CHAPTER IV: MORTALITY AND FERTILITY PATTERNS

 The connections between child mortality and fertility are the root of many explanations of demographic transition and are important for population policy in less developed countries[1]. In the child replacement hypothesis, high fertility is a necessary biological and behavioral response to high mortality and that parents try to replace children who die, and that couples aim to produce enough children to ensure the survival of some intended number to adulthood; in the argument that couples will not reduce their fertility until they are convinced infant mortality levels have dropped.[2]

One of the millennium development goals is to reduce mortality rate among under-five year children by two-thirds between 1990 and 2015. Estimates derived from these indicators are relevant not only for demographic assessment of the population in Guyana, but also for evaluation of health policies and programmes. It is within this context that we present the levels and trends of infant and childhood mortality and fertility of the country in this chapter.

Before embarking on the examination of the data, we should bear in mind that the calculation of these parameters (fertility and mortality rates) from census data sometimes suffers from some inherent difficulty. To obtain robust estimates of these parameters, we have avoided using direct method, because of omission of some children due to memory lapse on the part of older women in stating their fertility information or overstating by including grand children when asked to state their children ever born.

4.1   Infant and Childhood Mortality

This sub-section is intended to estimate infant and childhood mortality rates using the indirect technique commonly known as Brass P/F Ratio[3]. This method was developed to derive robust estimates of infant and child mortality rates because death registrations for many developing countries are incomplete at most either for failure to cover the entire geographic regions and or failure to register all vital events in the established area. Such under registrations are more severe for children than adults. As such, information provided by childbearing women aged 15-49 years on their fertility history of children ever born and children surviving in a survey or census can be used to estimates infant and childhood mortality rates using Trussell Variant[4] developed from the original Brass's P/F Ratio method.

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[1] Kenneth I. Wolpin, <u>An Estimable Dynamic Stochastic Model of Fertility and Child Mortality</u> (Online Publication available at http://links.jstor.org/sici?sici=0002)
[2] Susan C. M. Scrimshaw, <u>Infant Mortality and Behavior in the Regulation of Family Siz</u>e (Online Publication available at http://links.jstor.org/sici?sici=0098-
[3] United Nations (1983) <u>Manual X Indirect Techniques for Demographic Estimation</u>, UN Publication, Population studies, No. 81 (P. 73)
[4] Ibid (P.77)

The main objectives of the section are as follow:

- **Estimate infant mortality**: the probability of dying during the first year of life;
- **Estimate child mortality**: the probability of dying between the first and the fifth birthday; and
- **Estimate under-five mortality**: the probability of dying before the fifth birthday.

As mentioned, Trussell Variant conforming to West model mortality life table which is believed to be similar to the child mortality pattern in Guyana was selected and used to estimate the ratio of probability of dying to proportion of children dead. The infant and under-five mortality rates are expressed per 1,000 live births while the child mortality rate is expressed as deaths per 1,000 children surviving to the first birthday.

4.1.1 Assessment of Children Ever Born Data

The mean number of children ever born and the proportion dead classified by current age of childbearing women aged 15 to 49 years used to estimate the mortality level among children are given in Table 4.1. The average parities (CEB) for all regions and the country as a whole follow an expected pattern, for instance, gradually rising from the least for 15-19 years old women to the highest for the women in their terminal age group of childbearing. The only deviation was Region 8, where average parity for age group 40-44 was slightly higher than 45-49 years. This is somewhat suspicious and may be due to omission of some children ever born on account of memory lapse by 45-49 years old women. Apart from this, there was no region where the preceding average parity was reported higher than the succeeding one, thus suggesting that the quality of the data was fairly good.

Besides, the proportions of dead children gradually increase with the age of the mother except young women aged 15-19 years. This age group shows higher proportion of dead children than the succeeding age group.

Obviously, many researches have shown a strong relationship between patterns of fertility and children's survival risk. The findings proved that the risk of death in early childhood increases among children born to mothers who are too young or too old[5]. As such, the proportion of dead children for young women 15-19 is always out of line, probably because of the stated reasons. Because this pattern is observed to be similar to the experience of the Guyanese women, the information provided by women aged 20-24 years is deemed appropriate and has been used as correction factor in this estimation.

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[5] United Nations (1983) <u>Manual X Indirect Techniques for Demographic Estimation</u>, UN publication, Population studies, No. 81 (P.81)

**Table 4.1: Mean Number of Children Ever Born (CEB) and Proportion Dead by Current Age of
Mothers, and Number of Women Who Gave the Parities by Region, Guyana: 2002**

Current age	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Region 10	Guyana Total
Mean Number of Children Ever Born (CEB)											
15 - 19	0.5904	0.1854	0.1781	0.1525	0.1967	0.1854	0.2913	0.3980	0.2901	0.1686	0.1891
20 - 24	2.1186	1.2270	0.9788	0.8698	1.0625	1.0930	1.3778	1.5954	1.6571	1.0011	1.0265
25 - 29	3.6027	2.2911	1.8934	1.7002	2.0111	2.0030	2.3731	3.1338	3.1742	1.9755	1.9383
30 - 34	4.7537	2.9294	2.5081	2.3237	2.8070	2.5154	3.4486	4.4091	4.7464	2.7589	2.6076
35 - 39	5.7824	3.4958	2.8789	2.7285	3.1720	2.8927	4.2581	5.2436	5.8522	3.4415	3.0644
40 - 44	6.4296	3.6912	3.1142	2.9784	3.3363	2.9889	4.5881	6.0731	6.5054	3.7241	3.2860
45 - 49	6.6389	4.0973	3.3504	3.2417	3.6473	3.3939	5.3987	5.8542	6.8980	4.1321	3.6027
Proportion Dead											
15 - 19	0.0605	0.0573	0.0357	0.0425	0.0711	0.0515	0.0597	0.0833	0.0661	0.0669	0.0514
20 - 24	0.0650	0.0408	0.0294	0.0485	0.0481	0.0506	0.0722	0.0344	0.0366	0.0330	0.0459
25 - 29	0.0752	0.0427	0.0349	0.0542	0.0453	0.0511	0.0453	0.0630	0.0597	0.0457	0.0502
30 - 34	0.0888	0.0448	0.0456	0.0477	0.0520	0.0550	0.0645	0.0979	0.0727	0.0583	0.0528
35 - 39	0.0998	0.0580	0.0528	0.0600	0.0597	0.0648	0.0721	0.0668	0.0797	0.0667	0.0627
40 - 44	0.1373	0.0718	0.0647	0.0720	0.0702	0.0677	0.0858	0.1135	0.1157	0.0731	0.0751
45 - 49	0.1636	0.0975	0.0847	0.0888	0.0778	0.0806	0.1241	0.1400	0.1429	0.0885	0.0933
Number of Women											
15 - 19	896	2,260	4,558	13,734	2,288	5,232	690	392	886	1,862	32,798
20 - 24	784	1,899	4,379	14,276	2,193	5,077	704	346	627	1,785	32,070
25 - 29	657	1,697	4,251	13,924	2,063	4,950	595	314	528	1,551	30,530
30 - 34	609	1,714	4,133	12,503	1,953	4,810	593	220	481	1,547	28,563
35 - 39	579	1,656	3,790	11,198	1,744	4,632	492	234	433	1,273	26,031
40 - 44	426	1,480	3,362	9,983	1,585	3,971	386	219	372	1,138	22,922
45 - 49	360	1,079	2,463	8,046	1,188	2,909	306	144	343	848	17,686
Total	4,311	11,785	26,936	83,664	13,014	31,581	3,766	1,869	3,670	10,004	190,600

4.1.2   Early childhood mortality

The estimates of the probabilities of children dying in Guyana from below one year to five years are reflected in Table 4.2. Before reaching ages one and five years, the probabilities are 54 and 52 per 1,000 live births respectively, while before reaching ages two and four, the estimates are 47 and 49 per 1,000 live births at the national level (see Table 4.2).

Table 4.2 also shows some regional differences of child mortality in Guyana. The probability of infant dying before age one ranges from as low as 37 deaths per 1,000 live births in Region 3 to as high as 74 in Region 5. Other regions with slightly higher probability of infant death include Regions 10, 9 and 8, with nearly 70 deaths per 1,000 live births respectively.

Table 4.2: Probability of Children Dying by Region, Guyana: 2002

Region	Probabilities of Dying (Per 1,000)			
	Before Age 1	Before Age 2	Before Age 4	Before Age 5
Region 1	51	62	72	88
Region 2	65	42	41	44
Region 3	37	30	34	45
Region 4	45	50	53	47
Region 5	74	49	44	51
Region 6	57	52	49	54
Region 7	61	71	43	63
Region 8	71	34	62	99
Region 9	71	37	58	72
Region 10	72	34	45	59
Guyana Total	54	47	49	52

For under-five mortality, Regions 2, 3 and 4 recorded low rates, around 45 deaths per 1,000 live births, whereas other regions have higher rates, ranging from 51 deaths per 1,000 live births in Region 5 to 88 and 99 deaths also per 1,000 live births in Regions 1 and 8. Probabilities of child deaths before reaching age four were high in Regions 1 and 8, 72 and 62 deaths respectively, per 1,000 children surviving to the fifth birthday, compared to 34 per 1,000 in Region 3.

4.1.3   National Child Mortality and Time Reference Period

Since mortality is not likely to have remained constant in Guyana until September 15, 2002, it is necessary to know the time reference period to which the infant mortality rate and probabilities of child dying between ages one and five, shown in columns 4 and 5 of Table 4.3 refer. The values of the time reference period imply that, the estimates of $q_{(1)}$, $q_{(2)}$, $q_{(3)}$ and $q_{(5)}$, refer to mortality conditions prevalent in Guyana approximately 1.06 years, 2.49 years, 4.59 years, and 7.07 years respectively before the census date. By this approach, the reference-date for the estimated infant mortality rate, and the probability of dying between ages 1 and 5, for the entire country, are taken as August 2001, March 2000, February 1998 and August 1995 respectively. The reference date is calculated by subtracting the time reference period (t_x) from the average date of the census, that is, t_x from 2002.71 or September 15, 2002. The complete sets of the time reference period and reference date corresponding to each condition of child mortalities are given in columns 6 and 7 of Table 4.3.

The plausible estimates of child dying between ages one and five are also graphically depicted in Figure 4.1. By inspection, the rate referring to August 2001 is comparatively high; indicating that the trend of mortality was worst at the beginning and toward the end of the period, but relatively lower in the middle. This deviation is due to low levels of the Coale-Demeny Model, in conjunction with child mortality experiences of very young women. It is elaborated further in the preceding section 4.1.4.

Table 4.3: Estimates of Reference Period and Date to Which the Estimated Infant Mortality Rate and Probabilities of Dying Between Ages 1 and 5 Refer, Guyana:

Age Group	Age of Child	Parameter Estimate	Probability of dying between ages 1 and 5	Infant Mortality Rate	Reference Period (tx)	Reference Date
(1)	(2)	(3)	(4)	(5)	(6)	(7)
15-19	1	q(1)	0.0200	0.0540	1.06	Aug 2001
20-24	2	q(2)	0.0130	0.0410	2.49	Mar 2000
25-29	3	q(3)	0.0120	0.0410	4.59	Feb 1998
30-34	5	q(5)	0.0120	0.0410	7.07	Aug 1995
35-39	10	q(10)	0.0140	0.0450	9.78	Dec 1992
40-44	15	q(15)	0.0160	0.0490	12.60	Feb 1990
45-49	20	q(20)	0.0190	0.0540	15.51	Mar 1987

Note: Census Date Was September 15, 2002

Fig. 4.1: Probability of Dying Between Ages 1 and 5, Guyana: 2002
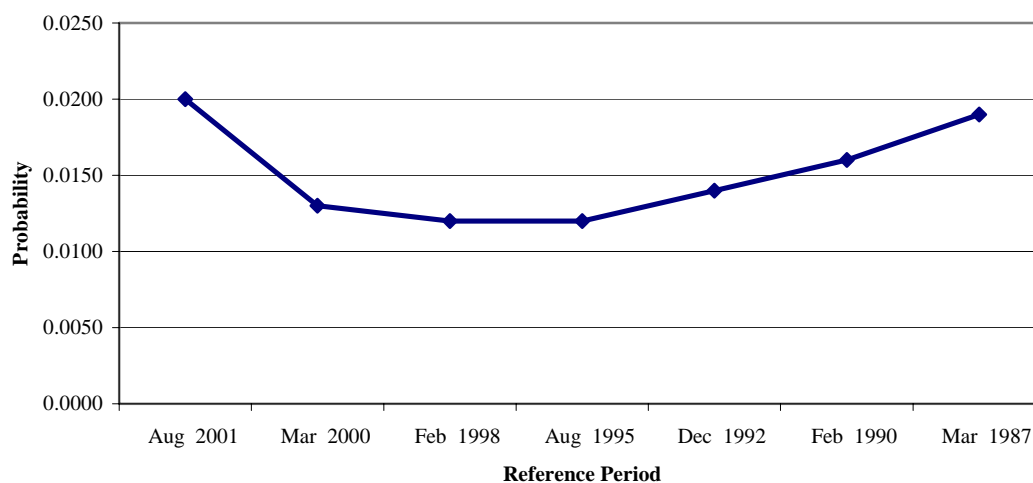
4.1.4 Mortality Level

One way to determine whether child mortality has been falling in Guyana prior to the census date is to convert the estimates of the probabilities of child deaths presented in Table 4.3, into mortality levels in the Coale-Demeny system, with the view of comparing them with the age pattern of the models.

Table 4.4 shows the mortality levels corresponding to child's survival probabilities reflected in column 5. These levels were derived from the West model life table, for instance, by interpolating between any two levels which bracketed the estimated child survivorship (column 5, Table 4.4) and the model's survivorship values, found in Table 238, Annex VIII, of the United Nations Manual X[6].

Table 4.4: Estimates of Mortality Level Corresponding to Child's Survivorship Probabilities and Reference Period, by Age Group of Mothers, Model West: Guyana, 2002

Age Group	Age of Child	Parameter Estimate	Reference Period t_x	Survival Ratios $_np_x$	West Model Level
(1)	(2)	(3)	(4)	(5)	(6)
15-19	1	q(1)	1.06	0.94606	19.26
20-24	2	q(2)	2.49	0.95333	20.45
25-29	3	q(3)	4.59	0.95104	20.47
30-34	5	q(5)	7.07	0.94777	20.48
35-39	10	q(10)	9.78	0.93681	20.09
40-44	15	q(15)	12.60	0.92528	19.57
45-49	20	q(20)	15.51	0.90788	19.19

By viewing the levels and the estimated child survivorship probabilities ($_np_x$), and in conjunction with the reference period, it can be concluded that child mortality was relatively constant for nearly seven years prior to the September 15, 2002 census. The evidence is that, the estimates of $q_{(2)}$, $q_{(3)}$ and $q_{(5)}$, which are mortality conditions experienced within seven years prior to the census date, have almost identical mortality level. For example, infant mortality rate remained stable at 41 deaths per 1,000 from August 1995 to March 2000 (see column 5, Table 4.3). But, approximately, ten years before the 2002 census date or around December, 1992 however, the remaining estimates of the level decline steadily as the age of mother rises, suggesting strongly that child mortality has been falling.

The only deviation is the estimate of $q_{(1)}$, which implies relatively high mortality; thus reflecting that infant mortality condition about one year before the census date or August, 2001 was marked the highest. There is no evidence to suggest that child mortality condition was bad about one year prior to the census. This, accordingly, had been noted to be associated with low levels in the Coale-Demeny models[7]. Ignoring the $q_{(1)}$ estimate, however, the trends of child mortality through time in Guyana can be determined from the findings shown in Tables 4.3 and 4.4. For instance, every child born 15.51 years before the average date of the census or around March 1987, has a survival probability of 90.8 percent; improving gradually to 95.3 percent, approximately, 2.49 years before the census (see columns 4 and 5 of Table 4.4).

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[6] United Nations (1983) Manual X Indirect Techniques for Demographic Estimation, UN publication, Population Studies, No. 81 (P.271)

[7] United Nations (1983) Manual X Indirect Techniques for Demographic Estimation, UN publication, Population Studies, No. 81 (P.81)

Thus, ignoring the suspected abnormal estimate derived for $q_{(1)}$, infant mortality rate and the probability of dying between ages 1 and 5, referring to the period March 2000, can be taken to approximately represent the prevalent child mortality rates in Guyana, 2002.

4.2   Fertility

The measurement of fertility levels and trends is a major objective of this sub-section. In the census, data were collected from each woman between 15-49 years about whether they gave birth to live baby boy or girl during the past twelve months preceding the census. This information, as provided, had been used to derive current fertility level which includes total fertility rate, general fertility rate, crude birth rate, and gross and net reproduction rates for the country. Such demographic estimates are necessary because they help to evaluate and monitor the impact of health programmes on the population and other socio-economic indicators of Guyana.

4.2.1   Current Fertility

Total fertility rate (TFR) and its corresponding age-specific fertility rates (ASFR) are the measures used widely to determine the current fertility level. By definition, total fertility rate is the number of children a woman would have by the end of her childbearing period (usually 15-49 years) if she passes through those years bearing children at the current observed age-specific fertility rates.

The total fertility rate and mean age of childbearing derived from using the age-specific fertility rates are given in Table 4.5 and graphically depicted in Figure 4.2. To show the trends, we presented the earlier fertility estimates obtained from 1980 and 1991 censuses.

Based on the current age-specific fertility rates, a Guyanese woman would have on average 3.7 children during her reproductive period. It was 3.2 children per woman in 1980, but given random variation inherent in the sources of the data, it had slightly increased.

Differences in the age pattern of childbearing are measured in terms of median or mean age of women in childbearing. An examination of the pattern of fertility in the country reveals that the peak of childbearing in Guyana occurs between 20 and 29 years, or precisely, at age 27.2 years dropping thereafter. The mean ages shown at the bottom of Table 4.5 for the three consecutive censuses seems not to have changed much. It was 27.0 years in 1980 and increased just by 0.8 and 0.2 years in 1991 and 2002 respectively. The pattern also shows that there had been a decline in teenage fertility rate, and on the reverse, a slight increase in the births among women in their terminal age of childbearing. For instance, the rates were 95 births per 1,000 teenage girls in 1980 and declined to 58 by 2002, and 8 births per 1,000 women aged 45-49 years in 1991 and increased to 20 births per 1,000 women in 2002 (see Table 4.5 and Figure 4.2).

Table 4.5: Trends and Patterns of Fertility, Guyana: 1980-2002

Age group	Age-Specific Birth Rates Per 1000		
	1980	**1991**	**2002**
15 - 19	94.54	58.22	84.12
20 - 24	183.58	132.60	196.88
25 - 29	158.70	120.95	178.87
30 - 34	104.64	82.43	133.88
35 - 39	66.27	51.89	89.82
40 - 44	25.02	17.94	38.70
45 - 49	na	8.39	20.30
TFR	3.2	2.4	3.7
Median Age	27.0	27.8	27.2

Note = na = not available

Fig.4.2: Age Specific Fertility Rates, Guyana: 1980 - 2002
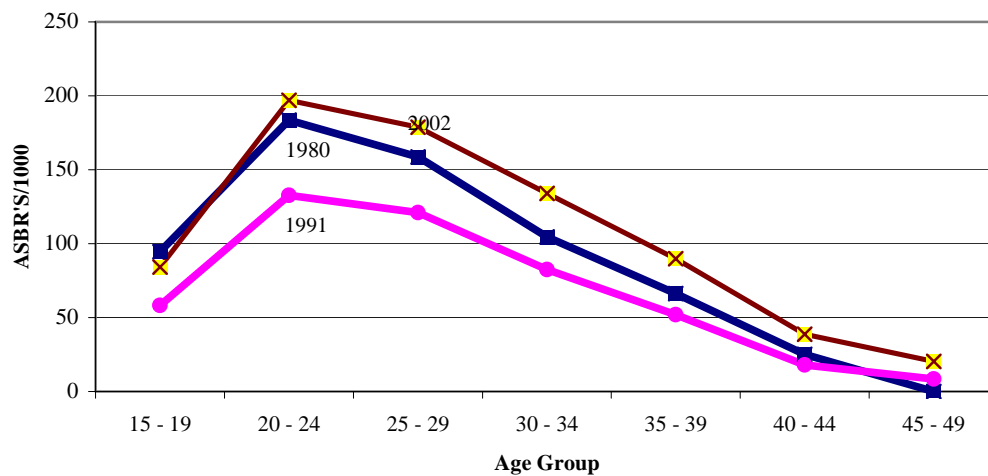
As a result of the decline, the contribution of teenage fertility to the total births which was nearly 18 percent in 1980, declined to 12.6 percent in 2002 (see Table 4.6). This is probably due to a significant achievement over the years in enrollment of the girl children in school. It can be noted that the percentage of the teenage girls (15-19 years) attending school full-time or part-time against the total population in that age range rose from 27 percent in 1991 to 41 percent in 2002 (see Chapter V, education and training). Knowledge and use of contraceptives among the teenage are plausible important factors but require independent inquires.

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Table 4.6: Distribution of Births 12 Months Preceding the Census by Current Age of Mothers, Guyana: 1980 - 2002

Age group	Number of Births Preceding the Census			Percent by Current Age of Mothers		
	1980	1991	2002	1980	1991	2002
15 - 19	3,344	2,445	2,759	17.6	15.5	12.6
20 - 24	7,235	5,180	6,314	38.0	32.9	28.8
25 - 29	4,600	4,148	5,461	24.2	26.4	24.9
30 - 34	2,350	2,368	3,824	12.4	15.0	17.4
35 - 39	1,140	1,165	2,338	6.0	7.4	10.7
40 - 44	359	320	887	1.9	2.0	4.0
45 - 49	na	112	359	na	0.7	1.6
Total	19,028	15,738	21,942	100	100	100

4.2.2 Fertility Differentials

The variation of current fertility level is noted almost everywhere in developing countries. The measures of aggregate fertility (TFR, GFR and CBR) by geographic regions, level of education and marital status indicate wide variations. The GFR is the annual number of births in a population per 1,000 women age 15-49, and the CBR refers to the total number of births occurring in a given year per 1,000 populations. As stated earlier, ASFRs from which these aggregate estimates are based refer to births that occurred twelve months preceding the 2002 census in Guyana.

At the national level the GFR and CBR are 115 births per 1,000 women aged 15-49 and 29 per 1,000 persons within the total population respectively; while the TFR is estimated as 3.7 per woman as mentioned earlier (see Table 4.7).

Regional differentials: The examination of the fertility differentials groups the ten administrative regions according to their level of variations as follows:
- High fertility regions (TFR 6.0 to 9.6 per woman); and
- Modest fertility regions (TFR 3.0 to 4.0 per woman).

The high fertility regions include Regions 1, 9, 8 and 7 in that ranking order. Theses regions recorded average numbers of children (TFR) by the time each woman there completes her childbearing as 9.6, 8.0, 7.9 and 6.0 respectively, while that of general fertility rate (GFR) was registered as 303, 231, 242 and 190 children per 1,000 women aged 15-49 years. The rest are modest fertility regions, with TFR averaging less than 4 children per child-bearing woman (see Figure 4.3 and Table 4.7).

The high fertility regions are those presented earlier in Chapter 3 to have experienced rapid growth rate during the intercensal period, thus concurring with our assertion that part of the increase was due to high birth rates in those areas compared to others.

The high fertility rates observed in the hinterland regions is undisputable, in that, the distance of these regions to the industrialized coastal belt is an impediment to modern birth control methods.

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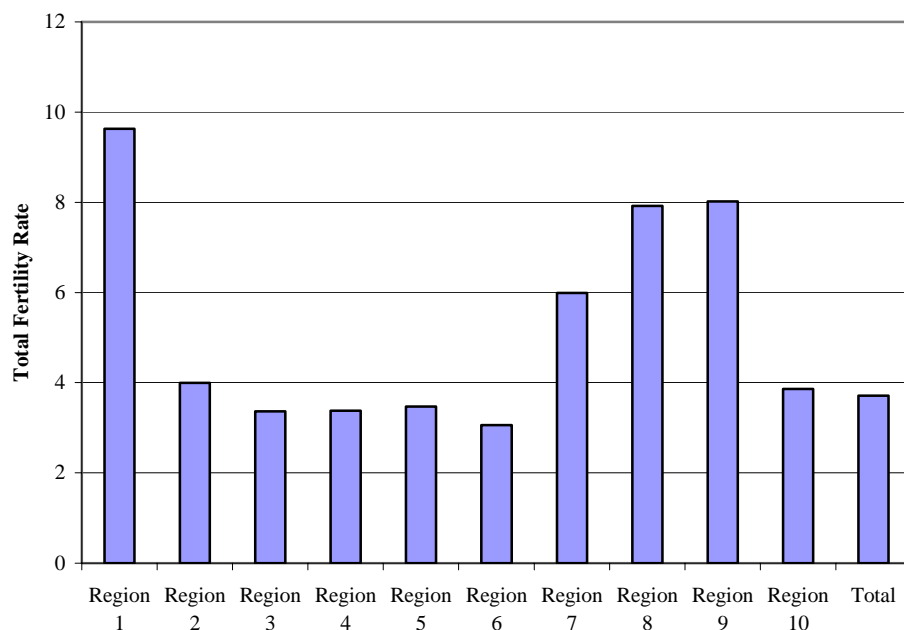**Fig. 4.3: Regional Fertility Differentials, Guyana: 2002**

Table 4.7: Age-Specific Fertility Rates, Total Fertility Rate, General Fertility Rate, Crude Birth Rate and Mean Age of Childbearing by Region, Guyana: 2002

Age group	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Region 10	Total
15 - 19	0.2567	0.0796	0.0779	0.0677	0.0909	0.0849	0.1406	0.1633	0.1106	0.0811	0.0841
20 - 24	0.4490	0.2391	0.1900	0.1678	0.2020	0.1895	0.2798	0.3237	0.3509	0.1933	0.1969
25 - 29	0.4140	0.2098	0.1517	0.1730	0.1634	0.1420	0.2874	0.3822	0.3333	0.1754	0.1789
30 - 34	0.3300	0.1237	0.1159	0.1268	0.1290	0.1015	0.2293	0.3273	0.3451	0.1493	0.1339
35 - 39	0.3195	0.1002	0.0741	0.0821	0.0728	0.0604	0.1565	0.2094	0.2818	0.1029	0.0898
40 - 44	0.1315	0.0324	0.0363	0.0363	0.0252	0.0224	0.0648	0.1370	0.1505	0.0518	0.0387
45 - 49	0.0250	0.0139	0.0268	0.0221	0.0101	0.0117	0.0392	0.0417	0.0321	0.0189	0.0203
Total	1.9257	0.7988	0.6727	0.6758	0.6935	0.6124	1.1976	1.5845	1.6043	0.7727	0.7426
Rate											
TFR	9.63	3.99	3.36	3.38	3.47	3.06	5.99	7.92	8.02	3.86	3.71
GFR	303	121	103	105	109	95	190	242	231	120	115
CBR	54	29	27	28	27	24	41	45	44	29	29
Mean Age	28.8	28.0	28.5	28.9	27.6	27.3	28.9	29.6	30.4	29.0	28.5

Note:Institutional population and No-contact persons are not included.

TFR: Total fertility rate for 15-49 years, expressed per woman.

GFR: General fertility rate (births divided by number of women 15-49 years), expressed per 1,000.

CBR: Crude birth rate, expressed per 1,000 population.

On the other hand, it seems more likely that women there have a high fertility preference. Of note, high birth rate is associated with reproductive health and status of women; hence, this finding requires an independent study to investigate the fertility behaviors in those regions and its determinants.

Besides, the more urbanized regions are said to have higher number of literate women, who mostly work outside of the agricultural industry; as such, there seems to be less desire for children. The age-specific birth rates and total fertility rate classified by level of education presented in Table 4.7 support this evidence.

Differentials by Education Level: The level of fertility is also shown to be negatively associated with educational achievement in Table 4.8. The TFR for the whole country tends to decrease by higher level of education, for example, fertility tends to gradually decrease from 5.2 children among women with primary education or less to 2.5 and 2.2 children for women with secondary or university qualifications.

Table 4.8: Age-Specific and Total Fertility Rates by Level of Education, Guyana: 2002

Age group	None / Nursery	Primary	Secondary	Post Secondary	University/ Tertiary	Other	Total
15 - 19	0.1536	0.2034	0.0763	0.0391	0.0186	0.0158	0.0841
20 - 24	0.2695	0.2820	0.1998	0.1129	0.0666	0.1422	0.1969
25 - 29	0.2370	0.2167	0.1777	0.1324	0.1045	0.1341	0.1789
30 - 34	0.1816	0.1584	0.1279	0.1018	0.1198	0.1267	0.1339
35 - 39	0.1219	0.0964	0.0874	0.0743	0.0831	0.1249	0.0898
40 - 44	0.0507	0.0414	0.0382	0.0294	0.0313	0.0518	0.0387
45 - 49	0.0246	0.0214	0.0199	0.0161	0.0215	0.0444	0.0205
Total	1.0389	1.0197	0.7272	0.5060	0.4452	0.6399	0.7428
TFR	**5.19**	**5.10**	**3.64**	**2.53**	**2.23**	**3.20**	**3.71**

Differentials by Marital Status: Fertility differentials characterized by marital status of women are presented in Table 4.9. The findings on marital fertility are important, for fertility occurring in broken marital relationships and among those women too young to marry seems to have high correlation with infant and childhood mortality[8]. However, since, fertility is a product of timing and coital frequency, higher proportion of ever married women is related to number of births, which may occur within a given population in a year.

The age-specific birth rates and total fertility rates indicated in Table 4.9 reveal that stable marital status was positively related to high fertility, while broken relation status such as divorced and separated seem to negate fertility. The fertility rates of legally married couples and those in common law unions were 6.0 and 6.4 children per woman as compared to 3.9 and 2.7 among legally separated and divorced women.

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[8] Atossa Rahmanifar, Indiana Infant Mortality Report: 1999, Period Linked Birth/Infant Death Data Set, Epidemiology Resource Center, May 2001 (Online publication available at http://www.in.gov/isdh/dataandstats/mch/infant_mortality.pdf)

Table 4.9: Age-Specific Fertility Rates and Total Fertility Rate by Union Status, Guyana: 2002

Age group	Married	Common Law	Divorced	Legally Separated	Widowed	Married (Not in Union)	Was Common Law (Not in Union)	Never married	Total
15 - 19	0.3910	0.3604	0.1099	0.4397	0.8332	0.3044	0.4730	0.0000	0.0841
20 - 24	0.3058	0.3172	0.1703	0.0966	0.5249	0.1691	0.2601	0.0000	0.1969
25 - 29	0.2084	0.2250	0.1103	0.0593	0.4125	0.1312	0.1760	0.0000	0.1789
30 - 34	0.1463	0.1631	0.0599	0.0414	0.1052	0.0924	0.1200	0.0000	0.1339
35 - 39	0.0878	0.1206	0.0482	0.0734	0.0516	0.0668	0.0884	0.0000	0.0898
40 - 44	0.0372	0.0579	0.0210	0.0282	0.0204	0.0266	0.0400	0.0000	0.0387
45 - 49	0.0174	0.0263	0.0139	0.0332	0.0178	0.0231	0.0351	0.0000	0.0206
Total	1.1939	1.2705	0.5336	0.7718	1.9654	0.8136	1.1926	0.0000	0.7429
TFR	**5.97**	**6.35**	**2.67**	**3.86**	**9.83**	**4.07**	**5.96**	**0.00**	**3.71**

However, contrary to the assertion was widowed and the "was common law" women. The TFR among the widowed marked the highest, that is, 9.8 children per woman and followed by 6.0 children per every "was common law" woman in the child-bearing age groups. These rates are unexpected; as such, a special study is required, probably, to link the rates to their health and welfare systems.

Another area of suspicion is fertility rate among women who were never married. Accordingly, the finding shows that this group of women has no births, suggesting that fertility in Guyana only occurred within marriage. The validity of this finding needs further research.

4.2.3 Reproduction Rates

The total fertility rate as stated above is concerned only with the births of both sexes. Under reproduction, we measure the replacement of the female population that will sustain the growth of the population. For instance, a rate of 1.00 (or 100 or 1000, depending on the value of the constant 'k') means exact replacement, a rate above unity indicates that the population is more than replacing itself, and a rate below unity means the population is not replacing itself.[9] Thus, reproduction rate has high correlation with whatever happens to the size of population over time, for example, the higher the number of girl babies, the higher the growth rate of the population and vice versa. Gross and net reproduction rates which are key indicators for study of reproduction are given below using the census data of 2002.

Gross Reproduction Rate (GRR): The gross reproduction rate (GRR) is the measure of total number of daughters a cohort of women will have and can be obtained by multiplying total fertility rate by the proportion of the total births that were females in a calendar year.[10] In the case of Guyana, we assume a constant sex ratio at birth to be 1.02; hence the proportion that was girl babies is 0.49505.

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[9] Henry S. Shryock et al (1971) <u>The Methods and Materials of Demography Volume 2,</u> U.S. Government Printing Office (P. 525)

[10] Ibid (P.524)

Converting the total fertility rate in Table 4.7, we arrived at the total number of girl babies expected to be born to every 100 Guyanese women by the time they complete their child-bearing as 184. This rate, shown in Table 4.10, seems to have geographic variations. For instance, every 100 women in Regions 1, 9, 8 and 7 have a total of 477, 397, 392 and 392 girl babies respectively during their lifetime more than the other Regions.

Table 4.10: Gross and Net Reproduction Rates Classified by Current Age of Women and Region, Guyana: 2002

Age group	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Region 10	Total
15 - 19	0.2567	0.0796	0.0779	0.0677	0.0909	0.0849	0.1406	0.1633	0.1106	0.0811	0.0841
20 - 24	0.4490	0.2391	0.1900	0.1678	0.2020	0.1895	0.2798	0.3237	0.3509	0.1933	0.1969
25 - 29	0.4140	0.2098	0.1517	0.1730	0.1634	0.1420	0.2874	0.3822	0.3333	0.1754	0.1789
30 - 34	0.3300	0.1237	0.1159	0.1268	0.1290	0.1015	0.2293	0.3273	0.3451	0.1493	0.1339
35 - 39	0.3195	0.1002	0.0741	0.0821	0.0728	0.0604	0.1565	0.2094	0.2818	0.1029	0.0898
40 - 44	0.1315	0.0324	0.0363	0.0363	0.0252	0.0224	0.0648	0.1370	0.1505	0.0518	0.0387
45 - 49	0.0250	0.0139	0.0268	0.0221	0.0101	0.0117	0.0392	0.0417	0.0321	0.0189	0.0203
GRR	4.77	1.98	1.67	1.67	1.72	1.52	2.96	3.92	3.97	1.91	1.84
NRR	4.72	1.96	1.65	1.66	1.70	1.50	2.94	3.88	3.93	1.89	1.82

Note: NRR based on female survival ratios based on $e_0 = 68.3$ **years**. (West model life table)

Net Reproduction Rate (NRR): The gross reproduction rate is limited, because it considers mortality schedule through the child bearing period to be zero, which doesn't hold because some girls will die before attaining the age of reproduction, other will die during the reproductive span, while others will live and complete the reproductive life. This refinement over GRR is net reproduction rate, and measures the net number of girl babies a cohort of women will bear during their lifetime assuming a fixed schedule of age-specific fertility and mortality rates[11].

The net reproduction rate given in Table 4.10 reveals that for Guyana as a whole, every 100 women have 182 girl children, indicating that every 100 women in Guyana replace themselves plus additional eighty-two girl children. Similar to the GRR, the regional net reproduction rates conform to the socioeconomic development of the regions. The hinterland Regions of 1, 9, 8 and 7 had corresponding NRR of 472, 393, 388 and 294 daughters per 100 childbearing women respectively. The findings for the rest of the regions are reflected in Table 4.10.

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[11] Henry S. Shryock et al (1971) The Methods and Materials of Demography Volume 2, U.S. Government Printing Office (P.525)