THE DEMOGRAPHY OF CYPRUS, 1881-1982

A thesis submitted to the University of London
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By

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ABSTRACT

This research aims at determining the demographic characteristics of the population of Cyprus over 1881-1982, using all available data from censuses, registration and surveys. The thesis consists of two main parts. The first part focuses on the period from 1881 to 1960 and refers to the entire population. The second part deals with the period after 1960 and mainly focuses on the majority Greek Cypriot population, virtually no information being available for the Turkish minority after this time; the island was partitioned between Greeks and Turks in 1974.

Chapter 1 describes the objectives of the thesis and the data available. Chapters 2-7 refer only to the period up to 1960. Chapter 2 deals with the growth of the population and changes in the distribution by age and sex. In Chapter 3 it is established that mortality transition was under way by the 1880s while it is argued that female mortality was slightly higher than male mortality before 1911. Chapter 4 traces changes in marriage patterns after 1911 and their relationship to changing ratios of males to females. In Chapter 5 it is argued that although fertility had decreased slightly by the 1940s, an uninterrupted declining trend was only established in the 1950s. In Chapter 6 migration is considered; emigration from Cyprus was substantial in the period 1955-1960. In Chapter 7 differences between Greeks and Turks in mortality, fertility and nuptiality are examined.

In Chapter 8 it is established that fertility for Greek Cypriots had reached low levels though above replacement by 1976 while mortality had reached low levels by 1982. There was substantial emigration between 1974 and 1978.

In Chapter 9 the validity of the mortality and fertility estimates is assessed by using them to project the population of Cyprus from 1921 onwards.

Chapter 10 presents a summary of the major findings.

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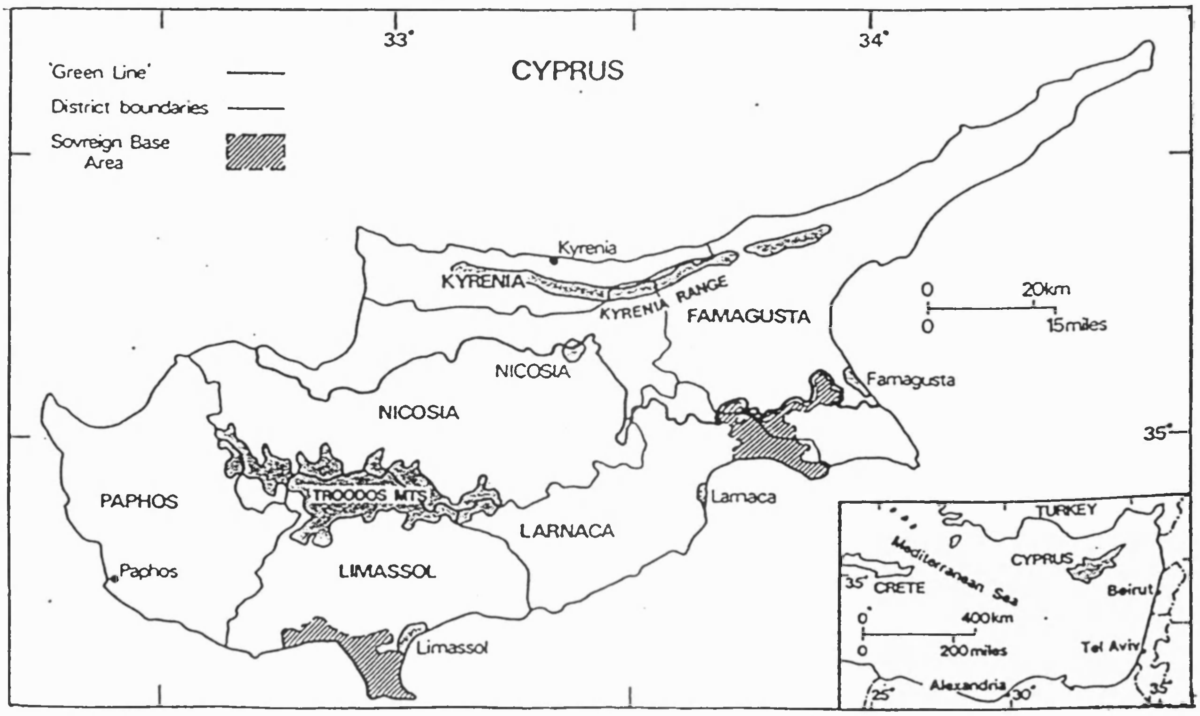
Chapter 1: INTRODUCTION

In this chapter a brief account of the geography and history of Cyprus is given. This is followed by a discussion of the history of the island's population for the period before 1881 and an account of previous research for the period after 1881 when demographic data were first collected in a systematic way. Finally, a short description of the scope and structure of the thesis is included and of the available data on which the thesis is based.

1.1 A brief account of the geography and history of Cyprus

Cyprus is an island in the Mediterranean, situated in the north-east corner of that sea at a distance of about 60 miles from the Syrian coast and 40 miles from Turkey. It is the third largest island in the Mediterranean after Sicily and Sardinia and comprises 3,572 square miles. The greatest length of the island is about 140 miles and its greatest breadth is about 60 miles (see Figure 1.1). The island includes two major mountain ranges, the Kyrenia range in the north and the Troodos in the south-west; between them lies the Mesaoria plain, the richest and most fertile agricultural area of Cyprus.

Figure 1.1: Cyprus and the districts of Cyprus; the "green line" that separates Greek and Turkish areas post-1974; and the sovereign base areas



The history of Cyprus dates back to the 6th millennium BC. The origin of its first inhabitants is unknown. However, the archaeological evidence indicates that Cyprus attained a high degree of Neolithic civilisation (Alastos, 1955: 17). During the Bronze Age (2,500-1,050 BC) Cyprus began to assume increasing importance due to its rich copper mines and pottery. In the 18th century BC Cyprus came in close contact with the Minoan civilisation and a script called Cypro-Minoan was developed, probably during this period. During the 15th - 12th centuries BC the island was greatly influenced by the Mycenaean civilisation and it became an important centre of trade in the Middle East. Many Mycenaeans and Achaeans settled in Cyprus and by the end of the Bronze Age the population of the island was hellenised (Alastos, 1955: 30-31). During the early Iron Age (9th century BC) the Phoenicians established commercial posts in Cyprus and the island prospered as a trade centre.

As new empires in the Middle East emerged, Cyprus, due to its strategic location and small size, was fought over and invaded repeatedly. From 709 to 612 BC the Cypriots were forced to pay tribute to the Assyrian empire, in 569 BC the island was conquered by Egypt while in 525 BC it came under Persian dominion. In 333 BC Cyprus became part of the empire of Alexander the Great while from 323 BC it remained for two and a half centuries under the Ptolemies of Egypt. In 58 BC it was conquered by the Romans while in 395 AD Cyprus passed to the Byzantine empire. Richard I of England came to Cyprus as a result of a storm at sea and took the island in 1191. He was succeeded by the Frankish Lusignan family while in 1489 the island passed under Venetian rule which was little more than military occupation (Luke and Jardine, 1920: 23-24).

In 1571 the island was invaded by the Ottoman empire. Turkish rule continued until 1878 when the administration of the island was handed over to Great Britain as part of a move against expanding Russian influence in the Near East (Hill, 1952: 270). With the entry of Turkey into the First World War on the side of Germany, Cyprus was annexed by Britain. In 1955 a revolt against the government broke out, mainly aimed at the unification of Cyprus with Greece. In

August 1960 Cyprus became independent but intercommunal conflicts between Greek and Turkish Cypriots followed which resulted in the effective separation of the Greek and Turkish communities in 1963. A coup d'état opposed to President Makarios in July 1974 on the part of elements in the Greek Cypriot population was followed by an invasion by Turkey in July-August 1974 and the occupation of 37 per cent of the island. Some 200,000 Greek Cypriots (Demetriades, House, Khoury and Matsis, 1992: 9) were displaced from north to south and 45,000 Turkish Cypriots in the opposite direction. This situation has been maintained ever since.

1.2 The population of Cyprus before 1881

Various estimates of the total size of the population of Cyprus have been given, particularly for the periods of Venetian and Turkish rule, though most are based on observations of travellers or fiscal listings rather than reliable enumerations.

At the beginning of the Venetian period i.e. in the late 15th century, the population of the island was estimated to be around 106,000 persons. Other reports for the beginning of the 16th century show a total of 110,000 persons in 1504 and 121,179 for 1523. A memoir by Francois Attar drafted around 1540 indicates a population of 197,000 persons while Graziani reports a population of 200,000 in 1570 (Papadopoullos, 1965: 17-18). Overall, it seems probable that during the period of Venetian rule the population of Cyprus increased substantially.

During the period of Turkish occupation three "cen suses" of the population were carried out aiming at enumerating taxpayers. The initial "census " took place in 1571-72 and showed 85,000 male Christians aged 14-50 and 20,000 Turkish settlers (Alastos, 1955: 262). That figure would indicate a total population of at least 200,000 Greeks (Papadopoullos, 1965: 40). The second "census " was carried out in 1777 but the data were not made available. Archimandrite Kyprianos, however, based on that enumeration, estimated in 1788 that the total population of the island was 84,000 persons out of which 37,000 were Christians and 47,000 Moslems. Moreover, he estimated that the Christian population included 12,000 males and 25,000 females while the Moslem population included 15,000 males and 32,000 females (Papadopoullos, 1965: 48). The last Turkish "census " was carried out in 1841 by Talaat Efendi. Information on that enumeration is given by Lacroix who estimated a total population of 108,600 persons out of which 73,200 were Greeks and 33,300 were Turks (Papadopoullos, 1965: 62).

Estimates of the population of Cyprus have been given, also, by travellers (Papadopoullos, 1965: 40-77). Louis de Barrie estimated that in 1670 30,000 Christian families lived on the island and that a fourth of the total population was Moslem. Therefore, the total population can be roughly estimated as at least 120,000 Christians and 40,000 Turks. Coronelli reported that the population of the island in 1691-95 included about 28,000 Christians and 8,000 Moslems exclusive of women and children. That would mean a population of about 140,000 persons. Pococke reported that the taxable Christian population in 1738 amounted to 12,000 persons and a third of the population of the island were Turks. Drummond gave the Christian taxable population in 1745 as 12,000 persons and the total Christian population as 50,000. Clarke argued that due to oppression by the Turks the Greeks lived in misery and the total population of the island in 1801 was less than 60,000. Turner gave a population of 60,000-70,000 in 1815 out of which 40,000 were Greeks. Trikoupis estimated the population as 100,000 persons in 1821 out of which 20,000 were Moslems. Lilburn estimated a population of 100,950 in 1842 out of which 70,000 were Greeks and Kerr gave a population of 101,130 in 1844 out of which 75,000 were Greeks. Finally, Ritter argued that in the 1870s the island had a population of 144,000 persons of which 100,000 were Christians and 44,000 Moslems. In the event, when the island passed under British administration and the first census took place in 1881, 186,173 persons were enumerated of which 45,458 were Moslems and 140,715 were Christians.

There are clearly substantial differences between some of these estimates. For instance, if the accounts of Turner and Trikoupis were both correct then the Greek Cypriot population would have to have doubled between 1815 and 1821. Moreover, the Turkish "censuses " might be expected to be inaccurate as they were intended to assess the numbers of Christian taxpayers and were probably evaded whenever possible. Certainly, the numerical excess of Moslems over Christians as well as the extremely high number of females estimated by Kyprianos are highly implausible. However, taken as a whole, the estimates indicate plausible trends over time. They suggest a substantial decrease in the Greek Cypriot population between 1571 and the end of the 18th century. This is believable given the increases in taxation and the probable deterioration of living standards as well as the droughts and plagues of locusts that occurred in this period. By contrast, during the 19th century the Greek Cypriot population probably increased. The Moslem population, on the other hand, probably decreased only slightly between 1571 and the end of the 18th century before also increasing somewhat in the 19th century.

1.3 Previous research on the population of Cyprus

Apart from a few articles that do no more than touch on the population of Cyprus, and a very brief note by Langford (1975) on changes in nuptiality over time (this is discussed in a later chapter of the thesis), the only published research on the population of Cyprus is that carried out by St. John-Jones which resulted in his book, published in 1983, "The Population of Cyprus: Demographic Trends and Socio-economic Influences". In this study St. John-Jones attempted to make use of all the available data from censuses and registration to reconstruct the demographic history of Cyprus over the period 1881-1979. He examined the growth of the population over time and changes in the distribution by age and sex. He estimated levels and trends in mortality, nuptiality, fertility and migration. He also examined differentials between the Greek and

Turkish Cypriot communities and made projections for the Greek Cypriot population from 1976 to the year 2001. His analysis for the period 1881-1960 refers to the entire population while for the post-1960 period it refers mainly to the Greek Cypriot community due to lack of data for the Turkish Cypriots.

So far as the growth of the population is concerned, St. John-Jones concluded that the rate of growth was moderate between 1881 and 1931 while it was relatively high between 1931 and 1960. The rate of growth for the Greek Cypriot population after 1960, on the other hand, was relatively low. He argued that the relatively low rate for the period 1881-1931 was due to the poor economic conditions in the island while the rate increased as the economy recovered after the mid-1930s. The low rate for the Greek Cypriot community post-1960 was attributed, by St. John-Jones, to a recession in the economy which resulted in substantial emigration and declining fertility (1983: 35-40, 53).

St. John-Jones argued that mortality in Cyprus had been declining steadily since the beginning of the period under study, i.e. since the 1890s; the rate of decline accelerated after 1940 and crude death rates reached very low levels, around 10 per thousand, in the 1950s. Post-1960, mortality for the Greek Cypriots continued to decline and crude death rates had dropped to around 7 per thousand by 1971. Infant mortality, on the other hand, followed a different pattern with substantial declines only after 1946 when malaria had been eliminated (1983: 66, 68-70, 80-81).

According to St. John-Jones fertility decline in Cyprus began in the 1890s; the crude birth rate in 1894 stood at 39 per thousand and by 1914 it had dropped to 33 per thousand. He suggested that fertility then remained more or less constant between 1914 and 1958 while it resumed a declining trend after 1959. Fertility for the Greek Cypriot population after 1960 declined substantially and the crude birth rate had dropped to around 21 per thousand by 1965 and to 18 per thousand by 1970. He argued that the early onset of the fertility transition was probably associated with improvements in the standards of living, an increase in literacy among young women and urbanisation (1983: 81-83, 86).

So far as marriage patterns are concerned, St. John-Jones argued that, between 1901 and 1931, mean age at marriage for females increased while for males they remained constant. By contrast, after 1931, mean age at marriage for both males and females decreased substantially, reaching a low in 1960. The situation changed after 1960 for the Greek Cypriots, however, and by 1973 mean age at marriage had increased again. St. John-Jones concluded that the increase in the mean age at marriage for females over 1901-1931 was associated with a decline in the proportion of males in the population while the subsequent decline was probably due to increasing prosperity that enabled earlier marriage (1983: 117-118).

St. John-Jones concluded that emigration from Cyprus had been substantial, particularly over the period 1955 to 1966, and, for the Greek Cypriots, in the period 1974-1979 also. He argued that most emigrants prior to 1955 and in the period 1958-1962 were single males from the rural areas of the island while after 1962 female emigrants exceeded male emigrants. The major destinations of the emigrants before 1955 were Egypt, the United States of America (up to the early 1920s), the United Kingdom and Greece. Between 1955 and 1973, however, 77 per cent of the emigrants went to the United Kingdom while over the period 1975-1979 Australia became the major destination for Greek Cypriot emigrants (1983: 92-100, 107).

So far as differentials between the Greek and Turkish Cypriot communities are concerned, St. John-Jones noted that between 1881 and 1946 the Greek Cypriot community was growing at a substantially faster pace than the Turkish community while between 1946 and 1960 the opposite was true. He argued that the fertility of Turkish Cypriots was higher than that of Greek Cypriots and that the lower rates of growth for the Turkish Cypriot community over 1881-1946 were probably due to more emigration by Turkish Cypriots (1983: 53-57, 62).

1.4 The thesis

1.4.1 Objectives of the research

The research aims at determining and analysing the demographic characteristics of the population of Cyprus from 1881 to the present date. Using all available data an attempt is made to establish levels of mortality, nuptiality, fertility and migration as well as trends over time. The research attempts to answer questions such as when mortality started declining and what are the most plausible modern levels; when the fertility transition occurred and what were its stages in Cyprus; how nuptiality changed over time; and if migration played an important role in the demography of Cyprus. In addition, an attempt is made to examine differentials between the Greek and Turkish communities. An important objective of the research is to compare these findings with other research done on the population of Cyprus and particularly with St. John-Jones' book.

1.4.2 Available data

The available data roughly fall within three categories: censuses, which collected data for the whole population in particular years; registration, which recorded numbers of vital events such as births and deaths for every year; and one survey which collected more detailed information but was carried out in the 1980s and refers only to the Greek Cypriot population.

a) censuses

The first census was carried out in April 1881. The information collected included the individual's name, relationship to the head of the household, sex, age, conjugal condition, place of birth, occupation, religion and mother tongue. Subsequently, five censuses followed at ten year intervals, i.e. in 1891, 1901, 1911, 1921 and 1931, which contained information very similar to the first one. In the 1911 census a question on literacy was added. All the issued census reports were brief.

The next census, due to the Second World War, was not conducted until 1946. That census included new questions about nationality, level of education, age at marriage of ever-married women and numbers of children ever-born and surviving to ever-married women. The report included more information on the Greek and Turkish Cypriot communities as well as on urban and rural areas.

The first census of independent Cyprus was carried out very soon after its establishment, in 1960, and the information collected was very similar to that of the 1946 census. The report, on the other hand, showed additional information: the distribution of the population by age, sex and race; and the distribution by age, sex and urban-rural place of residence. However, the published material for the ethnic communities was less detailed than in the 1946 census report.

In 1970 no census was carried out due to inter-communal conflict. However, in 1973 a micro-census was conducted. This was on a de jure basis, unlike the previous Cyprus censuses which had been de facto. No report was issued but some tables were included in the annual Demographic Report for 1973 (Department of Statistics and Research, 1974: 31-38). These tables showed figures for the total population of Cyprus but were, in fact, based on a 10 per cent sample of Greek Cypriots, adjusted on the basis of the 1960 ethnic division of the population. However, thanks to the Department of Statistics and Research of Cyprus, it was possible to obtain unpublished material concerning the distribution of the entire Greek Cypriot population by age and sex from the 1973 micro-census.

After the Turkish invasion in 1974 and the partition of the island, a count of the non-Turkish population took place in 1976 which was originally designed to provide an account of property lost in the 1974 war. No report of this count was issued though some tables were published in the annual Demographic Report for 1977 (Department of Statistics and Research, 1978: 25-34) showing the population adjusted to include the Turkish Cypriot community. However, thanks to the Department of Statistics and Research of Cyprus, it was possible to obtain unpublished material concerning the distribution of the

Greek Cypriot population by age, sex and marital status from the 1976 count.

In 1982, finally, a census of housing was carried out which provided information on the distribution of the population by age, sex, marital status and urban-rural place of residence. The census referred to the Greek Cypriot population only.

b) registration system

The British administration attempted to organise a registration system as early as 1879. In the High Commissioner's Reports approximate numbers of births and deaths were published for Larnaka town for 1879, 1880 and 1881. In the 1882 High Commissioner's Report the Chief Medical Officer, F. C. Heidenstam, presented numbers of births and deaths for the six principal towns and some villages of Cyprus (High Commissioner for Cyprus, 1883: 38-41). Moreover, for each year up to 1889 crude birth and death rates for the whole island were published, based on the numbers of births and deaths in certain areas. However, the actual numbers of births and deaths were not given with the exception of the figures for 1883 (Government of Cyprus, 1884: 429). According to the Chief Medical Officer the area coverage increased between 1882 and 1889 from 45 to 480 towns and villages (High Commissioner for Cyprus, 1890). For the decade 1890-1899, however, no birth or death rates were published; and it was not until 1900 that a nation wide registration system was established.

Total numbers of registered births and deaths for the whole of Cyprus were published annually from 1900 onwards, total numbers of marriages from 1903 and figures for infant deaths from 1916. Total numbers of arrivals in and departures from the ports of the island were presented from 1920. Births were published by sex for the first time in 1947; deaths by sex and deaths by age in 1948; and births by age of mother in 1949. Greater detail was introduced in 1951 when births, deaths and infant deaths were published for the ethnic communities separately and births by duration of marriage and usual place of residence of the mother were provided. In 1955 greater detail was introduced to the migration data as well, with the inclusion of the declared intentions of persons arriving in and departing from Cyprus so far as immigration or emigration was concerned, as well as their age, sex, occupation, ethnic group, country of origin for immigrants and country of destination for emigrants.

The registration of births and deaths was the responsibility of the head of the village or of the town quarter community (Mukhtar) who forwarded the register sheet to the District Officers each month. The sheets were then forwarded to the Director of Medical Services and a report compiled. Numbers of marriages were collected by the District Officers from the Bishoprics for the Christians and from the Turkish Communal Chamber for the Moslems. Civil marriages were registered directly at the District Offices (Department of Statistics and Research, 1963: 2). Numbers of arrivals and departures were recorded at the main ports of the island and later at the airport.

In 1955 the registration system collapsed due to the resignation of the registrars for political reasons. From then on and until 1963 both reported and adjusted numbers of births, deaths and infant deaths were published. In fact, it was only the figures for the Greek Cypriot community that were considered to require adjustment; the adjustments were based on the observed trends over the years 1952-54 (Department of Statistics and Research, 1957: preface). However, marriage and migration data were not affected as their reporting was independent of the Mukhtars. In 1963 further difficulty was caused by the parting of the Greek and Turkish Cypriot communities; from this point numbers of births, deaths, infant deaths and marriages for the Turkish community had to be estimated. The annual Demographic Reports do not explain how the adjustments were carried out but from 1963 onwards only adjusted figures were published. In 1971 an enquiry in hospitals, clinics and cemeteries resulted in the published estimates of births and deaths for 1966-70 being revised (Department of Statistics and Research, 1972: 5). In 1973, after matching the data from the micro-census with the registration data it was concluded that deaths had been greatly underestimated while births had been overestimated

(Department of Statistics and Research, 1974: 15). This led to the 1961-72 estimates of births and deaths being revised.

After the partition of the island in 1974, the published numbers of births and deaths in the part of Cyprus controlled by Greek Cypriots included both the registered figures for the Greek sector -adjusted for underreporting- and the estimated numbers for the Turkish Cypriot community in the occupied area. From 1986 onwards, however, the Demographic Reports refer only to the Greek Cypriot population and include series of estimates of births and deaths beginning in 1974. Information on numbers of infant deaths is not presented in the Demographic Reports though infant mortality rates over a three or five year period are provided. According to the Demographic Reports the published estimates of births and deaths are obtained by matching data from two independent sources, using the Chandrasekar and Deming method (Department of Statistics and Research, 1978: 14; 1992: 22). Registered births are matched with data provided by midwives and doctors in clinics and hospitals while deaths are matched with data on burials, provided by priests. Finally, data on immigrants for the period 1974-1980 are unavailable in the annual Tourism, Migration and Travel Statistics; in addition, no explanation was provided as to why that was so (Department of Statistics and Research, 1975-81).

It seems that deaths are still greatly underreported in Cyprus. Agathangelou concluded that the proportion of deaths registered had increased from 33 per cent in 1973 to 39 per cent in 1976 and 43 per cent in 1980-81 (1985: 16). The percentage of deaths registered for the 0-4 age group in 1980-81, according to the same report, was only 15.4 per cent. In the Demographic Report for 1991 it was stated that while 95 per cent of births were registered, registration of deaths was still less than 45 per cent complete (Department of Statistics and Research, 1992: 22). Moreover, as the data were poor, it was felt necessary to revise the estimates of births and deaths for the period 1977-82 using the results of the Demographic Survey 1980-81.

Finally, from 1977 onwards, the Turkish Cypriot authorities have published total numbers of births, deaths and infant deaths for the Turkish sector of Cyprus. In the absence of information on the methods of assembling them it is not possible to assess their accuracy beyond saying that the numbers of deaths given are implausibly low (St. John-Jones, 1983: 21).

c) surveys

One survey that collected data on nuptiality, fertility, mortality and internal migration has been conducted in Cyprus: the 1980-81 Demographic Survey. The survey was planned as a multi-round enquiry; the sample consisted of 8,963 addresses; the response rate was 97.5 per cent (Department of Statistics and Research, 1984b: 5-7). The survey was carried out in three rounds with a duration of six months each. During the first round (January-July 1980) 6,800 addresses were visited. During the second round (July 1980-January 1981) these addresses were re-visited and changes in the demographic characteristics of the households noted; additionally, another 3,400 addresses were interviewed for the first time. During the third round (January-July 1981) all addresses were visited again.

The main objective of the survey was to provide data on levels and trends in fertility and mortality that could not be obtained from the registration system as it was incomplete. In addition, the survey aimed at collecting information on the size and direction of internal migration as well as data that would enable a study of the relationships between demographic variables and socio-economic characteristics.

1.4.3 The structure of the thesis

The thesis consists of two main parts due to the nature of the available data. The first part focuses on the period from 1881 to 1960 and refers to the entire population. The second part deals with the period after 1960 and mainly focuses on the situation in the Republic of Cyprus (the area controlled by Greek Cypriots) after the partition of the island in 1974. Hence, the second part of the thesis refers primarily to Greek Cypriots, due to lack of data for the period 1960-1974 and for the area controlled by Turkish Cypriots after 1974. Finally, the concluding section of the thesis aims at linking both these parts together.

The first part of the thesis includes chapters 2 to 7. Chapter 2 deals with the growth of the population of Cyprus between 1881 and 1960 and changes in the distribution of the population by age and sex. Chapter 3 deals with mortality levels and trends in the period 1881-1960. In Chapter 4 levels and trends in nuptiality are presented for the period 1891-1960 and changes in marriage patterns discussed. In Chapter 5 an attempt is made to establish fertility levels for the early period and determine when was the onset of the fertility transition in Cyprus. In Chapter 6 levels and trends of international and internal migration are presented based on the meagre data available. In Chapter 7 differences between ethnic groups and between the different districts of the island are discussed.

The second part of the thesis consists of Chapter 8 and deals mainly with the period 1974-1982. In this chapter the characteristics of the modern Greek Cypriot population are examined and differences from the earlier period are noted and discussed. The chapter deals with the growth of the population as well as with mortality, nuptiality, fertility and migration levels and trends.

In Chapter 9 the various estimates of mortality and fertility are fitted together for the whole period 1881 to 1982 and are used to project the population of Cyprus from 1921 to 1960 and the Greek Cypriot population from 1960 to 1982. Thus, the validity of these estimates is assessed.

Chapter 10 is the concluding section of the thesis. A summary of the major findings is presented and an attempt made to provide a comprehensive picture of changes over time.

Chapter 2: POPULATION SIZE AND DISTRIBUTION BY AGE AND SEX, 1881-1960

In this chapter, the growth of the population between 1881 and 1960 in the whole of Cyprus, in urban and rural areas and in the different districts of the island is considered. Changes in the distribution of the population by age and sex are also discussed.

2.1 Growth of the population and changes in the distribution by age and sex

Table 2.1 shows the size of the population of Cyprus for census years as well as annual rates of growth for intercensal periods, assuming a constant rate of growth between censuses. The population of Cyprus in 1881 was 186,173 persons; it followed an increasing trend over time and by 1946 it had more than doubled, to 450,114 persons, while by 1960 it had reached 573,566 persons. The annual rates of growth indicate that the population was increasing by 11.7 per thousand over the period 1881-1891. The rate of growth increased slightly between 1881-1891 and 1901-1911, reaching 14.5 per thousand in the latter period, while after 1911 it fell back, reaching 11.3 per thousand over the period 1921-1931. However, the rate increased again after 1931; the population was increasing by about 17 per thousand over 1931-1946 and 1946-1960, faster than in any earlier period.

The growth of a population depends upon three factors: mortality, fertility and migration. Cyprus has always been a country of emigration (Matsis, 1992: 103-104) and that is probably an important factor reducing rates of growth for most intercensal periods. In addition, fluctuations in the rates of growth for some periods may be due partly to changing levels of migration; for instance, the relatively high rate for the period 1901-1911 may be related to less emigration in that period. Another factor that probably affected the rates of growth between 1881 and 1931 was high mortality. By contrast, the relatively high rates of growth for the period 1931-1946 and 1946-1960 are probably due partly to declining mortality at a fast pace.

Table 2.1: Population and intercensal rate of growth (per person, per annum) for Cyprus, 1881-1960

	1881	1891	1901	1911	1921	1931	1946	1960
population	186,173	209,286	237,022	274,108	310,715	347,959	450,114	573,566
rate of growth		0.0117	0.0125	0.0145	0.0125	0.0113	0.0166	0.0172

Table 2.2 shows the percentage distribution of the population of Cyprus classified in three broad age groups for census years. 38.52 per cent of the population were aged 0-14 in 1881; this decreased slightly between 1881 and 1921 and more substantially between 1921 and 1931, when it reached 33.41 per cent. Between 1931 and 1946 the percentage of the population aged 0-14 remained constant but by 1960 it had increased again, to 36.70 per cent. The percentage of the population aged 15-64 stood at 55.69 in 1881; it apparently increased between 1881 and 1891 to 58.36 per cent but then remained fairly constant between 1891 and 1921, before rising slightly in 1931, to 61.76 per cent. Between 1931 and 1960, however, it decreased progressively to 57.38 per cent. The percentage of the population aged 65+ stood at 5.79 per cent in 1881 and apparently decreased between 1881 and 1891 to 4.37 per cent. It then remained fairly constant between 1891 and 1931 but increased thereafter, reaching 6.26 per cent in 1946. However, the proportion of the population aged 65 or more decreased slightly between 1946 and 1960, to 5.92 per cent.

The relatively high proportion of persons aged 65 or more in 1881 seems suspect; it might be due to overreporting of age or conceivably to substantial emigration on the part of persons aged 15-64. The considerable decline in the 0-14 age group between 1921 and 1931 seems implausible as it will be seen that child mortality was declining over that period while there was only a slight decrease in fertility. In fact, this may be related to reporting errors as the number of persons aged 0-9 in 1931 was lower than the number of persons aged 15-24 in 1946. The relatively high proportion of persons aged 65 or more in 1946 seems suspect, particularly as that proportion was lower in 1960 in spite of being slightly inflated due to emigration of persons aged 15-64. The relatively low percentage of persons aged 15-64 in 1960 and the relatively high proportion of persons aged 0-14 are probably partly due to substantial emigration of young adults. In fact, if the numbers of migrants for the period 1955 to 1960 were added to the 15-64 age group, 34.7 per cent of the population in 1960 would be aged 0-14 while 59.7 per cent would be aged 15-64 and 5.6 per cent would be aged 65 or more. Thus, emigration and reporting errors affected the proportions for certain years; however, it is likely that the proportion of the population aged 0-14 had decreased somewhat by 1960 while proportions in the 65+ age group had increased slightly.

Table 2.2: Percentage distribution of the population in broad age groups for Cyprus for census years, 1881-1960

age group	1881	1891	1901	1911	1921	1931	1946	1960
0-14	38.52	37.26	36.35	37.25	36.40	33.41	33.77	36.70
15-64	55.69	58.36	59.43	58.30	59.42	61.76	59.96	57.38
65+	5.79	4.37	4.22	4.45	4.18	4.83	6.26	5.92
Total	100	100	100	100	100	100	100	100

Table 2.3 shows ratios of males to females in different age groups and for the total population of Cyprus for census years. For the total population the ratio was more or less constant between 1881 and 1901, around 1.043. After 1901 a declining trend is apparent; by 1931 the ratio had dropped below one and by 1960 it had decreased to 0.967. The data indicate that there was an excess of males in the population between 1881 and 1921 while from 1931 onwards there was an excess of females. The decline in the sex ratio after 1901 is probably due partly to female mortality declining at a faster pace than male mortality and, perhaps, to a higher proportion of males emigrating than before 1901.

The ratios for the different age groups indicate a substantial excess of males in the 0-14 age group for all years, a substantial excess of females in the 15-34 age group, an excess of males in the 35-59 age group up to 1921 and in the 60+ age group up to 1931. For all age groups the ratios followed a declining trend over time though with some fluctuations. The ratio of males to females for the 0-14 age group decreased between 1881 and 1911 from around 1.08 to 1.05 while between 1921 and 1960 it fluctuated between 1.036 and 1.045. The ratio for the 15-34 age group increased between 1881 and 1901 from 0.934 to 0.975 and decreased thereafter -except for a substantially higher figure in 1946-, reaching 0.904 in 1960. The ratio for the 35-59 age group stood at 1.122 in 1881 and followed a declining trend thereafter; by 1960 it had decreased to 0.959. The ratio for the 60+ age group stood at 1.050 in 1881 and increased between 1881 and 1911 to 1.123; however, it declined progressively thereafter, reaching 0.909 in 1960.

The pattern of the ratios for the different age groups is rather unusual. One would expect the ratios to decrease with age, as female mortality is usually lower than male mortality. The relatively high ratios for the 0-14 age group cannot be explained simply by the fact that more males than females are born in a population; the ratio at birth is usually about 1.05 while for the Cypriot population the ratio in the 0-14 age group between 1881 and 1901 was substantially higher. More omissions of female than male children could be part of the explanation; also, females aged less than 15 might have been reported as older. The relatively low ratios for the 15-34 age group as well as the high ratios for the 35-59 and 60+ age groups are probably partly due to age misreporting. It is probable that females aged more than 35 were reported as younger while males aged more the 45 tended to overstate their age (see Appendix 3.3.a, Chapter 3). Nevertheless, it seems unlikely that age reporting errors alone explain all these features; another factor that might well have contributed to the low ratio for the 15-34 age group is more males than females in that age group emigrating abroad to find employment.

Table 2.3: Ratios of males to females in different age groups for Cyprus for census years, 1881-1960

age group	1881	1891	1901	1911	1921	1931	1946	1960
0-14	1.078	1.082	1.069	1.051	1.039	1.045	1.036	1.044
15-34	0.934	0.951	0.975	0.963	0.924	0.915	0.954	0.904
35-59	1.122	1.096	1.086	1.083	1.071	0.999	0.947	0.959
60+	1.050	1.107	1.115	1.123	1.046	1.019	0.936	0.909
Cyprus	1.042	1.043	1.044	1.035	1.008	0.986	0.978	0.967

To conclude, the population of Cyprus increased moderately between 1881 and 1931 and at a slightly faster pace thereafter. It took rather more than 50 years for the 1881 population to double and more than 70 years to treble. The relatively low rates of growth are probably the result of substantial emigration and high mortality. The population included a relatively high proportion of persons aged 0-14 for most years and a relatively low proportion of persons aged 65 or more. However, it is likely that proportions aged 0-14 had decreased somewhat by 1960 while proportions aged 65+ had increased slightly. A substantial excess of males was apparent in the population between 1881 and 1911 but after 1911 the excess decreased gradually and by 1931 it had turned to an excess of females.

2.2 Growth of the population and changes in the distribution by age and sex in urban and rural areas of Cyprus

Cyprus has been divided into six districts since 1878 as well as a number of further administrative sub-divisions. For each district there is a town that represents its administrative centre. These towns are referred to as the six principal towns of the island and have been regarded as the main urban centres in spite of varying greatly in size. All other towns, on the other hand, have been included in the rural sector of the island independently of their size. The smallest of the principal towns were Kyrenia with a population in 1881 of 1,192 and Paphos with a population of 2,204. The population of Paphos town increased over time to 5,803 persons in 1946 and 9,083 persons in 1960. However, the population of Kyrenia town increased only moderately, to 2,916 persons in 1946 and 3,498 persons in 1960. Of the towns included in the rural sector, on the other hand, quite a few had a population equal or somewhat larger than Kyrenia town over 1881-1931. Thus, Kyrenia town might be considered not particularly urban while rural areas include some small towns, two of which had reached a population of 4,000-5,000 persons by 1946. Nevertheless, the inclusion of Kyrenia town in the urban sector should not affect the results significantly as its size was very small relative to the other principal towns while the inclusion of small towns in the rural sector should not affect the results either as the size of the rural population was quite substantial.

Table 2.4 shows the percentage of the population "urban" i.e. resident in the six principal towns of the island, in census years. The percentage remained virtually constant between 1881 and 1911 at around 17 per cent. After 1911 the percentage increased somewhat between successive censuses, reaching 21.5 per cent in 1946. Between 1946 and 1960 the percentage increased substantially; by 1960 it had reached 36 per cent. The increase between 1946 and 1960, however, is exaggerated by the addition of Nicosia suburbs to the urban population in that period. Had Nicosia suburbs still been excluded in 1960 from the urban sector, the urban population would have been 27.27 per cent of the total. It is worth noting that, in spite of a tendency towards greater urbanisation, particularly after 1946, Cyprus was still a predominantly rural country in 1960.

Table 2.4: Percentage of the population resident in "urban" areas of Cyprus, i.e. the six district capitals, in census years, 1881-1960

	1881	1891	1901	1911	1921	1931	1946	1960
% Urban	16.91	16.72	16.85	16.82	17.59	19.12	21.54	35.91

Table 2.5 shows the annual rates of growth of the "urban" and rural populations for intercensal periods, assuming a constant rate of growth between censuses. Between 1881 and 1901 the population of rural areas increased slightly faster than that of urban areas. However, from 1901 onwards urban areas showed a higher rate

of growth than rural areas. The difference was moderate between 1901 and 1911 but increased over time and became very substantial later. The rate of growth of urban areas in the period 1901-1911 was 15.9 per thousand while for rural areas it was 14.2 per thousand. During 1921-1931 the rate of growth for urban areas was 19.6 per thousand compared to 9.5 per thousand for rural areas. Over the period 1946-1960 the rate of growth in urban areas was 53.5 per thousand against 2.8 per thousand for rural areas.

The higher rates of growth for the urban areas after 1911 were presumably due to rural-urban migration as it will be seen that fertility in urban areas was actually lower than in rural areas. In addition, substantial emigration of the rural population might also have reduced the rates of growth for rural areas over the period 1911 to 1960. The considerable difference in the rates between urban and rural areas in the period 1946-1960 is partly due to the inclusion of Nicosia suburbs in the urban population.

Table 2.5: Intercensal rates of growth (per person, per annum) for the "urban " and rural areas of Cyprus, 1881-1960

	1881-91	1891-01	1901-11	1911-21	1921-31	1931-46	1946-60
Urban	0.0110	0.0117	0.0159	0.0155	0.0196	0.0252	0.0535
Rural	0.0118	0.0126	0.0142	0.0118	0.0095	0.0144	0.0028
Cyprus	0.0117	0.0125	0.0145	0.0125	0.0113	0.0166	0.0172

Table 2.6 shows the percentage distribution of the "urban " and rural populations of Cyprus classified in three broad age groups, for 1946 and 1960. In 1946 the rural population included a higher percentage of young persons aged 0-14, 35.5 per cent, against 27.7 per cent in urban areas, and slightly more persons aged 60+. In urban areas there was a higher proportion of persons aged 15-59. By 1960 the percentage of young persons in the urban areas had increased considerably, to 34.6 per cent, though it remained lower than in rural areas. The percentage of persons aged 60 or more in urban areas decreased slightly between 1946 and 1960 while for the rural areas this percentage increased. The percentage of persons aged 15-59

fell in both urban and rural areas between 1946 and 1960 but still remained substantially higher in urban areas. The data for both 1946 and 1960 suggest that a large number of persons aged 15-59 had out-migrated from rural areas to urban areas while old persons and children had stayed behind.

Table 2.6: Percentage distribution of the population in broad age groups for the "urban" and rural areas of Cyprus, 1946 and 1960

age group	1946			1960		
	urban	rural	Cyprus	urban	rural	Cyprus
0-14	27.67	35.45	33.77	34.62	37.86	36.70
15-59	64.13	54.67	56.70	58.22	51.26	53.76
60+	8.21	9.89	9.52	7.17	10.88	9.55
Total	100	100	100	100	100	100

Table 2.7 shows ratios of males to females for the "urban" and rural areas of Cyprus for census years. The ratio in the urban areas in 1881 stood at 1.106 while in the rural areas it was 1.028. In both areas the ratio fluctuated slightly between 1881 and 1911 but followed a declining trend thereafter, reaching 0.990 in urban areas in 1960 and 0.955 in rural areas. The data indicate an excess of males in the urban population between 1881 and 1946, with a slight excess of females in 1960, while in rural areas there was an excess of males only until 1911 and an excess of females thereafter. The ratios for the urban areas were higher than for rural areas for all years, probably due to the movement of young males to the urban areas of the island where employment opportunities were better.

Table 2.7: Ratios of males to females for the "urban" and rural areas of Cyprus, 1881-1960

Area	1881	1891	1901	1911	1921	1931	1946	1960
Urban	1.106	1.118	1.083	1.089	1.049	1.023	1.031	0.990
Rural	1.028	1.028	1.036	1.024	0.999	0.978	0.963	0.955
Cyprus	1.042	1.043	1.044	1.035	1.008	0.986	0.978	0.967

To conclude, Cyprus was a predominantly rural country between 1881 and 1960 though there was some rural to urban migration after 1911. The urban areas of the island had a higher rate of growth than the rural areas after 1901, probably partly due to in-migration from the rural areas, while the difference increased over time. The population of the urban areas had slightly different characteristics from the population of the rural areas: it included a higher proportion of males and a higher percentage of persons aged 15-59.

2.3 Growth of the population and changes in the distribution by sex in the different districts of Cyprus

Cyprus has been divided historically into six administrative districts: Nicosia, Larnaka, Limassol, Famagusta, Paphos and Kyrenia. Table 2.8 shows the percentage distribution of the population in the different districts for census years. In 1881, the highest percentage of the population, 30.23 per cent, lived in Nicosia district while the lowest, 7.10 per cent, lived in Kyrenia. Changes between 1881 and 1931 were minimal for most districts, the exception being Paphos whose percentage share of the Cyprus population decreased from 15.26 to 12.58 per cent in this period. After 1921 the proportion of the population resident in Nicosia district increased, reaching 35.62 per cent in 1960. The percentage of the population resident in Limassol district also increased slightly between 1931 and 1960, from 16.62 to 18.70 per cent. On the other hand, the percentage of the population resident in Paphos district decreased still further after 1931, dropping to 10.14 per cent in 1960, while a declining trend is apparent for Kyrenia and Larnaka districts as well.

Differences in the percentages of the population living in different districts might be partly explained by differences in the size of the districts. For instance, Nicosia district is over four times larger in area than Kyrenia (St. John-Jones, 1983: 122). The increases in the proportions of the population resident in Nicosia and Limassol districts after 1931 are probably at least partly due to in-migration to Nicosia and Limassol towns. It may be seen from Appendix 2.1 that, by 1960, these had become the most "urbanised " districts of Cyprus.

Table 2.8: Percentage distribution of the population in the different districts of Cyprus for census years, 1881-1960

Districts	1881	1891	1901	1911	1921	1931	1946	1960
Nicosia	30.23	29.48	30.08	29.73	30.18	31.62	32.43	35.62
Larnaka	11.15	11.35	11.00	10.85	11.24	12.13	11.59	10.20
Limassol	15.70	17.07	16.51	16.81	17.49	16.62	16.76	18.70
Famagusta	20.57	19.79	20.47	21.35	20.52	20.54	20.99	19.93
Paphos	15.26	15.13	14.85	14.05	13.62	12.58	11.97	10.14
Kyrenia	7.10	7.17	7.09	7.21	6.96	6.51	6.26	5.40
Cyprus	100	100	100	100	100	100	100	100

Table 2.9 shows the annual rates of growth of the population in the different districts of Cyprus for intercensal periods, assuming a constant rate of growth between censuses. The rates of growth varied greatly among the different districts; over 1881-1891 the highest rate of growth can be observed for Limassol district, 20 per thousand, while the lowest was 7.8 per thousand for Famagusta district. The trend over time is not consistent for most districts; periods of relatively high growth are succeeded by periods of low growth. For instance, the rate of growth for Famagusta district over the period 1901 to 1911 was 18.8 per thousand, the highest in the island during that time, while in the period 1911-1921 it was only 8.5 per thousand, the lowest in the island. The districts that show the highest rates of growth between 1931 and 1960 are those that include the largest towns: Nicosia, Limassol and Famagusta. The high rates of growth for those districts can probably be at least partly attributed to in-migration from other districts of Cyprus.

Table 2.9: Intercensal rates of growth (per person, per annum) for the different districts of Cyprus, 1881-1960

Districts	1881-91	1891-01	1901-11	1911-21	1921-31	1931-46	1946-60
Nicosia	0.0091	0.0145	0.0134	0.0139	0.0160	0.0182	0.0239
Larnaka	0.0135	0.0093	0.0131	0.0160	0.0189	0.0137	0.0082
Limassol	0.0200	0.0091	0.0163	0.0164	0.0063	0.0171	0.0250
Famagusta	0.0078	0.0158	0.0188	0.0085	0.0114	0.0180	0.0135
Paphos	0.0108	0.0106	0.0090	0.0094	0.0033	0.0134	0.0054
Kyrenia	0.0127	0.0113	0.0162	0.0090	0.0047	0.0140	0.0067
Cyprus	0.0117	0.0125	0.0145	0.0125	0.0113	0.0166	0.0172

Appendix 2.1: Percentage of the population of a district resident in the principal town of the district in census years

Table A2.1 shows the percentage of the population of a district resident in the principal town of the district in census years. The most "urbanised" district of Cyprus in 1881 was Larnaka with 37.7 percent of its population living in Larnaka town. Larnaka district maintained this characteristic up to 1931 though the town shrank relatively to the rural part of the district. By contrast, the town of Limassol showed a tendency to increase in size relatively to the rural part of the district, particularly after 1911. Famagusta town also showed an increasing trend in the overall period; in 1881 only 6.7 per cent of the population of Famagusta district lived in the town while by 1960 that percentage had increased to 30.4 per cent. In fact, between 1931 and 1960 there was an increase in the proportion of the population resident in all towns, more pronounced for the districts where the principal town was large. For instance, the relative increase of the urban population for Nicosia, Limassol and Famagusta districts was substantial in that period while for Kyrenia district it was very small. By 1960, Nicosia had become the most "urbanised" district of the island with 46.7 per cent of its population living in the town while Limassol was the second most "urbanised" with 40.6 per cent of the population of the district living in the town.

To summarise, it seems likely that between 1931 and 1960 there was a movement of population from the rural areas of districts to the urban areas. Moreover, it is probable that the movement was directed mainly to the three largest cities of the island; Nicosia, Limassol and Famagusta. Therefore, the increase in the relative size of these towns and in the relative size of Nicosia and Limassol districts (see Table 2.8) might be partly due to in-migration.

Table A2.1: Percentage of the population of a district resident in the principal town of the district for census years, 1881-1960

Towns	1881	1891	1901	1911	1921	1931	1946	1960
Nicosia	20.49	20.29	20.69	19.70	19.81	21.52	23.63	46.67
Larnaka	37.72	31.96	30.55	31.15	27.97	28.13	28.30	33.79
Limassol	20.54	20.68	22.81	22.35	24.48	26.54	30.23	40.61
Famagusta	6.69	8.13	7.89	9.10	10.95	12.56	17.14	30.40
Paphos	8.34	8.84	8.90	8.92	9.73	10.32	10.77	15.61
Kyrenia	9.02	8.81	7.95	8.74	8.84	9.43	10.35	11.12
Urban	16.91	16.72	16.85	16.82	17.59	19.12	21.54	35.91

Chapter 3: LEVELS AND TRENDS IN MORTALITY, 1881-1960

In this chapter, levels and trends in mortality over the period 1881-1960 are considered. In the first section, mortality rates calculated from registration and census data are examined. In the second section, a variety of "indirect techniques" are employed to derive estimates of mortality from census data. Finally, an attempt is made to put together these various measures to provide a realistic account of both levels and changes over time.

3.1 Mortality levels and trends based on registration data

3.1.1 Year-by-year crude death rates and infant mortality rates

Total numbers of registered deaths for the whole of Cyprus were published annually from 1900 onwards and figures for infant deaths from 1916. Figure 3.1 shows crude death rates (CDRs) for each year 1901-1960 and infant mortality rates (IMRs) for 1916-1960. The rates themselves are presented in Appendix 3.1. Crude death rates were calculated by dividing the number of registered deaths in a year by the estimated mid-year population. Mid-year populations were estimated under the assumption that the rate of growth between censuses was continuous and even. Infant mortality rates were calculated by dividing the number of registered infant deaths in a year by the number of live births.

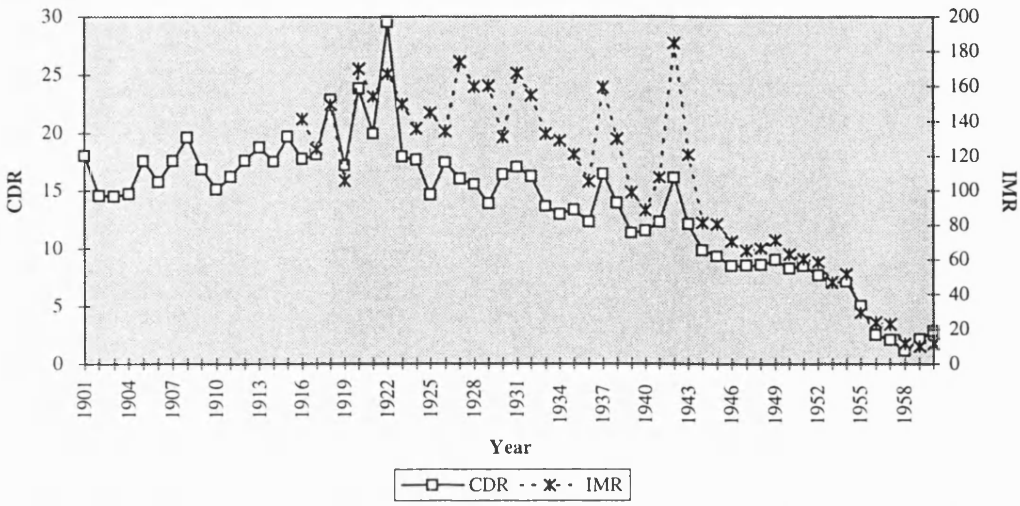
The CDR fluctuated between 15.2 and 19.7 per thousand over the period 1901 to 1917 with the exception of the years 1902, 1903 and 1904 when it remained constant at relatively low levels, around 14.6 per thousand. Between 1918 and 1922 some years of excessive mortality were recorded such as 1918, 1920 and 1922 when the CDR stood at 22.9, 23.8 and 29.5 per thousand, respectively. After 1922, the CDR indicates a declining trend in mortality though with some upsurges in 1930-1932, 1937 and 1942. By 1944 the CDR had dropped below 10 per thousand while by 1954 it had reached 7.2 per thousand. After 1954 the CDR declined further and reached extremely low levels over the period 1956-1960.

The IMR fluctuated between 106 and 174 per thousand over the period 1916 to 1931, reaching peaks in 1920, 1922, 1927 and 1931. From 1932 onwards the IMR followed a clear downward trend, interrupted by substantial peaks in 1937, when IMR was 159 per thousand, and in 1942, when IMR stood at 185 per thousand, the highest ever recorded in Cyprus. The pace of the decline accelerated after 1943 and by 1954 the IMR had dropped to 52 per thousand. After 1954 the IMR decreased further, reaching 12 per thousand in 1960.

It should be noted that registration of deaths and infant deaths has never been complete in Cyprus and the levels of mortality reflected by the CDR and the IMR are probably incorrect, especially for the first 5-10 years that registration was established and the post-1954 period when the registration system practically collapsed. Moreover, use of indirect methods for the estimation of the completeness of registration of adult deaths for 1946 in Appendix 3.7 suggests that adult deaths that year were underreported by about 20 per cent.

Some of the fluctuations in the rates are also probably related to changes in the completeness of registration. For instance, the slight increase in the CDR between 1904 and 1905 probably reflects an improvement in the completeness of death registration while the relatively low IMRs over the period 1916-1919 could be due to underregistration of infant deaths. In addition, St. John-Jones (1983: 64) suggests that completeness of registration decreased from the early 1950s; thus, the decline in the rates after 1950 may reflect underregistration of deaths. However, with the exception of the pre-1910 and the post-1950 period for the CDR and of the pre-1919 and post-1950 period for the IMR, the trends as described by these measures are probably more or less correct. Therefore, the declining trend in mortality after 1922 and in infant mortality after 1931 are probably genuine as well as the upsurges of mortality and infant mortality in certain years.

Figure 3.1: Crude Death Rate (per 1,000 population) & Infant Mortality Rate (per 1,000 live births), Cyprus 1901-1960



The CDRs and IMRs indicate relatively high mortality in 1918, 1920, 1922, 1927, 1930-1932, 1937 and 1942. The high mortality for 1918 was explained by the Colonial Report for Cyprus as the result of an influenza epidemic (St. John-Jones, 1983: 66). Excess mortality in 1920 and 1922 might be attributed to an outbreak of malaria, whose incidence increased from 1,962 reported cases in 1919 to 3,706 in 1920 and 4,008 in 1922 (Department of Health, 1923: 10) and to a severe epidemic of measles that in 1922 increased the numbers of infant and child deaths (Colonial Office of Great Britain, 1923: 7). For 1927, the high IMR was explained by the Colonial Report as the result of a coincidence of malaria (9,324 reported cases), of inherited syphilis and lack of proper care for infants (Colonial Office of Great Britain, 1928: 33). For 1930, the Medical Report shows an increase in the incidence of malaria, 10,080 cases against 6,762 cases reported in 1929 (Department of Health, 1931: 12). In 1937 an epidemic of cerebro-spinal meningitis occurred, which resulted in 286 deaths (Colonial Office of Great Britain, 1938: 8); moreover, there was an upsurge of malaria with 18,122 reported cases compared to 12,779 cases in 1936 (Department of Health, 1938: 6). For 1942 the Medical Report comments that there was a wide spread epidemic of measles and the complications resulting from it was the main factor which inflated mortality rates (Department of Health, 1943: 3). Thus, it seems that outbreaks of malaria, sometimes combined with epidemics of other diseases, led to mortality upsurges in the island between 1901 and 1943. After 1943 there were no such upsurges in mortality; that might be partly related to a campaign against malaria, carried out between 1945 and 1948, and the eradication of that disease in 1949 (St. John-Jones, 1983: 76).

3.1.2 Crude death rates and infant mortality rates for census years

In this section mortality measures for census years are presented for Cyprus. Table 3.1 shows crude death rates (CDRs) and infant mortality rates (IMRs). For 1901 the CDR was calculated by dividing half the number of deaths registered in the two twelve-month periods ending on 31st March 1901 and 31st March 1902 (these being the periods for which data were published) by the 1901 census population. This denominator was more or less appropriate as the census was carried out in April 1901. The rate for 1911 was calculated in the same manner. For 1921 the CDR was calculated by dividing the average number of deaths registered over 1920-22 (data were published for calendar years after 1919) by the 1921 census population. The rate for 1931 was calculated similarly. To calculate the rate for 1946, on the other hand, half the number of registered deaths in 1946 and 1947 was used as numerator as the census was carried out in November 1946; the rate for 1960 was computed in the same way as that census was also conducted in November. The IMR for 1921 was calculated as a third of the number of infant deaths registered over 1920-22 divided by a third of the number of live births registered over the same period. The IMR for 1931 was calculated in the same manner. To calculate the IMR for 1946, on the other hand, half the number of infant deaths registered in 1946 and 1947 was divided by half the number of live births registered in those years. The IMR for 1960 was calculated similarly.

The CDR indicates that mortality between 1901 and 1911 was fairly constant but increased substantially thereafter; the CDR increased from 15.6 per thousand in 1911 to 24.5 per thousand in 1921. From 1921 onwards, however, mortality followed a declining trend; by 1946 the CDR had dropped to 8.5 per thousand. The declining trend in mortality after 1921 is probably genuine though the relatively high rate for that year is at least partly due to 1920 and 1922 being years of exceptionally high mortality.

The IMR indicates that infant mortality declined slightly between 1921 and 1931 and substantially thereafter. The IMR decreased from 165 per thousand in 1921 to 68 per thousand in 1946 and 13 per thousand in 1960. The declining trend in infant mortality seems to be genuine, though the pace of the decline indicated by the IMR might be distorted by changes in the completeness of registration; for instance, the IMR for 1960 is certain to underestimate infant mortality due to the collapse of the registration system in 1955.

Table 3.1: CDR and IMR for Cyprus for census years, 1901-1960

	1901	1911	1921	1931	1946	1960
CDR	14.14	15.63	24.50	16.32	8.52	2.74
IMR	n.a.	n.a.	164.5	150.8	68.2	12.5

For the period 1921 to 1960 a comparison of urban-rural mortality patterns was possible as numbers of deaths, infant deaths and live births were published for the six principal towns of the island. The CDRs for the urban areas indicate a steady declining trend in mortality; the rate decreased from 20.7 per thousand in 1921 to 9.3 per thousand in 1946. A declining trend is apparent for the rural areas, too; the CDR decreased from 25.3 per thousand 1n 1921 to 8.3 per thousand in 1946. The rates imply that between 1921 and 1931 mortality in rural areas was higher than in urban areas while the situation had changed by 1946. The gap in the CDRs was more pronounced in 1921 and narrowed over time (see Table A3.3, Appendix 3.2).

The IMRs for the urban areas indicate substantial decreases in infant mortality between successive censuses. The IMR started off at 176 per thousand in 1921 and had declined to 51 per thousand by 1946. The picture for the rural areas is similar except for the period 1921-1931 when IMR remained fairly constant around 163 per thousand. By 1946, the IMR in the rural areas had dropped to 73 per thousand. The rates imply that infant mortality in urban areas was slightly higher than in rural areas in 1921; however, in 1931 and 1946 it was much lower (see Table A3.4, Appendix 3.2).

Overall, both CDRs and IMRs indicate that mortality was declining over time except for the period 1921 to 1931 when infant mortality increased slightly in the rural areas. The increase in infant mortality over that period is suspect and could be due to an increase in the completeness of registration of infant deaths. In fact, in 1921 the IMR for the rural part of Limassol district was only 60 per thousand while the next lower IMR was 148 per thousand, in the rural part of Kyrenia district. It seems probable that the low IMR for the rural part of Limassol district that year was due to underreporting of infant deaths and that the IMR for rural areas in 1921 should have been higher than 163 per thousand.

To conclude, it is probable that urban-rural differentials for certain years were partly distorted by differentials in the completeness of registration of deaths and infant deaths. Nevertheless, it is likely that mortality in rural areas was higher than in urban areas, except perhaps for adult mortality in 1946, as this is implied by both CDRs and IMRs.

3.2 Mortality levels and trends based on indirect methods

In this section, indirect techniques were used to estimate mortality levels and trends from census data (United Nations, 1983). Five different methods were used to estimate child and adult mortality. The first method uses model stable age distributions to estimate post-childhood mortality levels for census years (i.e. expectation of life at age five and death rate over age five). The second, third and fourth methods use successive census age distributions to estimate intercensal levels of adult mortality. The last method uses information about numbers of children ever born and children surviving and gives estimates of infant and child mortality. A detailed account of these methods and comments on the results are given in Appendices 3.3, 3.4 and 3.5.

Finally, an indirect technique was used to link the estimates of infant and child mortality with adult mortality in a life table for the early 1940s. The method involves smoothing and interpolation of an incomplete set of survivorship probabilities (Appendix 3.6).

3.2.1 Estimation of post-childhood mortality using model stable age distributions

This method aims at identifying a stable population, out of a selected family of Coale-Demeny model stable populations, which approximates the observed one. In this way, estimates of the expectation of life at age five (e_5) and the death rate over age five (DR(>5)) are obtained as well as of the expectation of life at birth (e_0), the CDR and the IMR (Appendix 3.3, a). However, if the relationship between infant and adult mortality for the observed population differs from that embodied in the selected family of Coale-Demeny model stable populations, the estimates that refer to the infant and the overall population may be incorrect. The method assumes that the observed population is stable or quasi-stable and the data used to identify the stable population, namely proportion of the population under age 15 and intercensal rate of growth, are reliable.

Table 3.2 shows mortality estimates produced by this method for census years. The estimates for all years except 1960 are based on the south family of Coale-Demeny model stable populations for males. For 1960 the south family of model stable populations for females was used (see Appendix 3.3, a and d). The estimates indicate that mortality declined substantially between 1881 and 1901; the expectation of life at age five increased by 4.2 years in that period while the expectation of life at birth increased by 7.4 years. Mortality apparently remained roughly constant over the period 1901 to 1921 and resumed a declining trend thereafter. By 1946 mortality had reached relatively low levels; the expectation of life at birth had increased to 57.0 years. However, the estimates imply that mortality increased again between 1946 and 1960; by 1960 the expectation of life at birth had dropped to 51.1 years.

Table 3.2: Mortality parameters estimated using Coale-Demeny model stable age distributions, 1881-1960

measure	1881	1891	1901	1911	1921	1931	1946	1960
e_5	43.8	45.8	48.0	47.9	47.9	52.3	60.4	55.9
DR(>5)	18.7	17.6	16.1	15.0	16.1	14.9	10.1	10.9
e_0	27.7	30.9	35.1	36.8	34.9	41.0	57.0	51.1
CDR	37.9	33.2	28.3	26.6	28.4	23.0	13.2	16.3
IMR	264.3	239.8	213.7	200.4	212.1	188.0	103.4	126.9

The estimates indicate extremely high mortality for 1881 and 1891. In addition, they show substantially higher mortality over the period 1901 to 1931 than the registration data; CDRs based on registration data were, on average, below 20 per thousand in that period. The stagnation of mortality between 1901 and 1921 might be suspect while the increase between 1946 and 1960 is implausible as all measures based on registration data showed the opposite to be true. In fact, if the period after 1954 is disregarded due to the collapse of the registration system, CDRs based on registration data decreased slightly between 1946 and 1954 from around 9 per thousand to 7 per thousand while IMRs declined from about 70 per thousand to 50 per thousand. Thus, it seems likely that the method did not provide reliable estimates for some years, probably because some of the assumptions are not satisfied or some of the data used are unreliable.

To assess the validity of the estimates one has to examine the factors that may have affected them; migration, fertility, mortality and data quality. Data on intercensal migration for the period 1881 to 1921 are not available, though probably there was some emigration, while for the period 1921 to 1946 the official data indicate that emigration was not substantial (St. John-Jones, 1983: 92-93). However, even little emigration would result in the underestimation of the rate of growth and thus, in mortality being slightly overestimated. Over the period 1946-1960, according to the official data, there was substantial emigration; that resulted in the underestimation of the intercensal rate of growth for that period and of the expectation of life at age five for 1960. Had the 34,429 emigrants being included in the computation of the rate of growth for 1946-1960, expectation of life at age five would have been 66.6 years compared with 55.9 years. Fertility, as it will be seen, was relatively low in the early 1920s while it recovered in the late 1920s but decreased somewhat from the early 1930s onwards; declining fertility would result in the underestimation of the expectation of life at birth at age five for the period 1920 to 1960. Mortality, according to the registration data, started declining in the early 1920s but there were some upsurges in particular years; the extend to which these irregularities had an impact on the age structure of the population is not known.

Other factors that may have affected the estimates are changes in census coverage over time and unreliably recorded proportions under age 15. The reliability of the recorded proportions under age 15 was assessed by an indirect technique that seeks to evaluate the distribution of males and females by age (Appendix 3.3, a). The technique showed that for 1960 the proportion of females under age 15, though more reliable than the proportion of males under age 15, would still result, for a certain rate of growth, in the identification of a stable population with too high birth and death rates. Hence it is probable that the expectation of life at age five for 1960 was underestimated. The same was true for the proportions under age 15 for 1881; it is probable that expectation of life at age five was underestimated for that year, too.

Finally, the selected family of model life tables (male south, female south or west) may not affect the estimation of the expectation of life at age five and the death rate over age five but has an impact on the estimates of the expectation of life at birth, IMR and CDR as different families of life tables embody different relationships between infant and adult mortality. For instance, if for 1960 the west model for females was used instead of the south model for females the expectation of life at birth, CDR and IMR would have been 55.1 years, 13.8 per thousand and 93.6 per thousand, respectively, compared with 51.1 years, 16.3 and 126.9 per thousand.

To conclude, there is evidence that the method overestimated mortality for 1960 and probably for 1881, too. In addition, as there was some emigration from Cyprus after 1921, according to the official data, but probably before 1921 as well, while fertility was declining from the 1920s onwards it is probable that mortality was slightly overestimated for most years.

3.2.2 Estimation of intercensal adult mortality using successive census age distributions

In this section three indirect techniques are used to estimate intercensal levels of adult mortality. All techniques use successive census age distributions and require relatively good data quality to give fairly reliable estimates. Technique A gives estimates of survivorship ratios for five-year age cohorts which are subsequently smoothed, using the Coale-Demeny model life tables. Technique B gives estimates of survivorship ratios using forward projection, cumulation and the Coale-Demeny model life tables while technique C serves to estimate a post-childhood life table from an age distribution and intercensal rates of growth. The features of these techniques are presented in detail in Appendix 3.3, b. Techniques B and C are more robust to some forms of age misreporting than technique A as they involve cumulation. However, differential coverage in successive censuses, substantial intercensal migration and systematic age misreporting (age shifting) are likely to distort estimates from all methods.

As the distribution of the population by age and by sex for successive censuses was available it was possible to obtain estimates of male and female adult mortality separately. Table 3.3 shows the estimated mortality levels, expectations of life at age 5 (e_5), expectations of life at birth (e_0) and IMRs for males for intercensal periods. For all techniques the south family of Coale-Demeny model life tables for males was used (see Appendix 3.3, d). Technique A implies that male mortality fluctuated slightly between 1881 and 1931; the expectation of life at birth ranged from 41 to 43 years in that period. Mortality declined substantially after 1931 while it increased slightly after 1946; the expectation of life at birth stood at 55 years over the period 1931-1946 but dropped to 52 years over 1946-1960. Technique B indicates that male mortality was declining between 1881 and 1911; the expectation of life at birth increased from 39 to 45 years in that period. Then, an upsurge of mortality occurred in the period 1911-1921 when the expectation of life at birth decreased to 39 years. After 1921, however, mortality followed a steep declining trend; the expectation of life at birth had increased to 67 years by 1946-1960. Technique C implies very similar trends to technique B for the period 1881 to 1946; however, it suggests that a substantial increase in mortality occurred in the period 1946-1960 when the expectation of life at birth dropped to 51 years.

The trends over time described by the estimates do not seem very consistent; different techniques indicate conflicting trends for some periods while, even when the same trend is implied, the estimated mortality levels may differ considerably. The stagnation of mortality between 1881 and 1931, implied by technique A, seems implausible as well as the substantial increase in mortality in the period 1911-1921 implied by techniques B and C. The steep decline in mortality between 1921-1931 and 1931-1946, which is apparent in all estimates, seems suspect as well as the increase in mortality indicated by techniques A and C for the period 1946-1960.

Table 3.3: Intercensal mortality estimates for males, 1881-1960

year	A				B				C			
	level	e_5	e_0	IMR	level	e_5	e_0	IMR	level	e_5	e_0	IMR
1881-91	10.7	53.4	42.2	169.9	9.1	51.4	38.7	189.4	9.3	51.6	39.0	190.2
1891-01	10.0	52.5	40.7	177.5	10.9	53.6	42.8	168.0	10.7	53.4	42.3	172.2
1901-11	10.3	52.9	41.3	174.5	11.6	54.5	44.5	159.6	11.8	54.8	44.6	160.8
1911-21	10.8	53.5	42.4	169.0	9.3	51.6	39.0	187.9	9.2	51.5	38.9	190.1
1921-31	10.8	53.5	42.5	168.4	11.7	54.7	44.5	167.8	10.7	53.4	42.3	173.4
1931-46	16.2	60.4	54.7	113.1	17.7	62.2	57.2	99.3	18.2	62.9	59.4	94.7
1946-60	15.1	59.0	52.2	123.7	21.4	67.6	67.2	65.3	14.3	58.0	50.5	134.8

Table 3.4 shows the estimated mortality levels, expectations of life at age 5 (e_5), expectations of life at birth (e_0) and IMRs for females for intercensal periods. For all techniques the south family of Coale-Demeny model life tables for females was used (see Appendix 3.3, d). Technique A indicates a steady declining trend in female mortality between 1881 and 1921; the expectation of life at birth increased from 36 to 42 years over that period. Mortality apparently increased slightly after 1921 but resumed a declining trend after 1931; the expectation of life at birth reached 61 years during 1931-1946. However, mortality increased again over 1946-1960 when the expectation of life at birth dropped to 53 years. Technique B implies a continuous declining trend in mortality with only moderate gains in the expectation of life at birth between 1881 and 1921 but very substantial gains thereafter. The expectation of life at birth increased from 34 years in the period 1881-1891 to 38 years during 1911-1921 and to 80 years over 1946-1960. Technique C indicates more or less the same trends as technique B for the period 1881 to 1946; the expectation of life at birth increased from 34 years in the period 1881-1891 to 44 years over the period 1921-1931 and to 61 years over 1931-1946. However, technique C implies that after 1946 mortality increased substantially; the expectation of life at birth decreased to 50 years in the period 1946-1960.

All techniques indicate roughly that female mortality was declining for the greater part of the period 1881-1946; however, the different methods imply differences in the pace of decline and different mortality levels for certain periods. The most substantial discrepancy can be observed for the period 1946-1960; technique B indicates that mortality continued declining over that period and gives an expectation of life at birth of 80 years. By contrast, techniques A and C imply that mortality increased in that period and give an expectation of life at birth of 50-53 years.

Table 3.4: Intercensal mortality estimates for females, 1881-1960

year	A				B				C			
	level	e_5	e_0	IMR	level	e_5	e_0	IMR	level	e_5	e_0	IMR
1881-91	7.2	49.6	35.5	195.9	6.7	48.8	34.2	203.5	6.5	48.5	33.8	209.5
1891-01	7.3	49.7	35.7	194.8	7.2	49.6	35.4	196.8	7.7	50.4	36.8	190.3
1901-11	8.2	51.2	38.0	182.8	8.0	50.9	37.4	185.8	8.1	51.0	37.7	184.9
1911-21	9.9	53.9	42.3	161.6	8.2	51.2	38.0	182.9	8.0	50.9	37.5	185.7
1921-31	9.5	53.2	41.2	166.9	10.9	55.4	44.7	152.4	10.6	53.3	44.0	156.0
1931-46	17.5	65.4	61.2	90.9	16.3	63.6	56.5	101.2	17.6	65.5	60.8	92.4
1946-60	14.3	60.6	53.2	118.9	24.7	76.7	79.5	30.0	13.1	56.7	50.2	130.3

Comparing the estimates for males and females all methods indicate that between 1881 and 1911 female mortality exceeded male mortality. The difference for certain years was substantial; for instance, technique B gives an expectation of life at birth of 43 years for males for the period 1891-1901 while for females expectation of life at birth was only 35 years over the same period. After 1911 sex differentials in mortality were reduced while after 1931 the situation changed more or less in favour of females.

The question that arises is whether the sex differentials in mortality implied by all techniques are genuine and, if not, whether the male or the female mortality estimates are more reliable. In Appendix 3.4 is shown that if the differentials in mortality were as substantial as the indirect techniques imply, the ratios of males to females for the period 1881 to 1911 would have been considerably higher than the observed ones for census years. Hence, it is highly improbable that female mortality exceeded substantially male mortality in that period though it is possible that female mortality was slightly higher than male mortality. Thus, one set of mortality estimates, the male or the female, must be unreliable.

Factors that may have affected the estimates are intercensal migration and misreporting of age. Over the period 1946-1960 emigration was substantial and, as emigration has the same effect on the distribution of the population by age as mortality, it probably resulted in techniques A and C overestimating mortality for that period. Before 1946, according to the official data, there was some intercensal emigration though it was not substantial; it is probable that more young adult males than females emigrated. In fact, more male than female emigration combined with a tendency of males to overstate their age probably resulted in an excess of females in the age groups 15-34 between 1881 and 1921, even though in all other age groups there was a substantial excess of males (see Chapter 2, Table 2.3). Similarly, an increase in male emigration between 1911 and 1921 may have resulted in techniques B and C implying an increase in male mortality in that period while they show that female mortality did not change significantly. Thus, the estimates derived from all techniques for males, particularly between 1881 and 1921, were erratic. For instance, the survivorship ratios obtained from technique A for the period 1881-1891 indicate that the 5-9 and 10-14 age groups experienced very heavy mortality in that period (below level one of the south family of Coale-Demeny model life tables), while the persons enumerated in the 25-29 and 30-34 age groups in 1891 were more than those in the 15-19 and 20-24 age groups in 1881. Similarly, the survivorship ratios indicate that males in the 35-39 and 40-44 age groups in 1881 experienced very heavy mortality (below level one of the south family of Coale-Demeny model life tables), while the ratios for above age 45 show successively very high or very low mortality, probably the result of age heaping (see Appendix 3.3, a). Similar inconsistencies can be observed in the survivorship ratios for females though they tended to overstate their age less than males. On the other hand, females tended to underreport their age, which may have resulted in female mortality being overestimated, and age heaping for females was more pronounced than for males. Nevertheless, it is likely that the female distribution by age, particularly over the period 1881 to 1921, was somewhat more consistent than the male distribution; thus, the estimates of female mortality are probably somewhat more reliable than the estimates of male mortality. Moreover, as age heaping was quite pronounced for females it seems that techniques B and C would give the most reliable estimates. However, for the period 1946-1960, technique C was severely affected by the substantial emigration and overestimated mortality while technique B probably underestimated mortality as the distribution by age for 1960 included a very high proportion of persons over age 60 (probably due to emigration of younger persons) that seems to have had the same effects as age exaggeration on that technique.

It is worth noting that, as all three techniques give estimates of adult mortality, the estimates of the expectation of life at birth and the IMR would be untrustworthy if the relationship between infant and adult mortality for the observed population differs from the one embodied in the selected family of Coale-Demeny model life tables. For instance, if the west family of model life tables was used instead of the south and technique C to estimate mortality for males over the period 1946-1960, the estimated mortality level would be 16.7 instead of 14.3, the expectation of life at birth would be 55.9 years compared to 50.5 years and the IMR would be 77.7 per thousand instead of 134.8 per thousand. However, the selected family of model life tables is not likely to affect significantly the comparability of the estimates over time.

To conclude, it seems probable that the estimates based on the distribution of females by age are more reliable than those based on the distribution of males by age. Moreover, techniques B and C seem to give somewhat better estimates with the exception of the period 1946-1960.

3.2.3 Estimation of child mortality from information about children ever born and children surviving

This method uses information from a question in a census or survey about the numbers of children ever born (CEB) and the numbers of children surviving at the time of the census (Appendix 3.3, c). This question was included in both the 1946 and 1960 censuses; however, for 1946 the Brass method was used to obtain estimates of childhood mortality as numbers of children ever born were published for ten year age groups of women after age 25 while for 1960 the Trussell variant of the method was used.

Table 3.5 shows estimates of probabilities of surviving between exact ages 0 and x (l(x)) as well as mortality levels, IMRs and expectations of life at birth (e_0) derived from the 1946 census data. Moreover, reference periods for the estimates are shown as well as the infant mortality rates that are based on the alpha parameter of Brass' logit life table system and are labelled IMR*s in Table 3.5. To calculate the mortality levels, the expectations of life at birth and the IMRs the south family of Coale-Demeny model life tables for both sexes was used. On the other hand, the probabilities of surviving, the time reference periods and the IMR*s were calculated under the assumption that the general standard model life table of Brass represented accurately the childhood mortality pattern of the observed population.

All estimates imply that childhood mortality was declining prior to the census. The pace of the decline was relatively slow between 1930.7 and 1937.0 while more substantial decreases occurred thereafter. The IMR*, however, indicates a slight increase in infant mortality for the most recent period before the census. In addition, IMR* implies more substantial declines in infant mortality than the IMR; the difference between these measures may be due to the different mortality patterns embodied in the model life tables they represent.

The estimates are based on fairly reliable data as is shown in Appendix 3.5 except perhaps for the period before 1931. The probabilities of surviving from birth to exact age two, l(2), and to age five, l(5), are considered the most reliable estimates of mortality obtained by the method though, usually, they underestimate mortality as they are based on reports of women that are alive at the time of the census (selection effect) and dead children are more likely to be omitted than children alive. The estimates for the earlier period probably underestimate mortality more substantially, as omissions of children dead increase with age of women. In fact, the estimated IMRs for the period around 1931 are lower than the IMRs based on registration data that stood at around 150 per thousand between 1930 and 1932. However, the estimates for the period 1937 to 1946 are quite similar to the IMRs computed from registration data (see Figure 9.1, Chapter 9).

Table 3.5: Mortality parameters based on the children ever born and children surviving method of Brass, 1946

exact age x	l(x)	reference period	level	e_0	IMR	IMR*
1	0.9066	1945.8	17.8	60.0	93.6	93.4
2	0.8782	1944.6	17.3	58.7	98.4	92.9
5	0.8462	1941.7	16.6	57.2	104.3	106.4
15	0.7859	1937.0	14.6	52.4	122.9	138.1
25	0.7417	1930.7	14.0	50.9	128.8	155.9
35	0.6596		12.5	47.4	143.7	

Table 3.6 shows estimates of probabilities of surviving between exact ages 0 and x (l(x)) as well as mortality levels, IMRs and expectations of life at birth (e_0) derived from the 1960 census data. Moreover, reference periods for the estimates are presented as well as the infant mortality rates that are based on the alpha parameter of Brass' logit life table system and are labelled IMR*s in Table 3.6. To calculate the probabilities of surviving, the reference periods, the mortality levels, the expectations of life at birth and the IMRs the south family of Coale-Demeny model life tables for both sexes was used. As the process was repeated using the west family of Coale-Demeny model life tables, IMRs based on the west model are also presented in Table 3.6. The IMR*s, on the other hand, were calculated under the assumption that the general standard model life table of Brass represented

accurately the childhood mortality pattern of the observed population.

Most of the estimates indicate that childhood mortality was declining gradually prior to the census. The IMR*, on the other hand, indicates a substantial increase in infant mortality for the more recent period before the census. Moreover, it shows lower mortality than the estimates based on the south model. These inconsistencies may be due to the general standard model being unrepresentative of the childhood mortality pattern of the population of Cyprus. The IMRs based on the west model are very similar to the rates based on the south model between 1946 and 1955 but imply somewhat higher infant mortality for 1959 and 1960.

The estimates are based on fairly consistent data as is shown in Appendix 3.5. The probabilities of surviving to exact age 2, 3 and 5 are probably the most reliable estimates though usually they underestimate mortality. The estimates for the earlier period are probably more unreliable (biased downwards), as omissions of dead children increase with age of women. On the other hand, the estimates may overestimate mortality slightly as fertility was declining prior to the census. However, as the decline was gradual and not particularly pronounced the impact on the estimates may be small. Overall, the estimates indicate higher infant mortality between 1946 and 1960 than the IMRs based on registration data that decreased from around 70 to 50 per thousand in the period 1946-1954.

Table 3.6: Mortality parameters based on the children ever born and children surviving method of Trussell, 1960

exact age x	$l(x)^a$	reference period[a]	level[a]	e_0[a]	IMR[a]	IMR[b]	IMR*
1	0.9477	1960.2	22.1	70.7	52.5	60.6	52.3
2	0.9391	1959.1	21.8	70.0	55.0	59.2	45.6
3	0.9312	1957.3	21.5	69.1	58.4	61.6	46.1
5	0.9156	1955.0	20.3	66.3	69.3	68.8	51.4
10	0.8955	1952.4	19.6	64.7	75.8	76.4	58.3
15	0.8638	1949.4	18.2	61.1	89.8	91.5	72.1
20	0.8442	1946.2	17.6	59.7	95.0	95.8	

[a]based on the south model of Coale-Demeny
[b]based on the west model of Coale-Demeny

Both sets of data imply that childhood mortality was declining from the early 1930s onwards. The estimates based on the 1946 census data underestimate childhood mortality for the period before 1937 but seem fairly plausible thereafter. The estimates based on the 1960 census data also seem fairly reliable though, for all periods, infant mortality may have been underestimated slightly.

3.2.4 Estimation of a life table for the early 1940s by smoothing and interpolation of an incomplete set of survivorship probabilities

Table 3.7 shows estimates of probabilities of surviving from birth to exact age x (l(x)) and of the expectation of life at exact age x (e(x)) for males and females for the early 1940s; the radix of the life table is one. The life table was obtained by linking the estimates of infant and child mortality derived from the children ever-born and children surviving method for 1946 with the estimates of adult mortality obtained from intercensal survivorship techniques for the period 1931-1946, using level 20 of the south family of Coale-Demeny model life tables for males and females as standard (Appendix 3.6).

The estimates indicate that expectation of life at birth for males in the early 1940s was 53.5 years and the male IMR was 109 per thousand. Expectation of life at birth for females that period was 56.2 years and the female IMR was 93 per thousand. If the 1946 census population is used to estimate numbers of deaths for males and females, the crude death rate for that year based on these life tables is 18.2 per thousand, higher than the rate computed from registration data which fluctuated between 10 and 16 per thousand over the period 1940-1945.

Use of other model life tables as standard to link child with adult mortality would result in only slightly different estimates of the expectation of life at birth and of the IMR. For instance, if level 16 of the south family of Coale-Demeny model life tables for males was used instead of level 20, the expectation of life at birth would have been 54 years instead of 53.5 years and the IMR would have been 92 per thousand instead of 109 per thousand. Similarly, if level 17 of the south family for females was used as standard, the expectation of life at birth and the IMR would have been 57 years and 98 per thousand, respectively, instead of 56.2 years and 93 per thousand.

Table 3.7: Life tables for males and females for Cyprus for the early 1940s

	Males		Females	
Exact age x	l(x)	e(x)	l(x)	e(x)
0	1	53.5	1	56.2
1	0.89059	59.0	0.90673	60.9
2	0.87122	59.3	0.88574	61.4
3	0.86139	59.0	0.87535	61.1
4	0.85575	58.4	0.86954	60.5
5	0.85235	57.6	0.86590	59.8
10	0.84403	53.1	0.85819	55.3
15	0.83763	48.5	0.85273	50.6
20	0.82827	44.0	0.84480	46.1
25	0.81502	39.7	0.83373	41.6
30	0.80095	35.4	0.82065	37.3
35	0.78339	31.1	0.80541	32.9
40	0.76273	26.9	0.78729	28.6
45	0.73390	22.8	0.76338	24.4
50	0.69379	19.0	0.73233	20.4
55	0.63576	15.5	0.68721	16.5
60	0.55707	12.4	0.62551	12.9
65	0.45608	9.5	0.53383	9.7
70	0.33743	7.0	0.40664	7.0
75	0.20880	4.8	0.25115	4.8
80	0.09708	2.5	0.11341	2.5

3.3 Conclusion

In this part of the chapter an attempt is made to fit together the various estimates of mortality to provide a realistic account of levels and trends for the period 1881-1960.

For the period 1881 to 1901 only estimates of mortality based on the use of indirect techniques are available. The method based on the use of model stable age distributions as well as techniques B (estimation of survivorship ratios using forward projection, cumulation and the Coale-Demeny model life tables) and C (estimation of a post-childhood life table from an age distribution and intercensal growth rates) for females indicate that mortality was declining over that period. However, the estimates based on the use of model stable age distributions show higher mortality in 1881 and 1891 than techniques B and C; in fact, mortality in 1881 by the former method was probably overestimated and that might be true for 1891, too. If the estimates of techniques B and C are used, as more reliable, one may conclude that the expectation of life at birth for females increased from 34 years in 1881-1891 to 35.5 years in 1891-1901 while the expectation of life at birth for males was probably slightly higher, perhaps by a year or so.

For the period after 1901 the CDRs computed from registration data indicate that mortality fluctuated somewhat over the period 1901-1917 while there was an upsurge of mortality during 1918-1922 and a clear downward trend thereafter which became steeper after 1932. The infant mortality rate indicates a declining trend only after 1932, though with some upsurges. The indirect method based on the use of model stable age distributions indicates that mortality was fairly constant between 1901 and 1921 while it followed a declining trend between 1921 and 1946 but increased thereafter. Although the implied trends are quite similar, with the exception of the post-1946 period, the indirect method indicates that mortality was substantially higher than is shown by the CDR based on registration data.

Indirect techniques B and C for females indicate that mortality between 1901-1911 and 1911-1921 remained more or less constant; however, mortality for the latter period may have been overestimated due to emigration. In addition, they show that mortality decreased substantially between 1921 and 1946 while technique B implies a continuation of that trend for the period 1946-1960. Techniques B and C show lower mortality than the technique based on the use of model stable age distributions but higher mortality than the CDRs and the IMRs from registration data, particularly for the period before 1921.

The estimates of infant and child mortality based on the reported numbers of children ever born and children surviving show that mortality was declining between 1930 and 1960 though it was higher than the registration data indicate, particularly after 1946, and higher than technique B for females implies for the period 1931-1946 and the period 1946-1960.

Overall, it seems likely that the trends implied by the registration data for the period after 1901 are more or less correct. However, the mortality levels implied by the CDRs and the IMRs probably underestimate mortality particularly for the period before 1921 and after 1946; use of indirect methods for the estimation of the completeness of registration of adult deaths for 1946 in Appendix 3.7 suggests that adult deaths that year were underreported by about 20 per cent. Thus, the indirect techniques probably reflect mortality levels more accurately.

As techniques B and C for females seem to give the most plausible estimates, the mortality levels obtained by these methods may be considered more or less correct, particularly for the period 1881-1931 though mortality for the period 1911-1921 was, perhaps, overestimated. For males, possibly, mortality was slightly lower than for females over the period 1881 to 1911 but slightly higher thereafter. Between 1931 and 1937 mortality was probably somewhat higher than the children ever born and children surviving method of Brass for 1946 indicates while, thereafter, the estimates obtained from numbers of children ever born and children surviving seem fairly plausible though, perhaps, they underestimate mortality slightly.

Fitting together the most plausible estimates from the indirect methods it is likely that levels and trends in mortality between 1881 and 1960 were as follows. Expectation of life at birth for females in the period 1881-1891 was probably around 34 years while it was slightly higher for males, possibly around 35 years. IMRs for that period, based on these mortality levels and the south family of Coale-Demeny model life tables, would be around 210 per thousand. Expectation of life at birth increased over time for both males and females but gains were moderate before 1921. It is likely that expectation of life at birth for females reached about 35.5 years in 1891-

1901, 37.5 years in 1901-1911 and 39.5 years in 1911-1921. For males, expectation of life at birth was perhaps slightly higher than for females in the period 1891-1901 and during 1901-1911, around 36 and 38 years respectively, while in the period 1911-1921 it was slightly lower, around 39 years. IMRs probably decreased between 1891 and 1921 from around 200 per thousand to 185 per thousand.

After 1921, gains in the expectation of life at birth were more substantial for both males and females though mortality was probably decreasing faster for females. In the period 1921-1931 expectation of life at birth for females reached 43.5 years while for males it was around 42 years. Then, expectation of life at birth for females increased further, reaching 49 years in the early 1930s, 51 years in the period 1935-39 and 56 years in the early 1940s. Expectation of life at birth for males for these periods was probably around 47 years, 48.5 years and 53.5 years, respectively. IMRs probably decreased substantially between the 1920s and the early 1940s from around 165 per thousand to 105 per thousand. In the late 1940s expectation of life at birth for females had reached 59 years while in the period 1950-54 it increased to 63.5 years and by the late 1950s it was 66.5 years. For males, expectation of life at birth for these periods was 56 years, 59.5 years and 63 years, respectively. IMRs probably were around 95 per thousand in the late 1940s and had decreased to around 65 per thousand by the late 1950s.

Appendices

Appendix 3.1: CDR and IMR for Cyprus, 1901-1960; annual estimates based on registered deaths and infant deaths

It should be noted that from 1901 to 1919 the published numbers of deaths related not to strict calendar years but to one-year periods starting on the 1st of April and ending on the 31st of March. Thus the figures for 1901, for example, include deaths registered in the first quarter of 1902, so that rates are slightly displaced in time. However, this should not affect their comparability except, perhaps, for 1920, when figures started being published for calendar years. The events of the first three months of that year were included in both the 1919 and the 1920 figures.

Table A3.1: CDR* for Cyprus, 1901-1960

Year	CDR	Year	CDR	Year	CDR	Year	CDR	Year	CDR	Year	CDR
1901	18.1	**1911**	16.2	**1921**	19.9	**1931**	17.1	**1941**	12.3	**1951**	8.5
1902	14.6	**1912**	17.6	**1922**	29.5	**1932**	16.2	**1942**	16.1	**1952**	7.7
1903	14.5	**1913**	18.8	**1923**	17.9	**1933**	13.6	**1943**	12.1	**1953**	7.0
1904	14.7	**1914**	17.5	**1924**	17.7	**1934**	13.0	**1944**	9.9	**1954**	7.2
1905	17.7	**1915**	19.7	**1925**	14.6	**1935**	13.3	**1945**	9.3	**1955**	5.0
1906	15.8	**1916**	17.8	**1926**	17.4	**1936**	12.3	**1946**	8.5	**1956**	2.5
1907	17.6	**1917**	18.2	**1927**	16.0	**1937**	16.4	**1947**	8.5	**1957**	2.1
1908	19.6	**1918**	22.9	**1928**	15.5	**1938**	13.9	**1948**	8.6	**1958**	1.1
1909	16.9	**1919**	17.2	**1929**	13.9	**1939**	11.3	**1949**	9.0	**1959**	2.2
1910	15.2	**1920**	23.8	**1930**	16.4	**1940**	11.6	**1950**	8.3	**1960**	2.8

* Deaths per 1,000 total population

Table A3.2: IMR* for Cyprus, 1916-1960

Year	IMR	Year	IMR	Year	IMR	Year	IMR	Year	IMR
1911		**1921**	154	**1931**	168	**1941**	108	**1951**	61
1912		**1922**	167	**1932**	155	**1942**	185	**1952**	59
1913		**1923**	150	**1933**	133	**1943**	121	**1953**	47
1914		**1924**	136	**1934**	129	**1944**	82	**1954**	52
1915		**1925**	145	**1935**	121	**1945**	81	**1955**	30
1916	141	**1926**	134	**1936**	105	**1946**	71	**1956**	24
1917	124	**1927**	174	**1937**	159	**1947**	66	**1957**	23
1918	149	**1928**	160	**1938**	130	**1948**	67	**1958**	12
1919	106	**1929**	160	**1939**	99	**1949**	72	**1959**	10
1920	170	**1930**	131	**1940**	89	**1950**	63	**1960**	12

* Infant deaths per 1,000 live births

Appendix 3.2: CDR and IMR for the urban and rural areas of Cyprus, 1921, 1931, 1946 and 1960

It should be noted that the urban sector includes only the six principal towns of the island. All other towns, independently of their size, are included in the rural sector.

Table A3.3: CDR* in urban and rural areas of Cyprus, 1921, 1931, 1946 and 1960

	1921	1931	1946	1960
Urban	20.70	14.06	9.29	2.24
Rural	25.31	16.87	8.30	3.03

* Deaths per 1,000 total population

Table A3.4: IMR* in urban and rural areas of Cyprus, 1921, 1931, 1946 and 1960

	1921	1931	1946	1960
Urban	176.3	121.1	51.4	16.6
Rural	162.9	164.1	73.0	10.9

* Infant deaths per 1,000 live births

Appendix 3.3: Indirect methods used for the estimation of mortality

a. Estimation of the expectation of life at age five and of the death rate over age five from the proportion of the population under age 15 and the rate of growth, using model stable age distributions

As a first step, a suitable family of Coale-Demeny model stable populations is chosen. Then, the proportion of the population under age 15 and the average annual rate of growth for the period before the census are used to identify a model stable population that approximates the observed one (United Nations, 1983: 172-174). Hence, estimates of the expectation of life at age five and of the death rate over age five are obtained. In addition, a complete set of mortality parameters (expectation of life at birth, CDR and IMR) can be calculated for the fitted stable population but may be unreliable if the relationship between infant and adult mortality for the observed population is different from that embodied in the selected family of Coale-Demeny model stable populations.

The method assumes that there is no substantial migration during, at least, the most recent intercensal period and that the observed population is stable or quasi-stable. It requires relatively good quality of data to provide reliable estimates while it is fairly sensitive to deviations from stability; changing fertility, age and sex selective migration or abrupt changes in mortality are likely to affect the estimates. For instance, declining fertility would result in the overestimation of mortality (United Nations, 1983: 173). In addition, differential coverage between two censuses will affect the rate of growth and give unreliable estimates. However, which family of model life tables is selected and whether the stable population chosen is male or female do not affect the estimation of expectation of life at age five and death rate over age five but have an impact on expectation of life at birth, CDR and IMR.

The rate of growth used to identify a stable population for each census year is the average annual rate for the period before that census, except for 1881, for which the rate for the period 1881-1891 was used.

Before applying the method the reliability of the recorded proportions under age 15 for both males and females was assessed by a technique that seeks to evaluate the distribution of the observed population by age (United Nations, 1983: 158-166). This technique requires as a first step the selection of a suitable family of Coale-Demeny model stable populations. Then, the proportions of the population under age x are computed and for each proportion and an arbitrarily chosen mortality level a stable population is identified and its birth rate is plotted against x. If the observed population is stable and the distribution by age is accurate the same stable population will be identified for all different proportions under age x and the sequence of birth rates will be constant. Fluctuations in the sequence of birth rates indicate deviations from stability or age reporting errors.

Use of that method for males and females separately showed that the birth rates for the proportions under age 15 (b(15)) for the years 1891, 1901, 1911, 1921 and 1946 were average points in the sequence of birth rates; thus, for these years the average of the proportions under age 15 for males and females was used to identify a stable population and estimate adult mortality. However, for 1881 the birth rates for the proportions of both males and females under age 15 were relatively high; thus, the average of those proportions was used to estimate adult mortality though the results may be unreliable. For 1931 b(15) for females was a relatively low point in the sequence of birth rates while b(15) for males was about average; thus, the proportion under age 15 for males was used to estimate mortality. For 1960 b(15) for both males and females were relatively high but as b(15) for females was slightly lower than for males the proportion under age 15 for females was used to estimate adult mortality. It should be noted that relatively high b(15) implies that too high a fraction of the population is reported as under age

15; thus, the stable population identified by the proportions under age 15 and a certain rate of growth will probably have too high birth and death rates.

The sequence of the birth rates obtained by this method also reveals some age reporting errors. Males aged more than 45 or 50 possibly exaggerate their age in most censuses while they also tend to concentrate in age groups that include an age ending on the digit zero rather than the digit five; for instance, males show a preference for the 50-54 age group rather than the 55-59. Females aged more than 35 or 40 show a tendency to underreport their age. Age heaping on age groups that include an age ending on the digit zero starts earlier for females (usually from age 30 or 35) and is more pronounced than for males while age exaggeration is less pronounced and can be seen only in the 1881, 1891 and 1946 censuses.

b. Estimation of adult mortality using successive census age distributions

Three methods were used: a) estimation of survivorship ratios for five-year age cohorts, smoothed using the Coale-Demeny model life tables, b) estimation of survivorship ratios using forward projection, cumulation and the Coale-Demeny model life tables and c) estimation of a post-childhood life table from an age distribution and intercensal rates of growth.

All methods use successive census age distributions to estimate levels of adult mortality. For the first method, cohort survivorship ratios for five-year age groups are calculated and mortality levels for each ratio are identified from a suitable family of Coale-Demeny model life tables (United Nations, 1983: 197-199). In this way, an estimate of the average intercensal mortality level is obtained. The second method requires that the distribution of the population by age at the initial census is projected forward, using a suitable family of Coale-Demeny model life tables and various mortality levels (United Nations, 1983: 208-210). Then, the projected age distribution is cumulated and the cumulated distribution of the population by age at the second census is used to determine mortality levels for the intercensal period. The third method requires that age specific intercensal rates of growth are calculated and the average intercensal distribution of the population by age is computed (United Nations, 1983: 218-220). Then, the rates of growth are used to transform the cumulated average age distribution of the observed population into the equivalent of a life table ${}_5L_x$ function. The implied mortality levels for each age group are identified from a suitable family of Coale-Demeny model life tables and an estimate of intercensal mortality is obtained. Once a mortality level has been identified, mortality parameters such as expectation of life at birth, IMR and CDR can be obtained but may be unreliable if the relationship between infant and adult mortality for the observed population is different from that embodied in the selected family of Coale-Demeny model life tables.

All three methods assume that there is no substantial net intercensal migration as well as that the reported distributions of the population by age are accurate. Substantial migration and systematic overreporting or underreporting of age can severely affect the estimates while differential coverage in successive censuses may give results that reflect the comparability of the census enumerations rather than the level of intercensal mortality.

There are, however, some differences among these methods. The second method has the advantage that the effects of age heaping are reduced by the cumulation of the distribution of the population by age at the second census; however, the effects of age reporting errors in the initial age distribution are not reduced. The third method has the advantages that it is not very sensitive to age heaping, as it involves an element of cumulation, and the use of rates of growth eliminates the age reporting errors for which the pattern is the same at both censuses.

c. Estimation of child mortality from information on children ever born and children surviving

The method uses information from a question in a census or survey about the number of children ever born and how many of those are still alive at the time of the census. Brass was the first to develop a procedure for converting proportions dead of children ever born into estimates of the probability of dying before attaining certain exact childhood ages (Brass, 1968: 105-116). To convert the proportions dead to probabilities of dying a set of multipliers is used. The multipliers provided by Brass were obtained using a fixed standard mortality schedule (the general standard model life table) and a model fertility distribution of third degree polynomial form with fixed shape but variable age location. Thus, an estimate of the age location of fertility for the observed population is necessary to obtain estimates of childhood mortality. The method assumes that the risk of dying is a function only of the age of child and not of other factors, such as the mother's age or the child's birth order. Moreover, it assumes that child mortality and fertility have remained constant in the recent past and requires good quality of data to provide fairly reliable estimates.

Trussell developed a variant of Brass' method, in which the multipliers were obtained using a least-squares regression model and model fertility schedules developed by Coale and Trussell (United Nations, 1983: 73-78). The mortality pattern of the observed population is represented by a suitable family of Coale-Demeny model life tables. The method assumes that fertility and childhood mortality remained constant in the recent past. The advantage of Trussell's variant over Brass' method is that a more flexible set of model fertility schedules was used to produce the multipliers and two estimates of the age location of fertility instead of one.

If the assumption about constant childhood mortality prior to the census is not satisfied, it is preferable to estimate reference periods for the probabilities of dying. Two procedures may be used; one by Brass that requires an estimate of the mean of the age specific fertility distribution (Brass, 1985: 2-10) and one by Coale and Trussell that uses regression coefficients (United Nations, 1983: 78). Both procedures assume a smooth change of mortality over time. The childhood mortality estimates may also be converted to infant mortality rates for the estimated reference periods, using the probabilities of surviving to exact age x to obtain an estimate of the alpha parameter of Brass' logit life table system. The method assumes a linear change of alpha over time and that the childhood mortality pattern of the observed population is accurately represented by the general standard model life table of Brass.

The methods are affected by changing fertility and errors in the reporting of children ever born and children surviving; declining fertility, for example, would result in the overestimation of child mortality. Reporting errors usually involve omissions of children ever born and particularly of dead children on the part of older women. Thus, the estimates based on older women tend to underestimate child mortality. On the other hand, the probability of dying between exact ages 0 and 1 usually overestimates mortality as it is based on the reporting of women aged 15-19. Mothers aged 15-19 are inexperienced and, usually, of low educational and socio-economic level and their children experience higher mortality. Moreover, as the number of births to that age group is small there are probably sampling errors. The most reliable estimates of childhood mortality are based on the reporting of women aged 20-24 and 25-29. Overall, the methods tend to underestimate mortality as they are based on the reporting of women that are alive at the time of the census (selection effect) and dead children are more likely to be omitted than children alive.

For the data from the 1960 census, the Trussell's variant of the method was used to estimate childhood mortality. This was not possible for the data from the 1946 census as the variant requires conventional five year age groups; the Brass' original method was used for that year. To time locate the estimates from the 1960 census, regression coefficients were used. For 1946, however, the Brass procedure was used as the average parity of women in the 25-29 age group was unavailable; the mean of the age specific fertility distribution for that year was estimated using the ratio of the average parity of women aged 15-19 over the average parity of women aged 20-24. For both 1946 and 1960 the probabilities of surviving to exact age x were used to estimate the alpha parameter of Brass' logit life table system and the IMR for the time reference periods, assuming that the childhood mortality pattern of the observed population was accurately represented by the general standard model of Brass.

d. Choosing a suitable family of Coale-Demeny model life tables to represent the population of Cyprus

In all indirect methods that involve the choice of a suitable family of Coale-Demeny model life tables the south family has been used. That family was considered a better representative of the mortality patterns of the Cypriot population than the west family, particularly for the period 1881 to 1946, as it is based on life tables for southern Europe (Spain, Portugal, Italy, southern Italy and Sicily) and it implies higher mortality under age 5 and lower adult mortality than the west family (United Nations, 1983: 12-16).

If, for instance, the west family had been used to estimate adult mortality for the period 1931 to 1946, method B for males, the estimated expectation of life at age 5 would have been 63.0 years, only slightly higher than the one based on the south family which is 62.2 years (see Table 3.3). The implied expectation of life at birth based on the west family, however, would have been too high, 63.4 years compared to 57.2 years based on the south family while the IMR would have been too low, 54.1 per thousand compared to 99.3 per thousand. Thus, the age pattern of mortality embodied in the south family seems to represent quite well the patterns of the Cypriot population for that period.

Appendix 3.4: Sex differentials in mortality, 1881-1921: a genuine feature of the population of Cyprus?

The estimates of intercensal adult mortality levels, based on the use of successive census age distributions, imply that female mortality between 1881 and 1911 was substantially higher than male mortality. To verify this feature, the mortality levels estimated by techniques A, B and C were used as well as the observed intercensal rates of growth to identify male and female stable populations, out of the south family of Coale-Demeny model stable populations, that would embody these characteristics. Then, the sex ratio for the stable populations was calculated by dividing males by females -assuming a sex ratio at birth equal to 1.05- and was compared to the observed sex ratio for census years.

Table A3.5 shows what the sex ratio in the observed population would have been if the sex differentials in mortality, reflected in the estimates of techniques A, B and C, were genuine and if the population was in fact stable.

Table A3.5: Sex ratios (males over females) for stable populations, 1881-1931

Intercensal period	Intrinsic r	Sex ratio (males/females)		
		Method A	Method B	Method C
1881-1891	0.012	1.23	1.18	1.20
1891-1901	0.012	1.19	1.16	1.20
1901-1911	0.014	1.14	1.18	1.18
1911-1921	0.012	1.06	1.05	1.09
1921-1931	0.011	1.09	1.05	1.01

Table A3.6 shows the sex ratio in the observed population for census years. Apparently, if the sex differentials in mortality were genuine and if the population was stable, the ratios of males to females would have been much higher. Moreover, the observed sex ratios are slightly lower than the sex ratio at birth, usually around 1.05; that would indicate that more males than females die in the population. In addition, as females are more likely to be omitted from an enumeration than males the actual sex ratio, particularly for the earlier period, might have been even lower. On the other hand, more male than female emigration would cancel the effects of more female underenumeration and, if emigration differentials were substantial, the observed sex ratios might have been reduced considerably. Overall, it is probable that the observed ratios of males to females were somewhat reduced by more male emigration and that female mortality might have been slightly higher than male mortality.

Table A3.6: Sex Ratios (males over females) in the observed population for census years, 1881-1931

Year	Sex ratio (males/females)
1881	1.042
1891	1.043
1901	1.044
1911	1.035
1921	1.008
1931	0.986

To conclude, the substantial difference between male and female mortality implied by the indirect methods for the period 1881 to 1911 is implausible. However, female mortality might have been slightly higher than male mortality in that period while the ratios of males to females imply a slight excess of male mortality due to more male than female emigration.

Appendix 3.5: Average parities and proportions of children dead based on numbers of children ever born and children surviving reported in the 1946 and 1960 censuses

The question about numbers of children ever born (CEB) and numbers of children surviving (CS) was included in both the 1946 and 1960 censuses though the wording was slightly different (St. John-Jones, 1983: 162-163). In 1960, the question was addressed to all women and the word "live" births was omitted while in 1946 it was addressed to ever-married women and the word "live" was included. The number of women that answered the question in the 1960 census was 145,722 while the number of ever-married women was 145,640. On the other hand, the number of women that answered the question in the 1946 census in unknown as the published figures do not include childless women. Moreover, the numbers of children ever born in 1946 were based on one sample of women and the numbers of children surviving were based on a different sample; the approximate number of mothers from the first sample was given as 97,795 while from the second sample it was 84,588. Hence, the published figures for 1946 were approximations and that may introduce an element of inaccuracy in the estimates of mortality. The numbers of children ever born and children surviving by age of mother for 1960 were published for conventional five year age groups while for 1946, from age 25 onwards, ten year age groups were used. Thus, the estimates derived from the two censuses are not entirely comparable.

Table A3.7 shows the numbers of children ever born and children surviving published in the 1946 census report. In addition, numbers of women aged 15-64 are presented as well as average parities and proportions of children dead for these women. The average parities increase with increasing age of women; thus, the data on numbers of children ever born are fairly reliable. The increase in parity from the age group 45-54 to 55-64, however, is suspect; it may imply that fertility was declining prior to the census or reporting errors. Hence, estimates based on those age groups should be treated with caution. The proportions of children dead also increase with age of women; that indicates fairly reliable reporting of children surviving as well as that childhood mortality was declining prior to the census. Thus, the estimation of time reference periods for the mortality estimates is necessary.

Table A3.7: Average parities and proportions of children dead, 1946

Age group	No. of women	no. of CEB	no. of CS	average parity	proportion dead
15-19	22,220	1,310	1,200	0.059	0.084
20-24	19,440	11,470	10,170	0.590	0.113
25-34	32,695	69,186	59,155	2.116	0.145
35-44	27,239	101,087	80,529	3.711	0.203
45-54	21,765	98,689	75,008	4.534	0.240
55-64	14,937	72,905	49,850	4.881	0.316

Table A3.8 shows the numbers of children ever born and children surviving reported in the 1960 census. In addition, numbers of women aged 15-49 are presented as well as average parities and proportions of children dead for these women. The average parities and the proportions of dead children increase with age of women. That indicates that the data on numbers of children ever born and children surviving are fairly reliable and that childhood mortality was declining prior to the census. Again, the estimation of time reference periods is essential.

Table A3.8: Average parities and proportions of children dead, 1960

Age group	No. of women	no. of CEB	no. of CS	average parity	proportion dead
15-19	24,212	1,408	1,347	0.058	0.043
20-24	24,443	19,097	18,057	0.782	0.054
25-29	20,443	39,874	37,237	1.950	0.066
30-34	20,356	60,403	55,453	2.967	0.082
35-39	15,337	54,572	49,101	3.558	0.100
40-44	17,205	67,480	58,470	3.922	0.134
45-49	13,580	54,735	46,280	4.031	0.154

Appendix 3.6: Estimation of a life table by smoothing and interpolation of an incomplete set of survivorship probabilities

The method requires that a set of survivorship probabilities for the observed population is available. As a first step a suitable model life table is chosen. The logit transformation of the survivorship probabilities for the observed population is computed and plotted against the logit transformation of the standard (United Nations, 1983: 148-150). If the plotted points form a fairly straight line, estimates of the slope (β) and of the intercept (α) can be obtained and a complete set of survivorship probabilities can be calculated.

This method was used to obtain a life table for the early 1940s. The available data for the observed population include survivorship probabilities obtained from the children ever born and children surviving method of Brass for 1946 and estimates of adult mortality obtained from intercensal survivorship techniques for the period 1931-1946 (see Tables 3.3, 3.4 and 3.5). However, it was not possible to use that method to produce a life table for the late 1950s as the indirect estimation techniques failed to provide robust estimates of adult mortality for the period 1946 to 1960.

The estimates of mortality for the period 1931-1946 based on intercensal survivorship methods suggest that level 17 of the south family of Coale-Demeny model life tables represents adequately adult mortality patterns for the population of Cyprus for the early 1940s. However, level 20 of the south family of Coale-Demeny model life tables was chosen as standard, in order to produce estimates of α and β comparable to those estimated for the mid-1970s (see Appendix 8.3, Chapter 8); level 20 is roughly the average level of mortality for the period between the early 1940s and the mid-1970s. To represent levels of child mortality $l(1)$, $l(2)$ and $l(5)$ were chosen as $l(15)$ deviated from a straight line when plotted against the standard. The estimates of the slope and the intercept are 1.23445 and 0.49004 for males and 1.3657 and 0.65027 for females.

Appendix 3.7: Estimation of the completeness of registration of adult deaths, 1946

Two indirect techniques were used to estimate the completeness of registration of adult deaths in 1946; the first technique was developed by Preston and Coale (United Nations, 1983: 130-135) while the second technique is the "growth balance method" of Brass (United Nations, 1983: 139-141).

The Preston-Coale procedure uses the registered numbers of deaths by age and sex and the rate of growth to obtain an estimate of the population at exact age x. Subsequently, ratios of the estimated over the observed population are computed and used to estimate the completeness of registration of adult deaths. The ratios also serve to indicate errors in the distribution of deaths and of the population by age and sex and deviations from the assumptions. The method assumes that the observed population is stable, that underreporting of deaths is constant with age and that the distribution of the population by age and sex, the distribution of deaths by age and sex as well as the rate of growth are reliably recorded. Deviations from stability produce distinctive patterns and are likely to be identified.

The "growth balance method" of Brass uses the registered numbers of deaths by age and sex to compute partial birth rates (i.e. population at exact age x divided by population over age x) and partial death rates (i.e. number of deaths to persons over age x divided by population over age x). Then, the partial death rates are plotted against the partial birth rates; the points should, ideally, lie on a straight line while deviations give indications of data errors and about the validity of the assumptions. A line is fitted on the points, using either "grouped" means or "trimmed" means. The intercept of the line gives an estimate of the rate of growth and the slope gives an estimate of the completeness of registration of adult deaths. The method requires exactly the same assumptions as the Preston-Coale method but is less vulnerable to the effects of age exaggeration. On the other hand, the Preston-Coale method is less vulnerable to the effects of destabilisation resulting from a rapid mortality decline.

Table A3.9 shows estimates of the completeness of registration of adult deaths, C, and the adjusted crude death rates for males and females for 1946. As the numbers of deaths by age and sex for 1946 were unavailable they were estimated using the percentage distribution of deaths by age and sex in 1948 and the average total number of deaths in 1946 and 1947. The Preston-Coale method indicates that registration of adult male deaths in 1946 was about 79 per cent complete while registration of adult female deaths was around 78 per cent complete. The ratios of the estimated over the observed population imply that mortality prior to the census was declining, that the reported age of males and females dying over age 60 tends to be exaggerated and that the distribution of the observed population by age and sex deviated from a stable distribution. The difference between the two estimates obtained from this method is minimal and is due to the different families of Coale-Demeny model life tables (west or south) used to estimate the number of persons in the open ended interval 75+.

The Brass' method indicates that completeness of death registration for adult males was about 85 per cent while for adult females it was 79-80 per cent. The slight difference in the two estimates derived from Brass' method is due to the "g rouped" means excluding persons over age 60 who exaggerated age at death; inclusion of those persons would inflate completeness. However, the estimates of the completeness of death registration for males based on the Brass method are very different from those obtained from the Preston-Coale method. Moreover, the estimated rate of growth for males by the Brass' method differs from the observed one that was used to estimate completeness in the Preston-Coale method. The discrepancy between the estimated and the observed rates of growth indicates that the estimates for males based on the Brass method are probably unreliable. On the other hand, the estimates of completeness of death registration for adult females derived from the Brass method are very similar to those derived from the Preston-Coale method.

To conclude, it seems probable that registration of adult male deaths in 1946 was about 78-79 per cent complete while registration of adult female deaths was around 78-80 per cent complete.

Table A3.9: Completeness of registration of adult deaths, 1946

	Preston-Coale south model		Preston-Coale west model		Brass grouped average		Brass trimmed means	
	males	females	males	females	males	females	males	females
C	78.20%	76.85%	78.82%	77.65%	83.83%	76.49%	85.26%	79.76%
r	0.0180	0.0203	0.0180	0.0203	0.0192	0.0190	0.0195	0.0201
CDR	10.98		10.88		10.47		10.31	

Chapter 4: LEVELS AND TRENDS IN NUPTIALITY, 1881-1960

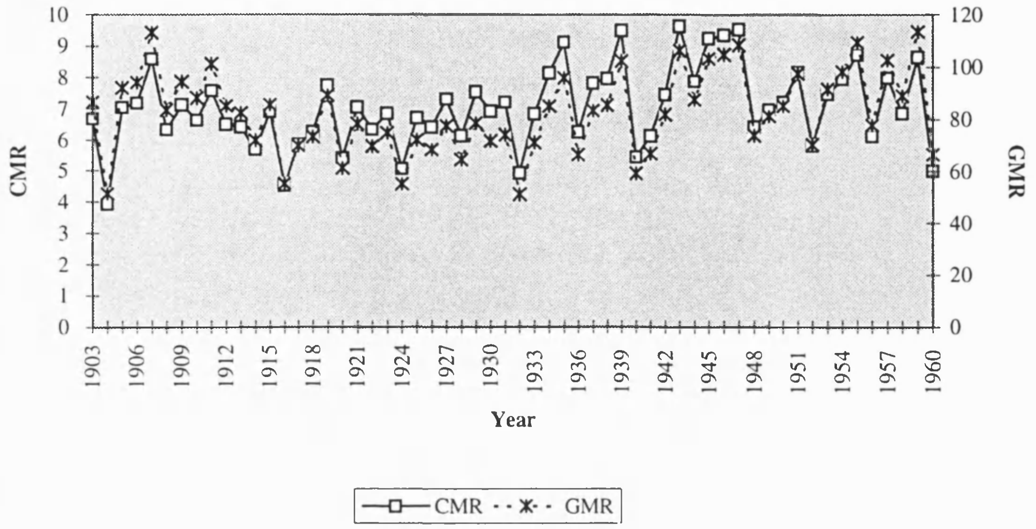
In this chapter, levels and trends in nuptiality over the period 1881 to 1960 are considered. Two different approaches were possible given the availability of data. Firstly, marriage rates were calculated from numbers of registered marriages and census data. After that, singulate mean ages at marriage were computed, using the distribution of the population by age, sex and marital status.

4.1 Year-by-year crude marriage rates and general marriage rates

Total numbers of marriages for the whole of Cyprus were published annually from 1903 onwards. Figure 4.1 shows crude marriage rates (CMRs) and general marriage rates (GMRs) for each year 1903-1960. The rates themselves are presented in Appendix 4.1. Crude marriage rates were calculated by dividing the number of registered marriages in a year by the estimated mid-year population. General marriage rates were calculated by dividing the number of marriages by the number of single females aged 15 or more at mid-year. Mid-year populations were estimated under the assumption that the rate of growth between censuses was continuous and even.

The most interesting feature shown by the data is that both CMRs and GMRs seem to follow roughly a periodical fluctuation, i.e. a four year cycle with a low point each leap year and a peak before or after that year. The periodicity is more pronounced after 1932. This phenomenon is due to the prejudice of the Cypriot population that marriages which take place in leap years will be unhappy; thus, marriages were "pushed" one year back or forward. CMRs and GMRs also indicate that the incidence of marriage decreased slightly after 1911 but increased again after 1933, reaching a peak over the period 1943 to 1947.

Figure 4.1: Crude Marriage Rate (per 1,000 population) & General Marriage Rate (per 1,000 single females aged over 15), Cyprus 1903-1960



4.2 Hajnal's singulate mean age at marriage and Coale's index Im for females for census years

The distribution of the population by age, sex and marital status enables the calculation of Hajnal's singulate mean age at marriage (SMAM). SMAM is an estimate of the mean age at first marriage; it is identical to the true mean age at first marriage at the time of the census if marriage patterns have not changed in the recent past and there are no differentials in mortality and migration according to marital status. These assumptions are unlikely to hold strictly in practice; thus, SMAM incorporates past trends and does not reflect exactly current marriage patterns. However, it is a robust measure of nuptiality.

Table 4.1 shows SMAMs for males and females for Cyprus for census years. The precise mode of computation of SMAM is presented in Appendix 4.2. SMAM for males remained essentially constant between 1891 and 1931, ranging from 27.1 years to 27.7 years. After 1931, however, SMAM followed a declining trend; by 1960 it had decreased to 24.7 years, a drop of around 3 years if compared to the earlier period. SMAM probably reflects rather accurately the mean age at first marriage for males over the period 1891 to 1931, when marriage patterns seem to have remained approximately constant. By contrast, it is likely that SMAM for 1946 overestimated current mean age at first marriage.

SMAM for females was more or less constant over the period 1891 to 1911, when women married on average not long after their twenty-second birthday. SMAM increased slightly between 1911 and 1921, by 0.8 years, and by a further 1.1 years in the period 1921 to 1931. After 1931, however, SMAM followed a declining trend; by 1960 it had dropped to 22.7 years and was very similar to that of the pre-1931 period. SMAM probably reflects more accurately the mean age at first marriage for females over the period 1891 to 1911 when marriage patterns were fairly constant. It is probable that SMAM for 1921 underestimated current mean age at first marriage while SMAM for 1946 overestimated it.

Comparing male to female SMAM, it is possible to observe some similarities in trends over time. In both cases marriage patterns between 1891 and 1911 remained constant and there was a tendency for earlier marriage after 1931. However, there are some differences; by 1931, female SMAM had reached a peak while male SMAM had remained unchanged. In addition, the post-1931 levels showed unprecedented early marriage for males while females returned to the pre-1931 patterns. It is worth noting, that all changes in marriage patterns led to decreases in the gap between male and female SMAM; the increase in female SMAM between 1921 and 1931 caused the gap to be reduced from 4.7 years to 3.4 years over that period. Moreover, the decline in SMAM for males after 1931 resulted in the gap being reduced further, to 2.4 years in 1946 and 2.0 years in 1960.

Table 4.1: SMAMs for males and females for Cyprus for census years, 1891-1960

	1891	1901	1911	1921	1931	1946	1960
males	27.7	27.2	27.1	27.6	27.4	26.2	24.7
females	22.3	22.3	22.1	22.9	24.0	23.8	22.7

Table 4.2 shows proportions of males and females remaining single at exact age 50 for Cyprus for census years. The proportions single at age 50 for 1891 were assumed to be equal to the proportions single in the 45-54

age group as the distribution of the population by age, sex and marital status for that year was provided for ten year age groups after age 25. For 1901, 1911, 1921 and 1931 the proportions single at age 50 were computed in the same manner. For 1946 and 1960, however, the proportions single at age 50 were calculated as the average of the proportions single in the 45-49 and 50-54 age groups, as information on marital status for those years was provided for conventional five year age groups. The proportions single at age 50 reflect roughly the proportion of persons that never got married, as the number of persons who get married for the first time after age 50 is very small and, usually, negligible.

Proportions single at age 50 for males were more or less constant between 1891 and 1946, at around 6.2-6.8 per cent. However, by 1960, the proportions for males had decreased substantially, to 4.0 per cent. Proportions single at age 50 for females increased between 1891 and 1921 from 4.2 per cent to 6.0 per cent. Between 1921 and 1931, however, the proportion apparently decreased substantially, to 3.0 per cent, but increased again thereafter, reaching 4.7 per cent in 1960. Comparing male to female proportions single at age 50, it is apparent that over the period 1891 to 1946 more males than females remained single for life while in 1960 the opposite was true.

The considerable decrease in proportions single at age 50 for females between 1921 and 1931 is suspect, particularly as SMAM for females was increasing over the same period. It seems probable that some kind of misstatement of marital status affected the proportions; either the pre-1931 levels are too high due to divorced and widowed women stated as single, or the 1931 level is too low due to single females stated as divorced or widowed. In fact, it is likely that there was some misreporting of marital status in 1921 as proportions single increase with age for women aged 35 or more. Moreover, the numbers of widowed and particularly of divorced women increased substantially between 1921 and 1931; that might indicate some reporting errors for 1931, too.

Table 4.2: Proportions of males and females single at age 50 for Cyprus for census years, 1891-1960

	1891	1901	1911	1921	1931	1946	1960
males	0.064	0.064	0.067	0.068	0.062	0.064	0.040
females	0.042	0.047	0.051	0.060	0.030	0.041	0.047

Table 4.3 shows Coale's index of proportions married (Im) for females for census years. Im was calculated as the number of births that would occur to married women if they experienced the age-specific marital fertility rates of the Hutterites, over the number of births that would occur if all women experienced the Hutterites' age-specific marital fertility rates (Coale, 1967: 205-209; Coale and Treadway, 1986: 153-162). To compute the numerator of Im numbers of married women for five year age groups are needed. However, between 1891 and 1931 the distribution of women by age and marital status was available only for ten year age groups above age 25. Thus, the ten year age groups were broken down to five year age groups, using as weights the distribution of females by age. For 1946 and 1960 the numbers of married women were available for five year age groups and Im was calculated in the conventional way.

Im remained fairly constant between 1891 and 1911, around 0.65-0.67. After 1911, however, Im followed a declining trend; by 1931 it had dropped to 0.57. Then, it increased again, reaching 0.61 in 1946 and 0.66 in 1960, the same level as in 1911. The trend implied by Im is similar to that indicated by the female SMAM though a perfect match could not be expected as Im does not measure strictly nuptiality; changes in mortality which lead to a decrease in the proportions of widowed females inflate Im but have no effect on SMAM.

Im for Cyprus is somewhat higher than the index for Italy in 1911 and for Spain in 1918 that stood at 0.54 and 0.51, respectively. The index for Cyprus, however, is somewhat lower than for countries of Eastern Europe; Im for Hungary in 1890 was 0.70 while for Bulgaria in 1912 it was 0.74 (Knodel and van de Walle, 1979). Im for Cyprus, on the other hand, is quite similar, though somewhat higher, than the index presented by Siampos and Valaoras for Greece, that fluctuated between 0.502 and 0.632 in the period 1900 to 1961 (1969: 604).

Table 4.3: Coale's index Im for females for Cyprus for census years, 1891-1960

	1891	1901	1911	1921	1931	1946	1960
Im	0.672	0.653	0.661	0.603	0.574	0.609	0.661

The question that arises is why these changes in male and female marriage patterns occurred. Table 4.4 shows ratios of females 15-34 and 15-39 to males 20-44 for Cyprus for census years. The ratios remained roughly constant between 1891 and 1911. Over the same period marriage patterns, as implied by the male and female SMAM, remained constant, too. The ratios followed an increasing trend between 1911 and 1931, implying an increase in the relative availability of females at marriageable age. The response to this "imbalance" was an increase in female SMAM over the period 1911-1931 while male SMAM remained unchanged. Thus, a new "balance " was achieved. Subsequently, a second change occurred; males shifted towards earlier and more marriage after 1931 and made it possible for females to shift back to earlier marriage also, even though the ratio of females to males remained higher than in the pre-1921 period. These changes were noted earlier by Langford (1975: 520-523).

Table 4.4: Ratios of females 15-34 and 15-39 to males 20-44 for Cyprus for census years, 1891-1960

Sex Ratio	1891	1901	1911	1921	1931	1946	1960
15-34/20-44	0.961	0.951	0.949	1.023	1.077	0.993	1.020
15-39/20-44	1.108	1.098	1.105	1.183	1.244	1.193	1.194

The distribution of the population by age, sex and marital status was published also for Nicosia town for the period 1891-1921. This information provided the means to compare urban and rural marriage patterns in Nicosia district. Table 4.5 shows SMAMs and proportions single at age 50 for males for Nicosia town and Nicosia district excluding Nicosia town i.e. the rural part of the district. SMAM for males for Nicosia town decreased between 1891 and

1901, from 31.1 years to 29.3 years, but remained fairly constant thereafter. Proportions single at age 50 for the town were more or less constant over the whole period, at around 20 per cent. SMAM for the rural part of the district decreased by about one year between 1891 and 1911, from 27.7 years to 26.8 years, and increased slightly thereafter. Proportions single at age 50 fluctuated between 4.5 per cent and 5.6 per cent over the period 1891-1921.

Male SMAM for the town was higher than for the rural part of the district for all years; the difference was substantial and ranged between 2.0 and 3.4 years. Even more significant, however, is the difference between the proportions of single males at age 50 in Nicosia town and rural Nicosia district. The figures for the town were more than triple the figures for the rural part of the district for all years.

Table 4.5: SMAMs and proportions single at age 50 (S_{50}) for males for Nicosia town and the rural part of Nicosia district for census years, 1891-1921

Year	Nicosia town		Nicosia district excluding Nicosia town	
	SMAM	S_{50}	SMAM	S_{50}
1891	31.1	0.200	27.7	0.045
1901	29.3	0.196	27.3	0.051
1911	29.7	0.195	26.8	0.048
1921	29.5	0.207	27.2	0.056

Table 4.6 shows SMAMs and proportions single at age 50 for females for Nicosia town and Nicosia district excluding Nicosia town. SMAM for females for Nicosia town increased slightly between 1891 and 1901, from 22.3 years to 22.7 years. Then, between 1901 and 1911, SMAM remained unchanged while it increased again over the following decade, reaching 23.4 years in 1921. Proportions single at age 50 in the town remained more or less constant between 1891 and 1901, around 11 per cent, while they followed an increasing trend thereafter, reaching 14 per cent in 1921. SMAM for the rural part of Nicosia district decreased somewhat between 1891 and 1911, from 22.9 years to 22.3 years, but followed an increasing trend thereafter, reaching 23.0

years in 1921. Proportions single at age 50 were roughly constant between 1891 and 1911, around 4 per cent, but increased slightly between 1911 and 1921, to 5.3 per cent.

SMAM for females in Nicosia town was quite similar to that for the rural part of Nicosia district for all years. However, proportions single at age 50 for females in the town differed substantially from the rural pattern; the proportions were approximately three times higher than those for the rural part of Nicosia district.

Table 4.6: SMAMs and proportions single at age 50 (S_{50}) for females for Nicosia town and the rural part of Nicosia district for census years, 1891-1921

Year	Nicosia town		Nicosia district excluding Nicosia town	
	SMAM	S_{50}	SMAM	S_{50}
1891	22.3	0.115	22.9	0.039
1901	22.7	0.113	22.6	0.043
1911	22.7	0.123	22.3	0.038
1921	23.4	0.141	23.0	0.053

Comparing male to female marriage patterns in Nicosia town, it is surprising that while SMAM for males was particularly high in the town, for females it was essentially the same as in the rural part of Nicosia district. As a result, the gap between male and female SMAM in the town was very substantial; it ranged between 6.1 and 8.8 years, the increasing female and decreasing male SMAM over time served to reduce the gap. On the other hand, proportions single at age 50 in Nicosia town were much higher than in the rural part of the district for both males and females.

It is likely that a high proportion of single persons and particularly of single males was resident in Nicosia town because employment opportunities were better there. In fact, over the period 1891-1921 there was a very substantial excess of males in the town that may partly explain the high proportions of single males at age 50. Another reason contributing to the unusual marriage patterns might be the heterogeneity of the population of the town; for instance, in 1881, 49.1 per cent of the resident population was reported as Greek Orthodox, 46.8 per cent as Moslem and the remaining 4.1 per cent as Maronites, Armenians and others. In 1921 the corresponding figures were 56.7 per cent, 36.3 per cent and 7 per cent.

Table 4.7 shows male and female SMAMs and proportions single at age 50 for the urban and rural areas of Cyprus for 1946. SMAM for males was higher in the urban areas by 1.3 years while the difference for females was insignificant. However, for both males and females proportions single at age 50 were substantially higher in urban areas; 12.4 per cent for males, triple the figure for rural areas, and 6.7 per cent for females, double the figure for rural areas.

Table 4.7: SMAMs and proportions single at age 50 (S_{50}) for males and females for the urban and rural areas of Cyprus, 1946

Area	Males		Females	
	SMAM	S_{50}	SMAM	S_{50}
Urban	27.1	0.124	23.9	0.067
Rural	25.8	0.046	23.8	0.034
Cyprus	26.2	0.064	23.8	0.041

It is worth noting that the urban-rural differentials in marriage patterns for 1946 had many similarities with the differences observed for Nicosia town and the rural part of Nicosia district over the period 1891 to 1921. In both cases, males in urban areas tended to marry later and an exceptionally high proportion of them remained single at age 50. Females, on the other hand, tended to marry at similar ages in both urban and rural areas but a substantially higher proportion of them remained unmarried in urban areas.

4.3 Conclusion

It seems that in 1891 males in Cyprus married on average a little earlier than their twenty-eighth birthday while females not long after their twenty-second birthday. Marriage was not universal though proportions single at age

50 were not particularly high, 6.4 per cent for males and 4.2 per cent for females. Marriage patterns remained roughly constant over the period 1891 to 1931 for males and between 1891 and 1911 for females. After 1911, as the relative availability of females at marriageable ages increased, females shifted towards later marriage to achieve a new balance. Thus, by 1931, females married on average at 24, 1.5 years later than in the earlier period. Then, male marriage patterns changed; male SMAM decreased by 1.2 years between 1931 and 1946 and by a further 1.5 years between 1946 and 1960. This change led to an increase in the relative availability of males; as a result, females could shift back to their former marriage patterns. The response of female SMAM was slow; it declined by only 0.2 years over the period 1931-1946 but decreased by a further 1.1 years between 1946 and 1960. Thus, by 1960 female marriage patterns had become very similar to the pre-1921 ones while male marriage patterns had changed significantly; SMAM indicates unprecedented early marriage for males while the proportions single at age 50 imply that more males were getting married than ever before.

The data also indicate substantial differentials in urban-rural marriage patterns; it seems that males tended to postpone marriage once in an urban environment while a high proportion of them never married. Females, on the other hand, tended to get married approximately at the same age in both urban and rural areas but a much higher proportion of them remained unmarried in urban areas. Hence, an urban environment in Cyprus seems to contribute to high proportions remaining single.

Appendices

Appendix 4.1: CMR and GMR for Cyprus, 1903-1960; annual estimates based on numbers of registered marriages

Table A4.1: CMR* for Cyprus, 1903-1960

Year	CMR	Year	CMR	Year	CMR	Year	CMR	Year	CMR	Year	CMR
		1911	7.59	**1921**	7.06	**1931**	7.20	**1941**	6.12	**1951**	8.17
		1912	6.51	**1922**	6.34	**1932**	4.92	**1942**	7.46	**1952**	5.82
1903	6.68	**1913**	6.43	**1923**	6.86	**1933**	6.83	**1943**	9.63	**1953**	7.48
1904	3.94	**1914**	5.72	**1924**	5.08	**1934**	8.13	**1944**	7.89	**1954**	7.94
1905	7.05	**1915**	6.92	**1925**	6.71	**1935**	9.12	**1945**	9.24	**1955**	8.72
1906	7.18	**1916**	4.55	**1926**	6.41	**1936**	6.26	**1946**	9.33	**1956**	6.13
1907	8.59	**1917**	5.88	**1927**	7.31	**1937**	7.82	**1947**	9.53	**1957**	7.99
1908	6.34	**1918**	6.27	**1928**	6.12	**1938**	7.97	**1948**	6.43	**1958**	6.85
1909	7.13	**1919**	7.76	**1929**	7.53	**1939**	9.48	**1949**	6.99	**1959**	8.63
1910	6.65	**1920**	5.43	**1930**	6.92	**1940**	5.45	**1950**	7.22	**1960**	5.00

* Marriages per 1,000 population

Table A4.2: GMR* for Cyprus, 1903-1960

Year	GMR	Year	GMR	Year	GMR	Year	GMR	Year	GMR	Year	GMR
		1911	101.3	**1921**	78.3	**1931**	74.0	**1941**	66.8	**1951**	97.5
		1912	85.3	**1922**	69.8	**1932**	50.9	**1942**	81.9	**1952**	70.3
1903	86.7	**1913**	82.7	**1923**	74.9	**1933**	71.0	**1943**	106.3	**1953**	91.5
1904	51.3	**1914**	72.2	**1924**	55.0	**1934**	85.1	**1944**	87.7	**1954**	98.3
1905	92.1	**1915**	85.8	**1925**	72.1	**1935**	96.0	**1945**	103.2	**1955**	109.3
1906	94.1	**1916**	55.3	**1926**	68.4	**1936**	66.2	**1946**	104.9	**1956**	77.8
1907	113.0	**1917**	70.2	**1927**	77.4	**1937**	83.3	**1947**	108.4	**1957**	102.6
1908	83.7	**1918**	73.5	**1928**	64.3	**1938**	85.4	**1948**	74.1	**1958**	89.0
1909	94.5	**1919**	89.3	**1929**	78.5	**1939**	102.2	**1949**	81.5	**1959**	113.5
1910	88.4	**1920**	61.4	**1930**	71.6	**1940**	59.1	**1950**	85.2	**1960**	66.6

* Marriages per 1,000 single females aged 15 or more

Appendix 4.2: Computation of SMAM

The distribution of the population by age, sex and marital status enables the calculation of Hajnal's singulate mean age at marriage (Hajnal, 1953: 111-136). The reports of the 1891, 1901, 1911, 1921 and 1931 censuses of Cyprus provided information on the distribution of the population by age, sex and marital status for the following age groups: 0-14, 15-19, 20-24, 25-34, 35-44, 45-54, 55-64 and 65+. Thus, a variant of the original formula of Hajnal's was used to compute SMAM:

$$SMAM = (15+5*\sum S_i+10*\sum S_j+5*S_{(45-54)} -50*S_{50})/(1-S_{50})$$

where S_i and S_j are the proportions single in the i and j age groups, i= 15-19, 20-24 and j= 25-34, 35-44
and S_{50} was assumed to be equal to $S_{(45-54)}$ i.e. proportions single in the 45-54 age group.

For the 1946 and 1960 censuses the distribution of the population by age, sex and marital status was provided for conventional five year age groups and the original formula was used to compute SMAM:

$$SMAM = (15+5*\sum S_i-50*S_{50})/(1-S_{50})$$

where S_i are the proportions single in the i age group, i= 15-19,..,45-49
and S_{50} was computed as the average of the proportions single in the 45-49 and 50-54 age groups.

For all censuses SMAM was computed under the assumption that marriage occurs after age 15. That was true for males while for females there was for some years a very small proportion, around 0.001, marrying before age 15; however, it was considered negligible.

Chapter 5: LEVELS AND TRENDS IN FERTILITY, 1881-1960

In this chapter, levels and trends in fertility over the period 1881-1960 are considered. In the first section, fertility rates calculated from registration and census data are examined. In the second section, parity progression ratios computed from census and survey data are presented while in the third section a variety of "indirect techniques" are employed to derive estimates of fertility from census data. Finally, an attempt is made to put together these various measures to provide a realistic account of both levels and changes over time.

5.1 Fertility levels and trends based on registration data

5.1.1 Year-by-year crude birth rates and general fertility rates

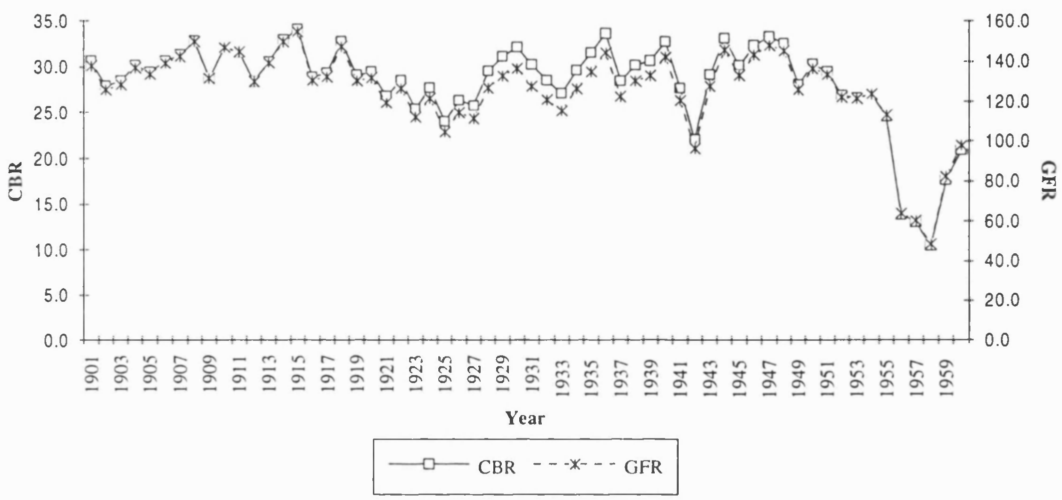
Total numbers of registered births for the whole of Cyprus were published annually from 1900 onwards. Figure 5.1 shows crude birth rates (CBRs) and general fertility rates (GFRs) for each year 1901-1960. The rates themselves are presented in Appendix 5.1. Crude birth rates were calculated by dividing the number of registered births in a year by the estimated mid-year population. General fertility rates were calculated by dividing the number of births by the number of females aged 15-44 at mid-year. Mid-year populations were estimated under the assumption that the rate of growth between censuses was continuous and even.

Both CBRs and GFRs indicate that fertility increased slightly between 1902 and 1908 while it remained more or less constant between 1908 and 1918 though with some fluctuations; CBRs ranged from 28 to 34 per thousand in the latter period while GFRs fluctuated between 130 and 154 per thousand. After 1918 the rates followed roughly a declining trend; by 1925, CBR had fallen to 24 per thousand and GFR to 104 per thousand, a 27 per cent drop for the CBR over that period and a 29 per cent drop for the GFR. After 1925, however, the rates followed an increasing trend and had reached again their pre-1918 levels by 1930. Between 1930 and 1940, the rates remained roughly constant though with substantial fluctuations. A major drop in the rates is apparent over the period 1940-1942 when the CBR decreased from 33 to 22 per thousand and the GFR from 142 to 96 per thousand. However, by 1943 the rates had recovered while between 1944 and 1948 they stabilised at a high plateau. From 1950 onwards, both CBRs and GFRs followed a downward trend that became very steep after 1954; by 1958 the CBR had dropped to 10 per thousand and the GFR to 49 per thousand. However, the rates increased again thereafter; by 1960 the CBR had reached 21 per thousand and the GFR had increased to 98 per thousand.

It should be noted that registration of births has never been complete in Cyprus and the levels of fertility reflected by the CBR and the GFR are probably incorrect, especially for the first few years of the century and the post-1954 period when the registration system practically collapsed. Moreover, some of the fluctuations in the rates are probably due to changes in the completeness of registration. For instance, the slight increase in the rates between 1902 and 1908 probably reflects an improvement in the completeness of registration of births while the sharp decline in the rates after 1954 and the subsequent increase after 1958 indicate changing completeness rather than changing fertility. In addition, St. John-Jones suggests that completeness of registration had decreased from the early 1950s (1983: 64). That seems plausible as CBRs decreased from 29.5 per thousand in 1951 to 26.9 per thousand in 1952 and remained at that level up to 1954 while CDRs, that stood at around 8.5 per thousand in the period 1946-1951, also decreased to 7.7 per thousand in 1952 and remained at that level up to 1954. Thus, the decline in the rates between 1950 and 1954 may be spurious.

However, with the exception of the pre-1908 and the post-1950 period, the trends as described by these measures are probably more or less correct. The decline in fertility between 1918 and 1925 may well be genuine as that period included some years of high mortality and at the same time mean age at first marriage for females increased significantly. The substantial fluctuations in fertility in the 1930s could, at least partly, be attributed to fluctuations in the number of marriages, as the CBRs and GFRs seem to follow closely the fluctuations in the crude marriage rate with a time lag of one year. Such a close relationship between marriage and fertility, however, is evident only during the 1930s. The relatively high fertility for the period 1944 to 1948 may be attributed to a post-war baby boom, brought about by an increase in the number of marriages in the period 1943 to 1947 and declining mean age at first marriage for males and females.

Figure 5.1 : Crude Birth Rate (per 1,000 population) & General Fertility Rate (per 1,000 females 15-44), Cyprus 1901-1960



5.1.2 Crude birth rates, general fertility rates, general marital fertility rates, Coale's fertility indices and child-woman ratios for census years

In this section fertility measures for census years are presented for Cyprus. Table 5.1 shows crude birth rates (CBRs), general fertility rates (GFRs) and the Coale index of overall fertility, If. For 1901 CBR and GFR were calculated by dividing half the number of births registered in the two twelve-month periods ending on 31st March 1901 and 31st March 1902 (these being the periods for which data were published) by the relevant 1901 census populations.

These denominators were more or less appropriate as the census was carried out in April 1901. The rates for 1911 were calculated in the same manner. For 1921 the rates were calculated by dividing the average number of births registered over 1920-1922 (data were published for calendar years after 1919) by the relevant 1921 census populations. The rates for 1931 were calculated similarly. To calculate the rates for 1946, on the other hand, half the numbers of registered births for 1946 and 1947 were used as numerators as the census was carried out in November 1946; the rates for 1960 were computed in the same way as that census was also conducted in November. Coale's index If is the actual number of births over the number of births that would occur if all women experienced the age-specific marital fertility rates of the Hutterites (Coale, 1967: 205-209; Coale and Treadway, 1986: 153-162). In this case, the average number of births per year used to calculate the CBR and GFR was taken as the "actual" number.

The CBR indicates that fertility increased slightly between 1901 and 1911 while it declined somewhat between 1911 and 1921; the rate increased from 27.3 to 31.7 per thousand in the former period while it had dropped to 28.3 per thousand by 1921. Thereafter, fertility followed again an increasing trend; by 1946 CBR had reached 32.9 per thousand. GFR and If imply roughly similar trends to the CBR for the period 1901 to 1921. However, for the period 1921 to 1931 GFR and If indicate that fertility remained more or less constant while CBR shows a 7.4 per cent increase in fertility. In addition, GFR and If imply that fertility increased substantially in the period 1931-1946 when these measures increased by 15.7 and 12.9 per cent, respectively. By contrast, CBR shows only a 8.4 per cent increase in fertility over that period.

The slight differences in fertility trends implied by the CBR and the GFR and If are due to the different qualities of these measures. The GFR is a more refined measure of fertility than the CBR as it relates births to the female population at the main reproductive age span while the If is even more refined as it is less affected by changes in the distribution by age of women within the 15-

49 age group than the GFR (Coale and Treadway, 1986: 156-162). Thus, the If may be considered as a more accurate indicator of fertility changes. However, all three measures are indicators of overall fertility and are affected by changing marriage patterns; increasing mean age at first marriage for women will have a negative impact on these measures even though fertility within marriage may have remained constant.

Table 5.1: CBR, GFR and Coale's index If for Cyprus for census years, 1901-1960

	1901	1911	1921	1931	1946	1960
CBR	27.29	31.72	28.30	30.39	32.93	19.44
GFR	122.73	145.33	125.96	126.09	145.88	91.39
If	0.29	0.35	0.30	0.31	0.35	0.22

Table 5.2 shows general marital fertility rates (GMFRs) and the Coale index of marital fertility, Ig, for Cyprus for census years. GMFRs were calculated in the same way as GFRs except that the denominator was confined to married women aged 15-44. Ig is the actual number of births to married women over the births that would occur to these women if they experienced the Hutterites' age-specific marital fertility rates (Coale, 1967: 205-209; Coale and Treadway, 1986: 153-162). However, as the numbers of births to married women for the periods 1901-1948 and 1955-1960 were unavailable, Ig was computed using the total number of births as numerator. This should not affect the measure significantly as in Cyprus fertility outside marriage has been negligible. For instance, in 1949 only 0.92 per cent of the registered births occurred outside marriage while in 1950 and 1952 the proportions were 0.75 per cent and 0.82 per cent, respectively. To calculate the denominator of Ig, the numbers of married women for five year age groups are needed. Between 1901 and 1931, however, the distribution of the population by age, sex and marital status was available only for ten year age groups after age 25. Thus, to calculate Ig the ten year age groups were broken down to five year age groups, using as weights the distribution of females by age.

Both GMFRs and Ig imply that marital fertility increased between 1901 and 1911 while it declined slightly between 1911 and 1921; GMFR increased from 195 per thousand to 228 per thousand in the former period and Ig from 0.45 to 0.53. After 1921, marital fertility followed an increasing trend, reaching a peak in 1946; GMFR increased from 216 to 246 per thousand in that period while Ig increased from 0.50 to 0.57.

As Cyprus has been a country where births occur predominantly within marriage measures of marital fertility are probably more accurate indicators of changes than measures of overall fertility. In fact, GMFR and Ig give a slightly different picture from the CBR, GFR and If for some years. According to GMFR and Ig, most of the decline in overall fertility between 1911 and 1921 was caused by increasing female mean age at first marriage. Between 1921 and 1931 marital fertility increased; If, however, remained fairly constant due to the female mean age at first marriage still increasing. Between 1931 and 1946 GMFR and Ig increased only by about 6-7 per cent; the increase in If was more pronounced, however, 12.9 per cent, due to declining female mean age at first marriage.

Ig for Cyprus seems relatively low when compared to the index for other countries when natural fertility still prevailed. For instance, Ig for Spain and Italy stood at 0.64 and 0.68, respectively, before the onset of the fertility transition while for Hungary it was 0.63 (Knodell and van de Walle, 1979). Estimates of Siampos and Valaoras indicate that Ig for Greece stood at 0.688 in 1900 while the index decreased to 0.535 in 1928, to 0.399 in 1951 and to 0.327 in 1961 (1969: 605).

Such a comparison, however, is affected by the mode of computation of Ig for Cyprus. As numbers of married women are available only for ten-year age groups after age 25 for the period 1901 to 1931, computing the index for these years involves the unrealistic assumption that proportions married remain constant within each ten-year age group. Ig is known to be affected by differences in the distribution by age of married women within the 15-49 age group though less than the GMFR (Coale and Treadway, 1986: 156-162).

Moreover, the index for Cyprus is probably affected by underreporting of births. If, for instance, births in 1931 were underreported by ten per cent, the adjusted index for that year would be 0.58 instead of 0.54 while if births were underreported by twenty per cent the index would be 0.64.

Table 5.2: GMFR and Coale's index Ig for Cyprus for census years, 1901-1960

	1901	1911	1921	1931	1946	1960
GMFR	195.34	227.77	215.73	230.10	246.00	142.68
Ig	0.45	0.53	0.50	0.54	0.57	0.33

Table 5.3 shows age-specific fertility rates (ASFRs) and age-specific marital fertility rates (ASMFRs) for Cyprus for 1946 and 1960. ASFRs are the number of births to women of a certain age group over the number of women of that age group while ASMFRs are the number of births to married women in the age group divided by the number of married women. The total fertility rate (TFR) is the sum of the ASFRs multiplied by five while the total marital fertility rate (TMFR) is the sum of the ASMFRs for women aged 20-49 multiplied by five. Numbers of live births by age of mother were first published in 1949. So, for 1946 the numerators of the ASFRs were calculated using half the number of live births registered in 1946 and 1947 and the percentage distribution of live births by age of mother in 1949. For 1960 the reported numbers of live births by age of mother were used to compute the ASFRs. In addition, as the number of births outside marriage for that year was unavailable, the same numerator was used to calculate both ASFRs and ASMFRs. Finally, ratios of the observed ASMFRs over the Coale-Trussell standard schedule of natural fertility (obs/C-T) are presented. These ratios serve to assess the extent of family limitation practised by a population; if they remain more or less constant with age, independently of their value, natural fertility prevails in the population (Appendix 5.2). By contrast, a declining trend in the ratios would indicate family limitation.

Fertility in 1946 was quite high: the TFR stood at 4.45 births per woman and the TMFR at 6.19 births per married woman. The ratios of the observed ASMFRs to those of the Coale-Trussell standard decrease sharply between age groups 25-29 and 30-34 while they fluctuate somewhat thereafter. Thus, it seems probable that from age 30 onwards there was some family limitation. However, as 1949 was the first year for which information on numbers of births by age of mother was collected, the fertility schedule may have been affected by misreporting of the age of mother or selective underreporting of births by age of mother. Nevertheless, the ASFRs for 1946 seem fairly reliable (see Appendix 5.5).

In 1960, the TFR was 2.70 births per woman while the TMFR stood at 3.51 births per married woman. It seems that both overall and marital fertility declined considerably over the period 1946-1960. However, as there was substantial underreporting of births in 1960 the actual trend is unknown. Had the adjusted numbers of births published by the Department of Statistics and Research in the Vital and Migration Statistics been used to compute the rates for 1960, the TFR would have been 3.7 births per woman. However, as the reports do not explain how the adjustments were carried out while the adjusted figures were later revised at least twice, only reported figures are used to compute fertility and mortality rates for 1960 throughout the thesis (see 1.4.2, b, Chapter 1).

The age pattern of the ASFRs did not change significantly in the period 1946-1960; however, the ASMFRs in 1960 peaked for the youngest age group while in 1946 they peaked for the 20-24 age group. The ratios of the observed ASMFRs over the Coale-Trussell standard in 1960 decrease more steeply with age than in 1946, particularly for women older than 30, and strongly suggest that levels of family limitation had increased by then.

The ratios for 1960 are relatively low as there was underreporting of births that year. That, however, does not affect the comparison between 1946 and 1960 as the declining trend in the ratios is solely determined by the shape of the fertility distribution. In fact, had the adjusted fertility schedules estimated by the P/F ratio method of Brass (Table A5.7, Appendix 5.5) been used to estimate ASMFRs for 1960 and ratios of the observed rates over the Coale-Trussell standard, the ratios would be higher but would still show a very similar trend.

Table 5.3: ASFRs and ASMFRs (per 1,000) for Cyprus, 1946 and 1960

age group	1946			1960		
	ASFRs	ASMFRs	obs/C-T	ASFRs	ASMFRs	obs/C-T
15-19	32.5	289.0	0.703	22.8	247.9	0.603
20-24	184.4	395.2	0.859	137.9	250.1	0.544
25-29	252.2	350.2	0.812	162.8	203.8	0.473
30-34	196.5	235.0	0.595	106.1	122.7	0.311
35-39	145.3	165.7	0.515	82.6	93.0	0.289
40-44	67.0	76.6	0.473	23.1	26.7	0.160
45-49	12.4	14.6	0.609	5.2	6.1	0.256
TFR	4,452			2,703		
TMFR		6,186			3,512	

Table 5.4 shows the indices of fertility control (m) and of the level of marital fertility (M), derived from the Coale-Trussell fertility model, for Cyprus for 1946 and 1960. In addition, the mean square error which is an indicator of the reliability of the estimates is shown. The precise mode of computation of the indices and their interpretation are presented in Appendix 5.2. The index of fertility control in 1946 was 0.48, higher than 0.20 which is considered by Coale and Trussell as a threshold value implying the onset of family limitation. Thus, the index indicates that there probably was some voluntary control of fertility by married women in 1946. The index of fertility control increased between 1946 and 1960, reaching 0.82; thus, levels of family limitation probably increased somewhat in that period.

The index M in 1946 was 0.872 and implies quite high marital fertility for that period. The index for 1960, however, was relatively low, 0.572, mainly due to underreporting of births that year. Levels of fertility, however, do not affect the index of fertility control m (see Appendix 5.2). The mean square error for 1946 is 0.002, relatively low, and indicates that the estimates are fairly reliable. However, the mean square error for 1960 is relatively high, 0.010, and implies that the model fits poorly with the 1960 age-specific marital fertility schedule.

Overall, the index of fertility control implies that there was some family limitation in 1946. However, as there are no data for the earlier period, it is difficult to assess whether m for 1946 reflects weak or moderate levels of voluntary control of fertility. In addition, the validity of 0.2 as a threshold value of m that would imply voluntary control of fertility has been questioned as even among the fertility schedules used to construct the standard m ranges from -0.3 to 0.4 (Wilson, Oeppen and Pardoe, 1988: 10). Nevertheless, it seems likely that levels of voluntary control of fertility increased between 1946 and 1960 as that is implied by both Tables 5.3 and 5.4.

Table 5.4: The indices of fertility control (m) and of the level of marital fertility (M) based on the Coale-Trussell model, for Cyprus, 1946 and 1960

	1946	1960
m	0.480	0.824
M	0.872	0.572
mean square error	0.002	0.010

Table 5.5 shows child-woman ratios for Cyprus for census years. The ratio was calculated as the number of persons aged 0-4 at the census over the number of women aged 15-44. The ratio stood at 0.66 in 1881, the highest value of the overall period; it declined slightly between 1881 and 1891 to 0.59 but then remained more or less constant over the period 1891-1911. After 1911, the ratio followed again a declining trend and reached 0.48, its lowest value, in 1931. However, after 1931 the child-woman ratio followed apparently an increasing trend; by 1960 it had reached 0.62 and was at the same level as during 1891-1911.

The child-woman ratio is a crude measure of fertility for the five year period preceding the census. However, it can be misleading; the numerator is affected by omissions of children aged 0-4 and changing infant and child mortality. The denominator is affected by women shifting from below age 15 and above age 45 into the main reproductive age span (and vice versa), by changing female adult mortality, changing age distribution within that age group and emigration of women. Hence, the relatively low ratios for 1921 and 1931 could be due to an increase in omissions in the 0-4 age group as persons aged 0-4 were less than those aged 5-9 in both years. Moreover, decreasing adult female mortality at a faster pace than infant and child mortality may have contributed to the phenomenon. The relatively high ratio for 1960 was probably due to substantial emigration of females in the 15-44 age group coupled with declining infant and child mortality.

The decrease in the ratio between 1881 and 1891 is more difficult to explain. More omissions of persons aged 0-4 in 1891 does not seem a likely explanation but more omissions of females aged 15-44 in 1881 seems more probable. Another explanation for the relatively high ratio for 1881 could be emigration of adult females. According to S. Panteli (1984: 79), living conditions during the last years of the 1880's became difficult; in 1877-1878 there was a drought, in 1877 a bad harvest and in 1880 a plague of locusts caused great damage to the crops. If these conditions "pushed" some persons to emigrate is not known but it would be consistent with the shortage of persons above age 15 indicated by the distribution of the population by age and sex in 1881. On the other hand, the particular shape of the age distribution could be due to a fertility boom that occurred over the period 1871-1881.

Table 5.5: Ratios of children 0-4 to women 15-44 for Cyprus for census years, 1881-1960

Year	1881	1891	1901	1911	1921	1931	1946	1960
Cyprus	0.66	0.59	0.60	0.62	0.51	0.48	0.54	0.62

For the period 1921 to 1960 a comparison of urban-rural fertility patterns was possible as numbers of births were published for the six principal towns of the island.

The CBRs for urban areas indicate that fertility was more or less constant between 1921 and 1931 while it increased substantially between 1931 and 1946; the rate increased from around 20 per thousand to 34 per thousand in that period. The CBRs for rural areas imply a slight increase in fertility between 1921 and 1931 when the rates increased from 30 to 32 per thousand while fertility remained fairly constant over the period 1931-1946. The rates indicate that fertility in urban areas was much lower than in rural areas, except for 1946 when fertility in urban areas was slightly higher. The difference between urban and rural areas in 1921 and 1931 was very substantial; for instance, the CBR in urban areas in 1921 stood at 19 per thousand while in rural areas it was 30 per thousand (see Table A5.3, Appendix 5.3).

GFR and Coale's index If for 1921 for Nicosia town and Nicosia district excluding Nicosia town i.e. the rural part of Nicosia district indicate that fertility in the town was substantially lower than in the rural part of the district; GFR in Nicosia town was 72 per thousand and If was 0.17 against 129 per thousand and 0.31 for the rural part of Nicosia district. GMFR and Coale's index Ig also imply a significant difference in marital fertility; GMFR in the town in 1921 stood at 148 per thousand and Ig was 0.34 compared with 217 per thousand and 0.50 for the rural part of the district. The measures imply that the difference in marital fertility was somewhat less than the difference in overall fertility (see Table A5.4, Appendix 5.3). This is probably due to the GFR and If for Nicosia town being affected by the high proportions of single females at age 50 in the town (see Table 4.6, Chapter 4).

The GFR and Coale's index If for the urban and rural areas of Cyprus in 1946 indicate that fertility that year was higher in the rural areas of the island; If for urban areas was 0.32 while for rural areas it was 0.36. The Ig, however, implies that marital fertility was only slightly higher in rural areas; Ig for rural areas in 1946 was 0.58 compared to 0.57 for urban areas. The GMFR also was approximately the same in both urban and rural areas (see Table A5.5, Appendix 5.3). Thus, it is probable that marital fertility in urban areas was only slightly lower than in rural areas in 1946 while the difference in overall fertility was more substantial due to the higher proportions single at age 50 for females in urban areas (see Table 4.7, Chapter 4).

The question that arises is whether the urban-rural differentials in fertility in 1921 and 1931 were genuine and, if that was so, why fertility in urban areas had increased significantly by 1946. In both 1921 and 1931 the urban population included a higher proportion of males than the rural population that would inflate the denominator of the CBR; thus, CBRs for urban areas would appear to be lower. In addition, in Nicosia town in 1921 there was a high proportion of single females that would inflate the denominators of the GFR and If. However, GMFR and Ig, whose denominators are not affected by high proportions of single persons, show that marital fertility in Nicosia town in 1921 was substantially lower than in the rural part of Nicosia district. Thus, it seems likely that fertility in 1921 and 1931 was lower in urban areas.

All measures indicate that by 1946 fertility in urban areas had increased significantly. The increase in GFR and If may be partly explained by a decline in the proportions of females remaining single at age 50 in urban areas in 1946; however, GMFR and Ig imply that marital fertility had also increased substantially. Hence, it seems that fertility in urban areas increased considerably between 1931 and 1946 though the reasons for that are not clear. On the other hand, part of the increase in fertility in that period may be related to an increase in the completeness of registration of births for urban areas in 1946; more underreporting of births in urban than in rural areas in 1921 and 1931 cannot be ruled out as CDRs show similar differentials to CBRs for the period 1921-1946 though less pronounced.

5.2 Fertility levels and trends based on parity progression ratios

In this section parity progression ratios for ever-married women are presented for Cyprus. The ratios are based on the numbers of children ever born reported in the 1946 and 1960 censuses as well as in the 1980-81 Demographic Survey (Department of Statistics and Research, 1984b).

Table 5.6 shows parity progression ratios (PPRs) and cohort fertility rates (CFRs) for ever-married women by current age in 1946. PPRs are the number of ever-married women of a certain age group that have had at least (n+1) births divided by the women of that age group who had at least n births; a0, for instance, denotes the proportion of women who, having got married, proceeds to have at least one birth while a1 is the proportion that having had one birth proceeds to have at least two births. The CFRs were calculated under the assumption that women with ten children or more had, on average, 11.3 children. Different assumptions would give slightly different CFRs but would not affect the measure significantly.

The PPRs for women aged 65 or more indicate that most women who got married had a first birth and high proportions of those who had a first birth went on having a second, a third and births of higher order. The PPRs for women aged 55-64 are quite similar to those for women aged 65 or more except for progression from marriage to first birth that is much lower, 0.889 compared to 0.929. The PPRs for women aged less than 55 also show relatively low progression from marriage to first birth; a0 ranges between 0.871 and 0.897 for these women. In addition, women aged 45-54 show a slight decline in most PPRs while women aged 35-44 and 25-34 show more substantial declines. The CFRs indicate a declining trend in fertility for younger women.

The PPRs for all age groups decrease with increasing parity; this is, at least partly, due to older women having higher levels of physiological sterility and to increasing proportions widowed with age. Progression from marriage to first birth, which is high even in populations with controlled fertility, is rather low for women aged 65 or more and very low for women aged less than 65. That could be due to high levels of involuntary sterility or, more likely, to ever-married women who did not respond to the question presumed to be childless. The relatively low progression from marriage to first birth for women aged less than 65 also causes, partly, the declining trend of the CFR. If a0 for the 45-54 and 55-64 age groups had been equal to that for the 65+ age group the CFRs would have been 4.92 and 5.29, respectively. If one disregards progression from marriage to first birth, it seems that the reproductive behaviour of women aged 65+ is very similar to that of women aged 55-64. However, women aged 45-54 seem to have modified slightly their reproductive behaviour towards smaller family size. The relatively low PPRs for the age groups 35-44 and 25-34 partly reflect the fact that these women have not yet reached the end of their reproductive lives.

The PPRs for the 65+ age group, which are the highest, are still relatively low to prove without any doubt that natural fertility was predominant among women born before 1881. However, the PPRs and CFRs are based on the reported numbers of children ever-born and are affected by certain reporting errors; for instance, older women tend to omit children that died early in life or those that have been living away from home for a long time. Thus, the PPRs for women over age 45 or even for women aged 35-44 may underestimate fertility. In addition, high proportions of widowed females are likely to reduce PPRs for higher parities. Finally, women who died before the census are excluded and that may introduce a bias if these women were selected on particular characteristics such as high or low number of births.

Table 5.6: Parity progression ratios for ever-married women by current age, based on numbers of children ever-born reported at the 1946 census

age group	a0	a1	a2	a3	a4	a5	a6	a7	a8	a9	CFR
65+	0.929	0.950	0.918	0.877	0.843	0.808	0.735	0.738	0.637	0.604	5.43
55-64	0.889	0.940	0.908	0.876	0.837	0.795	0.783	0.669	0.643	0.608	5.06
45-54	0.897	0.932	0.893	0.856	0.794	0.772	0.703	0.675	0.619	0.575	4.74
35-44	0.883	0.907	0.849	0.798	0.749	0.698	0.606	0.589	0.511	0.548	3.99
25-34	0.871	0.802	0.697	0.608	0.545	0.459	0.446	0.337	0.322	0.447	2.64

Table 5.7 shows parity progression ratios (PPRs) and cohort fertility rates (CFRs) for ever-married women by current age in 1960. The PPRs are based on the reported numbers of children ever-born at the census and were computed in the same manner as for 1946. The CFRs, however, were calculated under the assumption that women with eleven children or more had on average 11.3 children.

The PPRs indicate that progression from marriage to first birth was relatively low for all ever-married women. However, progression from first to second birth was relatively high though the ratios fluctuate somewhat for different age groups of women. PPRs decrease with parity after the second birth. The CFRs imply that women aged 60 or more in 1960 had, on average, more children than women aged 55-59; 4.96 compared to 4.40. However, the PPRs and CFRs for women aged 55-59 are very similar to those for women aged 50-54 and only slightly higher than those for women in the 45-49 and 40-44 age groups. PPRs decline gradually for women younger than 40. Thus, the PPRs and CFRs imply that ever-married women aged less than 60 had modified slightly their reproductive behaviour towards smaller family size but fertility levels remained unchanged for women born between 1900 and 1919.

The low progression from marriage to first birth is probably due to non-response perceived as childlessness. The fluctuations in the ratio of progression from first to second birth for the different age groups of women seem suspect; if the ratio for women in the 45-49, 50-54 and 55-59 age groups was the same as for women aged 60 or more the CFRs would have been 4.39, 4.52 and 4.48, respectively.

Nevertheless, even after that correction CFRs still indicate a decline in family size for women aged less than 60.

Table 5.7: Parity progression ratios for ever-married women by current age, based on numbers of children ever-born reported at the 1960 census

age group	a0	a1	a2	a3	a4	a5	a6	a7	a8	a9	CFR
60+	0.887	0.938	0.901	0.863	0.827	0.778	0.731	0.691	0.641	0.596	4.96
55-59	0.873	0.916	0.872	0.821	0.777	0.751	0.704	0.679	0.628	0.580	4.40
50-54	0.885	0.914	0.872	0.824	0.778	0.738	0.702	0.660	0.606	0.575	4.42
45-49	0.898	0.918	0.852	0.802	0.755	0.736	0.686	0.645	0.609	0.574	4.31
40-44	0.907	0.921	0.836	0.797	0.743	0.713	0.672	0.661	0.592	0.567	4.23
35-39	0.919	0.922	0.807	0.727	0.682	0.649	0.615	0.593	0.549	0.499	3.85
30-34	0.924	0.898	0.750	0.652	0.595	0.568	0.536	0.463	0.422	0.432	3.32

Table 5.8 shows parity progression ratios (PPRs) and cohort fertility rates (CFRs) for ever-married women by birth cohort. The PPRs and CFRs are based on the reported numbers of children ever-born at the 1980-81 Demographic Survey and were computed in the same manner as for 1946. The PPRs for the cohort born before 1905 indicate that high proportions of women who got married went on to have a first birth, a second, and births of higher order. The progression ratios remain quite similar for women born before 1910 while they decline slightly for women born between 1910 and 1919. However, PPRs for the 1920-24 cohort show an increase in progression to first birth but decreases in progression to third, fourth, fifth and sixth births. The ratios imply that the 1925-29 cohort maintained more or less the same reproductive behaviour as the 1920-24 cohort but the 1930-34 cohort showed a significant decrease in progression to fourth and fifth births while the 1935-39 cohort showed substantial decreases in all PPRs after the second birth.

The ratios of progression from marriage to first birth are relatively low for women born between 1910 and 1919 while they are relatively high for women born after 1930. The ratios of progression from first to second birth fluctuate between 0.905 and 0.946 for the different cohorts; they are higher for women born after 1925. The increase in progression from marriage to first birth, particularly for the cohorts born after 1930, may indicate that there was some involuntary sterility in the earlier period that decreased over time due to medical advances and better hygiene. On the other hand, higher a0 and a1 for women born after 1930 may imply more accurate reporting of children ever born by younger women. It is worth noting that the PPRs for cohorts born before 1930 are based on the reporting of women aged 50 or more at the survey; thus, it is probable that numbers of children ever born for the earlier period were underreported and the figures underestimate fertility. Nevertheless, the PPRs indicate that women born before 1910 had similar reproductive behaviour while small changes were introduced by women born between 1910 and 1919 and substantial changes by women born after 1920.

Table 5.8: Parity progression ratios for ever-married women by birth cohort, based on children ever-born reported at the 1980-81 survey

birth cohort	a0	a1	a2	a3	a4	a5	a6	a7	a8	a9	CFR
pre-1905	0.912	0.930	0.876	0.838	0.795	0.742	0.695	0.622	0.576	0.623	4.62
1905-09	0.930	0.905	0.862	0.806	0.823	0.712	0.699	0.651	0.563	0.550	4.50
1910-14	0.906	0.922	0.867	0.794	0.733	0.724	0.671	0.619	0.570	0.510	4.26
1915-19	0.908	0.914	0.864	0.785	0.729	0.747	0.632	0.669	0.682	0.603	4.27
1920-24	0.930	0.923	0.804	0.723	0.697	0.701	0.591	0.673	0.735	0.580	3.98
1925-29	0.930	0.931	0.826	0.693	0.673	0.643	0.668	0.618	0.632	0.688	3.93
1930-34	0.952	0.946	0.791	0.633	0.624	0.598	0.626	0.609	0.518	0.586	3.71
1935-39	0.969	0.934	0.690	0.542	0.514	0.479	0.432	0.714	0.480	0.667	3.19

Comparing the parity progression ratios derived from the 1960 census and the survey one may observe that progression from marriage to first birth for a particular cohort of women is higher when computed from survey data. For instance, the data from the 1960 census imply that the proportion of women who were born between 1905 and 1909 and had at least one birth is 0.885 while the survey data show that proportion to be 0.930. This probably indicates that the very low ratios of progression from marriage to first birth implied by the 1946 and 1960 census data were mainly due to ever-married women who did not respond to the question presumed to be childless. However, even the survey data imply relatively low progression from marriage to first birth, particularly for women born between 1910 and 1919; that may indicate relatively high levels of involuntary sterility in the population or reporting errors for women aged more than 60 at the survey.

The data from the 1960 census and the survey also imply slightly different levels of progression from first to second birth for the same cohort of women. On the other hand, both sets of data and the data from the 1946 census show that a1 was relatively high for women born before 1881 while it decreased somewhat for women born between 1881 and 1919 and increased for women born after 1920. This trend in progression from first to second birth seems suspect as introduction of family limitation should affect births of higher order first and may be related to reporting errors. Some inconsistencies can also be observed in ratios of progression to births other than the second. For instance, PPRs from the 1960 census for women born in the period 1905-1909 indicate that the proportion of these women that proceeded to have a third and a fourth birth was higher than that implied by the survey data while the proportions having a fifth birth was considerably lower. Thus, there are some reporting errors affecting the data.

The PPRs indicate a gradual decline in fertility for successive cohorts except for women born between 1900 and 1914. If CFRs are adjusted to reflect the same levels of progression from marriage to first birth (i.e. a0 is equal to 0.929) the data imply that fertility declined slightly for women born before 1881 and in the period 1881 to 1890 from 5.43 to 5.29 children per ever-married woman while it decreased more substantially for women born during 1891-1900 and 1900-1904; CFRs decreased to 4.92 and 4.68 for these women. However, the CFRs indicate that fertility remained fairly constant for women born between 1900 and 1914, at around 4.7 children per woman, while it declined gradually for women born after 1915. Thus, the CFRs imply that there might have been a decline in fertility roughly in the period 1915-1935 while fertility remained constant over the period 1935 to 1950 and followed again a declining trend thereafter.

The data also imply that fertility was relatively low even for women born before 1881; thus, it would seem that there was some family limitation from early on. However, as there were reporting errors for older women, mainly omissions of children ever born, and there were high proportions of widowed women among the ever-married female population, particularly for the earlier period, the progression ratios would appear lower. In fact, if cohort fertility rates were computed that included both ever-married and single women the CFR for women born before 1881 would have been 5.27 children per woman and would show quite high fertility. Thus, practice of family limitation for that cohort of women seems unlikely.

5.3 Fertility levels and trends based on indirect methods

In this section, indirect techniques were used to estimate fertility levels and trends from census data (United Nations, 1983). Three different methods were used, but only for 1946 and 1960 as the relevant information was unavailable in all other censuses. The first method uses model stable age distributions to estimate fertility for the 15 year period preceding the census. The second method yields estimates of crude birth rates by reverse-survival of the population under age ten while the third method uses information about children ever born and provides estimates of crude birth rates and total fertility rates. A detailed account of the methods applied is given in Appendix 5.4.

5.3.1 Estimation of fertility using model stable age distributions

This method aims at identifying a stable population, out of a selected family of Coale-Demeny model stable populations, which approximates the observed one. In this way, estimates of the crude birth rate (CBR) and the intrinsic rate of growth (r) are obtained for the 15 year period preceding the census (Appendix 5.4, a). In addition, the gross reproduction rate (GRR) and the total fertility rate (TFR) can be calculated for the fitted stable population if an estimate of the mean of the age-specific fertility distribution for the observed population is available. The method assumes that the observed population is stable and the data used to identify the stable population, namely proportion of the population under age 15 (C(15)) and probability of surviving to age five (l(5)), are reliable.

Table 5.9 shows estimates of the intrinsic rate of growth, the CBR, the GRR and the TFR for the 15 year period preceding 1946. Moreover, crude birth rates adjusted for the actual intercensal rate of growth of the period 1931-1946 are presented and are labelled CBR*s on Table 5.9. Both south and west families of Coale-Demeny model stable populations were used to obtain the estimates. The GRR was calculated assuming that the mean of the age-specific fertility distribution was equal to 29 while the TFR was computed assuming a sex ratio at birth of 105 males to 100 females.

The estimates based on the male south and female south model stable populations are quite similar; they imply that the average CBR in the period 1931 to 1946 was around 30 per thousand while TFR stood at about 3.8 births per woman. The estimates based on female west model stable populations, on the other hand, show slightly higher fertility; they indicate that CBR was around 33 per thousand and TFR was 4.3 births per woman in that period. The intrinsic rate of growth based on male south model stable populations is 16.3 per thousand while the rate based on female south model stable populations is slightly higher, 17.2 per thousand. The intrinsic rate of growth based on female west model stable populations is 19.4 per thousand, higher than those based on south model stable populations.

The difference between the estimates based on south and west families of model stable populations is probably due to the general standard model of Brass being used to obtain the probability of surviving to age five for 1946. The fact that the observed annual rate of growth for the period 1931-1946 was 16.6 per thousand, quite similar to the intrinsic rate of growth estimated by the south family of model stable populations, probably indicates that the estimates based on the south model are the most reliable. However, if the probability of surviving to age five underestimates slightly childhood mortality for the period prior to the 1946 census, as is discussed in Chapter 3, then fertility would be slightly underestimated by the method.

Table 5.9: Fertility parameters estimated using Coale-Demeny model stable age distributions, 1946

	male south level 16.96	female south level 16.25	female west level 14.30
intrinsic r	16.34	17.16	19.42
CBR	29.87	30.05	33.78
CBR*	29.93	29.91	33.04
GRR	1.97	1.98	2.17
TFR	3.84	3.87	4.27

Table 5.10 shows estimates of the intrinsic rate of growth, the CBR, the GRR and the TFR for the 15 year period preceding 1960. Moreover, crude birth rates adjusted for the actual intercensal rate of growth of the period 1946-1960 are presented and are labelled CBR*s on Table 5.10. Both south and west model stable populations were used to obtain the estimates. The GRR and TFR were computed under the same assumptions as for 1946.

The estimates based on south model stable populations indicate that CBR was around 30 per thousand in the period 1945-1960 while TFR was around 3.9 births per woman. The estimates based on female west model stable populations show similar levels of fertility. The intrinsic rate of growth estimated by the method ranges between 19.4 and 21.8 per thousand. However, the observed annual rate of growth over the period 1946-1960 was much lower, 17.2 per thousand. That may indicate either that the south and west mortality schedules are an inadequate representation of the mortality patterns of the Cypriot population for that period or that the 1960 census was less complete than the 1946 census. In fact, official statistics suggest that between 1946 and 1960 there were some 34,429 emigrants (St. John-Jones, 1983: 92-93); if these emigrants were included in the computation, the annual rate of growth for that period would have been 21.4 per thousand, very similar to the intrinsic rate of growth estimated by the south model. Thus, the estimates based on south model stable populations and the intrinsic rate of growth may be more reliable than the adjusted CBR. Nevertheless, as the CBR is quite robust even when the observed population is not stable and the difference between the CBR and the adjusted CBR is small one may conclude that CBR was around 29-30 per thousand in the 15 year period preceding the 1960 census.

Table 5.10: Fertility parameters estimated using Coale-Demeny model stable age distributions, 1960

	male south Level 20.90	female south Level 20.38	female west Level 18.04
intrinsic r	20.95	21.79	19.43
CBR	29.93	30.11	29.65
CBR*	29.15	29.15	29.19
GRR	1.98	2.00	1.92
TFR	3.87	3.90	3.76

To conclude, the adjusted CBRs derived from the south model are probably the most reliable estimates of fertility for the 15 year period preceding the 1946 census while CBRs around 29-30 per thousand seem to represent accurately fertility levels for the 15 period preceding the 1960 census. Thus, the estimates indicate that fertility had remained more or less constant over the period 1931-1960.

5.3.2 Estimation of birth rates by reverse survival of the population under age 10

This method uses the enumerated population aged 0-4 and 5-9 at a census and an estimate of the probability of surviving from birth to age 2 (l(2)) and gives estimates of the CBR for the periods 0 to 4 and 5 to 9 years before the census (Appendix 5.4, b). One may also obtain estimates of the CBR for the periods 10 to 14 and 15 to 19 years before the census, using the 10-14 and 15-19 age groups, but with less accuracy. The method involves the assumption that child mortality was constant prior to the census. However, if mortality was declining it is preferable to use an average of the probabilities of surviving to ages 2, 3 and 5 as a more accurate indicator of the mortality level before the census.

Table 5.11 shows estimates of the CBR produced by this method for the period before 1946. The estimates are based on both the south and west families of Coale-Demeny model life tables. To obtain estimates of the birth rate for the earlier period the 10-14 and 15-19 age groups were used. As the registration data indicate that child mortality was declining prior to the census, the average of the probabilities of surviving to ages 2, 5 and 15 was also used as a better indicator of the mortality level for the earlier period; these estimates are labelled "south male average" and "west male average" on Table 5.11.

The estimates based on the south family of Coale-Demeny model life tables for males and l(2) show that CBR in 1929.4 was around 31.1 per thousand then declined somewhat to around 29.8 per thousand in 1934.4 while it increased again to 30.2 per thousand in 1939.4 and decreased to 29.2 per thousand in 1944.4. All other estimates show the same trend in fertility though slightly different levels. The CBRs based on the south model for females and l(2) are slightly lower than those based on the south model for males while the estimates based on the average of the probabilities of surviving to ages 2, 5 and 15 and the south model are somewhat higher. The CBRs based on the west family of model life tables for males are slightly lower than those based on the south model for males. However, the difference in the estimates is small; for instance, CBRs for 1929.4 range from 30.5 to 32.4 per thousand while for 1944.4 the rates fluctuate between 28.8 and 29.7 per thousand.

The slight differences in the estimates are probably due to the different model life tables and the different mortality levels used to produce them. The slight fluctuations in the CBR over time are probably partly due to reporting errors. For instance, CBR for 1944.4 is slightly lower than for the earlier period probably because of some underreporting (omissions) in the 0-4 age group and should be considered as a lower bound of the actual value. As child mortality was declining prior to 1946 the estimates based on the average mortality level are probably more reliable, particularly for the period 5 to 14 years before the census. However, if the mortality level associated with the probabilities of surviving to ages 2, 5 and 15 underestimates mortality for the period 15 to 19 years before the census then the CBR of 32.4 per thousand for 1929.4 would underestimate fertility. Nevertheless, it seems likely that CBR remained more or less constant between 1934.4 and 1944.4 while it declined slightly between 1929.4 and 1934.4.

Table 5.11: Estimates of CBR by the reverse survival method, 1946

reference period	south male l(2)	south female l(2)	south male average	west male average
1944.4	29.15	28.78	29.66	28.80
1939.4	30.24	29.76	31.02	29.83
1934.4	29.84	29.35	30.95	29.51
1929.4	31.09	30.54	32.44	30.87

Table 5.12 shows estimates of the CBR produced by the reverse survival method for the period before 1960. The estimates are based on both the south and west families of Coale-Demeny model life tables. To obtain estimates of the birth rate for the earlier period the 10-14 and 15-19 age groups were used. In addition, as the registration data indicate that child mortality was declining prior to the census, the average of the probabilities of surviving to ages 2, 3 and 5 was also used as a better indicator of the mortality level for the earlier period; these estimates are labelled "south male average " and "west male average " on Table 5.12.

The estimates based on the south family of Coale-Demeny model life tables for males and l(2) show that CBR in 1943.4 was around 24.3 per thousand while it increased substantially thereafter, reaching 31.4 per thousand in 1948.4. Between 1948.4 and 1953.4, however, CBR declined to 29.1 per thousand while it reached 29.3 per thousand in 1958.4. All other estimates show the same trend in fertility though they imply slightly different levels. For instance, CBRs for 1948.4 range between 31.1 and 32.0 per thousand while for 1958.4 they range from 29.1 to 29.5 per thousand. CBRs based on south model life tables for males and l(2) are slightly higher than those based on the south model for females and l(2). CBRs based on the average of the probabilities of surviving to ages 2, 3 and 5 and the south model are higher than those based on the probability of surviving to age 2 and the south model while the estimates based on the west model show the highest fertility.

The slight differences in the estimates of CBR are probably due to the different model life tables and the different mortality levels used to produce them. The very low CBR estimated for 1943.4 is suspect; it could be due to severe underreporting in the 15-19 age group in 1960 or, more likely, to emigration of persons in that age group. In addition, the CBR obtained from the 1946 census data for around that period was 29 per thousand, substantially higher than the value obtained from the 1960 census data. As child mortality was declining prior to 1960 the estimates based on the average mortality level are probably more reliable, particularly for the period 5 to 14 years before the census. To sum up, the data indicate that CBRs declined slightly in the period 1948.4 to 1958.4 from about 32 to 29 per thousand.

Table 5.12: Estimates of CBR by the reverse survival method, 1960

reference period	south male l(2)	south female l(2)	south male average	west male average
1958.4	29.25	29.06	29.48	29.50
1953.4	29.09	28.87	29.39	29.57
1948.4	31.35	31.09	31.69	31.99
1943.4	24.34	24.12	24.62	24.96

Fitting together the estimates obtained from the 1946 and the 1960 censuses it seems that CBRs roughly decreased between 1929.4 and 1944.4 from about 32 to 29 per thousand then increased again to 32 per thousand in 1948.4 and declined to 29 per thousand in 1958.4. Therefore, one may conclude that CBRs changed only slightly between 1929.4 and 1958.4 while there was no clear sign of a decline in fertility. The estimates of CBR derived from this method are very similar to the ones obtained using model stable age distributions.

5.3.3 Estimation of fertility from information about children ever born (the Brass P/F ratio method)

This method uses information from a question in a census or survey about the numbers of children ever born and the reported numbers of births by age of mother for that year (Appendix 5.4, c). The aim of the method is to provide the means for adjusting the level of current fertility, under the assumptions that underreporting of current fertility is constant with age and that fertility has remained constant during the last 15 or 20 years. The question on numbers of children ever born was included in both the 1946 and 1960 censuses. However, the data from the 1946 census refer to ten year age groups after age 25 and parity equivalents (F) for that year had to be adjusted as described in Appendix 5.5.

Table 5.13 shows estimates of CBRs and TFRs obtained by the method for 1946. The P/F ratios are shown in Table A5.6 in Appendix 5.5. Two different factors were used to adjust current fertility. Factor 1 is the average of the P/F ratios for the 20-24 and 25-34 age groups weighted by the distribution of women in these age groups. Factor 2 is equal to the P/F ratio for the 20-24 age group and is advantageous in case of declining fertility due to family limitation on the part of older women.

The estimates based on factor 1 indicate that the CBR in 1946 was 32.0 per thousand while the TFR was around 4.3 births per woman. The estimates based on factor 2 show somewhat higher fertility; CBR was 34.3 per thousand while TFR was 4.6 births per woman. The CBR for 1946 computed from registration data was 32.9 per thousand while the TFR was 4.5 births per woman; thus, CBRs and TFRs based on factor 1 underestimate slightly fertility. The ASFRs based on registration data for 1946 (see Table 5.3) follow a pattern very similar to that of the adjusted rates presented on Table A5.6 in Appendix 5.5. In fact, the observed ASFRs fall between the rates based on factors 1 and 2. Thus, it seems unlikely that there was much underreporting of fertility in 1946.

If there was a recent decline in fertility for women aged less than 25 (Appendix 5.5) then use of factor 2 (i.e. the P/F ratio for the 20-24 age group) as adjusting factor would overestimate current fertility. On the other hand, use of factor 1 (i.e. the weighted average of the P/F ratios for the 20-24 and 25-34 age groups) underestimates slightly current fertility compared to registration data. Nevertheless, it seems likely that CBRs in 1946 were around 33 per thousand.

Table 5.13: Fertility estimates derived from the P/F ratio method of Brass, 1946

Measures	factor 1	factor 2
CBR	32.03	34.30
TFR	4.33	4.64

Table 5.14 shows estimates of CBRs and TFRs obtained by the method for 1960. The P/F ratios are shown in Table A5.7 in Appendix 5.5. Two different factors are recommended by the method to adjust current fertility; factor 1 is the average of the P/F ratios for the 20-24 and 25-29 age groups while factor 2 is equal to the P/F ratio for the 20-24 age group. A third factor was also used in this case, as the P/F ratios decline substantially between age groups 15-19 and 25-29 while they remain constant for the age groups 25-29 and 30-34; factor 3 is equal to the P/F ratio for the 30-34 age group.

The estimates based on factor 1 indicate that the CBR in 1960 was 32.5 per thousand while the TFR was around 4.5 births per woman. The estimates based on factor 2 show slightly higher fertility; CBR was 34.5 per thousand while TFR was 4.8 births per woman. By contrast, the estimates based on factor 3 imply that CBR in 1960 was around 30.5 per thousand while TFR was 4.2 births per woman. The TFR based on registration data for 1960 was only 2.7 births per woman, much lower than the ones based on factors 1, 2 and 3; this serves to show that underreporting of births in 1960 was very substantial.

All estimates show quite high fertility for 1960 though they imply different levels. If there was a recent decline in fertility for women aged less than 25 (Appendix 5.5) then use of factor 2 (i.e. the P/F ratio for the 20-24 age group) as adjusting factor would overestimate current fertility. In this case, factor 1 (i.e. the average of the P/F ratios for the 20-24 and 25-29 age groups) would also overestimate fertility slightly. As the P/F ratios for women aged 25-29 and 30-34 are constant it is probable that use of factor 3 as adjusting factor for the level of fertility may give more reliable estimates. In addition, the estimates based on factor 3 are quite similar to the estimates of fertility obtained using model stable age distributions and the reverse survival method. However, if there was a recent decline in fertility for women aged 25-29 and 30-34 as it may be implied by the slight decline in the P/F ratios for the 30-34 and 35-39 age groups then the method would still overestimate current fertility.

Table 5.14: Fertility estimates derived from the P/F ratio method of Brass, 1960

Measures	factor 1	factor 2	factor 3
CBR	32.51	34.47	30.54
TFR	4.52	4.79	4.24

5.4 Conclusion

In this part of the chapter an attempt to fit together the various measures and estimates is made to provide a realistic account of fertility levels and changes over time. The main question to be addressed is whether fertility started declining at some point prior to 1960 in Cyprus and, if so, when was the onset of the decline.

For the pre-1900 period only child-woman ratios are available. The ratios decreased between 1881 and 1891 from 0.66 to 0.59 while they remained fairly constant in the period 1891 to 1911. Thus, the child-woman ratios may imply that fertility was declining between 1881 and 1891 while it remained constant between 1891 and 1911.

For the period after 1900, the registration data indicate that fertility was fairly constant though it declined somewhat between 1919 and 1925 but recovered soon thereafter; CBRs ranged, on average, from 28 to 33 per thousand between 1901 and 1951. Between 1951 and 1952 CBRs decreased from 30 to 27 per thousand while the rates remained constant in the period 1952 to 1954. However, part of the decline in the CBRs in the early 1950s may be related to increasing underregistration of births. The TFR and TMFR in 1946 stood at 4.45 births per woman and 6.19 births per married woman, respectively, and indicate relatively high fertility for that year. The Coale index of fertility control implies relatively low levels of family limitation for 1946 while it shows that family limitation increased between 1946 and 1960.

The indirect techniques show only a slight decline in fertility between 1930 and 1960. The method based on the use of model stable age distributions indicates that the average CBR was around 30 per thousand in the period 1930 to 1946 while it was about 29-30 per thousand in the period 1945 to 1960. The reverse survival method implies that CBRs ranged between 30 and 32 per thousand in the period 1929 to 1948 while they were slightly lower, around 29 per thousand, in the 1950s. The P/F ratio method of Brass indicates that CBR in 1946 was around 33 per thousand while the rate in 1960 was about 31 per thousand though, perhaps, the figures for the latter period overestimate fertility. Nevertheless, both the registration data and the indirect techniques imply that fertility remained fairly constant in the 1930s and the 1940s while there was only a slight decline in the 1950s.

The parity progression ratios, on the other hand, show that women born before 1900 gradually reduced family size from 5.4 children per ever-married woman to 4.6 children per ever-married woman while fertility remained more or less constant for women born between 1900 and 1914. However, women born after 1915 and particularly those born after 1930 gradually reduced family size further. Thus, the

PPRs imply that fertility might have been declining roughly in the period 1915 to 1935 while it remained more or less constant between 1935 and 1950 and followed again a declining trend thereafter. In addition, PPRs for ever-married women born before 1881 are not particularly high and may indicate that there was some voluntary control of fertility among these women. That, however, is unlikely as PPRs for old women are affected by omissions of children ever born and high proportions of widowed women and underestimate fertility levels.

The registration data and the PPRs give different indications about trends in fertility. However, the registration data are consistent with the hypothesis that fertility was declining in the late 19th and perhaps in the early 20th century as CBRs of 30 per thousand are relatively low to imply that the Cypriot population experienced natural fertility in the period 1901-1950. Moreover, the child-woman ratio implies that fertility was declining in the period 1881-1891. In addition, St. John-Jones, having estimated that the child-woman ratio in 1891 was 0.69, after using a smoothing process for the distribution of the population by age, and having estimated series of CBRs by the reverse survival method for the period 1894 to 1958, argues that fertility in Cyprus was declining from the 1890s (1983: 83-86, 179-180). In fact, St. John-Jones suggests that CBR in 1894 was 39.1 per thousand and decreased to 36.9 per thousand in 1904 and to 33.3 per thousand in 1914 but the rate remained fairly constant thereafter, ranging between 30 and 34 per thousand, while it followed a sharp declining trend after 1958.

If fertility was indeed declining between 1881 and 1910 or 1914 then fertility transition in Cyprus began in the same period as in most Western and Northern European countries but reached an end in the 1910s rather than in the 1930s. Moreover, the "post-transitional" level of fertility was represented by CBRs around 30 per thousand, about twice as high those of North-western Europe, while it took more than three decades for fertility to resume a declining trend. This seems very unlikely as once the fertility transition is under way the decline is sustained over a long period and reaches an end only after a much lower level has been achieved (Knodel and van de Walle, 1979). In addition, Cypriot society is traditional and religious; thus, it is improbable that contraception was acceptable to large segments of the population so early on. It seems more likely that the decline in the child-woman ratio over 1881-1891 is at least partly due to data errors or emigration of females aged 15-44 while the registration data may have underestimated fertility for the period 1901-1930 due to underregistration of births.

To conclude, it is likely that there was natural fertility in Cyprus in the early 20th century when CBRs were probably around 38-39 per thousand. Fertility may have decreased slightly in the late 1910s and the early 1920s mainly due to increasing mean age at marriage for women. Fertility, however, probably recovered somewhat in the late 1920s while some family limitation was perhaps introduced in the population around that period or in the early 1930s; the Coale index of fertility control implies that there were low levels of family limitation in 1946. The urban-rural differentials in fertility for 1921 and 1931 may also partly reflect changing behaviour of small segments of the population. CBRs probably decreased only slightly in the 1930s; the rates were still relatively high in the late 1940s, around 33 or 34 per thousand, as there was an increase in the numbers of marriages over the period 1943-1947. Levels of family limitation increased between 1946 and 1960 while CBRs decreased, probably reaching 28 or 29 per thousand in 1960. The decline in CBRs in the period 1946-1960 was not very substantial probably partly due to declining mean age at first marriage for females.

Appendices

Appendix 5.1: CBR and GFR for Cyprus, 1901-1960; annual estimates based on registered births

It should be noted that from 1901 to 1919 the published numbers of births related not to strict calendar years but to one-year periods starting on the 1st of April and ending on the 31st of March. Thus, the figures for 1901 for example, include births registered in the first quarter of 1902, so that rates are slightly displaced in time. However, this should not affect their comparability except, perhaps, for 1920, when figures started being published for calendar years. The events of the first three months of that year were included in both the 1919 and the 1920 figures.

Table A5.1: CBR* for Cyprus, 1901-1960

Year	CBR	Year	CBR	Year	CBR	Year	CBR	Year	CBR	Year	CBR
1901	30.6	**1911**	31.6	**1921**	26.8	**1931**	30.2	**1941**	27.7	**1951**	29.5
1902	27.9	**1912**	28.4	**1922**	28.5	**1932**	28.5	**1942**	22.0	**1952**	26.9
1903	28.5	**1913**	30.5	**1923**	25.4	**1933**	27.1	**1943**	29.1	**1953**	26.6
1904	30.2	**1914**	32.9	**1924**	27.7	**1934**	29.6	**1944**	33.1	**1954**	27.1
1905	29.5	**1915**	34.1	**1925**	23.9	**1935**	31.5	**1945**	30.2	**1955**	24.6
1906	30.6	**1916**	28.8	**1926**	26.3	**1936**	33.6	**1946**	32.4	**1956**	13.9
1907	31.3	**1917**	29.3	**1927**	25.7	**1937**	28.4	**1947**	33.3	**1957**	13.0
1908	32.8	**1918**	32.7	**1928**	29.5	**1938**	30.1	**1948**	32.6	**1958**	10.4
1909	28.8	**1919**	29.1	**1929**	31.1	**1939**	30.7	**1949**	28.1	**1959**	17.6
1910	32.1	**1920**	29.4	**1930**	32.1	**1940**	32.7	**1950**	30.3	**1960**	20.9

* Live births per 1,000 total population

Table A5.2: GFR* for Cyprus, 1901-1960

Year	GFR	Year	GFR	Year	GFR	Year	GFR	Year	GFR	Year	GFR
1901	137.8	**1911**	144.8	**1921**	119.2	**1931**	127.2	**1941**	120.6	**1951**	133.5
1902	125.9	**1912**	129.8	**1922**	126.2	**1932**	120.7	**1942**	96.2	**1952**	122.2
1903	128.5	**1913**	139.2	**1923**	111.9	**1933**	114.9	**1943**	127.8	**1953**	121.5
1904	136.7	**1914**	149.6	**1924**	121.3	**1934**	126.0	**1944**	145.6	**1954**	123.9
1905	133.5	**1915**	154.3	**1925**	104.3	**1935**	134.5	**1945**	133.0	**1955**	113.1
1906	139.2	**1916**	130.1	**1926**	114.1	**1936**	143.9	**1946**	143.3	**1956**	64.0
1907	142.5	**1917**	132.1	**1927**	111.0	**1937**	122.2	**1947**	148.0	**1957**	60.4
1908	149.7	**1918**	147.0	**1928**	126.6	**1938**	130.0	**1948**	145.4	**1958**	48.6
1909	131.5	**1919**	130.2	**1929**	132.6	**1939**	132.7	**1949**	125.9	**1959**	82.4
1910	146.9	**1920**	131.5	**1930**	136.2	**1940**	142.1	**1950**	136.4	**1960**	97.9

* Live births per 1,000 women aged 15-44

Appendix 5.2: Natural fertility and the Coale-Trussell model of marital fertility

The distinction between natural and controlled fertility has important implications for the age pattern of marital fertility (Knodel, 1977). In populations with natural fertility the age pattern of marital fertility rates is determined mainly by fecundity. Hence, the shape of the fertility curve among these populations is very similar though fertility levels may vary considerably; in fact, the fertility curve has a convex shape. By contrast, in populations with voluntary control of fertility the ASMFRs decline more steeply with age and the fertility curve has a concave shape.

A simple way to examine whether there is family limitation in a population is to compare the observed ASMFRs to a standard. Coale and Trussell proposed a standard schedule of natural fertility based on empirical data (1974). Thus, one may compute ratios of the observed ASMFRs over those of the standard and use them to detect voluntary control of fertility. In the absence of family limitation the ratios would remain constant with age; the value of the ratios, however, would depend upon the fertility level of the observed population. On the other hand, voluntary control of fertility would cause the ratios to decrease with age.

Coale and Trussell also devised a model that compares the age-specific marital fertility rates of the observed population to a standard schedule and gives estimates of the deviation of the observed schedule from natural fertility. This model is defined in the following equation:

$r(a)=n(a)*M*\exp(m*v(a))$ (1) or $\ln[r(a)/n(a)]=\ln M+m*v(a)$ (2)

where a stands for age, n(a) is the empirically derived standard schedule of natural fertility, r(a) is the observed marital fertility schedule, v(a) is an empirically derived function that expresses the typical age pattern of voluntary control of fertility, m is the index of fertility control and M is the index of the level of marital fertility.

The indices m and M are estimated from equation (2) using linear regression. In addition, estimates of the mean square error may be obtained which indicate the goodness of fit (Coale and Trussell, 1978). The index of fertility control m depends on the age pattern of marital fertility but is independent of the level of fertility. The model is defined in such a way that if the observed population experiences natural fertility (i.e. the age-pattern of marital fertility is identical to the standard) then m becomes zero. If the observed marital fertility rates decline more steeply with age than for the standard, presumably indicating the presence of family limitation, m will become more than zero. If, however, the marital rates for the observed population decline less steeply than for the standard m will become negative. Coale and Trussell suggested that a value of m more than 0.2 would indicate the presence of family limitation in the observed population (1978). However, it is questionable that there is a simple threshold value of m that would imply voluntary control of fertility (Wilson, Oeppen and Pardoe, 1988: 10). The M parameter of the model is usually interpreted as indicating the underlying level of marital fertility. In populations with natural fertility M is influenced by factors such as the duration of breastfeeding and coital frequency. So far as the goodness of fit is concerned, Coale and Trussell suggest that a mean square error of zero implies a perfect fit while a mean square error of 0.005 indicates a mediocre fit and a mean square error of 0.01 implies a very poor fit (1978).

Appendix 5.3: Fertility measures for the urban and rural areas of Cyprus, 1921, 1931, 1946 and 1960

It should be noted that the urban sector includes only the six principal towns of the island. All other towns, independently of their size, have been included in the rural sector.

Table A5.3: CBR* in urban and rural areas of Cyprus, 1921, 1931, 1946 and 1960

	1921	1931	1946	1960
Urban	19.30	21.00	34.08	14.88
Rural	30.23	32.30	32.61	20.79

* Live births per 1,000 total population

Table A5.4: GFR, GMFR and Coale's indices If and Ig for Nicosia town and the rural part of Nicosia district i.e. the district excluding the town, 1921

	GFR[a]	GMFR[b]	If	Ig
Nicosia town	71.66	147.85	0.17	0.34
rural Nicosia district	129.35	216.98	0.31	0.50

[a] Live births per 1,000 women aged 15-44
[b] Live births per 1,000 married women aged 15-44

Table A5.5: GFR, GMFR and Coale's indices If and Ig for urban and rural areas of Cyprus, 1946

	1946			
	GFR[a]	GMFR[b]	If	Ig
Urban	137.03	246.94	0.32	0.57
Rural	148.63	245.73	0.36	0.58

[a] Live births per 1,000 women aged 15-44
[b] Live births per 1,000 married women aged 15-44

Appendix 5.4: Indirect methods used for the estimation of fertility

a. Estimation of fertility from the proportion of the population under age 15 and the probability of surviving to age 5, using model stable age distributions

As a first step, a suitable family of Coale-Demeny model stable populations is chosen. Then, the proportion of the population under age 15 and the probability of surviving to age five are used to identify a model stable population that approximates the observed one (United Nations, 1983: 166-169). Hence, estimates of the crude birth rate for the 15 year period preceding the census and of the intrinsic rate of growth are obtained. Moreover, if an estimate of the mean of the age-specific fertility distribution is available, the gross reproduction rate and the total fertility rate can be calculated for the fitted stable population.

The method assumes that there is no substantial migration during, at least, the most recent intercensal period and works best when the observed population is stable. It requires relatively good quality of data; thus, to assess the reliability of the recorded proportions under age 15, evaluation of the distribution of the population by age before applying the method is advisable (United Nations, 1983: 158-166).

Deviations from stability are likely to affect the estimates. If the intrinsic rate of growth estimated by the method differs from the observed one it is advisable to adjust the estimates of CBR; however, the estimates of GRR and TFR will be unreliable. Which family of model life tables is selected and whether the stable population chosen is male or female does not affect the estimation of fertility. However, the mortality pattern embodied in the chosen family of Coale-Demeny model life tables may affect the estimation of the intrinsic rate of growth.

For 1946 the probability of surviving to age five was estimated from information on numbers of children ever born and children surviving by a method due to Brass, assuming that the childhood mortality pattern of the Cypriot population prior to the 1946 census was represented accurately by the general standard model of Brass (see Table 3.5 and Appendix 3.3, c). Then, the probability of surviving to age five was used to identify appropriate mortality levels in the south and west families of Coale-Demeny model life tables. For 1960 the probability of surviving to age five was estimated from information on children ever born and children surviving, using the Trussell variant of Brass' method (see Table 3.6 and Appendix 3.3, c). The mean of the age-specific fertility distribution for 1960 was calculated from the reported numbers of births by age of mother for that year and was found to be 29.1. Thus, the GRR for 1960 was computed assuming that the mean of the age-specific fertility distribution was 29 years. The same assumption was used to calculate the GRR for 1946.

b. Estimation of birth rates by reverse survival of the population under age 10

As a first step, a suitable family of Coale-Demeny model life tables is chosen. Then, an estimate of the probability of surviving from birth to exact age 2 (l(2)) is used to identify mortality levels for the observed population for the period before the census and to compute life table values (i.e. the number of persons-years lived in the 0-4 and 5-9 age groups) (United Nations, 1983: 179-181). The average annual number of births for the periods 0 to 4 and 5 to 9 years before the census are computed by dividing the number of persons in the 0-4 and 5-9 age groups by the life table values. Then, the mid-period populations are calculated and the average annual birth rates are estimated. One may also obtain estimates of the birth rate for the periods 10 to 14 and 15 to 19 years before the census using the enumerated population aged 10-14 and 15-19 and an estimate of mortality for these periods. However, the earlier one moves back in time the less reliable the estimates are.

The method is particularly sensitive to age reporting errors that affect the 0-4 and 5-9 age groups and to recent changes in mortality. If child mortality has been declining prior to the census, use of the average of the probabilities of surviving to ages 2, 3 and 5 as an indicator of the mortality level for that period may provide more reliable estimates. The 0-4 age group is usually affected by omissions and thus tends to underestimate the birth rate for the period 0-4 years before the census. So this estimate can be considered as a lower bound for the birth rate. On the other hand, estimates of the birth rate based on the 5-9 age group are likely to be affected by errors in the estimation of mortality; in addition, the rates may be overestimated due to age reporting errors such as heaping on age five. The estimates also depend upon the pattern of mortality used to estimate l(2), l(3) and l(5). Finally, substantial migration for the period preceding the census may affect the estimates.

For 1946 the probabilities of surviving to exact ages 2, 5 and 15 were estimated from information on numbers of children ever born and children surviving by a method due to Brass while for 1960 the probabilities of surviving to ages 2, 3 and 5 were estimated using the Trussell variant of that method (see Table 3.5, Table 3.6 and Appendix 3.3, c).

c. Estimation of fertility from information on children ever born: the Brass P/F ratio method

The method uses information from a question in a census or survey about the number of children ever born and the registered number of births by age of mother for that year (United Nations, 1983: 31-35). Then, the cumulated period fertility (F) is calculated and compared with the average parity (P). The method is based on the fact that if fertility in the past was constant and the data used in the calculations are accurate, average parity and cumulated current fertility will be equal and the P/F ratio would be one. Thus, if fertility in the past was constant the P/F ratio permits the detection of reporting errors in the question about children ever born or in the current fertility data.

The original P/F ratio method of Brass seeks to adjust the level of the observed age-specific fertility rates, which are assumed to represent the true age pattern of fertility, to agree with the level of fertility indicated by the average parity of women in the age groups 20-24 and 25-29, which is assumed to be accurate. The method assumes that underreporting of current fertility is constant with age and that the level of fertility implied by the reported average parities 20-24 and 25-29 is equal to that embodied in the current fertility schedule. Hence, if fertility has been changing rapidly in the recent past the estimates may be subject to bias though if fertility changes are caused by increases in contraception at older ages, then the estimates would still be valid. In addition, it is assumed that females who died before the census experienced similar fertility levels up to their death to women that were alive at the time of the census. Finally, poorly reported age is likely to yield unreliable estimates.

Appendix 5.5: Adjusted age-specific fertility rates (ASFRs) for 1946 and 1960, using the Brass P/F ratio method

The question on numbers of children ever born was included in both the 1946 and 1960 censuses; however, the data from the 1946 census refer to ten year age groups after age 25 while ASFRs for that year refer to five year age groups. Thus, to compute P/F ratios for 1946 the parity equivalents (F) based on current fertility had to be adjusted. The adjustment was carried out by multiplying the F values for each five year age group of women by the numbers of women in that age group; in this way, numbers of "children ever born " based on the current fertility schedule were obtained. Then, the numbers of "children ever born" were added to correspond to ten year age groups over age 25 and were divided by the numbers of women in these ten year age groups.

Table A5.6 shows P/F ratios for 1946 as well as ASFRs adjusted using two different factors; factor 1 is the average of the P/F ratios for the 20-24 and 25-34 age groups weighted by the distribution of women in these age groups while factor 2 is equal to the P/F ratio for the 20-24 age group. The average parities for 1946 are shown on Table A3.7 in Appendix 3.5. The ASFRs for that year are based on the percentage distribution of live births by age of mother in 1949 and the average number of births registered in 1946 and 1947 (Table 5.3).

The P/F ratios decrease substantially between age groups 15-19 and 25-34 while they remain constant thereafter. The ratio is substantially higher than one for women aged 15-19 while it is only slightly higher than one for women aged 20-24; by contrast, the ratios are lower than one for women aged 25-44. Thus, the ratios imply that average parity was higher than cumulated current fertility for women aged 15-24 while it was lower for all other women.

The relatively high ratios for women aged 15-19 and 20-24 may imply a recent decline in fertility, particularly for women aged less than 20, or underreporting of current fertility. The relatively low ratios for women aged 25-34 and 35-44 may indicate an increase in current fertility for these women. In addition, more omissions of children ever born by women over age 25 may be part of the explanation or, more unlikely, overreporting of current fertility.

Overall, the P/F ratios indicate that there may be recent changes in current fertility or reporting errors affecting current fertility and, perhaps, average parities also. In fact, it is likely that the relatively high ratio for women aged 20-24 and the relatively low ratios for women aged 25-34 and 35-44 are due to reporting errors as it seems implausible that fertility increased by the same amount for women over age 25 while it was declining for younger women.

The pattern of the adjusted ASFRs is very similar to that of the rates computed from registration data for 1946 on Table 5.3. In fact, the observed ASFRs fall between those based on factors 1 and 2; thus, reporting of births for 1946 seems fairly reliable.

Table A5.6: P/F ratios and adjusted ASFRs using the Brass method, 1946

age group	P/F	age group	adjusted ASFRs factor 1	factor 2
15-19	1.480	15-19	0.0316	0.0338
20-24	1.042	20-24	0.1795	0.1920
25-34	0.933	25-29	0.2456	0.2627
35-44	0.938	30-34	0.1914	0.2047
		35-39	0.1415	0.1513
		40-44	0.0653	0.0698
		45-49	0.0107	0.0129

Table A5.7 shows P/F ratios for 1960 as well as ASFRs adjusted using three different factors; factor 1 is the average of the P/F ratios for the 20-24 and 25-29 age groups, factor 2 is equal to the P/F ratio for the 20-24 age group while factor 3 is equal to the P/F ratio for the 30-34 age group. The average parities for 1960 are based on the reported numbers of children ever born at the census and are shown on Table A3.8 in Appendix 3.5.

The P/F ratios are substantially higher than one for all age groups and imply that average parity was considerably higher than cumulated current fertility in 1960. The ratios decrease substantially between age groups 15-19 and 25-29 but remain constant for the age groups 25-29 and 30-34. However, the ratios decline again slightly between age groups 30-34 and 35-39 while they remain unchanged thereafter.

The high values of the P/F ratios are, at least partly, due to severe underreporting of births in 1960. The marked drop in the ratio between age groups 15-19 and 25-29 may be due to increasing current fertility for females aged 20-29 or, more likely, to a recent decline in fertility for women aged 15-19. In addition, more underreporting of current fertility for women under age 25 may be part of the explanation. The slight decline in the ratio between age groups 30-34 and 35-39 may be attributed also to a recent decline in fertility of women aged less than 35 or, less likely, to increasing current fertility for females aged more than 35. Increasing omissions of children ever borne by women older than 35 does not seem a likely explanation as the ratio remains constant thereafter.

Overall, the P/F ratios indicate that there may be recent changes in current fertility or reporting errors affecting current fertility; average parities, on the other hand, are based on fairly reliable data as is shown in Appendix 3.5. As the P/F ratios decrease between age groups 15-19 and 25-29 but remain constant for the age groups 25-29 and 30-34 it is likely that adjustment factor 3 may provide more reliable estimates of the level of current fertility.

The ASFRs computed from the reported numbers of births by the age of mother for 1960 on Table 5.3 are much lower than all the adjusted rates; the pattern of the rates, however, is fairly similar.

Table A5.7: P/F ratios and adjusted ASFRs using the Brass method, 1960

age group	P/F	adjusted ASFRs		
		factor 1	factor 2	factor 3
15-19	2.020	0.0405	0.0430	0.0380
20-24	1.666	0.2344	0.2485	0.2199
25-29	1.476	0.2694	0.2856	0.2527
30-34	1.474	0.1720	0.1824	0.1614
35-39	1.410	0.1366	0.1449	0.1282
40-44	1.408	0.0410	0.0435	0.0385
45-49	1.407	0.0093	0.0098	0.0087

Chapter 6: LEVELS AND TRENDS IN MIGRATION, 1881-1960

In this chapter levels and trends in migration between 1881 and 1960 are considered. In the first section, estimates of international migration derived from census and registration data are presented. In addition, characteristics of emigrants and immigrants for the period after 1955 are examined. In the second section, estimates of internal migration obtained from census data are discussed.

6.1 International migration levels and trends based on registration and census data

Table 6.1 shows estimates of net migration for Cyprus derived by the intercensal component method. To estimate net migration for the period 1901-1911 the " expected" population for 1911 was computed by adding the numbers of registered births in that period to the 1901 census population and subtracting the numbers of registered deaths. Then, the difference between the 1911 census population and the "expected " one was taken as an estimate of net migration for the period 1901-1911. Net migration for all other intercensal periods was computed in the same manner.

The data indicate that between 1901 and 1911 the numbers of immigrants exceeded emigrants by 2,020 persons. The excess of immigrants over emigrants apparently increased somewhat after 1911 and totalled 3,504 persons in the period 1911-1921 and 3,771 persons over the period 1921-1931. However, between 1931 and 1946 net migration amounted to only 711 immigrants, a very low figure compared to the earlier period, while in the period 1946-1960 emigrants exceeded immigrants by 4,638 persons.

Estimation of net migration using this method has several disadvantages. Firstly, the estimates are affected by changing coverage between successive censuses; improving coverage, for instance, would underestimate emigration or show as immigration. Secondly, the estimates are affected by underreporting of births and deaths. In fact, as the registration system collapsed after 1954 and the numbers of births and deaths between 1955 and 1960 were severely underreported the estimates of net migration for the period 1946-1960 are probably unreliable. If the "expected " population for 1954 was computed, by adding the numbers of births registered in the period 1946-1954 to the 1946 census population and subtracting the numbers of registered deaths in that period, and compared to the mid-year population for 1954, computed under the assumption that the rate of growth between the 1946 and 1960 censuses was continuous and even, then a net outflow of 16,077 persons would be estimated for the period 1946-1954 alone. The estimates of net migration for the period before 1946 may also be unreliable as there was some underreporting of births and deaths over the period 1901-1946 and coverage might have been improving between successive censuses.

Table 6.1: Estimates of net migration for Cyprus for intercensal periods based on the intercensal component method, 1901-1960

	1901-11	1911-21	1921-31	1931-46	1946-60
net migration	2,020	3,504	3,771	711	-4,638

Table 6.2 shows estimates of net migration for intercensal periods between 1921 and 1960 based on registration data. Net migration for each year was computed by subtracting the numbers of persons registered as departing from Cyprus from the numbers of those recorded as arriving at the island. For the period 1955-1960 numbers of persons with the declared intention to immigrate or emigrate were also available; thus, a second estimate of net migration for that period was obtained using numbers of intending immigrants and emigrants and is denoted by an asterisk in Table 6.2.

The data show that between 1921 and 1930 departures exceeded arrivals by 6,917 persons. In the period 1931-1945 the excess of departures over arrivals decreased somewhat and totalled 4,752 persons while the excess became very substantial after 1946. The data indicate that between 1946 and 1954 there was a net outflow of 17,639 persons while emigration intensified further between 1955 and 1960 when the excess of departures over arrivals amounted to 17,215 persons and the excess of intending emigrants over intending immigrants was 32,935 persons.

The excess of departures over arrivals shown by the data for all periods seems plausible as Cyprus has always been considered as a country of emigration. The significant increase in emigration between 1955 and 1960 shown by the data is no doubt genuine and was, at least partly, caused by the unstable political situation as over that period the Cypriot population was fighting for independence. However, the levels reflected by the estimates may be incorrect as it is not known whether the recording of arrivals and departures at the ports of the island was carried out efficiently. Nor whether arrivals and departures were short or long term movements, except for the period 1955-1960 when intention was declared.

The estimates of net migration for the period 1955-1960 based on numbers of arrivals and departures imply that emigration was much less than those based on numbers of intending immigrants and emigrants. That may be due partly to return migrants who were not recorded as immigrants on arrival in Cyprus in spite of their intention to stay permanently in the island. Thus, immigration may have been underreported in that period. In addition, persons remaining illegally in Cyprus would not have declared their intention to immigrate on arrival at the island. Thus, numbers of arrivals and departures may provide a more robust measure of net migration in the long term than numbers of declared immigrants and emigrants but may understate the intensity of the outward movement for particular years.

The estimates of net migration derived from numbers of arrivals and departures as well as of intending immigrants and emigrants give a different picture from those based on census data and the numbers of registered births and deaths. The intercensal component method implies 4,638 emigrants for the period 1946-1960 while estimates of net migration based on numbers of arrivals and departures as well as on numbers of declared immigrants and emigrants indicate that emigration in that period was much more substantial. In addition, the component method indicates that immigrants exceeded emigrants in the period before 1946 while data on numbers of arrivals and departures show that there was an excess of emigrants. It is likely that the excess of immigrants implied by the intercensal component method for the period 1901-1946 is spurious and was possibly due to improving census coverage over time and underreporting of births.

Table 6.2: Estimates of net migration for Cyprus for intercensal periods based on registration data, 1921-1960

	1921-30	1931-45	1946-54	1955-60	1955-60*
net migration	-6,917	-4,752	-17,639	-17,215	-32,935

* based on numbers of intending immigrants and emigrants rather than arrivals and departures

Table 6.3 shows numbers of persons that were born in a country other than Cyprus but were enumerated in Cyprus in census years. In addition, the percentage that the foreign born population represented in comparison to the total population is shown as well as ratios of males to females. The data indicate that the proportion of the foreign born population decreased between 1881 and 1911, from 1.87 per cent to 1.03 per cent, while it increased thereafter, reaching 2.10 per cent in 1931. Between 1931 and 1946 the percentage decreased slightly but increased substantially thereafter and had reached 5.36 per cent by 1960. Thus, the foreign born population represented only a very small proportion of the population of Cyprus before 1960.

The ratio of males to females for the foreign born population in 1881 stood at 2.339, implying a very substantial excess of males. The ratio followed a declining trend over time; by 1931 it had decreased to 1.128 while by 1946 it had dropped below one, implying an excess of females. However, between 1946 and 1960 the ratio increased from 0.891 to 0.992. The ratio of males to females for the population of Cyprus, on the other hand, decreased from 1.042 to 0.986 between 1881 and 1931; thus, the ratio for the foreign born population was significantly higher than for the total population in that period. By contrast, the ratio for the foreign born population in 1946 was lower and in 1960 it was only slightly higher than for the whole population. The substantial excess of males that characterised the foreign born population up to 1931 probably indicates that this group included a high proportion of temporary male immigrants.

The decline in the percentage of the foreign born population between 1881 and 1911 may be partly due to an excess of emigrants over immigrants for that group in that period. Between 1881 and 1891 the numbers of persons born in Turkey decreased substantially; probably Turks were still leaving the island after the administration was handed over to British in 1878. The increase in the foreign born population between 1911 and 1931 was mainly due to an influx of Greek and Armenian refugees from Asia Minor over the period 1920-1923 and to Armenian refugees from Cilicia in the period 1920-1928 (Colonial Office of Great Britain, 1921-1930). The relatively high proportion of foreign born population in 1960 was mainly due to an increase in the numbers of persons born in the UK. That group increased from 777 persons in 1946 to 15,784 persons in 1960, as it included only civilians at first while by 1960 the British Sovereign Bases had been established and their personnel was included in the foreign born population, as well.

Data on the numbers of the foreign born population for census years, however, do not provide a reliable measure of immigration as they do not include immigrants that left the country or died before the census. In addition, immigrants and in particular the temporary ones are more likely to be omitted from the census enumeration than permanent residents. Thus, it is probable that the proportions of the foreign born population underestimate immigration while the ratios of males to females may be inflated by more omissions of females than of males.

Table 6.3: Size, percentage and ratios of males to females for the foreign born population resident in Cyprus at census years, 1881-1960

	1881	1891	1901	1911	1921	1931	1946	1960
number	3,469	2,829	2,506	2,809	5,358	7,292	9,066	30,762
percentage	1.87	1.35	1.06	1.03	1.73	2.10	2.01	5.36
sex ratio	2.339	1.809	1.778	1.561	1.353	1.128	0.891	0.992

Table 6.4 shows the percentage distribution of the foreign born population by country of birth and length of residence in Cyprus in 1946. The data indicate that more than half of persons born in the UK arrived at the island less than a year prior to the census while only 31 per cent of them had remained on the island for more than four years. Around 16-17 per cent of persons born in Greece and Egypt had remained in the island for 20 years or more while about 27-29 per cent had arrived less than a year before the census. However, a relatively high proportion of persons born in Egypt, about 28 per cent, had lived in the island for 10-19 years. By contrast, the highest proportion of the population born in Turkey, 68 per cent, had lived in the island for 20 years or more while only 11 per cent had stayed less than a year.

It seems likely that persons born in the UK included a high proportion of temporary immigrants while part of the group of persons born in Greece and Egypt were temporary immigrants and another part was living permanently on the island. The very high proportion of permanent residents among persons born in Turkey is, at least partly, due to the inclusion in that group of Greek and Armenian refugees from Asia Minor and Cilicia that arrived at the island before 1928.

Table 6.4: Percentage distribution of the foreign born population by country of birth and length of residence in Cyprus, 1946

years	UK	Greece	Turkey	Egypt	Total
20+	5.7	16.7	68.0	16.1	38.4
10-19	12.4	17.9	14.6	27.7	17.6
4-9	12.5	19.1	3.8	17.1	10.6
1-3	17.8	19.0	2.5	9.9	9.3
less than 1	51.7	27.3	11.2	29.2	24.0
Total	100	100	100	100	100

The data on intending emigrants and immigrants that became available after 1954 were quite detailed; thus, it was possible to examine characteristics of emigrants and immigrants for the period 1955 to 1960. The percentage distribution of emigrants by age indicates that in the period 1955-1960 the proportion aged 0-14 fluctuated between 20.7 and 33.1 per cent while the percentage aged 15-39 ranged from 54.5 to 61.9 per cent and the proportion of persons aged 40 or more fluctuated between 12.4 and 21.5 per cent. In the overall period 24.1 per cent of the emigrants were aged 0-14 while 58.2 per cent were aged 15-39 and 17.7 per cent were 40 or more. The distribution of emigrants by age implies that most of them were young adults though families with their children were also emigrating in that period (see Table A6.1, Appendix 6.1).

The proportion of persons aged 0-14 for the overall population in 1960 was 36.7 per cent, substantially higher than the proportion of emigrants in that age group, while the proportion of persons aged 15-39 in the whole population was only 35.1 per cent compared to 58.2 per cent for the emigrants. The proportion of persons aged 40 or more in 1960 was 28.2 per cent, higher than the proportion of emigrants in that age group. Thus, emigrants included much higher proportions of young adults compared to the population of Cyprus.

The ratio of males to females for emigrants in 1955 was 1.026 but decreased to 0.850 in 1956 while it followed an increasing trend thereafter, reaching 1.299 in 1959 and 1.271 in 1960. Thus, the ratio implies that, except for 1956, there was an excess of males among emigrants that became very substantial between 1958 and 1960. The ratio for the overall period was 1.138 and indicates that males were more likely to emigrate than females. Ratios of males to females for different age groups indicate that the excess of male over female emigrants was more substantial among persons aged 15-39; the ratio for that age group for the whole period 1955-1960 was 1.219 compared to 1.019 for the age group 0-14 and to 1.054 for the age group 40+ (see Table A6.2, Appendix 6.1).

The percentage distribution of emigrants by country of destination for each year 1955-1960 shows that the vast majority of emigrants in that period intended to go to the United Kingdom; the percentage increased between 1955 and 1960 from 78.4 to 92.8 per cent while the proportion for the whole period was 87.7 per cent. Lower proportions of emigrants intended to emigrate to Australia and the USA; these proportions for the overall period were 6.1 per cent and 2.0 per cent, respectively (see Table A6.3, Appendix 6.1).

The percentage distribution of emigrants by ethnic group indicates that in the period 1955-1960 73.0 per cent of the emigrants were Greek Cypriots, 15.5 per cent were Turkish Cypriots and 10.2 per cent were "Anglo-Americans", as British and people from the USA are referred to in the annual reports. It is worth noting that in 1960, 77.1 per cent of the population of Cyprus were Greek Cypriots while 18.2 per cent were Turkish Cypriots and 4.7 per cent were of other ethnicity. Thus, between 1955 and 1960 there was a high proportion of "Anglo-American" emigrants, probably due to British leaving the island as the political situation became unstable in the last months of 1955 (see Table A6.4, Appendix 6.1).

The percentage distribution of immigrants by age shows that in 1955, 26.1 per cent of them were aged 0-14; the proportion increased to 42.8 per cent in 1956 while it fluctuated between 11.1 per cent and 20.9 per cent in the period 1957-1960. The percentage of immigrants aged 15-39 fluctuated between 44.1 per cent and 59.9 per cent in the period 1955-1960. The proportion of immigrants aged 40 or more decreased between 1955 and 1956 from 28.7 to 13.1 per cent but increased again thereafter; in the period 1957-1960 it ranged from 27.9 per cent to 32.2 per cent (see Table A6.5, Appendix 6.2).

The relatively high proportion of immigrants aged 0-14 in 1956 and the low proportion of persons aged 40 or more are due to the inclusion of families of British military personnel that year; however, that group was excluded from immigrants all other years. If the data for 1956 are disregarded the proportion of immigrants aged 0-14 in the period 1955-1960 would be 16.9 per cent, the proportion aged 15-39 would be 53.0 per cent and the proportion aged 40 or more would be 30.1 per cent. Thus, immigrants between 1955 and 1960 included substantially higher proportions of persons aged 40 or more than emigrants, 30.1 per cent compared to 17.7 per cent, and lower proportions of persons aged 15-39 and 0-14. The relatively high proportion of immigrants aged 40 or more may indicate some return migration.

The ratio of males to females for immigrants stood at 0.845 in 1955 but decreased to 0.612 in 1956 while it increased substantially thereafter; in the period 1957 to 1960 the ratio fluctuated between 1.036 and 2.997. Thus, the ratio implies that immigrants in 1955 and 1956 included more females than males while there was a substantial excess of males thereafter. If the data for 1956 are disregarded, the ratio of males to females for the overall period would be 1.602 while the ratios for the 0-14, 15-39 and 40+ age groups would be 0.951, 1.744 and 1.882, respectively. The particularly high ratios for persons aged 40 or more and 15-39 may be partly due to return migration of males and to temporary male immigrants in search of employment (see Table A6.6, Appendix 6.2).

The percentage distribution of immigrants by country of last residence for each year 1955-1960 indicates that in that period 85.2 per cent of immigrants were coming from the UK while 5.0 per cent were coming from Egypt and 4.0 per cent from the USA. If the data for 1956 are disregarded the proportion of immigrants coming from the UK would be slightly lower, 78.9 per cent, while proportions coming from other destinations would be slightly higher. Nevertheless, in spite of a very substantial proportion of immigrants coming from the UK, their numbers were small and in the period 1955-1960 net migration to that country totalled 29,132 emigrants (see Table A6.7, Appendix 6.2).

The percentage distribution of immigrants by ethnic group for each year 1955-1960 shows that the proportion of Greek Cypriot immigrants fluctuated widely in that period, ranging from 4.0 to 71.6 per cent, while for the overall period that proportion was 27.4 per cent. The percentage of Turkish Cypriot immigrants for the overall period was 6.4 per cent while the proportion of "Anglo-American " immigrants was 64.0 per cent. The particularly high proportion of "Anglo-American " immigrants is mainly due to the inclusion of families of British military personnel in 1956. If the data for 1956 are disregarded, 48.4 per cent of the immigrants would be Greek Cypriots while 10.8 per cent would be Turkish Cypriots and 38.0 per cent would be "Anglo-Americans ". Thus, the data imply that about 59 per cent of the immigrants in that period were return migrants. In addition, relatively high proportions of "Anglo-Americans " were moving both to and from Cyprus (see Table A6.8, Appendix 6.2).

Data from the 1931, 1951 and 1961 censuses of Great Britain on the Cypriot born population enumerated in England and Wales indicate that up to 1931 England and Wales was a minor destination for Cypriot emigrants. In fact, the main destination for emigrants in the 1920s was Egypt while other destinations were the USA, Greece, Turkey and central Africa (Colonial Office of Great Britain, 1921-1931). The data also imply that by 1951 Great Britain had become a major destination for Cypriot emigrants (see Table A6.9, Appendix 6.3).

The available data on migration in Cyprus refer only to the period after 1920. However, it is likely that net migration was negative in the period before 1920, as well. In fact, the relatively low rates of growth for the population of Cyprus in the period 1881 to 1901 and over the period 1911 to 1931 were probably due partly to substantial emigration. In addition, the significant excess of females over males in the age group 15-34 that can be observed for the period 1881 to 1921 even though in all other age groups there was a considerable excess of males is probably partly attributable to male emigration (see Table 2.3, Chapter 2).

To conclude, data on arrivals in and departures from Cyprus indicate that there was some emigration in the period 1921 to 1945 while emigration became substantial after 1946 and, particularly, in the period 1955 to 1960. Similarly, data on intending immigrants and emigrants for the period 1955-1960 imply that emigration was very significant. In addition, it is likely that there was some emigration in the period before 1921 as well though as the relevant data are unavailable it is not possible to establish levels. Between 1955 and 1960 most emigrants were aged 15-39 while there was an excess of males among them.

The main country of destination for emigrants in that period was the UK while in the period before 1931 it was only a minor destination. 73 per cent of the emigrants in the period 1955-1960 were Greek Cypriots, 16 per cent were Turkish Cypriots and 10 per cent were "Anglo-Americans". The data on the distribution of immigrants by age, by place of last residence as well as their ethnic composition indicate that between 1955 and 1960 there was some return migration, mainly from the UK.

The data on numbers of the foreign born population for census years show that there was a small number of immigrants in the island between 1881 and 1946 while their numbers had increased considerably by 1960. The ratios of males to females for the foreign born population were relatively high in the period 1881-1931 and imply that this group included high proportions of temporary male immigrants. However, some communities, mainly refugees from Asia Minor arriving in Cyprus in the 1920s, became permanent residents.

6.2 Internal migration levels and trends based on census data

In this section, census data are examined to detect movements of the population within Cyprus and, particularly, rural to urban migration. It is worth noting that urban areas between 1881 and 1960 included the six principal towns of the island though they varied greatly in size. In fact, Kyrenia town was quite small throughout the whole period, its population increasing from 1,192 persons in 1881 to only 3,498 persons in 1960. Thus, Kyrenia town might be considered not particularly urban. On the other hand, rural areas included some small towns, two of which had reached a population of 4,000-5,000 persons by 1946. Thus, some of the "rural" areas may in fact be not very rural.

Table 6.5 shows annual rates of growth for intercensal periods for the population resident in the six principal towns of the island and for the total "urban" population, assuming a constant rate of growth between censuses. The annual rates of growth indicate that the population of urban areas was increasing, on average, by 11.0 per thousand in the period 1881-1891. The rate of growth followed an increasing trend between 1881-1891 and 1901-1911, reaching 15.9 per thousand in the latter period. Then, the rate remained more or less constant between 1901-1911 and 1911-1921, before resuming a steep increasing trend; the rate of growth reached 25.2 per thousand in the period 1931-1946 and 53.5 per thousand over 1946-1960.

The annual rates of growth for the different district capitals fluctuated substantially between successive censuses. For instance, in Kyrenia and Paphos towns periods of relatively high growth were succeeded by periods of low growth. The rates of growth for Larnaka town were relatively low except during 1901-1911 and 1921-1931. The rates of growth for Famagusta town were relatively high for most intercensal periods. The extremely high rate of growth, 72.2 per thousand, for Nicosia town over the period 1946-1960 is due to the inclusion of Nicosia suburbs in the urban sector in 1960 which resulted in the population of the town becoming double. Had Nicosia suburbs still been excluded in 1960 from the urban sector, the rate of growth for Nicosia town over that period would have been only 19.9 per thousand while the average rate for urban areas would have been 33.9 per thousand.

Table 6.5: Intercensal rates of growth (per person, per annum) for the urban areas of Cyprus, i.e. the six district capitals, 1881-1960

	1881-91	1891-01	1901-11	1911-21	1921-31	1931-46	1946-60
Nicosia	0.0081	0.0165	0.0084	0.0145	0.0235	0.0247	0.0722
Larnaka	-0.0031	0.0048	0.0151	0.0025	0.0211	0.0149	0.0208
Limassol	0.0207	0.0116	0.0216	0.0239	0.0139	0.0267	0.0460
Famagusta	0.0272	0.0128	0.0331	0.0223	0.0274	0.0395	0.0542
Paphos	0.0240	0.0113	0.0092	0.0180	0.0082	0.0168	0.0318
Kyrenia	0.0103	0.0011	0.0256	0.0101	0.0070	0.0227	0.0118
all urban	0.0110	0.0117	0.0159	0.0155	0.0196	0.0252	0.0535

Table 6.6 shows annual rates of growth for intercensal periods for the rural population resident in the different districts of Cyprus and for the total rural population, assuming a constant rate of growth between censuses. The rate of growth for rural areas increased between 1881-1891

and 1901-1911 from 11.8 per thousand to 14.2 per thousand but fell back thereafter, reaching 9.5 per thousand in the period 1921-1931. Then, the rate increased again in the period 1931-1946, reaching 14.4 per thousand, while it decreased substantially to 2.8 per thousand in the period 1946-1960.

The rates of growth for the different rural areas show substantial fluctuations between successive censuses. For instance, in the rural parts of Limassol and Famagusta districts periods of relatively high growth were succeeded by periods of low growth. The rates of growth for the rural part of Paphos district were relatively low for most intercensal periods. By contrast, the rates of growth for the rural part of Nicosia district were relatively high except during 1881-1891 and 1946-1960; in fact, the rates indicate a decrease in the population in the latter period. Had Nicosia suburbs still been included in the rural population in 1960 the rate of growth for that area over 1946-1960 would have been 25.1 per thousand, very high compared to the other rural areas, while the rate for the whole rural population would have been 11.8 per thousand, at the same level as for the periods 1881-1891 and 1911-1921.

Table 6.6: Intercensal rates of growth (per person, per annum) for the rural areas of Cyprus, 1881-1960

	1881-91	1891-01	1901-11	1911-21	1921-31	1931-46	1946-60
Nicosia	0.0094	0.0140	0.0146	0.0138	0.0140	0.0163	-0.0016
Larnaka	0.0223	0.0114	0.0123	0.0215	0.0181	0.0132	0.0026
Limassol	0.0198	0.0085	0.0149	0.0141	0.0037	0.0133	0.0136
Famagusta	0.0063	0.0161	0.0174	0.0070	0.0094	0.0143	0.0011
Paphos	0.0096	0.0105	0.0089	0.0085	0.0028	0.0130	0.0014
Kyrenia	0.0129	0.0123	0.0153	0.0089	0.0045	0.0131	0.0061
all rural	0.0118	0.0126	0.0142	0.0118	0.0095	0.0144	0.0028

Comparing the rates of growth for the different urban and rural areas one may observe that between 1881 and 1901 the population of rural areas was growing faster than the population of urban areas in most districts. The difference for certain areas over that period was quite substantial; for instance, the population of Larnaka town in the period 1881-1891 was decreasing by 3.1 per thousand per year while the population resident in the rural part of Larnaka district was increasing by 22.3 per thousand. However, between 1901 and 1921 in five out of the six districts it was the urban population that was growing at a faster pace while after 1921 that was true for all districts. In addition, the difference in the rates of growth between urban and rural population was substantial for most districts, particularly over the period 1946-1960. The rates of growth for the whole urban population also became higher than for the rural population after 1901 while the gap increased over time.

The substantial difference in the rates of growth between urban and rural areas after 1911 cannot be explained simply by differentials in mortality and fertility. The registration data indicate that between 1921 and 1931 both mortality and fertility in rural areas was higher than in urban areas while by 1946 differentials in fertility and mortality had become minimal. Thus, it is probable that the relatively high rates of growth for the different urban areas after 1911 were, at least partly, due to in-migration from rural areas while the unusually low rates for rural areas were partly due to out-migration to urban areas and perhaps, particularly in the periods 1921-1931 and 1946-1960, to emigration overseas. Nevertheless, in spite of the relatively high rates of growth for urban areas after 1911 and the addition of Nicosia suburbs in the urban sector in 1960, the urban population in 1960 was still only 36 per cent of the total and Cyprus was still a predominantly rural country.

It should be noted that the urban population in 1946 and 1960 included substantially higher proportions of persons aged 15-59 than the rural population and lower proportions of persons aged 0-14 and 60 or more (see Table 2.6, Chapter 2). In addition, the urban population between 1881 and 1960 included a much higher proportion of males than the rural population (see Table 2.7, Chapter 2). The difference in the distribution of the population by age and sex between urban and rural areas may be partly explained by rural to urban migration, particularly of young adult males.

In the 1946 census report numbers of persons by place of birth and place of enumeration were published; thus, it was possible to make some further observations about movements of the population within Cyprus. Table 6.7 shows net lifetime migration for the different urban and rural areas of Cyprus in 1946 for the Cypriot born population. In addition, the percentage that net lifetime migration represents compared to the population enumerated in each area is shown. Net lifetime migration for a certain urban or rural area was computed by subtracting the numbers of out-migrants from that area from the numbers of in-migrants. Numbers of in-migrants for a certain area were computed as the total number of persons enumerated in that area minus the number of persons that were born and enumerated there. Out-migrants from a certain area were considered those who were born in that area but were enumerated in another area.

The data indicate that net lifetime migration was positive for all urban areas in 1946. The excess of in-migrants over out-migrants was quite substantial for certain areas and represented 42.2 per cent of the population of Famagusta town, 34.4 per cent of the population of Nicosia town, 33.6 per cent of the population of Limassol town but only 16.2 per cent of the population of Kyrenia town. By contrast, net lifetime migration was negative for all rural areas in 1946. The excess of out-migrants over in-migrants represented a considerable proportion compared to the population enumerated in the rural parts of Paphos and Kyrenia districts, 19.8 per cent and 15.5 per cent respectively, but only a very small proportion of the population enumerated in the rural part of Nicosia district, 0.8 per cent.

The data show that net lifetime migration in 1946 was directed from rural to urban areas and, particularly, to the three largest towns of the island, Nicosia, Limassol and Famagusta while the areas that suffered the most significant proportionate net loss were the rural parts of Paphos and Kyrenia districts. Overall, net lifetime migration was very substantial compared to the relatively small numbers of urban population; in fact, it represented nearly a third of the population of the urban sector. By contrast, net lifetime migration was not very significant compared to the large rural population and represented, on average, only 8.9 per cent of it.

It is worth noting that the largest segment of the foreign born population in 1946, 7,081 persons out of 9,066 persons, were resident in urban areas; these persons, represented a further 7.3 per cent of the urban population. Thus, a substantial part of the increase in the urban population up to 1946 may be attributed to in-migration. However, the data do not indicate when rural to urban migration began or at what rate it proceeded; in addition, movements from the place of birth to areas other than the place of enumeration are not identified by the data and thus, mobility of the population is underestimated.

Table 6.7: Net lifetime migration for urban and rural areas of Cyprus and the percentage it represents compared to the population enumerated in each area, 1946

	urban areas		rural areas	
	net migration	percent	net migration	percent
Nicosia	11,864	34.4	-840	0.8
Larnaka	3,129	21.2	-3,280	8.8
Limassol	7,671	33.6	-5,591	10.6
Famagusta	6,840	42.2	-8,141	10.4
Paphos	1,286	22.2	-9,505	19.8
Kyrenia	471	16.2	-3,904	15.5
total	31,261	32.2	-31,261	8.9

Table 6.8 shows the percentage distribution of the population born in certain urban areas enumerated in the same area, or in another urban area, or in rural areas in 1946. The data indicate that high proportions of persons born in urban areas, on average about 76 per cent, remained at the place of birth in 1946. However, 11 per cent of those born in urban areas had out-migrated to a different town by 1946 while a further 13 per cent had moved to rural areas. Persons born in the smallest towns, Paphos and Kyrenia, show the highest mobility; by 1946, about 20 per cent of them had moved to a larger town while 12-14 per cent had migrated to rural areas. Relatively high mobility is also shown by persons born in Nicosia town; a

surprisingly high proportion of them, about 19 per cent, had moved to rural areas by 1946. By contrast, persons born in Famagusta town were the least mobile as 83 per cent of them remained in the town in 1946.

Table 6.8: Percentage of the population born in certain urban areas enumerated in the same area, or in another urban area, or in rural areas, 1946

place of birth (urban)	enumerated in place of birth	enumerated in other urban	enumerated in rural areas	total
Nicosia	72.7	8.5	18.8	100
Larnaka	77.1	14.7	8.2	100
Limassol	79.8	9.3	10.9	100
Famagusta	83.0	8.2	8.8	100
Paphos	68.8	19.6	11.6	100
Kyrenia	65.7	20.4	13.9	100
total	76.1	11.0	12.9	100

Table 6.9 shows the percentage distribution of the population born in certain rural areas enumerated in the same area, or in another rural area, or in urban areas in 1946. The vast majority of persons born in rural areas, about 86 per cent on average, remained in the same area in 1946. Only around 4 per cent of those born in rural areas had migrated to other rural areas by 1946; however, this proportion was higher, around 7-8 per cent, for those born in the rural parts of Paphos and Kyrenia districts. The proportion of persons born in rural areas that had migrated to urban areas by 1946 was about 10 per cent.

Table 6.9: Percentage of the population born in certain rural areas enumerated in the same area, or in another rural area, or in urban areas, 1946

place of birth (rural)	enumerated in same area	enumerated in other rural	enumerated in urban areas	total
Nicosia	88.9	3.0	8.1	100
Larnaka	86.3	3.4	10.3	100
Limassol	83.9	3.7	12.4	100
Famagusta	87.5	2.9	9.6	100
Paphos	80.9	6.8	12.3	100
Kyrenia	81.7	7.8	10.5	100
total	85.8	4.0	10.2	100

Comparing Table 6.8 and Table 6.9 one may observe that persons born in urban areas were more mobile than those born in rural areas. Out-migrants from urban areas tended to move, on average, in equal proportions to other urban or to rural areas. However, out-migrants from rural areas tended to move to urban rather than to other rural areas. The population born in Kyrenia and Paphos districts, independently of whether it was in the town or in the rural part of the district, shows the highest mobility while the population born in Famagusta district was the least mobile.

Table 6.10 shows the percentage distribution of the population that was born in rural areas but migrated to urban areas by whether the place of enumeration in 1946 was in the same district as the place of birth. The data indicate that about 56 per cent of the rural population that migrated to urban areas remained within the district of birth. That proportion was highest for Limassol and Nicosia districts, 72 per cent and 70 per cent respectively, as they included the largest urban centres while it was also relatively high, 63 and 61 per cent for Famagusta and Larnaka districts. By contrast, only 27 per cent of the persons born in the rural part of Paphos who migrated to urban areas remained within that district while that proportion was 22 per cent for those born in the rural part of Kyrenia district. Thus, rural to urban migrants coming from districts where the principal town was small, preferred to move to larger urban areas. For instance, 59 per cent of persons that migrated to urban areas from the rural part of Kyrenia district had moved to Nicosia town by 1946 and around 7 per cent had moved to Famagusta town. Similarly, 34 per cent of persons who were born in the rural part of Paphos district and migrated to urban areas had moved to Limassol town by 1946 while another 31 per cent had migrated to Nicosia town. Thus, it is likely that rural to urban migration, at least up to 1946, was mainly directed to large towns.

Table 6.10: Percentage distribution of out-migrants from rural to urban areas by whether the place of enumeration was in the same district as the place of birth, 1946

place of birth (rural)	place of enumeration		total
	urban area of district of birth	other urban area	
Nicosia	70.3	29.7	100
Larnaka	61.6	38.4	100
Limassol	71.8	28.2	100
Famagusta	62.6	37.4	100
Paphos	26.7	73.3	100
Kyrenia	22.0	78.0	100
total	56.3	43.7	100

To conclude, the annual intercensal rates of growth for urban and rural areas indicate that there was some rural to urban migration after 1911. The 1946 census data also indicate that net lifetime migration was positive for urban areas; in fact, the excess of in-migrants over out-migrants represented nearly a third of the urban population. The data also imply that the net movement of the population was mainly directed towards large urban centres: Nicosia, Limassol and Famagusta. Urban population, on the other hand, tended to be more mobile than rural population and about half of the lifetime out-migrants from urban areas had migrated to rural areas by 1946. Nevertheless, net lifetime migration for rural areas was negative in 1946. However, in spite of the rural to urban movement of the population, Cyprus was still a predominantly rural country in 1960.

Appendices

Appendix 6.1: Characteristics of emigrants, 1955-1960

Table A6.1: Percentage distribution of emigrants in broad age groups, 1955-1960

age group	1955	1956	1957	1958	1959	1960
0-14	25.21	33.14	23.54	22.13	20.70	22.02
15-39	61.92	54.48	57.28	60.99	57.79	57.81
40+	12.87	12.38	19.18	16.88	21.50	20.17
Total	100	100	100	100	100	100

Table A6.2: Ratios of males to females in different age groups for emigrants, 1955-1960

age group	1955	1956	1957	1958	1959	1960
0-14	0.978	0.973	0.997	1.037	1.003	1.078
15-39	1.110	0.839	1.086	1.435	1.416	1.369
40+	0.773	0.619	0.921	1.089	1.325	1.230
Total	1.026	0.850	1.031	1.273	1.299	1.271

Table A6.3: Percentage distribution of emigrants by country of destination, 1955-1960

country	1955	1956	1957	1958	1959	1960
USA	1.9	2.3	4.5	2.8	1.7	1.0
UK	78.4	81.0	86.3	86.8	92.9	92.8
Australia	17.0	11.3	4.9	6.2	1.8	1.8
other	2.7	5.4	4.3	4.2	3.6	4.4
total	100	100	100	100	100	100

Table A6.4: Percentage distribution of emigrants by ethnic group, 1955-1960

group	1955	1956	1957	1958	1959	1960
Greek	84.4	56.0	66.1	73.9	67.4	80.7
Turkish	15.1	13.8	17.4	11.5	19.9	15.2
Anglo-American	0.1	29.0	14.9	13.4	11.7	2.3
other	0.4	1.2	1.6	1.2	1.0	1.8
total	100	100	100	100	100	100

Appendix 6.2: Characteristics of immigrants, 1955-1960

Table A6.5: Percentage distribution of immigrants in broad age groups, 1955-1960

age group	1955	1956	1957	1958	1959	1960
0-14	26.09	42.80	15.35	11.13	20.88	20.18
15-39	45.22	44.09	52.43	59.89	51.19	49.11
40+	28.70	13.11	32.22	28.99	27.93	30.72
Total	100	100	100	100	100	100

Table A6.6: Ratios of males to females in different age groups for immigrants, 1955-1960

age group	1955	1956	1957	1958	1959	1960
0-14	0.765	1.028	0.936	1.093	1.215	0.720
15-39	0.793	0.303	1.338	3.884	1.690	1.225
40+	1.020	0.851	2.347	2.895	1.805	1.006
Total	0.845	0.612	1.501	2.997	1.603	1.036

Table A6.7: Percentage distribution of immigrants by country of last residence, 1955-1960

country	1955	1956	1957	1958	1959	1960
Egypt	12.8	1.4	18.9	4.4	1.8	1.4
UK	71.9	92.2	56.7	84.2	96.2	93.5
Australia	5.5	0.1	0.7	1.1	0.4	0.4
other	9.8	6.3	23.7	10.3	1.6	4.7
total	100	100	100	100	100	100

Table A6.8: Percentage distribution of immigrants by ethnic group, 1955-1960

country	1955	1956	1957	1958	1959	1960
Greek	63.5	4.0	37.7	23.7	70.7	71.6
Turkish	7.2	1.6	5.3	4.5	16.0	24.9
Anglo-American	27.0	92.8	52.3	69.2	12.1	2.0
other	2.3	1.6	4.7	2.6	1.2	1.5
total	100	100	100	100	100	100

Appendix 6.3: The Cypriot born population enumerated in England and Wales at census years, 1931-1961

Table A6.9 shows the Cypriot born population enumerated in England and Wales in 1931, 1951 and 1961. The Cypriot born population enumerated in England and Wales in 1931 included only 1,059 persons. However, by 1951 that group had increased by 9,149 persons while between 1951 and 1961 the Cypriot born population increased substantially, by a further 31,690 persons. The Cypriot born population enumerated in other areas of Great Britain in 1961 included 385 persons.

The registration data on migration in Cyprus show that between 1921 and 1930 the excess of departures over arrivals amounted to 6,917 persons while it is likely that net migration was negative in the period before 1921 as well. Thus, the proportion of emigrants that went from Cyprus to England and Wales up to 1931 was probably small. In fact, the Colonial Reports comment that the main destination for emigrants in the 1920s was Egypt while other destinations were the USA, Greece, Turkey and central Africa (Colonial Office of Great Britain, 1921-1931).

Between 1931 and 1950 net migration from Cyprus, as implied by the excess of departures over arrivals, amounted to 11,384 persons while in the period 1951-1960 it totalled 43,942 persons. Thus, it seems likely that by 1951 England and Wales had become an important destination for Cypriot emigrants.

Table A6.9: Number of Cypriot born population enumerated in England and Wales at census years, 1931-1961

	1931	1951	1961
number	1,059	10,208	41,898
increase from previous census		9,149	31,690

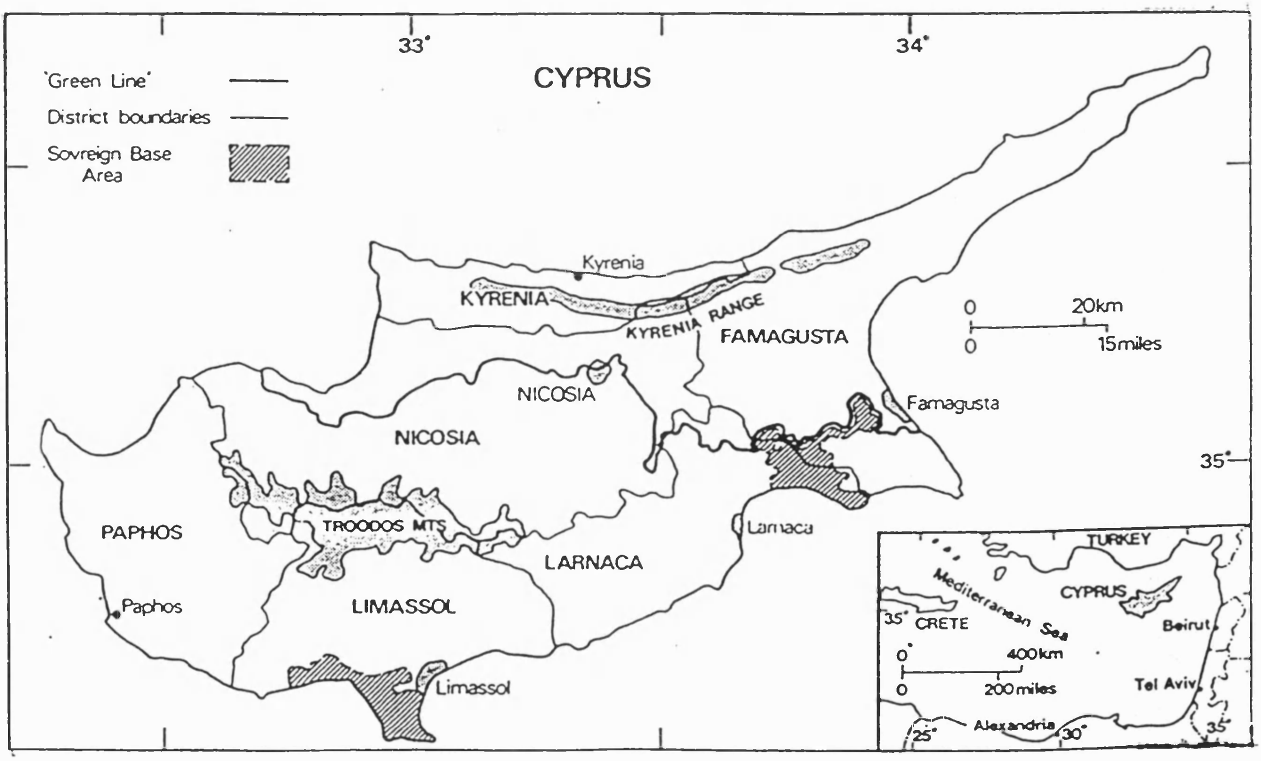
Chapter 7: DIFFERENTIALS BETWEEN THE DISTRICTS OF CYPRUS AND ETHNIC GROUPS, 1881-1960

This chapter includes two sections. In the first section, differentials in levels and trends in mortality, nuptiality and fertility between the six districts of Cyprus are considered. In the second section, information on the characteristics of the different ethnic groups of Cyprus is presented. In addition, a brief account of the demography of Greece and Turkey is given and an attempt is made to identify similarities and differences with the ethnic groups of Cyprus.

7.1 Differentials between the districts of Cyprus

Table 7.1 shows crude death rates (CDRs) for the whole of Cyprus and the different districts of the island for census years. These figures were calculated in exactly the same way as described in Chapter 3. The districts of Cyprus are depicted in Figure 7.1.

Figure 7.1: Cyprus and the districts of Cyprus; the "green line" that separates Greek and Turkish areas post-1974; and the sovereign base areas



The CDR for Cyprus stood at 14.1 per thousand in 1901. The rate apparently increased slightly between 1901 and 1911 while it increased substantially in the period 1911-1921, reaching 24.5 per thousand. However, after 1921 the CDR followed a declining trend and by 1946 it had dropped to 8.5 per thousand.

Trends in mortality for the different districts, as implied by the CDRs, varied in the period 1901 to 1911. CDRs for Kyrenia and Larnaka districts increased substantially in that period, from 11.3 per thousand to 22.6 per thousand and from 15.7 per thousand to 23.7 per thousand, respectively. By contrast, the CDR for Limassol district apparently decreased, from 17.3 per thousand in 1901 to 9.6 per thousand in 1911. Between 1911 and 1921 CDRs increased considerably for most districts, mainly due to the exceptionally high number of deaths recorded in the island in 1922. However, the rate decreased slightly in that period for Larnaka district, from 23.7 to 22.0 per thousand. After 1921 the CDRs for most of the districts roughly followed a similar trend to that for the whole of Cyprus.

CDRs for 1901 and 1911 show very different levels of mortality for different districts while, after 1911, variation was reduced over time. For instance, in 1901 the lowest CDR was 9.4 per thousand in Nicosia district while the highest was 17.3 per thousand in Limassol district. Similarly, in 1911 the CDR in Limassol district was only 9.6 per thousand compared to 23.7 per thousand for Larnaka and 22.6 per thousand for Kyrenia district. By contrast, the lowest CDR in 1921 was 22.0 per thousand in Larnaka district compared to 29.1 per thousand for Paphos district while variation was even less in 1931 and 1946.

Part of the variation in CDRs between different districts may well be attributable to differential underreporting of deaths. For instance, CDRs for Nicosia district in 1901 and Limassol district in 1911 are implausibly low compared to other districts; it is likely that they are due to underreporting of deaths rather than low mortality. On the other hand, part of the variation in the CDRs is probably genuine and reflects differentials in mortality among the districts. For instance, Paphos district had the highest mortality in the island in 1921 and 1931 while CDRs were relatively high in 1901 and 1911, as well. In fact, if the average number of deaths for the four-year period starting on the first of April 1909 and ending on the 31st March 1913 was used to compute the CDR for Paphos for 1911, the rate would have been 19.1 per thousand instead of 16.4 per thousand. Thus, Paphos district had relatively high mortality, particularly between 1911 and 1931. CDRs for Limassol district were also relatively high except for 1911, when the rate was extremely low due to underreporting of deaths, and 1921, when the rate was relatively low but, as it will be seen, probably affected by underreporting. It is worth noting that Limassol and Paphos districts were adjacent areas, situated in the south-western part of Cyprus (see Figure 7.1).

Table 7.1: CDR for Cyprus and the different districts for census years, 1901-1960

Districts	1901	1911	1921	1931	1946	1960
Nicosia	9.40 (1)	12.82 (2)	25.52 (4)	15.08 (1)	8.19 (2)	2.21 (3)
Larnaka	15.71 (3)	23.74 (6)	21.98 (1)	16.43 (3)	8.50 (3)	2.98 (4)
Limassol	17.27 (6)	9.62 (1)	23.07 (3)	17.58 (5)	8.84 (6)	2.20 (2)
Famagusta	17.09 (5)	17.32 (4)	21.99 (2)	15.88 (2)	8.81 (5)	4.33 (6)
Paphos	16.36 (4)	16.39 (3)	29.13 (6)	18.03 (6)	8.52 (4)	1.98 (1)
Kyrenia	11.34 (2)	22.55 (5)	26.06 (5)	17.10 (4)	8.15 (1)	3.24 (5)
Cyprus	14.14	15.63	24.50	16.32	8.52	2.74

Notes: the numbers in brackets indicate rank; (1) indicates lowest mortality while (6) highest

Table 7.2 shows infant mortality rates (IMRs) for the whole of Cyprus and the different districts of the island for census years for the period 1921-1960. These rates were calculated as described previously in Chapter 3. The IMR for Cyprus as a whole followed a declining trend over time; it decreased slightly between 1921 and 1931, from 165 per thousand to 151 per thousand, while it decreased substantially thereafter, reaching 68 per thousand in 1946. The IMRs for most of the districts followed a trend similar to that for Cyprus. However, between 1921 and 1931 the rate increased slightly for Kyrenia district while it apparently increased substantially for Limassol district, from 86 per thousand to 126 per thousand.

IMRs showed some variation among districts for all years. Maximum variation can be observed in 1921, when the lowest IMR, 86 per thousand, was recorded for Limassol district while the highest was 220 per thousand in Larnaka district. The extremely low IMR for Limassol district in 1921 seems suspect as the second lowest was still substantially higher, 144 per thousand for Kyrenia district. Thus, it is likely that the low IMR for Limassol district in 1921 was mainly due to underreporting of infant deaths while CDR for that area that year also underestimates mortality. Nevertheless, part of the variation in the IMRs probably reflects genuine differentials in mortality among districts. The data imply that Paphos district had on average relatively high infant mortality between 1921 and 1946 while IMRs for Larnaka district were also relatively high in 1921 and 1931. It is worth noting that Larnaka district is adjacent to Limassol district and is situated in the southern part of the island. Thus, it seems possible that mortality was somewhat higher in the southern and the south-western areas of the island.

Table 7.2: IMR for Cyprus and the different districts for census years, 1921-1960

Districts	1921	1931	1946	1960
Nicosia	177.8 (5)	139.0 (2)	59.6 (1)	12.2 (4)
Larnaka	220.2 (6)	165.0 (4)	65.7 (2)	7.5 (1)
Limassol	86.1 (1)	126.4 (1)	68.7 (3)	13.4 (5)
Famagusta	173.2 (3)	161.5 (3)	70.7 (4)	16.0 (6)
Paphos	177.8 (5)	168.2 (6)	88.2 (6)	10.5 (3)
Kyrenia	143.6 (2)	168.1 (5)	70.9 (5)	9.1 (2)
Cyprus	164.5	150.8	68.2	12.5

Notes: the numbers in brackets indicate rank; (1) indicates lowest mortality while (6) highest

Table 7.3 shows Hajnal's singulate mean age at marriage (SMAM) for males for the different districts of Cyprus for census years up to 1931. These measures could not be computed for districts for 1946 and 1960. The mode of computation of SMAM for these years was as specified in Appendix 4.2 for the whole population of Cyprus for the period 1891 to 1931. SMAMs for the whole of Cyprus for 1946 and 1960 were computed in the conventional way.

SMAM for males for all Cyprus fluctuated slightly between 1891 and 1931, from 27.1 to 27.7 years, while it followed a declining trend thereafter, reaching 24.7 years in 1960. SMAMs for the different districts between 1891 and 1931 followed various trends. Male SMAM in Nicosia district declined between 1891 and 1911 from 28.4 years to 27.3 years while it increased slightly thereafter. SMAM in Larnaka district remained fairly constant in the period 1891 to 1901, at around 28.5 years, while it decreased between 1901 and 1911, reaching 27.8 years, and remained unchanged thereafter. By contrast, SMAM for males in Paphos district decreased slightly between 1891 and 1901, from 25.7 years to 25.2 years, but increased significantly thereafter, reaching 26.6 years in 1921. It is worth noting that SMAM for males in 1931 had decreased for most districts compared to 1891 except for Paphos, where it had increased.

SMAMs for Paphos district were the lowest in the island for all years while SMAMs for Famagusta district were the second lowest; the difference between the two districts, however, was notable, ranging between 0.7 and 1.5 years. The difference between lowest and highest SMAM for all districts was 2.9 years in 1891 and 3.4 years in 1901; however, the gap decreased thereafter and was reduced to 1.5 years in 1931. Thus, after 1901, male marriage patterns became more homogeneous.

Table 7.3: SMAM for males for Cyprus and the different districts, 1891-1960

District	1891	1901	1911	1921	1931	1946	1960
Nicosia	28.4	27.7	27.3	27.6	27.6	n.a.	n.a.
Larnaka	28.5	28.6	27.8	27.8	27.8	n.a.	n.a.
Limassol	28.0	27.6	27.4	28.4	27.5	n.a.	n.a.
Famagusta	27.2	26.7	26.7	27.3	27.2	n.a.	n.a.
Paphos	25.7	25.2	25.9	26.6	26.3	n.a.	n.a.
Kyrenia	28.6	27.6	28.2	28.6	27.4	n.a.	n.a.
Cyprus	27.7	27.2	27.1	27.6	27.4	26.2	24.7

Table 7.4 shows Hajnal's singulate mean age at marriage (SMAM) for females for census years. Again, it is

possible to observe differentials in marriage patterns between the districts only for the period 1891 to 1931 as the relevant information was unavailable in the 1946 and 1960 censuses. SMAMs for females were calculated in the same manner as for males. Female mean ages at first marriage in Cyprus were more or less constant between 1891 and 1911, when women married on average not long after their twenty-second birthday. SMAM increased slightly between 1911 and 1921 and more substantially the following decade, reaching 24.0 years in 1931. However, SMAM followed a declining trend thereafter, reaching 22.7 years in 1960.

SMAMs for the different districts between 1891 and 1911 followed various trends; for Kyrenia district mean age at first marriage for women increased by one year between 1891 and 1901, reaching 23.6 years, while it remained constant between 1901 and 1911. SMAM for Famagusta district decreased slightly between 1891 and 1911 from 22.5 years to 21.9 years. SMAM for Paphos district was fairly constant in the period 1891 to 1901 while it increased between 1901 and 1911, from 20.6 years to 21.1 years. In the period 1911 to 1921 female SMAM increased in all districts except Larnaka while by 1931 it had reached a peak in all districts.

SMAM for females in Paphos district was the lowest in the island for all years; in fact, it differed by about 1.5 years from the second lowest SMAM in 1891 and 1901 while the difference was reduced thereafter as it followed an increasing trend. SMAM in Kyrenia district was relatively high, particularly after 1891. The gap between highest and lowest SMAM for all districts was 2.3 years in 1891 and 3.0 years in 1901 but decreased thereafter, reaching 2.1 years in 1931.

Table 7.4: SMAM for females for Cyprus and the different districts, 1891-1960

District	1891	1901	1911	1921	1931	1946	1960
Nicosia	22.7	22.6	22.4	23.1	24.1	n.a.	n.a.
Larnaka	23.0	22.9	22.2	22.1	24.5	n.a.	n.a.
Limassol	22.1	22.6	22.0	22.7	23.5	n.a.	n.a.
Famagusta	22.5	22.2	21.9	23.4	24.6	n.a.	n.a.
Paphos	20.7	20.6	21.1	22.1	22.9	n.a.	n.a.
Kyrenia	22.6	23.6	23.6	24.4	25.0	n.a.	n.a.
Cyprus	22.3	22.3	22.1	22.9	24.0	23.8	22.7

Both males and females in Paphos district married on average quite early compared to the other districts of the island, though differentials were reduced after 1901. The distinct marriage patterns for Paphos district may be partly related to the relatively high proportion of Moslems that lived in that area, 30.6 per cent in 1891 though the percentage decreased over time and had dropped to 24.6 per cent by 1931. Moslems, as will be seen, married on average earlier than the remainder of the population.

Table 7.5 shows crude birth rates (CBRs) for the whole of Cyprus and the different districts of the island for census years. The rates were calculated as described previously in Chapter 5. The CBR for Cyprus increased between 1901 and 1911, from 27.3 per thousand to 31.7 per thousand, while by 1921 it had decreased again to 28.3 per thousand. However, the rate followed an increasing trend thereafter, reaching 32.9 per thousand in 1946. The rates increased substantially for most districts between 1901 and 1911; CBRs for Paphos, Larnaka and Kyrenia districts reached a peak in 1911 when they were 36.1, 39.1 and 48.2 per thousand, respectively. The CBR in Nicosia district apparently was extremely low in 1901, 19.1 per thousand, but also increased in that period, reaching 31.3 per thousand in 1911. By contrast, the CBR in Limassol district apparently decreased considerably in this period, from 28.2 per thousand to 18.9 per thousand. Between 1911 and 1921 CBRs decreased for most districts except for Limassol where the rate increased to 26.2 per thousand. After 1921 CBRs for most districts followed more or less a trend similar to that for the whole of Cyprus.

The exceptionally high CBRs for Kyrenia, Larnaka and Paphos districts in 1911 were, at least partly, due to a surprisingly high number of births recorded in these districts, and particularly in Kyrenia, in the two twelve-month periods ending on 31 March 1911 and 1912. Regrettably it was not possible to establish why an upsurge of births was registered in these districts that period. Had the average number of births for the four-year period starting on the first of April 1909 and ending on the 31st March 1913 been used to compute the CBRs for these districts for

1911, the rate for Kyrenia would have been 38.8 per thousand instead of 48.2 per thousand while the rates for Larnaka and Paphos districts would have been 36.4 and 34.6 per thousand, respectively, instead of 39.1 and 36.1 per thousand.

CBRs for Nicosia district in 1901 and Limassol district in 1911 were extremely low compared to other districts and to the rates for those districts in all other years. In addition, CDRs for Nicosia district in 1901 and for Limassol district in 1911 were implausibly low (see Table 7.1); thus, it seems certain that the rates for these districts were affected by underreporting of births and deaths. The CBRs imply that fertility was relatively high in Paphos district, particularly before 1946, while Famagusta and Larnaka districts also had relatively high fertility for most years.

Table 7.5: CBR for Cyprus and the different districts for census years, 1901-1960

Districts	1901	1911	1921	1931	1946	1960
Nicosia	19.08 (6)	31.33 (4)	26.16 (6)	29.35 (4)	33.16 (2)	19.09 (3)
Larnaka	31.05 (2)	39.14 (2)	29.55 (3)	27.37 (6)	34.98 (1)	21.76 (2)
Limassol	28.16 (4)	18.89 (6)	26.22 (5)	29.17 (5)	33.03 (3)	18.44 (4)
Famagusta	34.88 (1)	30.21 (5)	30.03 (2)	33.06 (1)	32.70 (4)	23.27 (1)
Paphos	30.19 (3)	36.06 (3)	31.97 (1)	32.86 (2)	31.55 (5)	13.16 (6)
Kyrenia	26.27 (5)	48.15 (1)	28.56 (4)	30.92 (3)	31.04 (6)	17.84 (5)
Cyprus	27.29	31.72	28.30	30.39	32.93	19.44

Notes: the numbers in brackets indicate rank; (1) indicates highest fertility while (6) lowest

Table 7.6 shows general marital fertility rates (GMFRs) for the whole of Cyprus and the different districts of the island for census years. The rates were calculated in the same manner as the CBRs except that the denominator was confined to married women aged 15-44. However, as numbers of married females aged 15-44 were unavailable for the districts in 1946 and 1960 the rates are presented only for the period 1901-1931. The GMFR for Cyprus increased between 1901 and 1911 from 195.3 per thousand to 227.8 per thousand while it declined slightly in the period 1911-1921, reaching 215.7 per thousand. However, GMFR followed an increasing trend thereafter and had reached 246.0 per thousand by 1946.

GMFRs for the different districts followed more or less similar trends to the CBRs. However, GMFRs imply slightly different levels of fertility for some districts. This is due to GMFRs relating births to married women; thus, the rates are not affected by high proportions of males and are less affected by differences in marriage patterns. For instance, GMFRs indicate that Kyrenia district had slightly higher marital fertility than Paphos district in 1901; the rate was 197.4 per thousand in Kyrenia compared to 195.4 per thousand for Paphos. By contrast, CBRs show that overall fertility was higher in Paphos district; the rate in Paphos was 30.2 per thousand while in Kyrenia it was only 26.3 per thousand. The higher overall fertility for Paphos in 1901 was probably due partly to females in that area getting married on average three years earlier than in Kyrenia district and to higher proportions of married females. Similarly, GMFRs indicate that marital fertility in 1921 in Famagusta district was higher than in Paphos district while CBRs imply the opposite for overall fertility. This is probably due partly to females in Paphos getting married earlier by 1.3 years than in Famagusta district and to higher proportions of married females in Paphos. In addition, the ratio of males to females in Paphos was only 0.982 compared to 1.028 for Famagusta; thus, CBR for Famagusta would appear lower. The GMFRs imply that Famagusta had the highest marital fertility in the island, except for 1911, while marital fertility in Paphos district was not particularly high, except for 1911.

Table 7.6: GMFR for Cyprus and the different districts for census years, 1901-1960

Districts	1901	1911	1921	1931	1946	1960
Nicosia	139.73 (6)	229.61 (4)	204.81 (5)	226.98 (4)	n.a.	n.a.
Larnaka	232.01 (2)	291.88 (2)	214.64 (4)	213.81 (6)	n.a.	n.a.
Limassol	203.89 (3)	134.27 (6)	199.10 (6)	214.38 (5)	n.a.	n.a.
Famagusta	248.57 (1)	221.44 (5)	240.92 (1)	254.61 (1)	n.a.	n.a.
Paphos	195.37 (5)	232.54 (3)	222.81 (2)	230.77 (3)	n.a.	n.a.
Kyrenia	197.36 (4)	361.60 (1)	219.93 (3)	238.38 (2)	n.a.	n.a.
Cyprus	195.34	227.77	215.73	230.10	246.00	142.68

Notes: the numbers in brackets indicate rank; (1) indicates highest fertility while (6) lowest.

To conclude, the data indicate that there were some differences in mortality and fertility levels among the six districts of Cyprus. It seems likely that southern and south-western areas of the island had relatively high mortality while Famagusta district in the eastern part of Cyprus had relatively high fertility for most years. The singulate mean ages at marriage indicate that in the period 1891 to 1901 marriage patterns in Paphos district were distinct as both males and females married on average quite early compared to the other districts of Cyprus. However, differentials in marriage patterns were reduced after 1901.

7.2 Differentials between the ethnic groups of Cyprus and how they compare with Greece and Turkey

In this section differentials between the two main ethnic groups of Cyprus, Greek Cypriots and Turkish Cypriots, are examined. In addition, a brief account of the demographic characteristics of the populations of Greece and Turkey for the period before 1960 is given and a discussion of how they compare with the Greek and Turkish Cypriot communities follows.

7.2.1 Differentials between the ethnic groups of Cyprus

The population of Cyprus in 1881 included two main ethnic groups: Greek Cypriots and Turkish Cypriots. Data on the different ethnic groups were not available as such, except in the 1960 census, but there was some information published in the census reports referring to religious communities and mother tongue of the population. This information is indirectly related to ethnic groups, as most Greek Cypriots' mother tongue is Greek and they are Greek Orthodox in religion while most Turkish Cypriots speak Turkish and are Muslim. However, the numbers of Greek Orthodox were slightly lower than the numbers of persons whose mother tongue was Greek for all censuses while the numbers of Moslems were slightly higher than the numbers of persons whose mother tongue was Turkish. In fact, the data show that Moslems included small numbers of persons whose mother tongue was Greek and Arabic. However, religion was chosen instead of mother tongue to represent ethnicity as more information was available for the religious communities of Cyprus.

Table 7.7 shows the percentage distribution of the population of Cyprus according to religion for census years. The group labelled "other religions " on Table 7.7 includes Armenians, Maronites, Roman Catholics and Anglicans. The data indicate that 73.9 per cent of the population of Cyprus in 1881 were Greek Orthodox. That percentage increased gradually between 1881 and 1901, reaching 77.1 per cent, while it continued increasing thereafter but at a slower pace; by 1946, 80.3 per cent of the population of the island were Greek Orthodox. However, the proportion of Greek Orthodox declined after 1946 and by 1960 it had dropped to 77.0 per cent. 24.4 per cent of the population of Cyprus in 1881 were Moslems; the proportion of Moslems followed a declining trend over time and by 1946 it had dropped to 17.9 per cent. However, that proportion increased slightly between 1946 and 1960, reaching 18.3 per cent. The percentage of the population having "other " religious beliefs stood at 1.7 per cent in 1881 but declined slightly thereafter, reaching 1.2 per cent in 1911. Between 1911 and 1931, however, that percentage increased slightly while it increased substantially in the period 1946 to 1960, reaching 4.7 per cent.

The increase in the proportions of Greek Orthodox in the period 1881 to 1946 and the decline in the proportions Muslim is probably related to more emigration for Moslems as, particularly in the earlier period, Turks were still leaving the island after the administration was handed over to the British in 1878. In fact, as it will be seen, differentials in emigration were very substantial before 1931. The decline in the proportion of Greek Orthodox between 1946 and 1960 is probably mainly due to a substantial increase in emigration after 1946. Over the same period, however, the proportion of Moslems increased somewhat probably due to emigration for that group increasing only slightly compared to the period 1931-1946 while emigration was less than in the period before 1931. In addition, it is possible that mortality for Moslems decreased more sharply than for Greek Orthodox after 1946, as it will be seen that differentials between these communities were reduced in that period. The numbers of persons of "other religions " between 1881 and 1960 were very small and very much dependent on changes in the numbers of the foreign born population.

Table 7.7: Percentage distribution of the population of Cyprus according to religion for census years, 1881-1960

	1881	1891	1901	1911	1921	1931	1946	1960
Greek Orthodox	73.93	75.77	77.10	78.25	78.81	79.48	80.25	77.00
Moslem	24.42	22.90	21.65	20.59	19.74	18.48	17.90	18.30
Other	1.65	1.33	1.25	1.16	1.45	2.04	1.85	4.70
total	100	100	100	100	100	100	100	100

Table 7.8 shows annual rates of growth for intercensal periods for the Greek Orthodox and Muslim communities of Cyprus, assuming a constant rate of growth between censuses. The annual rates of growth indicate that the Greek Orthodox community was increasing by 14.2 per thousand per year in the period 1881-1901. The rate of growth increased slightly between 1891-1901 and 1901-1911, reaching 16.0 per thousand in the latter period, while it followed a declining trend thereafter, reaching a low of 12.2 per thousand in the period 1921-1931. However, the rate of growth for the Greek Orthodox increased again between 1921-1931 and 1931-1946, reaching 17.2 per thousand in the latter period but then fell back to 14.3 per thousand in the period 1946-1960. By contrast, the annual rates of growth imply that the Muslim community was increasing by only 5.3 per thousand in the period 1881-1891. The rate of growth followed an increasing trend between 1881-1891 and 1901-1911, reaching 9.5 per thousand in the latter period but decreased thereafter, reaching a low of 4.6 per thousand, over the period 1921-1931. However, after 1931 the rate of growth increased very substantially; the Muslim community was increasing by 14.6 per thousand over 1931-1946 and by 18.8 per thousand in the period 1946-1960.

Comparing the rates of growth for the different religious communities over time it can be observed that between 1881 and 1931 the Greek Orthodox community was increasing at a much faster pace than the Muslim community while in the period 1931-1946 the difference had decreased significantly due to a substantial increase in the rates of growth for the Moslems. By contrast, over the period 1946-1960 it was the Muslim community that was growing at a faster rate. It is worth noting that between 1891 and 1946 the trend for the two communities was quite similar even though the levels were very different. For instance, rates of growth peaked for both communities in the period 1901-1911, before declining and reaching a low in the period 1921-1931 while the rates increased thereafter.

The substantial difference in the rates of growth for the two communities may be due partly to differentials in migration levels. It is probable that a higher proportion of Moslems than of Greek Orthodox emigrated in the period 1881 to 1946 while the difference may have been very considerable in the period before 1931. For instance, the Colonial Report for 1931 comments that in the period 1924 to 1926 large numbers of Moslems left Cyprus to become Turkish subjects (Colonial Office of Great Britain, 1932: 5). Thus, it is likely that in that period the very low rate of growth for Moslems, 4.6 per thousand, was mainly due to a substantial outflow of emigrants. In addition, higher mortality for Moslems than for Greek Orthodox in the period 1881-1946 may have contributed to the difference in the rates of growth as it will be seen that fertility was only slightly higher for Moslems before 1946 while mortality differentials between the two communities were more substantial. The higher rates of growth for Moslems in the period 1946-1960 may be due partly to a steeper decline in mortality than for Greek Orthodox that reduced differentials in mortality between the two communities in that period while differentials in fertility were maintained as for the period before 1946. In addition, emigration for the Greek Orthodox increased substantially after 1946 while it may have increased only slightly for Moslems compared to the period 1931-1946.

Table 7.8: Intercensal rates of growth (per person, per annum) for the religious communities of Cyprus, 1881-1960

	1881-91	1891-01	1901-11	1911-21	1921-31	1931-46	1946-60
Greek Orthodox	0.0142	0.0142	0.0160	0.0132	0.0122	0.0172	0.0143
Moslem	0.0053	0.0068	0.0095	0.0083	0.0046	0.0146	0.0188
Cyprus	0.0117	0.0125	0.0145	0.0125	0.0113	0.0166	0.0172

Table 7.9 shows ratios of males to females for the Greek Orthodox and Muslim communities of Cyprus for census years. The ratio for the Greek Orthodox community stood at 1.023 in 1881 while it increased slightly between 1881 and 1891, reaching 1.032. Then the ratio remained constant between 1891 and 1901 but followed roughly a declining trend thereafter; by 1921 the ratio had dropped below one while by 1960 it had decreased to 0.964. The ratio of males to females for the Muslim community was 1.068 in 1881; then the ratio followed an increasing trend and had reached 1.080 by 1911. However, after 1911 the ratio followed a declining trend and by 1960 it had dropped below one.

The ratios for the Greek Orthodox imply that there was an excess of males between 1881 and 1911 while there was an excess of females thereafter. The ratios for the Moslems, on the other hand, indicate an excess of males for the period 1881-1946 while there was an excess of females only in 1960. In addition, the ratios imply that the excess of males within the Muslim community was much more substantial than for the Greek Orthodox community, particularly before 1946. However, the ratios for the two communities followed roughly a similar trend over time with the exception of the period 1901-1911 when the ratio declined for the Greek Orthodox but increased slightly for the Moslems.

The substantial difference in the ratios of males to females for the religious communities may be partly explained by more omissions of Muslim than of Greek Orthodox females. Also, as female mortality for the period before 1911 was probably higher than male mortality (see Chapter 3), more pronounced sex differentials in mortality for Moslems than for Greek Orthodox may be part of the explanation. In addition, higher female than male mortality for the Muslim community may have persisted for longer. It is worth noting that the Muslim community included not only Turkish Cypriots but also Moslems born in countries other than Cyprus who were enumerated in the island at census years; in addition, the Muslim foreign born population included high proportions of males, particularly before 1931, which may have affected slightly the ratios of males to females for the Muslim community. For instance, had the numbers of the foreign born population from Turkey been subtracted from the Muslim population in 1891 the ratio of males to females would have been 1.063 instead of 1.071. Nevertheless, it is likely that Turkish Cypriots included higher proportions of males than Greek Cypriots.

Table 7.9: Ratios of males to females for the religious communities of Cyprus for census years, 1881-1960

	1881	1891	1901	1911	1921	1931	1946	1960
Greek Orthodox	1.023	1.032	1.032	1.020	0.995	0.971	0.971	0.964
Moslem	1.068	1.071	1.078	1.080	1.055	1.034	1.007	0.975
Cyprus	1.042	1.043	1.044	1.035	1.008	0.986	0.978	0.967

Table 7.10 shows the percentage distribution of the population for the Greek Orthodox and Muslim communities classified in three broad age groups in 1946 and 1960. Distributions by age and sex in 1960, however, were published for different races i.e. Greeks and Turks rather than for religious communities. Nevertheless, the numbers of Turks in 1960 were lower than those of Moslems by only 622 persons while Greeks exceeded Greek Orthodox by only 482 persons; thus, the comparability of the figures for 1946 and 1960 should not be affected significantly.

The data show that in 1946, 33.6 per cent of the Greek Orthodox population were aged 0-14, 56.8 per cent were aged 15-59 while 9.6 per cent were aged 60 or more. The figures for the Muslim community indicate that in 1946 there was a higher proportion of persons aged 0-14 than for Greek Orthodox, 35.6 per cent compared to 33.6 per cent, while the proportions of persons aged 15-59 and 60 or more were slightly lower. By 1960 the proportion of Greek Orthodox in the 0-14 age group had increased to 36.1 per cent while the percentage for the age group 15-59 had decreased from 56.8 per cent to 53.8 per cent and the proportion of persons aged 60 or more had increased slightly to 10.1 per cent. The changes for the Muslim community between 1946 and 1960 were very similar to those for the Greek Orthodox community; the proportion of persons aged 0-14 increased to 39.7 per cent in that period while the proportion of persons aged 15-59 decreased to 52.1 per cent. However, the proportion of persons aged 60 or more declined slightly for the Moslems, from 8.9 per cent to 8.2 per cent, while it had increased for the Greek Orthodox.

The proportions of persons aged 0-14 were higher for the Moslems than for the Greek Orthodox, both in 1946 and 1960, while proportions of persons aged 15-59 were slightly lower. The difference in the distribution by age for the two communities may be due, at least partly, to more emigration of Moslems aged 15-59 than of Greek Orthodox, as is implied by the relatively low rates of growth for the Muslim community before 1946. In addition, slightly higher fertility for Moslems than for Greek Orthodox may be part of the explanation. It is worth noting that while the proportions changed for both communities between 1946 and 1960, as emigration increased in that period, the differentials persisted.

Table 7.10: Percentage distribution of the population of the different religious communities in broad age groups for Cyprus, 1946 and 1960

age group	1946		1960	
	Greek Orthodox	Moslem	Greek Orthodox	Moslem
0-14	33.63	35.60	36.10	39.74
15-59	56.76	55.49	53.76	52.05
60+	9.61	8.91	10.14	8.22
total	100	100	100	100

Table 7.11 shows ratios of males to females in different age groups for the Greek Orthodox and Muslim communities of Cyprus for 1946 and 1960. For 1946 the ratios for the Greek Orthodox community indicate an excess of males in the 0-14 age group and an excess of females in all other age groups. The overall ratio was 0.971 and implies an excess of females in the Greek Orthodox population. The ratios for the Muslim community in 1946

indicate an excess of males in the 0-14 and 35-59 age groups and an excess of females in the 15-34 and 60+ age groups. The overall ratio for the Muslim community was 1.007 and shows a slight excess of males.

In 1960 the ratios of males to females for the Greek Orthodox community still showed an excess of males in the 0-14 age group and an excess of females in all other age groups. However, the ratio of males to females for the 15-34 age group had decreased between 1946 and 1960 from 0.953 to 0.906 while the ratio for the 35-59 age group had increased from 0.923 to 0.945. The overall ratio decreased slightly for Greek Orthodox in that period, reaching 0.964 in 1960. The ratios of males to females for the Muslim community in 1960 indicate that there was an excess of males in the 0-14 age group and an excess of females in all other age groups. The ratio for the 15-34 age group declined substantially between 1946 and 1960 from 0.963 to 0.892 while the ratio for the 35-59 age group decreased from 1.052 to 0.994. Thus, the overall ratio for Moslems decreased substantially, reaching 0.975 in 1960.

The substantial decline in the ratios of males to females between 1946 and 1960 for the 15-34 age group for the Greek Orthodox and Muslim communities may be, at least partly, due to an increase in the proportions of male emigrants in that period. The same may be true for the decrease in the ratio for the 35-59 age group for the Muslim community. However, declining female mortality at a faster pace than male mortality may have contributed to decreasing ratios of males to females, particularly for Moslems.

Table 7.11: Ratios of males to females in different age groups for the religious communities of Cyprus, 1946 and 1960

age group	1946		1960	
	Greek Orthodox	**Moslem**	**Greek Orthodox**	**Moslem**
0-14	1.037	1.037	1.047	1.035
15-34	0.953	0.963	0.906	0.892
35-59	0.923	1.052	0.945	0.994
60+	0.939	0.922	0.901	0.941
total	0.971	1.007	0.964	0.975

Table 7.12 shows Hajnal's singulate mean age at first marriage (SMAM) and proportions single at age 50 (S_{50}) for males and females for the Greek Orthodox and Muslim communities of Cyprus in 1946. The mode of computation of SMAM and of the proportions single at age 50 is specified in Appendix 7.1. SMAMs for 1946 indicate that Muslim males married at age 25 on average while Greek Orthodox males married 1.4 years later. Proportions single at age 50 imply that 5.9 per cent of Muslim males remained unmarried compared to 6.2 per cent for Greek Orthodox males. SMAMs for females indicate that Muslim women married on average at age 20.4; by contrast, women from the Greek Orthodox community married on average 4.1 years later, at age 24.5. Proportions single at age 50 for females indicate that only 1.2 per cent of Moslem women remained unmarried. However, the proportions were substantially higher for Greek Orthodox women, 4.7 per cent.

Muslim females had quite different marriage patterns from Greek Orthodox females; they married on average much earlier and much lower proportions remained single at age 50. However, the difference in marriage patterns between Muslim and Greek Orthodox males was less substantial; Moslems married on average only 1.4 years earlier while proportions single at age 50 were very similar. Thus, the gap between male and female SMAM in 1946 was much more pronounced for Moslems than for Greek Orthodox; that would imply that Moslems included a higher proportion of males than the Greek Orthodox or that there was polygyny among Moslems. In fact, ratios of males to females (see Table 7.9 and Table 7.11) suggest that Moslems included higher proportions of males than the Greek Orthodox, particularly in the period before 1946. On the other hand, polygyny for Moslems in Cyprus is unlikely to have been significant. For instance, the proportion of married females aged 15 or more over married males aged 15 or more in Cyprus in 1946 was 1.037, not particularly high, especially as that proportion is likely to be inflated by widowed females that were reported as married. In addition, married men are more likely to be away from Cyprus and thus, be omitted from the census than married women.

Table 7.12: SMAMs and proportions single at age 50 for males and females for the different religious communities of Cyprus, 1946

	males		females	
	Greek Orthodox	Moslem	Greek Orthodox	Moslem
SMAM	26.4	25.0	24.5	20.4
S_{50}	0.062	0.059	0.047	0.012

Table 7.13 shows average parities for all and ever-married women for the religious communities of Cyprus in 1946. The average parities are based on the numbers of children ever born reported at the census and are presented for three broad age groups as they were published in that format in the census report. Average parity for women aged 15-44 in 1946 was higher for Moslems, 2.17 children compared to 1.73 children for Greek Orthodox. Average parity for women aged 45-64 was very similar for Moslems and Greek Orthodox, 4.75 children against 4.73 children. By contrast, Greek Orthodox women aged 65 or more had on average slightly more children than Moslems, 5.30 compared to 5.22. In total, Muslim women aged more than 15 had on average the highest number of children, 3.06 compared to 2.79 for Greek Orthodox. Average parities for ever-married women aged 15-44, 45-64 and 65 or more in 1946 were slightly higher for Greek Orthodox than for Moslems; for instance, Greek Orthodox ever-married females aged 15-44 had on average 2.91 children against 2.83 children for Muslim women. Overall, Greek Orthodox ever-married women had on average 3.90 children compared to 3.65 for Moslems.

The data imply that for all age groups Greek Orthodox ever-married women had on average slightly more children than Muslim ever-married women. On the other hand, average parities for all women aged 15-44 were slightly higher for Moslems than for Greek Orthodox. This is probably due to Muslim females getting married on average 4.1 years earlier than Greek Orthodox females; thus, as marital fertility for women aged 15-44 was only slightly higher for Greek Orthodox, overall fertility was slightly higher for Moslems.

The average parities probably underestimate fertility, particularly for women aged 45 or more, due to omissions of children ever born. It is also possible that underreporting of children ever born was more for Muslim than for Greek Orthodox females, particularly as mortality before 1946 may have been higher for Moslems (see Table 7.14) and dead children are more likely to be omitted than children alive. Nevertheless, it is likely that Greek Orthodox and Muslim females had quite similar levels of marital fertility before 1946 while levels of overall fertility were slightly higher for Moslems.

Table 7.13: Average parities for all and ever-married women in different age groups for the religious communities of Cyprus, 1946

age group	all women		ever-married women	
	Greek Orthodox	Moslem	Greek Orthodox	Moslem
15-44	1.73	2.17	2.91	2.83
45-64	4.73	4.75	4.94	4.82
65 or more	5.30	5.22	5.51	5.29
total	2.79	3.06	3.90	3.65

Table 7.14 shows proportions of children dead for women for the religious communities of Cyprus in 1946. The figures are based on the numbers of children ever born and children surviving reported at the census. Again, the proportions are presented for three broad age groups as the relevant information was published in that format in the census report. Proportions of children dead increase with age of women for all religious groups. The data indicate that, for all age groups of women, children in the Muslim community had a higher risk of dying than children in the Greek Orthodox community while differentials were more pronounced for women over age 45. For instance, the proportion of children dead for Muslim women aged 15-44 was 20.0 per cent in 1946 compared to 16.3 per cent for Greek Orthodox women while that proportion for Muslim women aged 45-64 was 36.7 per cent against 25.9 per cent for the Greek Orthodox. Thus, it is likely that mortality before 1946 was higher for Moslems than for Greek Orthodox. Comparing Table 7.13 to Table 7.14 it seems likely that differentials in

mortality between the two communities were more pronounced than differentials in fertility.

Table 7.14: Percentage of children dead for women in different age groups for the religious communities of Cyprus, 1946

age group	percentage of children dead Greek Orthodox	Moslem
15-44	16.28	20.00
45-64	25.93	36.73
65 or more	33.23	43.90
total	23.31	29.86

Table 7.15 shows CBRs, CDRs and IMRs for the Greek Orthodox and Muslim communities of Cyprus for each year 1950-1954. The rates are presented only for that period as numbers of births and deaths for the ethnic groups were first published in 1950 while, as the registration system collapsed in 1955 and it was mainly the numbers of births and deaths for the Greek Cypriot community that were underreported, any data for the period after 1954 would not reflect genuine differentials. The rates were calculated by dividing the numbers of registered births and deaths in a year by the estimated mid-year populations. Mid-year populations were computed under the assumption that the rate of growth between the 1946 and 1960 censuses was continuous and even for both religious groups. IMRs were calculated by dividing the numbers of registered infant deaths in a year by the number of live births.

CBRs for the Greek Orthodox population were around 30 per thousand in the period 1950-1951 while the rates decreased thereafter, reaching 27 per thousand in 1952. Between 1952 and 1954 the rates for the Greek Orthodox community remained fairly constant. CBRs for the Moslems followed a declining trend in the period 1950-1952 when the rates decreased from about 35 per thousand to 29 per thousand while they remained fairly constant thereafter.

The CDR for the Greek Orthodox population was around 8 per thousand in 1950; the rate increased somewhat between 1950 and 1951 but followed a declining trend thereafter, reaching a low, 7 per thousand, in 1953. CDRs for the

Muslim community followed more or less a similar trend to those for Greek Orthodox though levels differed; the rate in 1950 was about 9 per thousand but had decreased to 8 per thousand by 1953.

IMRs for Greek Orthodox were around 59 per thousand in 1951; the rates followed a declining trend thereafter, reaching a low, 48 per thousand, in 1953 but had increased slightly by 1954, to 51 per thousand. IMR for Moslems stood at 67 per thousand in 1951; the rate increased slightly in 1952 but decreased substantially thereafter, reaching about 45 per thousand in 1953. However, IMR for Moslems increased again to 58 per thousand in 1954.

The data indicate that both fertility and mortality between 1950 and 1954 were higher for Moslems than for Greek Orthodox. However, the data may not be entirely reliable as there are substantial year-by-year fluctuations that may be related to changing completeness of registration. For instance, the rates for both religious communities reached a low in 1953. That seems suspect as there is no reason why mortality and fertility would reach a low at the same time. In addition, it is possible that there is differential underreporting between Greek Orthodox and Moslems. However, it is unlikely that underreporting would be more for the Greek Orthodox than for the Moslem. Hence, it seems likely that between 1950 and 1954 both fertility and mortality were slightly higher for Moslems than for Greek Orthodox. Thus, differentials in fertility observed for the period before 1946 were probably maintained in the period 1946-1954 as well while differentials in mortality seem to have been reduced.

Table 7.15: CBRs, CDRs and IMRs for the religious communities of Cyprus, 1950-1954

	Greek Orthodox			Moslem		
year	CBR	CDR	IMR	CBR	CDR	IMR
1950	29.85	8.12	n.a.	34.64	9.27	n.a.
1951	29.66	8.39	59.2	32.20	9.72	67.2
1952	27.22	7.72	56.3	29.13	8.24	70.1
1953	26.65	6.98	47.9	30.17	7.79	45.4
1954	27.18	7.07	51.0	30.26	8.36	57.5

To conclude, the Greek Orthodox community between 1881 and 1960 represented the largest proportion of the population of Cyprus, ranging from 74 per cent to 80 per cent. Over the same period the second largest community, the Moslems, represented between 18 and 24 per cent of the total population. The annual rates of growth indicate that the Greek Orthodox community between 1881 and 1931 was increasing much faster than the Muslim community while after 1931 the difference was reduced and in the period 1946-1960 it was the Muslim community that was growing at a faster pace. The Muslim community included a higher proportion of males than the Greek Orthodox community; in addition, in 1946 and 1960, Moslems included higher proportions of children aged 0-14 and slightly lower proportions of persons aged 60 or more. Marriage patterns in 1946 differed substantially between the two communities; Muslim males married on average 1.4 years earlier than Greek Orthodox males while Muslim females married 4.1 years younger than Greek Orthodox women. It is likely that Muslim females had slightly higher fertility than Greek Orthodox females before 1946 while differentials were maintained at least up to 1954. Mortality for Moslems also was higher than for Greek Orthodox, particularly before 1946 when differentials in mortality were more substantial than differentials in fertility. However, after 1946 differentials in mortality between the two communities were reduced.

7.2.2 Mortality, nuptiality and fertility in Greece and Turkey for the period before 1960 and how they compare with the ethnic groups of Cyprus

In this section a brief account of mortality, nuptiality and fertility levels and trends is presented for the populations of Greece and Turkey for the period before 1960. In addition, an attempt is made to link these characteristics with the Greek Cypriot and Turkish Cypriot communities.

According to Valaoras mortality in Greece was declining in the second half of the 19th century; CDRs were around 27 per thousand in the period 1860-64 but had decreased to 21 per thousand by 1905 (1960; 132). Between 1905 and 1925 CDRs fluctuated around 20-21 per thousand while the rates resumed a declining trend thereafter, reaching 15 per thousand in the period 1935-39 and 10 per thousand in the period 1954-59. Infant mortality also followed a declining trend after 1875; IMRs were around 200 per thousand in the period 1860-1874 but had decreased to 173 per thousand by 1905 (Valaoras, 1960). Thereafter, IMRs decreased further, reaching 148 per thousand in the period 1920-24, 109 per thousand in the period 1935-39 and 42 per thousand in the period 1955-59. Life tables computed by Valaoras for census years, starting from 1879, indicate that female mortality in Greece was lower than male mortality (1966: 18).

Mortality in Turkey was relatively high in the 1940s; CDRs stood at around 34 per thousand in the period 1940-44. However, mortality followed a declining trend over time with CDRs reaching 24 per thousand in the period 1950-54 and 19 per thousand in the period 1955-60 (Hacettepe University Institute of Population Studies; 1988: 4-5). IMRs in Turkey were around 260 per thousand in the period 1945-49 but followed a declining trend over time; in the late 1950s the rates had decreased to around 205 per thousand (Hacettepe University Institute of Population Studies; 1988: 4-6). So far as sex differentials in mortality are concerned, estimates of the expectation of life at age 5 indicate that female adult mortality between 1935 and 1945 was higher than male adult mortality while thereafter the opposite was true (Shorter, 1968: 22).

Mortality in Cyprus was probably higher for Turkish Cypriots than for Greek Cypriots. However, differentials between the two communities were less than between the Greek and Turkish populations. Female mortality for the whole population of Cyprus between 1881 and 1911 probably exceeded male mortality while it is possible that differentials were more pronounced within the Turkish Cypriot community. Thus, sex differentials in mortality in Cyprus resembled more or less the Turkish mortality patterns. On the other hand, mortality decline in Cyprus followed a pattern similar to that for Greece though with a time lag of about ten years.

Hajnal's singulate mean ages at marriage, computed in the conventional way (see Appendix 4.2 in Chapter 4) using the distribution of the population by age, sex and marital status from the 1907, 1920, 1928 and 1951 censuses of Greece, indicate that males in 1907 married on average at age 27.6. Mean age at marriage for Greek males increased between 1907 and 1920 from 27.6 years to 29.6 years while it decreased thereafter, reaching 27.9 years in 1928. However, male SMAM had increased again to 29.7 years by 1951. Proportions single at age 50 indicate that in 1907 8.2 per cent of males remained unmarried. Proportions single for males decreased over time, reaching 7.3 per cent in 1920 and 6.5 per cent in 1951. SMAM for females in 1907 indicates that women in Greece married on average at age 22.3. Mean age at marriage for females increased substantially between 1907 and 1920, reaching 24.8 years, while it decreased slightly thereafter, reaching 23.6 years in 1928. However, female SMAM increased again in the period 1928 to 1951, reaching 25.9 years. Proportions single at age 50 for females fluctuated between 3.0 per cent and 4.0 per cent in the period 1907 to 1928 while they increased somewhat thereafter, reaching 5.0 per cent in 1951. Numbers of marriages in Greece were relatively low in leap years due to a prejudice of the Greek population.

Singulate mean ages at marriage for the population of Turkey indicate that males in the period 1935-1960 married on average between ages 22.6 and 23.7 (Berksan, 1969: 148-159). Proportions single at age 50 for males ranged from 1.9 per cent to 3.5 per cent in that period. Females in Turkey in the period 1935 to 1960 married on average between ages 18.9 and 19.7 while proportions single at age 50 ranged between 1.3 per cent and 2.8 per cent. Mean age at marriage and proportions single at age 50 were higher for the population of urban areas than for the whole population of Turkey. For instance, males in urban areas of Turkey in 1935 married on average at age 25.3 while females married at age 21.3. Mean age at marriage decreased for both males and females in urban areas between 1935 and

1960, reaching 24.2 years for males and 20.2 years for females. Proportions single at age 50 for males in urban areas decreased between 1935 and 1960 from 6.5 per cent to 3.6 per cent while the proportions for females decreased from 4.0 per cent to 2.5 per cent in that period.

Marriage patterns for Turkish Cypriots resemble those for the urban population of Turkey, particularly for males. Male SMAM for Turkish Cypriots in 1946 was 25.0 years and proportions single at age 50 were 5.9 per cent compared to 25.3 years and to 6.5 per cent for the urban areas of Turkey in 1935. Similarly, SMAM for Turkish Cypriot females in 1946 was 20.4 years compared to 20.3 years for females in urban areas of Turkey in 1955; however, proportions single at age 50 for Turkish Cypriot women were substantially lower, 1.2 per cent against 3.5 per cent. In fact, proportions single at age 50 for Turkish Cypriot females were quite similar to those for women in rural areas of Turkey in 1955.

Marriage patterns for the Greek Cypriot population, on the other hand, present some similarities to those for the Greek population, particularly for females. Mean age at marriage for Greek males in 1951 were higher than for Greek Cypriots in 1946 by 3.3 years while proportions single at age 50 for Greek males were only slightly higher, 6.5 per cent compared to 6.2 per cent for Greek Cypriots. However, mean age at marriage for Greek males had reached a peak in 1951 while for Greek Cypriot males SMAM was declining after 1931. If male SMAM for 1931 for the whole population of Cyprus was compared to the SMAM for Greek males in 1928 or in 1907 the difference would have been insubstantial, 0.5 years and 0.2 years respectively. Thus, it is likely that marriage patterns for Greek males would fit more closely those for Greek Cypriot males before 1946. Greek females in 1951 married on average 1.4 years later than Greek Cypriot females in 1946. However, SMAM for Greek women in 1920 was 24.8 years, only 0.3 years higher than for Greek Cypriot females in 1946. Proportions single at age 50 for Greek females ranged between 3.0 and 5.0 per cent in the period 1907-1951 cent compared to 4.7 per cent for Greek Cypriot females in 1946. Greek Cypriots shared the prejudice of Greeks against marrying in leap years.

Fertility in Greece, according to Valaoras, followed a downward trend from the 1890s onwards; CBRs in the 1880s were around 40-41 per thousand but had decreased to 35 per thousand by 1905 and to 31 per thousand by 1925 (1960). Thereafter, CBRs fluctuated between 30 and 32 per thousand, before resuming a declining trend in 1935. The rates decreased to 28 per thousand in the period 1935-39 while they had dropped to 20 per thousand by 1960. Series of the Coale index of marital fertility, Ig, produced by Siampos and Valaoras also indicate that marital fertility was declining in Greece between 1900 and 1961 (1969: 605). The index stood at 0.688 in 1900 but decreased to 0.535 in 1928, to 0.399 in 1951 and to 0.327 in 1961.

Fertility in Turkey was relatively high in the late 1930s; CBRs were around 51 per thousand in the period 1935-40 (Balamir, 1978: 5). However, fertility followed a declining trend thereafter; CBRs had decreased to around 48 per thousand by 1950 and to 45 per thousand by 1960.

Fertility for Turkish Cypriots was probably higher than for Greek Cypriots though differentials may have been less substantial than between Greeks and Turks. Fertility levels for the whole population of Cyprus were probably lower than for the population of Turkey and more similar to those for Greece. However, the onset of the fertility transition in Greece, according to Valaoras, was in the last decade of the 19th century (1960). By contrast, it is likely that in Cyprus natural fertility prevailed around that period (see Chapter 5). Siampos and Valaoras' series of Ig indicate that marital fertility in Greece had declined by 22 per cent between 1900 and 1928 while the index had decreased to 0.399 by 1951 (1969: 605). Fertility in Cyprus, on the other hand, probably decreased only slightly in the early 1920s and in the 1930s while the index of marital fertility was still relatively high in 1946 when it stood at 0.57 (see Chapter 5).

Valaoras' account of fertility levels and trends in Greece (1960) is quite similar to the account of St. John-Jones about fertility changes in Cyprus (1983), particularly for the period between the 1890s and the 1930s. However, the account of St. John-Jones is highly improbable (see Chapter 5). Moreover, Valaoras' conclusions as well as the series of Ig produced by Siampos and Valaoras are based on estimates obtained after using methods to adjust the data which are not clearly specified. For instance, numbers of births for the Greek population are unavailable for the period 1885 to 1920 and between 1941 and 1955. Thus, Ig is based on estimates obtained by the reverse survival of the "smoothed" census population aged 0-4 and 5-9; the mortality levels used in that procedure are based on stable populations (1969: 602). However, no account of the estimated mortality levels is given or of the process used to smooth the census populations. Hence, it is impossible to verify Siampos and Valaoras' estimates of Ig or Valaoras' statement about the onset of the fertility transition in Greece.

To conclude, mortality levels and trends for the population of Cyprus present more similarities to levels and trends for the Greek population though sex differentials were more similar to those for the population of Turkey. Marriage patterns for Turkish Cypriots in 1946 were quite similar to those for the urban population of Turkey while marriage patterns for Greek Cypriots present some similarities to the patterns for the Greek population. In addition, both Greeks and Greek Cypriots shared a prejudice against marrying in leap years. Fertility levels for the Cypriot population were quite similar to those for the Greek population though fertility decline in Cyprus may have begun later than in Greece.

Appendix 7.1: Computation of SMAM for the religious communities, 1946

The 1946 census report provided information on the distribution of the population of the different religious communities by age, sex and marital status for five year age groups between ages 15 and 44. Thus, proportions single for the age groups 45-49 and 50-54 for the different religious communities were unavailable. To estimate the proportions single for the 45-49 and 50-54 age groups the proportions single in the age group 35-39 for a certain religious community were divided by the proportions single in that age group for the whole population of Cyprus and a ratio was obtained. This process was repeated for the 40-44 age group; then, the ratios obtained for the 35-39 and 40-44 age groups were averaged. Proportions single in the 45-49 age group for a certain religious group were calculated by multiplying the proportions single in that age group for the overall population by the aforementioned average ratio for that religious community. The proportions single for the 50-54 age group were computed similarly, using the proportions single in the 50-54 age group for the overall population and the same ratio. Then SMAM was computed in the conventional way while proportions single at age 50 were calculated as the average of the proportions single in the age groups 45-49 and 50-54.

Chapter 8: CHARACTERISTICS OF THE GREEK CYPRIOT POPULATION AFTER 1960

In this chapter, the growth of the population for the period after 1960 is considered as well as levels and trends in mortality, nuptiality, fertility and migration. In fact, the chapter mainly focuses on the characteristics of the population resident in the Republic of Cyprus (the area controlled by Greek Cypriots) after the partition of the island in 1974 due to lack of data for the period 1960-1974 and for the area controlled by Turkish Cypriots after 1974. However, there are some data on migration for the whole population of Cyprus between 1960 and 1973. In addition, the 1973 micro-census provided reliable data on the distribution of the Greek Cypriot population by age and sex (see Chapter 1). For the area controlled by Greek Cypriots after 1974 the available data include information from the 1976 count of the population, the 1982 census of housing and the 1980-81 Demographic Survey.

8.1 Population size and distribution by age and sex, 1960-1982

In this section the growth of the Greek Cypriot population between 1960 and 1982 is considered as well as changes in the distribution by age and sex. In addition, changes in the distribution of the urban and rural populations are discussed.

8.1.1 Growth of the population and changes in the distribution by age and sex

Table 8.1 shows the size of the Greek Cypriot population for census years as well as annual rates of growth for intercensal periods, assuming a constant rate of growth between censuses. The Greek Cypriot population increased between 1960 and 1973 from 442,138 persons to 515,778 persons while it decreased in the period 1973-1976, reaching 497,879 persons. However, after 1976 the population followed again an increasing trend though in 1982 it was still less than in 1973. The annual rates of growth indicate that the population was increasing by 13 per thousand in the period 1960 to 1973 while it was decreasing by 10 per thousand over the period 1973 to 1976. However, the rate of growth became positive again after 1976 and the population was growing by 5 per thousand in the period 1976-1982.

The annual rate of growth for the Greek Orthodox population in the period 1931-1946 was 17 per thousand and had decreased to 14 per thousand in the period 1946-1960 (see Table 7.8, chapter 7). The relatively low rates of growth for the period 1946 to 1973 are probably partly due to considerable emigration while declining fertility also reduced the rates of growth but mainly after 1960, as it will be seen that the decline was not substantial over 1946-1960 but became steep thereafter.

The negative rate of growth for the period 1973-1976 is due mainly to very substantial emigration; official statistics indicate that in 1974 there was a net outflow of 15,408 persons while between 1975 and 1978 net migration amounted to 23,283 emigrants (Department of Statistics and Research, 1993). The official statistics also show that between 1978 and 1982 there were only -232 net migrants (Department of Statistics and Research, 1993). Figures based on the numbers of intending immigrants and emigrants published in the Tourism, Migration and Travel Statistics (see Table 8.32), though they underestimate emigration, show that two thirds of the emigrants over 1974-1982 had left the island by 1976. Thus, the increase in the rate of growth for the period 1976-1982 is probably due to less emigration.

Table 8.1: Population and intercensal rates of growth (per person, per annum) for Greek Cypriots, 1960-1982

	1960	1973	1976	1982
population	442,138	515,778	497,879	512,098
rate of growth		0.013	-0.010	0.005

Table 8.2 shows the percentage distribution of the Greek Cypriot population classified in three broad age groups for the period 1960-1982. In addition, the distribution of the Greek Orthodox population in 1946 is presented to enable comparison with the earlier period. The data imply that the proportion of the population aged 0-14

increased between 1946 and 1960 from 33.6 per cent to 36.1 per cent while it followed a declining trend thereafter, reaching 24.7 per cent in 1982. By contrast, the proportion of persons aged 15-59 decreased between 1946 and 1960 from 56.8 per cent to 53.8 per cent while it followed an increasing trend thereafter, reaching 60.8 per cent in 1982. The proportion of the population aged 60 or more increased between 1946 and 1982 from 9.6 per cent to 14.5 per cent.

The proportion of persons aged 0-14 in 1960 was relatively high compared to all other years while proportions aged 15-59 were relatively low. This is probably due to substantial emigration of persons aged 15-59 in the period 1955-1960. If the figures for that year are disregarded, the data show a continuous decline in the proportions of young persons between 1946 and 1982 while the proportions of persons aged 15-59 and 60 or more increased in that period. It is likely that declining fertility resulted in the alteration of the distribution of the population by age, particularly after 1960. By 1973 the Greek Cypriot population showed signs of "ageing ".

Table 8.2: Percentage distribution of the Greek Cypriot population in broad age groups for census years, 1946-1982

age group	1946[a]	1960	1973	1976	1982
0-14	33.63	36.10	28.85	26.29	24.74
15-59	56.76	53.76	57.60	59.52	60.78
60+	9.61	10.14	13.55	14.19	14.48
total	100	100	100	100	100

[a] The data for 1946 refer to the Greek Orthodox population rather than to Greek Cypriots

Table 8.3 shows ratios of males to females in different age groups for Greek Cypriots for the period 1960-1982. In addition, ratios are presented for the Greek Orthodox population in 1946 to enable comparison with the earlier period. For the total population the ratio of males to females decreased slightly between 1946 and 1960, from 0.971 to 0.964, while it increased somewhat thereafter, reaching 0.988 in 1982. Thus, the ratio implies that the excess of females in the population decreased slightly between 1960 and 1982. The ratio of males to females for the 0-14 age group increased between 1946 and 1982, from 1.037 to 1.058, while the ratio for the 15-34 age group decreased in the period 1946 to 1960, from 0.953 to 0.906, but increased substantially thereafter, reaching 1.036 in 1982. The ratio of males to females for the 35-59 age group fluctuated somewhat between 1946 and 1982, ranging from 0.923 to 0.946, while the ratio for persons aged 60 or more decreased substantially in that period, from 0.939 to 0.853.

The data imply that in 1946 and 1960 there was an excess of males in the 0-14 age group and an excess of females in all other age groups; by 1982, however, the excess of males in the 0-14 age group had increased while there was an excess of males in the 15-34 age group, as well. The increase in the excess of males aged 0-14 between 1946 and 1982 may be partly attributable to declining infant mortality at a faster pace for males than for females as IMRs decreased very substantially in that period and differentials in infant mortality between males and females are likely to have been reduced. The relatively low ratio for the 15-34 age group in 1960 may be partly due to more male than female emigration while the increase in that ratio between 1960 and 1982 is probably mainly attributable to decreasing excess of male emigrants over time. The decline in the ratio for the 60+ age group probably implies that mortality for females was declining at a faster pace than for males while decreasing overreporting of age by males aged less than 60 over time may have also contributed to the decrease in that ratio.

Table 8.3: Ratios of males to females in different age groups for the Greek Cypriot population, 1946-1982

age group	1946[a]	1960	1973	1976	1982
0-14	1.037	1.047	1.053	1.057	1.058
15-34	0.953	0.906	0.995	1.005	1.036
35-59	0.923	0.945	0.931	0.934	0.946
60+	0.939	0.901	0.881	0.857	0.853
total	0.971	0.964	0.979	0.978	0.988

[a] The data for 1946 refer to the Greek Orthodox population rather than to Greek Cypriots

To conclude, the rate of growth for the Greek Cypriot population in the period 1960-1973 was only slightly lower than in the period 1946-1960. The rate of growth between 1973 and 1976, however, was negative due to very substantial emigration while as emigration decreased after 1976 the rate of growth became positive again, though it remained at much lower levels than in the pre-1973 period. Declining fertility resulted in changes in the distribution of the population by age, particularly after 1960; proportions of persons aged 0-14 decreased in the period 1946-1982 while proportions of persons aged 60 or more increased substantially. The ratios of males to females imply that the excess of females in the population decreased somewhat between 1960 and 1982, probably due partly to decreasing excess of male emigrants over time. However, the excess of females in the 60+ age group increased considerably in that period as mortality for females was declining at a faster pace than for males.

8.1.2 Changes in the distribution of the population by age and sex in urban and rural areas of Cyprus

After the partition of the island in 1974 urban areas in the part of Cyprus controlled by Greek Cypriots include the towns of Larnaka, Limassol and Paphos, part of Nicosia town and its suburbs. The towns of Famagusta and Kyrenia as well as the remainder of Nicosia town are in the area of Cyprus controlled by Turkish Cypriots.

Table 8.4 shows the percentage distribution of the Greek Cypriot population classified in three broad age groups for urban and rural areas in 1982. The proportion of persons aged 0-14 in urban areas in 1982 was 25.0 per cent, very similar to that for rural areas. However, the proportion of persons aged 15-59 was higher in urban areas, 62.7 per cent compared to 57.5 per cent for rural areas. The proportion of persons aged 60 or more, on the other hand, was higher in rural areas, 18.2 per cent against 12.4 per cent for urban areas. Thus, the population of urban areas in 1982 included higher proportions of persons aged 15-59 and lower proportions of persons aged 60 or more than the population of rural areas. It is likely that the difference in the distribution of the population by age between urban and rural areas is partly due to rural to urban migration of young adults which also accentuated the problem of population "ageing " in rural areas.

It is worth noting that the population of urban areas in 1946 and 1960 also included higher proportions of persons aged 15-59 and lower proportions of persons aged 60 or more than the population of rural areas (see Table 2.6, chapter 2). However, proportions of persons aged 0-14 were lower for urban areas, particularly in 1946, in spite of fertility being nearly the same in both urban and rural areas that year, while the difference in the percentage of the population aged 15-59 between urban and rural areas was more substantial in the period before 1960. This may be partly related to changing characteristics of in-migrants to urban areas after 1960. It is possible that in-migrants to urban areas in the earlier period included a high proportion of single males while after 1960 a high proportion of families moved to urban areas. In fact, this change may be partly due to Greek Cypriot refugee families migrating to urban areas after the partition of the island in 1974.

Table 8.4: Percentage distribution of the Greek Cypriot population in three broad age groups in urban and rural areas, 1982

age group	urban	rural	Cyprus
0-14	24.96	24.35	24.74
15-59	62.66	57.50	60.78
60+	12.38	18.15	14.48
total	100	100	100

Table 8.5 shows ratios of males to females for the Greek Cypriot population for urban and rural areas in 1982. The ratio for persons aged 0-14 in urban areas was 1.056, very similar to that for rural areas. By contrast, the ratio for the 15-34 age group implies a slight excess of females in urban areas but shows a substantial excess of males for rural areas; the ratio in urban areas was 0.993 against 1.121 for rural areas. The ratio of males to females for persons aged 35-59 indicates an excess of

females for both the urban and rural populations; however, the excess of females was substantial in rural areas while it was slight in urban areas. The ratio for persons aged 60 or more also implies an excess of females for both populations, though the excess was more substantial in urban areas. The ratio for the whole urban population in 1982 was 0.981 compared to 1.001 for the rural population.

The substantial excess of males in the 15-34 age group for the rural population is difficult to explain, particularly as between 1881 and 1960 it was the urban population that included a higher proportion of males and, specially, in the 15-34 age group. This may be related to changing characteristics of rural to urban migrants and of emigrants from rural areas after 1960. It is likely that after 1960 more females than males migrated from rural to urban areas or overseas. In fact, in Chapter 6 it was shown that in the period 1955-1960, but probably also before then, there was an excess of males among intending emigrants. In addition, it will be seen, that more males than females emigrated in 1961 and in 1962 while, thereafter, there was an excess of females among emigrants.

Table 8.5: Ratios of males to females in different age groups for the Greek Cypriot population in urban and rural areas, 1982

age group	urban	rural	Cyprus
0-14	1.056	1.060	1.058
15-34	0.993	1.121	1.036
35-59	0.973	0.894	0.946
60+	0.832	0.879	0.853
total	0.981	1.001	0.988

To conclude, the Greek Cypriot population in urban areas in 1982 included higher proportions of persons aged 15-59 and lower proportions of persons aged 60 or more than the population of rural areas. However, proportions of persons aged 0-14 were very similar for both urban and rural areas. Nevertheless, it is likely that rural to urban migration had accentuated population "ageing " for rural areas by 1982. The population of rural areas in 1982 also included a higher proportion of males, particularly in the 15-34 age group.

8.2 Levels and trends in mortality, 1960-1982

In this section mortality rates computed from registration and census data are examined and compared with data from the 1980-81 Demographic Survey. In addition, a variety of "indirect techniques " are employed to obtain estimates of mortality from survey data. Finally, an attempt is made to put together these measures to provide a realistic account of both levels and changes over time.

8.2.1 Crude death rates and infant mortality rates

Table 8.6 shows crude death rates (CDRs) and infant mortality rates (IMRs) for the Greek Cypriot population for census years and 1980-81. In addition, rates for 1946 are presented for the whole population of Cyprus to enable a comparison with the earlier period. For 1976 the CDR was calculated by dividing the average number of deaths registered in the period 1976-1977 by the 1976 census population. This denominator was more or less appropriate as the census was carried out on the 30th of September. The rate for 1982 was calculated in the same manner. To calculate the rate for 1980-81, on the other hand, the number of deaths reported by the respondents for the 12 months preceding the survey was divided by the number of respondents. The IMR for 1980-81 was calculated by dividing the number of infant deaths reported by the respondents for the year preceding the survey by the number of births reported for that year.

CDRs increased slightly between 1946 and 1976, from 8.5 per thousand to 9.2 per thousand while the rate apparently declined substantially thereafter, reaching 5.8 per thousand in 1980-81. However, CDR had increased again to 8.7 per thousand by 1982. IMRs, on the other hand, decreased significantly between 1946 and 1980-81 from 68 per thousand to 7 per thousand. The data imply that overall mortality remained unchanged between 1946 and 1982 while infant mortality decreased substantially.

The declining trend in infant mortality in the period 1946 to 1980-81 seems genuine though the levels reflected by the IMR for 1980-81 are implausibly low. This is probably related to sampling errors as only 4 infant deaths were reported for the 12 months preceding the survey. The CDR for 1980-81 is also extremely low compared with the rates for 1976 and 1982. It should be noted that deaths were still severely underreported in Cyprus in that period as the registration system had not yet recovered after collapsing in 1955 and the rates for 1976 and 1982 are based on adjusted numbers of deaths published in the Demographic Reports. The Demographic Report for 1991, for instance, states that registration of deaths that year was still less than 45 per cent complete (Department of Statistics and Research, 1992: 22).

Table 8.6: CDR and IMR for Cyprus, 1946-1982

measure	1946	1976	1980-81	1982
CDR	8.52	9.17	5.76	8.73
IMR	68.2	n.a.	6.7	n.a.

Table 8.7 shows CDRs and IMRs computed from numbers of deaths, infant deaths and births that occurred between rounds one and two and between rounds two and three of the 1980-81 Demographic Survey. However, the numbers of vital events between rounds one and two of the survey are based on a segment of the sample population while the numbers of vital events between rounds two and three are based on the whole sample.

The CDR based on numbers of deaths occurring between rounds one and two of the survey is 6.8 per thousand while the rate for between rounds two and three is higher, 8.0 per thousand. The IMR computed from numbers of infant deaths and births that occurred between rounds one and two is 5 per thousand, extremely low, while the rate computed from numbers of events occurring between rounds two and three is substantially higher, 19 per thousand.

The difference in the rates for the different rounds is surprising and may be due to more underreporting of deaths between rounds one and two of the survey or to that segment of the sample population being unrepresentative. However, if there is pronounced seasonality in deaths part of the difference in the rates may be genuine though this alone cannot explain the considerable difference in IMRs.

Again, IMRs are affected by sampling errors due to the very small numbers of infant deaths reported at the survey. The CDR based on numbers of deaths occurring between rounds two and three seems fairly plausible as it is based on the whole sample and is nearer to the rates estimated for 1976 and 1982.

Table 8.7: CDR and IMR for Cyprus, 1980-81

measure	Rounds 1-2	Rounds 2-3
CDR	6.80	8.03
IMR	5.1	18.8

Table 8.8 shows IMRs based on the numbers of last born children reported in the 1980-81 survey. The IMRs were computed by dividing the numbers of last born children that died in a certain period before reaching age one by the numbers born in that period. The rates indicate substantial decreases in infant mortality over time; IMR stood at 63 per thousand in the pre-1950 period while it had decreased to 38 per thousand in the period 1950-1959 and had reached 11 per thousand in the period after 1970.

Infant mortality based on last born children is usually an overestimate as mortality is higher for births of high order. On the other hand, more omissions of dead children by older women would result in the underestimation of infant mortality, particularly for the earlier period. In fact, these figures underestimate infant mortality compared to IMRs derived from registration data; IMRs based on registration data ranged between 66 and 81 per thousand in the period 1945 to 1949 while they fluctuated between 52 and 61 per thousand in the period 1950-1954. In addition, even IMRs based on registration data underestimate infant mortality; IMRs were probably, on average, around 105 per thousand in the late 1940s while the rates were around 65 per thousand in the late 1950s. Nevertheless, the declining trend in infant mortality is genuine.

Table 8.8: IMRs based on last born children, 1980-81

	pre-1950	1950-59	1960-69	post-1970
IMR	62.62	38.25	20.78	11.12

8.2.2 Mortality levels and trends based on indirect methods

In this section, indirect techniques were used to estimate mortality levels and trends from information provided in the 1980-81 Demographic Survey (United Nations, 1983). Three different methods were used to estimate child and adult mortality. The first method uses information on the orphanhood status of the respondents and gives estimates of male and female adult mortality. The second method uses information on the survival status of the first spouse of ever-married respondents and provides estimates of male and female adult mortality. The last method uses information about numbers of children ever born and children surviving and gives estimates of infant and child mortality. A detailed account of these methods is given in Appendix 8.1. Finally, a method was used to link the estimates of child with adult mortality to provide life tables for males and females for the mid-1970s (see Appendix 8.3).

a. Estimation of adult mortality using the orphanhood method

This method uses information from a question in a survey about the orphanhood status of the respondents. The proportions of the respondents whose mother is alive at the time of the survey are used to estimate female adult mortality while the proportions whose father is alive are used to estimate male adult mortality (Appendix 8.1, a).

Table 8.9 shows conditional survivorship probabilities for males derived from the orphanhood method of Brass. In addition, mortality levels, expectations of life at birth (e_0) and IMRs are presented as well as reference periods for the estimates. The mortality levels are based on both the west and south families of Coale-Demeny model life tables for males. The time reference periods were computed under the assumption that mortality prior to the survey was declining smoothly and the general standard model life table of Brass represented accurately the adult mortality patterns of the observed population.

The estimates imply that male adult mortality was declining in the period 1966.7 to 1975.9. The estimates based on the west model show that the pace of the decline was faster in the earlier period; expectation of life at birth apparently increased from 58.8 years in 1966.7 to 68.7 years in 1968.2 while it increased by a further 3.6 years thereafter, reaching 72.3 years in 1975.9. By contrast, the estimates based on the south model indicate that expectation of life at birth for males increased by 8.6 years between 1966.7 and 1968.2, from 54.5 years to 63.1 years, while it increased by another 8.3 years thereafter, reaching 71.4 years in 1975.9. However, both sets of estimates show a slight increase in mortality between 1970.4 and 1972.0.

The huge and abrupt decline in mortality implied by the method for the period 1966.7 to 1968.2 is totally implausible. In fact, estimates of mortality indicate that expectation of life at birth for males in the late 1950s was around 63 years (see Chapter 3). Thus, it seems likely that mortality for the earlier period has been overestimated by the method. That is probably related to the assumption about fertility remaining constant in the 20-year period preceding the survey not being satisfied, as it will be seen that fertility in Cyprus followed a steep downward trend in the 1960s and possibly in the early 1970s while it remained more or less constant between 1976 and 1982. Hence, mean age at paternity, which is used by the method as an indicator of the average age at which fathers are first exposed at the risk of dying, decreased between 1960 and 1980-81, from 30.2 years to 28.6 years. If mean age at paternity for 1960 were used to estimate mortality for the earlier period, the conditional probability of surviving between ages 32.5 and 80 would have been 0.270 instead of 0.219 while the expectation of life at birth based on the west model would have been 65.1 years instead of 58.8 years and the expectation of life at birth based on the south model would have been 60.4 years instead of 54.5 years.

The expectations of life at birth estimated by the method for the period after 1972 are relatively high and seem suspect. In addition, the increase of the expectation of life at birth by 2.4 years as implied by the west model or by 3.6 years as implied by the south model in the two year period between 1972.0 and 1973.8 is implausible. Thus, it seems likely that the figures for the more recent period underestimate mortality. This may be related to respondents aged less than 15 reporting on the survival status of their adoptive father. The IMRs based on the west model in Table 8.9, as it will be seen, underestimate infant mortality while those based on the south model are overestimates.

Table 8.9: Estimates of male adult mortality based on the orphanhood method of Brass, 1980-81

age x	survivorship probability from 32.5 to x	reference date	West model			South model		
			level	e_0	IMR	level	e_0	IMR
45	0.981	1975.9	23.4	72.3	18.2	23.2	71.4	45.0
50	0.963	1973.8	23.3	72.2	18.8	22.9	70.7	47.7
55	0.915	1972.0	22.4	69.8	26.8	21.4	67.1	62.1
60	0.870	1970.4	22.8	70.8	23.2	21.6	67.7	59.8
65	0.766	1969.2	22.2	69.1	29.5	20.3	64.4	73.1
70	0.640	1968.2	22.0	68.7	31.1	19.8	63.1	78.8
75	0.437	1967.4	20.5	64.9	46.4	18.1	59.0	95.4
80	0.219	1966.7	18.0	58.8	74.8	16.2	54.5	113.6

Table 8.10 shows conditional survivorship probabilities for females derived from the orphanhood method of Brass. In addition, mortality levels, expectations of life at birth (e_0) and IMRs are presented as well as reference periods for the estimates. The mortality levels are based on both the west and south families of Coale-Demeny model life tables for females. The time reference periods were computed under the assumption that mortality prior to the survey was declining smoothly and the general standard model life table of Brass represented accurately the adult mortality patterns of the observed population.

The estimates imply that female adult mortality declined substantially in the overall period. The estimates based on the west model show that expectation of life at birth increased from 64.8 years to 72.7 years in the early period while it increased by a further 4.7 years between 1968.6 and 1972.3 and remained fairly constant thereafter.

The estimates based on the south model indicate that expectation of life at birth for females increased from 60.2 years to 66.7 years in the earlier period while it increased by a further 10.8 years thereafter, reaching 77.5 years in 1976.2.

The estimates indicate that a huge and abrupt decline in female mortality occurred in the earlier period, just as the estimates of male mortality on Table 8.9. This substantial decrease in mortality is highly improbable; in fact, the method assumes that mean age at maternity, which is an indicator of the average age mothers are first exposed at the risk of dying, have remained constant at the past. However, mean age at maternity decreased between 1960 and 1980-81 from 28.2 years to 26.5 years. If mean age at maternity for 1960 was used to estimate mortality for the earlier period, the conditional probability of surviving between ages 25 and 80 would have been 0.370 instead of 0.313 while the expectation of life at birth based on the west model would have been 70.1 years instead of 64.8 years and the expectation of life at birth based on the south model would have been 65.0 years instead of 60.2 years. In fact, expectation of life at birth for females in the late 1950s was around 66.5 years (see Chapter 3); thus, an expectation of life at birth of around 70 years for the late 1960s seems plausible.

The estimates also show a considerable decline in mortality for the period 1969.6 to 1970.8 while the implied expectations of life at birth, particularly those based on the west model, are extremely high. It is possible that the figures for the more recent period before the survey underestimate mortality, perhaps partly due to adopted children and young adults reporting that their mother is alive. IMRs based on the west model, as it will be seen, underestimate infant mortality while those based on the south model overestimate it.

The time reference periods for before 1969.6 imply that the estimates refer more or less to the same year even though mortality levels differ. It is likely that the reference dates for the earlier period are unreliable probably because the assumption about a smooth change in mortality over time is not satisfied or perhaps because the general standard model of Brass is a poor representation of the adult mortality patterns of Cypriot females.

Table 8.10: Estimates of female adult mortality based on the orphanhood method of Brass, 1980-81

age x	survivorship probability from 25 to x	reference date	West model			South model		
			level	e_0	IMR	level	e_0	IMR
35	0.996	1976.2	24.0	77.5	8.86	24.0	77.5	32.9
40	0.992	1974.1	23.9	77.3	9.64	23.7	76.7	35.7
45	0.987	1972.3	24.0	77.4	9.91	23.6	76.6	35.9
50	0.973	1970.8	23.8	76.9	10.5	23.0	75.0	41.4
55	0.939	1969.6	22.9	74.7	16.3	21.5	71.2	54.9
60	0.901	1968.9	22.7	74.3	17.4	20.9	69.8	59.8
65	0.839	1968.6	22.5	73.8	18.9	20.4	68.5	64.5
70	0.731	1968.6	22.1	72.7	22.2	19.7	66.7	71.2
75	0.519	n.a.	20.2	67.9	39.2	17.7	61.6	89.6
80	0.313	n.a.	18.9	64.8	51.3	17.1	60.2	94.4

Table 8.11 shows conditional survivorship probabilities for females derived from a variant of Brass' method developed by Trussell. In addition, mortality levels, expectations of life at birth (e_0) and IMRs are presented as well as reference periods for the estimates. The mortality levels are based on both the west and south families of Coale-Demeny model life tables for females. The time reference periods were computed under the assumption that mortality prior to the survey was declining regularly and the general standard model life table of Brass represented accurately the adult mortality patterns of the observed population.

The estimates based on the west family of Coale-Demeny model life tables imply that female adult mortality decreased substantially in the period before 1969.2 when expectation of life at birth increased from 73.2 years to 76.2 years. Thereafter, however, mortality fluctuated slightly; expectation of life at birth ranged between 75.3 years and 77.3 years in the period 1969.2 and 1977.3. By contrast, the estimates based on the south model imply that expectation of life at birth increased from 67.5 years to 71.3 years in the early period while it increased by a further 4.5 years thereafter.

The fluctuations in mortality shown by the estimates based on the west model seem suspect as well as the extremely high expectations of life at birth for females implied for all years. In addition, the abrupt decline in mortality shown by both sets of estimates for the earlier period is implausible while the south model also indicates that mortality decreased significantly in the more recent period. The reference dates for the earlier period imply that different mortality levels corresponded to the same year. Thus, it is likely that the technique used to time locate the mortality estimates provided unreliable results, particularly for the earlier period, probably because the assumption about a smooth change in mortality is not satisfied.

Comparing the estimates of female adult mortality derived from the Brass method to those obtained using Trussell's variant, the latter method implies slightly lower mortality for the earlier period while it indicates slightly higher mortality for the more recent period before the survey. In fact, the conditional probabilities of surviving between ages 25 and 55 to ages 25 and 70 obtained by Trussell's variant are very similar to the ones that would be obtained by the Brass' method if the mean age at maternity for 1960 was used. However, the estimates based on the Brass method indicate more or less a continuous decline in mortality while those based on Trussell's variant and the west model imply declining mortality for the early period only and fluctuations thereafter.

Table 8.11: Estimates of female adult mortality based on the orphanhood method of Trussell

age x	survivorship probability from 25 to x	reference date	West model			South model		
			level	e_0	IMR	level	e_0	IMR
45	0.985	1977.3	23.8	77.0	10.4	23.4	75.9	38.4
50	0.975	1975.1	23.9	77.3	9.6	23.2	75.6	39.3
55	0.944	1973.1	23.1	75.3	14.7	21.8	72.0	51.9
60	0.913	1971.5	23.2	75.5	14.0	21.6	71.5	53.6
65	0.867	1969.2	23.3	75.9	13.1	21.6	71.4	54.0
70	0.791	1968.7	23.5	76.2	12.3	20.5	71.3	54.4
75	0.601	1968.7	22.3	73.2	20.8	20.0	67.5	68.4

Comparing the estimates of male and female mortality obtained from the orphanhood method it seems likely that between 1967 and 1976 male adult mortality exceeded female adult mortality. The estimates based on the west family of Coale-Demeny model life tables imply a less pronounced decline in both male and female mortality than the estimates based on the south model while they also show lower mortality for the earlier period; thus, they seem more plausible. However, both male and female mortality for the more recent period before the survey were underestimated by the method. The IMRs based on the west model, as it will be seen, underestimate infant mortality while those based on the south model are overestimates.

b. Estimation of adult mortality using the widowhood method

This method uses the proportions of ever-married respondents whose first spouse was alive at the time of the survey to provide estimates of male and female adult mortality (Appendix 8.1, b). In the 1980-81 Demographic Survey information was provided about the widowhood status of the female respondents only. Thus, it was possible to obtain estimates of male but not of female adult mortality. However, as proportions of non-widowed females were available both by age of the respondents and by duration of first marriage two different sets of estimates of male mortality were obtained.

Table 8.12 shows conditional survivorship probabilities for males based on the proportions of ever-married women whose first husband was alive at the time of the survey classified by age of women. In addition, mortality levels, expectations of life at birth (e_0) and IMRs are presented as well as reference periods for the estimates. The mortality levels are based on both the west and south families of Coale-Demeny model life tables for males. The time reference periods were computed under the assumption that mortality prior to the survey was declining regularly and the general standard model life table of Brass represented accurately the adult mortality patterns of the observed population.

The estimates seem to imply that male adult mortality increased between 1968.7 and 1981.3. The estimates based on the west model show that expectation of life at birth decreased from 70.3 years to 64.5 years in that period while the estimates based on the south model show that expectation of life at birth decreased from 67.2 years to 60.9 years.

The increasing trend in mortality implied by the data is highly unlikely; in addition, the estimates based on the orphanhood method show the opposite to be true. Thus, it is probable that the method provided unreliable estimates. This may be due to data errors; misreporting of age by women or misreporting of the survival status of the first husband. It is worth noting that the method assumes that marriage patterns were constant prior to the survey. However, singulate mean age at marriage increased for both males and females between 1960 and 1980-81; SMAM for males increased from 24.7 years to 25.8 years while SMAM for females increased from 22.7 years to 23.7 years. Nevertheless, use of SMAMs for 1960 for the earlier period gives only slightly higher conditional survivorship probabilities while the trend remains the same. Hence, reporting errors are more likely to have affected the estimates than deviations from the assumptions.

Table 8.12: Estimates of male adult mortality based on the reported proportions on non-widowed females by age

age x	survivorship probability from 20 to x	reference date	West model			South model		
			level	e_0	IMR	level	e_0	IMR
25	0.989	1981.3	20.4	64.5	48.4	18.9	60.9	87.8
30	0.980	1979.0	20.9	65.8	42.5	19.5	62.3	81.8
35	0.968	1976.8	20.8	65.6	43.5	19.5	62.6	80.9
40	0.962	1974.6	21.5	67.4	35.8	20.4	64.7	71.9
45	0.942	1972.6	21.3	66.9	37.9	20.2	64.1	74.4
50	0.914	1970.9	21.3	66.8	38.1	20.0	63.8	75.9
55	0.898	1969.6	22.3	69.5	27.8	21.3	66.8	63.5
60	0.852	1968.7	22.7	70.3	24.8	21.5	67.2	61.8

Table 8.13 shows conditional survivorship probabilities for males based on the proportions of ever-married women whose first husband was alive at the time of the survey classified by duration of first marriage. In

addition, mortality levels, expectations of life at birth (e_0) and IMRs are presented as well as reference periods for the estimates. The mortality levels are based on both the west and south families of Coale-Demeny model life tables for males. The time reference periods were computed under the assumption that mortality prior to the survey was declining regularly and the general standard model life table of Brass represented accurately the adult mortality patterns of the observed population.

The estimates indicate a declining trend in male adult mortality between 1970.0 and 1979.6 though with substantial fluctuations. The conditional probability of surviving between ages 20 and 40 is substantially higher than the probability of surviving between ages 20 and 35 and thus, the estimates for 1973.1 are out of line. The data also imply a very substantial decline in mortality for the more recent period before the survey. The estimates based on the west model indicate that expectation of life at birth for males increased from 68.9 years to 71.5 years in the period 1970.0 to 1977.3 while it had reached 76.0 years by 1979.6. The estimates based on the south model, on the other hand, imply that mortality increased somewhat between 1970.0 and 1977.3 when expectation of life at birth for males decreased from 69.8 years to 68.9 years while mortality declined considerably thereafter and expectation of life at birth reached 74.1 years in 1979.6.

The slight increase in mortality between 1970.0 and 1977.3 implied by the estimates provided by the south model is suspect; it is possible that the south model did not represent accurately the mortality patterns of the Cypriot population after 1960 or in the 1970s. The substantial decrease in mortality between 1977.3 and 1979.6 reflected in all estimates is implausible and may be related to reporting errors as only one woman out of the 862 with a marriage duration of less than five years declared that her first husband was dead while 15 women in that group did not respond to the question at all.

The method assumes that male marriage patterns were constant in the past; however, SMAM for males increased between 1960 and 1980-81. If SMAM for 1960 was used to estimate male mortality for the earlier period the expectation of life at birth based on the west model would have been 67.6 years instead of 68.9 years and the data would imply a more substantial decline in mortality for the overall period. Comparing Table 8.12 to Table 8.13 it seems that the estimates of male mortality based on duration of marriage are better than those based on age of respondents.

Table 8.13: Estimates of male adult mortality based on the reported proportions on non-widowed females by duration of marriage

age x	survivorship probability from 20 to x	reference date	West model			South model		
			level	e_0	IMR	level	e_0	IMR
25	0.998	1979.6	24.8	76.0	7.2	24.2	74.1	34.8
30	0.990	1977.3	23.2	71.5	20.6	22.1	68.9	55.0
35	0.983	1975.1	22.8	70.8	23.2	22.1	68.7	55.8
40	0.994	1973.1	25.0	76.6	5.4	25.2	76.6	25.4
45	0.962	1971.3	22.8	70.6	23.9	22.1	68.7	55.6
50	0.949	1970.0	22.1	68.9	29.7	22.5	69.8	51.2

Comparing the estimates of adult male mortality derived from the orphanhood method to those obtained by the widowhood method it seems likely that the estimates based on the former technique are more reliable.

c. Estimation of child mortality from information about children ever born and children surviving

This method uses information from a question in a census or survey about the number of children ever born and the numbers of children surviving at the time of the survey (Appendix 3.3,c). This question was included in the 1980-81 Demographic Survey and childhood mortality estimates were obtained for that period.

Table 8.14 shows estimates of probabilities of surviving between exact ages 0 and x (l(x)) as well as mortality levels, IMRs and expectations of life at birth (e_0) derived from the survey data. Moreover, reference periods for the estimates are presented as well as the infant mortality rates that are based on the alpha parameter of Brass' logit life table system and are labelled IMR*s in Table 8.14. To calculate the probabilities of surviving, the reference periods, the mortality levels, the expectations of life at birth and the IMRs both the west and south families of Coale-Demeny model life tables for both sexes were used. However, as the probabilities of surviving based on the west model were virtually identical to those based on the south model, only one column of l(x) is presented on the table. The IMR*s were calculated under the assumption that the general standard model life table of Brass represented accurately the childhood mortality patterns of the observed population.

The estimates based on the west model indicate that childhood mortality was declining more or less gradually between 1966.2 and 1974.8 when IMRs decreased from 41 per thousand to 24 per thousand while a substantial decline occurred in the period 1974.8 to 1977.1 when the rate dropped to 16 per thousand. However, the estimates based on the west model imply that childhood mortality increased between 1977.1 and 1980.1; IMRs increased to 26 per thousand in that period. The estimates based on the south model imply more or less the same trend though reference periods differ slightly. In addition, the IMRs based on the south model indicate slightly higher mortality for the period 1966 to 1975 and for 1979 than the IMRs based on the west model and thus, they seem better. The IMR*s, on the other hand, imply lower mortality than is shown by the west and south models, particularly for the earlier period, and seem improbable. The expectations of life at birth implied by the estimated mortality levels and the south model are implausibly high while those based on the west model may be somewhat low.

The substantial decline in childhood mortality between 1974.8 and 1977.1 as well as the subsequent increase are suspect. In fact, they are probably due to reporting errors as proportions of dead children for women aged 25-29 in 1980-81 were lower than for women aged 20-24 (see Table A8.1, Appendix 8.2). In addition, the proportions for women aged 20-24 were about the same as for women aged 15-19. Thus, the estimates for 1977.1 are unreliable while mortality for 1980.1 may have been overestimated.

The children ever born and children surviving method tends to underestimate somewhat mortality as dead children are more likely to be omitted than children alive. In addition, the IMRs for the earlier period probably underestimate mortality more than for the more recent period before the survey as omissions of dead children increase with age of women. On the other hand, declining fertility in the 1960s and early 1970s may have resulted in mortality for the earlier period being slightly overestimated. Thus, combination of declining fertility and more omissions from older women may have resulted in the slight underestimation of childhood mortality for the earlier period.

Table 8.14: Mortality estimates based on the children ever born and children surviving method of Trussell

x	l(x)	IMR*	West model				South model			
			reference date	level	e_0	IMR	reference date	level	e_0	IMR
1	0.974	25.39	1980.1	22.1	70.7	26.4	1980.1	25.0	77.9	26.7
2	0.976	17.98	1979.0	22.5	71.9	22.5	1979.0	25.2	78.4	25.2
3	0.983	11.39	1977.1	23.4	74.1	15.7	1977.2	26.9	82.7	10.6
5	0.972	16.95	1974.8	22.4	71.4	24.0	1974.9	24.9	77.6	27.7
10	0.963	19.99	1972.1	21.9	70.1	28.3	1972.2	24.2	76.0	33.2
15	0.945	28.09	1969.3	20.8	67.4	38.6	1969.2	22.9	72.7	44.9
20	0.935	29.80	1966.2	20.5	66.8	41.1	1965.9	22.4	71.4	49.7

The estimates of mortality levels derived from the children ever born and children surviving method and the west family of Coale-Demeny model life tables imply higher mortality than the estimates derived from the orphanhood method and the west model, particularly for the 1970s. By contrast, the estimates of mortality levels derived from the children ever born and children surviving method and the south family of Coale-Demeny model life tables imply lower mortality than the estimates derived from the orphanhood method and the south model. It seems likely that infant and child mortality decreased faster than adult mortality between 1930 and 1960 and thus, the relationship between infant and adult mortality changed. From the 1960s onwards, or even somewhat earlier, the south family of Coale-Demeny model life tables did not represent accurately the mortality patterns of the Cypriot population. Perhaps the mortality patterns of the Cypriot population in the 1960s and the 1970s were nearer to those embodied in the west family of Coale-Demeny model life tables though infant mortality was higher.

d. Estimation of a life table for the mid-1970s by linking child survivorship probabilities with conditional adult survivorship probabilities

Table 8.15 shows estimates of probabilities of surviving from birth to exact age x (l(x)) and of the expectation of life at exact age x (e(x)) for males and females for the mid-1970s. The radix of these life tables is one. The life tables were obtained by linking the estimates of infant and child mortality derived from the children ever-born and children surviving method for 1980-81 with the estimates of adult mortality for males and females obtained from the orphanhood method, using level 20 of the south family of Coale-Demeny model life tables for males and females as standard (Appendix 8.3).

The estimates indicate that expectation of life at birth for males in the mid-1970s was 69.0 years and the male IMR was 22 per thousand. Expectation of life at birth for females that period was 71.9 years and the female IMR was 18 per thousand. These IMRs are somewhat lower than the estimates obtained from numbers of children ever born and children surviving for 1979 and 1980 (see Table 8.14). If the 1976 census population is combined with these life tables to estimate numbers of deaths for males and females, the crude death rate would be 11.9 per thousand. The CDR based on numbers of deaths and the 1976 census population, on the other hand, is lower, 9.2 per thousand (see Table 8.6). However, numbers of deaths for 1976 are based on official estimates as the registration system in Cyprus had not yet recovered after collapsing in 1955; hence, the estimates based on indirect techniques are likely to be more reliable.

Use of model life tables other than level 20 of the south family as standard would provide slightly different estimates of mortality for the mid-1970s. For instance, if level 23 of the west family of Coale-Demeny model life tables was chosen to represent mortality patterns for males aged 0-44 while level 23 of the south family was used for those aged 45 or more, expectation of life at birth for males would have been around 70 years instead of 69 years and the IMR would have been 26 per thousand instead of 22 per thousand. Similarly, if levels 25, 24 and 23 of the south family were used to represent mortality patterns for females aged 0-9, 15-29 and 30 or more, respectively, expectation of life at birth would have been 73 years instead of 72 years and IMR would have been 27 per thousand instead of 18 per thousand.

Table 8.15: Life tables for males and females for Cyprus for the mid-1970s

	Males		Females	
Exact age x	l(x)	e(x)	l(x)	e(x)
0	1	69.0	1	71.9
1	0.97797	69.6	0.98175	72.2
2	0.97289	68.9	0.97679	71.6
3	0.97019	68.1	0.97423	70.8
4	0.96860	67.2	0.97278	69.9
5	0.96764	66.3	0.97185	68.9
10	0.96523	61.5	0.96986	64.1
15	0.96333	56.6	0.96843	59.2
20	0.96050	51.7	0.96632	54.3
25	0.95636	47.0	0.96330	49.5
30	0.95179	42.2	0.95962	44.6
35	0.94584	37.4	0.95519	39.8
40	0.93847	32.7	0.94970	35.0
45	0.92747	28.1	0.94210	30.3
50	0.91072	23.5	0.93154	25.6
55	0.88314	19.2	0.91473	21.0
60	0.83831	15.1	0.88851	16.6
65	0.76487	11.3	0.84109	12.4
70	0.64708	7.9	0.75208	8.6
75	0.46266	5.0	0.58296	5.3
80	0.23467	2.5	0.32958	2.5

8.2.3 Conclusion

The registration data imply that infant mortality was declining between 1960 and 1982. In addition, estimates derived from the children ever born and children surviving method also indicate that infant and child mortality followed a declining trend between 1966 and 1980. The method probably underestimated slightly mortality for the earlier period while it overestimated mortality for 1980. The estimates of IMR for the earlier period based on the south family of Coale-Demeny model life tables are slightly higher than those based on the west model and probably reflect more accurately childhood mortality levels.

The orphanhood method indicates that male and female adult mortality decreased significantly between the late 1960s and the mid-1970s. The estimates based on the west family of Coale-Demeny model life tables, however, imply a more modest decline in both male and female mortality than those based on the south model and thus, they seem more plausible. The estimates also show that female adult mortality was lower than male adult mortality. The method probably overestimated mortality for the earlier period while it underestimated mortality for the more recent period before the survey. The widowhood method did not provide plausible estimates.

It seems likely that IMRs followed a declining trend in the overall period; the rates probably decreased from around 65 per thousand in the late 1950s to around 55 per thousand in the early 1960s, reaching 50 per thousand in the late 1960s. Thereafter, IMRs decreased further, reaching about 35 per thousand in the early 1970s and around 25 per thousand in the late 1970s. Expectation of life at birth for females probably increased from around 66.5 years in the late 1950s to 68.5 years in the early 1960s and to 70 years in the late 1960s. Thereafter, female mortality continued a downward trend and expectation of life at birth increased to 72 years in the early 1970s and to 74.5 years in the late 1970s, reaching perhaps around 75.5 years in the early 1980s. Expectation of life at birth for males probably increased from around 63 years in the late 1950s to 65 years in the early 1960s and to 67 years in the late 1960s. Then, expectation of life at birth for males increased further, reaching 69 years in the early 1970s, 71 years in the late 1970s and perhaps around 72 years in the early 1980s.

8.3 Levels and trends in nuptiality, 1960-1982

In this section, nuptiality measures computed from registration, census and survey data are presented. Figure 8.1 shows crude marriage rates (CMRs) for each year 1976-1987. The rates themselves are presented in Appendix 8.3. Crude marriage rates were calculated by dividing the number of registered marriages in a year by the mid-year population. Mid-year populations were estimated under the assumption that the rate of growth between the 1976 and 1982 censuses was continuous and even. Mid-year populations for the period 1983-1987 were calculated using the same rate of growth as for the period 1976-1982.

The most interesting feature shown by the data is that the rates follow a four year cycle, with a low point each leap year; thus, the prejudice of the Cypriot population against marrying in leap years continues to be strong. CMRs also imply that the incidence of marriage in the period 1976-1987 was higher than for the pre-1960 period. For instance, when CMRs had peaked over the period 1943-1947 they fluctuated between 7.9 and 9.6 per thousand. By contrast, between 1976 and 1987 the rates ranged from 7.4 to 12.9 per thousand.

Figure 8.1: Crude Marriage Rate (per 1,000 population), Cyprus 1976-1987

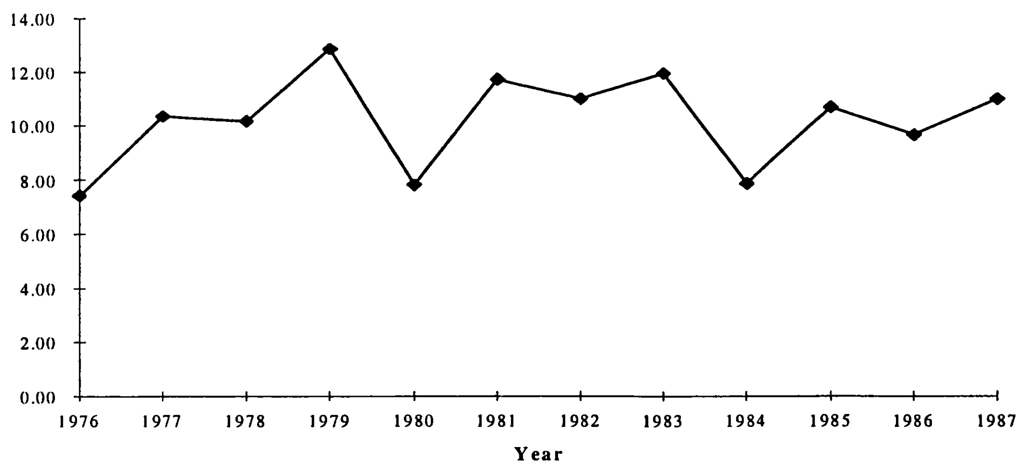


Table 8.16 shows crude marriage rates (CMRs), general marriage rates (GMRs) and Coale's index of proportions married for females (Im) for the Greek Cypriot population for census years and 1980-81. In addition, rates for 1946

and 1960 are presented for the whole population of Cyprus to enable a comparison with the earlier period. For 1946 CMR was calculated by dividing the average number of marriages registered in the period 1945 to 1948 by the 1946 census population. The rates for 1960, 1976 and 1982 were calculated in the same way. The denominators were more or less appropriate as the censuses were carried out in September or later while the four year average of marriages serves to eliminate the leap year effect. However, the rate for 1980-81 was computed by dividing the number of marriages reported by the respondents for the year preceding the survey by the survey population. General marriage rates were calculated in the same manner as CMRs except that the denominators were confined to single females aged 15 or more. Im is the number of births that would occur to married women if they experienced the Hutterites' age-specific marital fertility rates over the number of births that would occur if all women experienced those marital fertility rates (Coale, 1967: 205-209; Coale and Treadway, 1986: 153-162).

CMRs indicate that the incidence of marriage decreased between 1946 and 1960 while it increased substantially between 1960 and 1976 and remained at relatively high levels thereafter. The rates decreased from 8.6 per thousand to 6.7 per thousand in the period 1946-1960 but had increased to 10.0 per thousand by 1976. GMRs, on the other hand, show only a slight decline in the incidence of marriage between 1946 and 1960, when the rates decreased from 97.2 per thousand to 89.6 per thousand, while GMRs had recovered by 1976 and had increased substantially by 1982, reaching 120.8 per thousand. By contrast, Im increased between 1946 and 1960, from 0.609 to 0.661, while it decreased substantially in the period 1960-1976, reaching 0.568. However, Im increased again after 1976, reaching 0.645 in 1980-81 and remained constant thereafter.

CMRs and GMRs give slightly different indications about trends in nuptiality. The GMR is a more refined measure of nuptiality as it relates numbers of marriages to single females who are at risk of getting married for the first time and thus, it reflects nuptiality trends more accurately than the CMR. For instance, the substantial increase in GMRs between 1976 and 1982 is due to a decline in the numbers of single females aged 15 or more while, as the total population increased in that period, CMRs imply a slight increase only.

Im differs from both the CMR and the GMR as it is based on the numbers of married females at a census or a survey. Thus, Im is based on female marriages that took place in the twenty or thirty year period preceding the census and incorporates past trends. In addition, Im is an "average " of proportions married for females, weighted by the Hutterites' marital fertility rates. The increase in Im between 1946 and 1960 probably reflects the fact that mean age at first marriage for females was declining in that period as well as that the proportion of married females aged 15-49 had increased from 61.9 per cent to 66.2 per cent. The relatively low Im for 1976 reflects the fact that mean age at first marriage had increased by then while the proportion of married females aged 15-49 had decreased. The increase in Im between 1976 and 1982 implies that women after 1976 tended to get married earlier again as well as that the proportion of married females aged 15-49 had increased from 59.9 per cent to 65.3 per cent in that period.

Table 8.16: CMR, GMR and Coale's index Im for Cyprus, 1946-1982

	1946	1960	1976	1980-81	1982
CMR	8.64	6.72	10.00	9.10	10.68
GMR	97.2	89.6	96.8	94.4	120.8
Im	0.609	0.661	0.568	0.645	0.643

The distribution of the population by age, sex and marital status enables the calculation of Hajnal's singulate mean age at marriage (SMAM) which is an estimate of the mean age at first marriage. Table 8.17 shows SMAMs for males and females for the whole population of Cyprus in 1946 and 1960 and for the Greek Cypriot population thereafter.

SMAM for males decreased between 1946 and 1960 from 26.2 years to 24.7 years while it increased in the period 1960 to 1976, reaching 26.3 years. Between 1976 and 1980-81, however, SMAM for males apparently decreased by 0.5 years while it increased somewhat thereafter, reaching 26.1 years in 1982. SMAM for females also decreased between 1946 and 1960, from 23.8 years to 22.7 years, while it increased by 1.5 years in the period 1960 to 1976, reaching 24.2 years. However, between 1976 and 1982 SMAM for females decreased by 0.7 years.

Male and female SMAMs followed roughly similar trends between 1946 and 1982. However, male SMAM remained well below the pre-1946 levels, when it fluctuated between 27.1 and 27.7 years, while female SMAM remained higher than in the pre-1931 period when females married on average at age 22.3. Nevertheless, part of the increase in female SMAM after 1960 is due to the exclusion of the Turkish Cypriot population from the calculations as Muslim females married on average much younger than Greek Orthodox females; in fact, in 1946 Greek Orthodox women married on average at age 24.5 compared to age 20.4 for Muslim women (see Table 7.12, chapter 7). It is worth noting that the trend of female SMAM between 1946 and 1982 is very similar to that of the Im; as mean age at first marriage decreases Coale's index of proportions married for females increases and vice versa.

Table 8.17: SMAMs for males and females for Cyprus, 1946-1982

	1946	1960	1976	1980-81	1982
males	26.2	24.7	26.3	25.8	26.1
females	23.8	22.7	24.2	23.7	23.5

Table 8.18 shows proportions of males and females remaining single at age 50 for the whole population of Cyprus in 1946 and 1960 and for the Greek Cypriot population thereafter. The proportions single at age 50 are the average of the proportions single in the 45-49 and 50-54 age groups and roughly correspond to the proportion of persons that never got married.

Proportions single at age 50 for males followed a downward trend between 1946 and 1976, when they decreased from 6.4 per cent to 2.3 per cent, while they remained more or less constant thereafter. Proportions single at age 50 for females followed roughly an increasing trend between 1946 and 1982, reaching 5.2 per cent in the latter period. It is worth noting that proportions single at age 50 for males reached a low in the more recent period while for females the proportions remained at levels similar to the pre-1921 period. Thus, between 1891 and 1946 more males than females remained single for life while the opposite was true thereafter. In particular, between 1976 and 1982 proportions single for females were double those for males.

Table 8.18: Proportions of males and females single at age 50 for Cyprus, 1946-1982

	1946	1960	1976	1980-81	1982
males	0.064	0.040	0.023	0.020	0.023
females	0.041	0.047	0.049	0.040	0.052

Table 8.19 shows age-specific marriage rates (ASMRs) for females for census years and 1980-81. ASMRs are the number of marriages in a year to females of a certain age group over the number of unmarried females (i.e. single, divorced and widowed) in that age group. To calculate the ASMRs for 1976 and 1982 the numbers of marriages for these years were used. For 1980-81, however, the rates were computed using the numbers of marriages reported by the respondents for the year preceding the survey.

The rates for 1976 are substantially lower than for 1980-81 and 1982, particularly for females aged 20-24 and 25-29. This may be due partly to 1976 being a leap year. The rates for 1982 are somewhat higher than for 1980-81 for all age groups and may indicate that the incidence of marriage was slightly higher that year. The pattern of ASMRs, however, is similar for all years; the rates reach a peak for the 20-24 and 25-29 age groups while they decrease sharply with age thereafter. The rates for 1980-81 are irregular for women over age 40, probably due to the small number of marriages for these women.

Table 8.19: ASMRs (per 1,000 unmarried females) for Cyprus, 1976-1982

Age-group	1976	1980-81	1982
15-19	26.5	32.6	51.1
20-24	133.7	217.2	230.3
25-29	145.8	202.8	233.9
30-34	81.8	96.6	113.0
35-39	42.9	42.0	68.8
40-44	29.2	7.9	39.5
45-49	21.7	17.7	24.6
50-54	11.1	23.1	11.6
55-59	6.8	0.0	5.9

Table 8.20 shows age-specific marriage rates (ASMRs) for males for census years and 1980-81. The ASMRs for males were calculated in the same manner as for females. The rates for 1976 are lower than those for 1980-81 and 1982, just as for females, probably partly due to 1976 being a leap year. The rates for 1982 are the highest and imply that there were more marriages that year. The pattern of the ASMRs is quite similar for all three years; the rates indicate that only a negligible proportion of males married before age 20 while most of them tended to marry between ages 25 and 39. However, the rates in 1976 were relatively high for the 40-44 age group as well while ASMRs in 1982 were relatively high up to age 55; for instance, the rate for the 50-54 age group that year was slightly higher than for the 20-24 age group.

The rates for 1980-81 are irregular for males aged 40 or more, probably due to the small number of marriages for these persons. Comparing the ASMRs for males and females it is obvious that marriage for females was earlier and more concentrated than for males. However, the relatively high rates for males over age 40 may be due partly to high numbers of remarriages in these age groups.

Table 8.20: ASMRs (per 1,000 unmarried males) for Cyprus, 1976-1982

Age-group	1976	1980-81	1982
15-19	3.1	3.9	3.3
20-24	71.3	93.2	108.1
25-29	204.5	324.4	274.7
30-34	257.5	264.2	339.0
35-39	199.4	191.5	268.3
40-44	111.4	27.0	175.1
45-49	69.6	35.7	151.0
50-54	76.8	178.6	111.9
55-59	55.8	111.1	70.4

Table 8.21 shows ratios of females aged 15-34 and 15-39 to males aged 20-44 for the whole population of Cyprus in 1960 and for the Greek Cypriot population thereafter. The ratios remained more or less constant between 1960 and 1973; over the same period, however, mean age at first marriage was increasing for both males and females. As the change in marriage patterns occurred at the same period for males and females and both male and female SMAM increased by nearly the same amount, a relative "balance " was maintained, in spite of the decline in the proportions single at age 50 for males. The ratios of females to males decreased after 1973 implying a decline in the relative availability of females at marriageable age. The response to this "imbalance " was a decline of 0.7 years in female SMAM between 1976 and 1982 while male SMAM decreased by only 0.2 years over the same period. Thus, a new balance was achieved.

Table 8.21: Ratios of females 15-34 and 15-39 to males 20-24 for Cyprus, 1960-1982

Ratios	1960	1973	1976	1980-81	1982
15-34/20-44	1.020	1.015	0.996	0.936	0.881
15-39/20-44	1.194	1.189	1.174	1.126	1.063

The distribution of the Greek Cypriot population by age, sex and marital status was also published for urban and rural areas in the 1980-81 survey and in the 1982 census. Table 8.22 shows Hajnal's singulate mean age at marriage (SMAM) and proportions single at age 50 (S_{50}) for males and females for the urban areas of Cyprus in 1946, 1980-81 and 1982. SMAM for males in urban areas decreased by one year between 1946 and 1982 while SMAM for females decreased by only 0.3 years in that period. Proportions single at age 50 for males, on the other hand, decreased substantially between 1946 and 1982, from 12.4 per cent to 2.5 per cent. Proportions single at age 50 for females also decreased in that period from 6.7 per cent to 4.8 per cent.

Table 8.22: SMAMs and proportions single at age 50 for males and females in urban areas, 1946, 1980-81 and 1982

	Males		Females	
	SMAM	S_{50}	SMAM	S_{50}
1946	27.1	0.124	23.9	0.067
1980-81	25.8	0.025	23.7	0.031
1982	26.2	0.025	23.6	0.048

Table 8.23 shows Hajnal's singulate mean age at marriage (SMAM) and proportions single at age 50 (S_{50}) for males and females for the rural areas of Cyprus in 1946, 1980-81 and 1982. SMAM for males remained constant between 1946 and 1982, at about 26 years, while SMAM for females decreased by 0.4 years. Proportions single at age 50 declined for males in that period, from 4.6 per cent to 2.0 per cent, while the proportions increased for females, from 3.4 per cent to 5.8 per cent.

Table 8.23: SMAMs and proportions single at age 50 for males and females in rural areas, 1946, 1980-81 and 1982

	Males		Females	
	SMAM	S_{50}	SMAM	S_{50}
1946	25.8	0.046	23.8	0.034
1980-81	25.9	0.014	23.8	0.052
1982	25.9	0.020	23.4	0.058

Comparing Table 8.22 to Table 8.23 it is apparent that differentials in marriage patterns between urban and rural areas changed over time, particularly for males. In 1946, males in urban areas got married for the first time 1.3 years later than in rural areas; in 1980-81 and 1982, however, the difference was trivial. Similarly, proportions of single males at age 50 in urban areas in 1946 were substantially higher than in rural areas while by 1982 the difference had become negligible. Females in 1946 married, on average, at similar ages in both urban and rural areas; however, proportions single at age 50 were higher for urban areas. In 1982 females also married at similar ages in both urban and rural areas; however, proportions single at age 50 were slightly higher for rural areas. Thus, urban-rural differentials in male marriage patterns were reduced substantially over time while for females the differentials remained small.

To conclude, marriage patterns for both males and females changed after 1960. Mean age at first marriage for males increased from 24.7 years to 26.3 years in the period 1960 to 1976 while it decreased somewhat thereafter. Mean age at first marriage for females also followed an increasing trend in the period 1960 to 1976, reaching 24.2 years, while it decreased by 0.7 years thereafter. Part of the increase in female SMAM after 1960, however, was probably due to the exclusion of Turkish Cypriot females as they married on average much earlier than Greek Cypriot women. Proportions single at age 50, on the other hand, decreased further after 1960 for males, reaching 2.3 per cent, while they increased somewhat for females. Thus, males between 1976 and 1982 still married earlier than in the pre-1931 period while a remarkably low proportion of them, only two per cent, remained single at age 50. Females, on the other hand, married on average later than in the pre-1931 period while about 4-5 per cent of them remained single at age 50.

8.4 Levels and trends in fertility, 1960-1982

In this section fertility rates computed from registration and census data are examined and compared with data from the 1980-81 Demographic Survey. In addition, an "indirect technique " is employed to derive estimates of fertility from survey data. Finally, an attempt is made to put together these measures to provide a realistic account of both levels and changes over time.

8.4.1 Fertility levels and trends based on registration data

Table 8.24 shows crude birth rates (CBRs), general fertility rates (GFRs) and the Coale index of overall fertility If for the whole population of Cyprus in 1946 and 1960 and for the Greek Cypriot population thereafter. For 1976 the CBR was calculated by dividing the number of births registered over 1976-1977 by the 1976 census population. This denominator was more or less appropriate as the census was carried out on the 30th of September. The rate for 1982 was calculated in the same manner. To compute the rate for 1980-81, however, the number of births reported by the respondents for the 12 months preceding the survey was divided by the number of the respondents. GFRs were calculated in the same way as CBRs except that the denominator was confined to females aged 15-44. Coale's index If is the actual number of births over the number of births that would occur if all women experienced the age-specific marital fertility rates of the Hutterites (Coale, 1967: 205-209; Coale and Treadway, 1986: 153-162). In this case, the average number of births per year used to calculate the CBR and GFR was taken as the "actual " number.

All measures indicate that fertility declined substantially between 1946 and 1960 while it fluctuated at relatively low levels thereafter. The CBR was 32.9 per thousand in 1946 but had decreased to 19.4 per thousand by 1960 while the rate fluctuated between 17.6 per thousand and 21.2 per thousand in the period 1976-1982. GFRs also declined substantially between 1946 and 1960, from 145.9 per thousand to 91.4 per thousand; thereafter, the rates fluctuated between 78.0 and 91.6 per thousand. If followed a similar trend; it decreased from 0.35 to 0.22 in the period 1946 to 1960 while it remained fairly constant thereafter, ranging from 0.19 to 0.22.

The low rates for 1960 are mainly due to the collapse of the registration system; in fact, it is likely that fertility decreased only moderately in the period 1946 to 1960 (see Chapter 5). The relatively low rates for 1976, 1980-81 and 1982, on the other hand, are more or less genuine as registration of births in Cyprus over that period was about 95 per cent complete and the rates for 1976 and 1982, though based on the adjusted figures published in the Demographic Reports, are likely to be fairly reliable (Department of Statistics and Research, 1992: 22). Thus, the figures for the post-1960 period imply that a significant decline in fertility occurred between 1960 and 1976 and that fertility had stabilised at low levels over the period 1976-1982.

Table 8.24: CBR, GFR and Coale's index If for Cyprus, 1946-1982

measure	1946	1960[a]	1976	1980-81	1982
CBR	32.93	19.44	19.21	17.64	21.23
GFR	145.88	91.39	82.31	77.95	91.63
If	0.35	0.22	0.20	0.19	0.22

[a]The registration system had not yet recovered in 1960 after collapsing in 1955

Table 8.25 shows general marital fertility rates (GMFRs) and the Coale index of marital fertility, Ig, for the whole population of Cyprus in 1946 and 1960 and for the Greek Cypriot population thereafter. GMFRs were calculated in the same way as GFRs except that the denominator was confined to married women aged 15-44. Ig is the actual number of births to married women over the births that would occur to these women if they experienced the Hutterites' age-specific marital fertility rates (Coale, 1967: 205-209; Coale and Treadway, 1986: 153-162). To compute the Ig for 1946, 1960 and 1976, however, the total number of births was used as numbers of births to married women were unavailable for these years. This should not affect the measure significantly as the proportion of births outside marriage is negligible in Cyprus; for instance, between 1980 and 1986 that proportion ranged from 0.3 per cent to 0.6 per cent.

Both measures imply that marital fertility declined significantly between 1946 and 1960 while it fluctuated somewhat, at relatively low levels, thereafter. GMFRs decreased from 246.0 per thousand to 142.7 per thousand in the period 1940-1960 while the rates fluctuated between 125.0 and 145.9 per thousand in the period 1976-1982. Ig also decreased considerably between 1946 and 1960, from 0.57 to 0.33, while it ranged between 0.29 and 0.34 thereafter.

The rates for 1980-81 are somewhat lower than for 1976 and 1982; this may be due to some underreporting of births for the year preceding the survey as deaths were also underreported for that year. The low rates for 1960 are mainly due to substantial underreporting of births that year. The figures for 1976, 1980-81 and 1982, on the other hand, indicate that fertility transition had come to an end by 1976 while marital fertility remained fairly constant between 1976 and 1982. It is worth noting that GMFR and Ig show a 40 per cent drop in marital fertility between 1946 and 1976 while GMR and If show a 43 per cent drop in overall fertility over the same period. Thus, it is likely that the decline in fertility was mainly caused by changing reproductive behaviour of married women while changes in marriage patterns did not affect fertility significantly.

Table 8.25: GMFR and Coale's index Ig for Cyprus, 1946-1982

measure	1946	1960[a]	1976	1980-81	1982
GMFR	246.00	142.68	144.95	125.00	145.88
Ig	0.57	0.33	0.34	0.29	0.34

[a]The registration system had not yet recovered in 1960 after collapsing in 1955

Table 8.26 shows age-specific fertility rates (ASFRs) and total fertility rates (TFRs) for the whole population of Cyprus in 1946 and 1960 and for the Greek Cypriot population in 1980-81 and 1982. ASFRs are the number of births to women of a certain age group over the number of women of that age group. The TFR is the sum of the ASFRs multiplied by five.

The TFR in 1946 stood at 4.45 births per woman; the rate apparently decreased significantly in the period 1946 to 1960, reaching 2.70 births per woman, while it seems to have remained fairly constant thereafter; in 1982 the TFR was 2.52 births per woman. The age-pattern of fertility, on the other hand, changed only slightly between 1946 and 1960 but substantially in the period 1960-1982. ASFRs in 1946 peaked for the 25-29 age group and decreased more or less gradually with age thereafter. In addition, the rates for the 30-34 age groups were slightly higher than for the 20-24 age group. In 1960 the rates followed a pattern similar to that of 1946 though they declined somewhat more steeply with age. By 1982 the age pattern of fertility had changed considerably; the rates reached a peak for women aged 20-29 and decreased sharply with age thereafter while the contribution of women aged 35 or more to the total fertility was negligible. For instance, ASFRs for the 35-39 age group in 1946 were 145.3 per thousand compared to 28.9 per thousand in 1982.

Table 8.26: ASFRs (per 1,000) and TFRs for Cyprus, 1946-1982

age group	1946	1960[a]	1980-81	1982
15-19	32.5	22.8	20.1	37.7
20-24	184.4	137.9	149.8	168.9
25-29	252.2	162.8	174.2	170.2
30-34	196.5	106.1	93.4	92.9
35-39	145.3	82.6	29.0	28.9
40-44	67.0	23.1	1.9	4.7
45-49	12.4	5.2	0.0	0.5
TFR	4,452	2,703	2,342	2,518

[a]The registration system had not yet recovered in 1960 after collapsing in 1955

Table 8.27 shows age-specific marital fertility rates (ASMFRs) and total marital fertility rates (TMFRs) for the whole population of Cyprus in 1946 and 1960 and for the Greek Cypriot population in 1980-81 and 1982. ASMFRs are the number of births to married women of a certain age group over the number of married women of that age group.

The TMFR is the sum of the ASMFRs for women aged 20-49 multiplied by five.

The TMFR in 1946 stood at 6.19 births per married woman; the rate apparently had decreased substantially by 1960, reaching 3.51 births per married woman, while it seems to have remained fairly constant thereafter; in 1982 the TMFR was 3.57 births per married woman. The age-pattern of marital fertility, on the other hand, changed only somewhat between 1946 and 1960 while it had changed significantly by 1982. In 1946 ASMFRs peaked for women aged 20-29 and declined more or less gradually with age. In 1960 the rates peaked for women aged 15-24 while they decreased somewhat more steeply with age than in 1946. By contrast, the rates in 1982 were highest for women aged 15-19 and decreased sharply with age thereafter. Women aged over 35 contributed very little to marital fertility in 1982 while married women aged 30-34 contributed on average only 0.55 children to the TMFR. Thus, childbearing in 1982 was restricted to younger women.

Both the TFR and the TMFR seem to imply that fertility in 1960 was at about the same level as in 1982; that is due, however, to substantial underregistration of births in 1960. This also becomes apparent when the age-pattern of fertility and marital fertility rates for 1960 is considered as it shows little change compared to 1946 while it is very different from the pattern for 1982. TFRs indicate a 43 per cent drop in fertility for the period 1946 to 1982 while TMFRs imply that marital fertility decreased by 42 per cent over the same period. The fact that the TFRs decreased by nearly the same amount as the TMFRs in that period probably indicates that the decline in fertility was almost exclusively due to family limitation.

Table 8.27: ASMFRs (per 1,000) and TMFRs for Cyprus, 1946-1982

age group	1946	1960[a]	1980-81	1982
15-19	289.0	247.9	372.1	445.1
20-24	395.2	250.1	302.3	343.1
25-29	350.2	203.8	224.7	224.6
30-34	235.0	122.7	106.7	109.0
35-39	165.7	93.0	32.5	32.9
40-44	76.6	26.7	2.2	5.3
45-49	14.6	6.1	0.0	0.4
TMFR	6,186	3,512	3,342	3,574

[a]The registration system had not yet recovered in 1960 after collapsing in 1955

Table 8.28 shows ratios of the observed ASMFRs over the Coale-Trussell standard schedule of natural fertility (see Appendix 5.2, Chapter 5). The ratio serves to assess whether family limitation is practised within a population. If the ratio remains constant with age, independently from its actual value, then the population experiences natural fertility. On the other hand, a declining trend in the ratios would indicate family limitation.

The ratio for 1946 is more or less constant for women aged 20-24 and 25-29 but declines sharply for women aged 30-34 while it stabilises thereafter. The ratios imply that there was some family limitation for women over age 30 but the levels of voluntary control of fertility remained fairly constant with age. For 1960 the ratio decreases somewhat between age groups 20-24 and 25-29 and more substantially for women aged 30-34 and 40-44. The ratios imply that women over age 25 in 1960 tended to limit their fertility somewhat more than in 1946. For 1980-81 and 1982 the ratios follow very similar patterns; they are relatively high for women aged 15-19 but decrease sharply with age thereafter; thus, levels of family limitation increase significantly for successive age groups.

The relatively low ratios for 1960 are due to underreporting of births. However, if underreporting in 1960 was independent of the age of mother, which is likely, any fluctuations in the ratios would be caused by family limitation and the analysis would still be valid. Thus, levels of family limitation probably increased slightly between 1946 and 1960 while they increased considerably thereafter.

Table 8.28: Ratios of the observed ASMFRs over the Coale-Trussell standard for Cyprus, 1946-1982

age group	1946	1960	1980-81	1982
15-19	0.703	0.603	0.905	1.083
20-24	0.859	0.544	0.657	0.746
25-29	0.812	0.473	0.521	0.521
30-34	0.595	0.311	0.270	0.276
35-39	0.515	0.289	0.101	0.102
40-44	0.473	0.160	0.013	0.032
45-49	0.609	0.256	0.000	0.022

[a]The registration system had not yet recovered in 1960 after collapsing in 1955

Table 8.29 shows the indices of fertility control (m) and of the level of marital fertility (M), derived from the Coale-Trussell fertility model, for the whole population of Cyprus in 1946 and 1960 and for the Greek Cypriot population in 1980-81 and 1982. In addition, the mean square error which is an indicator of the reliability of the estimates is shown. The precise mode of computation of the indices and their interpretation are presented in Appendix 5.2 in Chapter 5.

The index of fertility control for 1946 was 0.48 and probably implies that there was some family limitation in the population. The index increased moderately between 1946 and 1960, reaching 0.82, while it increased very considerably thereafter, reaching 2.67 in 1980-81 and 2.23 in 1982. Thus, levels of family limitation probably increased only somewhat between 1946 and 1960 but very substantially thereafter.

The index of the level of marital fertility in 1946 was 0.872. However, the index decreased between 1946 and 1960, reaching 0.572, while it apparently increased substantially thereafter, reaching 1.017 in 1980-81 and 0.928 in 1982. The index M implies that marital fertility was quite high in 1946 while it was relatively low in 1960 as births were underreported that year. However, the index indicates that the underlying level of marital fertility for 1980-81 and 1982 was higher than for 1946. Had M been estimated as the ratio of the observed over the standard ASMFRs for the 20-24 age group, the index for 1980-81 and 1982 would be 0.657 and 0.795 respectively, lower than for 1946 (Coale and Trussell, 1978).

The mean square error for the estimates of m and M in 1946 is relatively low, 0.002; thus, the estimates for that year are fairly reliable. However, the mean square error for 1960 is relatively high, 0.010, while for 1982 it is even higher, 0.041, and for 1980-81 it is extremely high, 0.200. Thus, the estimates of fertility control and of the level of marital fertility, particularly for 1980-81, may be unreliable.

Table 8.29: The indices of fertility control (m) and of the level of marital fertility (M) based on the Coale-Trussell model, for Cyprus, 1946-1982

	1946	1960 [a]	1980-81	1982
m	0.480	0.824	2.668	2.225
M	0.872	0.572	1.017	0.928
mean square error	0.002	0.010	0.200	0.041

[a] The registration system had not yet recovered in 1960 after collapsing in 1955

For the year preceding the 1980-81 Demographic Survey numbers of births were published for urban and rural areas; thus, it was possible to make some observations about urban-rural differentials in fertility using survey data. The CBRs for the year preceding the survey were quite similar in both urban and rural areas. However, the GFR and If show that fertility was higher in rural areas; GFR in rural areas was 82.8 per thousand compared to 74.8 per thousand for urban areas while If for rural areas was 0.20 against 0.18 for urban areas. It is likely that overall fertility was higher in rural areas but the CBRs failed to show any difference as they were affected by the relatively high proportion of males in the rural population (see Table 8.5).

The GMFR and Ig also show that marital fertility was higher in rural areas; GMFR in rural areas was 138.7 per thousand compared to 116.6 per thousand for urban areas. In fact, GMFR and Ig imply that the difference in marital fertility was more substantial than in overall fertility; this may be due, at least partly, to higher proportions of single females in rural areas (see Table A8.3, Appendix 8.5).

ASFRs and ASMFRs for the year preceding the survey were higher in rural than in urban areas except for women aged 25-29. Nevertheless, TFRs and TMFRs were higher in rural areas; TFR in rural areas was 2.53 births per woman compared to 2.19 births per woman for urban areas while TMFR in rural areas was 3.66 births per married woman against 3.12 births per married woman in urban areas (see Table A8.4, Appendix 8.5). Thus, the survey data indicate that both overall and marital fertility were somewhat higher for rural than for urban areas. Fertility in 1921 and 1931, however, was substantially lower in urban than in rural areas while differentials had nearly been eliminated by 1946 (see Table A5.4 and Table A5.6, Chapter 5).

8.4.2 Fertility levels and trends based on indirect methods

In this section the P/F ratio method of Brass was used to estimate fertility levels for 1980-81 (United Nations, 1983). The method uses information on numbers of children ever born derived from a census or a survey and the reported numbers of births by age of mother for that year (Appendix 5.4, c). The method provides the means to adjust the level of current fertility, under the assumptions that underreporting of current fertility is constant with age and that fertility has remained constant for the 15 or 20 years preceding the census or survey.

Table 8.30 shows estimates of CBRs and TFRs obtained by the method, using data from the 1980-81 Demographic Survey. The P/F ratios are presented in Table A8.5 in Appendix 8.6. Two different factors are recommended by the method to adjust current fertility; factor 1 is the average of the P/F ratios for the 20-24 and 25-29 age groups while factor 2 is equal to the P/F ratio for the 20-24 age group. Factor 2 is advantageous in case of declining fertility due to family limitation on the part of older women.

The estimates based on factor 1 indicate that the CBR in 1980-81 was 17.6 per thousand and TFR was 2.39 births per woman. The estimates based on factor 2 indicate that fertility was slightly higher; CBR was 18.3 per thousand while TFR was 2.43 births per woman. The CBR based on factor 1 is very similar to the rate computed from the reported numbers of births for the year preceding the survey. The TFR based on factor 1, however, is slightly higher, 2.39 compared to 2.34 births per woman.

The P/F ratios in Table A8.5 imply some recent changes in fertility; in addition, reporting errors may affect current fertility (see Appendix A8.6). If fertility for women aged less than 25 was declining then use of factor 2 (i.e. the P/F ratio for the 20-24 age group) as adjusting factor would overestimate current fertility. However, as the data imply that fertility for women aged 25-29 may have been increasing, use of factor 1 (i.e. the average of the P/F ratios for the 20-24 and 25-29 age groups) would provide more reliable estimates of the level of fertility. Nevertheless, both estimates of fertility obtained by the method are very similar.

Table 8.30: Fertility estimates derived from the P/F ratio method of Brass, 1980-81

measures	1980-81	
	factor 1	factor 2
CBR	17.61	18.31
TFR	2.39	2.43

8.4.3 Conclusion

The data indicate that fertility decreased moderately between 1946 and 1960 while it decreased substantially in the period 1960-1976 and remained fairly constant thereafter. The age pattern of fertility and marital fertility was altered somewhat in the period 1946-1960 but had changed considerably by 1982. Women aged 35 or more contributed very little to fertility in 1982 while fertility within marriage peaked for women aged 15-24. The ratios of the ASMFRs over the Coale-Trussell standard schedule of natural fertility as well as Coale's index of fertility control imply that low levels of family limitation in 1946 had become moderate by 1960 and very substantial by 1982. The data also show that the fertility decline between 1946 and 1976 was caused by changing reproductive behaviour of married women while changing marriage patterns affected fertility only slightly.

To conclude, it is likely that fertility levels in the late 1940s were characterised by CBRs around 34 per thousand. The rates decreased in the 1950s, probably reaching 28 or 29 per thousand in 1960. After 1960, as family limitation became widespread, CBRs declined further, reaching around 20 per thousand in 1976, while fertility remained fairly constant thereafter. Thus, fertility transition had come to an end by 1976; post-transitional fertility levels were characterised by TFRs above replacement level, around 2.4 or 2.5 births per woman.

8.5 Levels and trends in migration, 1960-1982

In this section levels and trends in international migration for the whole population of Cyprus between 1960 and 1973 and for the Greek Cypriot population between 1974 and 1982 are considered. In addition, a brief account of levels and trends in internal migration for the Greek Cypriot population is given, based on census and survey data.

8.5.1 International migration

Data on international migration for the period 1961-1962 were published in the Vital and Migration Statistics (Department of Statistics and Research, 1961-62) while for the period 1963 to 1970 they were published in the Demographic Reports (Department of Statistics and Research, 1963-70). Data on intending immigrants and emigrants for the period after 1970 were published in the Tourism, Migration and Travel Statistics (Department of Statistics and Research, 1971-82) while some estimates of migration for the period 1974 to 1982 were published in the Demographic Report for 1993.

Table 8.31 shows numbers of intending immigrants, intending emigrants and net migration for the whole population of Cyprus for each year 1961-1973. In addition, ratios of males to females for emigrants are presented. The data indicate that between 1961 and 1973 there were 1,974 immigrants and 49,898 emigrants; thus, migration amounted to a net outflow of 47,924 persons. In fact, 18,256 persons had left the island by 1962 while net migration thereafter totalled, on average, about 2,700 emigrants per year.

Data on numbers of arrivals in and departures from the island indicate that between 1961 and 1971 departures exceeded arrivals while in 1972 and 1973 the opposite was true; in the overall period the net balance was -42,946 persons compared to -47,924 persons based on numbers of immigrants and emigrants. In addition, estimates suggest that in the period 1960-1969 there were 7,050 immigrants compared to only 2,926 immigrants shown by the registration data while over the period 1970-1973 there were 10,410 immigrants compared to 54 immigrants from registration data (Matsis, 1992: 105-108). If these estimates are accurate net migration for the period 1970-1973 would indicate an influx of 3,190 persons. Thus, immigration was perhaps underreported, particularly in the period 1970-1973.

The ratio of male to female emigrants in 1961 and 1962 stood at 1.267 and 1.123 respectively, implying a substantial excess of males. However, the ratios for the period 1963-1973 were well below one and indicate an excess of females among emigrants. The ratio for the whole period was 1.004 and implies a slight excess of males; this is due to the substantial numbers of male emigrants in 1961 and 1962. In the period 1955-1960 there were 43,724 emigrants while the average ratio of males to females was 1.138. Thus, it seems likely that for a short period before and after the independence of the island there was substantial emigration, mainly of males, while females followed shortly afterwards but in smaller numbers.

Table 8.31: Numbers of immigrants, emigrants, net migration and ratios of males to females for emigrants, for the whole population of Cyprus, 1961-1973

year	immigrants	emigrants	net migration	sex ratio for emigrants
1961	1,173	13,489	-12,316	1.267
1962	337	6,277	-5,940	1.123
1963	35	2,933	-2,898	0.962
1964	267	5,081	-4,814	0.942
1965	88	2,967	-2,879	0.731
1966	0	3,408	-3,408	0.855
1967	4	3,470	-3,466	0.834
1968	16	2,676	-2,660	0.928
1969	0	2,378	-2,378	0.956
1970	0	2,318	-2,318	0.961
1971	0	2,271	-2,271	0.855
1972	54	1,318	-1,264	0.849
1973	0	1,312	-1,312	0.840
total	1,974	49,898	-47,924	1.004

The percentage distribution of emigrants by age indicates that in the whole period 1961-1973, 27.1 per cent of emigrants were aged 0-14 while 55.0 per cent were aged 15-39 and 17.9 per cent were aged 40 or more. In 1973, 28.9 per cent of the Greek Cypriot population was aged 0-14, 38.9 per cent was aged 15-39 and 32.2 per cent was aged 40 or more. Thus, emigrants included higher proportions of young adult persons and lower proportions of persons over age 40 than the Greek Cypriot population in 1973. In fact, the distribution of emigrants by age had changed somewhat compared to the 1955-1960 period and it included slightly higher proportions of persons aged 0-14 and slightly lower proportions of persons 15-39. As proportions of persons aged 0-14 were relatively high between 1963 and 1968 the data may imply that the families of male emigrants who left the island before 1963 followed thereafter (see Table A8.6, Appendix 8.7).

The percentage distribution of emigrants by country of destination for each year 1961-1973 indicates that in 1961 the vast majority of emigrants, 91.5 per cent, intended to emigrate to the UK while only 3.3 per cent of them were going to Australia and 2.5 per cent to South Africa. However, the proportions of emigrants whose destination was the UK followed a declining trend over time; by 1969 that proportion had decreased to 49.0 per cent while by 1973 it had reached 15.7 per cent. By contrast, the proportions of emigrants that intended to go to Australia increased substantially in that period, reaching 51.7 per cent in 1973, while proportions intending to emigrate to the USA, Canada and South Africa also increased, reaching 8.1 per cent, 12.0 per cent and 6.1 per cent, respectively. Thus, in the period 1961-1970 the major destination for emigrants was the UK while, thereafter, Australia emerged as a more important destination. In the overall period, 68.2 per cent of the emigrants declared their intention to emigrate to the UK while 13.8 per cent intended to go to Australia and 11.2 per cent to the USA, Canada and South Africa (see Table A8.7, Appendix 8.7).

The percentage distribution of emigrants by ethnic group for each year 1961-1972 shows that in 1961 the majority of emigrants, 79.5 per cent, were Greek Cypriots while 18.9 per cent were Turkish Cypriots and 1.4 per cent were Armenians. The percentage distribution of emigrants by ethnicity did not change appreciably over time though the proportions fluctuated somewhat. The proportions of Greek

Cypriot emigrants fluctuated between 65.9 per cent and 85.2 per cent in the period 1961-1972 while the proportions of Turkish Cypriot emigrants ranged from 13.9 per cent to 34.1 per cent in that period. The proportions of Armenian emigrants were relatively high in 1962 and 1963 when they stood at 5.5 per cent; however, the proportions were relatively low thereafter, ranging between 0.0 per cent and 1.5 per cent. In the overall period, 78.9 per cent of the emigrants were Greek Cypriots while 19.2 per cent were Turkish Cypriots and 1.7 per cent were Armenians. In fact, these proportions are quite similar to the distribution of the population by ethnic group in 1960, when 77.1 per cent of the population were Greek Cypriots and 18.2 per cent were Turkish Cypriots (see Table A8.8, Appendix 8.7).

Table 8.32 shows numbers of declared emigrants departing from the Republic of Cyprus (the area controlled by Greek Cypriots) after the partition of the island in 1974. In addition, numbers of intending immigrants for the period after 1980 are presented, as the relevant data were unavailable for the period 1974-1980, as well as ratios of males to females for Greek Cypriot emigrants. The figures for 1974, however, may refer to the whole population of the island up to August of that year, when the partition occurred. The data indicate that between 1974 and 1982 there was a net outflow of 21,343 persons. Emigration was more substantial between 1974 and 1977, when 18,136 persons left the island, while, thereafter, the numbers of emigrants decreased gradually and from 1981 onwards net migration became positive. The ratios of male to female emigrants imply a substantial excess of females for the period 1974-1980; the ratio fluctuated between 0.710 and 0.967 in that period. In 1981, however, the numbers of female emigrants equalled those of male emigrants while in 1982 there was an excess of males. The average ratio for the overall period was 0.884 and implies an excess of females among emigrants.

Table 8.32: Numbers of immigrants, emigrants, net migration and ratios of males to females for emigrants, for the Greek Cypriot population, 1974-1982

year	immigrants	emigrants	net migration	sex ratio for emigrants
1974	n.a.	3,346	-3,346	0.835
1975	n.a.	5,454	-5,454	0.898
1976	n.a.	5,647	-5,647	0.864
1977	n.a.	3,689	-3,689	0.894
1978	n.a.	1,835	-1,835	0.967
1979	n.a.	1,087	-1,087	0.907
1980	n.a.	525	-525	0.710
1981	246	192	54	1.000
1982	390	204	186	1.318
total	636	21,979	-21,343	0.884

The percentage distribution of emigrants by age indicates that in the whole period 1974-1982 24.3 per cent of the emigrants were aged 0-14 while 57.7 per cent were aged 15-39 and 18.0 per cent were aged 40 or more. It is worth noting that 26.3 per cent of the Greek Cypriot population in 1976 was aged 0-14, 41.0 per cent was aged 15-39 and 32.7 per cent was aged 40 or more. Thus, emigrants included lower proportions of persons aged 0-14 and 40 or more and higher proportions of persons aged 15-39. In fact, the distribution of emigrants by age in that period is very similar to that for the period 1955-1960 (see Table A8.9, Appendix 8.7).

The percentage distribution of emigrants by country of destination shows that in the whole period 1974-1982 a high proportion of emigrants, 34.3 per cent, intended to emigrate to Australia while 17.0 per cent intended to go to Greece, 15.6 per cent to the UK, 10.2 per cent to Canada and 8.4 per cent to the USA. Thus, emigrants in that period moved to a variety of destinations, though a preference towards English-speaking countries is apparent (see Table A8.10, Appendix 8.7).

Estimates of net migration for the Greek Cypriot population for the period 1974-1982 published in the Demographic Report for 1993 (Department of Statistics and Research, 1993), on the other hand, indicate that net migration in 1974 amounted to 15,408 emigrants and in the period 1975-1978 to 23,283 emigrants while between 1979 and

1982 there was a net outflow of only 232 persons (see Table A8.11, Appendix 8.7). Thus, the estimates imply that emigration was substantial in the period following the Turkish invasion while it decreased considerably after 1978. These estimates of net migration show different levels from the figures on Table 8.32 that are based on numbers of intending immigrants and emigrants. The estimates indicate that in the period 1974-1978 net migration totalled 38,691 emigrants compared to only 19,971 emigrants implied by the data on declared immigrants and emigrants. In addition, the estimates imply that numbers of immigrants were underreported in the period 1979-1982; net migration in that period, according to data on declared immigrants and emigrants, amounted to 1,372 emigrants compared to only 232 emigrants shown by the estimates.

The question that arises is whether the estimates of net migration are more reliable than net migration based on intending immigrants and emigrants. If the numbers of births for the period January 1974 to October 1982 were added to the Greek Cypriot population for 1973 while the numbers of deaths for that period were subtracted, the expected number of persons for 1982 would be 559,580 or higher, as the numbers of births and deaths for the period April 1973 to the 31st of December 1973 are not included in the calculation. As the 1982 census population was 512,098 that would indicate a net loss of 47,482 persons in the period 1973 to 1982. Thus, it is likely that numbers of emigrants were underreported in the period following the partition of the island.

To conclude, emigration for the whole population of Cyprus was quite substantial in 1961 and 1962 while numbers of emigrants remained at relatively low levels thereafter. Net migration between 1961 and 1973 totalled 47,924 emigrants though if numbers of intending immigrants were underreported the excess of emigrants over immigrants may have been less, particularly in the period 1970-1973. Emigrants in 1961 and 1962 included a high proportion of males; however, there was an excess of females among emigrants thereafter. Between 1961 and 1973 emigrants included a slightly higher proportion of persons 0-14 than in the earlier period and a somewhat lower proportion of persons aged 15-39. However, proportions of emigrants aged 15-39 were substantially higher than for the Greek Cypriot population in 1973. The major destination for emigrants in 1961 was the UK; however, proportions intending to emigrate to the UK decreased over time and by 1971 Australia had become the major destination for emigrants. The percentage distribution of emigrants by ethnic group indicates that Greek and Turkish Cypriots were leaving the island in proportions similar to the distribution of the population by race in 1960.

For the period 1974-1978 data on intending immigrants and emigrants underestimate levels of emigration. Emigration was probably quite substantial in 1974, following the invasion by Turkey, as a segment of the Greek Cypriot refugee population from the occupied territories emigrated overseas. In addition, there was probably quite a lot of emigration in the period 1975-1978 while, as the situation in the island became stable again, numbers of emigrants decreased. The data indicate that emigrants between 1974 and 1982 included high proportions of females and high proportions of persons aged 15-39 while the major destination for emigrants in that period was Australia. However, as emigration was understated in that period characteristics of emigrants may be incorrect; in fact, it is likely that emigrants after the partition of the island included a high proportion of Greek Cypriot refugee families.

8.5.2 Internal migration

Census data indicate that in 1960 only 32.0 per cent of the Greek Cypriot population lived in urban areas while by 1982 that proportion had increased to 63.5 per cent. Thus, it is likely that between 1960 and 1982 there was a substantial movement of persons from rural to urban areas. However, part of the increase in the urban population in that period may have been caused by Greek Cypriot refugees that came from the occupied territories in 1974 to urban areas as employment opportunities were better there.

Data from the 1980-81 Demographic Survey indicate that 40.48 per cent of the sample population were lifetime migrants. 61.66 per cent of the lifetime migrants had moved from rural to urban areas while 28.82 per cent had moved from rural to other rural areas. Lower proportions of lifetime migrants, 7.96 per cent, had moved from urban to other urban areas while only 2.57 per cent had migrated from urban areas to rural areas. Thus, the survey data also imply that before 1980 there was a rural to urban movement of the population.

It is worth noting that the distribution of the urban and rural populations by age and sex in 1982 possibly imply that the characteristics of in-migrants to urban areas changed after 1960. It is probable that in-migrants to urban areas before 1960 included high proportions of young adult males while, thereafter, they included high proportions of families. In addition, it is likely that rural to urban migrants aged 15-34 included a higher proportion of females than of males.

Appendices

Appendix 8.1: Indirect methods used for the estimation of mortality

a. Estimation of adult mortality from information about the orphanhood status of the respondents

The method uses information from a question in a census or survey about the orphanhood status of the respondents. Brass was the first to develop a procedure for converting the proportions of respondents whose mother or father was alive at the time of the survey to estimates of female or male adult mortality (United Nations, 1983: 100-107). The technique requires as a first step the computation of the mean age at maternity for the estimation of female adult mortality or of the mean age at paternity for the estimation of male adult mortality. Mean age at maternity is the sum of the numbers of births to women of a certain age group multiplied by the mid-point of that age group over the total number of births. The mean age at paternity were computed as the mean age at maternity plus the difference between male and female SMAM. Then, the mean age at maternity (paternity) are used to obtain weighting factors that transform the proportions of respondents whose mother (father) was alive at the time of the survey to conditional probabilities of surviving for females (males). Then the probabilities of surviving are used to identify mortality levels from a suitable family of Coale-Demeny model life tables.

The method assumes that fertility and mortality have remained constant for at least 20 years prior to the survey. The weighting factors used to estimate the conditional survivorship probabilities are based on the African standard model life table of Brass; thus, the method assumes that the African standard represents accurately the adult mortality patterns of the observed population. The estimation of adult male mortality requires that nuptiality has remained constant in the past as SMAMs are used to compute the mean age at paternity. If adult mortality has been changing smoothly prior to the survey it is possible to time locate the mortality estimates by a procedure developed by Brass and Bamgboye. The procedure assumes that the general standard model life table of Brass represents accurately the adult mortality patterns of the observed population.

To estimate female adult mortality a variant of Brass' method was also developed by Hill and Trussell; the variant uses regression coefficients to transform the proportions of respondents whose mother is alive at the time of the survey to conditional survivorship probabilities (United Nations, 1983: 107-108). The regression coefficients are based on mortality schedules generated by the logit system and the Coale-Demeny model life tables. This method also requires the computation of the mean age at maternity and assumes that fertility and mortality have remained constant for at least 20 years prior to the survey. However, if mortality has been changing regularly prior to the survey it is possible to time locate the estimates using the procedure by Brass and Bamgboye. It has been shown empirically that the regression method produces substantially better results than the Brass' method for probabilities of surviving between ages 25 and 55 or more.

Estimation of mortality using data on the orphanhood status of the respondents has some disadvantages; the estimates refer to the segment of the population with children who survive at the time of the survey. In addition, parents with more than one surviving children are overrepresented. Data for young respondents usually underestimate mortality for the more recent period before the survey as adopted children tend to report on the survival status of the adoptive parents. On the other hand, data based on respondents aged 30 to 45 tend to provide reliable estimates of mortality for the period 10 to 15 years before the survey. Finally, the method usually provides more reliable estimates of female than of male mortality.

In this case the estimates of male and female adult mortality are based on the responses of the whole sample population. Mean age at maternity was computed from data on the numbers of births for the year preceding the 1980-81 survey while to estimate mean age at paternity SMAMs computed from survey data were used. Thus, mean age at maternity was 26.5 years while mean age at paternity was 28.6 years. However, if data from the 1982 census were used, mean age at maternity would be 26.3 years while mean age at paternity would be 28.9 years but the mortality estimates would have been only slightly different.

b. Estimation of adult mortality from information about the widowhood status of the respondents

The method uses the proportions of ever-married women whose first husband is alive at the time of the survey to estimate male adult mortality (United Nations, 1983: 111-114). In addition, the proportions of ever-married men whose first wife is alive at the time of the survey may be used to estimate female adult mortality. The proportions of non-widowed females (males) and the male and female singulate mean age at marriage are then transformed to conditional probabilities of surviving after age 20 for males (females), using regression coefficients. The conditional survivorship probabilities are used to identify mortality levels from a suitable family of Coale-Demeny model life tables.

The method assumes that marriage patterns and mortality have remained constant in the past. The regression coefficients are based on mortality schedules generated by the logit system and the Coale-Demeny model life tables. If mortality has been changing regularly in the past it is possible to estimate reference periods for the probabilities of surviving, using a procedure developed by Brass and Bamgboye. The procedure assumes that the general standard model life table of Brass represents accurately the adult mortality patterns of the observed population.

A variant of that method has also been developed that provides estimates of male (female) adult mortality from the proportions of non-widowed women (men) classified by duration of first marriage and the male (female) singulate mean age at first marriage (United Nations, 1983: 114-117). The proportions and the SMAMs are transformed to conditional probabilities of surviving after age 20, using regression coefficients; mortality levels are then identified from a suitable family of Coale-Demeny model life tables. The method requires that male marriage patterns have remained constant in the past to estimate male adult mortality or that female marriage patterns were constant to estimate female adult mortality. It also assumes that mortality was constant in the past though if mortality was declining smoothly it is possible to time locate the estimates using the Brass and Bamgboye procedure.

The widowhood technique has several advantages compared to the orphanhood method. Firstly, as only first marriages are considered, persons with more than one marriages are not overrepresented as do parents with more than one children. In addition, the method provides more reliable estimates for the more recent period before the survey than the orphanhood method as the data are not affected by the adoption effect. The information provided by women on the survival of their first husband is usually quite accurate and the method provides reliable estimates of male adult mortality. However, the method has some disadvantages. The mortality estimates derived by the method refer to the survivorship of the ever-married population only. In addition, the method assumes that the survival of the respondents is independent of that of their spouse.

In the 1980-81 survey numbers of ever-married females whose first husband was alive at the time of the survey were published both by age of women and by duration of first marriage. Thus, it was possible to obtain two different estimates of male adult mortality. However, as information on the numbers of ever-married men whose wife was alive at the time of the survey was unavailable it was not possible to derive estimates of female adult mortality by this method. To estimate the conditional survivorship probabilities for males, the male and female SMAMs for 1980-81 were used; SMAM for males was 25.8 years and SMAM for females was 23.7 years.

Appendix 8.2: Average parities and proportions of children dead based on numbers of children ever born and children surviving reported in the 1980-81 Demographic Survey

Table A8.1 shows the numbers of children ever born (CEB) and children surviving (CS) reported in the 1980-81 survey. In addition, numbers of women aged 15 to 49 are presented in five-year age groups as well as average parities for these women and proportions of children dead. Average parities increase with age of women; thus, the data on numbers of children ever born seem fairly reliable. The data, however, indicate that average parity increases only by 0.444 children for women aged 35-39 while it increases by 0.530 children between age groups 40-44 and 45-49; this may be due to a more substantial long term fertility decline for younger women.

The proportions of dead children increase only slightly for women aged 20-24 compared to women aged 15-19 while they decrease for women aged 25-29; thereafter, the proportions increase with age. Thus, the data on numbers of children surviving are irregular for women aged 15-29. Proportions of children dead for women aged 15-19 may be unreliable due to the small numbers of children ever born and children dead for these women. The decline in the proportions for women aged 25-29 is suspect and may be due to omissions of dead children by ever-married women in that age group. The data also imply that childhood mortality was declining prior to the census. Thus, estimation of time reference periods for the mortality estimates is essential.

Table A8.1: Average parities and proportions of children dead, 1980-81

Age group	No. of women	no. of CEB	no. of CS	average parity	proportion dead
15-19	1,590	49	48	0.031	0.020
20-24	1,262	653	639	0.517	0.021
25-29	1,234	1,628	1,601	1.319	0.017
30-34	1,338	2,713	2,638	2.028	0.028
35-39	1,103	2,727	2,630	2.472	0.036
40-44	1,052	3,109	2,940	2.955	0.054
45-49	888	3,095	2,894	3.485	0.065

Appendix 8.3: Estimation of a life table for the mid-1970s by linking child survivorship probabilities with conditional adult survivorship probabilities

The method requires that a set of estimates of child mortality is available as well as conditional adult survivorship probabilities. As a first step a suitable model life table is chosen. Then, the logit transformation of the child survivorship probabilities and the logit transformation of the standard are used to obtain an initial estimate of α, assuming β equals one (United Nations 1983: 151-154). Thus, estimates of probabilities of surviving from birth are produced for adult mortality and a first approximation of β. A second estimate of α is obtained using the approximation of β and new survivorship probabilities for adult mortality are computed. The process is repeated as many times as necessary for each parameter to converge to a value. Once estimates of α and β are obtained a life table for the observed population is computed.

The method was used to compute life tables for males and females for the mid-1970s. Child mortality estimates were obtained from the children ever born and children surviving method for 1980-81 while adult, male and female, conditional survivorship probabilities were obtained by the orphanhood method of Brass (see Tables 8.9, 8.10 and 8.14). As standard, level 20 of the south family of Coale-Demeny model life tables was used to provide estimates of α and β comparable to those obtained for the early 1940s. In this way series of parameters may be estimated for five-year periods, by interpolation and extrapolation, as well as series of expectations of life at birth that can be used for population projections (see Appendix 9.2, Chapter 9). The estimates of the intercept and the slope produced by the method are -0.12759 and 1.41706 for males and -0.05470 and 1.48065 for females. Parameter α decreased between the early 1940s and the mid-1970s, both for males and females; the decline signifies that expectation of life at birth increased in that period. Parameter β, on the other hand, increased in that period but only slightly.

Appendix 8.4: CMR for Cyprus, 1976-1987; annual estimates based on registered marriages

Table A8.2: CMR* for Cyprus, 1976-1987

Year	CMR	Year	CMR
1976	7.4	**1982**	11.0
1977	10.4	**1983**	12.0
1978	10.2	**1984**	7.9
1979	12.9	**1985**	10.7
1980	7.8	**1986**	9.7
1981	11.7	**1987**	11.0

* Marriages per 1,000 population

Appendix 8.5: Fertility measures for the urban and rural areas of Cyprus, using numbers of births for the year preceding the 1980-81 survey

Table A8.3: CBR, GFR, GMFR and Coale's indices If and Ig in urban and rural areas of Cyprus, 1980-81

	CBR[a]	GFR[b]	If	GMFR[c]	Ig
Urban	17.89	74.77	0.18	116.6	0.27
Rural	17.31	82.78	0.20	138.7	0.33
Cyprus	17.64	77.95	0.19	125.0	0.29

[a] Live births per 1,000 total population

[b] Live births per 1,000 women aged 15-44

[c] Live births per 1,000 married women aged 15-44

Table A8.4: ASFRs and ASMFRs (per 1,000) in urban and rural areas of Cyprus, 1980-81

age group	urban areas		rural areas	
	ASFRs	ASMFRs	ASFRs	ASMFRs
15-19	19.3	361.7	21.1	384.1
20-24	125.5	266.7	184.4	351.2
25-29	177.9	226.5	164.2	221.6
30-34	87.3	98.9	102.3	120.8
35-39	27.3	30.2	31.9	36.6
40-44	1.6	1.8	2.4	2.7
45-49	0.0	0.0	0.0	0.0
TFR	2,194		2,531	
TMFR		3,121		3,664

Appendix 8.6: Adjusted age-specific fertility rates (ASFRs) for 1980-81, using the Brass P/F ratio method

Table A8.5 shows P/F ratios for 1980-81 as well as ASFRs adjusted using two different factors; factor 1 is the average of the P/F ratios for the 20-24 and 25-29 age groups while factor 2 is equal to the P/F ratio for the 20-24 age group. The average parities for 1980-81 are based on the reported numbers of children ever born at the 1980-81 Demographic Survey and are shown on Table A8.1 in Appendix 8.2. To compute cumulated current fertility the numbers of births for the year preceding the survey were used.

The P/F ratios decrease gradually with age for women aged 15-29 while they increase with age thereafter. The ratios are higher than one for women aged 15-24 and 35-49 while they are lower than one for women aged 25-34. Thus, average parity was lower than cumulated current fertility in 1980-81 for women aged 25-34 while it was higher for all other women and particularly for those over age 40.

The declining trend in the P/F ratios for women aged 15-29 may indicate increasing current fertility with age for these women or a recent decline in fertility for women aged less than 25. In addition, more underreporting of current fertility by women aged less than 25 may be part of the explanation. The relatively low ratios for women aged 25-34 imply that cumulated current fertility for these women exceeded average parity. This might be due to reporting errors such as overreporting of current fertility by women aged 25-34 or, less likely, to more omissions of children ever borne by women aged 25-34. However, the relatively low P/F ratios may also imply increasing current fertility for women aged 25-34 following a long term decline that reduced average parities. The steep increase in the ratios for women over age 35 may indicate a recent decline in fertility for these women or increasing underreporting of current fertility with age.

To summarise, the P/F ratios indicate that there may be recent changes in fertility; a slight increase in fertility for women aged 25-34 and declining fertility for females aged less than 25 and, particularly, for women over

35. In addition, it is possible that there was some underreporting of current fertility by women aged less than 25 and more than 35. Average parities, on the other hand, are based on fairly reliable data as is shown in Appendix 8.2. If fertility for women aged less than 25 was declining while it was increasing for women aged 25-29, use of adjustment factor 1 may provide more reliable estimates of the level of current fertility.

Table A8.5: P/F Ratios and adjusted ASFRs using the Brass method, 1980-81

age group	P/F	adjusted ASFRs	
		factor 1	factor 2
15-19	1.085	0.0284	0.0296
20-24	1.026	0.1588	0.1652
25-29	0.947	0.1656	0.1722
30-34	0.998	0.0829	0.0862
35-39	1.080	0.0248	0.0258
40-44	1.263	0.0015	0.0016
45-49	1.489	0.0000	0.0000

Appendix 8.7: International migration for the whole population of Cyprus, 1961-1973; migration for the Greek Cypriot population, 1974-1982

Table A8.6: Percentage distribution of emigrants in broad age groups; average for the period 1961-1973

age group	percentage
0-14	27.05
15-39	55.03
40+	17.92
Total	100

Table A8.7: Percentage distribution of emigrants by country of destination, 1961-1973

year	UK	Australia	USA	Canada	South Africa
1961	91.5	3.3	0.8	n.a.	2.5
1962	79.2	8.8	1.4	n.a.	3.1
1963	74.6	9.4	1.7	n.a.	4.5
1964	76.0	7.7	2.1	1.1	4.2
1965	67.2	11.5	2.1	6.8	4.0
1966	54.8	15.9	9.2	7.9	5.4
1967	64.2	13.5	6.0	8.4	2.9
1968	54.3	18.3	7.4	5.2	4.2
1969	49.0	19.7	6.8	6.1	6.3
1970	34.5	33.7	8.6	8.9	4.0
1971	29.8	37.4	7.5	7.9	6.9
1972	21.9	45.9	7.6	9.1	3.4
1973	15.7	51.7	8.1	12.0	6.1
total	68.2	13.8	3.8	3.6	3.8

Table A8.8: Percentage distribution of emigrants by ethnic group, 1961-1972

year	Greek	Turkish	Armenian
1961	79.5	18.9	1.4
1962	80.6	13.9	5.5
1963	78.6	15.4	5.5
1964	78.6	19.5	1.5
1965	80.2	19.1	0.4
1966	83.8	15.8	0.4
1967	73.2	25.9	0.6
1968	81.1	18.8	0.2
1969	85.2	14.2	0.4
1970	75.1	24.5	0.2
1971	72.6	27.0	0.4
1972	65.9	34.1	0.0
total	78.9	19.2	1.7

Table A8.9: Percentage distribution of emigrants in broad age groups; average, for the period 1974-1982

age group	percentage
0-14	24.28
15-39	57.74
40+	17.98
Total	100

Table A8.10: Percentage distribution of emigrants by country of destination, 1974-1982

year	UK	Australia	USA	Canada	South Africa	Greece
1974	19.4	27.2	5.3	15.0	6.0	19.3
1975	9.7	37.1	10.5	14.1	4.2	18.9
1976	12.9	46.3	6.3	6.0	5.8	15.6
1977	21.2	28.7	7.8	7.1	11.3	16.4
1978	20.8	19.5	10.8	7.2	10.2	22.9
1979	27.3	20.5	11.6	8.6	18.7	6.3
1980	12.2	25.4	13.1	14.5	8.4	17.5
1981	2.6	54.2	10.9	17.7	8.3	1.0
1982	1.0	56.4	16.2	12.8	9.3	1.5
total	15.6	34.3	8.4	10.2	7.5	17.0

Table A8.11: Estimates of net migration for the Greek Cypriot population, 1974-1982

net migration	1974	1975-1978	1979-1982	total
	-15,408	-23,283	-232	-38,923

Chapter 9: EVALUATION OF MORTALITY AND FERTILITY LEVELS USING POPULATION PROJECTIONS, 1881-1982

This chapter includes two parts. In the first part the various estimates of mortality are fitted together to provide a comprehensive picture of levels and changes for the whole period 1881 to 1982; these levels form a basis for the mortality assumptions used in the population projections. In addition, indirectly standardised TFRs for the period 1901 to 1982 are presented which form the basis for the fertility assumptions used in the projections. In the second part of the chapter, the most plausible estimates of mortality and fertility for the period 1921 to 1982 are used to project the population of Cyprus from 1921 to 1960 and the Greek Cypriot population from 1960 to 1982; thus, the validity of these estimates is assessed.

9.1 Mortality and fertility levels and trends, 1881 to 1982

9.1.1 Mortality levels and trends

In this section, mortality estimates obtained from indirect estimation techniques and registration data for the whole period 1881 to 1982 are fitted together to provide a realistic account of levels and changes over time. Figure 9.1 shows IMRs based on registration data for the period 1916 to 1960 and on mortality estimates obtained from various indirect techniques for the period 1885 to 1980. The IMRs labelled inter-male and inter-female are based on the estimates of intercensal levels of male and female adult mortality, obtained using successive census age distributions and method C (see Tables 3.3 and 3.4, Chapter 3). The IMRs labelled VR IMR are based on registration data while those estimated from the reported numbers of children ever born and children surviving are labelled Brass 1946, 1960 and 1980-81 (see Tables 3.5, 3.6 and A3.2, Chapter 3; Table 8.14, Chapter 8). The IMRs labelled last child were computed from the numbers of deaths reported for last born children at the 1980-81 survey (see Table 8.8, Chapter 8).

The IMRs indicate a declining trend in infant mortality, particularly after the mid-1910s. The IMRs based on intercensal survivorship methods for males underestimate infant mortality between the mid-1880s and the mid-1900s. The rates based on intercensal survivorship methods for females seem fairly plausible for the mid-1880s, the mid-1910s and the mid-1920s. IMRs computed from registration data seem to underestimate infant mortality for the period before the mid-1920s while the rates for the 1930s and the early 1940s seem fairly plausible and are quite similar to the Brass 1946 estimates between the mid-1930s and the mid-1940s, except for some period fluctuations.

For the period after the mid-1940s two different sets of estimates can be distinguished. IMRs computed from registration data seem to fit quite well with those based on last born children, with the exception of the post mid-1950s period when the registration system collapsed. On the other hand, the Brass 1946, 1960 and 1980-81 estimates form a second self-consistent group that implies a slower pace of decline in infant mortality. The estimates of IMRs obtained from the reported numbers of children ever born and children surviving seem to provide plausible levels of infant mortality for the period between the late 1940s and 1980, particularly as retrospective reporting of deaths of last born children usually provides underestimates.

Figure 9.1: Infant Mortality Rate (per 1,000 live births), Cyprus 1881-1982

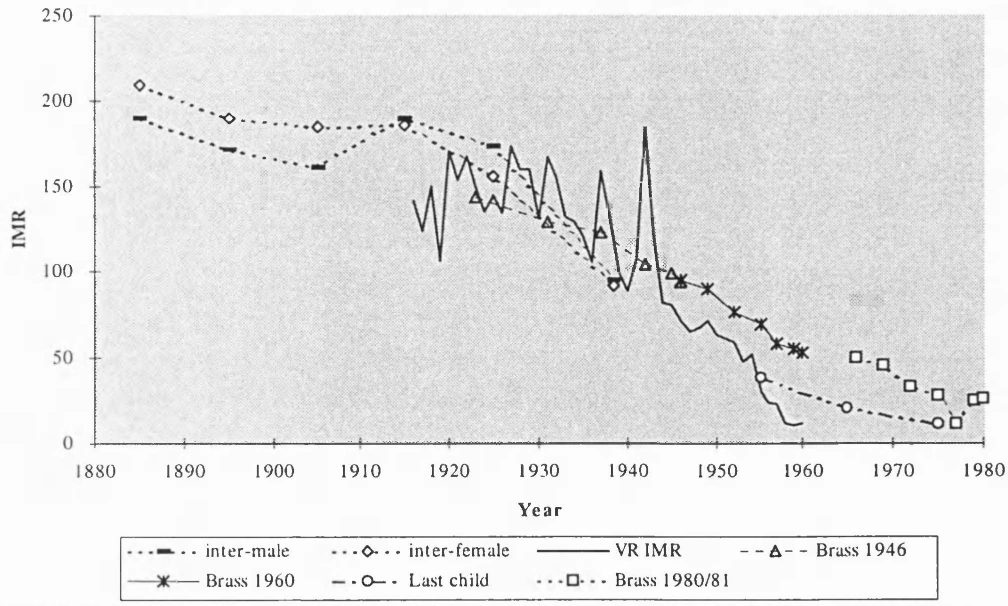


Figure 9.2 shows levels of mortality obtained from indirect techniques for the period 1880 to 1960. The levels labelled inter-male and inter-female are based on the estimates of intercensal male and female adult mortality obtained using successive census age distributions and method C (see Tables 3.3 and 3.4, Chapter 3). The levels labelled Brass 1946 and Brass 1960 are based on the estimates of child mortality obtained from the reported numbers of children ever born and children surviving in the 1946 and 1960 censuses (see Tables 3.5 and 3.6, Chapter 3).

Levels of mortality based on the intercensal survivorship of females may overestimate slightly mortality for the period before 1900 while levels based on male adult intercensal survivorship probably underestimate mortality for the period before the mid-1910s. The sharp decline in mortality implied by both sets of intercensal survivorship estimates for the 1930s and the early 1940s is unlikely. The Brass 1946 and 1960 estimates imply a slower pace of decline for that period while the best estimates of mortality presented in the conclusion of Chapter 3 imply an even slower pace of decline, with mortality about one level lower than the Brass' estimates. Nevertheless, mortality decreased substantially from the 1920s onwards.

Figure 9.2: Mortality levels based on indirect estimation techniques and the south family of Coale-Demeny model life tables, Cyprus 1881-1960

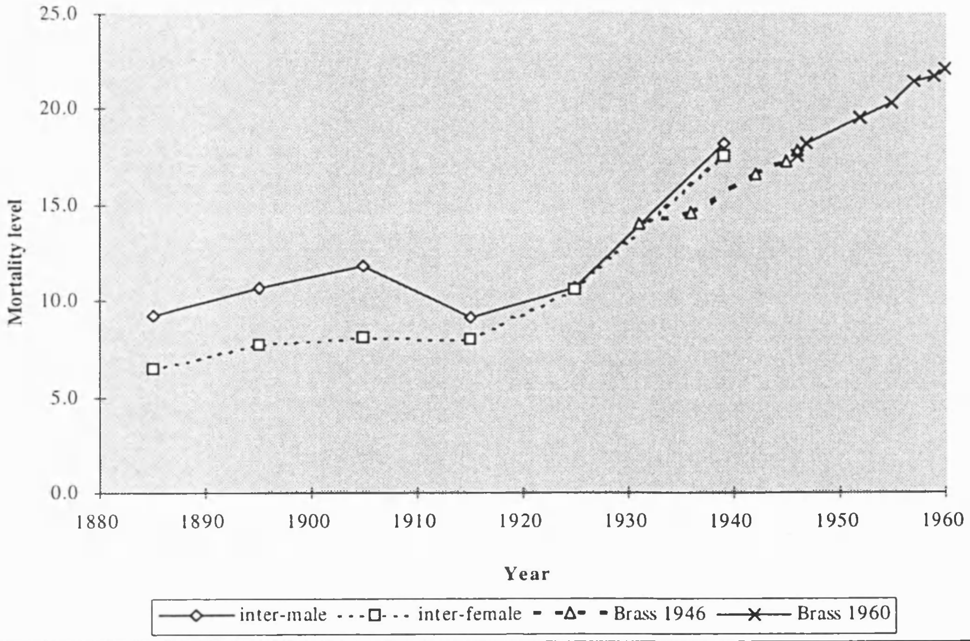


Figure 9.3 shows levels of mortality obtained from indirect estimation techniques for the period 1960 to 1982; the levels are based on the south family of Coale-Demeny model life tables. The levels labelled orph-male and orph-female are estimates obtained by the orphanhood method of Brass and data from the 1980-81 survey (see Tables 8.9 and 8.10, Chapter 8). The levels labelled wid-male are based on the widowhood method and data from the 1980-81 survey while those labelled Brass 1980-81 were obtained from the numbers of children ever born and children surviving reported at the survey (see Tables 8.13 and 8.14, Chapter 8).

The estimates obtained from the orphanhood method for males indicate a quite substantial decline in adult mortality between 1966 and 1968. In fact, male adult mortality for that period has been overestimated by the method (see Chapter 8). The estimates of mortality levels for females obtained by the orphanhood method for the period 1968 to 1970 match exactly the levels for males; female adult mortality for that period, however, was overestimated by the method (Chapter 8). For the period after 1970 the estimates based on the orphanhood method indicate that female adult mortality is lower than male mortality; the implied levels seem fairly plausible. The estimates of mortality levels based on the widowhood method seem to underestimate male adult mortality before 1974 while they may slightly overestimate male mortality between 1975 and 1978.

The estimates of mortality levels based on the children ever born and children surviving method fit quite well with the estimates obtained by the orphanhood method for the early 1970s, though they underestimate adult mortality. This is not surprising given that the method provides estimates of infant and child mortality and the relationship between child and adult mortality for the population of Cyprus that period probably differed from the one embodied in the south family of Coale-Demeny model life tables.

Figure 9.3: Mortality levels based on indirect estimation techniques and the south family of Coale-Demeny model life tables, Cyprus 1960-1982

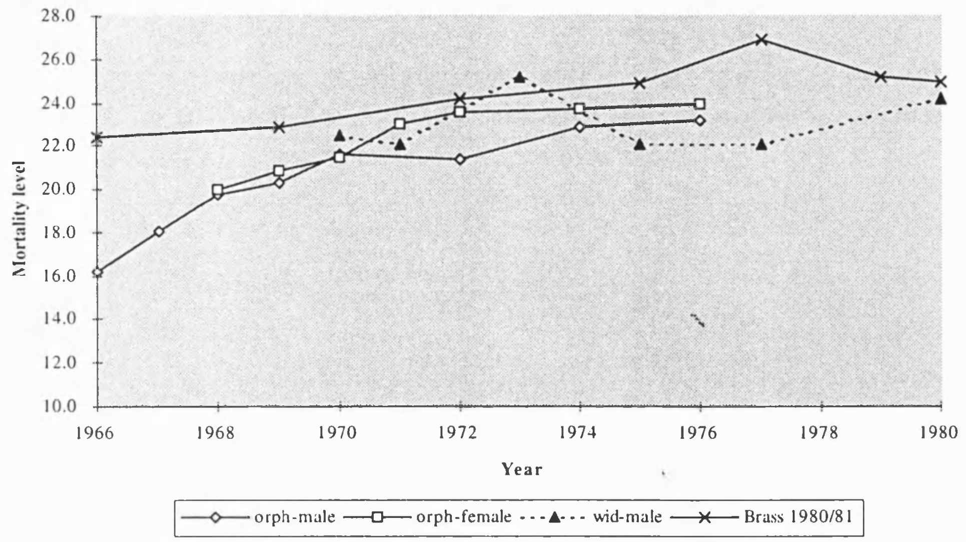
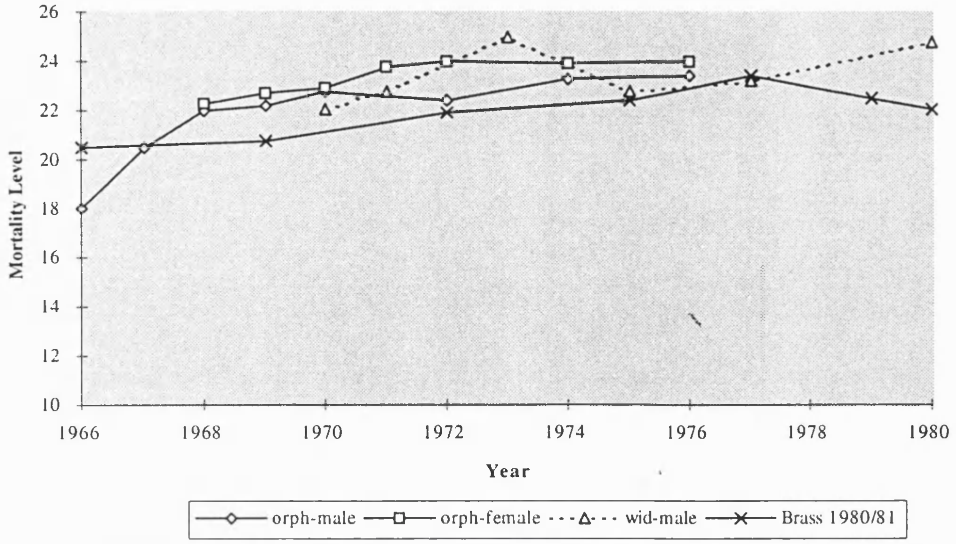


Figure 9.4 shows levels of mortality obtained from indirect estimation techniques for the period 1960 to 1982; the levels are based on the west family of Coale-Demeny model life tables. The levels labelled orph-male and orph-female are estimates obtained by the orphanhood method of Brass and data from the 1980-81 survey (see Tables 8.9 and 8.10, Chapter 8). The levels labelled wid-male are based on the widowhood method and data from the 1980-81 survey while those labelled Brass 1980-81 were obtained from the reported numbers of children ever born and children surviving at the survey (see Tables 8.13 and 8.14, Chapter 8).

The levels obtained from the orphanhood method for males probably overestimate adult mortality for the period 1966-1968 while those based on the orphanhood method for females overestimate adult mortality for the period 1968 to 1970. After 1970 mortality levels based on the orphanhood method seem fairly plausible. Mortality levels based on the widowhood method possibly underestimate male adult mortality between 1971 and 1974 while they fit quite well with the levels obtained from the orphanhood method, thereafter. The estimates based on the children ever born and children surviving method fit quite well with the estimates obtained by the orphanhood method though they overestimate adult mortality.

Figure 9.4: Mortality levels based on indirect estimation techniques and the west family of Coale-Demeny model life tables, Cyprus 1960-1982



The IMRs obtained form the children ever born and children surviving method and data from the 1980-81 survey are quite similar independently of whether they are estimated using the west or the south family of Coale-Demeny model life tables. However, the implied mortality levels differ quite substantially; those based on the south family underestimate adult mortality while those based on the west family overestimate it. Nevertheless, figures 9.3 and 9.4 indicate that the indirect techniques provided fairly reliable estimates of mortality for the 1970s.

To summarise, the indirect techniques seem to have provide fairly plausible estimates of mortality between 1881 and 1982. Thus, it is likely that the series of expectations of life at birth presented in the conclusion of Chapter 3 and Chapter 8, which are based on the best estimates, as well as expectations of life at birth obtained by interpolation between the life tables for the early 1940s and the mid-1970s would form a robust basis for the mortality levels used in the projections.

9.1.2 Fertility levels and trends

To obtain appropriate fertility estimates to use in the projections, a set of indirectly standardised TFRs was produced for census years between 1901 and 1982. To estimate these TFRs Booth's model fertility schedule was used as standard, having first been adjusted using estimates of α and β for census years (see Appendix 9.1). The estimated TFRs as well as estimates of α and β are presented on Table 9.1. The indirectly standardised TFRs were computed by multiplying the observed number of births by the TFR of the adjusted standard and dividing by the expected number of births.

The standardised TFR increased by about 0.7 children per woman in the period 1901 to 1911 but decreased by about 0.5 children per woman between 1911 and 1921. However, by 1931 TFRs had reached again levels similar to 1911; the rate in 1931 stood at 4.4 children per woman while in 1946 it was 4.5 children per woman. After 1946 TFRs decreased substantially, reaching a low of 2..1 children per women in 1976 while the rate had increased somewhat by 1982, to 2.5 children per woman.

The relatively low TFR for 1901 is probably due to underreporting of births as that is the first year for which numbers of vital events were published; the low rate for 1960 is due to the collapse of the registration system. The indirectly standardised TFRs indicate that fertility was fairly constant between 1911 and 1946, with the exception of a low in 1921. This is contrary to the trends implied by the CBR, the GFR and the If which showed that fertility in 1931 was still relatively low but had increased again by 1946 (see Table 5.1, Chapter 5). The indirectly standardised TFRs also imply that fertility was barely above replacement level in 1976 but the rate had recovered somewhat by 1982. That trend is also shown by the GFR and the If but the increase in these rates between 1976 and 1982 is less than for the TFRs while the GMFR and the Ig do not show any change in marital fertility for that period (see Table 8.24 and Table 8.25, Chapter 8).

Table 9.1: Indirectly standardised TFRs using Booth's standard for Cyprus for census years, 1901-1982

Year	1901	1911	1921	1931	1946	1960	1976	1982
α	-0.5117	-0.5117	-0.5117	-0.4841	-0.4013	-0.2468	0.3735	0.3735
β	0.9563	0.9563	0.9563	0.9694	1.0087	1.0820	1.4629	1.4629
TFR	3,805	4,536	4,004	4,413	4,478	2,718	2,134	2,515

9.2 Projections for the population of Cyprus

In this section, the methodology used to perform the projections is firstly discussed. Then, projections for the population of Cyprus are presented for two different periods, due to the nature of the available data. Projections for the period 1921 to 1960 refer to the whole population of Cyprus while for the period 1960 to 1982 they refer to the Greek Cypriot population. In addition, how the projected population compares with the population enumerated at census years is considered and the validity of the mortality and fertility assumptions used in the projections is assessed.

9.2.1 Methodology

To perform the projections, an initial set of mortality and fertility assumptions for five-year periods between 1921 and 1980 is required. The set of mortality assumptions is represented by expectations of life at birth for these periods. To obtain the expectations of life at birth, α and β for five-year periods were computed by linear interpolation and extrapolation, using the parameters obtained when computing the life tables for the early 1940s and the mid-1970s (see Appendix 3.6, Chapter 3 and Appendix 8.3, Chapter 8). The estimates of the expectations of life at birth thus obtained are presented on Table A9.1 in Appendix 9.2 where they are compared with the best estimates of mortality included in the conclusions of Chapter 3 and Chapter 8.

The fertility levels used in the projections are based on the indirectly standardised TFRs presented on Table 9.1. Parameters α and β, which are used to adjust Booth's standard fertility schedule for each five-year period between 1921 and 1980, were obtained by interpolation and extrapolation, using the assumptions outlined in Appendix 9.1.

The projections for the population of Cyprus were carried out using the software package PEOPLE version 3.0, developed by the Overseas Development Administration in London and the Economic Planning Unit in Kuala Lumpur. To perform the projections for the period 1921 to 1960 the initial estimates of mortality and fertility were applied to the 1921, the 1931 and the 1946 census populations. The population of Cyprus for census years was then compared with the projected populations to assess the validity of these assumptions. Then the process was repeated, using slightly modified assumptions, to arrive at the most plausible set of mortality and fertility levels for the period 1921 to 1960. The projections for the period 1960 to 1982 were carried out in the same manner.

9.2.2 Projections for the whole population of Cyprus, 1921-1960

The projections presented here for the whole population of Cyprus for the period 1921 to 1960 are based on three different sets of mortality and three different sets of fertility assumptions. In total results for four variants are presented.

Table 9.2a shows the mortality and fertility levels for five-year periods between 1921 and 1961 for variant one of the projections. Variant one assumes relatively low mortality for that period; levels of mortality are identical to the estimates based on parameters α and β and level 20 of the south family of Coale-Demeny model life tables for the period 1921 to 1931 while in the period 1931 to 1961 mortality is somewhat lower than these estimates imply. Expectations of life at birth for both males and females are higher than the estimates obtained using level 20 of the south family as standard by 1.5 years in the period 1931-1936 and by about 0.5 years over 1936-1951. For the period 1951-1961 the expectations of life at birth for males and females used in the projections are higher by 0.5 years than the best estimates presented in Chapter 3. The fertility levels used in variant one are very similar to the indirectly standardised TFRs for census years (see Table 9.1). The TFRs used for the periods 1921-1926 and 1926-1931 are 4.0 and 4.2 children per woman, respectively, while TFRs were assumed to be about 4.4-4.5 children per woman in the period 1931 to 1951. The rates used for the periods 1951-1956 and 1956-1961 are 4.0 and 3.8 children per woman, respectively.

Table 9.2a: Mortality and fertility levels used to project the population of Cyprus from 1921 to 1960, variant one

	Mortality		Fertility		
	e_0 (males)	e_0 (females)	TFR	α	β
1921/26	40	42	4.0	-0.5117	0.9563
1926/31	43.5	46	4.2	-0.4980	0.9629
1931/36	48.5	51	4.4	-0.4703	0.9760
1936/41	51	53.5	4.4	-0.4437	0.9890
1941/46	54	56.5	4.4	-0.4151	1.0022
1946/51	57	60	4.5	-0.3737	1.0218
1951/56	60	64	4.0	-0.3185	1.0480
1956/61	63.5	67	3.8	-0.2689	1.0715

These mortality and fertility assumptions were used to project the population of Cyprus from 1921 to 1961, from 1931 to 1961 and from 1946 to 1961. Table 9.2b shows estimates of the excess of the projected over the census populations in 1931, 1946 and 1960 as well as estimates of net migration for intercensal periods. For the last period, as the population was projected to 1961 but the census was carried out in 1960, the projected population was adjusted using the annual rate of growth implied by the assumptions for the period for which the projection was carried out. For instance, when the 1921 population was projected to 1961 the annual rate of growth for the period 1921-1961 was used to adjust the projected population one year backwards.

The estimates of the excess of the projected over the census populations are shown for three broad age groups, as any excess for persons aged 0-9 is mainly related to the fertility assumptions and to migration while, for a 10-year projection, any excess for the 10-14 age group would be mainly related to the mortality assumptions and to migration. If the population is projected forward for more than 10 years, however, any excess of persons aged 10-14 would also be related to the fertility assumptions. Any excess in the projected over the census population for persons aged 15 or more would be related to the mortality assumptions and to migration for a 15-year projection, while fertility assumptions will also affect that excess if the population is projected forward for more than 15 years.

Finally, omissions for the census populations, particularly for the 0-9 age group, age misreporting and changing census coverage over time are likely to affect the comparison between the projected and the census populations.

Table 9.2b: Excess of the projected over the census population, 1921 to 1960; variant one

	Projections from 1921		
Age group	**1931**	**1946**	**1960**
less than 10	10,028	17,220	14,651
10-14	-5,335	8,071	6,211
15 or more	7,743	7,812	54,812
Total	12,436	33,103	75,674
		Projections from 1931	
Age group		**1946**	**1960**
less than 10		19,239	10,453
10-14		8,290	3,172
15 or more		-4,401	45,290
Total		23,128	58,915
		Projections from 1946	
Age group			**1960**
less than 10			3,420
10-14			4,825
15 or more			20,387
Total			28,631
	1921-31	**1931-46**	**1946-60**
net migration[a]	6,917	4,752	34,854
net migration[b]	n.a.	n.a.	50,574

[a] based on numbers of arrivals and departures
[b] based on numbers of arrivals and departures 1946-1953 and numbers of intending immigrants and emigrants 1954-60.

Projecting the 1921 census population to 1931, the projected population aged 0-9 in 1931 exceeds substantially the census population, by 10,028 persons. By contrast, the projected population aged 10-14 is less than the census population in that age group; the difference is 5,335 persons. The projected population aged 15 or more exceeds the census population by 7,743 persons.

The substantial excess of persons aged 0-9 for the projected population in 1931 might indicate that the TFRs used for the period 1921-1931 overestimate fertility. On the other hand, females aged more than 40 in 1921 probably underreported their age, concentrating into the main reproductive age span (see Appendix 3.3.a in Chapter 3). As a result, the estimated numbers of births for the period 1921 to 1931 are likely to be inflated. In addition, persons aged 15-24 at the 1946 census are more than those aged 0-9 in the 1931 census while the numbers should have decreased over time through mortality and migration; the difference is 1,998 persons. In fact, if the 1931 census population is projected to 1946 using the mortality levels of Table 9.2a the census population aged 15-24 in 1946 exceeds the projected population by 7,164 persons. That probably indicates that numbers of persons aged 0-9 were severely underreported in 1931. Hence, it is unlikely that the TFRs on Table 9.2a overestimate fertility for the period 1921 to 1931.

The deficit in the projected population aged 10-14 in 1931 is probably related to underreporting of persons aged 0-4 in the 1921 census. Some form of age misreporting in the 1931 census is also possible, like heaping on age ten from persons aged less than ten. In that case the excess of 10,028 persons aged under ten in the projected population would have been less while the TFRs used for the period 1921 to 1931 may even underestimate fertility slightly.

The excess of 7,743 persons aged 15 or more for the 1931 projected population seems fairly plausible as net migration for the period 1921-1930, computed by subtracting the numbers of persons registered as departing from Cyprus from the numbers of those recorded as arriving at the island, amounted to 6,917 emigrants.

Projecting the 1921 census population to 1946 there is an excess of 17,220 persons in the projected population aged 0-9 while for the 10-14 age group there is an excess of 8,071 persons. The total excess of the projected over the 1946 census population is 33,104 persons. Net migration in the period 1931 to 1946, estimated as the difference between numbers of arrivals and departures, totalled 4,752 emigrants. That added to the estimate of net migration for the period 1921-1931 would give a total of 11,669 emigrants. Thus, the excess of 7,812 persons over age 15 in 1946 seems to underestimate considerably net migration for the period 1921 to 1946. This may be partly related to underreporting of persons aged 0-4 in the 1921 census while there might have been some underenumeration for other age groups, as well.

The excess for persons aged 0-14 in 1946 is quite substantial, about 16.6 per cent of the census population in that age group. That excess may imply that there was a lot of underreporting for persons aged 0-14 in the 1946 census. It is also possible that the TFRs used in variant one for the period 1931-1946 overestimate fertility; the effects of somewhat lower fertility for that period will be examined in variant two. On the other hand, the 1931 projected population had a relatively high proportion of women in reproductive ages compared to the census populations in 1921, 1946 and 1960. 47.4 per cent of women in the 1931 projected population were aged 15-44 compared to 45.1 per cent of women for the 1921 census population and to 44.6 per cent in 1946. That would inflate the estimated numbers of births for the period 1931 to 1946.

Projecting the 1921 census population to 1960 there is an excess of 14,651 persons aged 0-9 compared to the census population, while for the 10-14 age group the excess is 6,211 persons. The total excess of the projected over the 1960 census population is 75,674 persons. Net migration between 1946 and 1960 was estimated to a total of about 34,854 emigrants using numbers of arrivals and departures or to a total of about 50,574 emigrants using numbers of intending immigrants and intending emigrants for the period 1954-1960. The latter figure is a more plausible estimate of net migration for that period though it may overestimate somewhat emigration as return migrants may have been missed (see Chapter 6). If the estimate of net migration for the period 1921 to 1946 is added to the 50,574 emigrants of the period 1946 to 1960, net migration for the whole period would amount to about 62,243 emigrants. The excess of the projected over the 1960 census population, however, would be more than that as it should include both the emigrants and their "lost" fertility. Nevertheless, the figure of 75,674 persons may overestimate slightly emigration for that period.

Using the assumptions on Table 9.2a to project the 1931 census population to 1946 there is an excess of 19,239 persons aged 0-9, an excess of 8,290 persons aged 10-14 while there is a deficit of 4,401 persons aged 15 or more. The substantial excess for persons aged less than 15 may be partly related to some underreporting for that age group in the 1946 census while, as women over 40 in 1931 tended to underreport their age (see Appendix 3.3.a in Chapter 3), the estimated numbers of births over that 15-year period are likely to be inflated. In addition, the proportion of women aged 15-44 in the 1931 census was relatively high compared to the 1921, 1946 and 1960 censuses. 47.1 per cent of women in 1931 were aged 15-44 compared to 45.1 per cent in 1921 and to 44.6 per cent in 1946. If that feature is related to more age misreporting for women in 1931 it would cause the estimated numbers of births for the period 1931 to 1946 to be inflated further. In fact, if the distribution by age of females in 1931 is changed to include 46.3 per cent of women in the 15-44 age group instead of 47.1 and the 1931 census population is projected to 1946 as before, the excess for the 0-14 age group in 1946 would be only 23,586 persons compared to the estimated 27,520 persons. If the percentage of women 15-44 in 1931 was reduced further to reflect the levels in 1921 or 1946, the excess would be reduced even more considerably. The deficit for persons aged 15 or more is probably due to substantial underreporting of persons aged less than ten in the 1931 census.

Projecting the 1931 census population to 1960 the total excess of the projected over the census population is 58,915 persons while the excess for persons aged 15 or more is 45,290. If net migration for the period 1931-1946 is added to that for the period 1946 to 1960, net migration for the whole period 1931 to 1960 would total between 39,606 and 55,326 emigrants; the latter estimate is probably nearer the true value. The excess of 58,915 persons, however, may overestimate somewhat emigration for that period, as it is likely that numbers of persons aged 0-9 were underreported in the 1931 census.

Projecting the 1946 census population to 1960, using the mortality and fertility levels on Table 9.2a the excess of the projected over the census population is 28,631 persons. The excess for persons aged 15 or more is 20,387 persons, too low compared to the estimates of migration for that period that show a net loss of between 34,854 and 50,574 persons. This may be related to the expectations of life at birth used for the period 1946-1960 being too low or to some underenumeration for the 1946 census. In fact, if lower mortality is used for the periods 1946-1951, 1951-1956 and 1956-1961, for instance expectations of life at birth for males of 60 years, 62.5 years and 65.5 years, respectively, and for females 63 years, 66 years and 69 years, respectively, the excess of the projected over the 1960 census population aged 15 or more would still be relatively low, 23,579 persons. Thus, the underestimation of emigration for that period is probably partly related to some underreporting in the 1946 census, mainly of persons aged less than 15; in fact, the proportion of the population under 15 in 1946 was implausibly low (see Table 2.2 , Chapter 2). However, this alone cannot explain the substantial difference between the excess of the projected over the 1960 census population and the estimates of net migration. Perhaps census coverage in 1960 was better than in 1946.

Table 9.3a shows the mortality and fertility assumptions for variant two of the projections. Variant two assumes the same mortality levels as variant one but somewhat lower fertility for the period 1931 to 1946; the α and β used to adjust Booth's standard schedule of fertility for that period, however, are identical to those used for variant one. The TFRs used in variant two for the period 1931 to 1946 range between 4.1 and 4.2 children per woman.

Table 9.3a: Mortality and fertility levels used to project the population of Cyprus from 1921 to 1960, variant two

	Mortality		Fertility		
	e_0 (males)	e_0 (females)	TFR	α	β
1921/26	40	42	4.0	-0.5117	0.9563
1926/31	43.5	46	4.2	-0.4980	0.9629
1931/36	48.5	51	4.1	-0.4703	0.9760
1936/41	51	53.5	4.2	-0.4437	0.9890
1941/46	54	56.5	4.2	-0.4151	1.0022
1946/51	57	60	4.5	-0.3737	1.0218
1951/56	60	64	4.0	-0.3185	1.0480
1956/61	63.5	67	3.8	-0.2689	1.0715

Table 9.3b shows the excess of the projected over the census populations in 1931, 1946 and 1960 as well as estimates of net migration for intercensal periods. As the only difference between variants ohe and two is the fertility levels used for the period 1931 to 1946, there is no difference in the excess of the projected over the census population in 1931. Projecting the 1921 census population to 1946 there is a total excess of 23,817 persons compared to the 1946 census population, out of which 16,005 are aged less than 15. The excess for persons under age 15 is 10.5 per cent compared to the census population in that age group and would seem a more plausible estimate for that period than the excess of 25,291 persons aged 0-14 estimated from variant one. Projecting the 1921 census population to 1961 and adjusting it one year backwards, the excess of the projected over the 1960 census population is 46,210 persons aged 15 or more; the total excess is 61,319 persons. This figure underestimates net migration for the period 1921 to 1960 when there was an outflow of 62,243 persons, particularly as the excess of the projected population in 1960 should include both the emigrants and their "lost" fertility.

Projecting the 1931 census population to 1946 there is an excess of 18,136 persons aged less than 15 while there is a deficit of 4,401 persons aged 15 or more. The excess for persons aged less than 15 seems more plausible than the excess of 27,529 persons computed for variant one. On the other hand, the relatively high proportions of women aged 15-44 in the 1931 census would inflate the estimated numbers of births for the period 1931 to 1946. The deficit in the projected population aged 15 or more is probably related to underreporting of persons aged less than ten in the 1931 census. If the 1931 census population is projected to 1960 there is a total excess of 44,538 persons compared to the census population, out of which 36,684 are aged 15 or more. These figures underestimate considerably migration for the period 1931 to 1960, when there was a net outflow of about 55,326 emigrants. This is probably partly due to underreporting for persons under age tèn at the 1931 census while it is also probable that the TFRs used for the period 1931 to 1946 underestimate fertility somewhat.

Projecting the 1946 census population to 1960, the total excess is 28,631 persons, exactly the same as for variant one, since these variants use the same levels of fertility and mortality for that period. These figures underestimate net migration for the period 1946 to 1960.

Table 9.3b: Excess of the projected over the census population, 1921 to 1960; variant two

	Projections from 1921		
Age group	**1931**	**1946**	**1960**
less than 10	10,028	11,612	9,697
10-14	-5,335	4,393	5,412
15 or more	7,743	7,812	46,210
Total	12,436	23,817	61,319
		Projections from 1931	
Age group		**1946**	**1960**
less than 10		13,539	5,469
10-14		4,597	2,386
15 or more		-4,401	36,684
Total		13,735	44,538
		Projections from 1946	
Age group			**1960**
less than 10			3,420
10-14			4,825
15 or more			20,387
Total			28,631
	1921-31	**1931-46**	**1946-60**
net migration[a]	6,917	4,752	34,854
net migration[b]	n.a.	n.a.	50,574

[a] based on numbers of arrivals and departures
[b] based on numbers of arrivals and departures 1946-1953 and numbers of intending immigrants and emigrants 1954-60.

Table 9.4a shows the mortality and fertility assumptions for variant three of the projections. Variant three assumes higher mortality than variants one and two for the period 1931 to 1961. Expectations of life at birth for males and females for variant three are between 1.5 and 2.5 years lower than for variants one and two for the period 1931-1946 and by 0.5 years lower over the period 1946-1961. In fact, expectations of life at birth are almost identical to the best estimates presented in the conclusion of Chapter 3, except for the period 1941-1946 when they are lower by 1.5 years both for males and females. Levels of fertility, on the other hand, are assumed to be the same as for variant one; the TFR between 1931 and 1946 is 4.4 children per woman.

Table 9.4a: Mortality and fertility levels used to project the population of Cyprus from 1921 to 1960, variant three

	Mortality		Fertility		
	e_0 (males)	e_0 (females)	TFR	α	β
1921/26	40	42	4.0	-0.5117	0.9563
1926/31	43.5	45.8	4.2	-0.4980	0.9629
1931/36	47	49	4.4	-0.4703	0.9760
1936/41	48.5	51	4.4	-0.4437	0.9890
1941/46	52	55	4.4	-0.4151	1.0022
1946/51	56.5	59.5	4.5	-0.3737	1.0218
1951/56	59.5	63.5	4.0	-0.3185	1.0480
1956/61	62.5	66.5	3.8	-0.2689	1.0715

Table 9.4b shows estimates of the excess of the projected over the census populations in 1931, 1946 and 1960 as well as estimates of net migration for intercensal periods. Projecting the 1921 census population to 1931, the excess of the projected over the census population is 12,319 persons. This estimate is slightly different to the one obtained from variants one and two due to a small difference in the expectation of life at birth for females used for the period 1926-1931. Projecting the 1921 census population to 1946, the total excess of the projected over the census population is 25,758 persons out of which 4,822 persons are aged 15 or more. The excess for persons aged 15 or more is an underestimate as net migration for the period 1921 to 1946 amounted to an outflow of 11,669 persons. The

excess for persons under age 15 is substantial and may be partly related to some underreporting for that age group in the 1946 census. Projecting the 1921 census population to 1960 the excess of the projected over the census population is 63,486 persons out of which 47,809 are over age 15. This figure probably underestimates emigration for the whole period 1921 to 1960 when there was a net outflow of 62,243 persons, particularly as the excess of the projected population in 1960 should include both the emigrants and their "lost" fertility.

If the 1931 census population is projected to 1946 using the levels of mortality and fertility on Table 9.4a, the excess of the projected over the census population is 16,024 persons; the excess for persons under age 15 is quite substantial, about 23,000 persons while there is a deficit of 7,185 persons aged 15 or more. The relatively high numbers in the projected population of persons aged less than 15 is partly related to the tendency of women aged more than 40 in 1931 to underreport their age, which would cause the estimated numbers of births to be inflated (see Appendix 3.3, a in Chapter 3). Also, in the 1931 census there was an unusually high proportion of women aged 15-44 compared to the 1921, 1946 and 1960 censuses, which would result in too high an estimate of the numbers of births for the period 1931 to 1946. The deficit for persons aged over 15 is probably partly due to underreporting of persons 0-9 in the 1931 census. If the 1931 census population is projected to 1960, there is an excess of 47,449 persons in the projected population, out of which 38,641 are aged 15 or more. This figure is relatively low, given that in the period 1931 to 1960 there was a net outflow of about 55,326 persons. This is partly related to underreporting of persons aged 0-9 in the 1931 census.

Projecting the 1946 census population to 1960 the excess of the projected over the census population is only 26,653 persons. The difference compared to variant two is very small, about 2,000 persons, and is related to the slightly higher mortality assumed in variant three. Nevertheless, these figures underestimate emigration for the period 1946 to 1960, when there was a net outflow of about 50,574 persons.

Table 9.4b: Excess of the projected over the census population, 1921 to 1960; variant three

	Projections from 1921		
Age group	1931	1946	1960
less than 10	9,962	14,278	10,733
10-14	-5,339	6,658	4,944
15 or more	7,696	4,822	47,809
Total	12,319	25,758	63,486
	Projections from 1931		
Age group		1946	1960
less than 10		16,325	6,743
10-14		6,884	2,065
15 or more		-7,185	38,641
Total		16,024	47,449
	Projections from 1946		
Age group			1960
less than 10			2,476
10-14			4,472
15 or more			19,705
Total			26,653
	1921-31	1931-46	1946-60
net migration[a]	6,917	4,752	34,854
net migration[b]	n.a.	n.a.	50,574

[a] based on numbers of arrivals and departures
[b] based on numbers of arrivals and departures 1946-1953 and numbers of intending immigrants and emigrants 1954-60.

If the assumptions involved a combination of relatively "high" mortality and "low" fertility, i.e. if the mortality levels used for variant three are combined with the TFRs used for variant two, then the estimates of net migration would be too low for all periods. For instance, if the 1921 census population is projected to 1960, the excess of the projected over the census population would be only 49,539 persons. Net migration for that period amounted to about 55,326 emigrants.

Table 9.5a shows the mortality and fertility assumptions for variant four of the projections. Variant four assumes almost identical mortality levels to variant three except for the period 1941-1946 when expectations of life at birth for males and females are higher by 1.5 years. Levels of fertility used in variant four are higher for the period 1921 to 1931 compared to all variants. TFRs are assumed to be 4.2 children per woman in the period 1921-1926 and 4.4 children per woman in the period 1926-1931. TFRs after 1931 are the same as for variants one and three.

Table 9.5a: Mortality and fertility levels used to project the population of Cyprus from 1921 to 1960, variant four

	Mortality		Fertility		
	e_0 (males)	e_0 (females)	TFR	α	β
1921/26	40	42	4.2	-0.5117	0.9563
1926/31	43.5	46	4.4	-0.4980	0.9629
1931/36	47	49	4.4	-0.4703	0.9760
1936/41	48.5	51	4.4	-0.4437	0.9890
1941/46	53.5	56	4.4	-0.4151	1.0022
1946/51	56	59	4.5	-0.3737	1.0218
1951/56	59.5	63.5	4.0	-0.3185	1.0480
1956/61	62.5	66.5	3.8	-0.2689	1.0715

Table 9.5b shows estimates of the excess of the projected over the census populations in 1931, 1946 and 1960 as well as estimates of net migration for intercensal periods. The table shows projections only for the period 1921 to 1960 as TFRs for the period 1931 to 1960 are identical to those used for variants one and three while mortality levels roughly fall between the ones used in these variants. Thus, for projections using the 1931 and the 1946 census populations as basis, the estimates of variant three would form a lower bound while those of variant one would form an upper bound.

Projecting the 1921 census population to 1931 the excess of the projected over the census population is 14,336 persons aged less than ten while there is a deficit of 5,335 persons aged 10-14 and an excess of 7,696 persons aged 15 or more. The excess for persons aged less than ten seems relatively high but is probably a better estimate compared to all other variants, given the substantial underreporting for that age group in the 1931 census and the overestimation of births due to some underreporting of age by women over 40 in the 1921 census. Projecting the

1921 census population to 1946 the excess is 33,294 persons. The excess for persons aged 15 or more is 9,531 persons and seems a more plausible approximation of net migration for the period 1921 to 1946 than the estimates obtained from all other variants. The excess for persons under age 15 is 23,766 persons, quite substantial but less than the 25,291 persons estimated from variant one. The relatively high excess for that age group is probably partly due to the high proportion of women in reproductive ages in the 1931 projected population (46.9 per cent) that inflated numbers of births for the 15-year period between 1931 and 1946. In addition, some underenumeration for the 0-14 age group in the 1946 census may be part of the explanation.

Projecting the 1921 census population to 1960 the total excess of the projected over the census population is 73,146 persons, out of which 51,613 are aged 15 or more. These figures may overestimate slightly emigration for the period 1921 to 1960, when there was a net outflow of about 62,243 persons. However, the projected population should include both the emigrants and their "lost" fertility. In addition, a slight overestimation of the numbers of births for the 15-year period between 1931 and 1946, due to the relatively high proportion of women in reproductive ages in the 1931 projected population, would result in the overestimation of the projected population aged 15 or more in 1960.

If the mortality levels of variant four were used to projected the 1921 census population to 1960 but slightly lower fertility for the period 1931 to 1946, i.e. TFRs were between 4.2 and 4.3 children per woman in that period, the excess of the projected over the census population aged under 15 in 1946 would be 18,570 persons while the excess for persons aged 15 or more would still be 9,631. The excess of the projected over the 1960 census population would be 49,499 persons aged 15 or more, very similar to that on Table 9.5b, but the total excess would be lower, 67,247 persons. That figure seems a better estimate of net migration for the whole period 1921 to 1960 when there was a net outflow of about 62,243 persons. However, use of these TFRs would result in the substantial underestimation of emigration when projecting the 1931 census population to 1960; the excess of the projected population over the 1960 census population would be only 40,592 persons.

Table 9.5b: Excess of the projected over the census population, 1921 to 1960; variant four

Age group	Projections from 1921 1931	1946	1960
less than 10	14,336	17,051	14,614
10-14	-5,335	6,712	6,919
15 or more	7,696	9,531	51,613
Total	16,693	33,294	73,146
	1921-31	**1931-46**	**1946-60**
net migration[a]	6,917	4,752	34,854
net migration[b]	n.a.	n.a.	50,574

[a] based on numbers of arrivals and departures
[b] based on numbers of arrivals and departures 1946-1953 and numbers of intending immigrants and emigrants 1954-60.

For all variants, when projecting the 1921 census population to 1960 the excess of the projected population aged 15 or more at census years includes a high proportion of males, particularly in 1931 and 1946. The excess for persons under 15, on the other hand, is roughly equally distributed between males and females. In the conclusion of Chapter 6 it is noted that there was an excess of males among emigrants in the period 1955 to 1960, particularly in the 15-39 age group, while that was probably the case for the earlier period, as well.

Comparing the results obtained from the four variants a number of observations can be made. Firstly, there are errors in census data. It is likely that there was underreporting of persons aged 0-4 in the 1921 census while there was substantial underreporting of persons aged 0-9 in the 1931 census. Thus, the projections based on the 1931 census population underestimate emigration for the period 1931 to 1960, except if a combination of high fertility and very low mortality is used for that period, i.e. variant one. It is also likely that there was some underreporting for persons aged less than 15 in the 1946 census while that census is probably less complete than the 1960 one. Both these factors resulted in the underestimation of emigration when the 1946 census population is projected to 1960. Other age reporting errors involve women over 40 at the census underreporting their age; that would result in the overestimation of the numbers of births for the 10 or 15 year period that follows the census.

The evaluation of the assumptions is complicated both by lack of knowledge on the extent of census underreporting and by the fact that the estimates of net migration are not entirely reliable. For instance, the estimate of net migration for the period 1946-1960 based on numbers of arrivals and departures differs substantially from that computed from numbers of intending immigrants and intending emigrants.

Variant one of the projections which assumes relatively "low" mortality and "high" fertility may overestimate slightly emigration for the period 1921 to 1960. On the other hand, variant two which assumes relatively "low" mortality and "low" fertility and variant three which assumes relatively "high" mortality and "high" fertility seem to provide underestimates of emigration for that period. Variant four, which assumes "high" fertility not only for the period 1931 to 1960 but also for the period 1921 to 1931 while it assumes slightly lower mortality than variant three for the period 1941 to 1946, imply slightly less emigration in the whole period than variant one but more than variants two and three. In addition, variant four gives more plausible estimates of emigration when the 1921 census population is projected to 1946. Use of somewhat lower fertility than for variant four for the period 1931 to 1946 would provide better estimates of net migration for the whole period 1921 to 1960 but would underestimate considerably emigration if the 1931 census population is used as basis for the projections. Thus, it seems likely that variant four provides somewhat better estimates than all other variants though fertility for the period 1931 to 1946 may have been somewhat lower than the TFRs used for that variant.

The expectations of life at birth used in variant four are almost identical to those presented in the conclusion of Chapter 3 (see Table A9.1, Appendix 9.2). Thus, the levels presented in Chapter 3 seem to represent adequately mortality for the population of Cyprus in the period 1921 to 1960.

The fertility levels used in variant four imply that TFR was 4.2 children per woman in the period 1921-1926 but the rate increased slightly to 4.4 children per woman over 1926-1931 and remained fairly constant up to 1951. The rate decreased somewhat thereafter, to 4.0 children per woman over 1951-1956 and to 3.8 children per woman over 1956-1961. The CBRs based on the estimated numbers of births and the projected populations for variant four stood at 36 per thousand in the early 1920s while the rate increased to 38.5 per thousand in the late 1920s. CBRs decreased somewhat thereafter, reaching 36 per thousand in the early 1930s and 34 per thousand in the late 1930s while the rates increased somewhat in the late 1940s, reaching 35 per thousand. From 1950 onwards, CBRs followed a declining trend, reaching 29 per thousand in the late 1950s. Had slightly lower TFRs been used in the projections for the period 1931 to 1946, the CBRs for the projected population would show the same trend while the rates would be only insubtantially lower; i.e. CBR for the late 1930s would be 33 per thousand instead of 34 per thousand.

The CBRs obtained by variant four for the projected population are roughly in accordance with the conclusion of Chapter 5 where it was suggested that the rates were around 38-39 per thousand in the early 20th century but decreased somewhat in the late 1910s and the early 1920s. It was argued in Chapter 5 that fertility had increased again by the late 1920s but as some family limitation was introduced in the population around that period, CBRs decreased slightly in the 1930s though the rates were still relatively high in the late 1940s, around 33-34 per thousand. Fertility decreased thereafter but at a slow pace as mean age at first marriage for women was declining; CBR in 1960 was around 28-29 per thousand. Hence, it seems likely that the TFRs used for variant four represent fairly well fertility levels for the population of Cyprus between

1921 and 1960 though slightly lower rates for the period 1931 to 1946 cannot be ruled out.

To conclude, the expectations of life at birth presented in the conclusion of Chapter 3 probably represent adequately mortality levels for the population of Cyprus for the period 1921 to 1960. In addition, the fertility assumptions used in variant four seem a fairly good representation of fertility levels for that period and fit quite well with the conclusion of Chapter 5.

9.2.3 Projections for the Greek Cypriot population, 1960-1982

To perform the projections for the period 1960 to 1982 mortality and fertility levels for five-year periods were applied to the 1960, the 1973 and the 1976 census Greek Cypriot populations. To project the population from 1960 to 1980 one set of mortality and two different sets of fertility assumptions were used. These are presented on Table 9.6a along with the assumptions used to project the 1973 census population to 1983 and the 1976 census population to 1981.

The expectations of life at birth used to project the 1960 census Greek Cypriot population to 1980 are those presented in the conclusion of Chapter 8. These, for males, are only slightly higher than the expectations of life at birth obtained using parameters α and β, and level 20 of the south family of Coale-Demeny model life tables as standard. For females, however, the difference is more substantial (see Table A9.1, Appendix 9.2). Two different sets of fertility levels for the period 1960 to 1980 are used in the projections; TFRs (A) indicate somewhat higher fertility than TFRs (B) while both sets imply declining fertility between 1960 and 1975. To project the 1973 census Greek Cypriot population to 1983 the levels of mortality and fertility for the periods 1970-1975 and 1975-1980 are used. To project the 1976 census population to 1981 the levels of mortality and fertility for the period 1975-1980 are used.

Table 9.6a: Mortality and fertility levels used to project the Greek Cypriot population from 1960 to 1980, from 1973 to 1983 and from 1976 to 1981

Period	Mortality		Fertility			
1960-80	**e_0 (males)**	**e_0 (females)**	**TFR (A)**	**TFR (B)**	α	β
1960/65	65	68.5	3.4	3.2	-0.1434	1.1455
1965/70	67	70	2.6	2.5	0.1034	1.2724
1970/75	69	72	2.3	2.0	0.2701	1.3994
1975/80	71	74.5	2.4	2.2	0.3735	1.4629
1973-83	**e_0 (males)**	**e_0 (females)**	**TFR**		α	β
1973/78	69	72	2.3		0.3489	1.4534
1978/83	71	74.5	2.4		0.3735	1.4629
1976-81	**e_0 (males)**	**e_0 (females)**	**TFR**		α	β
1976/81	71	74.5	2.5		0.3735	1.4629

Estimates of net migration for the Greek Cypriot population for the period 1961 to 1982 are presented on Table 9.6b. Net migration between 1961 and 1973, computed from the numbers of intending immigrants and intending emigrants, was estimated to about 47,924 emigrants for the whole population of Cyprus (see Table 8.30, Chapter 8). Using the distribution of emigrants by ethnic group, as this was unavailable for the immigrants, net migration for the Greek Cypriot population over the period 1961-1973 may have amounted to an outflow of 38,627 persons. However, numbers of immigrants may have been underreported for the period 1970-1973 (see Chapter 8). If numbers of arrivals and departures are used to estimate net migration over 1961-1973, there would be a net outflow of 42,946 persons out of which 34,614 may have been Greek Cypriots.

Net migration for Greek Cypriots in 1974, according to official estimates, amounted to 15,408 emigrants; thus, net migration in the whole period 1961 to 1974 amounted to at least 50,000 emigrants while in the period 1975 to 1978, according to official estimates, it totalled another 23,283 emigrants. Net migration between 1979 and 1982 was negligible. The estimates of net migration for the period 1974 to 1982 on Table 9.6b that are based on numbers of intending immigrants and emigrants underestimate emigration for that period (see Chapter 8).

Table 9.6b: Estimates of net migration, 1960 to 1982

	1961-1973	1974-1976	1977-1982
net migration[a]	-34,614	n.a.	n.a.
net migration[b]	-38,627	-14,447	-6,896
	1974	**1975-1978**	**1979-1982**
net migration[c]	-15,408	-23,283	-232

[a] based on numbers of arrivals and departures
[b] based on numbers of intending immigrants and emigrants
[c] based on official estimates (Department of Statistics and Research, 1993)

Table 9.6c shows estimates of the excess of the projected over the census populations in 1973, 1976 and 1982. To compare the population projected from 1960 to 1975 to the 1973 and the 1976 census Greek Cypriot populations, the projected population was adjusted using the annual rate of growth implied by the assumptions for the period 1960 to 1975. To compare the population projected from 1960 to 1980 to the 1982 census population, the projected population was adjusted using the annual rate of growth implied by the assumptions for the period 1960 to 1980. The estimates of the excess of the projected over the census populations are shown for three broad age groups.

If fertility is assumed to be relatively high, i.e. TFRs (A) are used in the projections, the projected population shows a deficit of about 6,000 persons aged 0-14 compared to the 1973 census population while there is an excess of 16,744 persons aged 15 or more. Comparing the projected population to the 1976 census population there is an excess of 17,081 persons aged less than ten while the excess for the 10-14 age group totals 7,256 persons. Overall, the projected population exceeds the 1976 census population by 68,752 persons.

The excess of only 16,744 persons aged 15 or more in the projected over the 1973 census population underestimates substantially emigration for the period 1960 to 1973 when net migration amounted to an outflow of at least 34,614 persons. On the other hand, the excess of 44,415 persons over age 15 compared to the 1976 census population seems a plausible estimate of net migration for the period 1960 to 1976 as in the period 1961 to 1974 there was an outflow of at least 50,000 persons while between 1975 and 1978 there were another 23,283 emigrants.

Table 9.6c: Excess of the projected over the census populations, 1960 to 1982

	Projections from 1960				
Age group	**1973[a]**	**1976[a]**	**1982[a]**	**1976[b]**	**1982[b]**
less than 10	-3,049	17,081	18,669	9,007	7,509
10-14	-2,920	7,256	5,798	3,971	3,855
15 or more	16,744	44,415	58,417	43,955	54,019
Total	10,774	68,752	82,884	56,934	65,383
	Projections from 1973			**Projections from 1976**	
Age group			**1982**		**1982**
less than 10			10,679		4,762
10-14			2,012		-1,835
15 or more			39,802		4,040
Total			52,493		6,968

[a] Based on TFR (A)
[b] Based on TFR (B)

Comparing the projected population aged less than 15 to the 1973 and the 1976 census populations gives different indications so far as the fertility assumptions are concerned. The deficit in the projected population in 1973 indicates that TFRs (A) may underestimate slightly fertility for the period 1960-1975. By contrast, the rates seem to overestimate fertility if the projected population is compared to the 1976 census population. This may be partly due to some underreporting for persons aged 0-14 in the 1976 census. Nevertheless, emigrants in the period following the partition of the island in 1974 are likely to include a high proportion of Greek Cypriot families who were displaced from northern Cyprus; thus, the substantial excess of persons aged less than 15 for the projected population in 1976 is probably related mainly to children and young persons emigrating along with their parents. It is also possible that fertility following the partition of the island was exceptionally low; this, however, would affect only the estimates for the 0-4 age group in 1976.

If the 1960 census Greek Cypriot population is projected to 1982, the census population would show a deficit of 82,884 persons out of which 58,417 are aged 15 or more. These figures seem fairly plausible as net migration between 1961 and 1978 may have amounted to at least 73,305 emigrants while between 1979 and 1982 it was negligible. Moreover, the excess of the projected over the census population would include not only the emigrants but also their lost fertility. Nevertheless, fertility for the period 1975 to 1980 may have been slightly overestimated by the assumptions.

Projecting the 1973 census Greek Cypriot population to 1982, using the assumptions on Table 9.6a, the excess of the projected over the census population is 52,493 persons out of which 39,802 are aged 15 or more. These figures imply very substantial emigration between 1973 and 1982. The official estimates of net migration for the period 1974 to 1982 indicate a net outflow of 38,923 persons; emigrants in that period probably included high proportions of persons under the age of 15. Thus, the total excess of 52,493 persons may overestimate net migration for the period 1973-1982. That may be related to better coverage for the 1973 census compared to the 1960, the 1976 and the 1982 censuses; this would also account for the underestimation of net migration for the period 1960 to 1973.

Projecting the 1976 census population to 1982, using the assumptions on Table 9.6a, the excess of the projected over the census population is only 6,968 persons, out of which 4,040 are aged 15 or more. That would imply that emigration after 1976 is negligible.

Projecting the 1960 census Greek Cypriot population to 1976 assuming relatively low fertility (i.e. using TFRs (B)) the projected population shows an excess of 56,934 persons compared to the census population, out of which 43,955 are aged 15 or more. If the 1960 census population is projected to 1982 there is an excess of 54,019 persons aged 15 or more compared to the census and a total excess of 65,383 persons. These figures probably underestimate emigration for the period 1961 to 1982 when there was a net outflow of at least 73,305 persons.

To conclude, the mortality levels used in the projections and TFRs (A) (i.e. relatively high fertility) seem to provide fairly plausible estimates of net migration compared to the 1976 and the 1982 census populations. Comparisons with the 1973 census population, on the other hand, underestimate emigration for the period 1960 to 1973, perhaps due to better coverage for the latter census. Fertility schedule TFR (A) probably provides better estimates than TFR (B), though it may overestimate slightly fertility for the period after 1970. Thus, the expectations of life at birth presented in the conclusion of Chapter 8 seem to represent adequately mortality levels for the Greek Cypriot population for the period 1960 to 1982 while fertility indeed decreased substantially after 1960, reaching around 2.3 or 2.4 children per woman in the 1970s.

Appendices

Appendix 9.1: Estimation of α and β using the Gompertz relational model of fertility and Booth's standard

Brass' Gompertz relational model of fertility enables the estimation of α and β for an observed age-specific fertility schedule by comparing a transformation of that schedule to Booth's standard model of fertility (Zaba B, 1981). The parameters α and β determine the shape of the standard fertility schedule which best fits the data. In fact, parameter α determines the age by which half of the childbearing has occurred while β determines the spread of the fertility schedule (United Nations, 1983: 25-26).

Using the observed age-specific fertility rates for 1946, 1960 and 1982, α and β for these years were obtained. Then, parameters were estimated for the period before 1946 by extrapolation, assuming that α and β changed linearly between 1946 and 1960 and that the annual rate of change for the period 1926-1946 was half that for the period 1946-1960. For the period before 1926 it was assumed that both parameters remained constant. For the period after 1960 it was assumed that change was linear between 1960 and 1975 while there was no change between 1975 and 1982. The estimates of α and β were used to adjust Booth's standard schedule of fertility for census years and to compute the expected numbers of births by multiplying the age-specific fertility rates of the adjusted standard by the numbers of women at each census.

Appendix 9.2: Expectations of life at birth based on α, β and level 20 of the south family of Coale-Demeny model life tables and how they compare with the best estimates of mortality presented in Chapter 3 and Chapter 8

Table A9.1 shows expectations of life at birth for five year periods based on the most plausible estimates presented in the conclusion of Chapter 3 for the period 1921 to 1960 and in Chapter 8 for the period 1960 to 1980 (e_0^a). In addition, expectations of life at birth computed using level 20 of the south family of Coale-Demeny model life tables as standard and parameters α and β (e_0^b) are shown. The parameters were computed by linear interpolation and extrapolation using the α and β obtained for the early 1940s and the mid-1970s (see Appendix 3.6, Chapter 3 and Appendix 8.3, Chapter 8).

For males, both sets of expectations of life at birth are very similar, except for the period 1936-1941, for which the expectation of life at birth presented in Chapter 3 is lower by 2 years than the one obtained using level 20 of Coale-Demeny model life tables as standard. For females also there is a two-year difference in the expectation of life at birth for that period, while both sets of expectations of life at birth for all other periods before 1951 are very similar. However, thereafter, the expectations of life at birth presented in Chapter 3 and Chapter 8 are higher than those obtained using level 20 as standard, by about one year.

Table A9.1: Expectations of life at birth for males and females for five year periods, 1921 to 1980

	Males		Females	
	e_0 [a]	e_0 [b]	e_0 [a]	e_0 [b]
1921/26	42	40	43.5	42
1926/31		43.5		45.8
1931/36	47	47	49	49.5
1936/41	48.5	50.4	51	53
1941/46	53.5	53.5	56	56.2
1946/51	56	56.7	59	59.5
1951/56	59.5	59.6	63.5	62.5
1956/61	63	62.3	66.5	65.2
1960/65	65	64.7	68.5	67.6
1965/70	67	66.6	70	69.5
1970/75	69	68.3	72	71.1
1975/80	71	69.8	74.5	72.6

[a] Based on the best estimates presented in Chapter 3 and Chapter 8

[b] Obtained using level 20 of the south family of Coale-Demeny model life tables as standard and parameters α and β

Chapter 10: CONCLUSION

In this chapter a summary of the major findings for the population of Cyprus is presented and an attempt made to link together the pre-1960 and the post-1960 periods to provide a comprehensive picture of changes over time.

10.1 Growth of the population and changes in the distribution by age and sex, 1881-1982

The population of Cyprus in 1881 was 186,173 persons; it took rather more than 50 years for the population to double and more than 70 years to treble. The annual rates of growth in the period 1881-1931 ranged between 11.3 and 12.5 per thousand, except for a peak over the period 1901-1911 when the rate was 14.5 per thousand. The growth of the population in the pre-1931 period was relatively slow mainly due to emigration and high mortality. By contrast, the rates of growth between 1931 and 1960 were relatively high, ranging from 16.6 to 17.2 per thousand, probably partly due to mortality declining at a fast pace. The annual rates of growth for the Greek Cypriot population decreased after 1960; the rate in the period 1960-1973 was 12.5 per thousand, probably partly due to fertility declining sharply, while the rate became negative in the period 1973-1976, mainly due to very substantial emigration. However, as emigration decreased after 1976 the annual rates of growth became positive again though in the period 1976-1982 the Greek Cypriot population was growing by only 4.7 per thousand per year, much slower than in the period before 1973, probably due to low fertility.

The Cyprus population in the period 1881-1921 was characterised by relatively high proportions of persons aged 0-14, around 36.4 to 37.3 per cent, and relatively low proportions of persons aged 65 or more, about 4.2 to 4.5 per cent. Proportions aged 15-64 ranged between 58.3 and 59.4 per cent in that period. It is likely that by 1960 the proportion of the population aged 0-14 had decreased slightly while proportions aged 65 or more had increased somewhat. By 1973, however, proportions aged 0-14 had decreased substantially for the Greek Cypriot population, reaching 28.9 per cent, while proportions aged 65 or more had increased to 9.5 per cent; proportions aged 15-64 had also increased slightly, reaching 61.7 per cent. The significant difference in the distribution of the population by age in 1973 is probably mainly due to declining fertility in the 1950s and the 1960s. By 1982 population "ageing" had progressed further as only 24.7 per cent of the Greek Cypriot population was aged 0-14 that year while 64.5 per cent was aged 15-64 and 10.8 per cent was aged 65 or more.

The population of Cyprus between 1881 and 1911 was characterised by a substantial excess of males; however, the excess decreased over time and by 1931 it had turned to an excess of females. Thereafter, the ratios of males to females decreased further, reaching a low in 1960, but followed an increasing trend for the Greek Cypriot population between 1960 and 1982; the ratio in 1982 was 0.988, very similar to that for 1931. The decline in the ratio after 1911 was probably partly due to more male than female emigration as well as to female mortality declining at a faster pace than male mortality. However, as the excess of male emigrants decreased after 1960 the ratio increased somewhat for the Greek Cypriot population in the period 1960-1982.

10.2 Levels and trends in mortality, 1881-1982

Crude death rates based on registration data indicate that there was an upsurge of mortality in Cyprus in 1918, probably due to an influenza epidemic, as well as in the period 1920-1922 when there was an outbreak of malaria and an epidemic of measles. Thereafter, mortality followed a clear downward trend that was interrupted, however, by substantial peaks in certain years; these upsurges were probably related to outbreaks of malaria combined with epidemics of other diseases. After 1942 there were no more upsurges of mortality, perhaps partly due to a campaign against malaria, carried out between 1945 and 1948, and the eradication of that disease in 1949.

Registration data, however, do not reflect accurately mortality levels, mainly due to underreporting of deaths. Use of indirect techniques, on the other hand, provides fairly plausible estimates. The estimates indicate that mortality in Cyprus was declining throughout the whole period 1881 to 1982. In addition, it is likely that female mortality in the period 1881 to 1911 was somewhat higher than male mortality while, thereafter, the opposite was true.

The estimates imply that expectation of life at birth for females in the 1880s was around 34 years while for males it was slightly higher, perhaps around 35 years; IMRs in that period were around 210 per thousand. By the 1920s expectation of life at birth had probably increased to 43.5 years for females and to 42 years for males while IMRs had decreased to 165 per thousand. Mortality probably decreased substantially thereafter; expectation of life at birth for females reached 49 years in the early 1930s, 56 years in the early 1940s and 66.5 years in the late 1950s. Expectation of life at birth for males also increased from about 47 years to 53.5 years between the early 1930s and the early 1940s, reaching 63 years in the late 1950s. IMRs probably decreased from around 145 per thousand in the early 1930s to 105 per thousand in the early 1940s and to 65 per thousand in the late 1950s.

After 1960, mortality for the Greek Cypriot population continued its declining trend; expectation of life at birth for females probably had reached 70 years by the late 1960s and 74.5 years by the late 1970s. Expectation of life at birth for males was probably around 67 years in the late 1960s and had increased to 71 years by the late 1970s while IMRs decreased from about 50 per thousand to 25 per thousand in that period.

10.3 Levels and trends in nuptiality, 1881-1982

Crude marriage rates for the period 1903 to 1960 and for the period 1976 to 1987 indicate that the Greek Cypriot population was prejudiced against marrying in leap years. The rates also imply that the incidence of marriage reached a peak for the whole population in the period 1943 to 1947. In addition, crude marriage rates were relatively high for the Greek Cypriot population between 1976 and 1982.

Hajnal's singulate mean age at marriage shows that marriage patterns in Cyprus were more or less constant between 1891 and 1911. Males in that period married on average between ages 27.1 and 27.7 while females married not long after their twenty-second birthday. In addition, about 6.5 per cent of males remained single at age 50 in that period while the proportion for females ranged between 4.2 and 5.1 per cent. After 1911 the relative availability of females at marriageable ages increased; thus, females shifted towards later marriage while male marriage patterns remained unchanged. By 1931, female SMAM had reached a peak, 24.0 years, while male SMAM was still 27.4 years. However, marriage patterns changed again after 1931; males shifted towards earlier and more marriage and made it possible for females to shift back to their former patterns, too. In 1960, males married at an unprecedented early age, 24.7 years, while more males married than ever before; by contrast, female marriage patterns were very similar to the pre-1931 ones.

Marriage patterns changed for the Greek Cypriot population after 1960; SMAMs increased for both males and females, reaching 26.3 and 24.2 years respectively in 1976. Proportions single at age 50, on the other hand, continued declining for males in that period, reaching two per cent, while they remained unchanged for females. After 1976 both male and female mean age at first marriage decreased somewhat; however, as the relative availability of females at marriageable ages declined after 1973, male SMAM decreased by only 0.2 years between 1976 and 1982 compared to 0.7 years for female SMAM. In spite of the increase in male SMAM after 1960, males in the period 1976 to 1982 still married earlier than in the pre-1931 period. Females, on the other hand, after 1960 shifted again towards later marriage, getting married on average at ages similar to the period 1931-1946 and later than in the pre-1931 period. It should be noted that part of the increase in female SMAM after 1960 is due to the exclusion of the Turkish Cypriot population as Muslim females in 1946 married on average 4.1 years earlier than Greek Orthodox women.

10.4 Levels and trends in fertility, 1881-1982

Crude birth rates based on registration data indicate that fertility in Cyprus remained fairly constant between 1901 and 1951 though with substantial fluctuations for certain periods. However, registration data are probably affected by underreporting of births while changing completeness of registration may have affected trends over time.

It is likely that the population of Cyprus experienced more or less natural fertility in the early 20th century; CBRs were probably around 38-39 per thousand in that period. Fertility may have decreased slightly in the late 1910s and in the early 1920s, partly due to increasing mean age at first marriage for women. It is also possible that some voluntary control of fertility was introduced to urban segments of the population before 1921 as urban fertility in 1921 and 1931 was much lower than rural fertility. However, levels of fertility for the whole population of Cyprus had probably more or less recovered by the late 1920s.

Fertility probably decreased somewhat in the 1930s and in the early 1940s; the Coale index of fertility control implies that there were low levels of family limitation in 1946. CBRs, however, were still relatively high in the late 1940s, around 34 per thousand, due to an increase in the numbers of marriages in that period. Fertility followed a declining trend in the 1950s; the Coale index of fertility control implies that levels of family limitation had increased by 1960. However, CBRs did not decrease significantly in this period as mean age at marriage for females was declining. The rates probably reached 28 or 29 per thousand in 1960.

Fertility for the Greek Cypriot population probably decreased considerably in the 1960s and in the early 1970s; by 1976, fertility decline had come to an end with CBRs around 20 per thousand. Fertility apparently remained fairly constant between 1976 and 1982 and was characterised by TFRs above replacement level, around 2.4 births per woman.

The suggestion of St. John-Jones that fertility in Cyprus was declining from the 1890s but was stabilised again in the 1910s with CBRs around 30-33 per thousand while it resumed a declining trend only in the late 1950s is highly unlikely. Cypriot society is traditional and religious; thus, it is improbable that contraception was acceptable to large segments of the population so early on. It is more likely that the relatively low fertility in the late 1910s and in the early 1920s is related to changes in marriage patterns while some family limitation was introduced in the population in the late 1920s or in the early 1930s though it may have been practised by the urban elite earlier than that.

10.5 Levels and trends in international migration, 1881-1982

For the period before 1920 data on migration are unavailable; however, it is likely that there was some emigration, perhaps quite substantial for certain periods. For instance, the relatively low rates of growth for the population of Cyprus in the period before 1901 and over the period 1911-1921 may be due partly to considerable emigration.

Data on departures from and arrivals at the ports of Cyprus for the period 1920 to 1954 as well as on the numbers of intending immigrants and emigrants for the period after 1954 indicate a net loss of population through migration. Between 1921 and 1945 departures exceeded arrivals by 11,669 while levels of emigration increased substantially thereafter. The data show a net outflow of 17,639 persons in the period 1946-1954 while net migration totalled 32,935 emigrants in the six-year period between 1955 and 1960. The figure for the latter period, however, may overestimate emigration slightly, as numbers of immigrants may have been underreported. Emigration was also quite substantial in 1961 and 1962 when emigrants exceeded immigrants by 18,256 persons; however, levels of emigration decreased thereafter. Nevertheless, net migration between 1961 and 1973 for the whole population of Cyprus totalled 47,924 emigrants though, as immigration may have been underreported in the period 1970-1973, the excess of emigrants over immigrants may have been less. Emigration for the Greek Cypriot population after the partition of the island in 1974 was considerable; estimates indicate that in the period 1974-1978 emigrants exceeded immigrants by 38,923 persons while emigration decreased substantially thereafter.

Emigrants in the period 1955 to 1960 included a very high proportion of persons aged 15-39 compared to the distribution of the whole population by age in 1960 and relatively low proportions of persons aged 0-14 and 40 or more. Between 1961 and 1973, however, emigrants included on average slightly higher proportions of persons aged 0-14 and slightly lower proportions of persons 15-39 than in the earlier period. The data indicate that the distribution of the Greek Cypriot emigrants by age after 1974 was very similar to that for the period 1955-1960 though as emigration was underreported between 1974 and 1978 this may be incorrect. In fact, it is likely that the majority of emigrants in that period were refugees from the part of Cyprus controlled by Turkish Cypriots; thus, emigrants probably included a high proportion of families.

Between 1955 and 1962 emigrants were characterised by a substantial excess of males. However, in the period 1963 to 1973 more females than males emigrated though emigration was less than in the earlier period. Between 1974 and 1980 there also appears to be an excess of females among Greek Cypriot emigrants though, as emigration was underreported in that period, this may not be the case.

The major destination for emigrants between 1955 and 1970 was the UK; in fact, proportions that intended to emigrate there were as high as 92-93 per cent in the period 1959-1961. However, after 1970 Australia became a more important destination than the UK; in addition, the proportions of emigrants that intended to emigrate to the USA, Canada and South Africa had increased by 1973. In the period 1974-1982 Australia maintained its status as the major destination for Greek Cypriot emigrants while Greece became also an important destination. The proportions of emigrants intending to emigrate to Canada, the USA and South Africa increased on average compared to the pre-1974 period while proportions intending to go to the UK decreased further.

Between 1955 and 1960, 73.0 per cent of emigrants were Greek Cypriots while 15.5 per cent were Turkish Cypriots; however, emigrants in that period also included relatively high proportions of "Anglo-Americans", as British and Americans from the USA are referred to in the annual reports. Between 1961 and 1972, 78.9 per cent of emigrants were Greek Cypriots, 19.2 per cent were Turkish Cypriots and 1.7 per cent were Armenians. It is worth noting that emigrants in the period 1955-1960 included a slightly higher proportion of Greek than of Turkish Cypriots compared to the distribution of the population by race in 1960 while differentials in the period 1961-1972 were non-existent.

Data on the characteristics of emigrants for the period before 1955 are unavailable. However, census data on the distribution of the population by age and sex imply that there was a substantial excess of males among emigrants while a high proportion of them were young adults. In addition, it is likely that between 1881 and 1946 emigrants included high proportions of Moslems while the UK became a major destination for emigrants only after 1931.

10.6 Levels and trends in internal migration, 1881-1982

The annual intercensal rates of growth for the urban and rural areas of Cyprus indicate that there was some rural to urban migration after 1911. The proportion of the population resident in the urban sector increased between 1911 and 1960 from 16.8 per cent to 35.9 per cent. Data from the 1946 census indicate that net lifetime migration was positive for urban areas and represented 33.2 per cent of the urban population. The data also imply that the rural to urban movement was mainly directed, at least up to 1946, towards large urban centres: Nicosia, Limassol and Famagusta.

After 1960 the movement towards urban areas probably increased; in 1982 the majority of the Greek Cypriot population, 63.5 per cent, lived in urban areas. However, part of the increase of the urban population in 1982 may be attributable to Greek Cypriot refugees coming from the occupied territories to urban areas after the partition of the island in 1974.

The urban population in 1946 and 1960 included much higher proportions of persons aged 15-59 than the rural population and lower proportions of persons aged 0-14 and 60 or more; in addition, it included higher proportions of males, particularly in the 15-34 age group. Thus, it is likely that in-migrants to urban areas before 1960 included high proportions of young adult males.

The urban population in 1982 also included higher proportions of persons aged 15-59 than the rural population and lower proportions of persons aged 60 or more; however, proportions of persons aged 0-14 were very similar in both urban and rural areas. In addition, there was an excess of females in the urban population in 1982 while there was an excess of males in the rural population, particularly for the 15-34 age group. Thus, it seems likely that the characteristics of in-migrants to urban areas changed after 1960. It is possible that in-migrants to urban areas after 1960 included high proportions of families; in fact, this may be due to Greek Cypriot refugee families in-migrating to urban areas after the partition of the island in 1974. In addition, rural to urban migrants aged 15-34 in the more recent period may have included a higher proportion of females than of males.

10.7 Differentials between the ethnic groups of Cyprus, 1881-1960

The Greek Orthodox community between 1881 and 1960 represented the largest proportion of the population of Cyprus, ranging from 74 per cent to 80 per cent. Over the same period the second largest community, the Moslems, represented roughly between 18 and 24 per cent of the total population. The annual rates of growth indicate that the Greek Orthodox community between 1881 and 1931 was increasing much faster than the Muslim community while after 1931 the difference was reduced and in the period 1946-1960 it was the Muslim community that was growing at a faster pace. The substantial difference in the rates of growth for the two communities may be due partly to differentials in migration levels. It is probable that a higher proportion of Moslems than of Greek Orthodox emigrated in the period 1881 to 1946 while the difference may have been very considerable in the period before 1931.

Moslems included higher proportions of males than Greek Orthodox; in addition, in 1946 and 1960, they included higher proportions of persons aged 0-14 and slightly lower proportions of persons aged 60 or more. Marriage patterns in 1946 differed substantially between the two communities; Muslim males married on average 1.4 years earlier than Greek Orthodox males while Muslim females married 4.1 years younger than Greek Orthodox women. It is likely that Muslim females had slightly higher fertility than Greek Orthodox females in the period before 1946 while differentials were maintained at least up to 1954. Mortality for Moslems also was higher than for Greek Orthodox, particularly before 1946 when differentials in mortality were more substantial than differentials in fertility. However, after 1946 differentials in mortality between the two communities were reduced.

Mortality levels and trends for the population of Cyprus between 1881 and 1960 present similarities to levels and trends for the population of Greece in that period though sex differentials were more similar to those for the population of Turkey. Marriage patterns for Turkish Cypriots in 1946 were quite similar to those for the urban population of Turkey while marriage patterns for Greek Cypriots present some similarities to the patterns for the Greek population. In addition, both Greeks and Greek Cypriots shared a prejudice against marrying in leap years. Fertility levels for the Cypriot population were quite similar to those for the Greek population though fertility decline in Cyprus began later than in Greece. However, Valaoras' estimates of fertility are questionable and it is possible that fertility transition in Greece began not much earlier than in Cyprus.

10.8 Differentials between the districts of Cyprus, 1881-1960

Between 1881 and 1960 the highest proportion of the population of Cyprus was resident in Nicosia district. The rates of growth for the different districts between 1881 and 1931 were variable. However, between 1931 and 1960 Nicosia, Limassol and Famagusta districts showed consistently higher rates of growth than other districts. In 1881, the population in all districts included more males than females; that feature changed over time and by 1931 most districts were characterised by an excess of females while by 1960 that was true for all districts.

The data indicate that there were some differences in mortality and fertility levels among the six districts of Cyprus. It seems likely that southern and south-western areas of the island had relatively high mortality while Famagusta district in the eastern part of Cyprus had relatively high fertility for most years. The singulate mean ages at marriage indicate that both males and females in Paphos district married on average quite early compared to the other districts of the island; differentials, however, were reduced after 1901. The distinct marriage patterns for Paphos district may be related to the relatively high proportion of Moslems that lived in that area, 30.6 per cent in 1891, though the percentage decreased over time and had dropped to 24.6 per cent by 1931.

10.9 Differentials between urban and rural areas of Cyprus, 1881-1982

Urban areas between 1881 and 1946 included the six principal towns of the island; in 1960, however, the suburbs of Nicosia town were added in the urban sector. After the partition of the island in 1974 urban areas in the part of Cyprus controlled by Greek Cypriots include the towns of Larnaka, Limassol and Paphos, part of Nicosia town and their suburbs. The towns of Famagusta and Kyrenia as well as the remainder of Nicosia town are in the area of Cyprus controlled by Turkish Cypriots.

Between 1881 and 1960 Cyprus was a predominantly rural country, in spite of an increase in the proportion of the population resident in urban areas after 1911 due to some rural to urban migration. By contrast, in 1982 the majority of the Greek Cypriot population, 63.5 per cent, lived in urban areas.

The population of urban areas between 1881 and 1960 included a higher proportion of males than the population of rural areas. By contrast, in 1982 it was the rural population that included a higher proportion of males. The urban population in 1946 and 1960 included higher proportions of persons aged 15-59 than the rural population and lower proportions of persons aged 0-14 and 60 or more. In 1982, the population in urban areas also included higher proportions of persons aged 15-59 and lower proportions of persons aged 60 or more than the population of rural areas. However, proportions of persons aged 0-14 were very similar for both urban and rural areas. The difference in the composition of the population by age and sex between urban and rural areas is probably partly related to rural to urban migration. It is likely that in-migrants to urban areas before 1960 included high proportions of young males while thereafter they included high proportions of families. In addition, rural to urban migration had accentuated population "ageing" for rural areas by 1960.

Registration data indicate that both mortality and fertility in 1921 and 1931 were higher in rural areas; however, by 1946 differentials had become minimal. Data from the 1980-81 Demographic Survey indicate that fertility for the year preceding the survey was somewhat higher in rural than in urban areas.

Between 1891 and 1946 there were substantial differentials in marriage patterns between urban and rural areas, particularly for males. Males in Nicosia town between 1891 and 1921 married on average 2.0 to 3.4 years later than in the rural part of the district while proportions single at age 50 in the town were approximately triple the figure for rural Nicosia. Males in 1946 in urban areas also married 1.3 years later than in rural areas while proportions single at age 50 were three times higher. By 1982, however, differentials in marriage patterns had become minimal; males in urban areas married only 0.3 years later than in rural areas while the difference for proportions single was insubstantial.

Females in Nicosia town between 1891 and 1921 married on average at similar ages as in the rural part of the district; however, proportions single at age 50 in the town were about three times higher than for rural Nicosia. In 1946, females still married at similar ages in both urban and rural areas while proportions single at age 50 for urban areas were double the figure for rural areas. Females in 1982 also married at similar ages in both urban and rural areas but proportions single at age 50 were higher in rural areas.

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