Adult Mortality Based on Death Notification Data in South Africa, All Causes and by Natural and Unnatural Causes: 1997-2004

Barbara A. Anderson
(barba@umich.edu)
University of Michigan
and
Statistics South Africa

Heston E. Phillips
(hestonp@statssa.gov.za)
Statistics South Africa

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SUMMARY OF FINDINGS

Coverage of Paper
This paper examines mortality from all causes as well as from natural causes and from unnatural causes for people age 15-64 for 1997-2004. Types of unnatural mortality are also examined.

All Cause Mortality
Between 1997 and 2004, death rates rose for virtually every age and sex group. The rates more than tripled for females 20-39 and more than doubled for males 30-44. The most distinctive aspect of mortality change between 1997 and 2004 is the large increase in female death rates age 20-39.

The traditional female survival advantage narrowed and for reversed for those age 20-34. Female survival from age 15 to 40 dropped from 91% in 1997 to 69% in 2004.

Even in 2004, female survival from age 15 to age 65 (45%) was higher than for males (33%). Female survival from age 45 to age 65 was almost unchanged – 75% in 1997 and 71% in 2004. Males age 40-64 had the highest mortality in 1997 and 2004.

Sex Difference in Mortality – High Female Mortality below Age 25
Even in 1997, below age 30, female death rates from natural causes were higher than male death rates from natural causes. This higher female than male mortality in 1997 was masked by higher male than female mortality from unnatural causes. Higher female than male mortality below age 25 is found for a wide variety of causes of death. The sources of this should be analysed further.

Decline or Small Increase in Mortality Age 15-19
For each sex for those aged 15-19 death rates in 2004 were either lower than for the same age and sex in 1997 or were less than 20% greater in 2004 than the1997 rate.

Decline or Small Increase in Mortality Age 55-64
For each sex for all cause mortality, natural cause mortality and unnatural cause mortality, for those age 55-64 death rates in 2004 were either lower than for the same age and sex in 1997 or were less than 20% greater in 2004 than the1997 rate.

Natural Causes
Mortality rates from natural causes increased substantially between 1997 and 2004 for each sex. In 2004, the age-standardised death rate age 15-64 from natural causes was 2.1 times its 1997 value for males and 2.7 times its 1997 value for females. Male age-standardised death rates age 15-64 from natural causes were higher than female rates at all dates. However, in 2004, the male rate was only .3% higher than the female rate. Below age 20 and above age 55 for males and above age 55 for females natural cause death rates increased modestly between 1997 and 2004 – by less than 20%.

Unnatural Causes
Overall mortality rates from unnatural causes changed little 1997-2004, although they declined for each sex for those 15-19 and for those at older ages. This decline at age 15-19, but it might indicate a lesser tendency by teenagers to engage in risky behavior.

The number of homicides in South Africa has declined since the late 1990s. Nonetheless the toll of homicide remains enormous, especially for males. Homicides account for the majority of unnatural deaths for males 35-39 and account for a larger portion of unnatural deaths than transport or other unnatural causes for males 25-44. Male homicide death rates are about six times higher than female homicide death rates.

Unnatural deaths occur disproportionately in December including death from knives, firearms, transport, drowning and falls. Additional action to address the risk of unnatural death during the December holiday period could be justified.

A 1959 South African law inhibits the recording of manner and intent of death on the Death Notification Form. It might be wise to consider modifying this law.

INTRODUCTION

In South Africa there has been a major concern with high age-specific death rates and increases in death rates, especially for women at young adult ages. Much of increasing mortality has clearly been due to HIV deaths. Levels of infection from HIV[1] have risen rapidly. HIV only appeared to any substantial extent in South Africa in the early 1990's. At public antenatal clinics in South Africa, the percent of pregnant women who were HIV-positive was 1% in 1990, 17% in 1997 and 30% in 2004 (South Africa, Department of Health, 2004: 6, 2005: 6). The average time from becoming HIV-positive to death is about 8-10 years in sub-Saharan Africa (Hunter and Williamson, 2000: 23). Large increases in the death rates of women in their twenties and thirties since the late 1990s are thought to result mainly from HIV. With the increases in HIV prevalence at antenatal clinics since 1990, and with the long average large from infection to death, it seems likely that HIV deaths will continue to increase in South Africa for some years.

At the same time, traditional causes of death, such as malaria, have not disappeared and in some cases have presented an increasing problem as drug-resistant strains of malaria have emerged (World Health Organization, 2005). In addition, death rates related to unhealthy behaviors, such as diabetes have also increased. With economic improvements in formerly underprivileged parts of the population, overeating and obesity can lead to, complicate, or increase the death rates from many serious health problems, including diabetes (Abid *et al*., 2000; Jung, 1997; Popkin *et al*., 1997; Tierney *et al*., 2001; World Health Organization, 1998; Zohoori *et al*., 1998).

South Africa also has high death rates from unnatural causes and probably has the second highest homicide rate in the world, trailing only Colombia.[2] The trajectory of unnatural mortality in South Africa is also a subject of scientific and policy concern.

In this paper, we examine changes in overall adult mortality by age (age 15-64), as well as the changes role of mortality from natural and from unnatural causes 1997-2004.[3]

ALL CAUSE MORTALITY

First we examine mortality by sex from all causes. It is important to know what the chance is that people by age and sex will die, even apart from the distribution of causes of death. We look at death rates by age and sex and how they changed between 1997 and 2004. We also look at the implications of these death rates for the probability that a person age 15 will survive to age 65 and other related questions.

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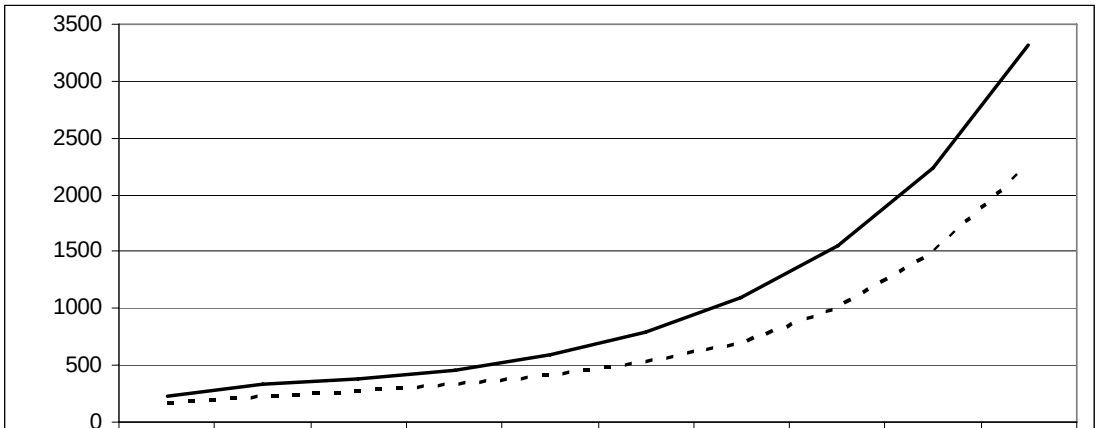
[1] In this paper, we use the term HIV to refer to all HIV-positive persons, whether or not they have progressed to AIDS. Occasionally when discussing medical literature, we draw a distinction between those who are HIV-positive but have not progressed to AIDS and those who have progressed to AIDS.

[2] It is estimated that in 2002 the homicide death rate in South Africa was 48 per 100,000 population (based on number of homicides from the South African Police Service and Statistics South Africa mid-year population estimates) and in Colombia was 66 per 100,000 population (Colombia, 2005).

[3] For a discussion of technical issues, including estimated completeness of death registration by year, sex and age group, as well as the weights used, see Anderson and Phillips (2006).

It is useful to set a context for examination of mortality in South Africa by noting what typical patterns of mortality by age and sex have been throughout the world.



	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
Males	235	336	384	458	587	787	1091	1559	2238	3311
Females	165	226	275	335	415	526	705	1006	1489	2254

Figure 1. Death Rates by Age and Sex per 100,000 from UN General Mortality Pattern

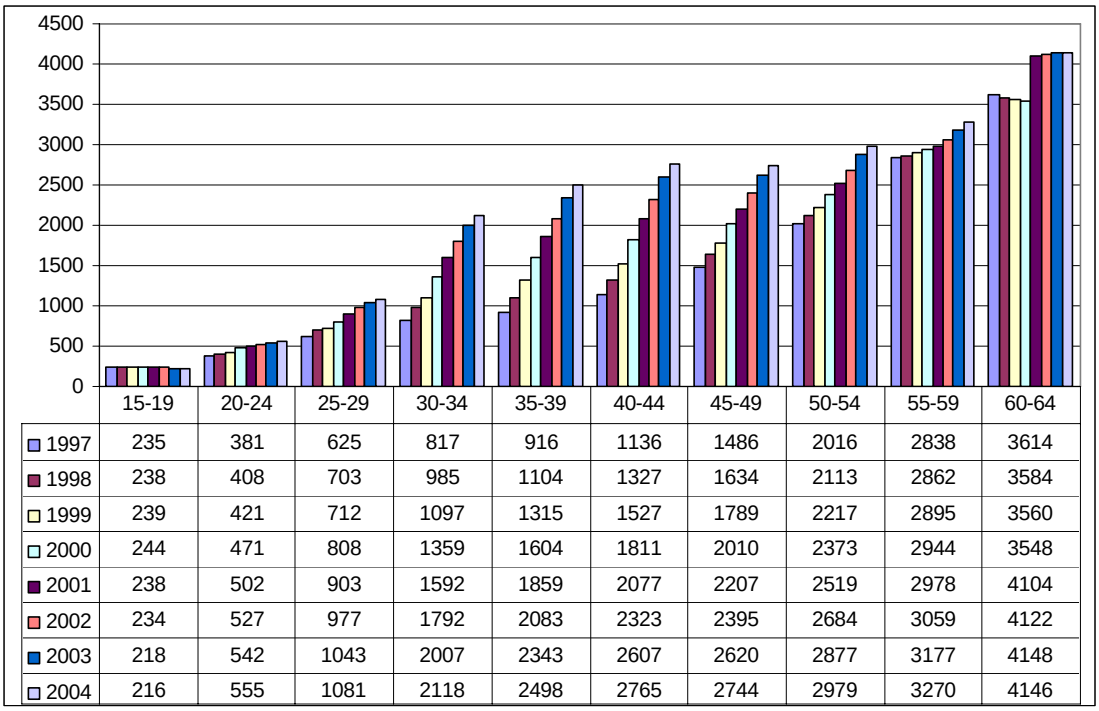
Figure 1 shows death rates by age and sex have usually differed.[4] Typically, after age 15, death rates increase with age. After age 35 they rise at an increasing rate. Usually male death rates are higher at every age than female death rates.

Occasionally female death rates have been higher than male death rates at some ages, especially among infants and young children. But this has typically occurred in high male preference and female deprivation societies (Anderson and Liu, 1997; D'Souza and Chen, 1980; Dyson and Moore, 1983; Miller 1981), which does not include South Africa does not qualify. Higher female than male mortality has become increasing rare above age 15 (Tabutin, 1992).

Usually, over time death rates for each sex and at all ages have declined. However, in some societies at times other than wartime, death rates have increased for certain age-sex groups. For example after World War II, male death rates in the older working ages increased in the United States and much of Europe substantially due to cigarette smoking (Anderson and Silver, 1986; Preston, 1970). However mortality increase over a sustained time has been fairly uncommon. A long-term increase in mortality of adult men and to a lesser extent of adult women in the former Soviet Union and parts of Eastern Europe has been an object of concern (Demko, Ioffe and Zayonchkovskaya, 1999; McKee and Shkolnikov, 2001; Mitchell, 1997).

Now we turn to the mortality situation in South Africa. First we consider mortality by age and sex from all causes. Figures 2 and 3 show age-specific death rates by sex in South Africa for every year 1997-2004.

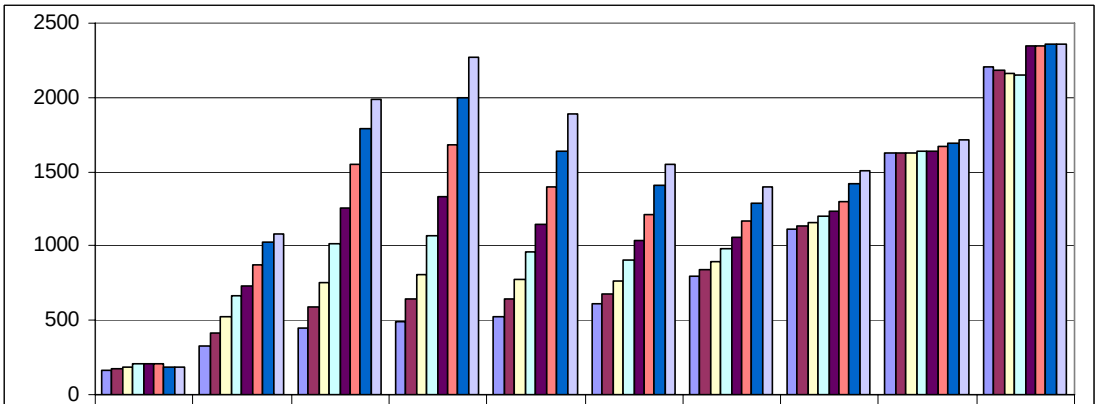
[4] The death rates in Figure 1 are from United Nations (1982: 212-213, 236-237) with the same death rate at age 15-19 for each sex as the actual death rate at that age in South Africa in 1997. "Per 100,000" in all graphs and tables means "per 100,000 population."



	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
1997	235	381	625	817	916	1136	1486	2016	2838	3614
1998	238	408	703	985	1104	1327	1634	2113	2862	3584
1999	239	421	712	1097	1315	1527	1789	2217	2895	3560
2000	244	471	808	1359	1604	1811	2010	2373	2944	3548
2001	238	502	903	1592	1859	2077	2207	2519	2978	4104
2002	234	527	977	1792	2083	2323	2395	2684	3059	4122
2003	218	542	1043	2007	2343	2607	2620	2877	3177	4148
2004	216	555	1081	2118	2498	2765	2744	2979	3270	4146

Figure 2. Male Death Rates by Age per 100,000: 1997-2004

The presentations in Figures 2 and 3 make it easy to determine what the trend has been in death rates for a given sex and age. We see that except for those under age 20 and for those over age 60, death rates have increased in each year for each sex in every age group.

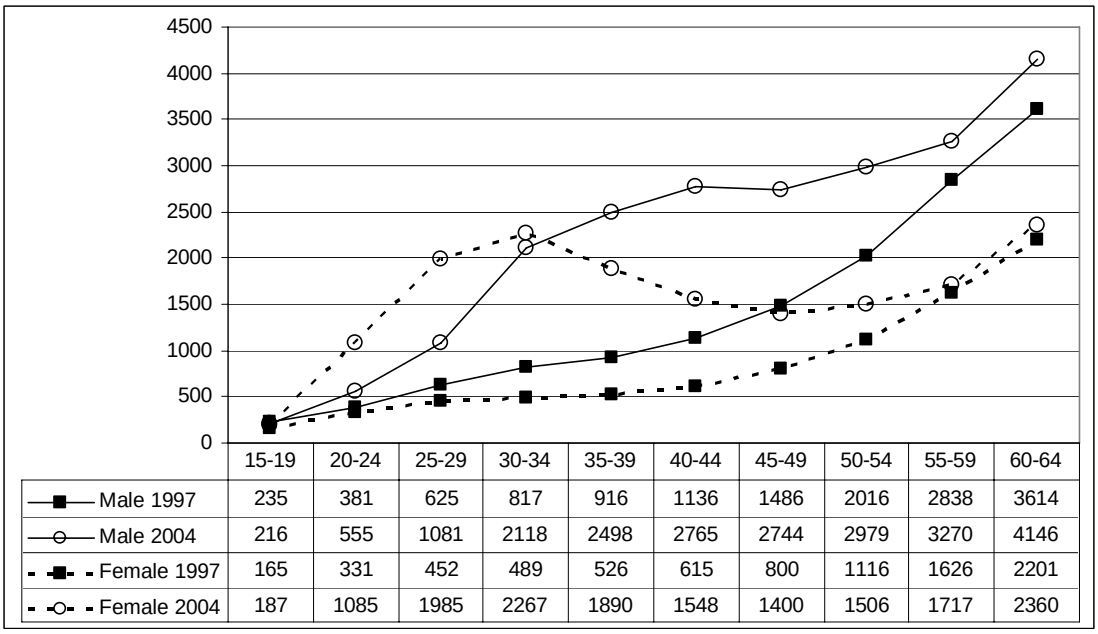


	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
1997	165	331	452	489	526	615	800	1116	1626	2201
1998	176	420	589	648	648	681	841	1130	1624	2179
1999	185	521	756	803	773	767	895	1154	1626	2163
2000	206	670	1011	1073	960	902	981	1199	1642	2155
2001	206	728	1254	1336	1143	1032	1059	1231	1642	2348
2002	203	870	1547	1680	1396	1210	1173	1297	1668	2352
2003	187	1026	1789	1997	1642	1404	1291	1423	1695	2363
2004	187	1085	1985	2267	1890	1548	1400	1506	1717	2360

Figure 3. Female Death Rates by Age per 100,000: 1997-2004

Figure 4 shows the death rates for each sex in 1997 and in 2004. Focusing on 1997 and 2004 makes it easier to get a clear picture of the age pattern of death

rates and how these have changed over time. In Figure 4, and in many other figures that show age-specific death rates by sex in 1997 and 2004, rates for males are indicated by a solid line for both dates, while rates for females are indicated by a dashed line for both dates. The marker for each sex for the data referring to 1997 is a solid square, and the marker for each sex for the data referring to 2004 is a hollow circle.



	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
Male 1997	235	381	625	817	916	1136	1486	2016	2838	3614
Male 2004	216	555	1081	2118	2498	2765	2744	2979	3270	4146
Female 1997	165	331	452	489	526	615	800	1116	1626	2201
Female 2004	187	1085	1985	2267	1890	1548	1400	1506	1717	2360

Figure 4. Death Rates by Age per 100,000 by Sex: 1997 and 2004

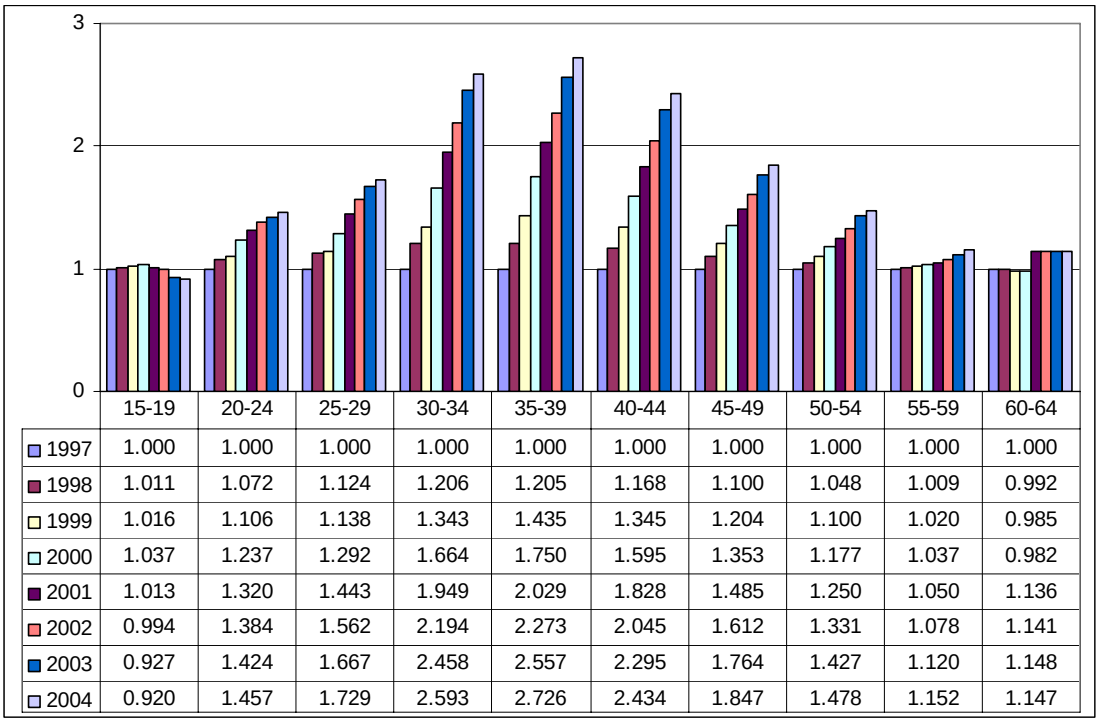
In 1997, for each sex, death rates increase with each successively older age, as was shown in Figure 1. In 2004, the male death rate increases with each successively older age (except for a small decline from the 40-44 to the 45-49 age group), but after a rapid increase up to age 30, there is a slower rise to age 50, and then a more rapid rise. In 2004, for females the death rate age 25-44 is higher than at age 45-54, which is quite unusual.

The age pattern shown in Figure 4 above age 35 is very different for the two sexes. Above age 35, male death rates tend to continue to rise; above age 35, female death rates decline sharply then to rise after age 50. Only for age 60-64 does the female death rate in 2004 exceed that for females at age 30-34.

In 1997, at every age the male death rate was higher than the female death rate, as is seen in Figure 1 and as is usually found in the world. In 2004, for age 20-34 the female death rate was higher than the male death rate, but above age 35, the male death rate in 2004 was higher than the female death rate.

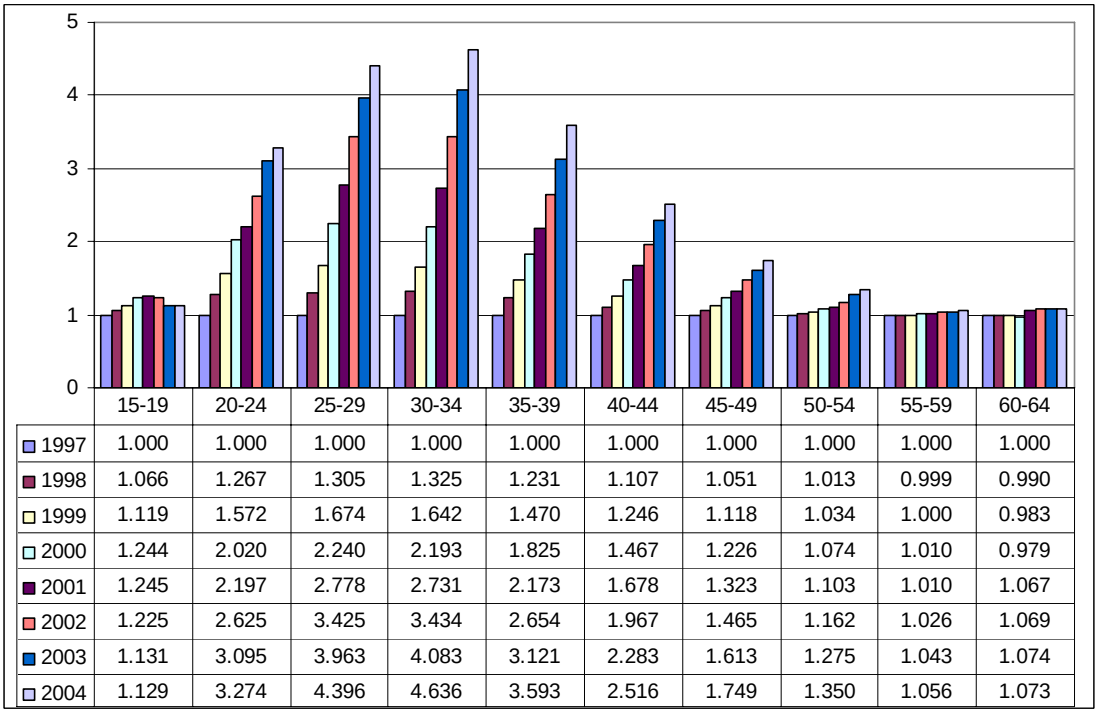
Figures 5 and 6 show trends in death rates in another way. In these figures the values of the death rates for each sex are shown relative to the value for the same age and same sex in 1997. That is, the death rate for a given age and sex in a particular year is divided by the value for that age and sex in 1997. If the rate is the same in a given year as in 1997, the value for the given year is 1.00. This was close to the situation for men age 55-59 in 2000. That value in Figure 5 is 1.037, which means the death rate for males age 55-59 in 2000 was 3.7% higher than the death rate for males age 55-59 in 1997. A value below 1.00 means that the rate in the given year for a particular age-sex group is lower than the rate was for that age-sex

group in 1997. This was the situation for females age 60-64 in 1999.



	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
1997	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1998	1.011	1.072	1.124	1.206	1.205	1.168	1.100	1.048	1.009	0.992
1999	1.016	1.106	1.138	1.343	1.435	1.345	1.204	1.100	1.020	0.985
2000	1.037	1.237	1.292	1.664	1.750	1.595	1.353	1.177	1.037	0.982
2001	1.013	1.320	1.443	1.949	2.029	1.828	1.485	1.250	1.050	1.136
2002	0.994	1.384	1.562	2.194	2.273	2.045	1.612	1.331	1.078	1.141
2003	0.927	1.424	1.667	2.458	2.557	2.295	1.764	1.427	1.120	1.148
2004	0.920	1.457	1.729	2.593	2.726	2.434	1.847	1.478	1.152	1.147

Figure 5. Male Death Rates by Age Relative to Value by Age in 1997 (1997 Value=1.00): 1997-2004

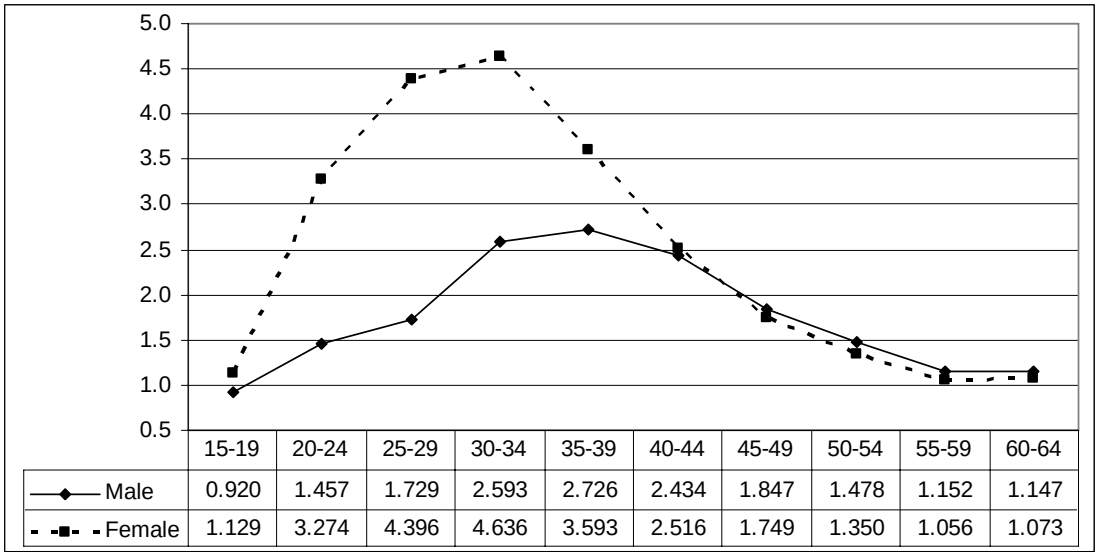


	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
1997	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1998	1.066	1.267	1.305	1.325	1.231	1.107	1.051	1.013	0.999	0.990
1999	1.119	1.572	1.674	1.642	1.470	1.246	1.118	1.034	1.000	0.983
2000	1.244	2.020	2.240	2.193	1.825	1.467	1.226	1.074	1.010	0.979
2001	1.245	2.197	2.778	2.731	2.173	1.678	1.323	1.103	1.010	1.067
2002	1.225	2.625	3.425	3.434	2.654	1.967	1.465	1.162	1.026	1.069
2003	1.131	3.095	3.963	4.083	3.121	2.283	1.613	1.275	1.043	1.074
2004	1.129	3.274	4.396	4.636	3.593	2.516	1.749	1.350	1.056	1.073

Figure 6. Female Death Rates by Age Relative to Value by Age in 1997 (1997 Value=1.00): 1997-2004

The type of presentation in Figures 5 and 6 is a useful way to compare the pace of change in death rates at different ages and for the two sexes. Except for males age 15-19, for each sex and every age group, the death rate was higher in

2004 than in 1997. For males age 15-19 and 55-64, there was no increase or a small increase over time. For females over age 55, there also was a small increase over time. For all other sex and age groups, there was a large, steady increase in the death rate over time. The proportionate increase was especially large for women age 20-39, for whom the death rate in 2004 was more than three times its value in 1997.



	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
Male	0.920	1.457	1.729	2.593	2.726	2.434	1.847	1.478	1.152	1.147
Female	1.129	3.274	4.396	4.636	3.593	2.516	1.749	1.350	1.056	1.073

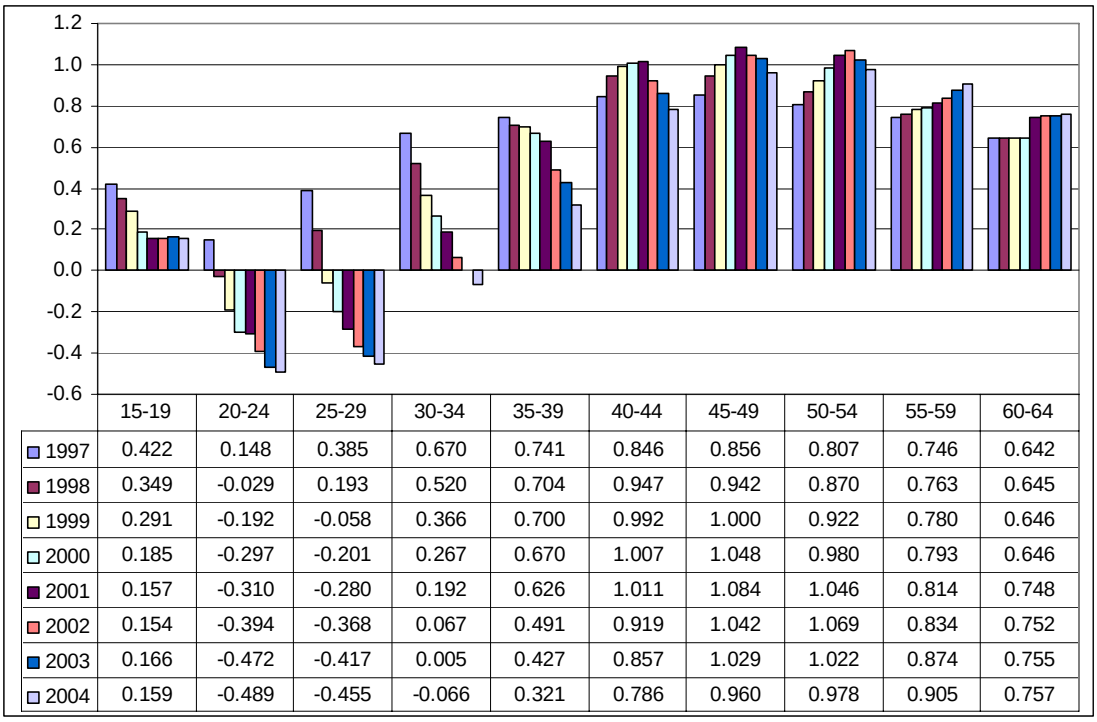
Figure 7. Death Rates in 2004 by Sex Relative to Value in 1997 by Age and Sex (1997 Value=1.00)

Figure 7 shows the same information as in Figures 5 and 6 but for 2004 and for both sexes. The much greater proportionate increases in female than male death rates below age 40 are striking. It is clear from Figure 7 that the increase in mortality between 1997 and 2004 has been concentrated in the younger ages, 20-44, and especially for females. For males 15-19 the death rate declines, and for females 15-19, the death rate increased by only 13%. At age 40-64 the increase for each sex by age was about equal, and at age 45-64, the female death rate increased at a slightly lower rate than did the male death rate. At aged 55-64, the death rates for each sex increased modestly.

The large increase in mortality for women in their twenties and thirties is not part of a commensurate increase in female mortality at all ages. The increase in death rates for females in their twenties and thirties has been attributed to HIV by many people (Dorrington *et al*. 2001; Hosegood, Vanneste, and Timaeus, 2004; Tollman, *et al.,* 1999) Whether similar large increases in mortality will occur at older ages as those age 20-39 in 2004 (the cohort that was born in 1964-1984) grow older is yet to be seen.

Sex Differences in Age-Specific Death Rates

Figure 8 shows the sex difference in mortality in a different way. In this figure, the proportion by which the male age-specific death rate in a given year exceeds or falls short of the female age-specific death rate for that year is shown. A value above zero means that the male death rate at that age is higher than the female death rate at that age; a value below zero means that the female death rate at that age is higher than the male death rate at that age.

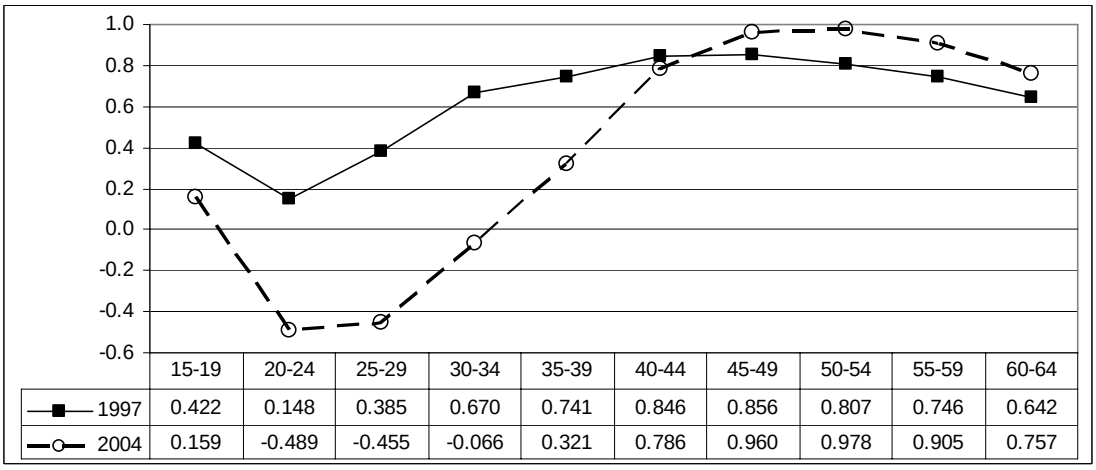


	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
1997	0.422	0.148	0.385	0.670	0.741	0.846	0.856	0.807	0.746	0.642
1998	0.349	-0.029	0.193	0.520	0.704	0.947	0.942	0.870	0.763	0.645
1999	0.291	-0.192	-0.058	0.366	0.700	0.992	1.000	0.922	0.780	0.646
2000	0.185	-0.297	-0.201	0.267	0.670	1.007	1.048	0.980	0.793	0.646
2001	0.157	-0.310	-0.280	0.192	0.626	1.011	1.084	1.046	0.814	0.748
2002	0.154	-0.394	-0.368	0.067	0.491	0.919	1.042	1.069	0.834	0.752
2003	0.166	-0.472	-0.417	0.005	0.427	0.857	1.029	1.022	0.874	0.755
2004	0.159	-0.489	-0.455	-0.066	0.321	0.786	0.960	0.978	0.905	0.757

Figure 8. Proportion by Which the Male Death Rate Exceeds or Falls Short of the Female Death Rate ((MaleDR-FemaleDR)/FemaleDR) by Age: 1997-2004

Thus, in 2000 the male death rate at age 45-49 was 105% higher than the female death rate – the male rate was 2.05 times the female rate. In 2004 the male death rate at age 20-24 was 49% lower than the female death rate at age 20-24.

Below age 39, the excess in the male death rate over the female death rate declined over time. For those aged 20-34, the female death rate became larger than the male death rate some time between 1998 and 2004. Between age 40 and 54, the excess of the male death rate over the female death rate increased for 4 to 6 years after 1997and then decreased. Above age 55, the excess of the male death rate over the female death rate continued to increase over time.



	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
1997	0.422	0.148	0.385	0.670	0.741	0.846	0.856	0.807	0.746	0.642
2004	0.159	-0.489	-0.455	-0.066	0.321	0.786	0.960	0.978	0.905	0.757

Figure 9.Proportion by which the Male Death Rate Exceeds or Falls Short of the Female Death Rate ((MaleDR-FemaleDR)/FemaleDR) by Age: 1997 and 2004

Figure 9 shows the same information as in Figure 8 but only for 1997 and 2004. The changing situation in the sex differential in mortality between 1997 and

2004 is even clearer in Figure 9. In 1997 at every age the male death rate was higher than the female death rate. By 2004, this was only true below age 20 and above age 35. Above age 45, the male death rate was larger than the female death rate by a larger proportion than in 1997.

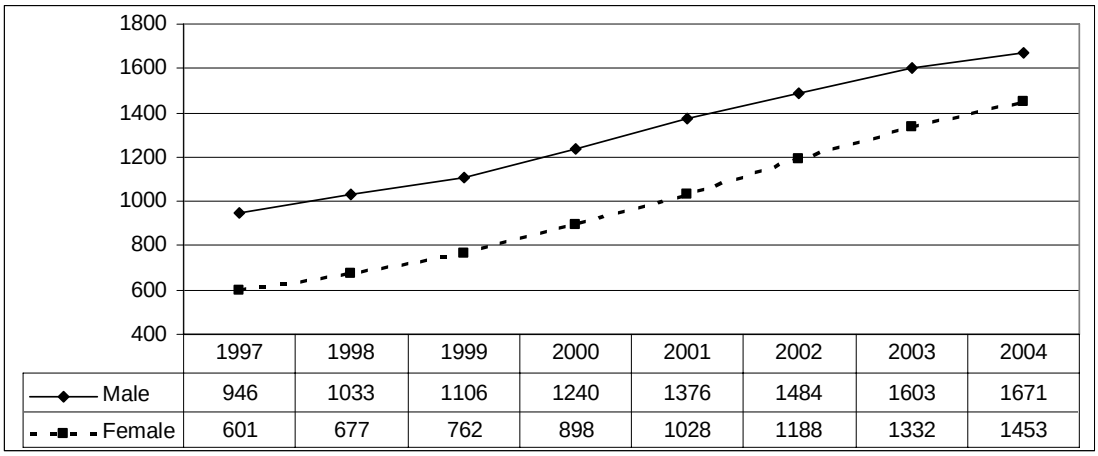
Age-Standardised Death Rates

As we see in Figure 4, death rates differ greatly by age and by sex. We are considering people age 15-64 in this paper. One could calculate a death rate for men age 15-64 from all causes or from some particular cause of death by dividing the total number of deaths to men age 15-64 from the cause by the number of men age 15-64. However, the level of this rate would be affected by the age distribution of men within the 15-64 age range. For example, in Figure 4 the male death rate increases with age. If the male population grew older with time, the kind of simple death rate just described would increase even if the chance of men dying at each age were unchanged.

To take account of changes in the age distribution within the 15-64 age range over time, we calculate an age-standardised death rate for each sex. To do this, first we choose a standard population. We use the 2001 mid-year population of South Africa for each sex by five-year age group, as estimated by Statistics South Africa, as the standard population. We then take the actual death rate for the given sex by five-year age group and calculate how many deaths these rates would have produced in the 2001 population by age for each sex. We take the implied number of deaths to the 2001 population age 15-64 of the given sex and divide that number of deaths by the number of people of the given sex age 15-64 in mid-2001. We do this for each year. What results is a series of rates for which the age distribution (by sex) is held constant. Thus, the age-standardised rate does not go up or down because the population of the given sex has gotten older or younger over time. The age-standardised death rate for age 15-64 for a given sex is what the overall death rate would be for that sex in those ages per 100,000 population –

$$\frac{100{,}000 * (\text{deaths to people of the given sex age 15-64})}{(\text{number of people of the given sex age 15-64})}$$

--if the people in that year of that sex had the same age distribution as people of that sex did in South Africa as a whole in 2001.



	1997	1998	1999	2000	2001	2002	2003	2004
Male	946	1033	1106	1240	1376	1484	1603	1671
Female	601	677	762	898	1028	1188	1332	1453

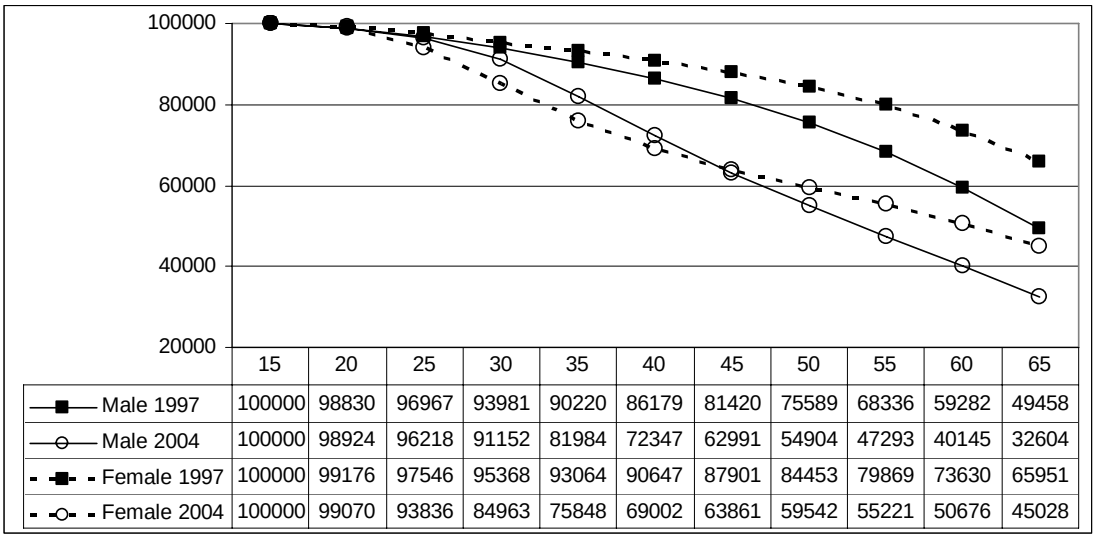
Figure 10. Age-Standardised Death Rates per 100,000 from All Causes by Sex, Age 15-64: 1997-2004

Figure 10 shows the age-standardised death rate per 100,000 population for

each sex. The age-standardised death rate for each sex increases every year. Also, in every year, the rate is much lower for females than males, although the gap has narrowed over time.

Chances of Survival Given Mortality Conditions in a Given Year

Figure 11 shows for each sex, for 1997 and 2004, out of 100,000 people alive on their 15th birthday, the number who would survive to successive ages, given the mortality conditions of that year (1997 or 2004). In demographic life table terms, what is shown in Figure 11 is l_x/l_{15}.



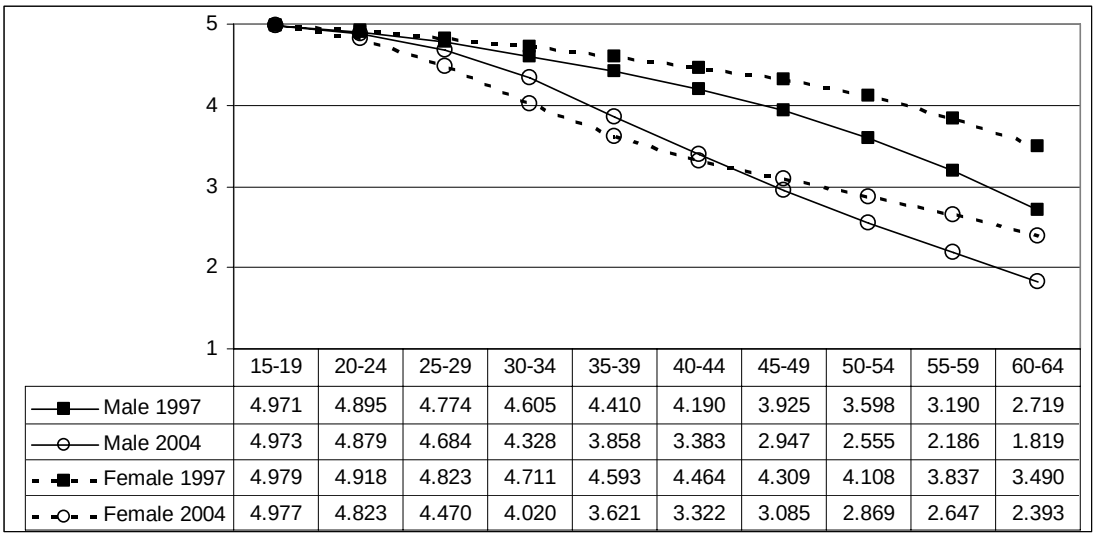
	15	20	25	30	35	40	45	50	55	60	65
Male 1997	100000	98830	96967	93981	90220	86179	81420	75589	68336	59282	49458
Male 2004	100000	98924	96218	91152	81984	72347	62991	54904	47293	40145	32604
Female 1997	100000	99176	97546	95368	93064	90647	87901	84453	79869	73630	65951
Female 2004	100000	99070	93836	84963	75848	69002	63861	59542	55221	50676	45028

Figure 11. Number of Survivors to a Given Age from 100,000 People Alive on Their 15th Birthday by Sex: 1997 and 2004

Across all ages, the best survival conditions obtained for females in 1997. In 2004, to age 20, females had better survival than males in that year. However, this survival advantage for females in 2004 was lost by age 25; females in 2004 had the lowest number surviving to age 25 out of 100,000 people alive at age 15 of the four groups considered in Figure 11. Above age 20, the second best survival to all ages was for males in 1997. Females in 2004 had a higher proportion surviving to age 65 than males in 1997. From age 25 through 40, females in 2004 had slightly worse survival than males in 2004, but after age 40, females in 2004 had better survival than males in 2004

Figure 12 shows for each sex in 1997 and 2004, the number of years lived in each five-year age interval among those alive on their 15th birthday. In demographic life table terms, what is shown in Figure 12 is ${}_5L_x/l_{15}$.

The maximum that could be lived in any five-year interval is five years. If half the people died after 2.5 years and the other half lived through the interval, then they would have lived on average 3.75 years (half lived 5 years and half lived 2.5 years, .5*5=2.5, .5*2.5=1.25, 2.5+1.25=3.75). The picture shown in Figure 12 is very similar to that in Figure 11.



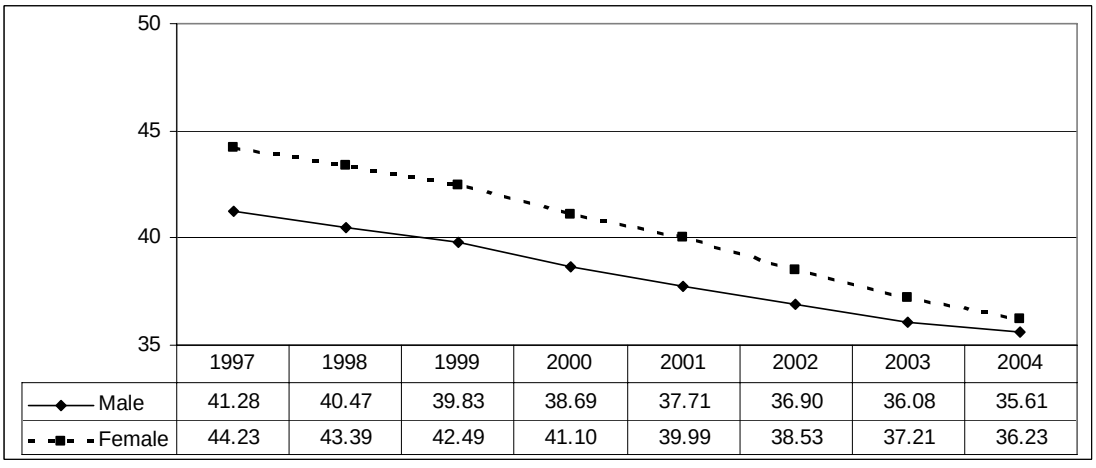
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
Male 1997	4.971	4.895	4.774	4.605	4.410	4.190	3.925	3.598	3.190	2.719
Male 2004	4.973	4.879	4.684	4.328	3.858	3.383	2.947	2.555	2.186	1.819
Female 1997	4.979	4.918	4.823	4.711	4.593	4.464	4.309	4.108	3.837	3.490
Female 2004	4.977	4.823	4.470	4.020	3.621	3.322	3.085	2.869	2.647	2.393

Figure 12. Number of Years Lived in Each Five-Year Age Group, Among Those Alive on Their 15th Birthday by Sex: 1997 and 2004

Number of Years Lived from the Fifteenth Birthday to the Sixty-Fifty Birthday, Under the Mortality Conditions of a Given Year

Figure 13 shows for each sex the number of years lived from age 15 through age 65 among those alive on their 15th birthday. In demographic life table terms, Figure 13 shows $(T_{15}-T_{65})/l_{15}$.

There is a maximum of 50 possible years that could be lived between the 15th birthday and the 65th birthday. What is shown in Figure 12 is an analogue to the expectation of life at birth. The expectation of life at birth is the average number of years that a person would live if he or she were born and then subject to the mortality risks that were present in that year.



	1997	1998	1999	2000	2001	2002	2003	2004
Male	41.28	40.47	39.83	38.69	37.71	36.90	36.08	35.61
Female	44.23	43.39	42.49	41.10	39.99	38.53	37.21	36.23

Figure 13. Number of Years Lived from the 15th Birthday Through the 65th Birthday, Among Those Alive on Their 15th Birthday by Sex: 1997-2004

We cannot calculate an expectation of life at birth since that requires information on mortality at all ages, and we are not considering people age 0-14 or people age 65 or older. This “temporary life expectation” between age 15 and 65, with a maximum of 50 years, looks at how many years out of the theoretical

maximum a person on average would live between age 15 and age 65 under the mortality conditions in South Africa at a given date. We also use this temporary life expectation later when we examine hypothetical mortality scenarios and their overall effect on survival by sex in South Africa.

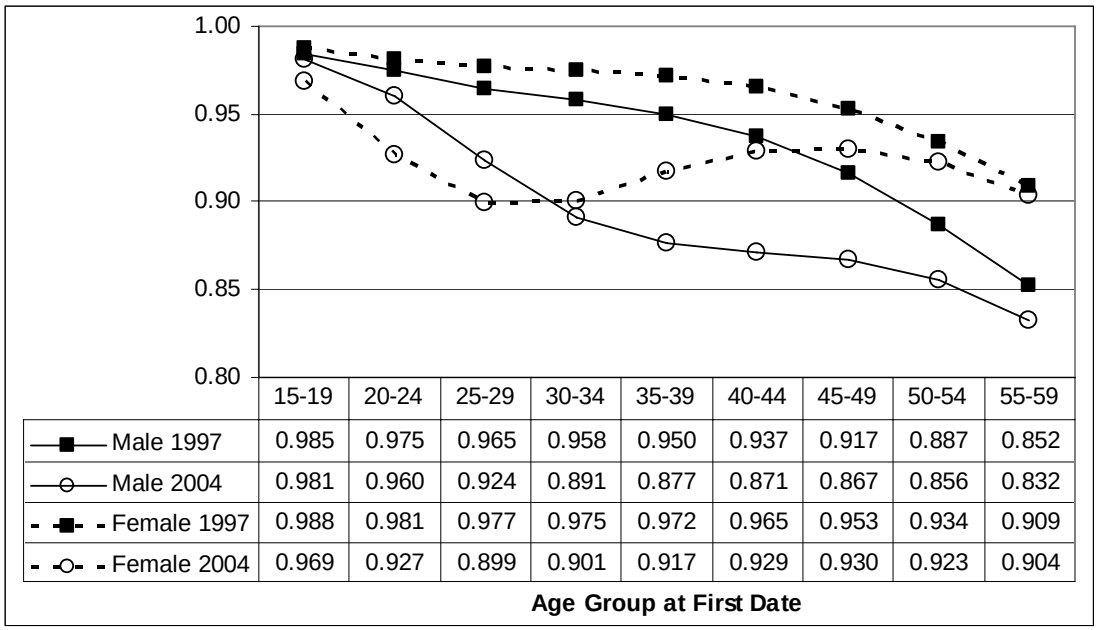
For each sex the number of years lived age 15-64 declined in each year 1997-2004. Female survival was better than male survival in every year, although the female advantage declined from almost three years in 1997 to less than one year in 2004.

The Chance of Living Five More Years, Under the Mortality Conditions in a Given Year

Figure 14 shows for each sex in 1997 and 2004, the chance of living five more years among people who are alive and in a given five-year age group in a given year. In demographic life table terms, Figure 13 shows ${}_5L_{x+5}/{}_5L_x$. For example, for females age 30-34 in 1997, 97.2% of them will be alive five years later, when they will be in the 35-39 age group, assuming the mortality conditions in 1997.

The kind of calculation in Figure 14 looks not at survival from a given age, such as age 15, to a later age such as 20, 45 or 65. Rather it considers for those who are alive at a given age (no matter what proportion survived to that age), what the probability is of subsequent survival for five more years.

The values shown in Figure 11 have to decrease with each successively older age. This is because Figure 11 showed survivors to a given age from 100,000 people alive at age 15. Once people had died in their twenties, they couldn't return to life in their thirties. In Figure 14, since we are looking at the proportion surviving five years in the future among those alive in a given age group, the values can rise as well as fall. Figure 14 shows that for females in 2004, among those 30-34, only 90% would survive five years to the 35-39 age group (under the mortality conditions in 2004). However, for those alive in the 35-39 age group, 92% would survive five years to the 40-44 age group.



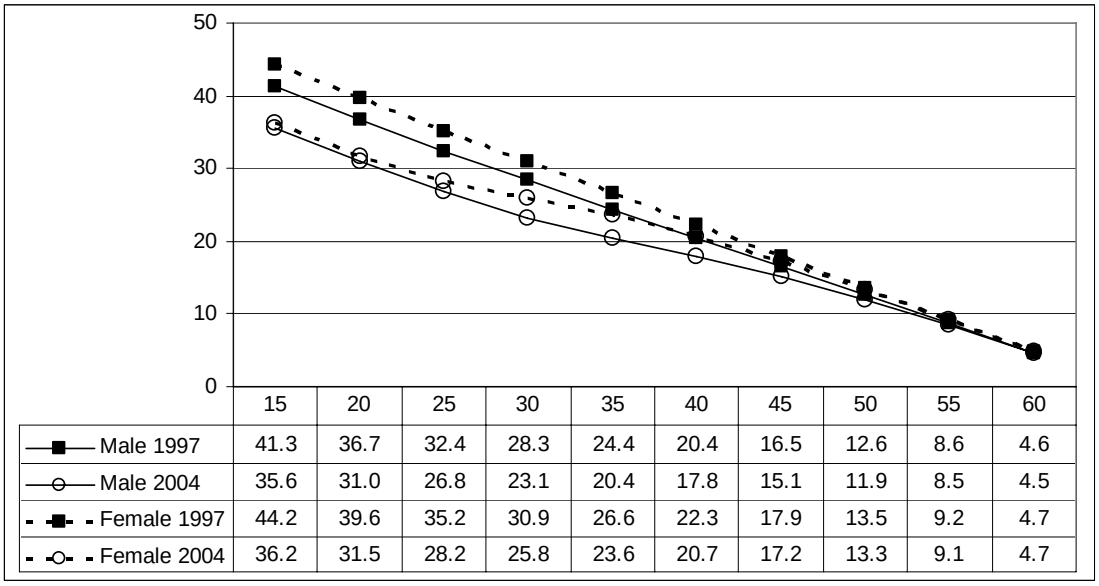
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59
Male 1997	0.985	0.975	0.965	0.958	0.950	0.937	0.917	0.887	0.852
Male 2004	0.981	0.960	0.924	0.891	0.877	0.871	0.867	0.856	0.832
Female 1997	0.988	0.981	0.977	0.975	0.972	0.965	0.953	0.934	0.909
Female 2004	0.969	0.927	0.899	0.901	0.917	0.929	0.930	0.923	0.904

Figure 14. Among People in a Given Age Group, the Proportion Alive Five Years Later by Sex: 1997 and 2004

The measure shown in Figure 14 can be considered a conditional probability of survival – the probability of surviving to a subsequent age interval, given you have already survived to a certain age interval. This is the kind of question asked when people are planning a population projection: What proportion of those age 40-44 in 2001 will be alive (and age 45-49) in 2006?

At all ages, the conditional survival probability was best for females in 1997. In 1997, conditional survival for males was much lower from every age group, and in 1997 the gap between males and females increased with age. Also, in 1997, for each sex, the chance of surviving five more years declined with every successively older age group. This is the pattern that is usually found in the world.

In 2004, for males, the probability of surviving for five more years also declined with each successively older age group. For females in 2004, the chance of surviving five more years from the 25-29, the 30-34, and the 35-39 age groups was lower than for the 40-54 age groups. If a woman survived to the 45-49 age group under the 2004 mortality conditions, her chance of surviving five more years was almost as high as it had been in 1997. In fact, for females, in 1997, 81% of those alive in the 45-49 age group would have survived to the 60-64 age group – by 2004, the proportion surviving from the 45-49 to the 60-64 age group had declined only slightly to 78%. In 2004, below age 30, males had a higher probability of surviving five more years than females, but above age 30, females had a higher probability of survival five more years than males.



	15	20	25	30	35	40	45	50	55	60
Male 1997	41.3	36.7	32.4	28.3	24.4	20.4	16.5	12.6	8.6	4.6
Male 2004	35.6	31.0	26.8	23.1	20.4	17.8	15.1	11.9	8.5	4.5
Female 1997	44.2	39.6	35.2	30.9	26.6	22.3	17.9	13.5	9.2	4.7
Female 2004	36.2	31.5	28.2	25.8	23.6	20.7	17.2	13.3	9.1	4.7

Figure 15. For People Alive at a Given Birthday, the Average Number of Years They Will Live Between that Birthday and the 65th Birthday by Sex: 1997 and 2004

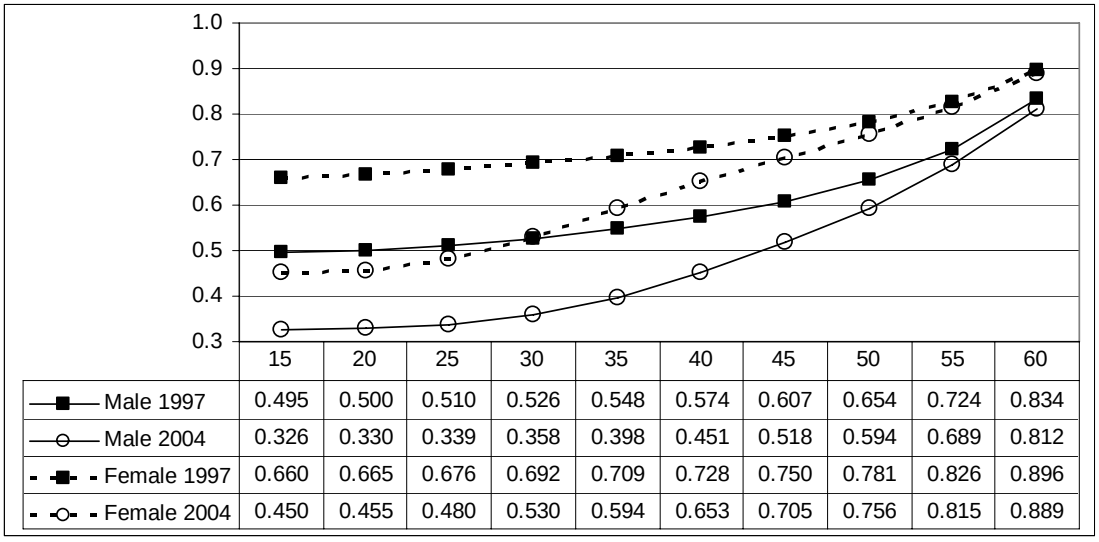
Figure 15 looks at survival in yet another way. It shows for people alive at a given age the number of years they could expect o live between that age and their 65th birthday. For example, those alive on their 30th birthday could live at most 35 years between that age and their 65th birthday. In 1997, males alive on their 30th birthday could expect to live 28.3 years before their 65th birthday. In 2004, males on their 30th birthday could expect to live 23.1 years before their 65th birthday. . In demographic life table terms, Figure 15 shows $(T_x-T_{65})/l_x$.

For each sex and at every age, the number of years lived before the 65th

birthday declined between 1997 and 2004, except for females age 60, for whom there was no change. Also in both 1997 and 2004, females at each age could expect to live more years before their 65th birthday than could males of the same age in the same year. Even in 2004, a female at age 20 could expect to live ½ year more before age 65 than could a male at age 20.

It also is clear in Figure 15 that if a female survived to age 45, her subsequent survival chances were not much worse in 2004 than they were in 1997. As noted earlier, person on their 15th birthday could live at most 50 years to age 65. A person alive on their 50th birthday could live at most 15 years to age 65.

Figure 16 shows for people alive on a given birthday, the proportion who will survive to age 65, given the mortality conditions in the given year. In demographic life table terms, Figure 16 shows l_{65}/l_x.



	15	20	25	30	35	40	45	50	55	60
Male 1997	0.495	0.500	0.510	0.526	0.548	0.574	0.607	0.654	0.724	0.834
Male 2004	0.326	0.330	0.339	0.358	0.398	0.451	0.518	0.594	0.689	0.812
Female 1997	0.660	0.665	0.676	0.692	0.709	0.728	0.750	0.781	0.826	0.896
Female 2004	0.450	0.455	0.480	0.530	0.594	0.653	0.705	0.756	0.815	0.889

Figure 16. Proportion Alive on a Given Birthday Who Survive to Their 65th Birthday by Sex: 1997 and 2004

Figure 11 showed that between 1997 and 2004, the percent of females who survived from age 15 to age 45 declined from 88% to 64%. However, we see from Figure 16 that for those females who survived to age 45, the percent who then survived to age 65 declined only from 75% to 71% between 1997 and 2004.

We also see in Figure 16 the proportion surviving from a given age to age 65 declined somewhat between 1997 and 2004 for each sex. However, at both dates, females had substantially higher chances of surviving to age 65 from every age than did males.

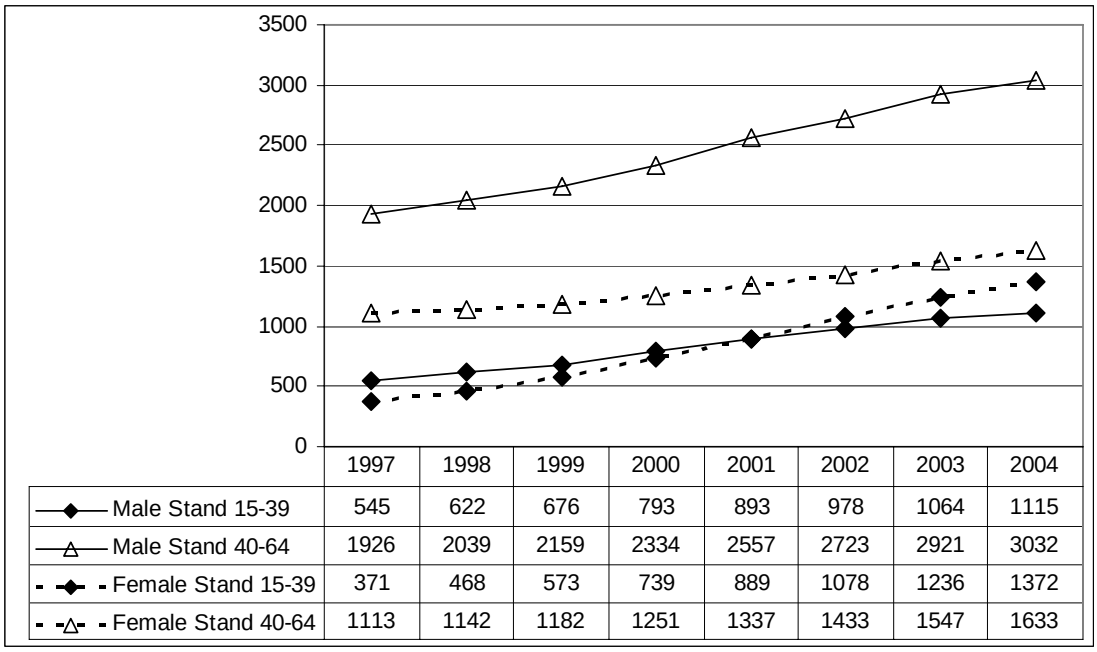
Even in 2004, while 45% of females who were alive on their 15th birthday survived to age 65, this was only true of 33% of males who were alive on their 15th birthday. The gap between the sexes in survival to age 65 is especially large in 2004 for those age 40. While 65% of females who live to age 40 will survive to age 65, this is only true of 45% of males who survive to age 40. Thus, despite the justifiable concern with elevated female mortality in their twenties through forties, survival to a fairly advanced age remains a more serious problem for males than females.

Looking at Younger and Older Adults: Those Age 15-39 and Those Age 40-64

It is clear in the figures that we have already examined that the pattern of increase in mortality is very different for younger adults than for older adults and that the relation between male death rates and female death rates also differs according to the age range considered. In this section we divide the 15-64 50-year age span into two 25-year segments, those age 15-39 and those 40-64.

Besides being a convenient division, these two segments encompass very different stages of the life cycle. The 15-39 age range includes the completion of education and establishment of a career. For most women it includes all of their childbearing. It is the family formation part of the life cycle. The 40-64 age range encompasses the mature career and preparation for retirement. It often includes grandparenthood.

Just as Figure 10 showed age-standardised death rates by sex over the entire 15-64 age range, we can calculate by sex age-standardised death rates separately for the 15-39 age range and the 40-64 age range. In each of these age ranges we calculate for the given sex for a given year what the death rate in that age range would be if the group had the death rates by age and sex of the given year but had the age distribution that was present for the given sex in mid-year 2001.



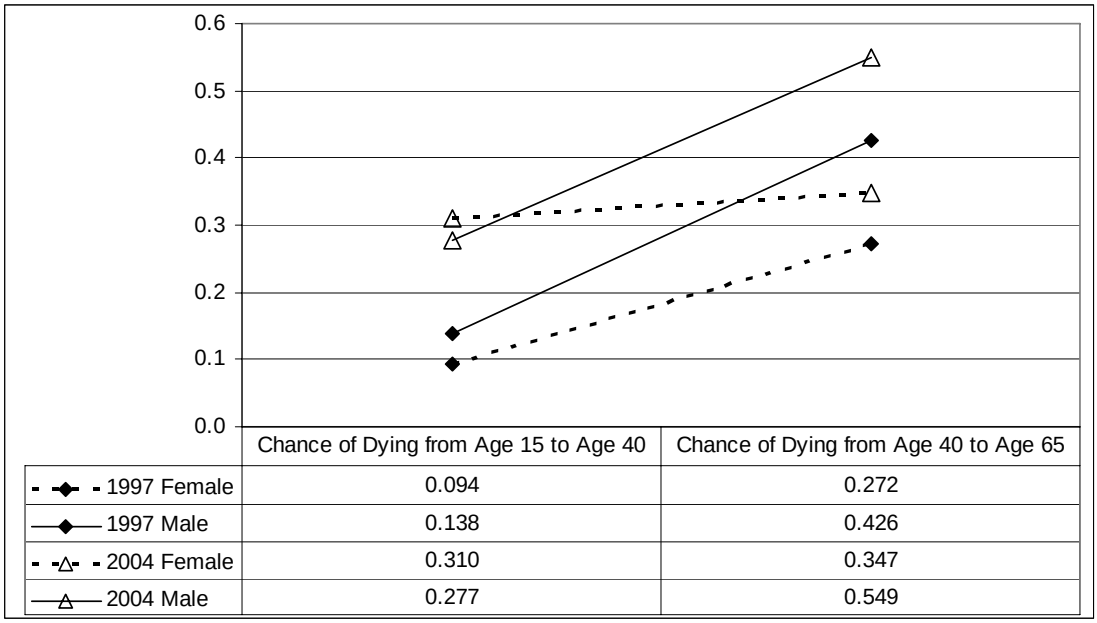
	1997	1998	1999	2000	2001	2002	2003	2004
Male Stand 15-39	545	622	676	793	893	978	1064	1115
Male Stand 40-64	1926	2039	2159	2334	2557	2723	2921	3032
Female Stand 15-39	371	468	573	739	889	1078	1236	1372
Female Stand 40-64	1113	1142	1182	1251	1337	1433	1547	1633

Figure 17. Age-Standardised Death Rates per 100,000 by Sex: Age 15-39 and Age 40-64: 1997-2004

Figure 17 shows age-standardised death rates by sex for the younger and older age ranges. Figure 17 makes even clearer some things that were apparent in earlier figures. For the younger age range, the male rate is higher than the female rate in 1997-2001, but in 2002-2004 the female rate is higher than the male rate. For the older age range, the male rate is always higher than the female rate, and the gap increases over time. The age-standardised rate for the older age range for either sex is always higher than for the younger age range for either sex, although for females the gap between the older and the younger age ranges becomes very small by 2004. In 1997, the age-standardised death rate for females 40-64 was 3.0 times that for females age 15-39, by 2004, the rate for the female older age segment was only 1.2

times that of the younger female age segment.

Figure 18 examines these two age segments in another way. It shows for each sex in 1997 and in 2004 the proportion of those who died between the beginning and the end of the younger adult age segment and the proportion who died between the beginning and the end of the older adult age segment, among those who were alive at the beginning of each age segment. In demographic life table terms, Figure 18 shows l_{40}/l_{15} by sex for the younger age range and shows l_{65}/l_{40} by sex for the older age range.



	Chance of Dying from Age 15 to Age 40	Chance of Dying from Age 40 to Age 65
1997 Female	0.094	0.272
1997 Male	0.138	0.426
2004 Female	0.310	0.347
2004 Male	0.277	0.549

Figure 18. Chance of Dying from 15th to 40th Birthday and from 40th to 65th Birthday by Sex: 1997 and 2004

We noted for Figure 11 that the proportion of females who survived from their 15th to their 40th birthday declined greatly between 1997 and 2004. This is seen in Figure 18 in the leftmost point being much higher for females in 2004 than for females in 1997. The lines for each sex in each year connect the chance of surviving from the beginning to the end of the younger age segment to the chance of surviving from the beginning to the end of the older age segment. The steep upward slant for females in 1997 and for males in both 1997 and 2004 shows a typical pattern of higher chances of death at older than at younger ages. Although the line for females in 2004 still slants upward, it is at an angle that is close to horizontal. This is because in 2004 for females survival through the younger age segment was only slightly better than survival through the older age segment.

Despite worsening younger female mortality between 1997 and 2004, the overall conclusion about which sex and which age segment had worse mortality is the same based on Figure 18 as it was based on Figure 17. In 2004, the highest chance of dying in a 25-year period was for males 40-65, the next highest was for females age 40-65, third came females age 15-40 and the lowest chance of dying in a 25-year period was for males 15-40.

It is possible that in the future the female chance of dying in the 15-40 age range could exceed that of females in the 40-65 age range. In 1997, females were 2.9 times as likely to die before their 65th birthday given they were alive on their 40th birthday than they were to die before their 40th birthday given they were alive on their

15th birthday. By 2004, they were only 1.1 times more likely to die in the older age range than in the younger age range.

There was also a narrowing of the morality differential between the younger age segment and the older age segment for males, although not as drastically as for females. In 1997, males were 3.1 times ore likely to die in the older age segment than in the younger age segment. By 2004, males were 2.0 times more likely to die in the older age segment than in the younger age segment.

Comments on All Cause Mortality

The increase in death rates between 1997 and 2004 in every age-sex group except males 15-19 is disturbing. The increase between 1997 and 2004 by more than three times in the death rates for females age 20-39, and the more than doubling of death rates for males age 30-44 in the same time period is alarming. In addition, the narrowing, and for some ages disappearance, of the traditional female survival advantage is disturbing.

There is some encouragement in the small mortality worsening for those under age 20 and those above age 55. In light of the large mortality increase for younger women, the much smaller increase for women over age 40 is also encouraging. Time will reveal whether mortality deterioration for females continues to mainly occur for those in their twenties and thirties, or whether large mortality deterioration will move up the age range as cohorts age. The loss of more than 4.5 years lived out of the 50 years possible between age 15 and 65 for males between 1997 and 2004 and the loss of 8 years of life for females between age 15 and 65 between 1997 and 2004 is a striking illustration of the extent of mortality increase for each sex.

Female survival from age 15 to ages 20-45 has dropped drastically since 1997. However, among those alive starting at any age, even age 15, females have a better chance of living to age 65 than do males. Also, even in 2004, mortality age 40-64 is worse for each sex than it is for either sex in the age range 15-39. However, while in 1997 males age 15-39 had higher mortality than females age 15-39, by 2004, female mortality in the younger age segment was higher than male mortality in the same age range. High mortality at the older ages, especially for males, remains a problem that should not be ignored.

NATURAL AND UNNATURAL CAUSE MORTALITY

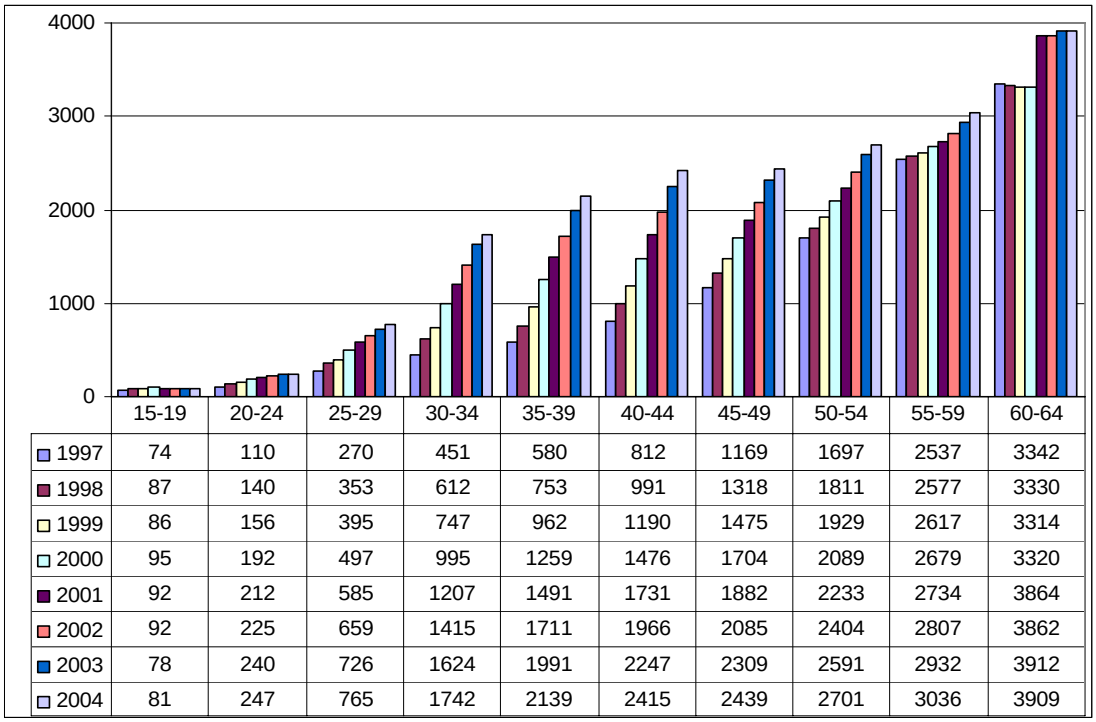
Next we examine the division of mortality into natural and unnatural causes of death. Natural causes include disease, whether infectious or not and whether acute or chronic. Unnatural causes are not naturally caused deaths. They are the result of intentional harm by others, intentional self-harm, or accidents. Natural causes of death are those in ICD-10 codes A00-R99, and unnatural causes of death are those in ICD-10 codes V01-Y89.

The division into natural and unnatural causes is important partly because the policies to decrease natural cause and unnatural cause mortality are quite different. To attack natural cause mortality requires things such as immunization programs, development of new drugs to treat diseases, health promotion campaigns to decrease smoking and improve diet and to encourage safe sex practices. To attack unnatural cause mortality involves promotion of safe driving practices and safe walking practices for pedestrians, policing programs to decrease homicide, help lines

to decrease suicides, and safer housing conditions to decrease fatal accidents.

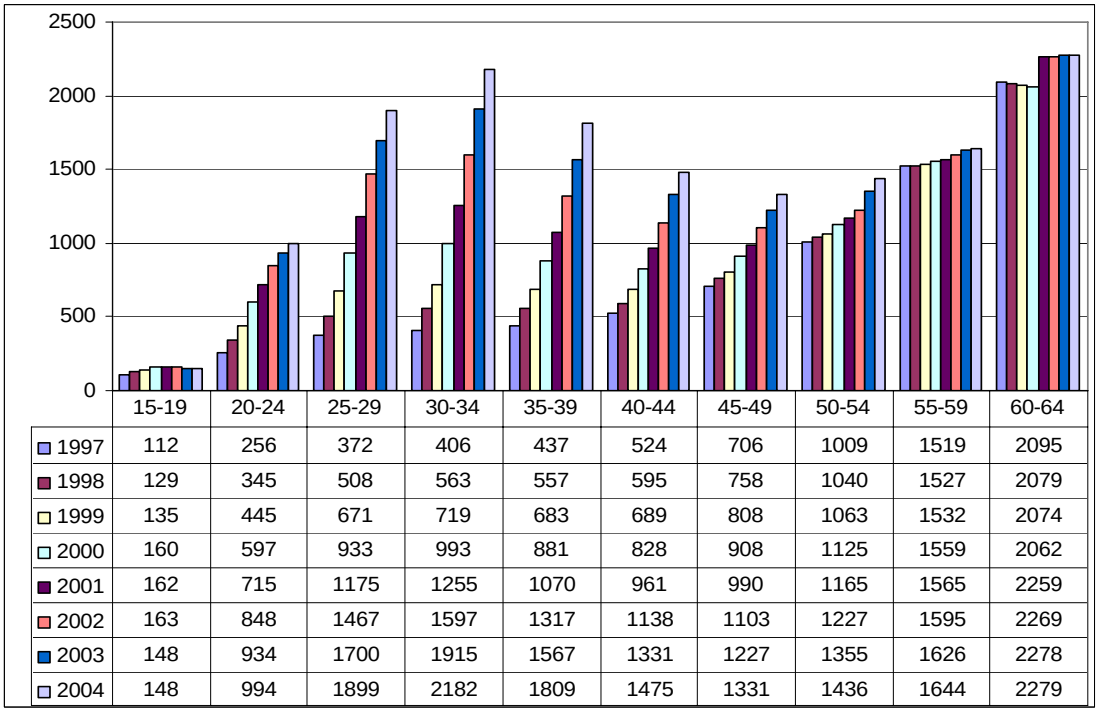
Natural Causes of Death

Figure 19 shows age-specific death rates from natural causes for males, and Figure 20 shows age-specific death rates from natural causes for females.



	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
1997	74	110	270	451	580	812	1169	1697	2537	3342
1998	87	140	353	612	753	991	1318	1811	2577	3330
1999	86	156	395	747	962	1190	1475	1929	2617	3314
2000	95	192	497	995	1259	1476	1704	2089	2679	3320
2001	92	212	585	1207	1491	1731	1882	2233	2734	3864
2002	92	225	659	1415	1711	1966	2085	2404	2807	3862
2003	78	240	726	1624	1991	2247	2309	2591	2932	3912
2004	81	247	765	1742	2139	2415	2439	2701	3036	3909

Figure 19. Male Death Rates by Age per 100,000 from Natural Causes: 1997-2004

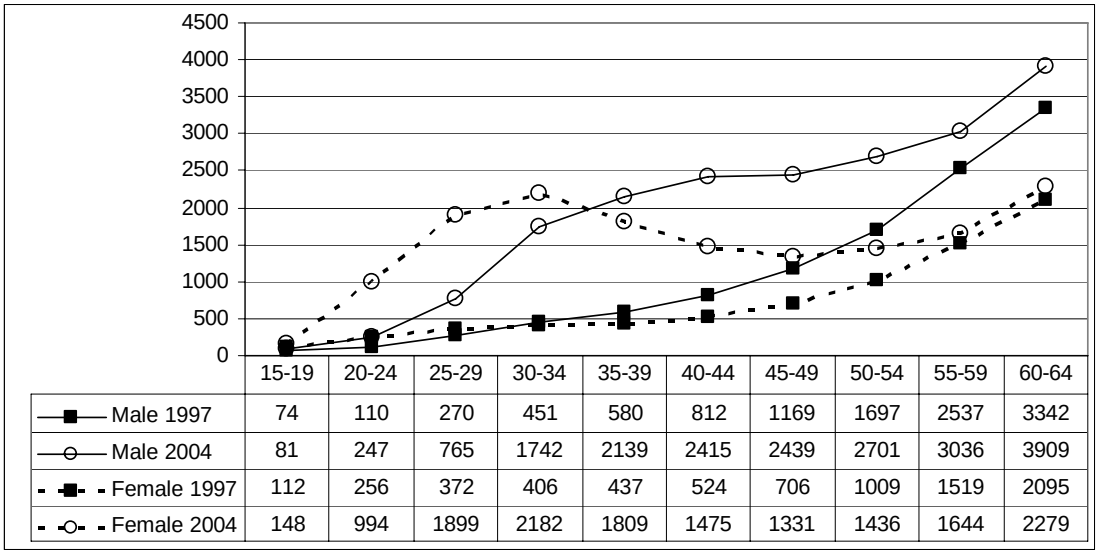


	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
1997	112	256	372	406	437	524	706	1009	1519	2095
1998	129	345	508	563	557	595	758	1040	1527	2079
1999	135	445	671	719	683	689	808	1063	1532	2074
2000	160	597	933	993	881	828	908	1125	1559	2062
2001	162	715	1175	1255	1070	961	990	1165	1565	2259
2002	163	848	1467	1597	1317	1138	1103	1227	1595	2269
2003	148	934	1700	1915	1567	1331	1227	1355	1626	2278
2004	148	994	1899	2182	1809	1475	1331	1436	1644	2279

Figure 20. Female Death Rates by Age per 100,000 from Natural Causes: 1997-2004

Death rates from natural causes increased in every year for each sex at every age except for those 15-19 and males 60-64. For each sex, for those age 60-64 there was little mortality increase after 2001.

Figure 21 shows age-specific death rates from natural causes by sex for 1997 and 2004. The highest death rates from natural causes occur for older males. The male death rates above age 55 in 1997 were higher than the female death rates age 30-34 in 2004. In 2004, the male rates above age 40 were higher than the female rate in every age group.



	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
Male 1997	74	110	270	451	580	812	1169	1697	2537	3342
Male 2004	81	247	765	1742	2139	2415	2439	2701	3036	3909
Female 1997	112	256	372	406	437	524	706	1009	1519	2095
Female 2004	148	994	1899	2182	1809	1475	1331	1436	1644	2279

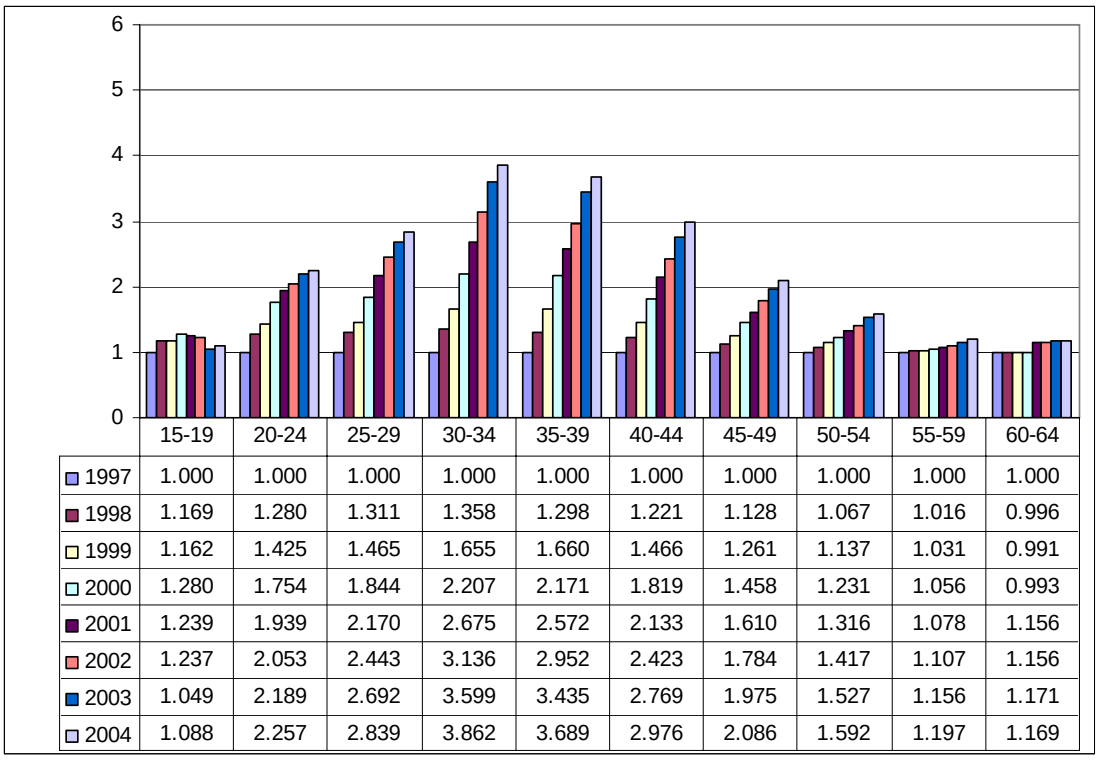
Figure 21. Death Rates by Age and Sex per 100,000 from Natural Causes: 1997 and 2004

The most striking feature of Figure 21 is the sharp increase in female death rates in 2004 to the 30-34 age group followed by a decline in death rates through the 45-49 age group. The male death rate in 2004 increases with every successively older age, although the pace of increase slows between age 40 and 54.

Figure 22 shows male death rates from natural causes relative to the value for males of the given age in 1997, and Figure 23 shows similar information for females. The rapid increase in death rates from natural causes for males and females age 20-54 is clear.

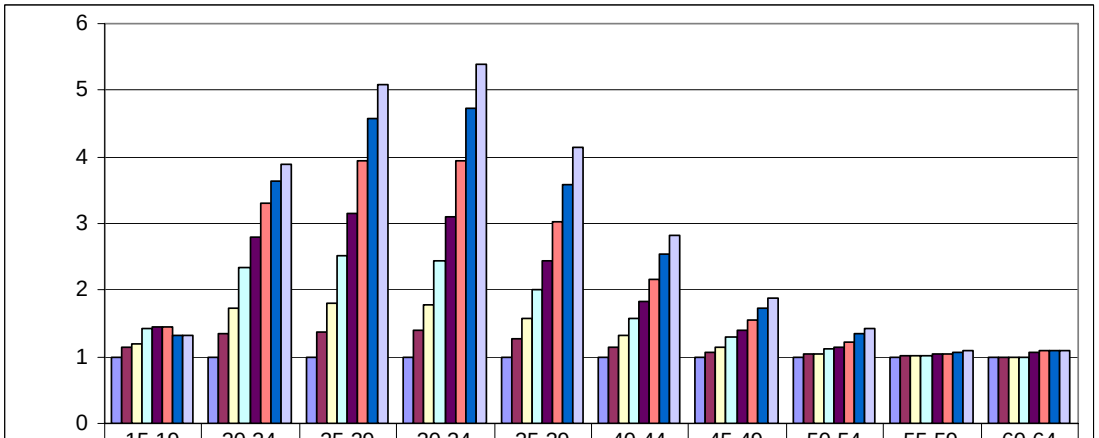
Figure 22 looks similar to Figure 5, although the increases shown in Figure 22 are more extreme. The largest increase in Figure 5 (for all cause mortality) was for males age 35-39 in 2004, whose death rate in 2004 was 2.7 times its value in 1997; when death rates only from natural causes are considered, the 2004 rate is 3.7 times its 1997 value.

Figure 23 looks similar to Figure 6, but again the increases in Figure 23 (when only natural cause mortality is considered) are larger than when all cause mortality is examined. The largest value in Figure 6 is 4.636, which is found for females age 30-34 in 2004; the largest value in Figure 23 (for natural cause mortality) is for females age 30-34 in 2004. That value is 5.380, and the value for females age 25-29 in 2004 is only slightly lower at 5.097.



	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
1997	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1998	1.169	1.280	1.311	1.358	1.298	1.221	1.128	1.067	1.016	0.996
1999	1.162	1.425	1.465	1.655	1.660	1.466	1.261	1.137	1.031	0.991
2000	1.280	1.754	1.844	2.207	2.171	1.819	1.458	1.231	1.056	0.993
2001	1.239	1.939	2.170	2.675	2.572	2.133	1.610	1.316	1.078	1.156
2002	1.237	2.053	2.443	3.136	2.952	2.423	1.784	1.417	1.107	1.156
2003	1.049	2.189	2.692	3.599	3.435	2.769	1.975	1.527	1.156	1.171
2004	1.088	2.257	2.839	3.862	3.689	2.976	2.086	1.592	1.197	1.169

Figure 22. Male Death Rates from Natural Causes by Age Relative to Value by Age in 1997 (1997 Value=1.00): 1997-2004

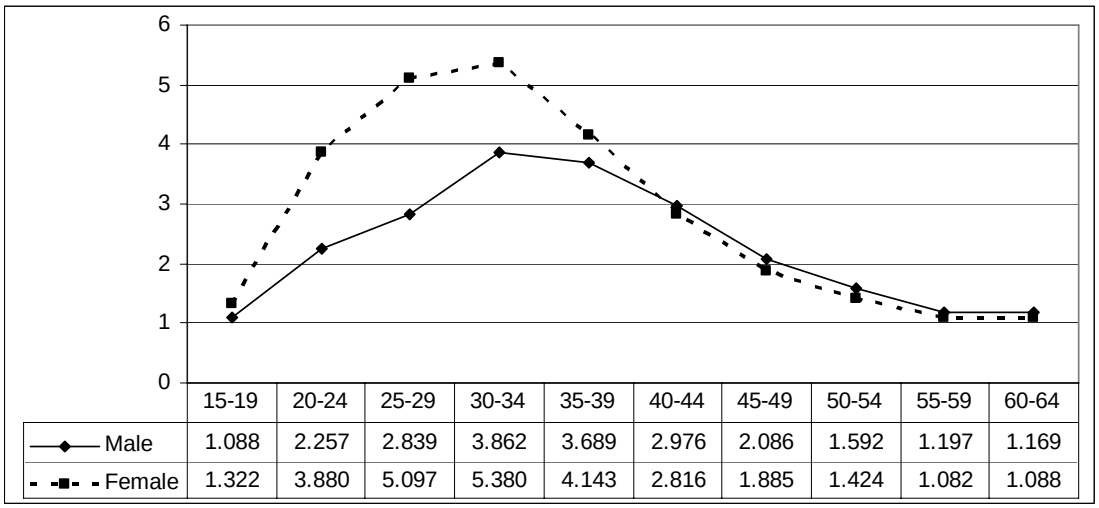


	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
1997	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1998	1.152	1.346	1.363	1.388	1.277	1.135	1.073	1.031	1.006	0.992
1999	1.208	1.736	1.802	1.772	1.565	1.315	1.144	1.054	1.008	0.990
2000	1.425	2.331	2.505	2.448	2.019	1.580	1.286	1.115	1.026	0.985
2001	1.448	2.791	3.156	3.093	2.450	1.833	1.402	1.154	1.031	1.079
2002	1.452	3.308	3.937	3.936	3.016	2.171	1.561	1.216	1.050	1.083
2003	1.322	3.646	4.565	4.721	3.589	2.540	1.738	1.343	1.071	1.088
2004	1.322	3.880	5.097	5.380	4.143	2.816	1.885	1.424	1.082	1.088

Figure 23. Female Death Rates from Natural Causes Relative to Value by Age in 1997 (1997 Value=1.00): 1997-2004

Figure 24 shows the same information as in Figures 22 and 23 but for 2004 relative to the 1997 value and for both sexes. Figure 24 looks similar to Figure 7

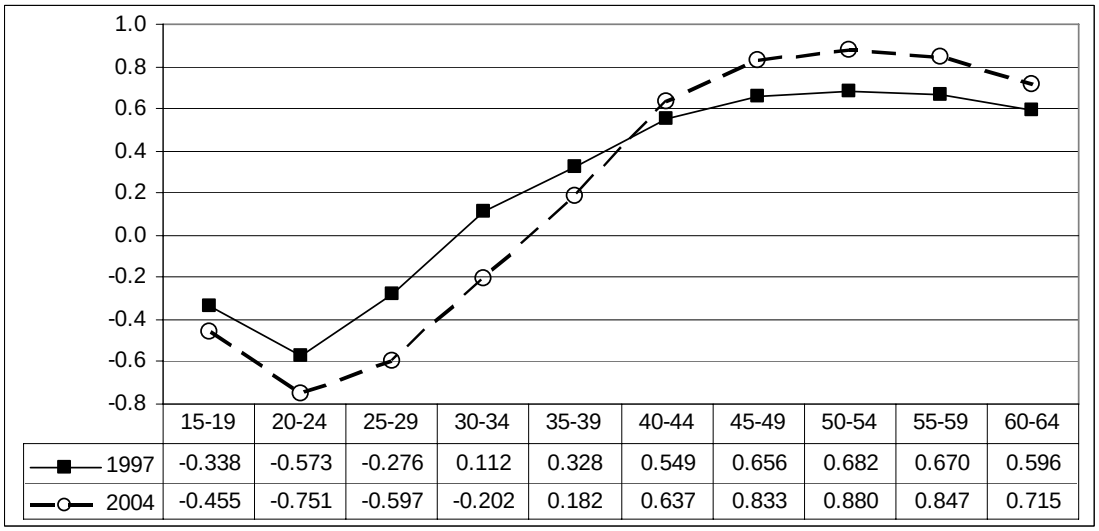
which considered the death rate in 2004 relative to 1997 for all cause mortality. As for all cause mortality, the increases are largest for those age 20-44 and especially for females. As for all cause mortality, above age 40 the percent increase in the death rate for females between 1997 and 2004 was less than for males.



	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
Male	1.088	2.257	2.839	3.862	3.689	2.976	2.086	1.592	1.197	1.169
Female	1.322	3.880	5.097	5.380	4.143	2.816	1.885	1.424	1.082	1.088

Figure 24. Death Rates from Natural Causes by Sex in 2004 Relative to Value by Age and Sex in 1997 (1997 Value=1.00)

Figure 25 shows the sex differential in mortality from natural causes in 1997 and 2004. It graphs the proportion by which the male death rate from natural causes by age exceeds (or falls short of) the female rate from natural causes. In Figure 25, a value above zero means that the male rate was higher than the female rate; a value less than zero means that the female rate was higher than the male rate.



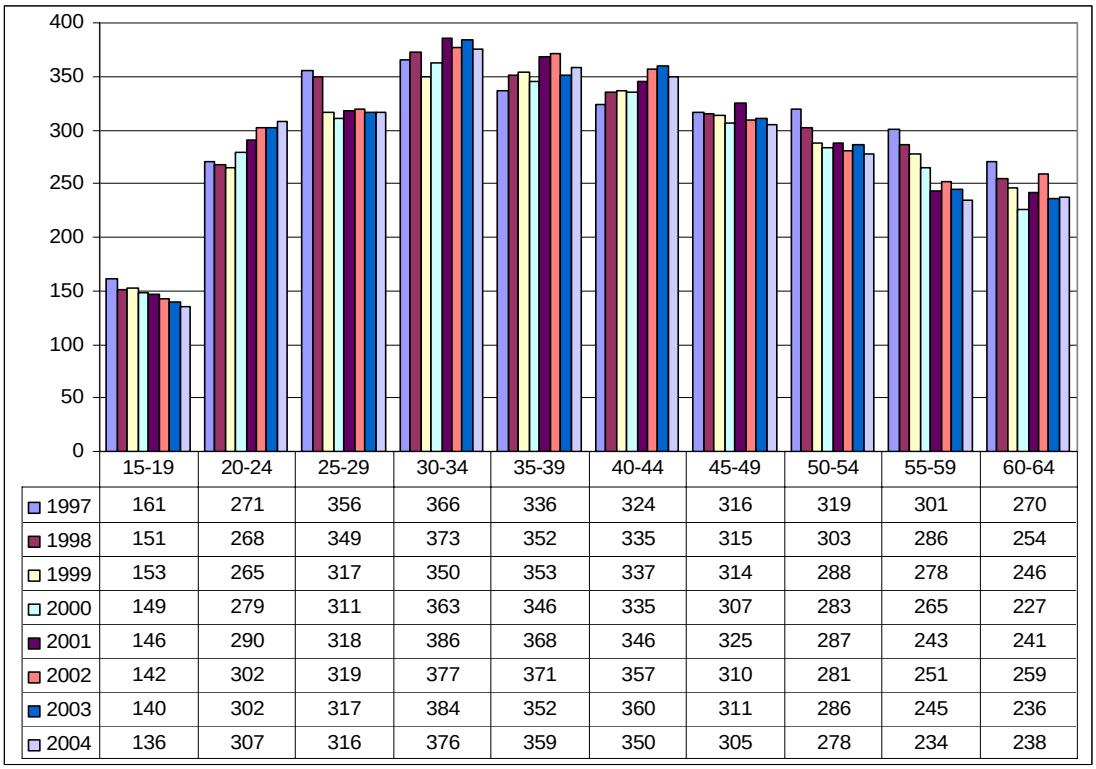
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
1997	-0.338	-0.573	-0.276	0.112	0.328	0.549	0.656	0.682	0.670	0.596
2004	-0.455	-0.751	-0.597	-0.202	0.182	0.637	0.833	0.880	0.847	0.715

Figure 25. Proportion by Which the Male Death Rate from Natural Causes Exceeds or Falls Short of the Female Death Rate from Natural Causes ((MaleDR-Female DR)/FemaleDR): 1997 and 2004

In Figure 25 we see that in both 1997 and 2004, the female death rate from natural causes was higher than the male rate at ages 15-24. In both years above age 25, the male rate was higher than the female rate. Above age 40, the male death rate from natural causes exceeded the female rate by a larger percent in 2004 than in 1997.

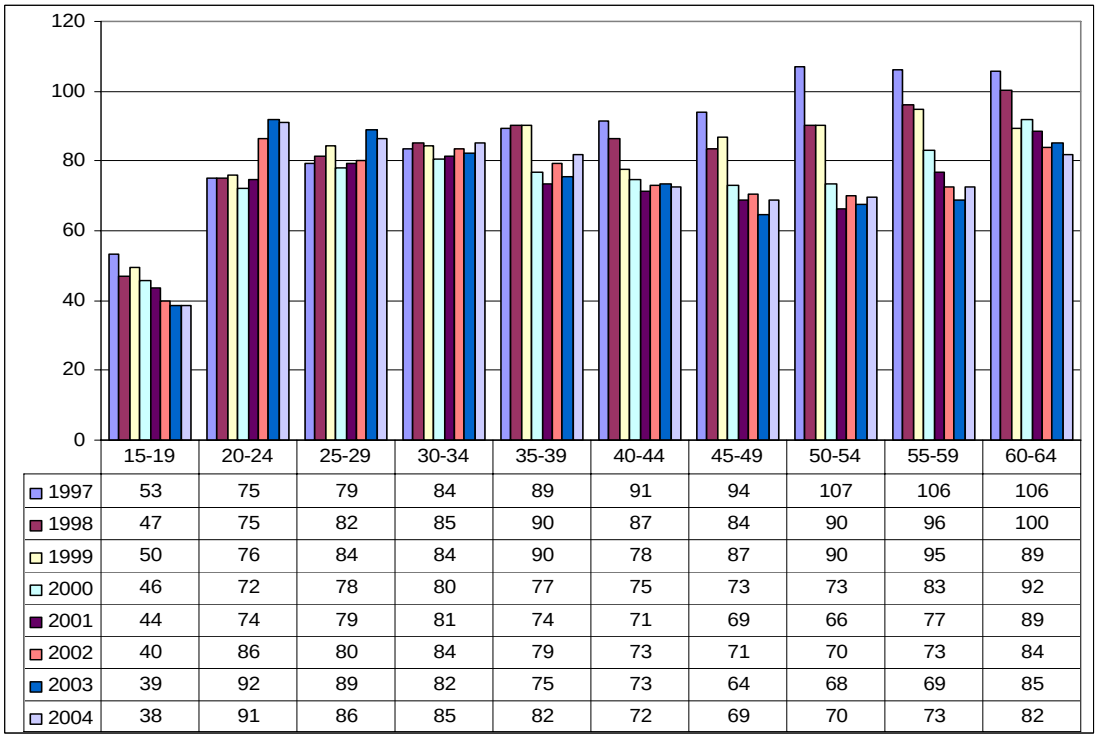
Unnatural Causes of Death

When we look at mortality from unnatural causes, the picture is very different than for natural causes. Figure 26 shows age-specific death rates from unnatural causes for males, and Figure 27 shows similar information for females.



	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
1997	161	271	356	366	336	324	316	319	301	270
1998	151	268	349	373	352	335	315	303	286	254
1999	153	265	317	350	353	337	314	288	278	246
2000	149	279	311	363	346	335	307	283	265	227
2001	146	290	318	386	368	346	325	287	243	241
2002	142	302	319	377	371	357	310	281	251	259
2003	140	302	317	384	352	360	311	286	245	236
2004	136	307	316	376	359	350	305	278	234	238

Figure 26. Male Death Rates by Age per 100,000 from Unnatural Causes: 1997-2004

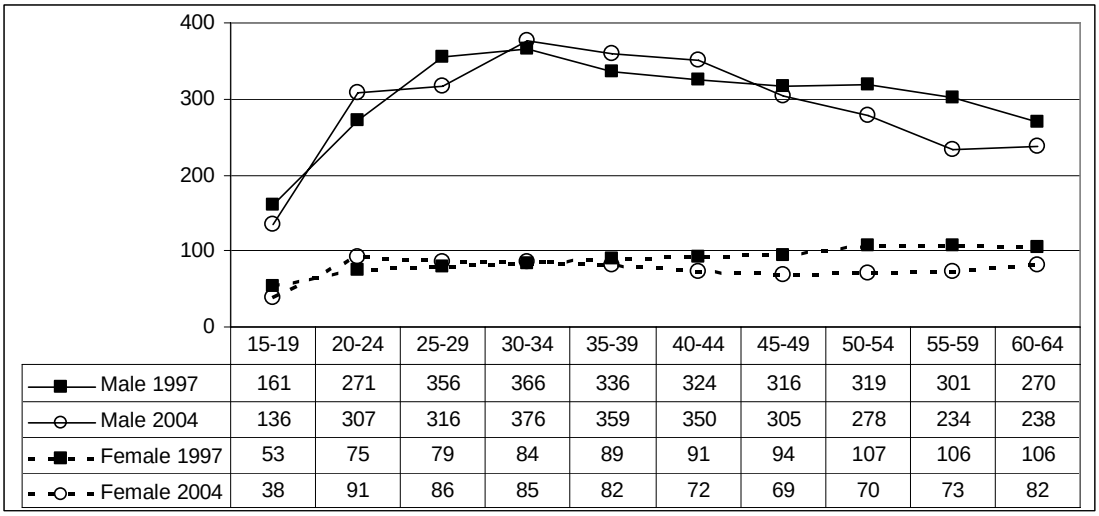


	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
1997	53	75	79	84	89	91	94	107	106	106
1998	47	75	82	85	90	87	84	90	96	100
1999	50	76	84	84	90	78	87	90	95	89
2000	46	72	78	80	77	75	73	73	83	92
2001	44	74	79	81	74	71	69	66	77	89
2002	40	86	80	84	79	73	71	70	73	84
2003	39	92	89	82	75	73	64	68	69	85
2004	38	91	86	85	82	72	69	70	73	82

Figure 27. Female Death Rates by Age per 100,000 from Unnatural Causes: 1997-2004

In Figures 26 and 27 we do not see the steady rise in death rates over time that we saw for all cause mortality and for natural cause mortality. For most age-sex groups unnatural cause death rates declined over time; for other age-sex groups, there were modest increases. In many countries death rates from unnatural causes are high for young men, due to their tendency to engage in risky behaviour. At the older ages unnatural mortality is usually mainly from accidents.

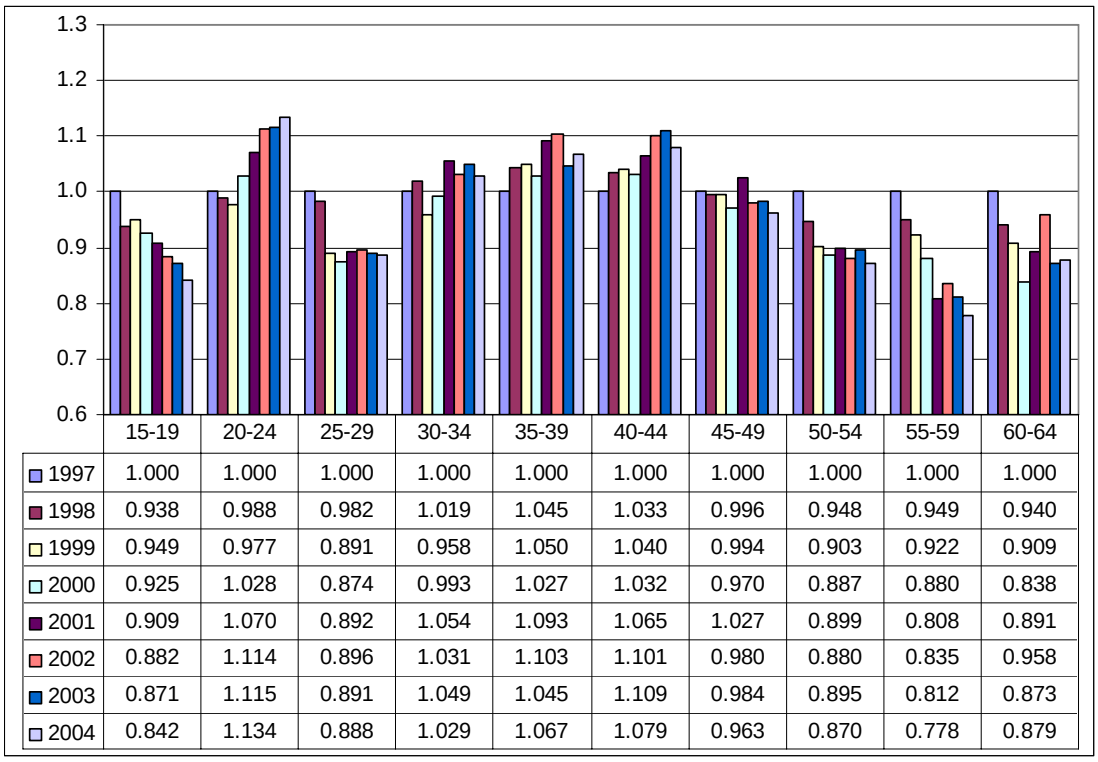
Figure 28 shows age-specific death rates from unnatural causes by sex for 1997 and 2004. As in most countries, male unnatural cause death rates are much higher than female unnatural cause death rates.



	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
Male 1997	161	271	356	366	336	324	316	319	301	270
Male 2004	136	307	316	376	359	350	305	278	234	238
Female 1997	53	75	79	84	89	91	94	107	106	106
Female 2004	38	91	86	85	82	72	69	70	73	82

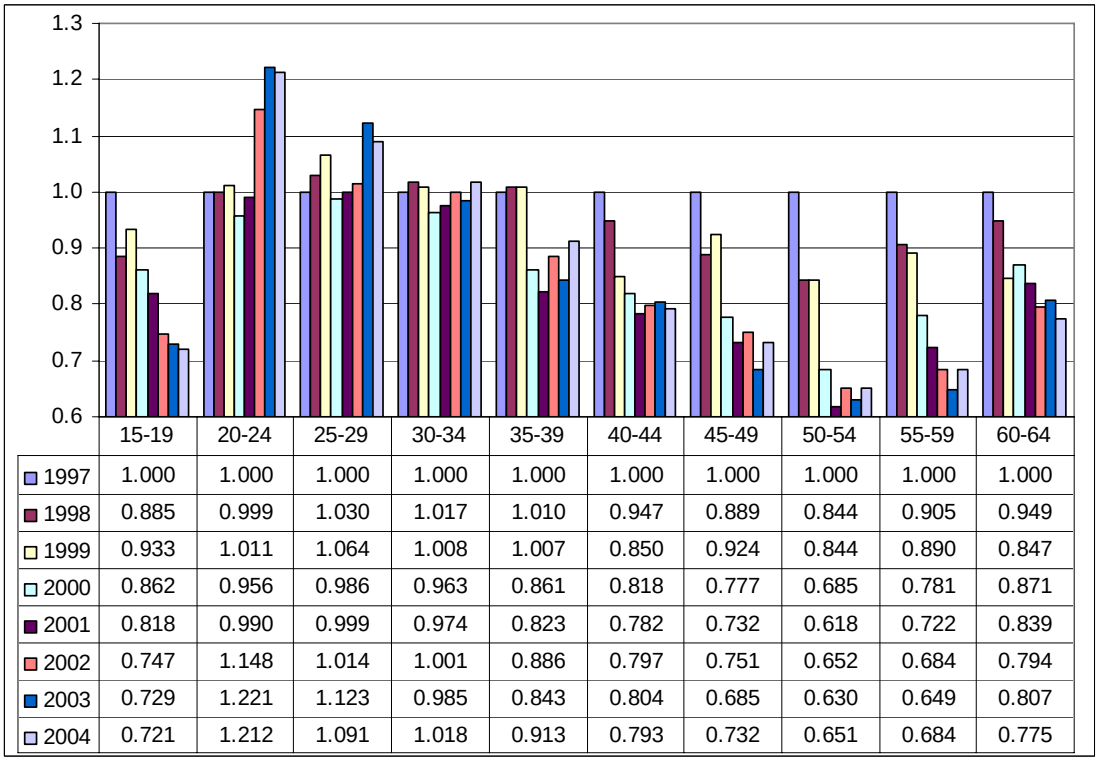
Figure 28. Death Rates per 100,000 from Unnatural Causes by Age and Sex: 1997 and 2004

While the age profile of unnatural death rates for females is almost horizontal, for males there is a distinct pattern of increase in unnatural cause death rates until the twenties or the thirties and then moderate declines with age. For each sex, over time the rates increased slightly at some ages and decreased at other ages. Figure 29 shows male death rates from unnatural causes relative to the value for 1997, and Figure 30 shows similar information for females.



	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
1997	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1998	0.938	0.988	0.982	1.019	1.045	1.033	0.996	0.948	0.949	0.940
1999	0.949	0.977	0.891	0.958	1.050	1.040	0.994	0.903	0.922	0.909
2000	0.925	1.028	0.874	0.993	1.027	1.032	0.970	0.887	0.880	0.838
2001	0.909	1.070	0.892	1.054	1.093	1.065	1.027	0.899	0.808	0.891
2002	0.882	1.114	0.896	1.031	1.103	1.101	0.980	0.880	0.835	0.958
2003	0.871	1.115	0.891	1.049	1.045	1.109	0.984	0.895	0.812	0.873
2004	0.842	1.134	0.888	1.029	1.067	1.079	0.963	0.870	0.778	0.879

Figure 29. Male Death Rates from Unnatural Causes Relative to Value by Age in 1997 (1997 Value=1.00): 1997-2004

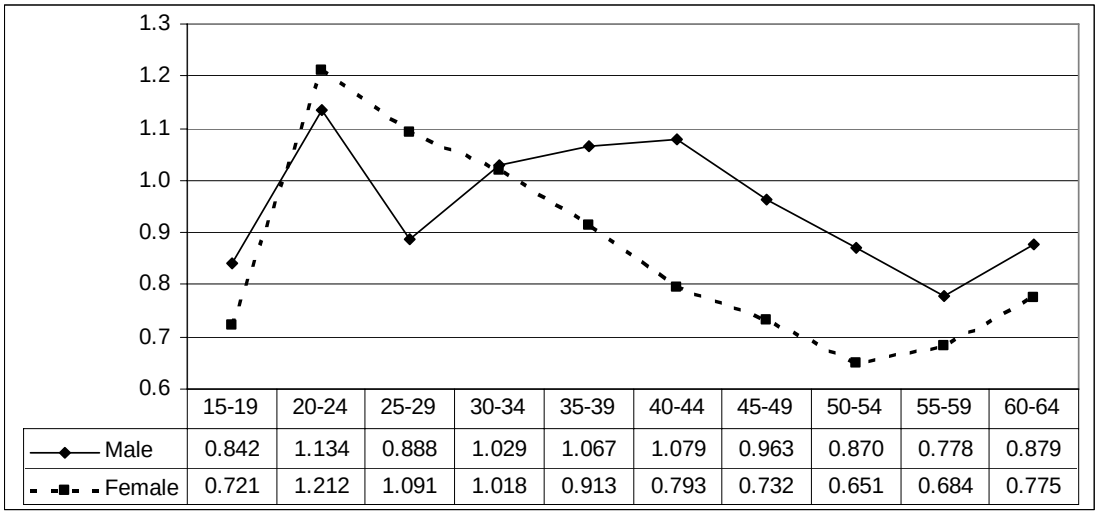


	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
1997	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1998	0.885	0.999	1.030	1.017	1.010	0.947	0.889	0.844	0.905	0.949
1999	0.933	1.011	1.064	1.008	1.007	0.850	0.924	0.844	0.890	0.847
2000	0.862	0.956	0.986	0.963	0.861	0.818	0.777	0.685	0.781	0.871
2001	0.818	0.990	0.999	0.974	0.823	0.782	0.732	0.618	0.722	0.839
2002	0.747	1.148	1.014	1.001	0.886	0.797	0.751	0.652	0.684	0.794
2003	0.729	1.221	1.123	0.985	0.843	0.804	0.685	0.630	0.649	0.807
2004	0.721	1.212	1.091	1.018	0.913	0.793	0.732	0.651	0.684	0.775

Figure 30. Female Death Rates from Unnatural Causes by Age Relative to Value by Age in 1997 (1997 Value=1.00): 1997-2004

Figure 31 shows similar information to that in Figures 29 and 30 but only for 2004 relative to 1997 and for both sexes. Males age 25-29 had a relatively high death rate from unnatural causes, but it declined by more than 11% between 1997

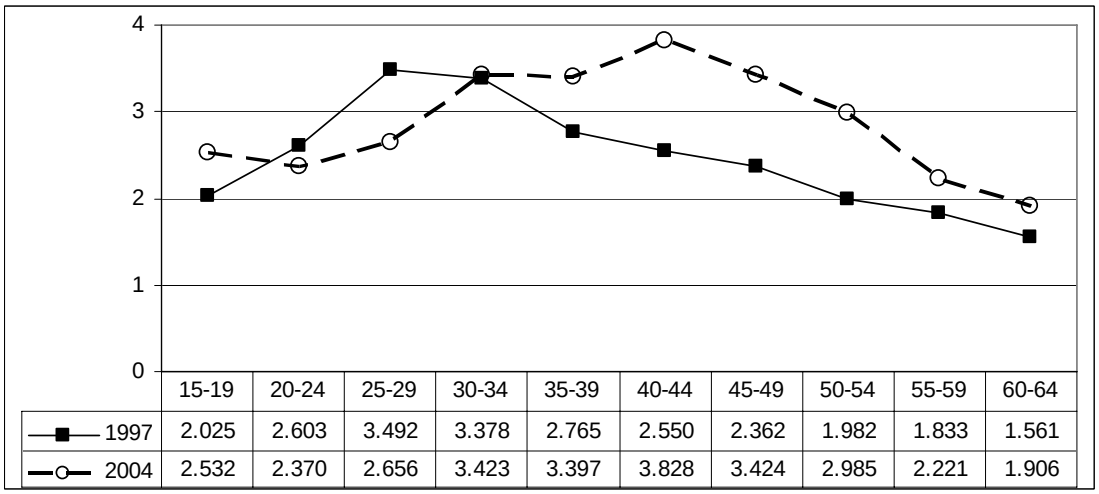
and 2004. The decline in the unnatural cause death rate for the 15-19 age group for each sex is an encouraging trend. Perhaps teenagers have begun to engage in less risky behaviour. For each sex at older ages, unnatural death rates declined substantially. This is likely due to a decrease in fatal accidents above age 50 for males and above age 40 for females, which is also an encouraging trend.



	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
Male	0.842	1.134	0.888	1.029	1.067	1.079	0.963	0.870	0.778	0.879
Female	0.721	1.212	1.091	1.018	0.913	0.793	0.732	0.651	0.684	0.775

Figure 31. Death Rates from Unnatural Causes in 2004 by Sex Relative to Value by Age and Sex in 1997 (1997 Value=1.00)

For each sex, the unnatural cause death rate increased in the 20-24 age group between 1997 and 2004, by 13% for males and by 12% for females. For each sex the increase at age 20-24 was a larger proportionate increase than for any other age group. At this time, it is not clear what the cause of these increases might be. If these kinds of increases in death rates for people in their early twenties were seen for some other causes, some people might have interpreted unnatural cause deaths them as a hidden source of HIV mortality, which is very unlikely.



	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
1997	2.025	2.603	3.492	3.378	2.765	2.550	2.362	1.982	1.833	1.561
2004	2.532	2.370	2.656	3.423	3.397	3.828	3.424	2.985	2.221	1.906

Figure 32. Proportion by Which the Male Death Rates from Unnatural Causes Exceeds or Falls Short of the Female Death Rate from Unnatural Causes ((MaleDR-FemaleDR)/FemaleDR): 1997 and 2004

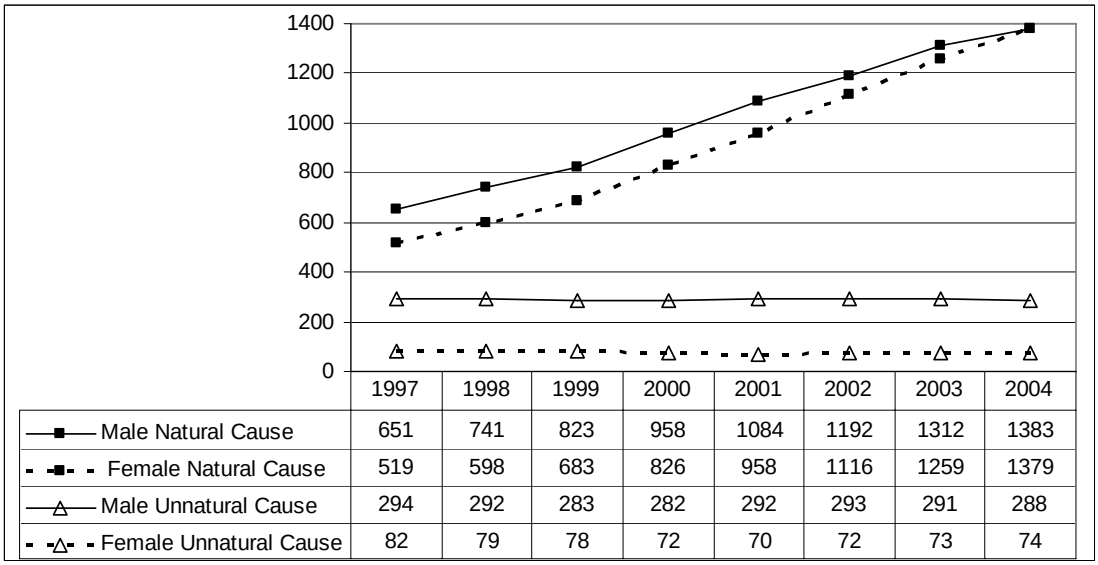
Figure 32 shows for 1997 and 2004 the proportion by which the male death rate from unnatural causes exceeded (or fell short) of the female death rate from unnatural causes. In both years, at every age the male death rate from unnatural

causes was much higher than the female death rate from unnatural causes. The smallest percent differential was for age 60-64 in 1997, for which the male rate exceeded the female rate by 1.56 times. This means that the male rate was 2.58 the value of the female rate at that age. In 2004, the proportionate female advantage was somewhat less at ages 20-29 than it was in 1997, while at 15-19 and above age 35, the female advantage was greater in 2004 than in 1997.

Age-Standardised Death Rates from Natural and Unnatural Causes by Sex

Figure 33 shows the age-standardised death rates by sex from natural causes and from unnatural causes for those age 15-64. For each sex, while the age-standardised rate from natural causes increased rapidly over time, the age-standardised rate from unnatural causes declined slightly over time.

The male rate is higher than the female rate for both natural and unnatural causes, although by 2004, the female rate is very close to the male rate for natural causes. Figure 33 makes it clear that natural cause mortality has come to play an increasing role in the mortality of both males and females.



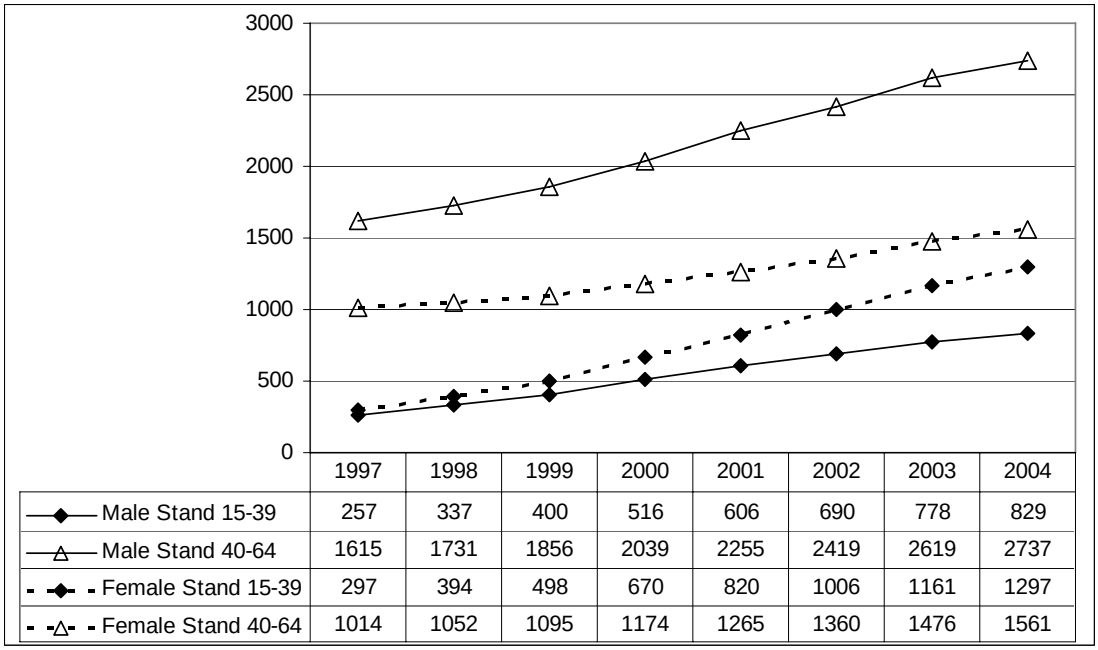
	1997	1998	1999	2000	2001	2002	2003	2004
Male Natural Cause	651	741	823	958	1084	1192	1312	1383
Female Natural Cause	519	598	683	826	958	1116	1259	1379
Male Unnatural Cause	294	292	283	282	292	293	291	288
Female Unnatural Cause	82	79	78	72	70	72	73	74

Figure 33. Age-Standardised Death Rates per 100,000 from Natural Causes and from Unnatural Causes by Sex, Age 15-64: 1997-2004

Looking at the Role of Natural and Unnatural Mortality on Younger and Older Adults: Those Age 15-39 and Those Age 40-64

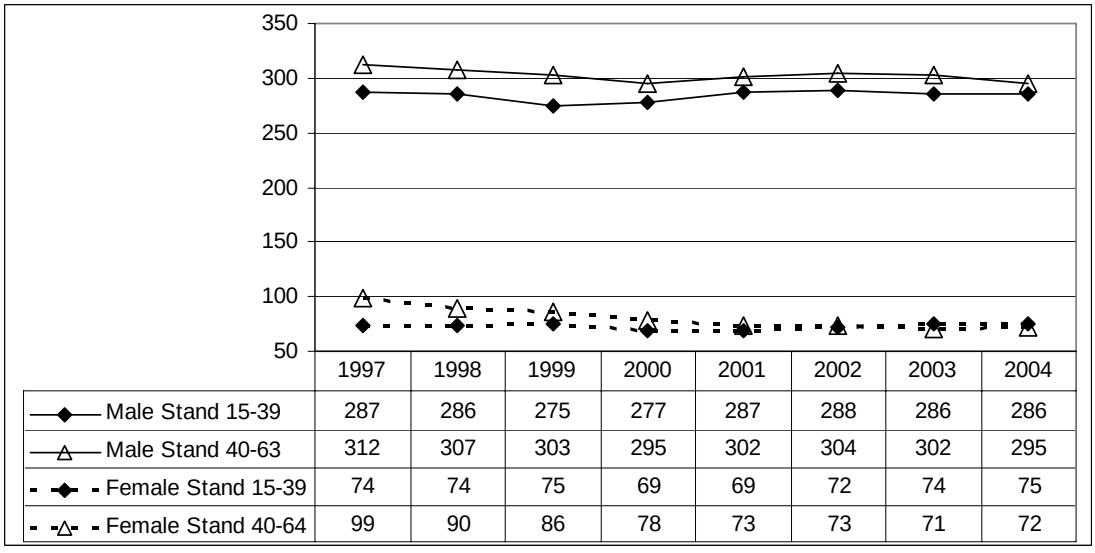
Figure 34 shows age-standardised death rates from natural causes by sex for the younger age segment (15-39) and the older age segment (20-64). Age-standardised death rates rose over time for each sex and for both age segments.

Age-standardised death rates rose most quickly for females age 15-39 and for males age 40-64. After 1998, for the younger age segment, the female rate was always higher than the male rate. For the older age segment, the male rate was always higher than the female rate, and the gap increased with time.



	1997	1998	1999	2000	2001	2002	2003	2004
Male Stand 15-39	257	337	400	516	606	690	778	829
Male Stand 40-64	1615	1731	1856	2039	2255	2419	2619	2737
Female Stand 15-39	297	394	498	670	820	1006	1161	1297
Female Stand 40-64	1014	1052	1095	1174	1265	1360	1476	1561

Figure 34. Age-Standardised Death Rates per 100,000 from Natural Causes by Sex, Age 15-39 and Age 40-64: 1997-2004



	1997	1998	1999	2000	2001	2002	2003	2004
Male Stand 15-39	287	286	275	277	287	288	286	286
Male Stand 40-63	312	307	303	295	302	304	302	295
Female Stand 15-39	74	74	75	69	69	72	74	75
Female Stand 40-64	99	90	86	78	73	73	71	72

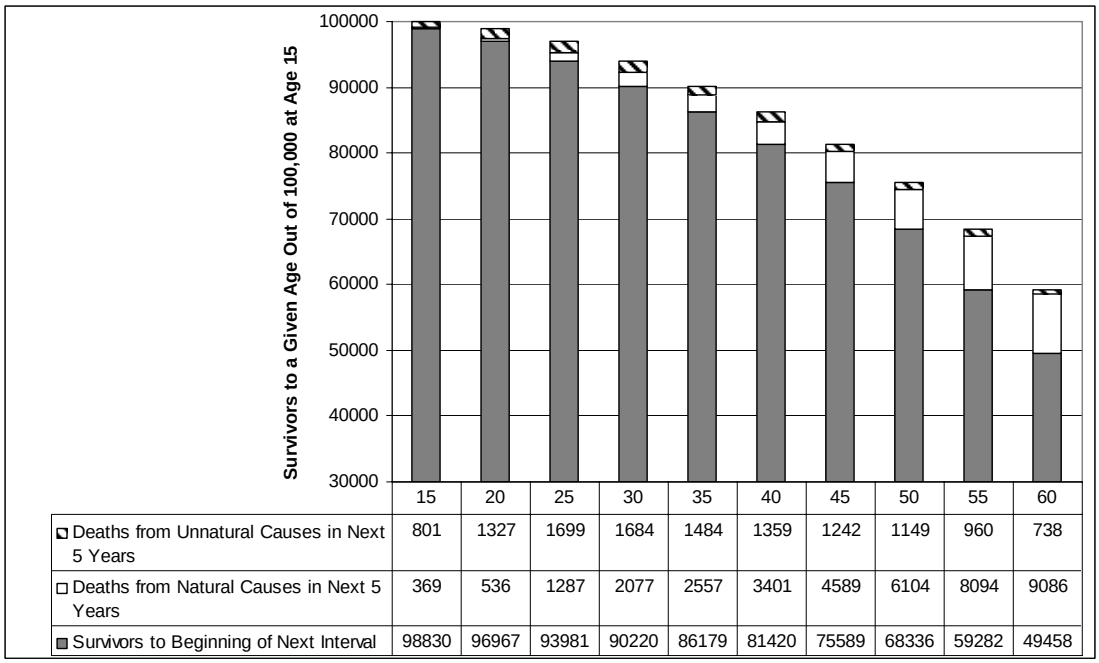
Figure 35. Age-Standardised Death Rates per 100,000 from Unnatural Causes by Sex, Age 15-39 and Age 40-64: 1997-2004

In Figure 35 we see the age-standardised death rates from unnatural causes by sex for the younger and the older age segments. For males, the older age segment always had a higher rate than the younger age segment, although the gap declined over time. While the rate for the younger age segment was virtually unchanged, the rate for the older age segment declined over time. For females, until 2002, the older age segment had a higher rate. In 2003 and 2004, the younger age segment had a higher rate. As for males, this was because the rate for the younger age segment was virtually unchanged, while the rate for the older age segment declined. Even though the unnatural cause death rates rose between 1997 and 2004 for both males and females age 20-24, this had essentially no effect on the age-standardised rate for those age 15-39 of either sex.

Effects on Survival from Natural Causes and from Unnatural Causes of the Mortality Conditions in a Given Year

Figures 36-39 show survival in a different way. In each figure for a given sex in a given year, the fate of people alive at their 15h birthday is shown, given the mortality conditions in a given year.

Starting with 100,000 people of a given sex on their 15th birthday, each figure shows in the total height of the column the number of people of that sex who would survive to that age. Within the column, it shows in dark grey the number who will survive five more years. In Figure 36 for example, it shows in the column for age 20 that out of 98830 males who survived from their 15th to their 20th birthday, 96967 will survive five more years to their 25th birthday. In demographic life table terms, 96967 is l_{25}/l_{15}. It also shows the number who die from unnatural causes between their 20th and 25th birthday, indicated by a diagonal stripe. That number is 1327. Lastly, it shows the number who die from natural causes between their 20th and 25th birthday in white. That number is 536.[5]

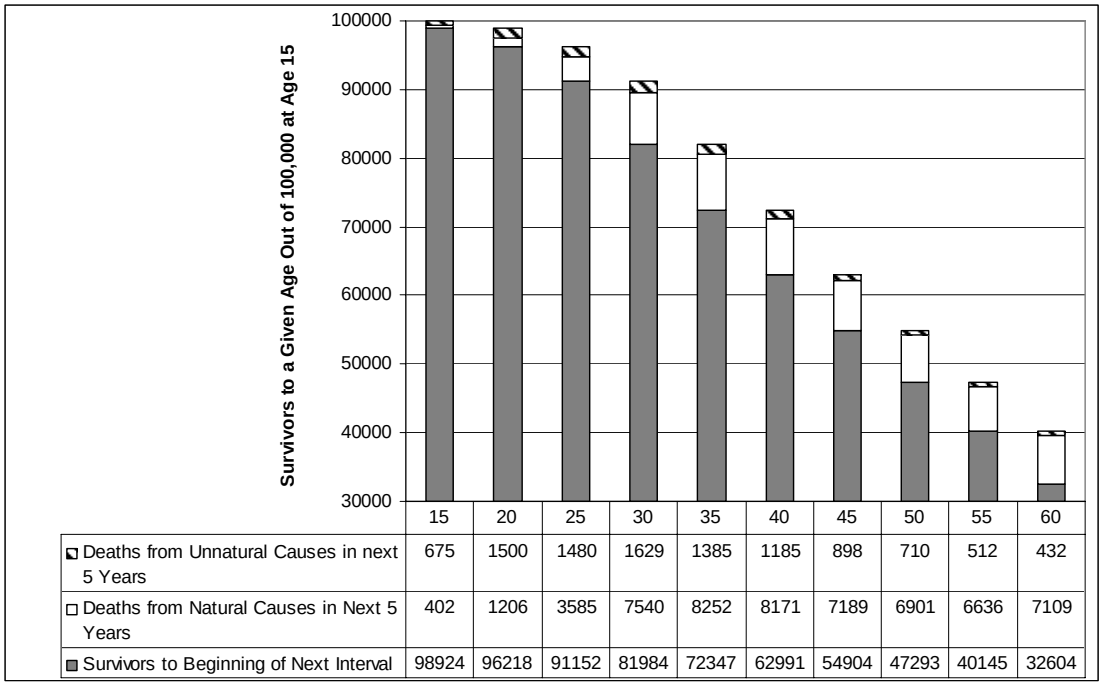


	15	20	25	30	35	40	45	50	55	60
Deaths from Unnatural Causes in Next 5 Years	801	1327	1699	1684	1484	1359	1242	1149	960	738
Deaths from Natural Causes in Next 5 Years	369	536	1287	2077	2557	3401	4589	6104	8094	9086
Survivors to Beginning of Next Interval	98830	96967	93981	90220	86179	81420	75589	68336	59282	49458

Figure 36. Male 1997 Survivors to a Given Age, Survivors for 5 More Years, Deaths from Natural Causes in the Next 5 Years and Deaths from Unnatural Causes in the Next 5 Years Starting with 100,000 on their 15th Birthday

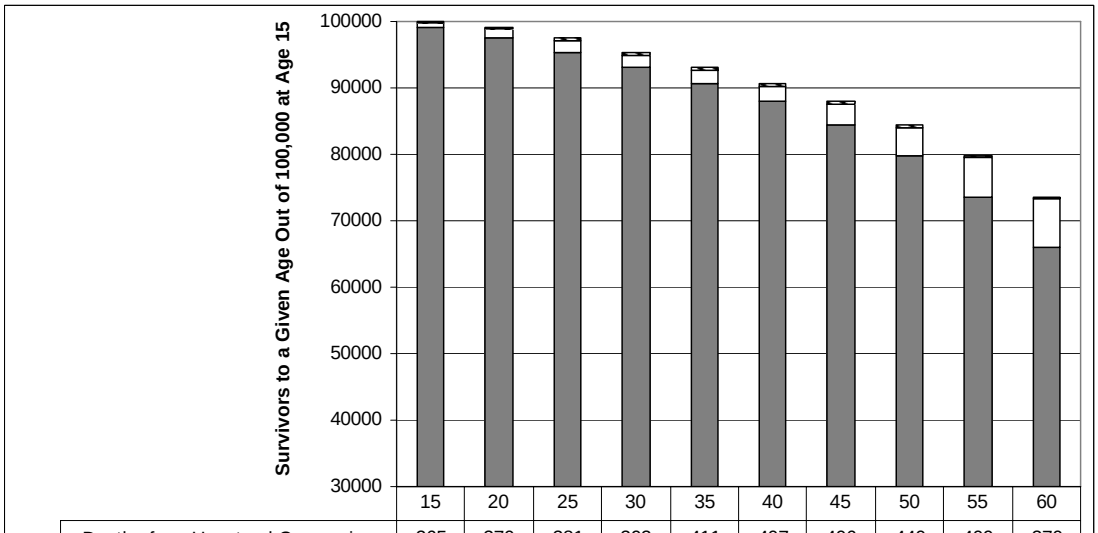
If the mortality conditions in a given year would have led all people alive on their 15th birthday to die before they reached their 65th birthday, the vertical scale in Figures 30-33 would need to go down to zero. However, given the actual mortality conditions, in none of the figures shown does it go below 30000. The lower bound of the figures is thus 30000. This makes it easier to see the effects of natural morality at the younger ages when the implied number of deaths is small, and it also makes it easier to see the effects of unnatural mortality for females, for whom the implied number of deaths is often small.

[5] This division of deaths by cause follows the suggestions of Siegel and Swanson (2004: 328) and Spencer and Trickett (1980).



	15	20	25	30	35	40	45	50	55	60
Deaths from Unnatural Causes in next 5 Years	675	1500	1480	1629	1385	1185	898	710	512	432
Deaths from Natural Causes in Next 5 Years	402	1206	3585	7540	8252	8171	7189	6901	6636	7109
Survivors to Beginning of Next Interval	98924	96218	91152	81984	72347	62991	54904	47293	40145	32604

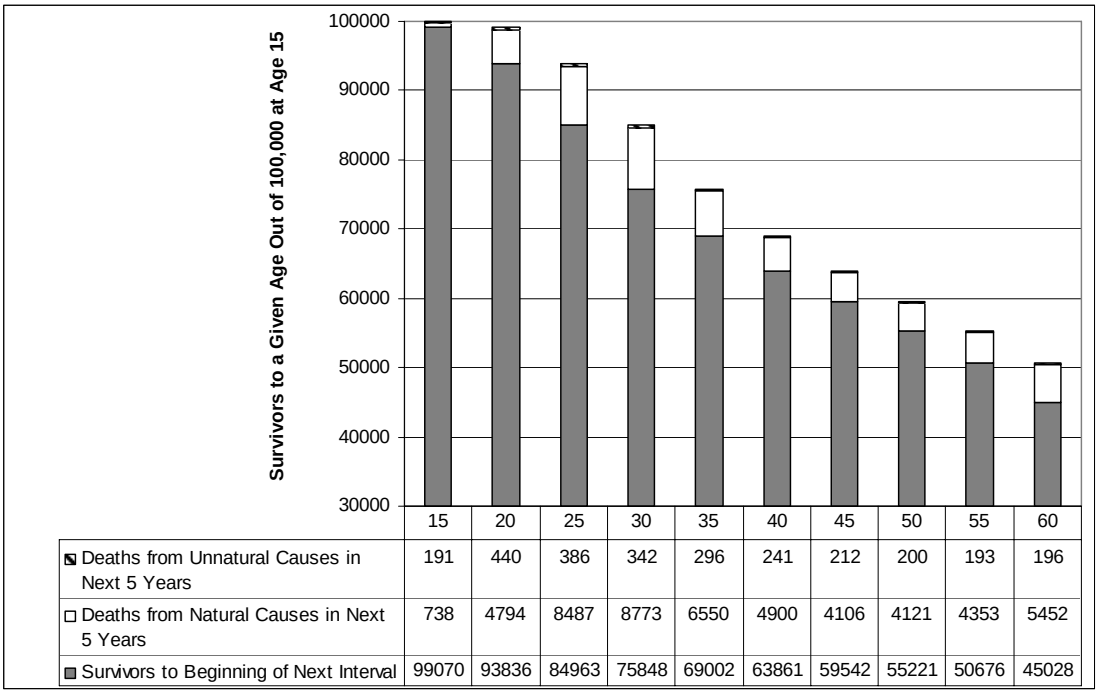
Figure 37. Male 2004 Survivors to a Given Age, Survivors for 5 More Years, Deaths from Natural Causes in Next 5 Years and Deaths from Unnatural Causes in Next 5 Years Starting with 100,000 on their 15th Birthday



	15	20	25	30	35	40	45	50	55	60
Deaths from Unnatural Causes in Next 5 Years	265	370	381	393	411	407	406	440	409	370
Deaths from Natural Causes in Next 5 Years	559	1260	1796	1911	2005	2339	3043	4144	5829	7309
Survivors to Beginning of Next Interval	99176	97546	95368	93064	90647	87901	84453	79869	73630	65951

Figure 38. Female 1997 Survivors to a Given Age, Survivor for 5 More Years, Deaths from Natural Causes in Next 5 Years and Deaths from Unnatural Causes in Next 5 Years Starting with 100,000 on their 15th Birthday

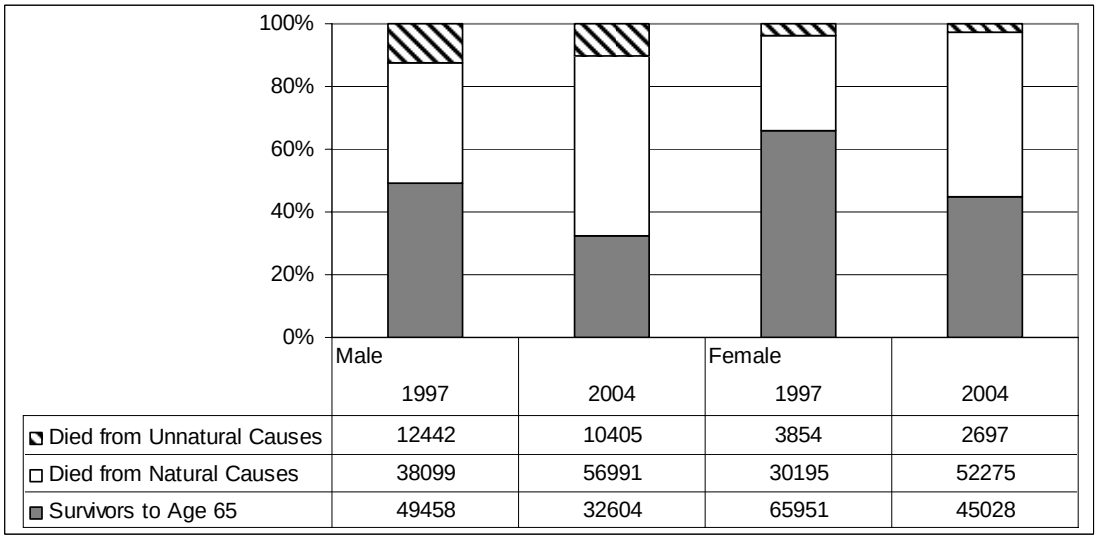
We can see in Figures 36-39 the much greater role that unnatural mortality plays for males than for females. The increased role of natural mortality between 1997 and 2004 for each sex is also clear.



	15	20	25	30	35	40	45	50	55	60
Deaths from Unnatural Causes in Next 5 Years	191	440	386	342	296	241	212	200	193	196
Deaths from Natural Causes in Next 5 Years	738	4794	8487	8773	6550	4900	4106	4121	4353	5452
Survivors to Beginning of Next Interval	99070	93836	84963	75848	69002	63861	59542	55221	50676	45028

Figure 39. Female 2004 Survivors to a Given Age, Survivors for 5 More Years, Deaths from Natural Causes in Next 5 Years and Deaths from Unnatural Causes in Next 5 Years Starting with 100,000 on their 15th Birthday

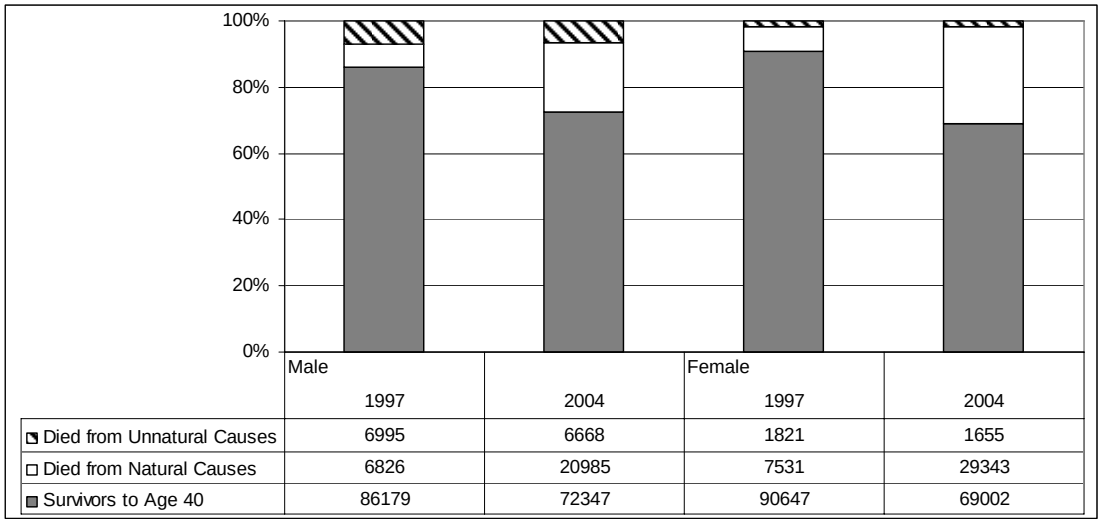
Figure 40 examines the role of unnatural and natural mortality for those who are alive on their 15th birthday. It shows what their situation will be by the time they reach (or would have reached) their 65th birthday. The percent of males who would have died from unnatural causes before their 65th birthday declined from 12.4% in 1997 to 10.4% in 2004. For females, the percent who would have died from unnatural causes declined from 3.9% in 1997 to 2.7% in 2004. The decline in the percent surviving to age 65 for each sex between 1997 and 2004 is entirely accounted for by increases in natural cause mortality.



	Male		Female	
	1997	2004	1997	2004
Died from Unnatural Causes	12442	10405	3854	2697
Died from Natural Causes	38099	56991	30195	52275
Survivors to Age 65	49458	32604	65951	45028

Figure 40. Out of 100,000 on Their 15th Birthday, Number Surviving to Age 65, Number Dying from Natural Causes by Age 65 and Number Dying from Unnatural Causes by Age 65 by Sex: 1997 and 2004

Figures 41 and 42 are similar to Figure 40 but show the situation considered for the two twenty-five year age segments, those 15-40 and those 40-65. Figure 41 shows for 100,000 alive on their 15th birthday what their fate would have been by the time they reached (or would have reached) their 40th birthday -- how many would have survived, how many would have died from natural causes and how many would have died from unnatural causes, assuming the mortality conditions of the given year.



	Male		Female	
	1997	2004	1997	2004
Died from Unnatural Causes	6995	6668	1821	1655
Died from Natural Causes	6826	20985	7531	29343
Survivors to Age 40	86179	72347	90647	69002

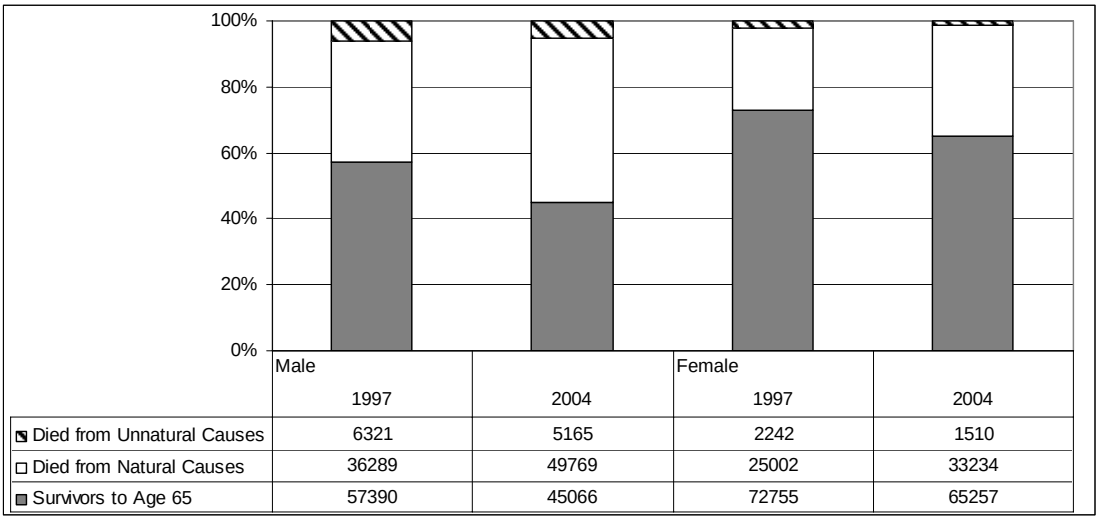
Figure 41. Out of 100,000 on Their 15th Birthday, Number Surviving to Age 40, Number Dying from Natural Causes by Age 40 and Number Dying from Unnatural Causes by Age 40 by Sex: 1997 and 2004

We see in Figure 41 that for this younger age group, even in 1997, among those alive on their 15th birthday, females had a higher chance than males of dying from natural causes in the subsequent 25 years (7.5% of females versus 6.8% of males). It was only the higher chance for males than females of dying from unnatural causes in the 25 years after the 15th birthday (7.0% of males versus 1.8% of females) that resulted in a higher percent of females than males surviving from age 15 to 40 in 1997 (86.2% of males versus 90.6% of females).

By 2004, the chance of dying from natural causes for females had increased even more than the chance of dying from natural causes for males (21.0% for males versus 2.3% for females) and the female advantage in unnatural cause mortality had declined enough that by 2004, males had a higher chance of surviving 25 years after their 15th birthday than females (72.3% for males versus 69.0% for females).

Figure 42 is similar to Figure 41. It shows for 100,000 people alive on their 40th birthday what their fate would have been by the time they reached (or would have reached) their 65th birthday – how many would have survived, how many would have died from natural causes and how many would have died from unnatural causes.

In Figure 42 we see that in both 1997 and 2004, females in the older age segment had lower chances of dying from both natural causes and from unnatural causes in the 25 years after they reached their 40th birthday than did males. Thus both lower natural cause mortality and lower unnatural cause mortality for females than males contributed to the better survival from age 40 to 65 for females than males at each date.



	Male		Female	
	1997	2004	1997	2004
Died from Unnatural Causes	6321	5165	2242	1510
Died from Natural Causes	36289	49769	25002	33234
Survivors to Age 65	57390	45066	72755	65257

Figure 42. Out of 100,00 on Their 40th Birthday, Number Surviving to Age 65, Number Dying from Natural Causes by Age 65 and Number Dying from Unnatural Causes by Age 65 by Sex: 1997 and 2004

Comments on Natural and Unnatural Mortality

It is clear that increases in natural cause mortality are the source of the increase in all cause mortality between 1997 and 2004. The increase in age-specific death rates from natural causes for females age 25-34 of more than fivefold between 1997 and 2004 is astounding. Despite concern with high levels of violence in South Africa, the unchanging level and at times decline in unnatural cause mortality has muted the overall increase in mortality in South Africa for each sex. Declines in the death rates from unnatural causes for those age 15-29 and for the elderly are also encouraging. Perhaps teenagers in South Africa have come to engage in somewhat less risky behaviour.

While large increases in female death rates at the younger ages between 1997 and 2004 are important, and while these increases are due to increases in death rate from natural causes, it is important to note that even in 1997 below age 30 females had higher death rates than males. Also, although all cause mortality is often interpreted as reflecting mainly mortality from natural causes, if male unnatural mortality had not been much higher than female unnatural mortality in 1997, the chance of survival from the15th birthday to the 40th birthday would have been lower for females than males.

Thus, although the female mortality advantage at younger ages had disappeared at the younger ages by 2004, examination of mortality from natural causes reveals that the female mortality situation at younger ages was not very good in comparison to males even in 1997. The roots of this situation in 1997 deserve further examination by scholars and analysts.

FURTHER DIVISION OF UNNATURAL CAUSES OF DEATH

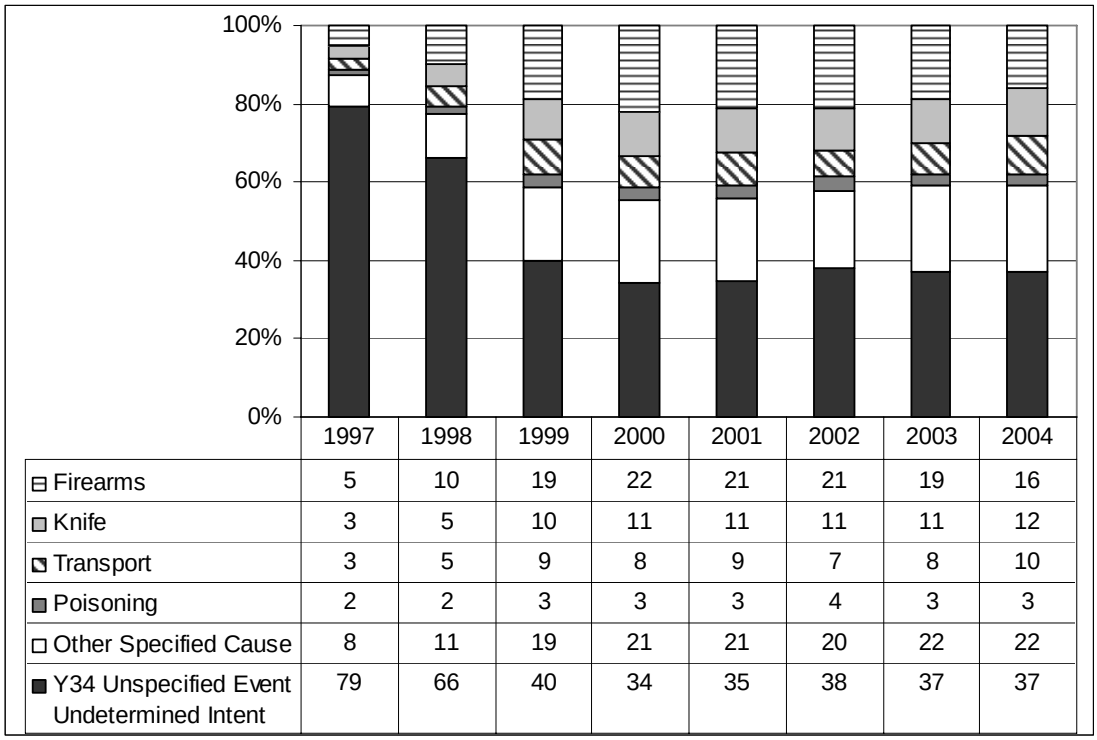
We next look at a further division of unnatural causes of death. With cooperation from the Department of Transport and of the South African Police Service, we have some specific information on deaths from transport and on deaths from homicide. We use this information to say more about transport deaths, homicide deaths and other kinds of death. We also look somewhat at other divisions

of causes of unnatural deaths.

Detail in Unnatural Deaths

It is useful to know the death rates from unnatural causes by age and sex and how they have changed over time. However, it would be useful for analysis and policy planning to know the level of death rates and how they have changed over time from causes such as transport, use of firearms, and use of knives, as well as the homicide death rate. However, detail about the nature of external deaths is almost completely lacking in 1997 and 1998, and is quite incomplete in 1999 and later years.

Figure 43 shows the distribution of stated causes of unnatural deaths for all thoseage 15-64 for every year 1997 through 2004. The ”unspecified event unknown intent” category means that it was an unnatural death, but nothing else is known about the death. This is ICD-10 code Y34. In 1997 and 1998, this undetermined category constituted more than 2/3 of all unnatural deaths. This undetermined category was about 40% of all unnatural deaths in 1999-2002.



	1997	1998	1999	2000	2001	2002	2003	2004
Firearms	5	10	19	22	21	21	19	16
Knife	3	5	10	11	11	11	11	12
Transport	3	5	9	8	9	7	8	10
Poisoning	2	2	3	3	3	4	3	3
Other Specified Cause	8	11	19	21	21	20	22	22
Y34 Unspecified Event Undetermined Intent	79	66	40	34	35	38	37	37

Figure 43. Percent Distribution of Stated Causes of Unnatural Deaths, Age 15-64: 1997-2004

One reason for this large percent undetermined is Wet op geregtelike doodsondersoeke (Judicial Death Enquiries Act #58) of 1959. This law states that determination of intent (assault by others, intentional self-harm, or accident) is the prerogative of the court. Court proceedings can take a long time, and the Death Notification Form is usually filled out long before any court proceedings have been completed. Thus, intent is rarely recorded on the Death Notification Form. This means that a classification of unnatural deaths into the traditional categories of homicide, suicide, and accident is not possible from the Death Notification data. Very often the manner of death (transport, firearm, knife, etc.) also is not recorded, although the Judicial Death Enquiries Act does not prohibit the recording of that kind of information.

Other Sources of Detailed Data on Unnatural Cause Deaths

Departments that collect data pertinent to various kinds of unnatural deaths, such as the Department of Transport and the South African Police Service (SAPS) are possible sources of detailed data on unnatural deaths. Data from both the Department of Transport and from SAPS are used later in this section.

In 1999, the National Injury Mortuary Surveillance System (NIMSS) was established in order to improve knowledge about unnatural deaths. Mortuaries voluntarily participate in this system. In 2004, participating mortuaries were in 6 different provinces and included about 40% of all unnatural deaths. The participating mortuaries are almost predominantly located in urban places (NIMSS, 2005: 2).

Participating mortuaries fill out a special form for each unnatural death which includes information about the circumstances of the death (firearm, sharp, burn, etc.) and the apparent manner (intent) of death (homicide, suicide, accident, natural, undetermined). The NIMSS form is not a legal document, so filling out the apparent manner of death does not violate the Judicial Death Enquiries Act. Thus, the NIMSS data can show the distribution of unnatural deaths among homicide, suicide, and accidents, with only a small percent of unnatural deaths left with undetermined intent. They also can give information on the proportion of unnatural deaths due to causes such as firearms, sharps, drowning, and burns, for the unnatural deaths recorded in the NIMSS data.

We are not using the NIMSS data in this paper because at least 60% of all unnatural deaths are not included and, more importantly, the mainly urban location of the participating mortuaries raises questions about the generalisability of their results.

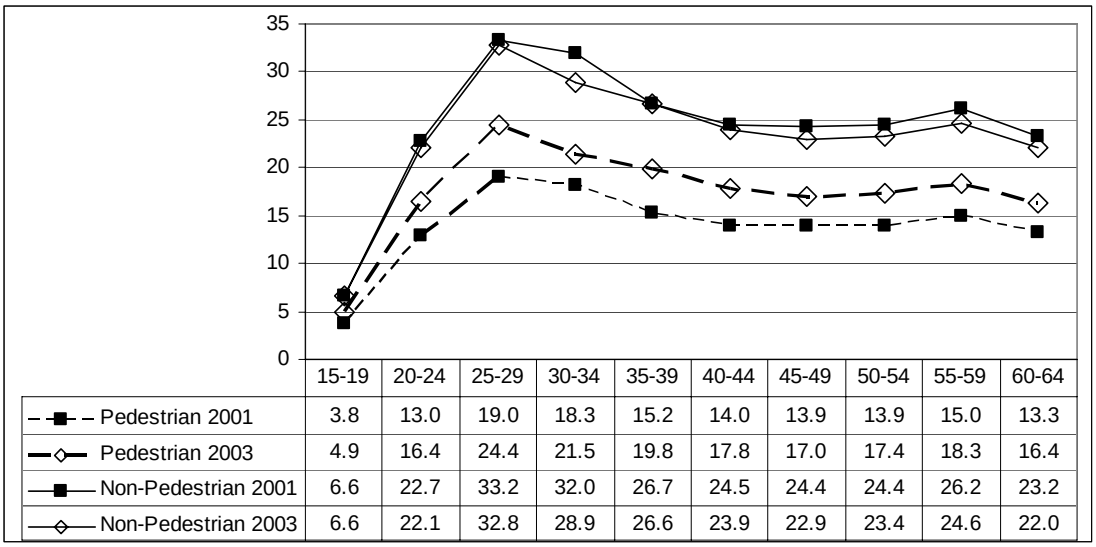
Transport and non-Transport Death Rates

The Department of Transport provided data on the number of transport deaths by age for 2001 and 2003. The data on deaths by age were also presented separately according to whether the victim was a pedestrian or not.

To obtain transport deaths by age and sex, the sex ratio by age from reported transport deaths in the Death Notification Data was applied to the transport deaths by age from the Department of Transport.

Figure 44 shows death rates for both sexes combined for pedestrian deaths and for non-pedestrian transport deaths in 2001 and 2003. Transport death rates for non-pedestrians are higher than for pedestrians at every age. For people age 15-64, in 2001 36% of all transport deaths were to pedestrians, while in 2003 43% of all transport deaths were to pedestrians.

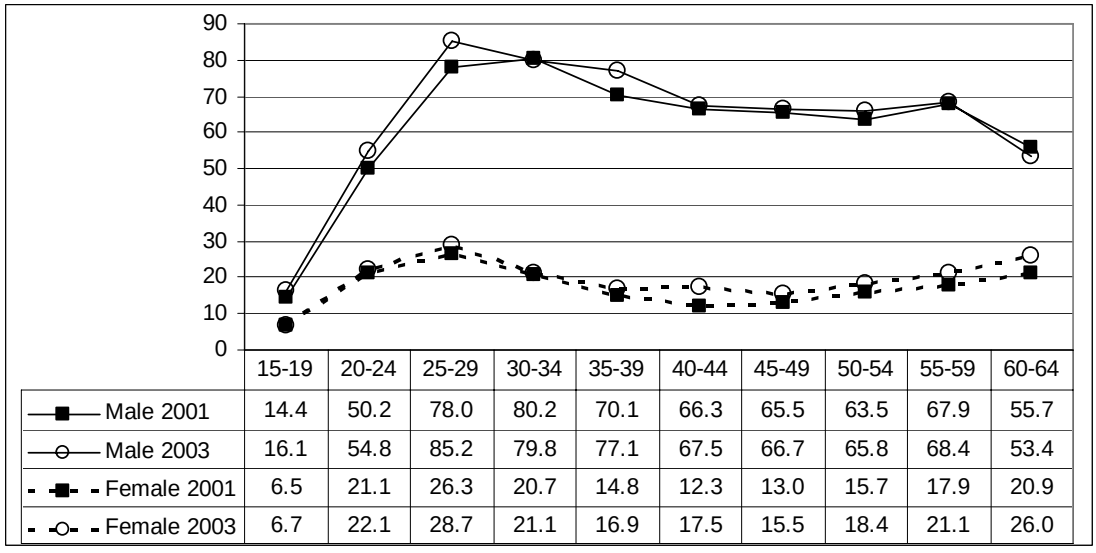
For both pedestrians and non-pedestrians, death rates increase to age 25-29 and then decline somewhat, with a secondary peak at age 55-59. Death rates to non-pedestrians were virtually the same in 2001 and 2003, while death rates for pedestrians at every age increased between 2001 and 2003.



	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
Pedestrian 2001	3.8	13.0	19.0	18.3	15.2	14.0	13.9	13.9	15.0	13.3
Pedestrian 2003	4.9	16.4	24.4	21.5	19.8	17.8	17.0	17.4	18.3	16.4
Non-Pedestrian 2001	6.6	22.7	33.2	32.0	26.7	24.5	24.4	24.4	26.2	23.2
Non-Pedestrian 2003	6.6	22.1	32.8	28.9	26.6	23.9	22.9	23.4	24.6	22.0

Figure 44. Death Rates by Age per 100,000 from Transport: Pedestrians and Non-Pedestrians, Both Sexes Combined Based on Transport Department Data: 2001 and 2003

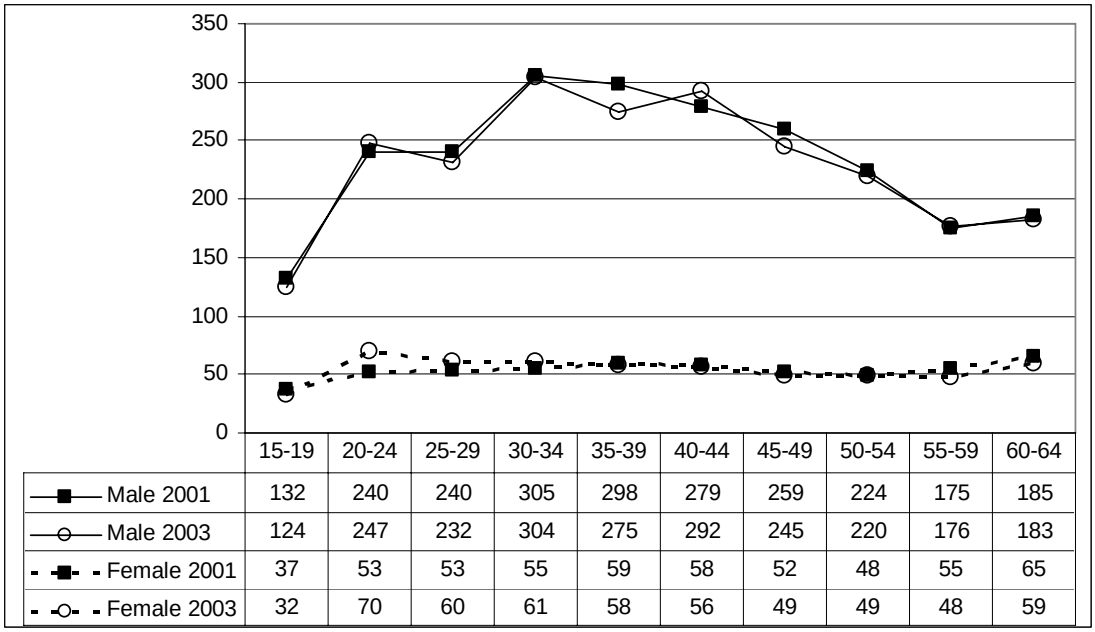
Figure 45 shows the death rates from transport causes by age and sex in 2001 and 2003, based on the deaths from the Department of Transport. For each sex, there was very little change by age between 2001 and 2003. At every age, the transport death rate is higher for males than females. For each sex, the rate increases to its highest value at age 25-29. The rate then declines somewhat before rising at older ages. For males, it rises to age 55-59 and then declines for age 60-64. For females, the rate increases after the forties.



	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
Male 2001	14.4	50.2	78.0	80.2	70.1	66.3	65.5	63.5	67.9	55.7
Male 2003	16.1	54.8	85.2	79.8	77.1	67.5	66.7	65.8	68.4	53.4
Female 2001	6.5	21.1	26.3	20.7	14.8	12.3	13.0	15.7	17.9	20.9
Female 2003	6.7	22.1	28.7	21.1	16.9	17.5	15.5	18.4	21.1	26.0

Figure 45. Death Rates by Age and Sex from Transport per 100,000 Based on Transport Department Data: 2001 and 2003

Figure 46 shows death rates by sex in 2001 and 2003 from non-transport unnatural causes. The rates changed little for either sex between 2001 and 2003. Figure 149 looks much like Figure 28 which showed death rates by sex from all unnatural causes.



	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
Male 2001	132	240	240	305	298	279	259	224	175	185
Male 2003	124	247	232	304	275	292	245	220	176	183
Female 2001	37	53	53	55	59	58	52	48	55	65
Female 2003	32	70	60	61	58	56	49	49	48	59

Figure 46. Death Rates by Age and Sex per 100,000 from non-Transport Unnatural Causes: 2001 and 2003

Homicide and non-Homicide Death Rates

Homicide is a major problem in South Africa. It is generally agreed that South Africa has the second highest homicide rate in the world, exceeded only by South Africa.

Considerable violence accompanied the political struggle in South Africa. After 1994, deaths from political violence declined rapidly in South Africa, except in Kwazulu/Natal, where political violence continued until 1999 (Keegan, 2005: 18-19). Social disorganization after large political changes has also been cited as a cause of increases in unnatural cause mortality in South Africa (Shaw, 2001, 2002).

With new social and political arrangements after 1991, individual freedoms increased, but crime and other deviant behaviour also increased. Firearm license applications increased from 135 thousand in 1985 to 257 thousand in 1993 (Keegan, 2005: 30). These license applications declined after 1994 to 162 thousand in 2004 (Gould *et al.* 2004: 197). Homicide rates peaked in South Africa in 1994 -1995 and have declined since (Moller, 2005: 265). In South Africa the number of licensed firearms increased from 2.5 million in 1986 to 3.5 million in 1996 to 3.7 million in 2004 (Keegan, 2005: 27), and there is a widespread perception that illegal firearms have steadily been entering South Africa from countries in the region in conflict (Meek, 2000). According to police records, firearms were used in 42% of murders in 1994 and in 49% of murders in 2000 in South Africa (Gun Free South Africa, 2002).

The role of alcohol in unnatural cause mortality in South Africa has also been highlighted (Duflou, Lamont and Knobel 1988;, Lerer, 1992; Pluddemann *et al*., 2004).

Figure 47 shows the number of homicides recorded by SAPS by financial year (SAPS, 2006). The number of homicide deaths has declined over time, especially since that late 1990s.

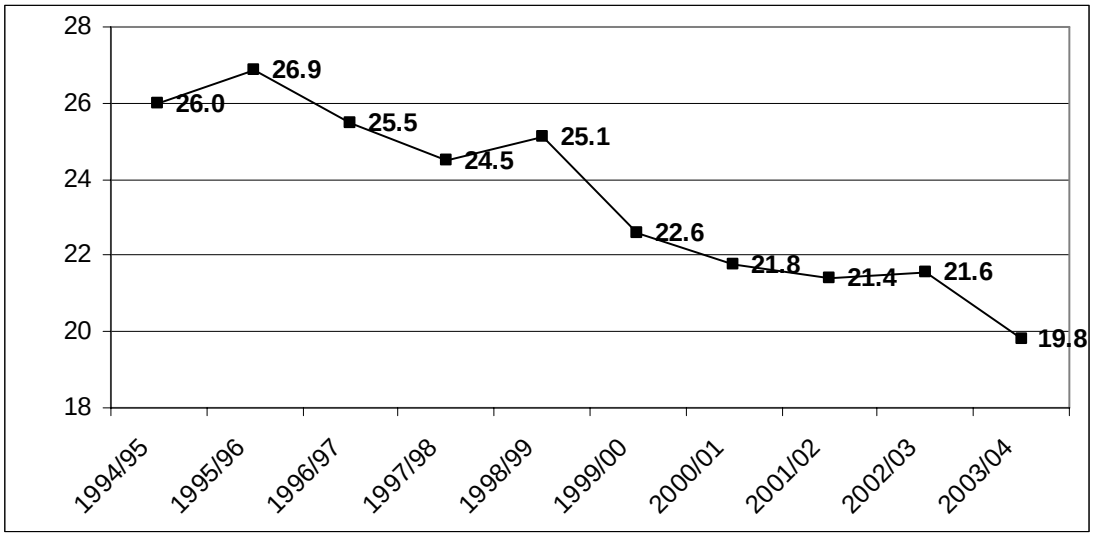
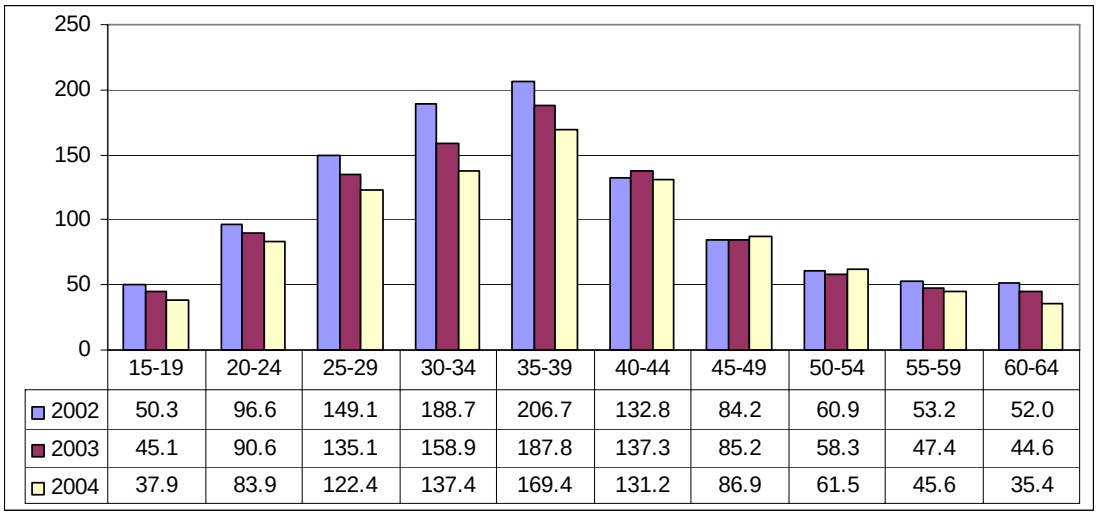


Figure 47. Number of Homicide Deaths in Thousands According to the South African Police Service by Financial Year: 1994/95-2003/04

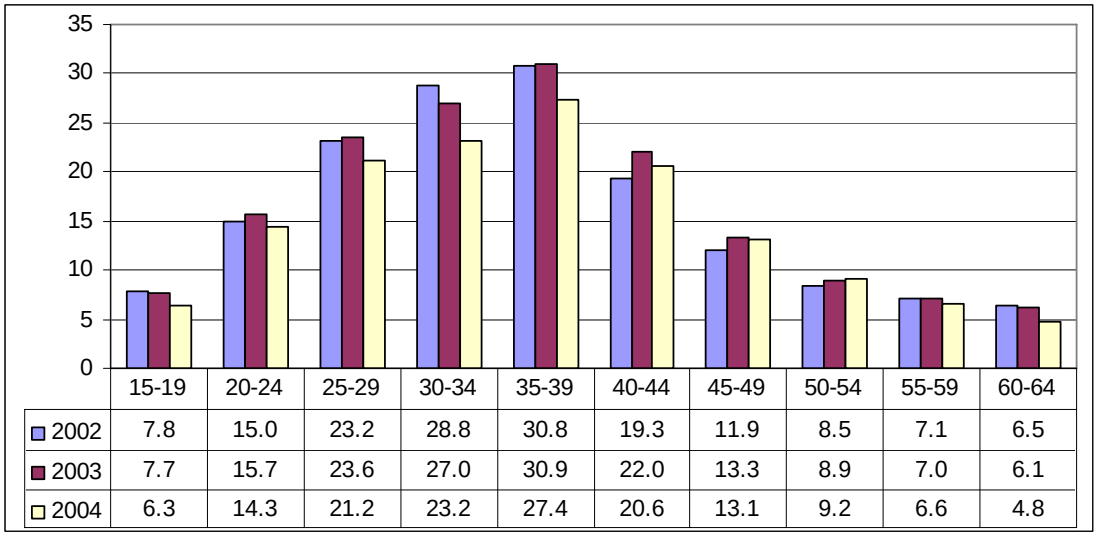
SAPS provided data on the number of homicide deaths by age for 2002, 2003 and 2004. The breakdown by sex (but not also by age) was given for each year.[6]



	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
2002	50.3	96.6	149.1	188.7	206.7	132.8	84.2	60.9	53.2	52.0
2003	45.1	90.6	135.1	158.9	187.8	137.3	85.2	58.3	47.4	44.6
2004	37.9	83.9	122.4	137.4	169.4	131.2	86.9	61.5	45.6	35.4

Figure 48. Male Death Rates by Age per 100,000 from Homicide Based on SAPS Data: 2002-2004

[6] There was a substantial number of homicide deaths with age unknown. These deaths were distributed proportionately to those homicide deaths with age known. The age groups in which the homicide data were provided were somewhat unconventional, being 11-15, 16-20, etc. The deaths were redistributed into conventional five-year age groups, using Statistics South Africa estimates of the number of people by sex by single year of age.



	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
2002	7.8	15.0	23.2	28.8	30.8	19.3	11.9	8.5	7.1	6.5
2003	7.7	15.7	23.6	27.0	30.9	22.0	13.3	8.9	7.0	6.1
2004	6.3	14.3	21.2	23.2	27.4	20.6	13.1	9.2	6.6	4.8

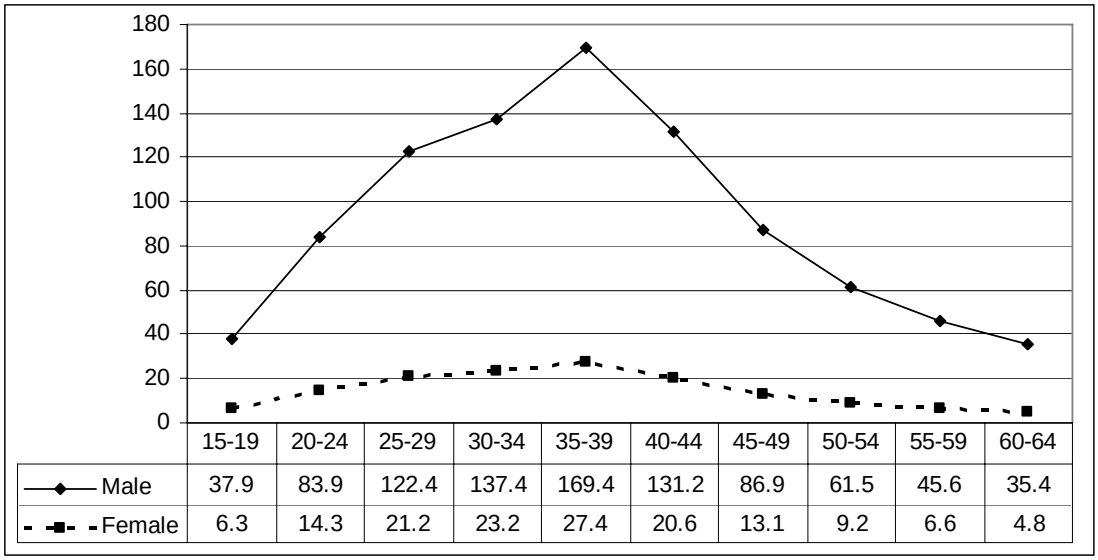
Figure 49. Female Death Rates by Age per 100,000 from Homicide Based on SAPS Data: 2002-2004

Figures 48 and 49 show the death rates from homicide by sex in 2002-2004, based on SAPS data. For males below age 40, homicide rates declined each year. For females below age 40, homicide rates wee lower in 2004 than in 2003.

Table 1 shows the age-standardised death rates age 15-64 from homicide for each sex 2002-2004. Even though we only have homicide death rates for three years, 2002-2004, it is interesting that overall homicide death rates declined in that period for males and were lower in 2004 than in 2002 or 2003.

Table 1. Age-Standardised Death Rates Age 15-64 from Homicide: 2002-2004

	2002	2003	2004
Male	115.2	105.6	96.4
Female	17.2	17.5	15.7



	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
Male	37.9	83.9	122.4	137.4	169.4	131.2	86.9	61.5	45.6	35.4
Female	6.3	14.3	21.2	23.2	27.4	20.6	13.1	9.2	6.6	4.8

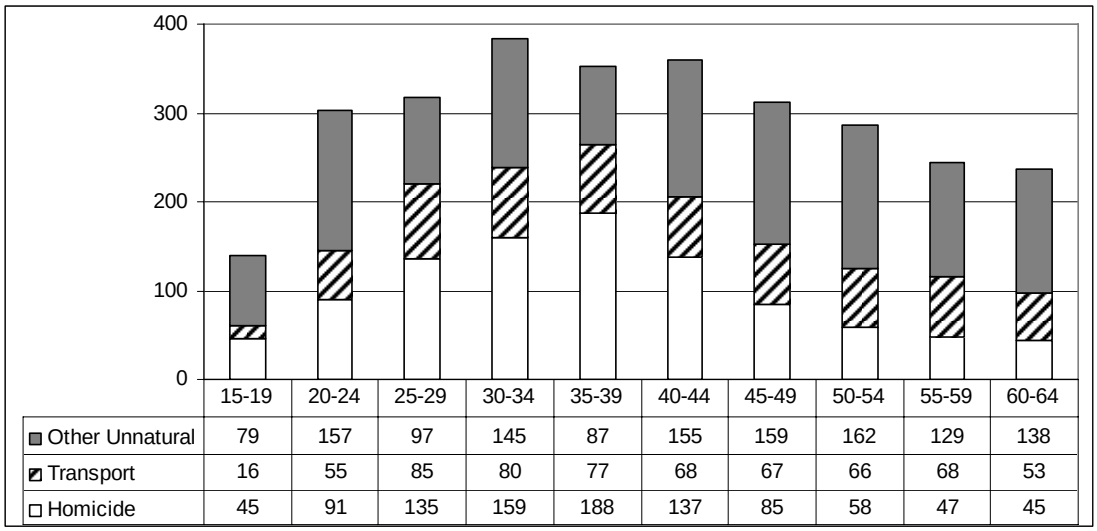
Figure 50. Homicide Death Rates by Age and Sex per 100,000
Based on SAPS Data: 2004

Figure 50 shows homicide rates by age and sex in 2004. In Figures 48 and 49 the shape of the age pattern of homicide death rates looks very similar for the two sexes. Figure 50 makes clear that the male homicide death rates are much higher than the female homicide death rates. In 2004, the age-standardised homicide death rate age 15-64 for males was 96 per 100,000 and for females was 16 per 100,000.

Estimates of Death Rates from Types of Unnatural Deaths

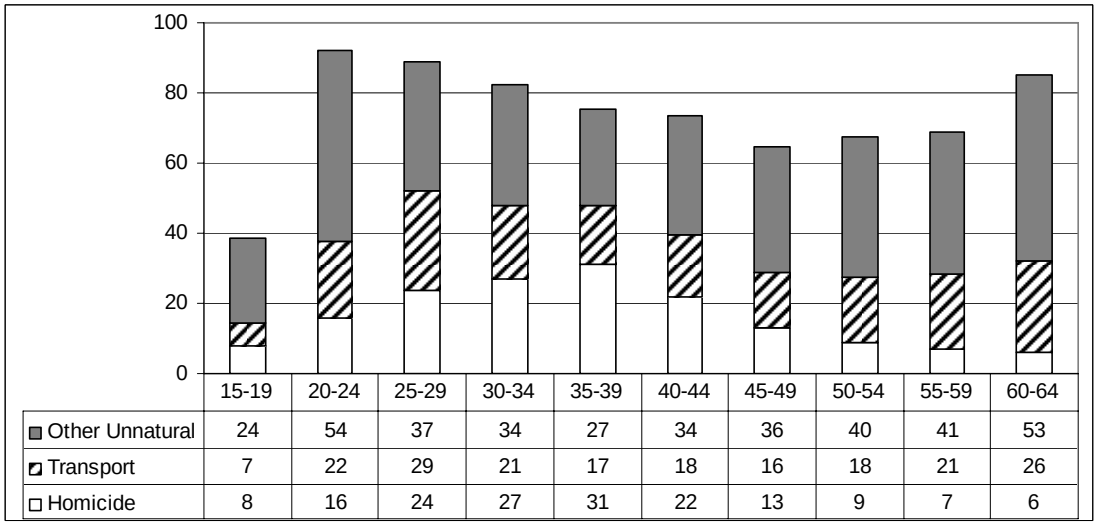
Using the information about all unnatural deaths, homicide deaths and transport deaths by age and sex for 2003, we can look at a decomposition of unnatural deaths. Other unnatural deaths (not from transport or homicide) include non-transport accidents and suicide. Other information suggests that in South Africa suicide death rates are low.

Figure 51 shows the decomposition of unnatural deaths for males and Figure 52 shows the decomposition of unnatural deaths for females. For males the age pattern of death rates from all unnatural causes looks similar to that for homicide death rates. For females this is less true, as death rates from other unnatural causes for females rise very rapidly from the 15-19 to the 20-24 age group.



	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
Other Unnatural	79	157	97	145	87	155	159	162	129	138
Transport	16	55	85	80	77	68	67	66	68	53
Homicide	45	91	135	159	188	137	85	58	47	45

Figure 51. Male Death Rates by Age per 100,000 from Homicide, Transport and Other Unnatural Causes: 2003



	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
Other Unnatural	24	54	37	34	27	34	36	40	41	53
Transport	7	22	29	21	17	18	16	18	21	26
Homicide	8	16	24	27	31	22	13	9	7	6

Figure 52. Female Death Rates by Age per 100,000 from Homicide, Transport or Other Unnatural Causes: 2003

Figures 53 and 54 show the percent distribution of the three types of unnatural deaths. These figures make it clear that the three kinds of unnatural deaths considered here play very different roles for the two sexes and different age groups. For males homicide accounted for a majority of all unnatural deaths for those 35-39, and accounted for the plurality of deaths for those 25-44. Other unnatural causes accounted for a majority of unnatural deaths for males 15-24 and 45-49. Homicide did not account for a plurality of all unnatural deaths for females at any age. Other unnatural cause accounted for a plurality of unnatural deaths for females at every age and accounted for a majority of female unnatural deaths at age 15-24 and 45-64.

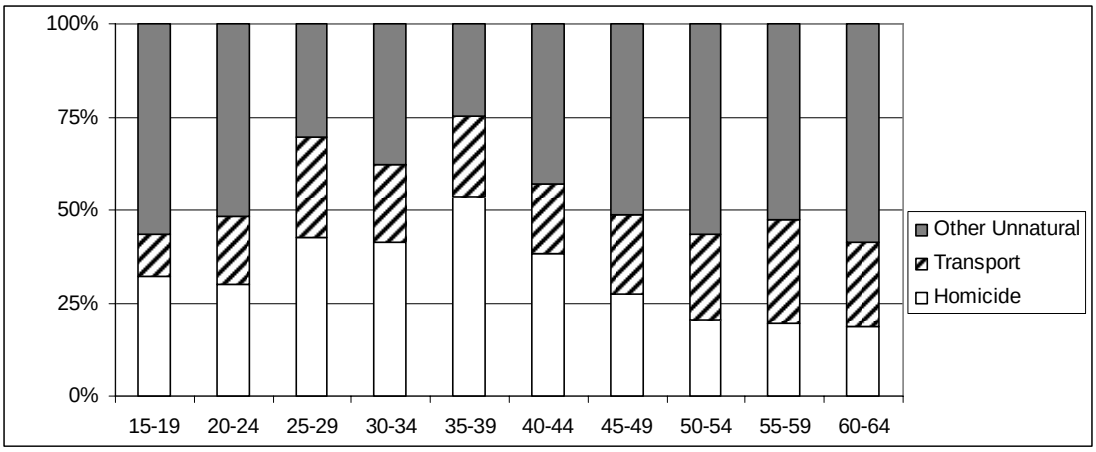


Figure 53. Percent Distribution of All Male Unnatural Deaths Among Homicide, Transport and Other Unnatural Causes: 2003

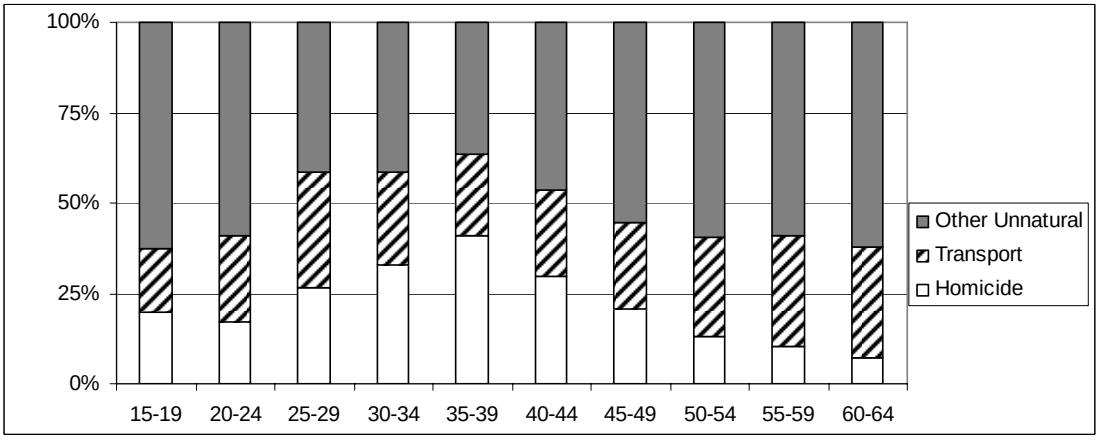


Figure 54. Percent Distribution of All Female Unnatural Deaths Among Homicide, Transport and Other Unnatural Causes: 2003

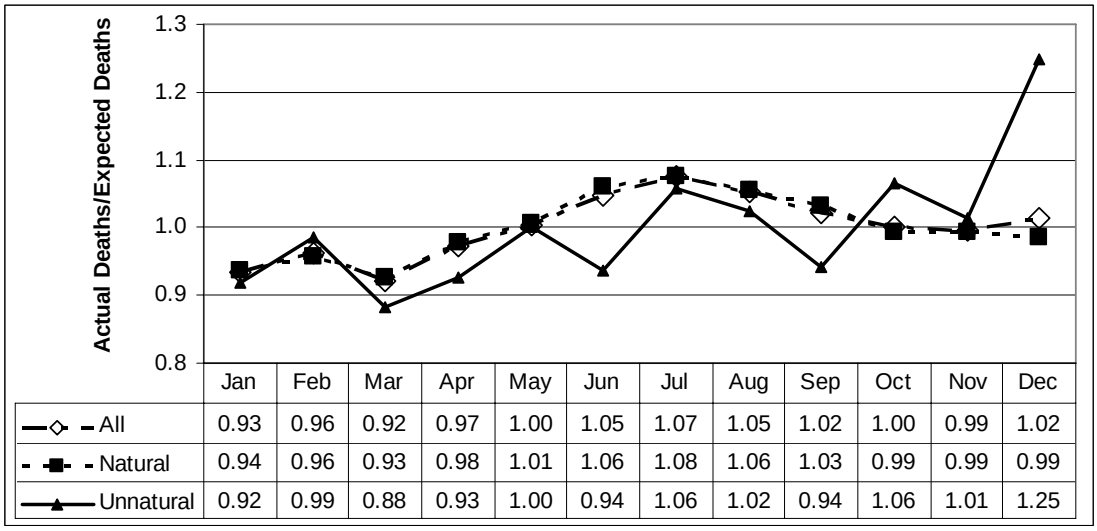
Seasonality of Types of Unnatural Deaths

Figure 55 looks at the seasonality of all deaths, of all natural deaths and of all unnatural deaths in 2004. In this figure and similar figures, the actual number of deaths reported from a particular cause is divided by the number of deaths that would be expected to occur in a given month, if the same number of deaths occurred on every day of the year.

If the value is 1.00, then the actual number of deaths from a given cause is the same as what would be expected. If the value is greater than 1.00, there were more deaths from the given cause than would be expected, and if the value is less than 1.00, there were fewer deaths in the given month than would have been expected. Thus, the differing number of days in various months is taken into account.

We see in Figure 55 that the seasonality of all deaths and of natural deaths in 2004 was virtually identical. This is not surprising, since in 2004, 89% of all deaths to people age 15-64 were from natural causes.

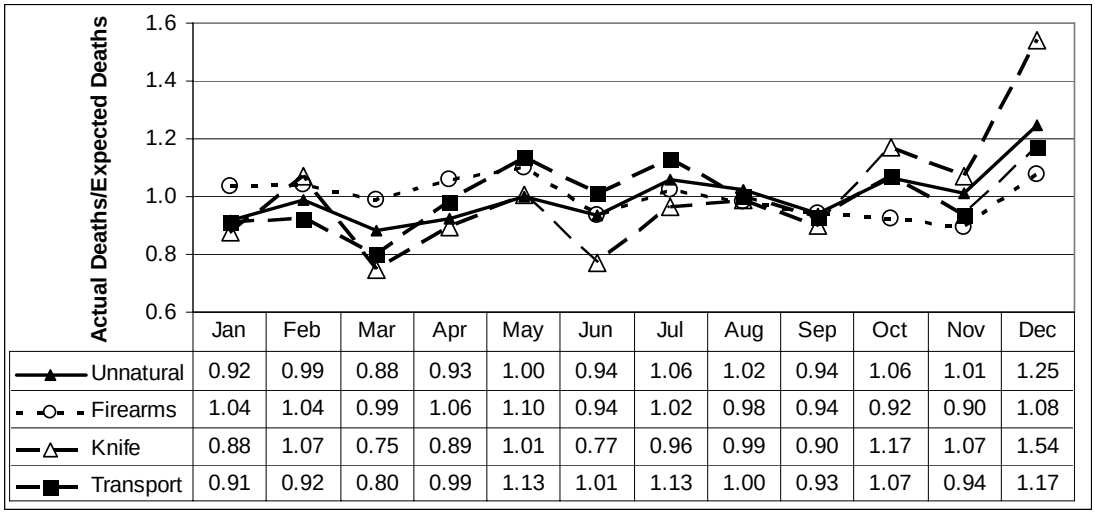
The seasonality of unnatural deaths in 2004 was somewhat different. The most striking aspect of the seasonality of unnatural deaths is the extent to which they disproportionately occur in December, in which there were 25% more deaths from unnatural causes than would have been expected. The most obvious explanation is that unnatural deaths tend to occur when people are on holiday.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
All	0.93	0.96	0.92	0.97	1.00	1.05	1.07	1.05	1.02	1.00	0.99	1.02
Natural	0.94	0.96	0.93	0.98	1.01	1.06	1.08	1.06	1.03	0.99	0.99	0.99
Unnatural	0.92	0.99	0.88	0.93	1.00	0.94	1.06	1.02	0.94	1.06	1.01	1.25

Figure 55. Seasonality of All Deaths, Natural Cause Deaths and Unnatural Cause Deaths, Age 15-64: 2004

Figures 56 and 57 show the seasonality of particular kinds of unnatural deaths. With 37% of all unnatural deaths to those age 15-64 coded as "unnatural cause but "undetermined cause unknown intent" we use caution in looking at the seasonality of unnatural deaths for which more detail was specified. In both figures the seasonality of all unnatural deaths is shown for comparison.



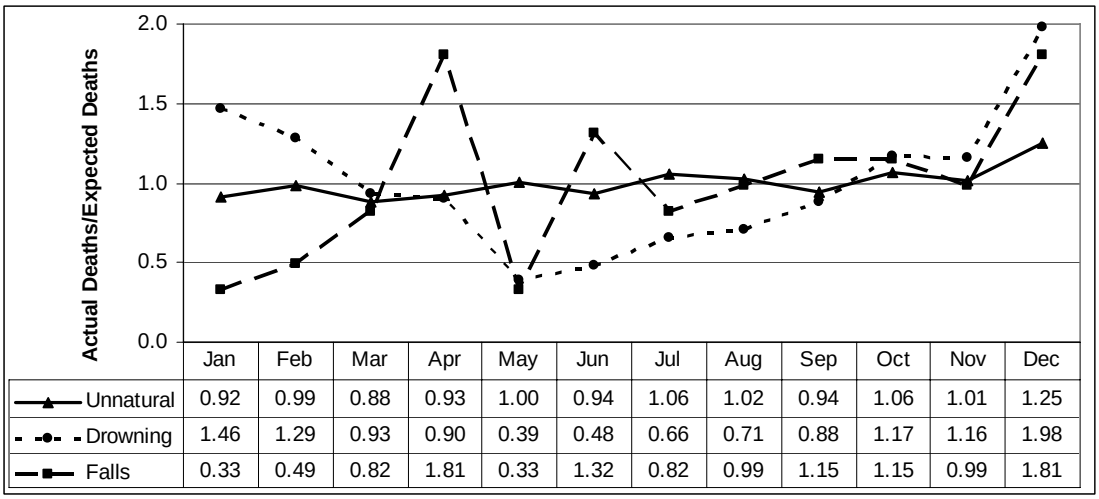
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Unnatural	0.92	0.99	0.88	0.93	1.00	0.94	1.06	1.02	0.94	1.06	1.01	1.25
Firearms	1.04	1.04	0.99	1.06	1.10	0.94	1.02	0.98	0.94	0.92	0.90	1.08
Knife	0.88	1.07	0.75	0.89	1.01	0.77	0.96	0.99	0.90	1.17	1.07	1.54
Transport	0.91	0.92	0.80	0.99	1.13	1.01	1.13	1.00	0.93	1.07	0.94	1.17

Figure 56. Seasonality of All Unnatural Cause Deaths and Selected Unnatural Cause Deaths, Age 15-64: 2004

In Figure 56 seasonality of reported deaths from use of knives[7] and use of firearms is shown as well as seasonality of transport deaths. All of these detailed

[7] What is referred to here as death due to knives is referred to in the Cause of Death data as death due to sharps.

causes of death in Figure 56 show a disproportionate number of deaths in December, with 54% more deaths from use of knives in December than would be expected. There are also 17% more transport deaths in December than expected.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Unnatural	0.92	0.99	0.88	0.93	1.00	0.94	1.06	1.02	0.94	1.06	1.01	1.25
Drowning	1.46	1.29	0.93	0.90	0.39	0.48	0.66	0.71	0.88	1.17	1.16	1.98
Falls	0.33	0.49	0.82	1.81	0.33	1.32	0.82	0.99	1.15	1.15	0.99	1.81

Figure 57. Seasonality of All Unnatural Cause Deaths, Drowning Deaths and Deaths from Falls, Age 15-64: 2004

In Figure 57, seasonality of deaths from drowning and from falls is shown. Drowning deaths disproportionately occurred in December and January. Deaths from falls were especially likely to occur in April and in December. Overall vacation time is especially risky for the chance of death from a variety of unnatural causes.

Comments on Further Division of Unnatural Causes of Death

It is striking what a large role homicide plays in unnatural mortality of males, although declines in male homicide rates since 2002 are encouraging. The high incidence of unnatural deaths from several causes, including drowning, transport, and knives justifies increasing attention to prevention of accidents and policing to prevent homicides in December.

Detailed information on deaths from homicide and transport deaths are very useful. Hopefully more information of this type will be available in the future.

The Judicial Death Enquiries Act has been interpreted as barring those that fill out the Death Notification forms from indicating the manner of death (intent). However, the law does not bar recording the circumstances of the injury (firearm, sharp, burn, etc.). It would be useful if the SAPS personnel who fill out the Death Notification form indicated the circumstances of the death (firearm, transport, burn, etc.) on a larger proportion of cases.

If a “best opinion about apparent manner of death” item were placed on the Death Notification form, without legal weight (as on the NIMSS form), it would allow calculation of unnatural death rates by intent (homicide, suicide, accidents) from death registration data

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The Judicial Death Enquiries Act was passed in 1959. Perhaps it would be timely for the provisions of the act to be reconsidered.

CONCLUDING THOUGHTS

South Africa is a member of a select but undesirable group of countries. McMichael *et al.* (2004: 1156) list 21 countries in which life expectancy at birth (both sexes combined) declined by 4 years or more between 1990 and 2001. This was looking at changes in mortality from all causes. The 21 countries include South Africa. All of the 21 countries are either in Africa or were formerly part of the Soviet Union. Hopefully this paper provides information and interpretations that will be helpful in understanding mortality change in South Africa and elsewhere.

Even though by the World Bank definition South Africa is an intermediate income country, it shares many mortality risks and challenges with other developing countries and especially with other sub-Saharan African countries. Issues relating to causes of death also present interesting questions for other sub-Saharan African countries, but no other sub-Saharan African country has a death registration system sufficiently complete to support the kind of analysis presented in this paper. Hopefully the patterns found and the explanations offered will be helpful not just for understanding South Africa but will contribute to the understanding of sub-Saharan Africa more generally.

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