The Sad Fate of Seychellois Men: Recent Trends in Mortality in the Seychelles

By Rosalie Michel; Zoe Matthews; and Andy Hinde

Contents

1 Introduction

Mortality in the Seychelles has declined markedly since the end of the Second World War. Webb (1960) remarked that at 10 per 1,000 in 1960, the death rate was remarkably low by developing countries standards, and was only slightly above those countries with highly developed medical services. Webb also, for the first time in 1960, attempted to estimate expectation of life at birth in the Seychelles, and found that it was 60.8 years for males and 65.9 years for females. Two of the most detailed studies of mortality in the Seychelles found that between 1971 and 1983, a decline in mortality occurred in most age groups, although the timing varied, and the improvement was more pronounced among females than males (Blacker and Hobcraft, 1976; d'Espaignet, 1984).

Despite the efforts made by the health authorities to prevent the transfer of diseases unknown to the country, according to the Ministry of Health (1984), tuberculosis became a serious problem in the Seychelles at the beginning of the 1950s when the number of notifications showed a sharp rise. The disease is thought to have been brought to the islands following the Second World War with the return of the Seychellois Pioneers from Africa. Tuberculosis has now been virtually eradicated in the Seychelles. The main causes of death between 1971 and 1982 were: 'Diseases of the circulatory system' (excluding 'Cerebro-vascular disease', being also a main cause of death), 'Neoplasms', 'Infectious and parasitic diseases' and 'Diseases of the respiratory system'. In terms of cause specific death rates, d'Espaignet found that among the main killer diseases, declines in deaths due to 'Cerebro-vascular disease' and 'Infectious and parasitic diseases' were observed in the population between 1972 and 1982. Hence, the Seychelles has been described as having a disease profile which is a mix of developed and less developed country diseases (World Bank, 1994).

Although not abundant compared to a few small island developing countries, studies on mortality in the Seychelles from the historical perspective have been undertaken by various authors (Kuczynski, 1949; Webb, 1960; Rosalie, 2000). The main objective of this paper is to identify the levels and trends of mortality and the causes of mortality over the period 1983 to 1997, although reference will also be made to the pre-1983

period for some analyses. It reviews the literature on mortality in the Seychelles conducted between 1960 and 1993, and attempts to explain why male and female mortality in the Seychelles is diverging. Lastly, a discussion of key factors influencing mortality decline in the Seychelles is presented.

2 Data Sources and Quality

The mortality data used in this paper are: deaths by age and sex, deaths by cause and distribution of deaths by age, sex and cause. These data are collected through the vital registration system, and they have been mainly drawn from the *Report of the Medical and Health Department* and the *Statistical Abstract.* Based on data from the Ministry of Health and the Civil Status Office, the Statistics Division, now Management Systems Information Division (MISD), has been compiling data on deaths by age and sex, deaths by cause and distribution of deaths by age, sex and cause in the *Statistical Abstract* since 1975. The data on deaths by age and sex have been made available from 1975 to 1997, and are given in five-year age groups, as well as differentiating infant mortality. In addition to data for the respective reporting year, each annual issue of the *Abstract* features data covering the last five years. For example, the *Abstract* for 1982 contains data by sex and age, and by cause of death for 1978-82. However, the data on the distribution of deaths by age, sex and cause are compiled only for the actual reporting year under the following age groups: under 1, 1-4, 5-14, 15-24, 25-44, 45-64 and 65 and above.

Data on the cause of death by age have been systematically made available since 1976 following the recommendation of the investigation in mortality between 1971 and 1975 by Blacker and Hobcraft (1976). All the data on cause of death between 1934 and 1969 come from the *Reports of the Medical and Health Department*. It is worth noting that data on the returns of diseases and deaths at the Victoria hospital for most of the years between 1900 and 1934 were made available at the time of the study. However, as would be expected, these data are not complete in terms of cause of death data. The *Reports* also provide useful information regarding public health.

With respect to the quality of the mortality data, the comments of Blacker and Hobcraft (1976) and d'Espaignet (1984) are worth noting. It has been remarked by

Blacker and Hobcraft that there could have been an appreciable under-registration of infant deaths in 1971-75, as the 1971 census data on lifetime fertility yielded rather higher estimates of infant and child mortality. They found that the proportion of children dying reported by mothers aged 20-24 gave an estimate of mortality in the first two years of life ($_2q_0$) of 95 per 1,000; whereas the reported infant mortality rate in 1971-75 was 35.0 per 1,000. However, they add that the census figures should not be taken as totally accurate, as it is quite possible that stillbirths may sometimes have been included with dead children.

In the analysis of life tables by d'Espaignet (1984), errors in reported ages at death for both males and females for the period 1978 to 1982 were found. It is observed that there was a preference for digits ending in 0 and 5 between ages 45 and 80 for males and 40 and 90 for females. A relative drop in deaths to males aged 50 to 59 is observed when deaths by single years of age are smoothed out.

Another remark made by Blacker and Hobcraft (1976) on mortality data relates to the discrepancies between the number of deaths for 1972-75 in the different sources. This problem also applies prior to and after 1972-75: statistics of cause of death do not always tally with the total number of registered deaths for a few years. For example, for 1949, 404 is reported as the total number of deaths by cause as opposed to the total number of registered deaths which was 426. No explanation is available for these discrepancies. However, there are evidence of data entry errors in the cause of death data by age and sex. For example, in 1987 'Congenital malformations, deformations and chromosomal abnormalities' is entered as the cause of death for one male in the age group 25-44. Similarly, for 1988; 'Certain conditions originating in the perinatal period' is reported to be the cause of death for one male in the age group 25-44 and two males in the age group 65 and above, and hence resulting in an excess of one in the data on the distribution of deaths by age, sex and cause for males. Overall, perhaps with the exception of the child mortality data which will need further research, the inadequacies elaborated upon are insignificant and should not affect the results of the study.

3 Literature Review

This section summarises the few studies on mortality and morbidity in the Seychelles. The earliest estimate of expectation of life in the Seychelles was undertaken as part of the 1960 Census (Webb, 1960). The study also presented the levels of expectation of life for selected countries, and along with the derived average for both sexes, these are shown in Table 1. It is seen that in 1960 the expectation of life in the Seychelles was 60.8 years for males and 65.9 years for females, giving an average of 63.4 years. In 1960 Seychellois males had expectation of life like Ceylonese (now Sri Lankan) males, but Seychellois females were doing quite a lot better than Ceylonese females.

More detailed mortality analyses have been done by Blacker and Hobcraft (1976) and d'Espaignet (1984). In their analysis for the period 1971-75, Blacker and Hobcraft showed that the expectation of life at birth for males was 62.5 and for females 69.9 years. They also found that mortality in the 1-4 age group for both sexes was unusually high and that overall sex differentials were unusually large, male mortality being greater than female mortality at all ages.

The study also looked at deaths by cause and the results were compared with those of the United Kingdom for 1972. The main findings were: just under 20% of all deaths were attributable to "Rheumatic fever and heart diseases" compared to 33% in England and Wales; 10% of all deaths were due to "Neoplasms" compared with 20% in England and Wales; "Cerebrovascular disease" accounted for less than 9% of deaths as compared with some 14% in England and Wales; infective and parasitic disease accounted for over 12% of deaths against less than 1% in England and Wales and perinatal mortality accounted for 5.1% of deaths against less than 1% in England and Wales.

The authors note the limitations of such comparison, namely the actual classification of cause of death in the Seychelles and the different age structures of the two populations. For example, with respect to cause of death classification, they remarked that it is probable that the incidence of deaths under the heading "Rheumatic fever and heart diseases" in the Seychelles is understated since the second largest category, "Sym ptoms and ill-defined conditions", accounting for 12.9% of deaths, probably

included those which would elsewhere be described as cardio-vascular deterioration (Blacker and Hobcraft, 1976).

Similar results were found by d'Espaignet (1984) in his study of the trends and patterns of death in the Seychelles between 1972 and 1983. Age-specific mortality rates had declined over time for the younger ages, whereas they had remained unchanged or increased at the very high ages. They were also consistently lower for females than males over time. With respect to the causes of death for the period 1972-82, d'Espaignet reports that 'Diseases of the circulatory system' were the major cause of death in the Seychelles for the entire period. It is noted that out of 402 deaths for the period 1980-82, 134 deaths or 33% were attributed to cerebro-vascular disease. However, it is shown through the calculation of specific death rates that while deaths due to disease of the circulatory system other than cerebro-vascular disease seemed to be on the increase in the population, there were declines in deaths due to cerebro-vascular disease. The other major changes reported were: a rapid decline in deaths due to infectious and parasitic diseases, which from a cause specific rate of 103.2 per 100,000 in 1972-75 declined to 22.4 in 1980-82, a steady increase in deaths due to neoplasms and an apparent increase in deaths due to diseases of the respiratory and digestive systems (d'Espaignet, 1984).

d'Espaignet and other authors[1] have made remarks on the classification of cause of death in the Seychelles similar to those made by Blacker and Hobcraft (1976). For example, through an analysis of statistics on cause of death by age, it was found that 506 out of 630 deaths coded under "Symptoms and ill-defined conditions" between 1976 and 1982 occurred to persons aged 65 years and over (d'Espaignet, 1984). Indeed, the practice of recording deaths in this category reduces the incidence of deaths due to other more specific causes.

The explanations given by d'Espaignet for the rapid decline in mortality are the increase in real income of Seychellois and the more egalitarian policies of the Government. The latter reason is explained through the improvement of medical and

[1]These authors, cited in d'Espaignet, are Wheeler (1979) and McIlroy (1980). It has not been possible to get copies of these sources at the time of the study, but the reference of the second source is given in the Reference section.

health services, which became widely accessible to the population in the late 1970s. The increase in real income, as well as better working conditions have resulted in better diets and improvement in general welfare (d'Espaignet, 1984).

Direct standardisation has been carried out to compare the average annual deaths of 1976-78 to 1986-88 by the Epidemiology and Research Division of the Ministry of Health. It was found that the mortality rate in 1986-88 was lower than that in 1976-78 and that the decline was greater for females at all ages, except for those 80 years and above (Ministry of Health, 1990).

A number of surveys of health and morbidity in the Seychelles have been undertaken by the Ministry of Health (MOH) in collaboration with various international agencies. One of the earliest was carried out in 1956-57 under the joint auspices of the Seychelles Government and the World Health Organisation (WHO) (Spitz, 1960). It was the first of its kind ever contemplated and carried out on such a scale in the Seychelles and its main objectives were to obtain basic information on: general morbidity of the population, including dental and nutritional status, malnutrition, incidence of intestinal diseases and other easily diagnosable conditions; and correlation of these findings with one another and also with general living conditions and sanitation. The sample size of the survey was 5,766 inhabitants, representing one-seventh of the total population in mid-1956.

As the primary object of the survey was fact-finding, the reported results were mainly descriptive. It was discovered that in much of the Seychelles, malnutrition and rather poor nutritional status was caused by intestinal parasitism, and that women generally appeared to be better fed than men. But even though females appeared "better fed" than males, malnutrition was found to be evenly distributed in males and females in the age groups below 20. In terms of regional differences, the study showed that West Mahé (West region) had the highest incidence of malnutrition and anaemia, the highest multiple infection rate of intestinal parasites and the highest rate of infestation with hookworm. With respect to other pathological conditions, the study remarked that in the Seychelles degenerative changes seem to set in at a relatively early age. Many of the degenerative conditions of the eye seem to be associated with extensive glare and exposure to wind and were particularly often encountered in fishermen.

Finally, in 1989 the MOH with assistance of the Canton of Jura and the University of Lausanne in Switzerland conducted a survey on Mahé in order to assess the levels of cardiovascular risk factors in the Seychelles (Hungerbuhler *et al.*, 1993). A sex- and age-stratified random sample of 1,251 subjects was drawn from the 21,300 residents aged 35-64 years. The response rate for both males and females was over 80%, and the assessment of risk factors followed the standard guidelines of the WHO-MONICA study.[2] The study concluded that the Seychelles appears to face an epidemiological transition to chronic diseases resulting perhaps to the ageing of the population and from the changes in lifestyle associated with a rapidly improving standard of living .

4 Recent Variations in Mortality

As mortality for the periods 1971-75 and 1974-83 has already been considered by Blacker and Hobcraft (1976) and d'Espaignet (1984) respectively, this and subsequent sections will mainly focus on mortality between 1983 and 1997, although mortality patterns prior to 1983 are also briefly examined in some of the analyses.

4.1 Age-Specific Death Rates

Age-specific death rates (ASDRs), which represent the average rates within age groups, have the effect of removing a large amount of the variation present in crude death rates (Barclay, 1958). The method used in deriving the ASDRs between 1983 and 1997 was by averaging the rates over overlapping periods of 3 years. This was to minimise the chance of large fluctuations due to small annual number of deaths. In so doing the number of deaths is increased and the size of possible errors in the calculated rate should be reduced (Benjamin and Pollard, 1993). Nevertheless, as can be seen from Figure 1 showing ASDRs on a logarithmic scale for 1983-85, 1989-91 and 1992-94, there are still fluctuations in the rates for both males and females.

A close look at Tables 2 and 3 further confirm that male mortality in the Seychelles is significantly greater than that of females. Instances where female mortality is slightly

in excess of that of males occur in infancy and childhood and the early reproductive age group 15-19. For example at 15.3 per 1,000 in 1993-95 female mortality was higher than male which was 11.4 per 1,000. In all the other age groups male mortality is in excess of female, and becomes distinctively greater at the more advanced ages. For example, while in 1993-95 female ASDRs in the age groups 45-49 and 80 and above were 2.4 and 114.8 per 1,000 respectively, those for males were 12.2 and 180.8 per 1,000 respectively. By 1995-97 female mortality had improved at all ages, except for a slight deterioration for the age group 70-74. However, male mortality had significantly increased in some age groups, with the greatest rise occurring in the age group 60-64, from 21.6 per 1,000 in 1983-85 to 32.9 per 1,000 in 1995-97.

Figures 2 and 3 show death rates by age and sex between 1975 and 1997. It can be further seen that while mortality has declined overall, the improvement has not occurred evenly in all the age groups. Improvement for males is hard to detect. Best conclusion seems that overall there is little change. There is a definite improvement for females overall, at least since 1986. In actual fact mortality has failed to improve, or even deteriorated at some ages for both sexes, especially for males, where no improvement has occurred overall in most of the age groups. The difference between the patterns of mortality for males and females is further seen in Figure 1; confirming that mortality is highest at the extremes of age; at high levels of mortality in the first year of life, the rates drop rapidly to a minimum in the age groups 5-9 and 10-14 where the risk of dying reaches its lowest (Omran, 1971; Benjamin and Pollard, 1993; Diamond and McDonald, 1994). Then after mortality rates rise slowly and accelerate from about 45 years for males and about 55 for females. It is also worth noting that the observed humps in the mortality curve are due to the fluctuations mentioned above. In summary, this section shows that mortality of Seychellois men is hardly improving, whereas that of females is falling, resulting in a divergence in the male and female mortality. This issue is further examined in section 6.

[2] World Health Organisation. *MONICA Manual*, CVD/MNC/ version 1.1. Geneva, WHO, 1986.

4.2 Standardisation

To get a much clearer idea of the 'general' level of mortality free of age distortions, both direct and indirect standardisation are applied to generate a general index. In both the direct and indirect methods of standardisation, the main aim is to get a single index of mortality by ironing out the differences of age structure which the crude death rate does not take into account. The standardised death rate (SDR) is a weighted average of the age-sex specific mortality of a particular population under observation, the weights being the proportions in each age-sex group of a standard population. The SDR relates to the same age-sex structure, any differences will arise from sources other than differences in the age-sex structure (Benjamin and Pollard, 1993). For the calculation of the SDR between 1975 and 1997, the year 1994 was taken as the standard population structure. The results are shown in Table 4 and Figure 4. They confirm the results of ASDRs that mortality has been declining but that the decline is clearer for females than for males. However, in comparing the SDR to the CDR, it appears that for both sexes the magnitude of the mortality decline is slightly under-estimated when changes in the age structure of the population are not taken into consideration. It is noticeable that both the SDR and CDR for both males and females were relatively high between 1986 and 1990, and in 1985 the SDR for males was nearly twice as much as that for females.

The standardised mortality ratio (SMR) is better seen as a weighted average of the mortality ratios between the standard population and population of interest. For the calculation of the standardised mortality ratio (SMR), no standard population structure is needed but a standard set of ASDRs is. In this case, the 1994 ASDRs are used for this purpose. The "standard" ASDRs are then multiplied by the actual population figure at each age in the year in question to yield "expected" deaths for the actual population. The actual annual deaths are then divided by the expected deaths and multiplied by 100 to produce the SMR (Barclay, 1958; Benjamin and Pollard, 1993). The results are shown in Figure 5. The SMRs confirm the decline in mortality for females in contrast to that of males between 1975 and 1997. Within period, male mortality increased up to 1989-90, when it then decreased.

4.3 Expectation of Life

The expectation of life at birth is another measure of mortality which is not distorted by age structure. It is obtained from a life table and indicates the average number of years that persons can expect to live from the time of birth if they were to experience the currently prevailing age-specific death rates throughout their lives. The expectation of life gives more weight to mortality at the younger ages than the overall standardised mortality rate. In view of the fact that there were no estimates of expectation of life at birth for the Seychelles before 1960, taking the expectation of life at birth of 51 years in Mauritius and 50 years in Réunion in 1951-53 (United Nations, 1962) as a benchmark, it can be assumed, given the homogeneity of these populations, that expectation of life in the Seychelles must have been above 50 years in the early 1950s.

From the existing life tables for the Seychelles, as well as the newly derived one for 1994, shown in Table 5, it can be seen that mortality for both sexes has improved since 1960. However, the improvement is more impressive for females than males. It is somewhat difficult to reconcile the expectation of life shown in Table 5 as a result of the different methods used in deriving these life tables. For 1973 a two-parameter model based on the linear logit transformation of suitable standard life table was used (Blacker and Hobcraft, 1976) and for 1976 and 1987 a four-parameter extension of the Brass model life table system was applied (*Statistical Abstract*, 1982; 1987). These life tables could not be verified through the normal procedures, as either complete data were not available, or in the case of 1987, it is not stated which exact years' deaths were centred on the 1987 population census. The life table for 1980 was derived through the normal procedure (directly from the raw data), although it is reported that the age distribution of the reported deaths were smoothed out to ensure a monotically decreasing stationary population at successive age (d'Espaignet, 1984). No explanation is provided on the method for the calculation of the life table for 1960.

In Table 6 we present new estimates of expectation of life at birth in the Seychelles since 1970. As the main interest was simply to get the actual expectation of life, no models have been fitted in deriving these life tables. They have been computed through the normal procedures. For the 1994 life table (Table 5), deaths between 1992

and 1996 were centred on the 1994 population census figures. For the life tables between 1981 and 1996 calculations were carried out in three-year groups with deaths centred on the middle year. The main purpose of calculating these life tables was to compare the expectation of life with few other countries of similar socio-cultural and demographic background as the Seychelles.

The results further confirm the preceding analysis that sex-specific mortality has diverged in the Seychelles between 1981 and 1996, with hardly any significant gains in male mortality. It can be seen from Table 6 that the expectation of life for females has fluctuated. For example, from 80.5 years in 1983-85 female life expectancy dropped to 73.4 years in 1984-8, and to 72.5 years in 1986-88. These fluctuations are probably due to data errors or sampling fluctuations. With the exception of 1990-92 when male life expectancy in the Seychelles rose to 69.9 years, Table 6 shows that it has stagnated between 65 and 66 years. Unlike female expectation of life which decreased slightly below its standard levels in 1986-88, male expectancy of life declined throughout the 1980s. By 1989-91 it had fallen to 62.5, close to the level it was in the early 1970s.

Table 6 also compares trends in the expectation of life at birth in the Seychelles, Mauritius, Martinique, Guadeloupe and Jamaica. Expectation of life for males in the Seychelles was reasonably similar to that in Martinique, Guadeloupe, Jamaica, but higher than that in Mauritius, in the early 1970s. The mortality differential by sex in Mauritius, Martinique, Guadeloupe and Jamaica was not as wide as in the Seychelles. As in the Seychelles, male mortality improved little between 1975 and 1985 in Mauritius, though there were improvements in the other populations. With respect to the level of expectation of life for females, it is seen when 1970-75, showing expectation of life for Martinique, Guadeloupe and Jamaica is compared with 1971-73, showing corresponding figures for the Seychelles and Mauritius, that at around 70 years, expectation of life for females was almost equal in the Seychelles, Martinique, Guadeloupe and Jamaica. In 1971-73 the expectation of life for females in Mauritius was much closer to that of males in the Seychelles, Martinique, Guadeloupe and Jamaica, ranging between 64.6 and 67.9 years.

By the late 1980s the expectation of life had risen appreciably to higher levels in the three Caribbean islands, especially Martinique and Guadeloupe, compared with the Seychelles. While women in Martinique and Guadeloupe were expected to live over 77 years in 1985-90, their Seychellois counterparts were expected to live around 73 years. Unlike in Martinique, Guadeloupe and Jamaica where men are now expected to live over 70 years, Seychellois and Mauritian men are only slowly approaching that level. Whereas in recent years the difference between male and female expectation of life at birth has been over 10 years in the Seychelles, that in the other island countries was less than 10 years. For example, in 1993-95, the differential in Mauritius was 7.5 years. Overall, these results show the existing contrast between the Indian Ocean and the Caribbean islands in male mortality.

The above analysis of expectation of life at birth is in agreement with various studies showing that mortality declines in developing countries decelerated during the period from the 1960s to the 1970s (Gwatkin, 1980; United Nations, 1982). The Seychelles achieved very high expectation of life for developing regions, but mortality improvements, especially for males have decelerated in recent years. The fact that the chance of surviving for adult males has been much less than that for adult females is further shown in Figure 6. These probabilities of surviving from age 15 to age 60 by sex were calculated from the derived life tables between 1981 and 1996 discussed above. The probability of surviving declined for both sexes almost throughout the 1980s, but the decline was more pronounced for males than females. Although by the late 1980s the probability of surviving for females was increasing, that for males continued to decline. Having declined significantly in 1990, the probability for males peaked up in 1991 when it mostly flattened until 1995. This analysis suggests that the divergence between male and female mortality is particularly marked in adult life, and is discussed in greater detail in section 6.

5 Mortality by Cause

5.1 Long-term Trends in Cause of Death and Mortality Transition

Although previous studies on mortality in the Seychelles have considered mortality by cause, none has attempted to approach the issue from a broad historical perspective. This section aims to describe long-term patterns of the cause of death in order to provide some insights into mortality and disease patterns. The analysis is based on the method used by Omran (1971) in his description of the shift in mortality and disease patterns in populations. The World Health Organisation (WHO) International Classification of Diseases and Related Health Problems (1992) has been used in the classification of death according to infectious diseases, neoplasms, circulatory diseases, violent death and other causes. The percentage distribution of causes of death for the Seychelles between 1934 and 1997 has been calculated. The results are shown in Figure 7. In spite of the missing data, mainly for the 1950s and 1960s, it is seen that there has been a shift in the disease pattern with a general decline in infectious diseases and a rise in degenerative diseases. Until around the mid-1970s, accounting for over 20% of mortality, deaths due to infectious diseases were still common. Indeed, as a result of the actual change in the classification of diseases, as well as the actual certification of causes of death in the Seychelles, the prevalence of infectious diseases might have been higher, especially in the pre-1960 period. It is noticeable that since the 1930s, the prevalence of deaths due circulatory diseases has been relatively high in the Seychelles, although deaths due to neoplasms, and violent death to a much lesser extent, have been increasing fairly gradually since the late 1970s.

It can be said, given that the average expectation of life in the Seychelles since 1987 (Table 5) and 1990-92 (Table 6), has been slightly over 70 years, that the Seychelles is now in the third stage of the epidemiological transition. Epidemiological transition refers to the shift from high to low mortality, and in its third stage the main cause of death is due to degenerative and man-made diseases (Omran, 1971; Diamond and McDonald, 1994). The discussion of the transition in mortality and diseases patterns in the Seychelles is continued in section 7.

5.2 Mortality by Cause in Recent Years

The WHO International classification of Diseases and Related Health Problems (1992) was also used for the analysis of causes of death between 1983 and 1997. The results of the analysis on the percentage distribution of deaths by cause and cause specific death rates are presented in Table 7 and 8 respectively. The findings on the distribution of deaths by cause are in agreement with those of earlier studies (Blacker and Hobcraft, 1976; d'Espaignet, 1984) in relation to the biggest killer diseases in the Seychelles. The principal causes of death between 1983 and 1997 were 'Diseases of the circulatory system', 'Neoplasms', 'Diseases of the respiratory system', 'Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified' and 'External causes of morbidity and mortality'. The other diseases that take a large toll of death in the Seychelles are 'Certain infectious and parasitic diseases' and 'Diseases of the digestive system'. The large decline in 'Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified' from 18.0% in 1983-85 to 5.0% in 1995-97 can be perhaps attributed to the improvement in the classification of death in the Seychelles.

The cause specific death rates (Table 8) do not entirely continue the trends noted by d'Espaignet (1984). The death rates due to 'Neoplasms' and 'Diseases of the circulatory system' continued the increase identified by d'Espaignet (at least until 1989-91 for 'Diseases of the circulatory system'). However, deaths due to 'Certain infectious and parasitic diseases' increased, and deaths due to 'Diseases of the respiratory system' and 'Diseases of the digestive system' declined in the population between 1983 and 1997. For example, from a cause specific rate of 29.9 per 100,000 in 1983-85, deaths due to 'Certain infectious and parasitic diseases' increased to 43.7 per 100,000 in 1995-97; and for the same periods, deaths due to 'Diseases of the respiratory system' decreased from 75.7 per 100,000 to 62.9 per 100,000. In order to be consistent with the previous studies on mortality in the Seychelles (Blacker and Hobcraft, 1976 and d'Espaignet, 1984), the analyses in this section are based on percentage distribution of causes of death and cause specific mortality rates for the entire Seychelles population. In the next section which considers the reasons for the divergence between male and female mortality between 1983 and 1997, percentage

distribution of cause of death and age-cause specific mortality rates by sex will be examined.

With respect to 'Diseases of the circulatory system', further calculations have been carried out to compare the prevalence of such disease with other countries. The results are shown in Table 9. It can be seen that the levels of death due to 'Diseases of the circulatory system' in the Seychelles are somewhat greater than in South Africa, Trinidad and Tobago, Barbados and Singapore, but somewhat less than in Mauritius, the Channel Islands, the United Kingdom and Australia.

6 Divergence in Male and Female Mortality

It has been shown in section 4 that compared to females, mortality among Seychellois males in recent years has not been improving. In order to address this issue, this section will attempt to analyse why male mortality is greater than female and getting relatively more so over time and why male mortality increased in 1989-90. To do this male and female causes of death between 1983 and 1997 are compared and male causes of death in 1989-90 and 1991-92 are compared. It will be remembered that compared to 1989 and 1990, 1991 and 1992 were years of low mortality among both males and females (Table 4). The derived proportion of deaths by cause of death by sex between 1983 and 1997 is shown in Table 10.

From Table 10, it can be seen that similar patterns in the main causes of death described above are observed for men and women. The only exception where there are big differences between male and female mortality is death due to 'External causes of morbidity and mortality'. Between 1983 and 1997 'External causes of morbidity and mortality' contributed over 10% of male mortality, while it has not exceeded more than 5% for females. Also, while deaths due to that cause have decreased for females, no sign of decline has been observed for males. It is difficult, given that a large number of deaths under 'External causes of morbidity and mortality' are classified as 'other' to know the exact cause of death. However, deaths due to motor vehicles accidents, and fractures, burns and poisonings are given separately, and the data confirm that deaths due to these two causes are not negligible among males. The age groups where deaths due to 'External causes of morbidity and

mortality' are particularly high are 15-24 and 25-44, although it has also been observed that there are instances when deaths due to that cause in the age group 5-14 have been as significant as in the other two age groups.

The other main causes of mortality which are generally higher among males are: 'Certain infectious and parasitic diseases', 'Diseases of the respiratory system' and 'Diseases of the digestive system'. In terms of 'Certain infectious and parasitic diseases', although for the most part deaths due to HIV/AIDS have been concentrated among men, the number is too low to have any significant impact on male mortality. It is reported that by the end of 1997 there were 18 cases of AIDS in the Seychelles (World Health Organisation, 1997). Between 1995 and 1997, 9 deaths were reported due to AIDS (*Statistical Abstract*, 1997). Although the proportion of deaths due to 'Neoplasms' is slightly higher among males, there are years when they accounted for a higher percentage of deaths among females. For example, in 1986-88 the percentage of deaths due to 'Neoplasms' was 17.4% for females compared to 14.0% for males. Although mortality due to 'Diseases of the circulatory system' forms a higher proportion of female death than male death, the proportion has been increasing for both sexes.

In order to get further insights in the causes for the divergence between male and female mortality, age-cause specific mortality rates (ACSMRs) by sex between 1983 and 1997 have been calculated. For the calculation of ACSMRs, the age groups were combined into four main groups, 0-4, 5-14, 15-64 and 65 and above. The actual cause specific mortality rates by sex for the five main causes of death in the Seychelles are shown in Figures 8 and 9. As would be expected, based on the previous analyses, the number of deaths due to all causes of deaths in the population between 1983 and 1997 were much higher among males than females. While the annual rate of mortality for all causes of deaths has generally been declining for females, that for males has increased. For example, at 279 per 100,000 in 1983-85, it went up to almost 300 per 100, 000 in 1995-97, having reached a peak of 315 per 100,000 in 1989-91. During the period 1983-97, the highest mortality rate for all the causes of death for females was in 1986-88 at 233 per 100,000.

Among the five main causes of death, the rate of dying due to 'Diseases of the circulatory system' was remarkably high and was overall increasing for both sexes. However, the rate of dying due to 'Diseases of the circulatory system' was higher for males, and on the whole, the increase has been more pronounced. For example, the rate of dying due to 'Diseases of the circulatory system' for males had risen to over 300 per 100,000 between the periods 1989-91 and 1995-97, a rate that had not been reached by females between 1983 and 1997. With the exception of 'Neoplasms' which reached 53 per 100,000 in 1995-97 for males, the rate of dying due to the other four main causes of death has been below 50 per 100,000. While the trend in 'Diseases of the respiratory system' followed almost similar patterns for both sexes, that was not the case for 'Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified' and 'External causes of morbidity and mortality'. Having declined for both sexes, the rate of dying due to 'Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified' was much higher among females than males. The situation is different for 'External causes of morbidity and mortality' where the rate of dying due that cause of death was fairly high among males. As already commented on by d'Espaignet (1984), the classification of deaths under 'Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified' in the Seychelles distorts the true picture of cause of death. Further research needs to be carried out to detect these 'unknown' causes of death and also why they are more prevalent among females.

The age-cause specific mortality rates for males for 1989-90 and 1991-92 are shown in Table 11. Evidence of the cause for the high male mortality in 1989-90 can be seen only for 'Diseases of the circulatory system'. At 195 per 100,000 in 1989-90, cause specific mortality rates for males due to 'Diseases of the circulatory system' had declined to 172 per 100,000 in 1991-92. Similar finding with respect to the higher male mortality, and the slow progress in improving men's life chances, come from the study of Hungerbuhler *et al.* (1993). They report that the incidence of fatal cerebrovascular diseases was 139 per 100,000 for males and 74 per 100, 000 for females, and for nonfatal cerebrovascular diseases the corresponding values were 267 and 85. They also account that about 9% of males (98 cases) admitted to the medical ward of the Victoria hospital in 1989 were diagnosed as having cardiomyopathies related to thiamine deficiency and/or alcohol. It is believed that these

cardiomyopathies result from a high consumption of alcohol and from the low thiamine content of the traditional Seychellois diet, which consists predominantly of fish and polished rice. In their study Hungerbuhler *et al.* found that there was evidence of detrimental diet patterns, such as a low intake of fruits and vegetables, a high alcohol intake in men, and a possibly substantial intake of saturated fats related to the use of hydrogenated palm oil.

As can be seen from Table 11, the rate of dying for males from almost all causes of death is greater in the adult (15-64) and the much older age groups. Although overall, the results on the percentage distribution of deaths by cause and age-cause specific mortality rates show that 'Diseases of the circulatory system' and 'External causes of morbidity and mortality' may be accounting for the difference in male and female mortality, the evidence on the issue in question is not clear. There are a number of other factors, such as occupation, life-styles and patterns of consumption and marital status, that may be contributing to the poor health of men compared to women. Hence, further research is required in order to form a more comprehensive explanation for the divergence in male and female mortality in the Seychelles.

7 Discussion of Factors Influencing Mortality Decline

A combination of factors have come into play since around the 1950s to improve adult and infant mortality, and to shift the pattern of causes of death, especially due to infectious and parasitic diseases, as described earlier. Several studies have shown the strong relationship between diseases and death to variables such as medical services, economic development, education etc. (Preston, 1975; Caldwell, 1986; Cleland and van Ginneken, 1988). As already alluded to by d'Espaignet (1984), the social welfare programmes in the late 1970s, namely free health services and compulsory and free education in the Seychelles have acted as major forces behind the improvement in mortality. This section discusses the pertinent forces that may have contributed to the decline in mortality and the transition of mortality due to infectious and parasitic diseases in the Seychelles, and the reference period will be 1950 to 1997.

The evidence of health inputs to mortality decline in the Seychelles is convincing. As partly confirmed the study of Spitz (1960), the standard of health in general used to be

poor in the Seychelles. Preventive medicine which was nothing but a name at the beginning of the 1950s has remarkably developed and gained momentum in the late 1970s. As was the case in many African countries and territories, the provisions for the extension and improvement of medical services have been given an important place in the long-term economic and development plans in recent years. One of the main vehicles for the expansion of primary and public health in the Seychelles was the National Health Plan 1980-84 (Ministry of Health, 1980). The overall objective of the Plan was to make the maximum contribution possible to the improvement of health conditions in the country. According to the Ministry of Health, the number of doctors working in Primary Health Care went up from 10 (1 for 6,400 people) in 1979 to 23 doctors (1 to 2,709 people) in 1984. The number of nurses went up from 32 (1 for 2,000 people) in 1979 to 121 nurses (1 per 554 people) in 1984 (Ministry of Health, 1984).

The decline in infant mortality is largely associated with the improvement in the area of maternal and child welfare. Since the 1960s the child and welfare clinics have been providing considerable advice and material help. Moreover, with the expansion of health services in the late 1970s, both antenatal and postnatal examinations were made possible in all the district health centres by qualified nurses. Follow up visits are also made to mothers failing to attend for postnatal clinics. Furthermore, the immunisation status of the population may be considered as excellent. Intensive vaccination campaigns began in 1953, and Mantoux tests and B.C.G.vaccinations were started towards the end of 1962. The activities of the WHO, United Nations Children's Fund (UNICEF), United Nations Population Fund (UNFPA), Red Cross Society, and various bilateral aid donors and local organisations have contributed greatly to the observed reduction in infant and child mortality too.

The drop in mortality caused by infectious and parasitic diseases may be associated with the various alleviation of poverty programmes. These resulted in marked improvements in housing, clean water supply, and hygiene and sanitary methods of sewage disposal. In 1953 72% of the houses were 'poor', 25% of the families lived in overcrowded conditions, and at least 33% of the people still drew their drinking water from streams (*Medical and Health Department Report*, 1954), and in 1968 it was estimated that there were 1,900 houses up to standard and 9,000 below standard. The

initiatives for the construction of Low Cost housing by Government and the private sector greatly helped in resolving the situation. The supply of filtered and chlorinated water on Mahé, Praslin and La Digue in the 1970s also went a long way to combat the diarrhoea that was highly prevalent in children. Further indications of success in the eradication of infectious diseases and parasitic diseases may be sought through the actual dismantling of the Leprosy Treatment Village on Curieuse Island in 1961 and the closure of tuberculosis sanatorium in 1976; two diseases which were highly prevalent in the Seychelles.

Cleland and van Ginneken (1988) have suggested that compared to the uneducated, educated mothers may attach a higher value to the welfare of children, have greater decision-making power on health-related and other matters, be less fatalistic about disease and death; be more knowledgeable about disease prevention and cure, be more innovative in the use of remedies, and be more likely to adopt new codes of behaviour which improve the health of children though they are not perceived as having direct consequences for health. All these issues are relevant to the Seychelles given the high level of both formal and popular education achieved since the late 1970s, and have had a direct bearing on infant and childhood mortality. For example, the sensitisation programmes of the Health and Education Unit in the Ministry of Health have contributed to the provision of accurate information on various health topics, and thus helped to change people's attitudes based on scientific information.

The impact of income on mortality decline prior to the late 1970s is debatable. Preston's (1975) finding that the growth in expectation of life for the world between the 1930s and 1960s was attributed to factors other than the nation's contemporary levels of income is also applicable to the Seychelles, as the relatively high level of expectation of life between 1960 and 1976 was probably gained independently of level of income. However, income may have played a significant role for the improvement in mortality in the 1980s and 1990s, as the standard wage has considerably increased during these periods.

The shift in occupation may also have acted as a force behind the improvement of adult mortality, especially for females. Although the proportion is not given, it is reported that in the mid-1950s women were employed on agricultural estates in the

care and maintenance of land; copra, cinnamon, vanilla and tea picking, also in coir factories (Labour Department, 1969). The majority of the population is now employed in service industries. The benefits provided by the Government through the Social Security Scheme to those unable to work, namely persons aged 65 years and above, the sick and disabled, might have also influenced mortality decline since the late 1970s.

The conditions identified by Caldwell (1986) from the experience of Sri Lanka, Costa Rica and Kerala for unusually low mortality are: sufficient female autonomy, considerable inputs into both health and education, health services accessible to all, ensuring that the health services work efficiently, providing a nutritional floor or distributing food in some kind of egalitarian fashion, achieving universal immunisation, and provision of antenatal and postnatal health services. These, as well as other targets vital for the control of mortality and morbidity, have been achieved in the Seychelles.

8 Summary and Conclusions

This paper has attempted to examine the levels and trends of mortality in the Seychelles between 1983 and 1997, as well as some aspects of the mortality and morbidity transition in the pre-1983 period. In this investigation, special reference has been on the widening gap between male and female mortality; a fact confirmed by all studies on mortality conducted in the Seychelles in recent years. This study provides further evidence, through the analyses of age-specific death rates, standardisation and expectation of life at birth that adult mortality has declined in almost all age groups, although the timing has varied, and male mortality decline lags behind females'.

Trends in the standardised mortality ratios and expectation of life at birth clearly showed that the divergence between male and female mortality occurred in the early 1980s. The deterioration in male mortality throughout the early 1980s and in the early 1990s is not an artefact of the data. An almost similar trend has been observed in other small island developing countries, namely Mauritius, Guadeloupe, Martinique and Jamaica. Expectation of life for males in the three Caribbean islands is greater and has been more progressive than in Mauritius and the Seychelles. However, from

just the aggregated cause of death data, the cause for the divergence between male and female mortality in the Seychelles is not clear. Therefore, this remains a subject for further research.

References

Barclay, G. W. (1958) *Techniques of Population Analysis*. John Wiley & Sons.

Benjamin, B. and Pollard, J.H (1993) The Analysis of Mortality and Other Actuarial Statistics. Institute of Actuaries and Faculty of Actuaries in Scotland.

Blacker, J.G.C. and Hobcraft (1976) *Fertility, Mortality and Population Growth in the Seychelles*. (Unpublished report).

Caldwell, J.C. (1986) Routes to Low Mortality in Poor Countries. *Population and Development Review*, **12** (2): 171-220.

Cleland J.G. and van Ginneken, J.K. (1988) Maternal Health and Child Survival in Developing Countries: The Search for Pathways of Influence. *Social Science and Medicine*, **27** (12): 79-100.

Colony of Seychelles, *Annual Report of the Medical and Health Department for the Year 1934* to *1941; 1943* to *1955; 1957* to *1959; 1962; 1964-67; 1968-69*. Victoria, Seychelles.

d'Espaignet, E.T. (1984) *The population of Seychelles*. UNFPA Project, Victoria, Seychelles.

Diamond, I. and McDonald, P. (1994) Mortality. In Lucas, D. and Meyer, P. (eds), *Beginning of population studies*. Second Edition. National Centre for Development Studies. The Australian National University, pp. 29-43.

Gwatkin, D.R. (1980) Indications of Change in Developing Country Mortality Trends: The End of an Era? *Population and Development Review*, **6** (4): 615-644.

Hungerbuhler, P., Bovet, P. and Shamlaye, C. (1993) The cardiovascular disease situation in Seychelles. *World Health Statistics Quarterly*, **46**, (2): 108-112.

Information Systems Division (ISD), *Statistical Abstract, 1986* to *1989*. Victoria, Seychelles.

Kuczynski, R.R. (1949) *Demographic Survey of the British Colonial Empire*. Vol. II. Augustus M. Kelley Publishers. The Harvester Press.

Labour Department (1969) *Biennial Report of the Labour Department for the period 1967-68*. Victoria, Seychelles.

Management Information Systems Division (MISD), *Statistical Abstract, 1990* to *1997*. Victoria, Seychelles.

MISD (1994) *National Population & Housing Census 1994*. Vol. 1. Victoria, Seychelles.

McIlroy (1980) *Report on Mortality and Fertility in Seychelles*.

Ministry of Health (1980) *National Health Plan 1980-84*. Victoria, Seychelles.

Ministry of Health (1984) *Country Profile Seychelles.* Draft report. Victoria, Seychelles.

Ministry of Health (1990) *Health Statistics Report 1990*. Epidemiology and Research Division. Victoria, Seychelles.

Omran, A.R. (1971) The Epidemiological Transition. A Theory of the Epidemiology of Population Change. *The Milbank Memorial Fund Quarterly*. **XLIX** (4): 509-538.

Preston, S. (1975) The Changing Relation between Mortality and Level of Economic Development. *Population Studies*, **29** (2): 231-48.

Rosalie, M. W. (2000) *Population Processes in the Seychelles*. Unpublished PhD Thesis, Department of Social Statistics, University of Southampton.

Spitz, A.J.W. (1960) Health and Morbidity Survey, Seychelles, 1956-57. *World Health Bulletin*, **22**, 439-67.

Statistics Division, *Statistical Abstract, 1975* to *1985*. Victoria, Seychelles.

United Nations (1962) *Population Bulletin*, No. 6. Department of Economic and Social Affairs.

United Nations (1982) *Levels and Trends of Mortality since 1950*. A joint study by the United Nations and the World Health Organisation. Department of International Economic and Social Affairs. New York.

United Nations *Demographic Yearbook, 1970, 1975, 1980, 1981, 1983, 1985, 1986, 1987, 1988, 1990, 1991, 1992, 1994, 1995, 1996*. New York.

Webb, A.W.T. (1960) *Population Census of the Seychelles Colony: report and tables for 1960*. Victoria, Seychelles.

World Bank (1994) *Poverty in Paradise*. Draft Report. Victoria, Seychelles.

World Health Organisation (1992) *International Statistical Classification of Diseases and Related Health Problems*. Tenth Revision. Geneva.

World Health Organisation (1997) *Weekly Epidemiological Record*, **72** (357-364): 3.

Table 2 Male Age-Specific Death Rates: Seychelles, 1983-97.

Age	1983-85	1984-86	1985-87	1986-88	1987-89	1988-90	1989-91	1990-92	1991-93	1992-94	1993-95	1994-96	1995-97
0-1	19.2	21.3	21.9	20.7	21.5	20.0	19.4	16.3	14.0	11.5	11.4	12.4	12.2
1-4	0.8	0.6	0.9	0.6	0.7	0.6	0.7	0.7	1.0	0.8	0.8	0.5	0.9
5-9	0.7	0.3	0.5	0.5	0.7	0.7	0.4	0.4	0.3	0.2	0.4	0.4	0.4
10-14	0.3	0.4	0.4	0.4	0.4	0.1	0.4	0.4	0.5	0.4	0.6	0.8	0.8
15-19	0.9	0.5	0.7	0.7	1.0	0.6	0.4	0.1	0.2	0.6	1.0	1.3	1.2
20-24	2.0	1.7	2.3	2.0	2.0	1.6	1.6	1.6	1.9	1.6	1.4	1.3	2.0
25-29	2.1	2.1	1.9	2.5	2.3	2.5	2.4	2.5	2.4	2.0	1.6	1.4	1.8
30-34	3.1	2.9	3.4	3.1	2.2	2.2	3.1	4.2	4.2	3.8	3.8	3.2	2.7
35-39	5.8	5.2	5.4	5.9	6.0	6.2	5.3	4.7	4.3	4.7	5.0	5.0	4.1
40-44	9.7	10.9	9.3	8.7	9.8	12.0	10.4	9.2	7.3	7.0	6.2	5.1	4.9
45-49	8.5	10.7	12.5	13.3	12.5	12.3	11.9	12.4	12.4	11.4	12.2	13.2	12.8
50-54	18.1	18.0	17.8	13.5	12.2	12.5	14.9	15.9	16.2	15.6	14.0	12.6	14.8
55-59	14.7	15.9	19.0	17.9	23.5	27.5	29.8	26.9	23.0	24.6	22.7	24.6	20.6
60-64	21.6	24.2	32.2	35.4	41.3	44.0	41.7	37.2	33.7	32.3	32.4	30.9	32.9
65-69	52.9	50.3	45.7	47.0	49.5	53.7	51.9	43.0	48.7	49.3	51.4	45.7	49.9
70-74	64.9	68.3	60.5	58.7	59.7	59.1	64.4	62.7	72.8	76.5	74.5	61.9	59.5
75-79	93.1	99.6	97.0	90.5	107.6	114.6	117.3	108.8	115.5	117.9	108.6	97.9	93.9
80+	335.3	331.3	334.8	318.9	359.5	425.5	295.6	212.2	160.0	180.9	180.8	176.6	186.9
All Ages	8.4	8.4	8.5	8.2	8.8	9.1	9.5	9.1	9.3	9.2	9.1	8.7	8.9

Sources: *Statistical Abstract*: 1986, p. 14 for 1983-86; 1991, p.13 for 1987-91; 1996, p. 14 for 1992-96; 1997, p.14 for 1997.

Table 3 Female Age-Specific Death Rates: Seychelles, 1983-97.

Age	1983-85	1984-86	1985-87	1986-88	1987-89	1988-90	1989-91	1990-92	1991-93	1992-94	1993-95	1994-96	1995-97
0-1	12.7	12.4	14.7	15.4	14.4	12.4	10.1	9.5	11.8	11.2	15.3	11.8	11.5
1-4	0.6	0.6	1.0	1.1	1.1	0.7	0.1	0.3	0.4	0.5	0.4	0.2	0.1
5-9	0.6	0.4	0.7	0.4	0.3	0.3	0.4	0.5	0.3	0.3	0.4	0.4	0.3
10-14	0.3	0.2	0.0	0.3	0.3	0.4	0.4	0.5	0.4	0.2	0.0	0.1	0.1
15-19	0.4	0.3	0.5	0.5	0.8	0.5	0.6	0.5	0.6	0.7	0.4	0.4	0.2
20-24	0.6	0.7	0.7	0.4	0.5	0.5	0.8	0.5	0.5	0.3	0.3	0.2	0.2
25-29	1.5	2.1	1.7	1.4	1.0	0.8	1.0	1.0	0.7	0.3	0.5	0.6	0.7
30-34	0.9	1.4	1.7	1.4	0.8	0.5	1.0	0.9	0.9	0.9	0.8	0.8	0.4
35-39	1.9	1.3	1.6	0.8	1.3	1.7	2.4	2.4	3.0	3.3	2.5	1.6	1.0
40-44	3.9	4.6	4.0	4.6	4.6	3.9	2.5	2.1	2.2	3.3	2.2	2.3	1.4
45-49	1.6	2.8	4.6	6.4	8.0	7.0	5.4	3.6	3.2	3.5	2.4	2.0	1.4
50-54	6.6	7.1	7.3	7.8	7.9	7.8	5.3	3.2	4.6	6.3	6.1	4.7	5.7
55-59	9.9	11.9	13.1	14.0	10.6	9.3	7.1	9.1	8.7	8.3	5.7	5.3	6.1
60-64	13.1	13.7	13.4	13.8	13.7	15.2	16.2	15.2	12.6	11.7	9.9	10.3	11.3
65-69	18.4	21.7	18.9	19.2	19.2	22.3	21.7	18.3	17.7	18.3	20.1	19.2	17.5
70-74	32.6	35.3	35.6	42.6	38.4	38.5	30.1	29.1	29.3	37.6	36.9	34.6	33.1
75-79	52.1	45.3	41.2	44.9	47.9	51.2	56.6	55.6	54.9	43.0	41.8	44.2	48.5
80+	145.1	152.6	139.7	153.4	154.8	156.1	147.6	133.4	123.8	123.1	114.8	115.6	111.3
All Ages	6.1	6.5	6.4	7.0	6.9	6.9	6.7	6.3	6.3	6.3	6.0	5.9	5.8

Sources: Refer to Table 2.

Table 5 Life Tables: Seychelles, 1960-97.

Males								**Females**						
Age	**1960**	**1971**	**1973**	**1976**	**1980**	**1987**	**1994**	**1960**	**1971**	**1973**	**1976**	**1980**	**1987**	**1994**
0	60.8	61.8	62.5	64.6	66.2	67.2	66.0	65.9	67.9	69.9	71.1	73.5	72.9	77.1
1	...	...	63.8	66.0	66.6	67.8	65.8	...	...	71.3	72.6	74.0	73.1	77.0
5	61.2	62.0	61.2	63.2	63.1	64.0	62.0	65.8	68.2	68.7	69.7	70.5	69.4	73.1
10	56.5	57.4	56.6	58.4	58.3	59.2	57.1	61.2	63.8	64.1	65.0	65.6	64.5	68.2
15	...	52.6	51.9	53.6	53.4	54.3	52.3	...	58.9	59.5	60.2	60.7	59.2	63.2
20	46.7	48.1	47.3	49.0	48.8	49.5	47.5	51.5	54.1	54.8	55.5	55.9	54.8	58.4
25	...	43.8	42.9	44.4	44.3	45.0	42.8	...	49.6	50.3	50.9	51.1	50.0	53.5
30	38.1	39.5	38.5	39.9	39.9	40.5	38.2	42.2	45.2	45.8	46.3	46.5	45.2	48.6
35	...	35.1	34.1	35.4	35.4	36.0	33.8	...	40.9	41.3	41.7	41.7	40.4	43.8
40	29.6	30.6	29.8	31.1	31.0	31.8	29.5	33.2	36.4	36.9	37.1	37.1	35.6	39.2
45	...	26.2	25.6	26.8	26.6	28.0	25.3	...	32.0	32.4	32.6	32.7	31.3	34.6
50	22.7	22.2	21.5	22.8	23.0	24.4	21.7	24.2	27.5	28.0	28.1	28.4	21.1	30.0
55	...	18.5	17.7	19.0	19.6	20.7	18.2	...	23.3	23.7	23.9	24.2	22.9	25.8
60	14.5	15.1	14.1	15.6	15.9	17.4	15.3	16.7	19.5	19.5	19.7	20.1	19.0	21.6
65	...	12.1	10.9	12.5	12.7	15.0	12.2	...	16.0	15.6	15.9	16.2	15.1	17.6
70	7.3	9.7	8.1	9.6	9.9	12.8	9.6	10.1	12.8	12.0	12.2	12.8	11.3	14.1
75	...	7.7	5.8	6.8	7.4	10.8	7.3	...	10.2	8.8	8.9	9.7	8.0	11.3
80	2.5	6.2	4.7	4.3	5.1	...	5.6	3.7	8.2	6.3	5.9	7.3	...	8.5
85	...	...	...	...	3.7	...	4.7	...	...	...	...	6.2	...	6.9

Sources: Census Report, 1960, p. 55; d'Espaignet, 1984, p. 48 for 1971, 1973 and 1980; Blacker and Hobcraft, 1976, for 1976 (Table 10); *Statistical Abstract*, 1991, p. 17 for 1987; and 1994 calculated from data referred to in Table 2.

Table 10 Percentage Distribution of Registered Deaths by Cause of Death by Sex: Seychelles, 1983-97.

ICD Code¬	Cause of Death	1983-85		1986-88		1989-91		1992-94		1995-97	
		M	F	M	F	M	F	M	F	M	F
1001-1025	Certain infectious and parasitic diseases	4.3	3.9	8.3	4.9	4.4	4.8	5.7	5.8	6.5	5.1
1026-1047	Neoplasms	14.5	12.6	14.0	17.4	14.0	13.6	16.0	16.2	17.7	15.0
1048-1050	Diseases of the blood and blood-forming organs	1.1	-	1.2	1.3	1.0	1.9	1.4	2.3	3.4	2.7
1051-1054	Endocrine, nutritional and metabolic diseases	1.4	3.2	0.4	2.0	1.5	2.9	1.4	3.2	2.8	5.5
1055-1057	Mental and behavioural disorders	-	-	-	-	-	-	-	-	0.4	0.4
1058-1061	Diseases of the nervous system	2.5	1.8	1.6	1.3	1.6	2.2	2.6	1.9	2.3	1.8
1063	Diseases of the ear and mastoid process	-	-	-	-	-	-	-	-	-	-
1064-1071	Diseases of the circulatory system	27.3	33.8	32.8	35.4	40.9	42.9	35.8	43.6	33.7	41.0
1072-1077	Diseases of the respiratory system	11.6	8.9	11.1	10.1	10.5	9.0	12.2	10.2	8.2	8.8
1078-1081	Diseases of the digestive system	6.3	3.4	4.9	3.6	6.8	4.3	7.0	3.1	5.1	3.3
1082	Diseases of the skin and subcutaneous tissue	-	-	-	-	-	-	-	0.3	0.3	0.7
1083	Diseases of the musculoskeletal system and connective tissue	-	-	-	-	-	-	-	-	0.1	0.9
1084-1086	Diseases of the genitourinary system	-	-	-	-	-	-	-	-	2.2	2.1
1087-1091	Pregnancy, childbirth and the puerperium	-	0.3	-	0.3	-	0.6	-	-	-	0.1
1092	Certain conditions originating in the perinatal period	4.1	3.4	4.2	4.5	1.9	2.0	1.5	2.3	1.6	2.1
1093	Congenital malformations, deformations and chromosomal abnormalities	0.6	1.0	0.9	0.1	1.5	0.9	0.3	0.4	0.4	1.0
1094	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	14.5	22.7	7.6	15.4	5.8	11.8	5.2	8.0	3.3	7.6
1095-1103	External causes of morbidity and mortality	11.9	5.0	13.1	3.7	10.2	3.2	10.7	2.5	12.0	1.9
	Total	100	100	100	100	100	100	100	100	100	100

Note: ¬ Refer to Table 7.

Sources: *Statistical Abstract*: 1983, p. 18; 1984, p.16; 1985, p.16; 1986, p. 16; 1987, p. 16; 1988, p.16; 1989, p. 16; 1990, p. 15; 1991, p. 15; 1992, p. 16; 1993, p. 16; 1994, p. 16; 1995, p.18; 1996, p. 18; and 1997, p. 18.

Table 11 Male Age-Cause Specific Mortality Rates: Seychelles, 1989-92.

		1989-90					1991-92				
ICD Code¬	Cause of Death	0-4	5-14	15-64	65+	All Ages	0-4	5-14	15-64	65+	All Ages
1001-1025	Certain infectious and parasitic diseases	12.16	-	17.42	231.02	22.38	18.65	-	19.78	162.38	23.58
1026-1047	Neoplasms	-	3.21	38.57	858.09	62.67	6.22	3.35	52.35	562.08	65.74
1048-1050	Diseases of the blood and blood-forming organs	-	-	-	82.51	3.73	-	-	-	49.96	2.86
1051-1054	Endocrine, nutritional and metabolic diseases	-	-	2.49	148.51	8.21	-	-	-	87.43	5.00
1055-1057	Mental and behavioural disorders	-	-	2.49	49.50	3.73	-	-	-	-	-
1058-1061	Diseases of the nervous system	12.16	3.21	4.98	33.00	6.71	12.43	6.69	3.49	87.43	10.00
1063	Diseases of the ear and mastoid process	-	-	-	-	-	-	-	-	-	-
1064-1071	Diseases of the circulatory system	12.16	-	130.66	2541.25	194.73	6.22	-	111.67	1811.14	172.93
1072-1077	Diseases of the respiratory system	36.49	3.21	34.84	544.55	50.73	12.43	3.35	23.27	599.55	50.74
1078-1081	Diseases of the digestive system	12.6	3.21	32.35	297.03	35.07	12.43	-	29.08	162.38	28.58
1082	Diseases of the skin and subcutaneous tissue	-	-	-	-	-	-	-	-	-	-
1083	Diseases of the musculoskeletal system and connective tissue	-	-	-	-	-	-	-	1.16	-	0.71
1084-1086	Diseases of the genitourinary system	-	-	-	-	-	-	-	-	-	-
1087-1091	Pregnancy, childbirth and the puerperium	-	-	-	-	-	-	-	-	-	-
1092	Certain conditions originating in the perinatal period	72.92	-	-	-	8.95	74.60	-	-	-	8.58
1093	Congenital malformations, deformations and chromosomal abnormalities	60.81	-	-	-	7.46	37.30	-	-	-	4.29
1094	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	-	-	4.98	528.05	26.86	6.22	3.35	6.98	287.28	22.15
1095-1103	External causes of morbidity and mortality	6.08	3.21	73.42	99.01	49.99	12.43	3.35	73.29	124.91	54.31
	Total	225.01	16.04	342.19	5412.54	481.22	198.93	20.08	321.06	3934.55	449.48

Note: ¬ Refer to Table 7. Sources: Refer to Figure 8.