	59001.3	6363.4	279097.7	1333150.1	22.60
50—54	0.0268	0.1256	52637.8	6610.6	246662.7	1054052.4	20.02
55—59	0.0317	0.1469	46027.3	6759.6	213237.3	807389.7	17.54
60—64	0.0412	0.1868	39267.6	7333.8	178003.8	594152.4	15.13
65—69	0.0507	0.2250	31933.9	7184.6	141707.9	416148.6	13.03
70—74	0.0680	0.2906	24749.3	7192.1	105766.2	274440.6	11.09
75—79	0.0840	0.3471	17557.2	6094.2	72550.4	168674.4	9.61
80—84	0.1036	0.4114	11463.0	4716.3	45524.1	96124.1	8.39
85+	0.1990	0.6644	6746.7	4482.8	50600.0	50600.0	7.50
					4975604.5		

Source: 10% Sample size of StatsSA, Census 2001

Table 6 shows the distribution of income by sex. As it is usually the case, males have higher income than female counterparts. But females have higher expectation of life than males (as seen in Tables 3 and 4). This suggests therefore that at the individual level, the income level of the sexes is not a determinant of mortality rate. The causes of higher mortality rates among males over females cannot be attributed to the level of income which they earn, therefore income could not be a predictive factor of mortality at the individual level. But income could affect mortality at the household level because at that level it is the size of that household that matters.

If the national income is used to provide health and social services that the people can access, then that can bring about decline in morbidity and mortality. A country with a good social service scheme would most likely show a smaller relationship between income and mortality, than a country with a poor social service scheme. A comparison between Canada and the United

Table 5: Life table for combined sexes: South Africa, 2001

Interval	*nMx*	*nQx*	*l(x)*	*nDx*	*nLx*	*T(x)*	*e(x)*
0	0.0716	0.0682	100000.0	6821.6	95224.9	5106278.8	51.06
1—4	0.0097	0.0380	93178.4	3543.3	364209.6	5011053.9	53.78
5—9	0.0020	0.0100	89635.1	895.5	445936.5	4646844.3	51.84
10—14	0.0015	0.0074	88739.5	658.0	442052.7	4200907.7	47.34
15—19	0.0033	0.0162	88081.5	1425.6	436843.8	3758855.0	42.67
20—24	0.0088	0.0429	86656.0	3714.7	423992.9	3322011.2	38.34
25—29	0.0151	0.0730	82941.2	6052.2	399575.7	2898018.3	34.94
30—34	0.0180	0.0859	76889.0	6607.7	367925.9	2498442.7	32.49
35—39	0.0181	0.0867	70281.3	6094.6	336170.0	2130516.8	30.31
40—44	0.0176	0.0842	64186.7	5406.9	307416.3	1794346.8	27.96
45—49	0.0194	0.0924	58779.8	5430.7	280322.1	1486930.5	25.30
50—54	0.0219	0.1039	53349.0	5544.3	252884.5	1206608.4	22.62
55—59	0.0247	0.1164	47804.8	5563.1	225116.0	953723.9	19.95
60—64	0.0325	0.1501	42241.6	6342.3	195352.5	728607.9	17.25
65—69	0.0398	0.1811	35899.4	6501.2	163243.8	533255.3	14.85
70—74	0.0534	0.2355	29398.2	6924.6	129679.3	370011.5	12.59
75—79	0.0672	0.2878	22473.6	6468.4	96196.7	240332.2	10.69
80—84	0.0847	0.3494	16005.1	5592.9	66043.5	144135.5	9.01
85+	0.1735	0.6051	10412.3	6300.6	78092.0	78092.0	7.50

Source: 10% Sample size of StatsSA, Census 2001

Table 6: Distribution of income by sex

Income	*Gender*		*Total*
	Male	*Female*	
1	66.5%	70.8%	68.7%
2	4.9%	6.0%	5.5%
3	8.2%	11.1%	9.8%
4	6.7%	4.1%	5.3%
5	5.9%	3.4%	4.6%
6	3.8%	2.9%	3.3%
7	2.3%	1.2%	1.7%
8	1.0%	.3%	0.7%
9	0.4%	.1%	0.2%
10	0.1%	.1%	0.1%
11	0.1%	.1%	0.1%
Total	100.0%	100.0%	100.0%

Source: 10% Sample size of StatsSA, Census 2001

States by Ross et al. (2000) concluded that Canada seemed to counter the increasingly noted association at the societal level between income inequality and mortality. The lack of a significant association between income inequality and mortality in Canada may, according to the authors, indicate that the effects of income inequality on health are not automatic and may be blunted by the different ways in which social and economic resources are distributed in Canada and in the United States (Ross et al. 2000).

Figures 4 and 5 show the proportion of the respondents who were attending school during the interview. Figure 2 shows that the level of education for respondents who have attained higher level than grade 12 (twelve years successful completion) was at most 5%. Table 7 and Figure 3 show that 65.7% of the respondents aged more than 5 years were not attending school at the time of the exercise. Though this proportion includes those who had graduated from different levels of schooling, Figure 4 shows that the percentage of those who have completed higher education are not more than 5% for any of the

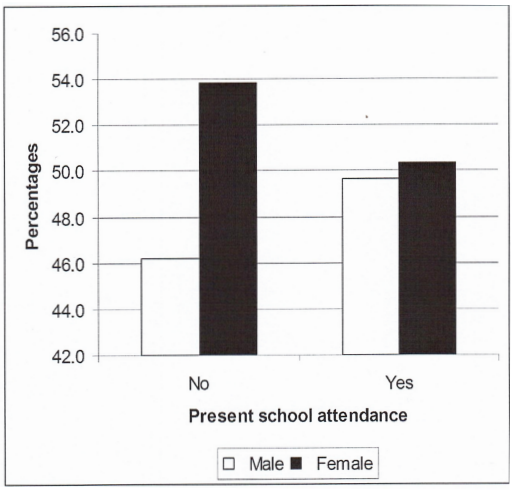

Fig. 3. Present school attendance by sex
Source: StatsSA, 10% sample of the Census 2001
[Please note that the proportions for Yes for Male and Female add to 100%. So are the proportion for No for Male and Female add up to 100%.]

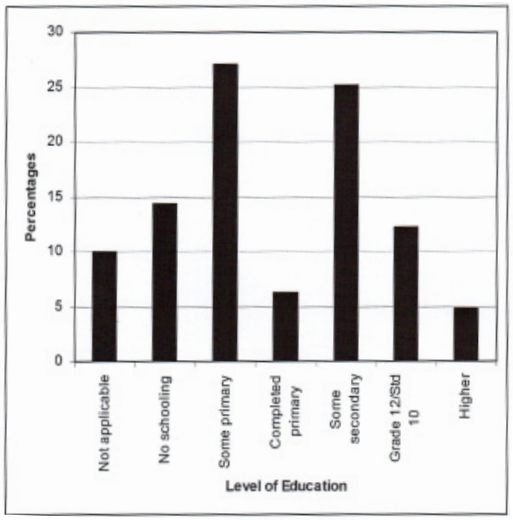

Fig. 2. Level of education
Source: 10% Sample size of StatsSA, Census 2001

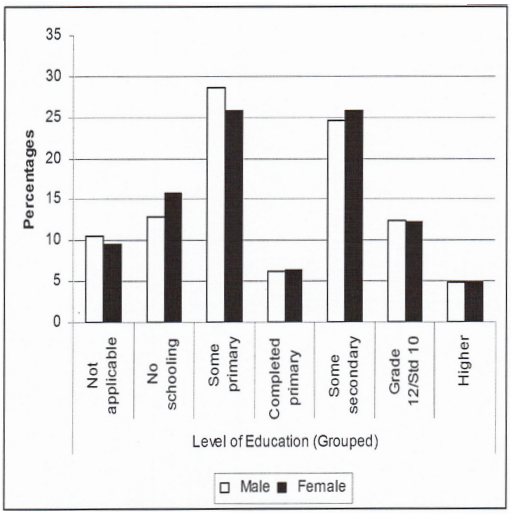

Fig. 4. Level of education by sex
Source: StatsSA, 10% sample of the Census 2001

Table 7: Present school attendance

School attendance	*Frequency*	*Percent*
1	2448904	65.7
2	94085	2.5
3	1103785	29.6
4	23138	.6
5	17442	.5
6	26514	.7
10	6565	.2
11	5222	.1
Total	3725655	100.0

Source: 10% Sample size of StatsSA, Census 200

sexes. Education is very important, especially when we consider women's education where it has been found that female education above grade 12 has a negative effect on childhood mortality (Kyei 1995). The effect that mother's education has on childhood mortality is far higher than the effect that father's education has on mortality).

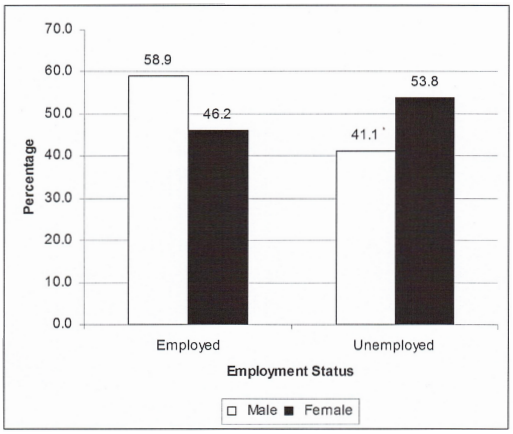

Fig. 5. Employment status by sex
Source: StatsSA, 10% sample of the Census 2001

A study by Zajacova (2006) showed that in the US, education had a comparable effect on mortality for men and women. No statistically significant gender difference was found in all-cause mortality or mortality by cause of death, among younger persons, and among the elderly. Analysis by marital status, however, suggested that these findings apply only to married men and women. Among the divorced, there was a statistically significant sex difference whereby education had effect on mortality for women but not on men (Zajacova 2006). That is proven by a strong education gradient (seven percent lower odds of dying for each year of schooling).

A similar study by Hurt et al. (2004) based on data from Bangladesh showed that mortality was lower in women with formal or Koranic education compared with those with none. After adjusting for her own education, the husband's level of education or occupation did not have an independent effect on a woman's survival. Men who had attended formal education had lower mortality than those without any education, but men whose wives had been educated had an additional survival advantage independent of their own education and occupation. Mortality in both sexes was also significantly associated with marital status and the percentage of surviving children and in men mortality was associated with the man's occupation, religion and area of residence.

In Japan, early termination of education was associated with an increased risk of mortality from all causes of death for both men and women. For men specifically, cardiovascular disease mortality for all men was increased by early termination of education compared to later termination (Hirokawa et al. 2006).

The effect of income-mortality based on sex has been one of contentious issues in most developed countries. According to Backlund et al. (2007), some of the most consistent evidence in favour of an association between income inequality and health has been among the US states. The researchers concluded that the relationship between income inequality and mortality is only robust to adjustment for compositional factors in men and women under 65, and that certain causes of death that occur primarily in the population under 65 may be associated with income inequality. They also noted that this result explains why income inequality is not a major driver of mortality trends in the US because most deaths occur at ages 65 and over.

They further concluded that certain causes of death that occur primarily in the population under 65 may be associated with income inequality. In the Limpopo province in South Africa, Kyei and Gyekye (2012) have showed that the proportion of the unemployed female population far exceeds the proportion of the males. This clearly suggests that employment cannot be the reason for the differences in mortality rates between males and females. There should be some other reasons (possibly the physiological make-up of the sexes) that make males to have higher mortality than females.

According to Guttmacher Institute (2002), on the average, 61 babies die for every 1000 live

births in developing countries, compared with eight deaths per 1000 in developed countries. In some developing countries, the rates are much higher than the average. For example, in Sub-Saharan Africa—the world's poorest region—more than one in 10 infants die (that is, 100 per 1000) before age one in Benin, Burkina Faso, Central African Republic, Chad, Ethiopia, Guinea, Malawi, Mali, Mozambique, Niger, Tanzania and Zambia. Per capita income is below $2000 in all of these countries; in many, it is $500-900 (Blacklund et al. 1996). In countries where per capital income is higher, infant mortality rates are substantially lower. High infant mortality is, therefore, clearly a result of poverty, which creates conditions—for example, the lack of clean water, poor sanitation, malnutrition, endemic infections, poor or nonexistent primary health care services and low levels of spending on health care—in which babies who are not robust at birth do not receive the health care they need to overcome their vulnerability (Guttmacher Institute 2002). A reduction in the levels of infant mortality can therefore be averted by an improvement in the per capita income of parents and guardians.

CONCLUSION

It has to be noted that the data and the BGBM method used in evaluating the mortality data have some weaknesses that cannot be ignored. Table 8 gives the summary of the principal findings in this study. Given the weaknesses in the data, this study has revealed that the mortality level is quite high in the new South Africa with infant mortality rate at almost 70 per 1000 and life expectancy at 51 years. The higher life expectancy of females (52.5 years) than males (49.8 years) cannot be explained by the differences in income because males earn more than females. Neither can that be explained by employment because more males are employed than females; nor can that be explained by the levels of education for the proportion of males educated is higher than the proportion of females. Whatever be the causes, high mortality rates in South African society will have long term devastating effects unless governments (local, provincial and national) and partners take action to control and bring down the level of mortality.

RECOMMENDATIONS

Data on mortality and fertility in South Africa leave much to be desired, therefore the study recommends that great efforts be made to get quality data, and especially on mortality and fertility so that accurate and realistic analyses can be done to enable policy makers and planners have knowledge about the true state of affairs in the country. Reliable data will enable the government to plan well to improve the living conditions of its citizens.

Table 8: Key findings from the study

Indicator	*Category*	*Estimate*
UN Joint Score		21.0
Sex Ratio	At birth	98.6
	Under 5	99.8
Average Household Size		4 persons
Growth Rate	Male	1.6%
	Female	1.1%
	Total	1.2%
Life Expectancy	Male	49.8 years
	Female	52.5 years
	Total	51.1years
Birth Rate	demographic modelling	24.6 per 1000
Death Rate	demographic	11.9 per 1000
Average Income	modelling	R3356.34/ month
Employment Status	employment	52.7%
	unemployment	47.3%
Level of Education/ Literacy	at most grade 12	71.0%
	higher than grade 12	5.0%

Source: 10% Sample size of StatsSA, Census 2001

NOTES

Computing life tables involves finding the probability at age x of dying before reaching age x+n, denoted by q(x) or ${}_nq_x$,; number of deaths between age x and x+n out of an original cohort (usually 100 000), denoted by d(x) or ${}_nd_x$; death rate in the life table population (number of deaths per person-years lived) between age x and x+n, denoted by m(x) or ${}_nm_x$; number of survivals at the beginning of age x out of an original cohort (usually 100 000), denoted by l(x); number of persons-years lived between age x and x+n by an original cohort, denoted by L(x) or ${}_nL_x$; number of persons-years lived at age x and over by an original cohort, denoted by T(x); and the average number of years remaining to be lived (expectation of life) at age x, denoted by e(x) (Coale, Demeny & Vaughan 1996).

The mathematical equations for these variables are:

$$ {}_nm_x = d(x)/l(x) = \frac{\text{(number of deaths aged x and x+n)}}{\text{(number of people aged x and x+n)}} $$

$$ {}_nq_x = \frac{(2 * n * {}_nm_x)}{(2+5 * {}_nm_x)} $$

Wunsch (1984) has suggested that the following be used to convert childhood mortality rates into their probabilities in high mortality countries.

For people aged 0 to 1, this is given as ${}_1q_0 = (2 * {}_nm_x) / (2+1.4* {}_nm_x)$

For people aged 1 to 4, this is given as ${}_1q_4 = (2 * 4 * {}_nm_x) / (2+3.7 * {}_nm_x)$

$L_x = (n/2) * (l(x) + l(x+n))$ *assumed linear relationship between age* $\underline{x}$ *and* $\underline{x+n}$

Again Wunsch (1984) recommends that the childhood persons-year be calculated as follows:

For people age 0 to 1, this is given as ${}_1L_0 = 0.3*l_0 + 0.7* l_0$

For people age 1 to 4, this is given as ${}_4L_1 = 1.6*l_1 + 2.4* l_4$

$T(x) = \Sigma {}_nL_x$ and $e(x) = T(x) / l(x)$

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