Working Paper

The Demographic Discontinuities of Mauritius

Wolfgang Lutz
Anne B. Wils

WP-90-35
July 1990

IIASA

International Institute for Applied Systems Analysis □ A-2361 Laxenburg □ Austria

Telephone: (0 22 36) 715 21 * 0 □ Telex: 079 137 iiasa a □ Telefax: (0 22 36) 71313

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FOREWORD

Mauritius is an example to encourage all those concerned with development. In these days of crushing debt and slow economic growth such an example is particularly welcome. Mauritius' population for long suffered high death rates, and up to the 1960s grew slowly. It was a one-crop economy, dependent on an erratic world sugar market. Since the 1960s all that has changed; its birth rate has come down to a level more nearly consistent with its death rate, and at the same time its economy has greatly diversified. The present is the first of a series of Working Papers analyzing the changes in which methods will be discussed, data summarized, and preliminary results announced.

Under the leadership of Wolfgang Lutz IIASA is undertaking an extended study of population and sustainable development, with the island-nation of Mauritius as the site of field studies. The field work that is about to be carried out, mostly by Mauritians, should provide extensive knowledge of the million or more people on the island. One of the things that makes such a study possible is the peaceful condition of the Island; people of African, Indian, and Caucasian origins work harmoniously together. Simon Kuznets said that a small country has the advantage of homogeneity in pulling its act together; here is a country that is small but by no means homogeneous, and it is doing well.

One consequence of the suddenness of change in Mauritius is an age discontinuity that is the special interest of this first paper. The changes of birth and death rates have produced large cohorts of men and women who are now in their 20s, and these will have a major impact on the further demographic, economic and cultural development of the country. The demographic and other characteristics of these young adults are discussed in the pages that follow.

Nathan Keyfitz
Leader
Population Program

ACKNOWLEDGEMENTS

The Ford Foundation has promoted the study of discontinuities in population change, and especially the discontinuity shown in many countries after World War II. IIASA's study started with Ford Foundation support and is now moving into a field work phase under sponsorship of the United Nations Fund for Population Activities.

ABSTRACT

Up to the middle of the 20th century, immigration of Europeans, African slaves, and indentured laborers from India was the major source of population growth on the island of Mauritius. Immediately after World War II, fertility increased and mortality entered a rapid decline which is largely attributable to the eradication of malaria. During the 1960s Mauritius had one of the highest growth rates in the world. Over the last two decades, however, fertility declined to replacement level. These demographic discontinuities resulted in a strong youth cohort born during the 1960s and early 1970s that will characterize the Mauritian age structure for decades to come. This paper studies these discontinuities from several different angles.

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THE DEMOGRAPHIC DISCONTINUITIES OF MAURITIUS

Wolfgang Lutz and Anne B. Wils

1. INTRODUCTION

Mauritius – situated in the Indian Ocean about 800 km east of Madagascar – has been known to mankind much longer than it has been settled. Arab merchants had it marked on their maps 1000 years ago and called it Dina Mozare, but did not live on it. The population history of the island of Mauritius started in 1638 when the Dutch East India Company sent a group of settlers to the previously uninhabited island. While the major interest of the Dutch was in cutting and selling the valuable ebony trees, the island served as a haven for merchant ships to Asia, and the large populations of turtles and famous, quickly exterminated, flightless dodo birds became a welcome supplement to the sailors' diet. It is estimated that by the end of the 17th century, about 200 Dutch and 500–1000 slaves lived on Mauritius. But in 1710 the Dutch abandoned Mauritius in favor of their new stronghold at the Cape of Africa.

In 1721 a small French party landed in Mauritius, which was then called Ile de France. Soon the French East India Company brought more settlers to Mauritius. It is reported that during the influential governorship of Mahe de Labourdonnais (1735–1746), the population of the island increased from under 1000 to over 3000. Already during this time sugar cultivation was introduced, and increasing numbers of slaves were brought from Madagascar and West Africa to work on the sugar estates. By 1817 the population of the island had increased to almost 100,000, consisting of more than 80% slaves, 11% free colored population, and 8% Europeans or descendants of Europeans.

In 1810 Mauritius was conquered by the British. This made little difference to the life of the island and its people because the French were guaranteed their properties, use of language, laws, and religion. The biggest change came with the abolition of slavery between 1835 and 1839. Large numbers of indentured laborers were brought in from India to replace the freed slaves. From 1851–1861 more than 100,000 Indians arrived in Mauritius. Since that time a majority of the Mauritian population is of Indian origin.

The final political change came with the independence of Mauritius in 1968. In terms of population trends, this had little immediate impact. Already in the late 1940s and early 1950s, mortality had declined considerably due to malaria eradication and other health improvements. Simultaneously, fertility rates increased even further, thus resulting in a steep increase of population growth rates

reaching levels of more than 3% per year. This demographic discontinuity which dominates the picture of any kind of visual or quantitative description of Mauritian population trends resulted in a large number of young Mauritians born in the 1950s. This phenomenon, together with a second remarkable discontinuity of past trends, i.e. the steep decline of fertility during the late 1960s and 1970s, resulted in an unusually large cohort of young people – the youth cohort – that will characterize the Mauritian age structure over decades to come.

This paper will be mostly devoted to the appropriate quantitative description and analysis of these two discontinuities in the Mauritian population history that may also be viewed as the mortality and fertility components of the demographic transition in Mauritius in the perspective of historical population development. In contrast to the usual analysis of demographic transition that studies the determinants of mortality and fertility trends that ultimately result in specific growth rates and age structures, this paper will approach the phenomenon from the other end and take changes in the age structure and age specific growth rates as the point of departure. In this it follows the example of several papers by Keyfitz (1987, 1989) on the demographic discontinuity under a global perspective and for individual countries such as Indonesia.

2. THE HISTORY OF POPULATION GROWTH IN MAURITIUS

2.1. Information From Censuses

Official census enumerations of the population living on the island of Mauritius are available from 1767 onwards. Generally the censuses were taken in ten-year intervals, with irregularities during the middle of the last century and since World War II. The censuses also give an ethnic breakdown of the population which is very informative for understanding the population history of Mauritius. The abolition of slavery in 1834 also brought about a reclassification of the categories. After that year the category "General Population" includes the descendents of Europeans and the freed slave population, whereas for the Indians, the Indo-Mauritians (Indians born in Mauritius) and the Chinese, separate categories were kept in the census. Table 1 gives the series of censuses since 1767 (mostly derived from Central Statistical Office of Mauritius 1956).

The historical development of the Mauritian population broken down by ethnic groups is also shown in Figure 1. During the 18th century the largest part of the population was slave from Africa. A small portion of the population was white, European and their descendants. A third group, the free coloreds were about as large as the European population. Population growth from 1767 (the first year we have data) to 1834 – the year of slavery abolition – was steady and high. The average annual increase was 8%. The available data indicate that very little of this growth was natural; almost all of it was due to the import of new slaves and immigration of Europeans and others. The sex ratio in the majority, the slave population, was about 1.6 men to each woman, and the crude birth rate in that population was accordingly low – estimated at around 25 per 1000. The sex ratio among the white and free colored population was more favorable. In the

Table 1. Population of Mauritius for census years 1767–1983.

Year	Population of Europeans and Descendants of Europeans	Free Colored Population	Slave Population	Total Population
1767	3,163	587	15,027	18,777
1777	3,434	1,173	25,154	29,761
1787	4,372	2,235	33,832	40,439
1797	6,237	3,703	49,080	59,020
1807	6,489	5,912	65,367	77,768
1817	7,375	10,979	79,493	97,847
1830	8,592	18,877[1]	69,476	96,945

Year	General Population	Indian Population	Indo-Mauritian Population	Chinese Population	Total Population
1840	99,450[2]	23,490	–	1,395[3]	124,335
1846	101,017	56,245	–	1,200[4]	158,462
1851	101,527	72,180	5,816	1,300[4]	180,823
1861	115,864	172,425	20,209	1,552	310,050
1871	97,497	155,367	60,891	2,287	316,042
1881	107,323	135,595	113,398	3,558	359,874
1891	111,517	99,329	156,591	3,151	370,588
1901	108,422	60,208	198,878	3,515	371,023
1911	107,432	35,396	222,301	3,662	368,791
1921	104,216	17,056	248,468	6,745	376,485
1931	115,666	7,044	261,605	8,923	393,238
1944	143,056	–	265,247	10,882	419,185
1952	148,238	–	335,327	17,850	501,415
1962	----------	658,561	----------	23,058	681,619
1973	----------	802,115	----------	24,084	826,199
1983	----------	----------	----------	----------	966,863

1 Includes a small number (less than 1000) of Indians and Chinese.
2 Includes for 1840 all native born.
3 Includes also some Malayans and Europeans in 1840.
4 Approximate figures.

colored population, it was even 0.8 men to each woman because women who married out of their race were subsequently categorized as colored. In this free population the birth rate is estimated to have been around 40 per 1000. Together, this would amount to a total crude birth rate a little under 30. At the same time, the death rate cannot have been much below 30 – the first year we have data is 1875, when the death rate starts around this level – resulting in natural growth close to nil.

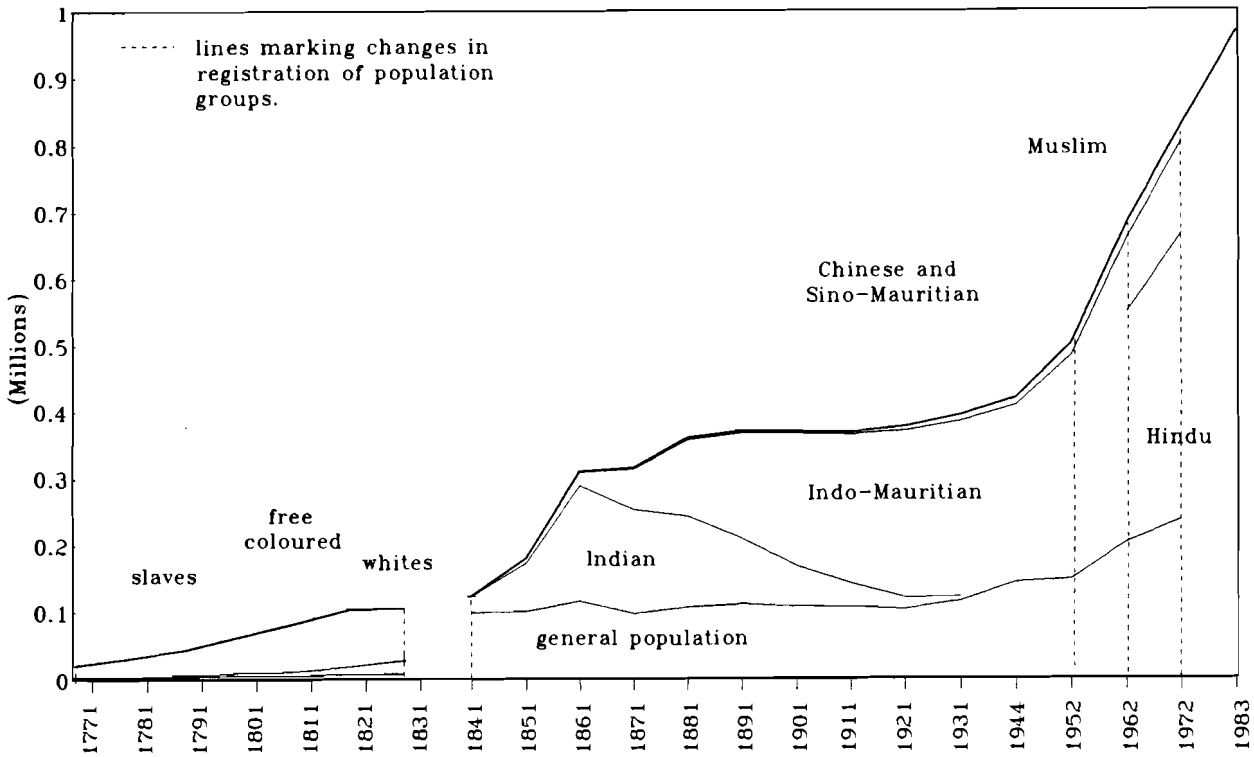

Figure 1. Population on Mauritius by groups 1767–1983. Note: Criteria were not always the same from census to census; this figure is an approximation of the population composition.

In 1834 slavery was abolished, and in the same year, the active recruitment of indentured laborers from India began to replace the freed slaves in the sugar cane plantations. The white plantation owners, who were expanding their sugar production, instigated the wave of indentured labor, often misleading the Indians about the conditions they would live and work under. Initially, the laborers were mostly males and promised a free return passage, but after 1853, the planters decided it was more profitable to bring over men and women and scrap the return passage from the contract, meaning that all laborers who arrived after this date were in fact emigrating from India for good. The Indian laborers were not treated much better than the slaves, the sanitary conditions were terrible (Parahoo 1986), and death rates were extremely high.

The immigration was enormous, and the population of Mauritius tripled during this time from around 100,000 in 1834 to 310,000 by the census of 1861. The strongest intercensal immigration decade was 1851–1861, with a total of over 100,000 immigrants. As women began to arrive from India soon after the men, the sex ratio normalized, and the native Indo-Mauritian population was born.

Figure 1 shows that the Indian population, that is, those born in India, Burma, and surrounding countries, began to decrease after a peak was registered in the 1861 census, particularly noticeable after the 1881 census. Since we know that almost none of the Indians returned home – who could afford the passage? – the very steep decline of the Indian population seems to be due to very high mortality rates and fewer newcomers compensating the mortality attrition.

The growth rate of the Indo-Mauritian population was initially enormous, 12% annual average from 1851 to 1861, due to the increasing numbers of immigrant Indian parents compared to the small number of Mauritian-born. By 1891–1901, this growth rate had decreased to 2.3% annual average, and in the 1920s and 1930s there was practically no growth. After World War II, the population growth among the Indo-Mauritians shot up to 2.3% per year again between the censuses of 1944 and 1952, this time being almost entirely due to natural increase.

During the century of Indian immigration and the birth of the Indo-Mauritian population, other ethnic groups in the population – previously the white, free colored, and slave population, classified as "general population" after the census of 1846 – barely grew at all. There were 101,000 general population enumerated in the 1846 census; 100 years later, there were 143,000. The general population includes those of mixed origin, for example white and Indian origin. The almost zero growth rate of the general population may indicate that intermarriage was not common.

In the censuses of 1962 and 1972, the heads of households could themselves classify according to the categories: Hindu, Muslim, Sino-Mauritian, and General Population. In the census of 1983 no such classification was given. Over this period the total population grew very rapidly from 681,619 in 1962 to 826,199 in 1972 and 966,863 in 1983. In 1987, the population was estimated at about 1.003 million. Special attention will be given to this period of most rapid growth below.

2.2. Information From Vital Statistics

In the following paragraphs we will only describe the basic trends in the crude birth and death rates and in migration rates as far as they can be reconstructed. A separate in-depth study of the demographic transition based on age specific rates is under preparation.

As indicated above, the early growth of the Mauritian population was characterized by immigration. Crude birth and death rates were roughly at the same level until World War II (see Figure 2) but showed enormous annual variations that are typical for pre-modern conditions. This resulted in very little if no natural growth. On the very left side of the figure, from 1875 to about 1893, the crude birth rate is slightly higher than the death rate which was probably due to a more favorable disease environment. Death rates are unstable, moving up and down around an average of 30–35. The peaks are caused by various epidemics – cholera, smallpox, the Bubonic plague in 1899 – and particularly strong hurricanes. Prior to around 1862 malaria, a major killer in subsequent years, was not endemic to Mauritius. In 1919 there was a mortality peak of more than 60 per 1000, not caused by Mauritian soldiers who died fighting for the British in World War I, but by an outbreak of the Spanish flu which killed more than 24,000 Mauritians (Titmus and Abel-Smith 1968, p.49).

In the beginning of the 1920s, mortality rates declined more consistently for the first time. During this period the water supply was chlorinated and there were campaigns against malaria and hookworm apparently resulting in the permanent

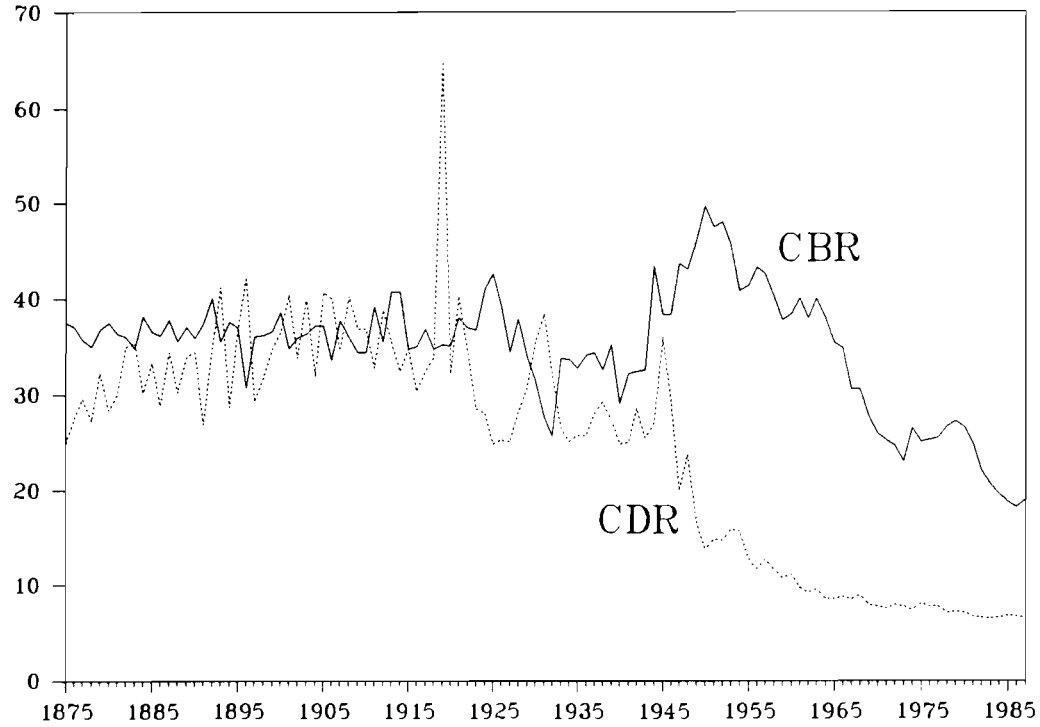

Figure 2. Crude birth and death rates in Mauritius, 1875–1985. (Source: Mitchell 1982).

decrease of the crude death rate (see Figure 2). There continued to be mortality peaks from epidemics, but they became less frequent. During that time, the birth rate was usually above the death rate, resulting in some natural growth after many decades of stagnation. However, this growth is still small, compared to the burst after 1948.

The big blow to mortality came in 1948–1949 mostly as a result of the eradication of malaria. Death rates dropped to a little over half of their previous (average) level in a few years. Simultaneously, birth rates increased to their highest level ever. In 1950 the crude birth rate (49.7) was 3.6 times greater than the crude death rate (13.9). The enormous gap between birth and death rates resulted in the burst of Mauritian population growth.

The growth rate was around 3% from the beginning of the 1950s to the mid-1960s. Although birth rates had been declining from their peak in 1950–1954, death rates also continued to fall quickly after the eradication of malaria in 1948–1949. From the second half of the 1960s to the present, the death rate decrease slowed down to a trickle, while the birth rates plummeted, bringing the current growth rate down to just over 1% annually. This presently observed growth is only due to the young age structure of the population, while the net reproduction rate remains below 1.0 since 1984, indicating that one generation will not even replace itself completely and the population size will decline in the long run.

Concerning migration – the third component of population change – exact information is much more difficult to obtain than for births and deaths. In published form we have only external migration data starting in 1970, but further

research of unpublished sources might provide longer series.

Early Mauritian population growth was due to a large extent to the immigration/import of slaves. The growth resulting from this was fairly steady and high. But it was nothing compared to the burst of population growth between 1851 and 1861 when Indian labor inundation began. The 1968 Report of the Committee on Population (Titmus and Abel-Smith 1968, p. 45) reports that between 1851 and 1881 almost 200,000 Indian migrants arrived on Mauritius. The report also states that Indian migration had almost stopped by 1880. Between 1881 and 1901 about 15,000 non-Indians immigrated, and between 1901 and 1911 another 9,000. These are averages of less than 1,000 per year or less than 4 arrivals per 1000 of the Mauritian population annually.

An indirect way to estimate immigration levels into Mauritius is to relate the population growth as measured in subsequent censuses to the registered numbers of births and deaths between the censuses, and assume that the residuals give us the number of migrants. If all census figures and birth and death statistics were perfect, this method should give the right results. We know, however, of various deficiencies – especially undercount – that are common, especially in earlier periods. For this reason the calculations given below have to be seen with extreme caution, especially since we have no information about the quality of registration and the changes in this quality over time. An application to more recent years for which we have real migration statistics indicates relatively good correspondence between the residuals calculated from births and death and the given migration figures. This, however, does not say much about the reliability of statistics in earlier years.

Another disconcerning factor is that the migration figures calculated as residuals in Table 2 do not correspond to those published by Titmus and Abel-Smith (1968). In the period from 1881 to 1901, the residuals amount to -11,500; in the period from 1901 to 1911 to only 2,800. The same equivocal results are obtained from residuals of estimated population size in five-year intervals from 1900 to 1960 (Central Statistical Office 1987). The numbers disagree on the sign, but they do agree that migration was a negligible factor in population change in this period. This indicates that further investigation of migration data is needed.

Table 2. Total population, births, deaths, and estimated migration from residual in ten-year intervals from 1871 to 1931. (Source for population: Census; for births and deaths: Titmus and Abel-Smith 1968, p.46.)

Estimation of Migration from Actual Residuals				
Year	Population	Births	Deaths	Migration
1871	316,042			
1881	359,874	123,836	97,864	17,860
1891	370,588	133,667	119,533	-3,420
1901	371,023	137,448	128,900	-8,113
1911	368,791	134,639	139,667	2,796
1921	376,485	137,478	137,757	7,973
1931	393,238	145,207	116,858	-11,596

3. ANALYSIS OF CHANGING AGE STRUCTURES

The development of the population by age group for men and women from 1851 to 1983 is shown in Figure 3. The x-axis, starting in the front middle and going back to the right, is the age axis, beginning with age group 0–4 in the front middle and going to age group 85+ in the back. The y-axis, starting from the front middle and going back to the left, is the period axis, starting from 1851 in the front and going to 1983 in the back left corner by five-year intervals. The vertical z-axis represents the number of people in each period age group. Cohorts move across diagonals of the graph to the back of the figure. These 3-D plots may be viewed as a series of subsequent age pyramids rotated by 90°.

In 1851 there was a large group of young adults. In the next two decades, there is a big bump in the male population resulting from the young Indian men brought over as laborers. The mountain quickly decreases in later decades, indicating that the import of labor slowed down. The big cohort of initial laborers disappears quickly as the cohort moves into older age groups. Since almost none of the laborers returned to their Asian homelands, almost all of this quick shrinkage of the cohort is due to extremely high mortality rates. In the female figure there is also an increase in young adults from 1851 to 1861, but there is much less of a bump effect, that is, this cohort disappears less quickly. Perhaps female mortality was less high than male mortality.

During the second half of the 19th century, the age structure of Mauritius "normalized", that is, took on a regular pyramid form with large young age groups and smaller old ones. The number of young children aged 0–4 increased continually from 1851 to a peak in 1901 as the number of women of childbearing age increased. In 1911, 1921 and 1931 the number of 0–4 year olds was smaller than in 1901. There was an increase in the number of births in the early 1920s which does not show up in the 0–4 year old group in the figure because this bigger group was born just after the 1921 census. This big group shows up as a large group of 5–9 year olds in 1931. This first cohort of small growth ripples through the age structure quietly. The fact that this cohort remains in the age structure as a large group even as it ages indicates that mortality is relatively low.

After a minimum in the census of 1931, the group of 0–4 year olds begins to increase slowly. Between 1944 and 1952 it jumps from 50,979 to 86,954. By 1962, the size of the 0–4 age group has increased even more to 112,126. This cohort increase shows up on the three dimensional figure as a steep wall moving diagonally left.

In 1972, the 0–4 age group is, for the first time, smaller than the five years before. The smaller group is the result of the fertility decline indicated by the rapidly declining crude birth rates shown in Figure 2. In 1983, the 0–4 age group is a bit larger again. This is the "echo effect" of the large cohorts from the 1950s and 1960s. The effect of the high birth rates in the 1950s and 1960s and the lowered birth rates thereafter is that a high ridge moves diagonally across the population figure – the large cohorts as they age.

4. THE TIMING OF THE POPULATION EXPLOSION

The analysis of age specific growth rates from 1950–2025 has shown that the highest periods of growth in all ages are generally found during the 1950s and 1960s. Very high rates of intercohort increase run diagonally across a period age population matrix reflecting the cohorts born during these decades. Birth cohort increases (estimated by the size of the 0–4 year old group) are evident from the interval 1950–1955 to 1960–1965. But, when were these areas of high growth initiated? With which cohorts does the intercohort increase begin, that is, where is/are the population growth discontinuity/ies located?

Keyfitz (1987) proposed that by observing first and second intercohort differences one could pinpoint the beginning of a discontinuity. We refer the reader to this publication for more information on method. Table 3 shows the average annual births of five-year birth cohorts as estimated by multiplying crude birth rate and estimated population from the cohort 1920–1925 to 1970–1975 in the first row. To remain consistent with the UN age specific period data, half of the births in the first and last years were taken and summed to the births of the four years in between (the UN measures 0–4 year olds in the year X – presumably in the middle of that year, although they do not specify – who would have been born from the middle of the year X–5 to the middle of year X). In the second row are the first differences and in the third row the second differences.

The annual number of children born is about stable until 1940–1945, and then increases for a number of years. The second row shows the first differences of the number of births. For example, the difference between the cohort 1935–1940 and 1940–1945 is 981; between 1945–1950 and 1950–1955 it is 4844, meaning an increase about four times as great. The third row of second differences shows that the amount of increase of the increase described above was greatest after 1940–1945, which pinpoints the beginning of the population growth discontinuity in the interval after the cohort of 1940–1945. There is a second, smaller peak below 1955–1960. The timing of the discontinuity in Mauritius corresponds to the timing Keyfitz found for the world as a whole.

Of course, the socioeconomic effects of such a discontinuity depend not only on the number born, but also on the number surviving into critical ages, say school age, or early labor age. Particularly large birth cohorts could theoretically be wiped out into insignificance by particularly high infant- and early childhood mortality. Table 4 examines the discontinuity by cohort measured by the intercohort differences at ages 20–44. The first five rows show the size of each cohort by five-year age groups, followed by the average of these five groups. The next row of first differences shows that – contrary to births – there are small intercohort increases from the cohort 1920–1925 through to the 1950s. The greatest increase is between 1950–1955 and 1955–1960. After that, cohort size decreases. The peak of the second differences is 10.4 underneath the cohort born 1955–1960, fifteen years later than the peak second difference of the number of births! Through improved mortality, from which later cohorts profited increasingly, and also because many belonging to the first big cohorts from the 1950s apparently emigrated, the 1960–1965 cohort improved its relative size by quite a bit. This fact is of importance for such practical matters as labor market: although the larg-

Table 3. Total average annual birth rates by five-year periods, first and second differences.

	1920–1925	1925–1930	1930–1935	1935–1940	1940–1945	1945–1950	1950–1955	1955–1960	1960–1965	1965–1970	1970–1975
Average number of births	14,322	14,134	12,127	13,521	14,502	19,346	23,133	24,279	26,571	23,560	20,804
First differences	-188	-2,007	1,394	981	4,844	3,787	1,146	2,292	-3,011	-2,756	
Second differences		-1,819	3,401	-413	3,863	-1,057	-2,641	1,146	-5,303	255	

Averages		
Abs	1st	2nd
18,754.5	2,240.6	2,210.9

Table 4. Total population in age groups 20–24 to 40–44 from cohort born 1925–30 to 1970–75, averages of these numbers, and first and second differences.

	Birth Year of Cohort										
	1920–1925	1925–1930	1930–1935	1935–1940	1940–1945	1945–1950	1950–1955	1955–1960	1960–1965	1965–1970	1970–1975
20–24		43.0	48.0	56.0	66.0	75.0	80.0	99.0	128.0	112.0	96.0
25–29	36.0	41.0	47.0	55.0	64.0	70.0	79.0	98.0	127.0	111.0	96.0
30–34	34.0	40.0	46.0	52.0	59.0	69.0	78.0	97.0	126.0	111.0	96.0
35–39	33.0	39.0	44.0	49.0	58.0	68.0	78.0	96.0	126.0	110.0	95.0
40–44	32.0	38.0	42.0	48.0	57.0	67.0	77.0	96.0	125.0	110.0	95.0
Average	33.8	40.2	45.4	52.0	60.8	69.8	78.4	97.2	126.4	110.8	95.6
First differences	6.4	5.2	4.6	8.8	9.0	8.6	18.8	29.2	-15.6	-15.2	
Second differences		-1.2		4.2	0.2	-0.4	10.2	10.4	-44.8	-30.8	

est birth cohort increases were in the beginning of the 1950s, the members of which arrive on the labor market in the beginning of the 1970s; the largest adult cohort increases affect the cohort 1960–1965 which arrived on the labor market in the beginning of the 1980s. The next section explores the relative contributions of fertility and mortality to the intercohort increase.

5. DECOMPOSING THE GROWTH OF THE YOUTH COHORT INTO FERTILITY AND MORTALITY COMPONENTS

We have seen above from the age structures of the population and will see from the patterns of age specific growth rates discussed below, that the sizes of subsequent birth cohorts increased very rapidly since the mid-1940s. Together with the steep fertility decline during the 1970s, this results in a large youth cohort that dominates the picture of the Mauritian age structure.

In the most recent census of 1983 the largest 5-year age group in the whole population was that of young men and women aged 15–19, comprising 113,804 Mauritians. Still 105,372 Mauritians belong to the age group 20–24 as compared to only 94,872 in the age group 10–14. It is not so much the absolute size of cohorts but rather their speed of increase that interests us in this section.

In particular we want to know what fraction of this observed increase is due to increases in the total number of births and which part can be attributed to the enormous improvements in mortality that were experienced in Mauritius especially during the late 1940s and early 1950s. Since during that time fertility also increased, it is not surprising that the cohorts born between the mid-1940s and mid-1950s show the highest relative increases as compared to previous cohorts. In the 1983 census the cohort of persons aged 30–34 is 42% greater than that of Mauritians aged 35–39. Only a small portion of this difference can be attributed to the fact that some people die between ages 30–34 and 35–39. The major portion of this increase is due to increasing numbers of births between 1944–1948 and 1949–1953 and to rapidly declining infant and child mortality during this period.

To distinguish between these different effects quantitatively, one needs a more rigorous approach. The logic behind the decomposition method described below is that we can infer the effect of fertility from the annual sequence of births given by vital statistics for birth cohorts that correspond to the age groups in the census. This ratio of subsequent birth cohort sizes can then be related to the ratios of subsequent age groups in one census.

Because of the irregular intervals between censuses in Mauritius in combination with the age structure given in 5-year age groups, it is not possible to directly calculate intercensal growth rates. Instead of attempting to estimate one-year age groups, in this context we prefer to stick to real data and apply the decomposition to the ratios between age group sizes in one census, namely that of 1983. This involves several steps which can also be seen from Table 5, which is a working table giving all the intermediate steps that are needed to get to the results presented in Table 6.

Table 5. Working table of decomposition into fertility and mortality effects for relative increase in cohort size for 1983 census.

Year of Birth	Age Group		(1) POP 1983	(2) Mortality Adjustment Factor (Average of Males, Females, Both Age Groups, from Life Table qx 1982–1984)	(3) Adjusted POP 1983 (1)x[1-(2)]	(4) (3)/(1) Increase Over Previous Cohort	(5) Size of Cohort at Birth	(6) Ratio of Cohort Size at Birth
68–73	(a1)	10–14	94,872	0.003492			104,943	
63–68	(a2)	15–19	113,804	0.005299	94,541	0.8307	127,681	0.8220
58–63	(a3)	20–24	105,372	0.006442	113,200	1.0743	127,351	1.0026
53–58	(a4)	25–29	89,446	0.008040	104,693	1.1705	117,775	1.0813
48–53	(a5)	30–34	77,961	0.010681	88,727	1.1381	113,931	1.0337
43–48	(a6)	35–39	54,820	0.018093	77,128	1.4069	86,840	1.3120
38–43	(a7)	40–44	40,492	0.028147	53,828	1.3293	66,266	1.3105
33–38	(a8)	45–50	38,861		39,352	1.0126	67,458	0.9826

(1) Size of total age groups (male and female) in 1983 census

(2) Probabilities of death from one 5-year age group to next (e.g. 10–14 to 15–19) taken from Mauritian life table 1982–84 (average of both sexes)

(3) Population of previous age group adjusted for mortality (e.g. (a1, 1) x (a1, 2) = (a2, 3)

(4) Relative increase of mortality adjusted younger cohort over next older cohort, (4) = (3)/(1)

(5) Size of cohort at birth calculated from annual series of births. Since census is at mid-year 1983, e.g. for age group 10–14, births from mid-1968 to mid-1973 were calculated. It was assumed that births are equally distributed over the year.

(6) Ratio of cohort sizes at birth, e.g. (a2, 6) = (a1, 5)/(a2, 5)

Table 6. Summary table of decomposition.

Age Group	Total Increase Over Previous Cohort in %	Increase due to Fertility	Increase due to Mortality Improvement
15–19	-16.9	-17.8	0.9
20–24	7.4	0.3	7.1
25–29	17.1	8.1	9.1
30–34	13.8	3.4	10.4
35–39	40.7	31.2	9.5
40–44	32.9	31.0	1.9
45–50	1.2	-1.7	2.9

1. First the enumerated population in a given age group must be multiplied with a mortality adjustment factor to make it comparable with the next older age group. This is only adjusting for the natural depletion from one 5-year age group to the next under current (i.e. over the last five years) mortality conditions. The appropriate probabilities of death were derived from a Mauritian life table of 1982–84. This is calculated in columns (1) to (3) in Table 5.
2. The ratio of the mortality-adjusted age group size to the enumerated (i.e. unadjusted) size of the next older age group is calculated. This gives an indication of whether the number of survivors to a certain age is larger (ratio above unity) or smaller (ratio below unity) for more recent cohorts. This ratio is given in column (4) of Table 5.
3. Next the absolute numbers of births are taken from vital registration for the 5-year periods that correspond to the age groups given in the census. This figure is given in column (5).
4. Finally the accumulated births over the 5-year period are divided by the total number of births in the subsequent 5-year period and the ratios – given in column (6) – are compared to the ratio of cohort sizes – as given in column (4).

Since column (6) gives the increase in cohort size resulting from fertility only while column (4) gives the increase in age group sizes due to fertility and mortality changes, the effect of mortality can be derived by subtracting the ratio in (6) from that in (4) if we assume the absence of significant migration streams. If there was migration, this difference between (4) and (6) gives the combined effect of migration and mortality.

The results of this decomposition procedure are given in Table 6. From there we see that the increase of a cohort over the mortality adjusted size of the previous cohort – derived from column (4) in Table 5 – was highest for the age group 35–39 in 1983. The size of this cohort in 1983 was 40.7% higher than that of the previous cohort aged 40–45 in 1983. From the corresponding series of births – column (6) in Table 5 – we see that only 31.2% of this increase can be explained by increasing numbers of births, the remaining 9.5% being attributable to improvements in mortality. If there was relevant migration over this period, it was probably more outmigration than immigration, which would tend to increase the share of growth due to mortality improvements.

The second largest intercohort increase is measured for the age group 40–44 in 1983. In sharp contrast to the next younger cohort described above, here the 32.9% increase is almost entirely due to fertility. The share of mortality is only 1.9 percentage points.

For the next younger age group the picture is again very different. Here more than two-thirds of the 13.8% increase are attributable to mortality decline and only 3.4% to fertility. This drastic change of the relative influences of fertility and mortality reflects the differential timing of fertility increase and mortality decrease during the years after 1945. During the period 1945–49 birth rates started to increase sharply while mortality rates still remained at a high level. During the 1950s mortality dropped dramatically while the number of births increased only to a lesser extent. This explains why the increase between age groups in today's po-

pulation of Mauritius is first mostly attributable to fertility and later to mortality.

For the age group 15–19, which is actually 16.9% smaller than the next older age group, the rapidly shrinking fertility rates would have implied an even somewhat stronger decline of 17.8%. It was the – though not very significant – improvement in mortality conditions over the past two decades that dampened that decline by one percentage point.

In conclusion, one can say that there is no simple unique answer whether the youth cohort is more an effect of increasing numbers of births or decreasing numbers of child deaths. Both factors played different roles at different times. For the first cohorts of the youth cohort, those aged 35–44 in 1983, showing the highest growth ratios of all, increasing numbers of births were certainly the major factor. For the subsequent cohorts having less significant growth ratios but showing higher increases in absolute numbers, mortality decline especially in childhood played the more important role. As for the recent decline of young age groups, it is only fertility through rapidly declining birth rates that causes the decline with further mortality improvements weakly counteracting this trend.

6. ANALYSIS OF AGE SPECIFIC GROWTH RATES 1950–2025 USING U.N. POPULATION ESTIMATES

In this section we use the 1988 United Nations Population Assessment data. Table 7 shows the male and female population of Mauritius from 1950–2025 in five-year intervals by five-year age groups, estimated prior to 1985 and projected from 1990–2025. The UN data, though it does not span as long a historical period as the Mauritius census data, does include most of the time period in which the population of Mauritius began its explosive growth, and the decline of growth rates. The UN data is presented in regular five-year intervals which makes detailed analysis possible, in contrast to the data from the irregular census intervals. In future work, we will be able to present the population in five-year intervals from 1950–1990 using original Mauritian census data. At the time of writing, not all data needed was available to us at IIASA. One disadvantage of the UN data is that they are an extra step removed from the real census data. The UN uses national population counts and estimates to produce its own estimates. Oddly enough, although the Mauritian population data is perceived as being good quality data, the UN population estimates diverge from the national data. Particularly, the UN data show a much larger wave of emigration during the 1970s than the national data. We believe that, given the quality, the Mauritian data is probably closer to the actual population than the UN estimates. The following analysis, which is based on the UN data, should therefore be viewed with some caution.

Table 7 shows the UN population estimate in absolute numbers from 1950–2025 by five-year age groups. Overall, the population age structure changes from a pyramid form to one with similar sized young to middle aged groups and attrition in the older age groups. The fertility increase of the 1940s is seen in the much larger size of the 0–4 year old group in 1980 than the 5–9 year old group.

Table 7. The population of Mauritius, male and female, estimated by the UN until 1985, and projected until 2025.

MAURITIUS
POPULATION, FEMALES, 1950-2025
YEAR

AGE	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
1950	43.7	35.748	30.022	25.324	21.238	17.862	14.901	12.356	10.325	8.466	6.949	5.628	4.38	3.279	2.251	1.321	0.93
1955	51.535	41.289	35.197	28.79	24.51	20.578	17.182	14.432	11.962	9.819	7.957	6.364	4.994	3.659	2.48	1.453	0.93
1960	60.13	49.959	40.79	33.766	27.984	23.921	19.953	16.795	14.105	11.477	9.335	7.389	5.758	4.285	2.867	1.676	1.049
1965	67.947	58.592	49.506	39.649	33.068	27.448	23.35	19.567	16.452	13.623	10.975	8.742	6.741	4.991	3.401	1.97	1.228
1970	57.914	66.39	57.488	45.034	37.597	31.895	26.139	22.798	19.193	15.564	12.853	10.046	7.867	5.763	3.906	2.295	1.405
1975	48.906	56.667	64.422	48.454	41.145	35.579	29.579	25.391	22.396	17.76	14.463	11.481	8.902	6.626	4.439	2.581	1.581
1980	56.21	48.285	56.409	63.805	47.999	40.729	35.135	29.219	25.025	21.897	17.193	13.776	10.672	7.907	5.427	3.18	1.989
1985	52.251	55.688	48.095	55.895	63.349	47.609	40.315	34.78	28.858	24.532	21.266	16.446	12.875	9.548	6.539	3.937	2.517
1990	46.749	51.945	55.52	47.642	55.559	62.982	47.249	40.009	34.442	28.387	23.932	20.467	15.497	11.653	8.025	4.85	3.236
1995	48.527	46.524	51.814	55.156	47.393	55.284	62.599	46.935	39.657	33.939	27.747	23.095	19.355	14.095	9.862	6.007	4.103
2000	49.272	48.355	46.473	51.747	55.029	47.24	55.054	62.269	46.585	39.181	33.274	26.89	21.955	17.737	12.058	7.468	5.222
2005	48.761	49.139	48.311	46.421	51.648	54.883	47.078	54.81	61.871	46.093	38.494	32.343	25.675	20.252	15.32	9.228	6.662
2010	47.414	48.664	49.108	48.271	46.353	51.541	54.734	46.908	54.514	61.3	45.374	37.521	31.005	23.824	17.647	11.875	8.465
2015	46.49	47.347	48.64	49.076	48.216	46.278	51.43	54.573	46.695	54.078	60.455	44.343	36.107	28.936	20.939	13.85	10.993
2020	46.017	46.445	47.329	48.616	49.034	48.156	46.2	51.309	54.367	46.375	53.428	59.235	42.839	33.901	25.666	16.658	13.642
2025	45.669	45.984	46.43	47.311	48.582	48.984	48.09	46.11	51.144	54.042	45.881	52.458	57.408	40.42	30.3	20.657	16.868

MAURITIUS
POPULATION, MALES, 1950-2025
YEAR

AGE	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
1950	44.299	36.095	30.22	25.438	21.288	17.744	14.71	12.161	10.05	8.205	6.603	5.171	4.054	2.938	1.919	1.118	0.707
1955	54.084	42.234	35.352	28.959	23.916	20.598	17.108	14.005	11.516	9.33	7.447	5.708	4.083	2.935	1.872	1.032	0.628
1960	62.649	52.517	41.633	34.217	27.565	23.334	20.059	16.502	13.462	10.889	8.654	6.618	4.681	3.09	1.97	1.071	0.614
1965	71.085	61.255	51.99	40.689	33.055	27.06	22.864	19.514	15.983	12.847	10.191	7.786	5.54	3.619	2.127	1.157	0.644
1970	60.638	69.197	60.022	49.014	36.917	31.82	26.005	21.678	18.651	15.025	11.97	9.063	6.277	4.196	2.4	1.231	0.67
1975	50.8	57.882	66.255	52.118	38.854	33.943	29.348	23.266	20.059	16.947	13.828	10.35	6.689	4.505	2.54	1.33	0.65
1980	58.048	49.981	57.381	65.079	50.645	38.278	33.406	28.718	22.693	19.323	16.049	12.636	8.857	5.307	3.198	1.547	0.791
1985	54.089	57.439	49.725	56.803	64.268	50.232	37.906	32.952	28.194	22.025	18.416	14.805	11.01	7.155	3.858	1.991	0.963
1990	48.328	53.685	57.229	49.227	56.103	63.878	49.867	37.492	32.46	27.489	21.109	17.116	13.042	9.02	5.295	2.451	1.251
1995	50.362	48.087	53.585	56.96	48.854	55.868	63.574	49.501	37.051	31.783	26.48	19.762	15.253	10.831	6.794	3.434	1.607
2000	51.139	50.213	48.074	53.542	56.858	48.737	55.69	63.248	49.033	36.393	30.732	24.93	17.773	12.809	8.276	4.473	2.236
2005	50.628	51.043	50.199	48.059	53.482	56.764	48.623	55.467	62.754	48.28	35.32	29.09	22.601	15.092	9.927	5.522	3.045
2010	49.265	50.579	51.028	50.183	48.027	53.428	56.673	48.475	55.112	61.919	47.004	33.585	26.548	19.37	11.834	6.697	3.961
2015	48.319	49.242	50.565	51.012	50.151	47.979	53.356	56.551	48.227	54.483	60.466	44.897	30.861	22.973	15.377	8.116	5.015
2020	47.89	48.296	49.228	50.548	50.979	50.101	47.915	53.262	56.361	47.793	53.393	58.046	41.559	26.976	18.47	10.723	6.29
2025	47.583	47.867	48.283	49.212	50.516	50.928	50.033	47.831	53.108	55.955	46.963	51.457	54.042	36.62	21.91	13.054	8.267

The fertility decline is obvious from the table by going along the 0–4 column. The actual extent of the decline is larger than shown in the column, because the column does not show that the smaller groups of young children in the 1970s came from the largest group of women in childbearing age in the history of Mauritius.

The extent of the mortality decline is difficult to see from the table. We can compare the survival of the male group aged 0–4 in 1955 to aged 5–9 in 1960 to the survival of the 0–4 group in 1985. There were 54,084 males 0–4 years old in 1955, and 54,089 in 1985. Of the 1955 group, 52,517 5–9 year olds were left in 1960, compared to 53,685 5–9 year olds in 1990 – an attrition rate of less than 1/3 compared to the 1955–1960 level.

Table 8 shows the age specific growth rates for males and females. The rates are period average annual growth rates, e.g. the growth rate of the age group 5–9 from 1950 to 1955: in 1950, the male age group 5–9 was 36,095; in 1955 it was 42,234; the average annual growth rate from 1950 to 1955 of the 5–9 year old group was $\ln(42{,}234/36{,}095)/5 = .0314$ shown in the first row, second column of the table. In general terms, the figures are arranged in the table such that

$$ {}_a r_t = \frac{1}{5} \ln \left(\frac{{}_a P_{t+5}}{{}_a P_t} \right) $$

where t is the first of the two years, and a is the age group.

The first row of Table 8 shows that the growth rates from 1950 to 1955 were fairly high, above 0.025 (2.5% growth annually) in each age group below age 55. From 1955 to 1960, and 1960 to 1965, the high growth rates even extend to the oldest female age groups, and to 60–64 among the males. In other words, in this period, all age groups of the population were increasing at similar, high rates. In general, the growth rates are highest in the third interval 1960–1965.

From 1965 to 1970 the growth rate of the 0–4 year group is negative because of the decreased birth rate. In all the older age groups, growth is still positive, still high, but generally lower than in the previous two decades. From 1970 to 1975, the growth rates in the age groups above 0–4 and 5–9 are even lower. Such across the board decreases in age specific growth rates would indicate increases in mortality or other attrition. Mortality increases are nowhere documented, so we presume emigration. We will return to this strong decrease in the rate of age specific growth below. Total population growth rates were low from 1965–1975, 1.8% in 1965–1970 and 0.5% in 1970–1975.

From 1975 to 1980 the growth of the 0–4 year group is again positive. In this period, total fertility – children per women – actually decreased, but because the number of women in childbearing ages increased (the enormous cohorts from 1950 to 1965 now entering and dominating the childbearing ages), the total number of births and the crude birth rate are higher than in the two intervals before. The growth rates of the groups 5–9 and 10–14 are negative, reflecting the decreasing cohort sizes of the late 1960s and early 1970s. At higher ages, the growth rates are enormous, peaking at 5.5% for the male 15–19 and female 20–24 age groups. These high growth rates are in strong contrast with the previous time interval from 1970 to 1975. The total population growth is 1.9% annually. The increases

Table 8. Annual age specific growth rates of the population of Mauritius measured between 5-year age groups in 5-year time intervals. Calculated from Table 7 data.

MAURITIUS
GROWTH, FEMALES, 1950-2025
YEAR

AGE	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
1950	0.0329	0.0288	0.0318	0.0256	0.0286	0.0283	0.0284	0.0310	0.0294	0.0296	0.0270	0.0245	0.0262	0.0219	0.0193	0.0190	0
1955	0.0308	0.0381	0.0294	0.0318	0.0265	0.0301	0.0299	0.0303	0.0329	0.0312	0.0319	0.0298	0.0284	0.0315	0.0290	0.0285	0.0240
1960	0.0244	0.0318	0.0387	0.0321	0.0333	0.0275	0.0314	0.0305	0.0307	0.0342	0.0323	0.0336	0.0315	0.0305	0.0341	0.0323	0.0315
1965	-0.031	0.0249	0.0298	0.0254	0.0256	0.0300	0.0225	0.0305	0.0308	0.0266	0.0315	0.0278	0.0308	0.0287	0.0276	0.0305	0.0269
1970	-0.033	-0.031	0.0227	0.0146	0.0180	0.0218	0.0247	0.0215	0.0308	0.0263	0.0236	0.0267	0.0247	0.0279	0.0255	0.0234	0.0236
1975	0.0278	-0.032	-0.026	0.0550	0.0308	0.0270	0.0344	0.0280	0.0221	0.0418	0.0345	0.0364	0.0362	0.0353	0.0401	0.0417	0.0459
1980	-0.014	0.0285	-0.031	-0.026	0.0554	0.0312	0.0275	0.0348	0.0285	0.0227	0.0425	0.0354	0.0375	0.0377	0.0372	0.0427	0.0470
1985	-0.022	-0.013	0.0287	-0.031	-0.026	0.0559	0.0317	0.0280	0.0353	0.0291	0.0236	0.0437	0.0370	0.0398	0.0409	0.0417	0.0502
1990	0.0074	-0.022	-0.013	0.0292	-0.031	-0.026	0.0562	0.0319	0.0281	0.0357	0.0295	0.0241	0.0444	0.0380	0.0412	0.0427	0.0474
1995	0.0030	0.0077	-0.021	-0.012	0.0298	-0.031	-0.025	0.0565	0.0322	0.0287	0.0363	0.0304	0.0252	0.0459	0.0402	0.0435	0.0482
2000	-0.002	0.0032	0.0077	-0.021	-0.012	0.0299	-0.031	-0.025	0.0567	0.0324	0.0291	0.0369	0.0313	0.0265	0.0478	0.0423	0.0487
2005	-0.005	-0.001	0.0032	0.0078	-0.021	-0.012	0.0301	-0.031	-0.025	0.0570	0.0328	0.0297	0.0377	0.0324	0.0282	0.0504	0.0479
2010	-0.003	-0.005	-0.001	0.0033	0.0078	-0.021	-0.012	0.0302	-0.030	-0.025	0.0573	0.0334	0.0304	0.0388	0.0342	0.0307	0.0522
2015	-0.002	-0.003	-0.005	-0.001	0.0033	0.0079	-0.021	-0.012	0.0304	-0.025	-0.024	0.0579	0.0341	0.0316	0.0407	0.0369	0.0431
2020	-0.001	-0.001	-0.003	-0.005	-0.001	0.0034	0.0080	-0.021	-0.012	0.0306	-0.025	-0.024	0.0585	0.0351	0.0331	0.0430	0.0424

MAURITIUS
GROWTH, MALES, 1950-2025
YEAR

AGE	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
1950	0.0399	0.0314	0.0313	0.0259	0.0232	0.0298	0.0302	0.0282	0.0272	0.0256	0.0240	0.0197	0.0014	-0.000	-0.004	-0.016	-0.023
1955	0.0294	0.0435	0.0327	0.0333	0.0283	0.0249	0.0318	0.0328	0.0312	0.0309	0.0300	0.0295	0.0273	0.0102	0.0102	0.0074	-0.004
1960	0.0252	0.0307	0.0444	0.0346	0.0363	0.0296	0.0261	0.0335	0.0343	0.0330	0.0326	0.0325	0.0336	0.0316	0.0153	0.0154	0.0095
1965	-0.031	0.0243	0.0287	0.0372	0.0220	0.0324	0.0257	0.0210	0.0308	0.0313	0.0321	0.0303	0.0249	0.0295	0.0241	0.0123	0.0079
1970	-0.035	-0.035	0.0197	0.0122	0.0102	0.0129	0.0241	0.0141	0.0145	0.0240	0.0288	0.0265	0.0127	0.0142	0.0113	0.0154	-0.006
1975	0.0266	-0.029	-0.028	0.0444	0.0530	0.0240	0.0259	0.0421	0.0246	0.0262	0.0297	0.0399	0.0561	0.0327	0.0460	0.0302	0.0392
1980	-0.014	0.0278	-0.028	-0.027	0.0476	0.0543	0.0252	0.0275	0.0434	0.0261	0.0275	0.0316	0.0435	0.0597	0.0375	0.0504	0.0393
1985	-0.022	-0.013	0.0281	-0.028	-0.027	0.0480	0.0548	0.0258	0.0281	0.0443	0.0272	0.0290	0.0338	0.0463	0.0633	0.0415	0.0523
1990	0.0082	-0.022	-0.013	0.0291	-0.027	-0.026	0.0485	0.0555	0.0264	0.0290	0.0453	0.0287	0.0313	0.0365	0.0498	0.0674	0.0500
1995	0.0030	0.0086	-0.021	-0.012	0.0303	-0.027	-0.026	0.0490	0.0560	0.0270	0.0297	0.0464	0.0305	0.0335	0.0394	0.0528	0.0660
2000	-0.002	0.0032	0.0086	-0.021	-0.012	0.0304	-0.027	-0.026	0.0493	0.0565	0.0278	0.0308	0.0480	0.0328	0.0363	0.0421	0.0617
2005	-0.005	-0.001	0.0032	0.0086	-0.021	-0.012	0.0306	-0.026	-0.025	0.0497	0.0571	0.0287	0.0321	0.0499	0.0351	0.0385	0.0525
2010	-0.003	-0.005	-0.001	0.0032	0.0086	-0.021	-0.012	0.0308	-0.026	-0.025	0.0503	0.0580	0.0301	0.0341	0.0523	0.0384	0.0471
2015	-0.001	-0.003	-0.005	-0.001	0.0032	0.0086	-0.021	-0.011	0.0311	-0.026	-0.024	0.0513	0.0595	0.0321	0.0366	0.0557	0.0453
2020	-0.001	-0.001	-0.003	-0.005	-0.001	0.0032	0.0086	-0.021	-0.011	0.0315	-0.025	-0.024	0.0525	0.0611	0.0341	0.0393	0.0546

in the age groups with positive growth rates are much higher than 1.9%. They are compensated by the two age groups with negative growth rates – 5–9 and 10–14.

6.1. Projection 1990–2025

In later intervals from 1985 to 2025, the growth of the older age groups – to the right of a diagonal trough of negative values – is always higher than the total average annual population growth. In the UN projection period, from 1990–2025, these high rates recede one age group to the right in each interval. On the left side, preceding one age group in each interval, are low values (of later cohorts). The high, right-side growth rates illustrate clearly that population growth continues even after fertility has dropped, and in which age groups this happens.

The diagonality of the patterns points to cohort patterns moving through time. The regularity of the height of the high and low rates along cohort diagonals is not surprising: data after 1985 are projected, which almost always produces regular population changes.

6.2. Cohort Patterns

The diagonal patterns mentioned above are caused by differences in the size of consecutive cohorts. Changes in the size of the differences (or growth rate) indicate that the mortality experiences of the two cohorts are different. If the mortality experience of two cohorts is the same, then the ratio of the growth rates between these two cohorts will remain the same as they age. The regularity of the troughs and ridges after 1975–1980 are caused by cohorts of different sizes with similar mortality experiences moving side by side across the matrix. Decreasing mortality causes the growth rates between the two cohorts to increase from age interval to age interval. This is what we see in the section of the matrix along the highest ridge and to the right of it, and in the first three rows.

In the intervals 1965–1970 and 1970–1975, the growth rates are smaller than the preceding interval when moving down along the cohort diagonals. This means mortality or some other attrition increased during this interval. This period is marked by independence – causing some ex-colonists to leave perhaps – and the beginning of crowding at the younger edge of the labor market as the first big cohorts enter it. It is surprising that it looks as if men and women from all adult age categories appear to have left: usually, migrants are concentrated in the young adult categories. A table with the changing ratios of the growth rates, this time calculated along cohort diagonals rather than vertically as in Table 8, will clarify some of the combined effects of mortality (presumably decreasing throughout the observation and projected period) and migration. The numbers in Table 9 are the ratios of the rates of intercohort growth as these two cohorts move from one age group to the next.

$$a^{ratio}_{t} = \frac{a^{r}t}{a^{r}t+5}$$

where r is the same as r above.

Table 9. Ratios of intercohort growth rates shown in Table 8, as measured along cohort diagonals.

Females

YEAR AGE	0/5	5/10	10/15	15/20	20/25	25/30	30/35	35/40	40/45	45/50	50/55	55/60	60/65	65/70	70/75	75/80
1950-55/1955-60	1.156	1.023	1.002	1.033	1.051	1.056	1.065	1.061	1.060	1.077	1.102	1.158	1.204	1.322	1.474	1.264
1955-60/1960-65	1.033	1.016	1.089	1.047	1.038	1.044	1.022	1.015	1.040	1.037	1.053	1.055	1.071	1.082	1.115	1.103
1960-65/1965-70	1.022	0.938	0.658	0.799	0.899	0.820	0.972	1.009	0.865	0.921	0.859	0.919	0.912	0.908	0.894	0.833
1965-70/1970-75	0.991	0.911	0.490	0.708	0.852	0.823	0.955	1.010	0.857	0.886	0.845	0.889	0.903	0.889	0.848	0.773
1970-75/1975-80	0.947	0.839	2.417	2.105	1.499	1.575	1.136	1.030	1.357	1.310	1.544	1.358	1.430	1.440	1.632	1.955
1975-80/1980-85	1.025	0.996	0.996	1.008	1.013	1.017	1.012	1.015	1.024	1.015	1.025	1.030	1.040	1.055	1.063	1.128
1980-85/1985-90	0.953	1.006	1.002	0.991	1.008	1.017	1.018	1.015	1.024	1.039	1.029	1.046	1.062	1.086	1.119	1.177
1985-90/1990-95	0.991	0.993	1.020	0.995	0.994	1.005	1.006	1.007	1.010	1.013	1.023	1.016	1.026	1.035	1.045	1.138
1990-95/1995-00	1.034	0.987	0.924	1.020	0.989	0.985	1.005	1.008	1.019	1.017	1.029	1.043	1.034	1.057	1.056	1.127
1995-00/2000-05	1.056	1.005	0.998	0.994	1.004	0.995	0.993	1.004	1.009	1.015	1.016	1.029	1.052	1.042	1.053	1.119
2000-05/2005-10	0.932	1.017	1.008	0.996	0.991	1.005	0.995	0.992	1.005	1.012	1.019	1.022	1.038	1.066	1.053	1.132
2005-10/2010-15	0.979	0.986	1.011	1.008	0.996	0.991	1.004	0.994	0.990	1.006	1.016	1.026	1.031	1.053	1.088	1.036
2010-15/2015-20	0.977	0.996	0.983	1.017	1.009	0.996	0.991	1.005	0.993	0.986	1.009	1.023	1.040	1.047	1.079	1.403
2015-20/1020-25	0.975	0.997	0.996	0.983	1.013	1.008	0.996	0.991	1.006	0.991	0.983	1.011	1.029	1.048	1.057	1.150

Males

YEAR AGE	0/5	5/10	10/15	15/20	20/25	25/30	30/35	35/40	40/45	45/50	50/55	55/60	60/65	65/70	70/75	75/80
1950-55/1955-60	1.092	1.041	1.064	1.095	1.071	1.067	1.086	1.106	1.135	1.169	1.230	1.383	7.220	*******	-1.496	0.282
1955-60/1960-65	1.047	1.019	1.059	1.089	1.043	1.049	1.054	1.046	1.059	1.058	1.082	1.139	1.156	1.490	1.514	1.286
1960-65/1965-70	0.965	0.933	0.838	0.638	0.892	0.869	0.803	0.921	0.912	0.973	0.929	0.768	0.878	0.764	0.809	0.512
1965-70/1970-75	1.123	0.810	0.427	0.275	0.585	0.746	0.549	0.692	0.780	0.921	0.825	0.419	0.569	0.383	0.641	-0.489
1970-75/1975-80	0.829	0.805	2.248	4.316	2.350	2.005	1.741	1.745	1.803	1.237	1.383	2.114	2.577	3.242	2.666	2.538
1975-80/1980-85	1.043	0.976	0.946	1.073	1.025	1.051	1.062	1.031	1.061	1.049	1.064	1.090	1.064	1.145	1.095	1.302
1980-85/1985-90	0.957	1.011	1.000	0.999	1.009	1.009	1.021	1.025	1.021	1.043	1.054	1.069	1.065	1.060	1.108	1.037
1985-90/1990-95	0.978	0.973	1.038	0.967	0.986	1.010	1.013	1.025	1.030	1.023	1.053	1.080	1.080	1.076	1.065	1.205
1990-95/1995-00	1.049	0.986	0.941	1.040	0.987	0.988	1.009	1.008	1.024	1.026	1.025	1.064	1.071	1.078	1.060	0.980
1995-00/2000-05	1.071	1.000	0.995	0.989	1.005	0.994	0.991	1.007	1.009	1.027	1.036	1.034	1.073	1.084	1.068	1.168
2000-05/2005-10	0.909	0.999	1.000	0.996	0.989	1.005	0.993	0.989	1.008	1.011	1.033	1.043	1.038	1.071	1.061	1.248
2005-10/2010-15	0.982	0.998	1.000	1.001	1.000	0.996	1.006	0.990	0.985	1.012	1.016	1.048	1.060	1.049	1.094	1.223
2010-15/2015-20	1.000	1.000	1.002	0.999	1.000	1.000	0.994	1.011	0.982	0.972	1.020	1.025	1.067	1.074	1.064	1.179
2015-20/1020-25	1.000	0.999	1.000	0.998	1.000	0.999	1.000	0.992	1.012	0.979	0.969	1.023	1.027	1.063	1.073	0.981

This ratio of growth rates spans a ten-year period. Values above unity mean that the growth rates between two cohorts, e.g. aged 5–9 in 1950 and 1955, had increased by the time these two cohorts were 5 years older, e.g. aged 10–14 in 1955 and 1960. An increase in growth rates means that the younger cohort had a lower rate of attrition during the age interval than the older cohort. Ratios with values below unity indicate that the younger cohort experienced *higher* attrition than the older cohort during the age interval. Values further from unity indicate greater changes in the intercohort growth rates, that is, greater changes in the rates of attrition. In the first two rows, showing the change of growth rates between the interval 1950–55 to 1955–60 and 1955–60 to 1960–65, all values are above unity, reflecting, as expected, mortality improvements across the board, more strongly among the elderly. The third and fourth rows of the table, reflecting the time from interval 1960–65 to 1965–70 and 1965–70 to 1970–75, are full of values below unity, reflecting increasing attrition. The values furthest from unity are in the fifth column for men, where the cohorts move from 15–19 to 20–24 years, and five years earlier among women, which is exactly the age of migration. Values closest to one are around middle age for both men and women. Among males, the values are below unity again at higher ages, perhaps having something to do with retirement (of ex-colonists?). In summary, although it seems that during the 1970s Mauritians from all age groups were disappearing, the tendency was more pronounced among young adult Mauritians.

In the next row, concerning the change in growth rates from the interval 1970–1975 to 1975–1980, the values are very high. These high rates mean that the younger cohorts experienced much lower attrition rates as they moved from one age group to the next five years later than the older cohorts. One suspects that the older age group was still emigrating, whereas the younger group five years later was not.

In later years, with values close to one except in high age groups, attrition rates apparently do not change much, although they change more for men than women and more at higher ages. The very slight deviations from unity found in the projection period in the triangle from 5–9 in 1990 to 2015 and from 30–34 in 2015 are due to statistical method; mortality is assumed to stay the same there.

7. CONCLUSION

The very rapid population growth of Mauritius during the 1960s alarmed social scientists of that time. Several reports were produced by British scientists (Mead 1961; Titmus and Abel-Smith 1968) that clearly pointed at the disastrous consequences of very fast population growth on a small island without many natural resources. There was fear of mass unemployment and poverty among others.

We have seen that since then, Mauritius has experienced a most remarkable decline in fertility down to an almost European level. To explain the factors that brought fertility down will be the subject of another paper. Without doubt these early warning reports played a role in preparing the grounds for efficient family planning efforts. But despite the fertility declines, the warnings of mass unemployment came true for large sections of the young generation because of the momen-

tum of population growth, i.e. the fact that through the very young age structure of the population, growth in absolute numbers will continue for some time, although the number of children per woman has declined.

To illustrate this important consequence of the youth cohort on the labor market, Table 10 gives the numbers of men by age groups as enumerated in the censuses of 1973 and 1983, and relates them to the number of employed men by age in the same year. This is only done for men because for women, the question whether they want to be part of the labor force or not is more ambiguous.

Table 10. Percentages of all men employed by age groups in 1973 and 1983.

	1973			1983		
	Total	Employed	% Employed	Total	Employed	% Employed
15–19	50,226	14,292	28.5%	57,431	8,402	14.6%
20–24	40,150	27,929	69.6%	53,077	22,551	42.5%
25–29	26,204	23,279	88.8%	44,708	32,941	73.7%
30–34	21,168	19,536	92.3%	39,230	32,975	84.1%
35–39	20,751	19,323	93.1%	26,955	23,749	88.1%
40–44	18,310	16,968	91.1%	19,952	17,429	87.4%

The first thing we see from Table 10 is that the employment situation significantly worsened between 1973 and 1983. This reduction in the percentage employed can be observed in all age groups. Generally the younger age groups are worse off because all available jobs are occupied by the older people and only few new jobs open up through retirement or creation of new jobs. This was still a period of economic stagnation. For the youngest age group 15–19, the decline in the numbers employed might be to a small extent due to increased rates of enrollment in secondary education, but educational statistics show that this is not a large factor. Certainly education cannot explain the fact that in 1983, almost 60% of all young men aged 20–24 were without jobs. This was indeed a dramatic situation because the growth of jobs was much smaller than the growth of the youth cohort. This presented a serious strain to the Mauritian society even in the early 1980s.

Since then, however, the situation has changed dramatically. Due to the rapid growth of the textile industry in the export producing zones (EPZ), today there is virtually no unemployment in Mauritius, or even a lack of labor. Through the introduction of very labor-intensive industries, Mauritius avoided the mistakes of other industrializing countries that could not reduce their unemployment through capital-intensive technologies.

In summary one can say that Mauritius succeeded in turning the potentially serious instability factor of the youth cohort into an asset for the country's economy and development. As it looks now, increased competition – another consequence of the youth cohort – is also turning into a positive phenomenon by increasing demand for continuing education and further development of skills. After

successfully absorbing the youth cohort, it will be a new challenge to the Mauritian economy to adjust itself to the future scarcity of labor through a gradual replacement of labor-intensive industries by capital-intensive ones that can take advantage of a smaller but more highly-skilled labor force.

8. REFERENCES

Central Statistical Office of Mauritius. 1956. *Natality and Fertility in Mauritius.* Mauritius.

Central Statistical Office. 1987. *Annual Digest of Statistics.* Rose Hill, Mauritius.

Keyfitz, N. 1987. The Demographic Discontinuity of the 1940s. *WP-87-92.* International Institute for Applied Systems Analysis, Laxenburg, Austria.

Keyfitz, N. 1989. Applying difference analysis to measuring the discontinuity. International Institute for Applied Systems Analysis, Laxenburg, Austria (draft).

Mead, J.E. 1961. *The Economic and Social Structure of Mauritius.* Frank Cass and Company, London.

Mitchell, B.R. 1982 *Historical Statistics.* MacMillan Press, London.

Parahoo, Kader A. 1986. Early colonial health developments in Mauritius. *International Journal of Health Services* **16**(3):409–423.

Titmus, R. and B. Abel-Smith. 1968. *1968 Report of the Committee on Population.* Frank Cass and Company, London.

United Nations. 1988. United Nations Population Assessment. New York.