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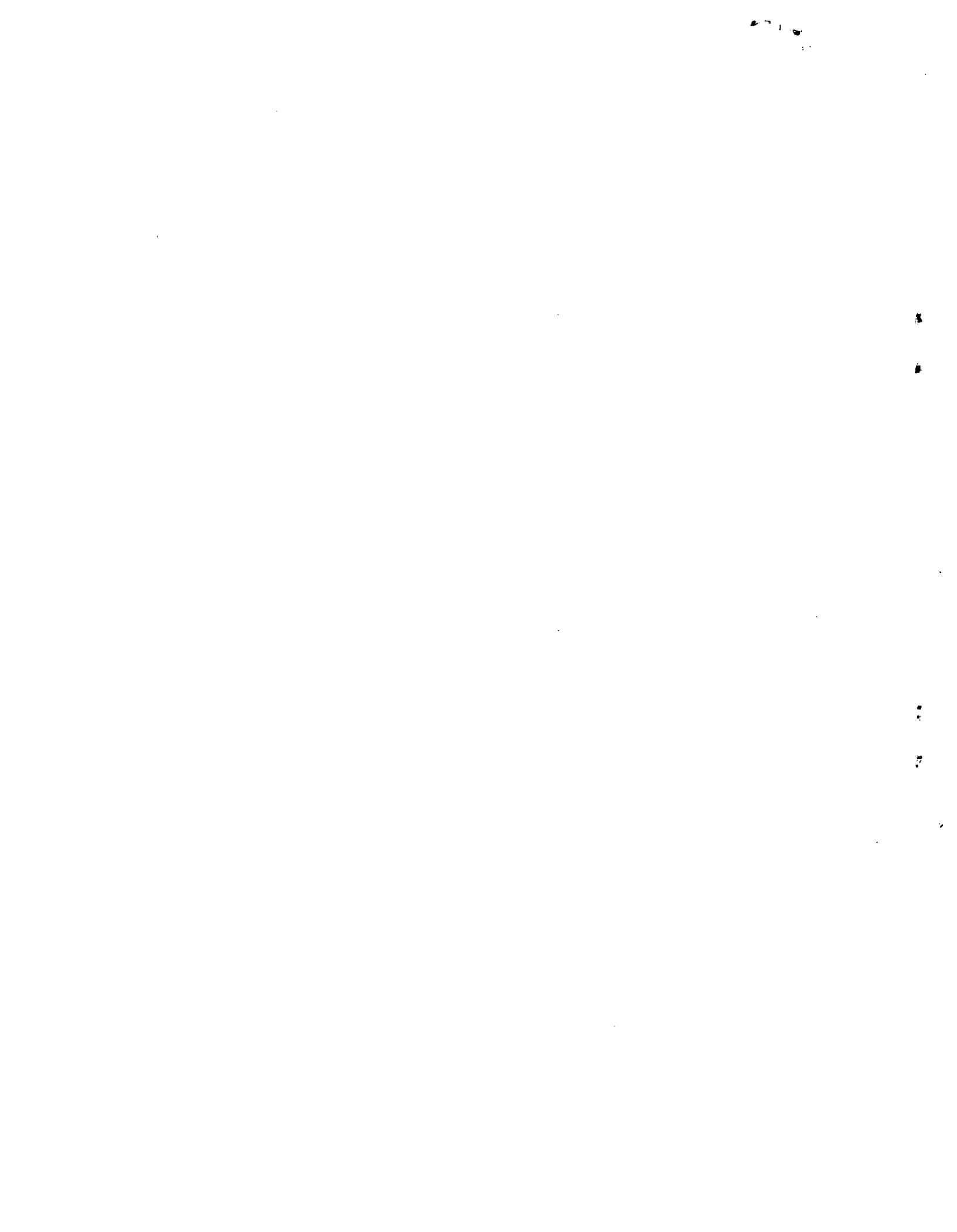
Subregional Office for the Caribbean



BARBADOS EXPERIMENTAL MIGRATION SURVEY

Analysis of the results

A Paper for the Seminar on Estimation of Migration
Barbados, May 19-21, 1982



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BARBADOS EXPERIMENTAL MIGRATION SURVEY

A preliminary analysis of the results of the first 3 rounds

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INTRODUCTION

Of all the components of a country's population change (births, deaths, and migrations) migration, particularly out migration, has always been the most difficult to measure. Entry and departure statistics are notoriously error prone, and whereas census questions on birthplace and length of residence in a country provide an alternative source of information on in-migration, no such inquiries can be made of people who are no longer resident.

For this reason, members of the International Union for Scientific Study of Population (IUSSP) study group on international migration, addressed themselves to the problem of measuring out migration using techniques parallel to those for measuring mortality in the absence of reliable death registration statistics - namely inquiring, in a survey or census about the residence (home or abroad) of specified relatives (mothers, siblings, children) of respondents; and converting the answers obtained to estimate of out-migration.

After the theoretical elaboration of these methods, a testing ground was sought for them: a small country with high out-migration, where a survey with good quality field work could be organised quickly and economically. Barbados seemed ideal in all respects, so the Statistical Service (BSS) was approached, and when they expressed their interest in such a venture, financial backing was secured from the International Development Research Centre (IDRC) in Canada.

BSS incorporated the migration survey into their continuous household survey, and IDRC paid for the increased fieldwork costs due to enlarging the sample size. IUSSP contributed the services of a consultant to design the questionnaire and assist in field trials, and computer time was provided by the Barbados Data Processing Unit. Programming and data analysis was performed by the author, who is employed by UN Centro Latino Americano de Demografia (CELADE) as adviser in demographic analysis in the Caribbean, funded by the British Overseas Development Administration.

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BARBADOS EXPERIMENTAL MIGRATION SURVEY -
analysis of the results

1. BACKGROUND

1.1 Theory: The theoretical ideas for the "indirect" estimation of out-migration by asking questions about the residence of relatives have been elaborated in various papers by members of the IUSSP Working Group for the Study of International Migration. The principal sources for the methodology used in this analysis are Jorge Somoza's paper "A Proposal for Estimating the Emigrant Population by Sex and Age in a Country's Census", in which he discussed how to use information given by mothers on the residence of their children, and Ken Hill's paper "A Proposal for the Use of Information on Residence of Siblings to Estimate Emigration by Age". The idea of combining and comparing the information from the reports of mothers and the reports of siblings is due to John Blacker - it is outlined in his report to the working group on the setting up of the experimental migration survey.

1.2 Field Work: The migration survey was incorporated into the continuous household survey which Barbados Statistical Service has been conducting on a quarterly basis since 1975. The questionnaire (See Appendix) was designed by John Blacker, who also helped with enumerator training, and field trials. As it was felt that a fairly large sample was needed to ensure that even relatively "rare" events could be measured reasonably accurately, the sample size of the household survey was doubled for the duration of the migration survey (October 1980 to December 1981). A two-stage sample was used - enumeration districts were sampled with probability proportional to size, and then a systematic sample of households was taken within each district, so the number of households was approximately the same from each district in the sample, and the probability of any household appearing in the sample was the same. The household sampling frame was taken from the census household count (the census was conducted in April 1980). The sample was designed by Eric Straughn, Chief Statistician.

1.3 Editing and Coding: Rules for manual editing (See Appendix) and coding were drawn up by John Blacker, but were revised after the first round field-work was completed. This part of the operations was under the control of Ms. Avril Scantlebury, Senior Statistician - it is worthy of comment that

after the "breaking-in" period when the first round questionnaires were processed, the document editors reached such a level of proficiency that in the second round, the computer edit discovered only one validity error in a total of 4,725 records!

1.4 Data Processing: Coded information was punched onto diskettes, for processing at the Barbados Government Data Processing Unit, on an IBM 370/115 computer. Processing was accomplished using a purpose written set of Fortran programs which edited the data, stored all the clean data round by round on a disc file, created "mother" and "sibling" files of selected fields from each record for the two sets of tables, and compiled and printed the tables. The list of tables available so far is shown in the appendix. A copy of the complete table set for all 5 rounds, and a listing of the programs are available for inspection. (The programs are still being revised and extended with a view to incorporating more of the analysis).

2. METHODOLOGY

2.1 Assumptions re Fertility and Mortality: To enable the fullest use to be made of information collected in the Survey, it is necessary to make some assumptions about the age distributions of children of respondent mothers, and the age distribution of mothers of respondent children. It is not possible to calculate these distributions directly from information collected in the survey, but in Barbados, registration data is available showing the course of fertility and mortality in the years preceding the survey, so these distributions can be put on an empirical basis.

Tables of deaths by sex and 5-year age group are available for Barbados from 1949 to 1980, with deaths under 5 years of age classified by single years. Births by 5-year age group of mother are available from 1952 onwards, but total annual births are available from 1937.^{1/} Censuses have been taken decennially from 1851 to 1921, and then in 1946, 1960, 1970 and 1980. Furthermore, estimates of intercensal population for each

^{1/} These are published annually by the registrar general, summaries are available in the occasional "Abstract of Statistics", and figures for the most recent events are from the latest monthly digest of statistics.

year from 1946 to 1960, by 5-year age group have been made by the University of the West Indies Census Research Programme (CRP),^{2/} and lifetables for 1960 have also been prepared.^{3/}

Table I shows the life table survivorship values for females for 1960 prepared by the CRP together with life tables for males for 1950 calculated from registered deaths and the CRP estimates of population by age; and one for females from 1970 calculated from registration data for that year and the census age distribution. Also shown in Table I are estimated cohort survivorship values for persons under 5 in 1980, based on registered births and deaths 1975-1980.

These life tables indicate that mortality has been improving dramatically since the 50's and when life expectation at birth was about 52.5 for males (57 for females) to 1970 when it was about 70 for females and 65 for males. It was therefore thought inappropriate to use any one time-period life table to represent the mortality experience of all the cohorts in the study. It was not possible to construct full cohort life tables, however, as there is no data prior to 1949, but in order to allow for higher mortality in older cohorts, a series of weighted survivorship values was constructed from the empirical life tables, with increasing weight given to earlier life tables for older cohorts. This is also shown in table I. The weighting procedure is somewhat arbitrary, as is the decision to use a male life table, (with its heavier mortality) for 1950, and female life tables for 1960 and 1970, but it is believed that the resulting survivorship curve is smooth enough and has roughly the right shape, and more complex techniques for estimating cohort survivorship were not thought to be worth the trouble for the present application.

Table II shows schedules of age specific fertility rates at 5-yearly intervals from 1935 to 1980. Those from 1955 to 1980 were calculated from registered births and census age distributions, or inter-censal estimates

^{2/} CRP publication No.8 - "Estimates of Intercensal Population by Age and Sex and Revised Vital Rates for British Caribbean Countries 1946-1960.

^{3/} CRP publication No.9 - "Life tables for British Caribbean Countries 1959-1961.

of the age distribution. Those from 1935 to 1950 were estimated, on the assumption that the shape of the fertility schedule was the same as for 1955 (i.e. the relative rates were constant) but the level was allowed to vary so that when the rates were applied to the numbers in each age group (taking the CRP estimates for 1980 and reverse surviving the 1946 census population for the others), the total number of births agreed with the figure published by the registrar general. The estimate for pre-1930 is simply a rough extrapolation of trends for the later years.

Table II shows that fertility has been far from constant - falling during the depression and war years to give a low total fertility rate of just over 2.5 in the early 40's, rising to around 4.75 in the early 60's, and then declining steadily to an even lower value of 2.3 for 1980.

Fertility rates and numbers of births by age group of women were also estimated for intermediate years, using similar methods to those outlined above (the numbers are not shown here for the sake of brevity), so that the number of births in any year to a given cohort of women could be estimated by a simple weighting of the births in adjacent age groups - e.g. no. of births in 1973 to women aged 30-34 in 1980 = .4 x (births to women aged 20-24 in 1973) + .6 x (births to women aged 25-27 in 1973).

2.2 Theoretical Age distributions of children and mothers: If the number of women currently aged x is denoted by $W(x)$, then the number of children currently aged y with mothers aged x is given by:

$$W(x) l(y) f(x-y)$$

where $l(y)$ is the probability of surviving to age y for a person born y years ago, and $f(x-y)$ is the fertility rate of women aged $x-y$, y years ago.

From this it can be shown that the proportion of children aged y to $y+5$ of mothers aged x to $x+5$ is:

$$\frac{\int_y^{y+5} l(y) \int_x^{x+5} W(x) f(x-y) dx dy}{\int_\alpha^\beta l(y) \int_x^{x+5} W(x) f(x-y) dx dy}$$

where α and β are the youngest and oldest ages respectively of children of women aged x to $x+5$.

Assuming that the distribution of women and children within each 5-year age group is approximately rectangular, we can simplify this expression to

$$5L_y \int_y^{y+5} \int_x^{x+5} f(x-y) dx dy$$

$$\sum_{y=\alpha}^{y=\beta-5} 5L_y \int_y^{y+5} \int_x^{x+5} f(x-y) dx dy$$

The $5L_x$ values are shown in the last column of table I. The double integral can be evaluated numerically by summing cohort fertility rates obtained by weighting adjacent age specific rates (as explained in section 2.1) over the appropriate 5-year intervals. The calculations, though simple enough, are long and tedious, so they are not shown here. The resulting distribution of children for each age group of women is shown in table III.^{4/}

For the purposes of this analysis, we also need to know the distribution by age of mothers of children of a given age, assuming that all mothers survived from the birth of the child.

If $C(y)$ is the number of children currently aged y , then the number of those children who would have a mother aged x if all mothers survived the intervening years is given by

$$\frac{W(x-y) \cdot f(x-y) \cdot C(y)}{B(y)}$$

where $W(x-y)$ is the number of women aged $(x-y)$ y years ago, and $B(y)$ is the total number of births y years ago.

Thus the proportion of children aged y to $y+5$ having mothers aged X to $X+5$ is given by

$$\frac{\int_x^{x+5} \int_y^{y+5} W(x-y) \cdot f(x-y) \frac{C(y)}{B(y)} dy dx}{\int_\alpha^\beta \int_y^{y+5} W(x-y) \cdot f(x-y) \frac{C(y)}{B(y)} dy dx}$$

^{4/} Note that table III has 2 alternative final columns, representing the distribution of children of women aged 75 and over. The first was obtained by taking a weighted average of the distributions of the constituent 5-year age groups up to 95-99 using weights of .5, .3, .15, .05, 0.0) to represent the situation where the 75+ age group is made up of successively shrinking 5-year age groups due to mortality (and population growth) within the age group, the second is the straight average of the same 5-year age groups, for use in a "no-mortality" calculation in a later part of this paper.

where α and β are the youngest and oldest ages of mothers of children aged y to $y+5$

Assuming a rectangular distribution for children within 5-year age groups (which also implies that total births within a 5-year period are constant) this simplifies to

$$\frac{\int_{\alpha}^{\beta} \int_{y}^{y+5} b(x-y) dy dx}{\int_{\alpha}^{\beta} \int_{y}^{y+5} b(x-y) dy dx}$$

where $b(x-y) = W(x-y) \cdot f(x-y)$ is the number of births y years ago to women who were then aged $x-y$

Once again it is a simple though tedious task to evaluate the double integral by weighting and summing the births in the mother's age groups for the years in question. The calculations are not shown, but the resulting distribution is shown in table IV.

2.3 Obtaining the Age Distribution of Emigrant Children: The theoretical age distribution in Table III can be applied to the number of children reported by women in each age-group, to obtain the distribution of these children by age. By summing across the children's age-groups an overall distribution of surviving children by age can be obtained. Table V shows the numbers of surviving children reported by each age-group of mother and their breakdown by sex and residence (Barbados/abroad). By assuming that the age distributions of surviving children shown in Table III hold also for each sex and residence category, it is possible to obtain the age distribution of male and female, resident and emigrant children. Table VI shows this procedure applied to male emigrant children, and Table VII for female emigrant children, as reported by their mothers who are resident in Barbados.

The assumption about the age distributions being the same for each sex and residence category is not entirely realistic - for one thing, sex differences in the pattern of mortality would tend to make the age distribution of male children slightly younger than that of female children. Also, if migration takes place mainly in the 20-40 age-groups, the age distributions of emigrant surviving children would tend to be older than that of residents.

A refinement of Table III could be devised, using some theoretical model of the age-specific propensity to emigrate, but this has not been done in the present analysis - partly because of its exploratory nature, partly because it is felt that Barbadian emigration patterns may display peculiarities that a general model may just obscure - e.g. as in other West Indian societies, it is not uncommon for children to live with grandparents and other relatives, or to be sent to schools abroad; and there is a considerable amount of return migration across all age-groups.

2.4 Allowing for the Effects of Orphanhood and Maternal Migration: The age distribution of emigrant children obtained above, only accounts for those emigrants who have a mother living in Barbados who is able to report on them - i.e. those whose mother has died or herself emigrated are not reported on. All respondents in the survey were asked if their mother was alive, and if so, was she resident in Barbados. When the results of this inquiry are tabulated by age of respondent as in Table VIII it is possible to find what proportion of respondents in each age-group have a mother living in Barbados. Polynomial smoothing was applied to these proportions to yield the values shown in the last column of Table VIII. Assuming that the same proportions apply to emigrant children, and dividing the number of emigrant children in each age-group (derived from the reports of their mothers) by the proportion in that age-group who have a mother resident in Barbados, yields an estimate of the total emigrants in that age-group. This calculation is shown in Table IX.

It is likely that this procedure somewhat under-estimates the total number of emigrants, especially for the youngest age-groups, where one might expect mothers to migrate with their young children. It is a small consolation that the resulting bias towards older ages in the estimate of the age distribution of emigrants, would tend to offset the bias towards younger ages discussed in section 2.3, caused by ignoring the age patterns of migration.

2.5 Reports on Siblings: Each respondent in the survey was questioned about the residence and survival of his/her siblings i.e. how many brothers and sisters they had living in Barbados, how many living abroad and how many who had died. In all cases, it was made clear that the information sought referred to brothers and sisters by the same mother, and that the respondent was to be included in the number of resident siblings. The responses could not be dealt with as simply as those of the mothers about children, because of the problem

of multiple reporting: a person who has n resident siblings in Barbados would be n times as likely to be reported as a person who has only one resident sibling (or is the only resident sibling in the family). To overcome this problem, the responses about numbers of siblings were weighted by the inverse of the number of resident siblings. Table X shows the distribution of siblings by sex and residence/survival status, and by age of respondent, after weighting for multiple response.

2.6 Adjusting for Whole Family Emigration: The next step is to estimate the number of emigrants who could not be reported on, because they had no resident siblings. Information on the extent of migration of whole family groups of siblings is available from the reports of mothers. Table XI shows the numbers of children reported abroad by all mothers, compared with the numbers of children reported abroad by those mothers who have children resident in Barbados, and this information is broken down by age of mother. The ratio: children abroad/children abroad with resident siblings is slightly irregular due to the small numbers involved but suggests a Ushaped pattern by age of mother. Polynomial smoothing was used to get rid of the irregularities, and the smoothed ratios are also shown in Table XI.

The (weighted) distribution of siblings abroad by age of respondent is then converted into a distribution of siblings abroad by "would-be" age of mother - i.e. by the current age of the respondent's mother, assuming she is still alive. This is done by applying the theoretical distribution shown in Table IV, to the total emigrant siblings in each age-group as shown in Table X. The calculations are shown in Tables XII and XIII for emigrant brothers and emigrant sisters respectively.

By multiplying the totals in each "mother's age-group" by the appropriate ratio of (total children abroad) (children abroad with resident siblings) as derived in Table XI, estimates of emigrant siblings adjusted for "whole sibling group" migration are obtained. This calculation is shown in Table XIV.

2.7 Obtaining the Age distribution of Emigrant Siblings: Finally, the age distribution of the emigrant siblings themselves is obtained, by applying the theoretical age distribution of children for each age-group of mother shown in Table III, (just as was done with the reports of the mothers, described in section 2.3). No further adjustment is required

for orphanhood and maternal migration, because the theoretical age distribution of the mothers of the respondents assumed no maternal mortality. This last calculation is shown in Tables XV and XVI for male and female emigrants respectively.

3. RESULTS

3.1 Response Rates: A total of 18,643 responses were collected from the individuals living in the sample households. As the census count of individuals in private households was 246,082, this represents 7.58 per cent of the non-institutional population. 1,310 respondents (558 males and 752 females) were reported as foreign born (7.0%), and these were excluded from this analysis, as it was assumed that most of the relatives of foreign-born respondents who live abroad would not be Barbadian emigrants. Of the Barbados-born females, 6,665 were over 15, and were asked questions about their children.

Only 102 respondents (0.59%) did not provide any information about the residence and survival of their siblings, and only 32 (.48%) of the women over 15 did not provide complete information about their children. These respondents were also omitted from the analysis, so that the final number of responses analysed was 17,231 (8,149 males and 9,082 females) on the sibling and orphanhood questions, and 6,633 females over 15 on the children questions. Of these respondents, there were none whose age was not known, and only 3 who could not give information about residence and survival of their mothers. The response rate would thus appear to be very high, and indeed enumerators did not report any reluctance to answer these questions amongst the people interviewed. The only households in the sample which did not yield any information were those which were found to be unoccupied.

3.2 Estimates of Emigrants from Mother's Reports: Table V shows that the total number of emigrant children reported by mothers is 3,155 (1,636 sons and 1,519 daughters). Table IX shows that after adjusting for the effects of maternal orphanhood and migration, a total of 7,004 emigrants is obtained (3,660 males and 3,344 females). This represents an overall adjustment factor of 2.22.

The estimated age distribution of emigrants shows a similar pattern for both sexes: the numbers rise with age up to the 50-54 age-group, and then decline at older ages. Table IX also shows the estimated emigrants expressed as a proportion of emigrants plus residents in each age-group and this data

is displayed in Figure (i). The pattern is broadly similar for the sexes - rising slowly up to the 20's, sharply up to the 40's, then more slowly again to the 60's and then coming down again sharply. Male proportions emigrating are noticeably higher than those for females from the mid-20's onwards. If this pattern is true, it would indicate either a substantial amount of return migration at older ages, or a lower life-time propensity to migrate on the part of the cohorts currently aged over 60. (The decline at old ages could also be an artefact, produced by omissions in reporting emigrant children by the older women - see discussion in section 5). The proportions who have emigrated are very high: the overall percentage for all ages and both sexes is 29 per cent; the peak for males in the 55-59 age-group is almost 60 per cent; the peak for females is in the same age-group at 48%.

Dividing the estimated number of emigrants by the sampling fraction (0.758) would yield a national estimate of 92,401 emigrants (48,285 males and 44,116 females).

3.3 Estimates of Emigrants from Sibling Reports: Table X shows that the survey respondents reported a total of 7,094 siblings abroad (after weighting to counter the effects of multiple response), composed of 3,642 brothers and 3,425 sisters. Table XIV shows that after making allowances for the emigration of whole sibling groups, we have an adjusted total of 8,865 emigrants, comprising 4,585 males and 4,280 females. This represents an overall adjustment factor of 1.25.

The estimated age distribution of the emigrants is shown in Tables XV and XVI for males and females respectively. The age pattern is similar for the sexes - rising steadily up to the 20-24 age-group, levelling out at the mid-40's, then rising to a peak in the 55-59 age-group, and thereafter declining steadily. Emigrants expressed as a percentage of residents plus emigrants in each age-group are shown in Table XVII and Figure (ii) displays these results graphically. In age-groups 10-24, proportionally more females are emigrants than males (though the differences are not large), but the reverse is true for ages over 25. Proportions who have emigrated rise steadily up to the end of the 50's, (peaking at just over 65% for males and nearly 55% for females), and fall after age 60. Again, the level is very high, but the pattern ties in reasonably well with what is generally presumed about patterns of migration with age - that the bulk of migration takes place in early

adulthood - the fall off at older ages could be due to return migration, or less initial out-migration for the older cohorts. The overall proportion migrating for all ages and both sexes is 34 per cent - even higher than that derived from the reports of mothers.

Dividing the sample estimate of total emigrants by the sampling fraction, gives us a national estimate of 116,952 emigrants - comprising 60,488 males and 56,664 females.

3.4 Comparison of the two sets of Results: The sibling method yields a substantially higher estimated total number of migrants (8,865) than the children method (7,004). The estimated sex composition of the emigrant population is more or less the same for both methods - with a small excess of males - the sex ratios being 1.07 for both methods.

Figures (iii) and (iv) show a comparison of the age distributions of male and female emigrants obtained from the two methods - the differences in level are evident throughout, but the age pattern is broadly similar, except for the levelling out at ages 20-44 which is only evident in the sibling reports. The sibling report distributions peak slightly later than the ones based on mothers reports.

3.5 Current Emigration from "last year" Questions: Questions were also asked about the numbers of siblings and children emigrating in the last year. Mother's reports yielded a total of 104 children (51 sons and 53 daughters) who left in the year before the survey. Applying the same overall adjustment factor of 2.22 which was the result of adjusting mother's reports for orphanhood and maternal migration, gives an estimated 231 current emigrants (113 males and 118 females).

Similarly, siblings reports yielded a total of 156 siblings (72 brothers and 84 sisters) who left in the year before the survey. Using the overall adjustment factor of 1.25 derived for correcting sibling reports yields a total of 195 current emigrants - comprising 90 males and 105 females.

Taking the average of the two estimates (213) and expressing this as a fraction of the total respondents, gives a current migration rate of 1.24 per cent per annum. Dividing it by the sampling fraction gives a national estimate of 2,810 emigrants in the year before the survey (roughly speaking - 1980).

Both methods indicate an excess of females over males amongst current migrants, with the sex ratios averaging out at about .91 - i.e. out of the 213 current emigrants 101 would be male and 112 females.

3.6 Current Emigration from Proportions Emigrated by Age: The numbers of current emigrants reported directly are too small to warrant any attempts at finding their age-structure by methods such as those outlined in section 2. However, by taking the results of the calculations shown in Tables VII and XV - the percentages of emigrants in each age-group, it is possible to calculate the expected annual rate of out-migration for each age-group.

As a first step, the percentages of emigrants in each age-group calculated by the two methods were averaged, and then these averages were smoothed polynomially. The resulting smoothed percentages are shown for the two sexes in Tables XVIII and XIX. Next, the between age-group decrements in the percentages of residents were found, divided by 5 to obtain annual, rather than 5-year decrements, and divided by the percentage of remaining residents in the age-group, to give the annual emigration rates. These calculations are also shown in tables XVIII and XIX. The expected numbers of current emigrants were then found by applying these rates to the respondents in each age-group.

The resulting totals of current emigrants are 103 males and 92 females (total 195). Dividing by the sampling fraction gives a national estimate of 2,573 emigrants per annum. The orders of magnitude are similar to those obtained directly from the reports on current emigrants in section 3.5, but the sex ratio is reversed. This is not surprising, as both the estimates of total migrants imply heavier migration amongst men than women. It might well be, however, that recently the sex balance of migration has undergone a change, and this would account for the differences in the two sets of results.

4. CONSISTENCY CHECKS

4.1 Comparison of Mothers and Siblings Reports: Section 3 dealt exclusively with the estimation of emigrants, and revealed some quite large differences between the estimates from the two sources. Before looking in detail at possible causes of these discrepancies, it is useful to make some other comparisons, which might shed some light on the reliability of the data, and to some extent, of the methodology used.

Table XX shows some comparisons between reports of different sets of respondents which should give the same results - e.g. the reports of mothers with resident sons should tally with the reports of sons with resident mothers, after the latter have been weighted for multiple response. In general, the agreements are pretty close, except in the case of reports about dead children/siblings, where the mother's reports exceed those of siblings by anywhere between 20 per cent and 50 per cent. It is not surprising to find that reporting of dead siblings is less complete than the reporting of dead children, as deaths of siblings could have taken place before the respondent was born, and he/she might grow up in ignorance of the death of an elder sibling.

Apart from the category of dead children/siblings, the reports of mothers with resident children and of mothers with resident daughters are lower than those of siblings with resident mothers and sisters with resident mothers. However, the reports of mothers with resident sons are in most cases higher than the reports of brothers with resident mothers.

4.2 "Reliable" Values: There are some pairs of reports in this table, where one would a priori place more trust in one value than the other, because of the way in which the two values are derived. For example, the number of mothers with resident children reported by the mothers themselves is more likely to be correct than the number of such mothers derived from the reports of siblings with resident mothers, since the former depend only on whether the mother was correctly identified as having or not having had one or more children, whereas the latter depend both on the correctness of the response to the question on mother's residence and on the correct statement of total number of resident siblings, since the responses are weighted by the inverse of this quantity. Similarly, one would put more trust in the number of resident siblings with resident mother reported by the siblings themselves, than in the number reported by the mothers, since the former depends simply on the correctness of the response about mother's residence, whereas the latter involves the correct statement of the actual number of resident children by each mother. Where one value is more "Believable" than its pair, in Table XX it has been ringed.

4.3 Comparisons of Reports by Males and Females: The number of families with one or more brothers derived from the weighted reports of females

should be the same as the number of families with one or more sisters derived from the weighted reports of males. The actual numbers of such families reported is shown in Table XXI, for the respondents classified by residence/survival of mother. Female reports of the number of such families exceed male reports in all cases. In the case of respondents with resident mother, the mother's reports lie between the values reported by either sex, but closer to the male value.

4.4 Distributions of Families by Size: As well as agreement in absolute numbers, one would expect agreement in the distributions of families by number and sex of children between reports of mothers with resident children and siblings with resident mothers. The agreement should be particularly strong as regards the composition of families in terms of resident children, as one would expect omissions here to be least significant. Table XXII shows the percentage distributions of such families, by number and sex of resident children based on the reports of mothers and siblings.

The general agreement between the distributions is pretty good, but the small deviations present are systematic: siblings report higher proportions of families in the categories zero sons, zero daughters, one son, one daughter, one child, and two children, than do mothers in the corresponding categories; to balance this, mothers consistently report higher proportions of families in the higher size categories.

4.5 Brothers Reports on Sisters and Sisters Reports on Brothers: One further comparison of family structure is made possible by the theoretical relationships:

$$E(M_b) = r \cdot F_{b-1}$$

$$E(F_s) = M_{s-1} / r$$

where M_b is the number of male respondents with b brothers, M_s the number of male respondents with s sisters; F_b and F_s the numbers of female respondents with b brothers and s sisters respectively, and r is the sex ratio (male: female) of respondents in the sample. Table XXIII shows the observed and expected numbers of male and female respondents distributed by numbers of sisters and brothers.

The importance of this comparison lies in the fact that the "expected" distributions are derived from the (unweighted) distributions of respondents by number of siblings of the opposite sex - hence there can be no question

of bias arising from the exclusion of the respondent from the number of resident siblings of the same sex. A study of Table XXIII shows only one major discrepancy between the observed and expected values - a large excess of females respondents in the "only sister" category.

4.6 Age Structure: The methods used to estimate the age structure of emigrants, can also be applied to estimate the age structure of the resident population, and this estimated age structure can be compared with the actual age structure of the respondents. Table XXIV shows the age structure of the resident male and female populations derived from reports of mothers about resident sons and daughters, corrected for orphanhood and maternal migration. Although the totals agree closely with the actual numbers of male and female respondents, the distributions by age-group show systematic differences - apart from the 0-4 age-group which agrees closely for both sexes, there is substantial under-estimation for age-groups under 20, and over-estimation for age-groups between 20 and 60. Table XXIV also shows the actual number of respondents of each sex in each age-group, and the ratios between the estimated and observed number. These results are illustrated in figures (v) and (vi) for males and females respectively.

Reports on numbers of resident siblings of the same sex, when weighted for multiple response, yield, by definition, the exact distribution (by age or any other characteristic) of the respondents. However, by following through the analysis of reported resident siblings of the opposite sex, in the same fashion as for emigrant siblings, and comparing these with the actual age distributions of respondent we can get an idea of the accuracy of the method for ascertaining age-structure. The results of this procedure are also shown in Table XXIV, together with the ratios between the estimated and observed members in each age-groups, and are illustrated in figures (v) and (vi). There is a strange discrepancy for both sexes at younger ages, the estimates showing highest numbers at ages 0-9, with a subsidiary peak of 20-24, whereas the observed distribution has only one peak at the 20-24 age-group. The overall numbers, and the numbers in most age-groups are under-estimated in the case of resident females reported by brothers, and over-estimated in the case of resident males reported by sisters.

5. POSSIBLE SOURCES OF ERROR

5.1 Possible Over-estimation: The methods discussed in Chapter 2, were designed to measure the numbers of persons born in Barbados, currently living abroad - but inevitably some people must be wrongfully included in the reported emigrants - e.g. children and siblings born abroad to Barbados-born persons currently residing in Barbados. Similarly, the adjustment factors used for maternal orphanhood/migration and emigration of whole sibling groups might be slightly too high, as some of the children born to mothers who have migrated could have been born abroad, and some of the siblings of those sibling groups currently all residing abroad, could in fact have been born abroad. No attempt has been made here to quantify these biases - but it is presumed they are small.

5.2 Children of Foreign Born Mothers: The reverse kind of bias is caused by omitting from the reported emigrants Barbados-born children and siblings of foreign-born persons. It is felt that due to non-negligence numbers of persons from other East Caribbean Islands settling and marrying in Barbados, it might be particularly important to take account of the children of foreign-born women. Full tables have not been produced for foreign-born women, but 630 of these women reported a total of 930 children resident in Barbados - adding these to the reports of Barbados-born women with resident children would more than account for the discrepancies among residing children shown in the first two columns of Table XX.

5.3 Omission of Children by Older Mothers: Another potential source of downward bias in the mother's reports on children lies in omissions in the reports of older women. The penultimate column of Table V shows the reported mean parities by age - these begin to decline after age 55, which is usually taken to be a sign of omission by older women. In this case, however, the decline at higher ages is quite compatible with the lower fertility rates experienced in the past (as shown in table II). The mean parities are also in general agreement with parities by age reported in the 1970 census, (when allowance is made for the 10-year age difference), except for that of the 55-59 age-group which is reported as 4.02 in the survey, whereas the 1970 census mean parity for women 45-49 is 4.13. There

is some evidence of omissions, however, in the reported proportions childless in each age-group. These decline steadily from .9 in the 15-19 age-group to .1 in the 40-49 age-groups, as expected, but then rise again to .25 in the 60+ age-groups. Even if fertility levels were lower in the past, one would not expect the proportions childless to be so much higher.

It has often been stated that it is the dead children in particular, who are liable to be omitted from the older women's reports - but a quick examination of reported proportions surviving by age of mother (last column of Table V) shows that despite a few irregularities, they generally decline in a manner consistent with the life table used for this population. It is, therefore, likely that omissions have been made in the reports of older women both in living and dead children. Even if there were no tendency to omit emigrant rather than resident children, this could account for the larger discrepancies in the reports of emigrant as opposed to resident children/siblings, as the oldest women, for whom omissions would be the largest, account for the largest numbers of reported emigrant children.

5.4 "Weighting" Errors in Sibling Reports: The enumerators were clearly instructed that the respondent was to be included in the count of resident siblings of the same sex. Omission of the respondent from this count would lead to over-estimates based on the weighted sibling data, as the numbers of siblings reported by the respondent would be divided by one less than the correct number. There is evidence that some such omissions occurred - the computer edit revealed a total of 264 persons (116 males and 148 females) who were recorded as having zero resident siblings of the same sex - (an error rate of 4.8%) - it is not known how many errors of this kind were detected and corrected during manual editing. The correction of this error results in a heaping of respondents in the category "only resident brother" and "only resident sister", since persons who are really one of a pair of resident same-sex siblings, but are reported as "only" resident brothers or sisters cannot be detected during editing, and so do not get corrected. Evidence of such heaping is present in the comparison of distributions of families by number and sex of siblings from the reports of mothers and siblings, shown in Table XXII, but Table XXIII would appear to show that this heaping is only present in the case of females but not males. Why such a reporting error should be sex-specific is not at all clear.

5.5 Errors affecting the estimated age structure: The use of a single age distribution for both resident and emigrant children for a given age-group of mother is undoubtedly an over-simplification - the age distribution of resident children should be younger, and the age distribution of emigrated children should be older, than the age distribution of all surviving children shown in Table I. This would, to some extent, account for the under-estimation of resident children below age 20, and the over-estimation of resident children above that age, based on orphanhood adjusted reports of mothers, shown in Table XXIV and figures (v) and (vi).

It was hoped that by comparing the actual age distribution of all the respondents, with the age distributions of surviving (resident plus emigrants) children reported by mothers and corrected for orphanhood, it might be possible to adjust the distributions in Table I to obtain separate age distributions for resident and emigrant children. However, the final three columns of Table XXIV show that there are other factors distorting the estimated age distribution. If the age distribution of surviving children obtained by this method was an accurate one, one would expect the resident population in each age-group to be a steadily decreasing fraction of the adjusted surviving children with age. (At least up to the 60's when it is suspected that return migration occurs). In fact, at ages 5-19, there are more respondents than estimated surviving children. This is unlikely to be caused by differential under-reporting of surviving children by mothers, as this would be more likely to affect older age-groups. One is thus driven to the conclusion that the estimated age-distribution of surviving children (Table I) itself needs some correction.

6. CONCLUSIONS

6.1 Internal Discrepancies: The estimated number of emigrants based on the two methods differ by some 25 per cent and it is pretty certain that the sibling method over-estimates the number somewhat, whilst the children method probably under-estimates it. It would, therefore, be reasonable to regard the two estimates as upper and lower limits for the true number. It is difficult to arrive at such a firm conclusion regarding the age distributions of emigrants produced by the two methods, since these are generated by rather elaborate methods which involve quite a lot of manipulation of registration data. More work would need to be done on the effects of the assumptions about the course of fertility and mortality.

6.2 External Checks: To date, no data on Barbados-born persons living abroad has become available from other country's censuses, so that no truly independent verification of these results has been possible. The figures are undoubtedly high - averaging the two totals scaled up to the national level gives 104,677 emigrants, or about 30 per cent of all persons born in Barbados. However, some recent work ^{5/} on intercensal population change in the 1960 to 1970 interval, shows that out-migration for that decade alone amounted to about 44,500 persons, so the order of magnitude arrived at is quite plausible.

Estimates of current net migration based on entry and departure statistics run at about 2,000 per annum outwards, and this is generally felt to be a quite severe under-estimate. Thus, the figure of between 2,573 and 2,810 derived above for current out-migration would appear to be reasonable also.

6.3 Feasibility of Using this Method Elsewhere: On the whole, this approach to measuring out-migration has been fairly successful in Barbados, but before assuming that it would work elsewhere, two considerations must be borne in mind:

- i. it was a cheap option here, because a continuous household survey was already underway and highly skilled staff were readily available; and
- ii. the heavy rate of out-migration and the small total size of the population meant that meaningful results could be derived from a relatively small sample.

As regards employing this approach in a census - the "children" method would seem particularly suitable, as in many countries questions about numbers of surviving and dead children are already asked, as is the question on orphanhood, so the only amendments required would be the sub-division of surviving children into resident in the country or abroad, and the classification of resident, emigrant and dead children by sex.

^{5/} ZABA, B. 1980 Caribbean Census - suggestions for an Analytical commentary - a model based on the Barbados 1970 Census.

T A B L E S



TABLE I

SELECTED LIFE TABLES USED TO RECONSTRUCT AGE DISTRIBUTION

Age	Proportions Surviving				Weighted lx values for birth cohorts	sLx for birth cohorts
	Males 1950	Females 1960	Females 1970	Both Sexes 1975-1980		
1	.8526	.9344	.9556	.9791	.9791)	.973
5	.8009	.9208	.9484	.9782	.9608)	.953
10	.7973	.9184	.9461		.9461	.941
15	.7945	.9165	.9418		.9362	.932
20	.7870	.9133	.9380		.9276	.922
25	.7768	.9081	.9319		.9171	.912
30	.7653	.9071	.9254		.9071	.885
35	.7523	.8916	.9189		.8637	.843
40	.7353	.8801	.9048		.8222	.796
45	.7061	.8645	.8855		.7695	.737
50	.6703	.8375	.8559		.7037	.662
55	.6206	.8010	.8105		.6206	.588
60	.5551	.7565	.7576		.5551	.507
65	.4597	.6995	.6725		.4597	.404
70	.3480	.6211	.5477		.3480	.291
75	.2347	.5070	.4020		.2347	
80	.1457	.3669	.2326			
e_0	52.52	67.48	70.87			

TABLE II
SELECTED FERTILITY SCHEDULES USED TO RECONSTRUCT AGE DISTRIBUTIONS

Age	pre-1930	1935	1940	1945	1950	1955	1960	1965	1970	1975	1980
15-19	.12	.110	.083	.101	.113	.137	.136	.105	.094	.089	.075
20-24	.20	.195	.158	.195	.208	.232	.243	.167	.164	.153	.128
25-29	.16	.145	.124	.152	.163	.193	.235	.169	.156	.143	.135
30-34	.12	.105	.093	.111	.137	.131	.185	.141	.102	.089	.078
35-39	.08	.056	.050	.067	.082	.087	.104	.102	.060	.048	.033
40-44	.02	.018	.015	.022	.029	.029	.039	.035	.025	.018	.011
45-49	.0	.001	.001	.002	.002	.003	.004	.004	.004	.002	.001
TFR	3.5	3.15	2.62	3.25	3.67	4.06	4.73	3.62	3.03	2.71	2.31

TABLE III
PERCENTAGE AGE-DISTRIBUTION OF CHILDREN FOR EACH AGE-GROUP OF MOTHER

	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75+	75+	
0-4	100.0	67.1	42.5	23.1	9.8	3.1	.7	.1						(Weighted	(Straight
5-9		32.9	40.1	32.9	20.5	10.2	4.1	1.1	.1					sum of	sum of
10-14			17.4	30.1	29.2	18.9	10.2	5.0	1.8	.2				over 75	over 75
15-19				13.9	25.9	25.6	20.1	14.8	8.6	2.7	.3			groups	age groups,
20-24					14.6	30.0	31.1	25.6	18.8	10.2	3.2	.4		for use	for use
														with	with sib-
														mothers'	ling
														reports)	reports)
25-29						12.2	25.4	26.1	21.2	16.0	8.7	2.4	.2		.1
30-34							8.4	20.4	23.8	21.8	17.0	9.2	1.9		.6
35-39								6.9	19.7	23.8	19.9	14.5	5.5		2.2
40-44									6.0	17.1	22.5	17.1	9.3		4.2
45-49										8.2	20.5	24.9	16.5		8.9
50-54											7.9	22.7	23.7		15.4
55-59												8.8	22.0		18.8
60-64													13.1		18.0
65-69													5.2		14.3
70-74													2.4		10.4
75+													.2		7.1

TABLE IV
PERCENTAGE AGE-DISTRIBUTION OF MOTHERS (IN ABSENCE OF
MORTALITY) FOR EACH AGE-GROUP OF CHILD

"Would be" age of mother	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
15-19	14.0												
20-24	30.2	14.8											
25-29	28.3	29.9	14.2										
30-34	16.7	26.6	27.8	12.7									
35-39	7.3	15.6	24.4	24.4	11.3								
40-44	2.7	8.1	15.6	23.3	24.3	11.4							
45-49	.7	3.8	10.4	18.4	24.4	25.0	10.7						
50-54	.1	1.1	5.7	13.2	19.3	25.6	25.6	11.3					
55-59		.1	1.7	6.3	12.7	18.2	25.2	25.8	10.5				
60-64			.2	1.6	6.2	12.3	18.8	25.9	26.7	12.1			
65-69				.1	1.7	5.9	12.4	18.6	26.7	27.5	11.4		
70-74					.1	1.5	5.8	12.0	18.8	26.7	27.2	11.8	
75+						.1	1.5	6.4	17.3	33.7	61.4	88.2	100.00

TABLE V
BARBADOS-BORN FEMALES BY AGE-GROUP, WITH NUMBERS OF CHILDREN BY THEIR
SEX, SURVIVAL AND RESIDENCE

Age Group	Number of Women	S o n s				D a u g h t e r s				C h i l d r e n				Mean Child- ren ever born	Propor- tion Children Surviving
		Living in B'dos	Living abroad	Who have Died	Total Sons	Living in B'dos	Living abroad	Who have Died	Total Dtrs.	Living in B'dos	Living abroad	Who have Died	Total Child- ren		
15-19	902	70	1	0	71	56	1	1	58	126	2	1	129	.14	.992
20-24	930	313	4	3	320	243	3	2	248	556	7	5	568	.61	.995
25-29	747	536	12	6	554	489	6	3	498	1025	18	9	1052	1.41	.991
30-34	584	608	31	14	653	637	18	10	665	1245	49	24	1318	2.26	.982
35-39	390	568	20	11	599	565	22	7	594	1133	42	18	1193	3.06	.985
40-44	379	675	42	24	741	626	51	22	699	1301	93	46	1440	3.80	.968
45-49	384	736	93	35	864	683	92	31	806	1419	185	66	1670	4.35	.960
50-54	435	757	149	60	966	756	157	41	954	1513	306	101	1920	4.41	.947
55-59	379	532	209	87	828	476	166	52	694	1008	375	139	1522	4.02	.909
60-64	352	391	228	111	730	412	221	82	715	803	449	193	1445	4.11	.866
65-69	373	322	264	77	663	347	243	62	652	669	507	139	1315	3.53	.894
70-74	312	219	236	99	554	271	238	84	593	490	474	183	1147	3.68	.840
75+	466	339	347	174	860	380	301	136	817	719	648	310	1677	3.60	.815
TOTAL	6633	6066	1636	701	8403	5941	1519	533	7993	12007	3155	1234	16396	2.47	.925

TABLE VI
DISTRIBUTION OF EMIGRANT SONS BY AGE, DERIVED FROM TOTAL EMIGRANT
SONS REPORTED BY MOTHERS

Age of Sons	A g e o f M o t h e r												TOTAL	
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74		75+
0-4	1	3	5	7	2	1	1							20
5-9		1	5	10	4	4	4	2						30
10-14			2	9	6	8	9	7	4					45
15-19				5	5	11	19	22	18	6	1			87
20-24					3	13	28	38	39	23	8	1		153
25-29						5	24	40	44	36	23	6	1	179
30-34							8	30	50	50	45	22	7	212
35-39								10	41	55	53	34	19	212
40-44									13	39	59	40	32	183
45-49										19	54	58	57	188
50-54											21	54	82	157
55-59												21	76	97
60-64													46	46
65-69													18	18
70-74													8	8
75+													1	1
Reported totals	1	4	12	31	20	42	93	149	209	228	264	236	347	1636

TABLE VII
DISTRIBUTION OF EMIGRANT DAUGHTERS BY AGE DERIVED FROM TOTAL
EMIGRANT DAUGHTERS REPORTED
BY MOTHERS

Age of Daughters	Age of Mother													TOTAL
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75+	
0-4	1	2	3	4	2	2	1							15
5-9		1	2	6	5	5	4	2						25
10-14			1	5	6	10	9	8	3					42
15-19				3	6	13	18	23	14	6	1			84
20-24					3	15	29	40	31	23	8	1		150
25-29						6	23	41	35	35	21	6	1	168
30-34							8	32	40	48	41	22	7	198
35-39								11	33	53	48	35	17	197
40-44									10	38	55	41	28	172
45-49										18	50	58	50	176
50-54											19	54	70	143
55-59												21	65	86
60-64													39	39
65-69													16	16
70-74													7	7
75+													1	1
Reported Totals	1	3	6	18	22	51	92	157	166	221	243	238	301	1519

TABLE VIII
BARBADOS-BORN RESPONDENTS BY AGE-GROUP AND SURVIVAL/
RESIDENCE OF MOTHER

Age Group	Mother living in B'dos	Mother living abroad	Mother dead	Total	Proportion with mother resident	Smoothed proportions
0-4	1,384	9	9	1,402	.987	.980
5-9	1,675	61	18	1,754	.955	.965
10-14	1,668	46	36	1,750	.953	.945
15-19	1,758	75	61	1,894	.928	.918
20-24	1,611	128	106	1,845	.873	.881
25-29	1,207	128	99	1,434	.842	.836
30-34	870	76	151	1,097	.793	.775
35-39	514	45	186	745	.690	.707
40-44	446	32	220	698	.639	.615
45-49	338	19	298	655	.516	.511
50-54	278	12	447	737	.377	.375
55-59	149	10	485	644	.231	.246
60-64	86	7	570	663	.130	.134
65-69	27	1	630	658	.041	.062
70-74	8	1	533	542	.015	.030
75+	15	4	691	710	.021	.008
TOTAL	12,034	654	4,540	17,228		

TABLE IX

ADJUSTMENT OF EMIGRANTS REPORTED BY MOTHERS FOR
ORPHANHOOD AND MATERNAL MIGRATION

Age Group of Emigrants	Proportion with Resident mother	Emigrants reported by mothers		Adjusted number of emigrants			Barbados-born respondents			Emigrants as a percent of (residents plus emigrants)		
		Sons	Daughters	Males	Females	Total	Males	Females	Total	Males	Females	Total
0-4	.980	20	15	20	15	35	717	685	1,402	2.7	2.1	2.4
5-9	.965	30	25	31	26	57	850	904	1,754	3.5	2.8	3.1
10-14	.945	45	42	48	44	92	886	864	1,750	5.1	4.8	5.0
15-19	.918	87	84	95	92	187	993	901	1,894	8.7	9.3	9.0
20-24	.881	153	150	174	170	344	915	930	1,845	16.0	15.5	15.7
25-29	.836	179	168	214	201	415	689	747	1,436	23.7	21.2	22.4
30-34	.775	212	198	274	255	529	514	583	1,097	34.8	30.4	32.5
35-39	.707	212	197	300	279	579	357	389	746	45.7	41.8	43.7
40-44	.615	183	172	298	280	578	319	379	698	48.3	42.5	45.3
45-49	.511	188	176	369	344	713	272	383	655	57.6	47.3	52.1
50-54	.375	157	143	419	381	800	302	435	737	58.1	46.7	52.0
55-59	.246	97	86	394	350	744	266	378	644	59.7	48.1	53.6
60-64	.134	46	39	343	291	634	311	352	663	52.4	45.3	48.9
65-69	.062	18	16	290	258	548	285	373	658	50.4	40.9	45.4
70-74	.030	8	7	266	233	499	230	312	542	53.6	42.8	47.9
75+	.008	1	1	125	125	280	243	467	710	34.0	21.1	26.0
TOTAL		1,636	1,519	3,660	3,344	7,004	8,149	9,082	17,231	31.0	26.9	28.9

TABLE X

BARBADOS-BORN RESPONDENTS BY AGE-GROUP, WITH WEIGHTED* NUMBERS
OF SIBLINGS BY THEIR SEX, RESIDENCE AND SURVIVAL

Age Group	No. of res-pondents	Brothers				Sisters			
		Resident	Abroad	Dead	Total	Resident	Abroad	Dead	Total
0-4	1,402	732	20	8	759	673	15	6	695
5-9	1,754	899	37	12	948	866	25	6	897
10-14	1,750	888	56	22	966	883	56	20	958
15-19	1,894	985	142	42	1,169	935	152	33	1,120
20-24	1,845	965	220	63	1,248	905	252	53	1,209
25-29	1,436	731	294	70	1,094	723	318	63	1,104
30-34	1,097	553	294	70	916	555	289	52	895
35-39	746	371	238	50	659	380	217	34	631
40-44	698	330	230	62	672	371	225	38	634
45-49	655	303	221	60	585	354	190	49	593
50-54	737	332	267	92	690	407	243	90	940
55-59	644	282	215	107	604	362	188	84	635
60-64	663	303	271	169	743	361	196	109	665
65-69	658	291	269	202	762	367	254	185	806
70-74	542	233	288	226	747	310	265	209	783
75+	710	257	581	538	1,377	453	540	496	1,489
TOTAL	17,231	8,454	3,642	1,792	13,889	8,904	3,425	1,526	13,856

* Any discrepancies in marginal totals are due to rounding to nearest integer values.

TABLE XI
CHILDREN LIVING ABROAD BY AGE-GROUP OF MOTHER, RE-
PORTED BY ALL MOTHERS, AND MOTHERS WITH RESIDENT
CHILDREN

Mothers age group	Children living abroad		Ratio <i>a/b</i>	Smoothed Ratios
	All mothers a	mothers with resident children b		
15-19	2	0	∞	2.20
20-24	7	3	2.33	2.02
25-29	18	13	1.38	1.70
30-34	49	36	1.36	1.37
35-39	42	36	1.17	1.15
40-44	93	91	1.02	1.06
45-49	185	177	1.05	1.07
50-54	306	272	1.13	1.12
55-59	375	297	1.26	1.17
60-64	449	389	1.15	1.22
65-69	507	428	1.20	1.28
70-74	474	320	1.48	1.33
75+	648	482	1.34	1.35
All ages	3,155	2,539	1.24	

TABLE XII
DISTRIBUTION OF EMIGRANT BROTHERS BY "WOULD BE" AGE OF MOTHER,
DERIVED FROM EMIGRANT BROTHERS CLASSIFIED BY AGE OF
RESPONDENT

"Would be" age of Mother	Age of Respondent Sibling											TOTAL		
	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54		55-59	60+
15-19	3													3
20-24	6	5												11
25-29	6	12	8											26
30-34	3	10	16	18										47
35-39	1	6	14	35	25									81
40-44	1	3	8	33	53	34								132
45-49		1	6	26	54	74	31							192
50-54			3	19	42	75	75	27						241
55-59			1	9	28	54	74	61	24					251
60-64				2	14	36	56	62	61	27				258
65-69					4	17	37	44	61	61	30			254
70-74						4	17	29	44	59	73	25		251
75+							4	15	40	74	164	190	1409	1896
Reported Totals	20	37	56	142	220	294	294	238	230	221	267	215	1409	3643

TABLE XIII

DISTRIBUTION OF EMIGRANT SISTERS, BY "WOULD BE" AGE OF MOTHER,
DERIVED FROM EMIGRANT SISTERS CLASSIFIED BY AGE OF RESPONDENT

"Would be" age of mother	Age of Respondent Sibling												Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59		60+
15-19	2													2
20-24	5	4												9
25-27	4	7	7											18
30-34	3	7	16	19										45
35-39	1	4	14	37	28									84
40-44		2	9	35	61	36								143
45-49		1	6	29	61	77	31							205
50-54			3	20	50	78	74	25						250
55-59			1	10	32	62	73	56	24					258
60-64				2	16	40	54	56	60	23				251
65-69					4	20	36	40	60	52	28			240
70-74						5	17	26	42	51	66	22		229
75+							4	14	39	64	149	166	1,255	1,691
Reported Totals	15	25	56	152	252	318	289	217	225	190	243	188	1,255	3,425

TABLE XIV

ADJUSTMENT OF EMIGRANT SIBLINGS BY "WOULD BE"
AGE OF MOTHER, FOR WHOLE FAMILY EMIGRATION

"Would be" age of mother	Ratio*	<u>Brothers</u>		<u>Sisters</u>	
		Reported	Adjusted	Reported	Adjusted
15-19	3.26	3	10	2	7
20-24	2.35	11	26	9	21
25-29	1.68	26	44	18	30
30-34	1.27	47	60	45	57
35-39	1.09	81	88	84	92
40-44	1.04	132	137	143	149
65-49	1.06	192	204	205	217
50-54	1.10	241	265	250	275
55-59	1.15	251	289	258	297
60-64	1.20	258	310	251	301
65-69	1.26	254	320	240	302
70-74	1.31	251	329	229	300
75+	1.32	1,896	2,503	1,691	2,232
TOTALS	1.25	3,643	4,585	3,425	4,280

*Ratio of siblings abroad.

Siblings abroad with
resident sibling.

TABLE XV

DISTRIBUTION OF EMIGRANT BROTHERS BY AGE DERIVED FROM ADJUSTED EMIGRANT BROTHERS,
CLASSIFIED BY "WOULD BE" AGE OF MOTHER

Age of migrants	<u>"Would be" Age of Mother</u>												Totals	
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74		75+
0-4	10	17	19	14	8	4	1	0						73
5-9		9	18	20	18	14	8	3	0					90
10-14			7	18	26	26	21	13	5	1				117
15-19				8	23	35	41	39	25	8	1			180
20-24					13	41	64	68	54	32	10	1		283
25-29						17	52	69	61	50	28	8	3	288
30-34							17	54	70	67	54	30	15	307
35-39								19	57	74	64	48	55	317
40-44									17	53	72	56	105	303
45-49										25	66	82	223	396
50-54											25	75	385	485
55-59												29	471	500
60-64													450	450
65-69													358	358
70-74													260	260
75+													178	178
TOTALS	10	26	44	60	88	137	204	265	289	310	320	329	2,503	4,585

(Adjusted figures from Table XIV).

TABLE XVI

DISTRIBUTION OF EMIGRANT SISTERS BY AGE DERIVED FROM ADJUSTED EMIGRANT SISTERS,
CLASSIFIED BY "WOULD BE" AGE OF MOTHER

Age of Migrants	<u>"Would be" Age of Mother</u>												Totals	
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74		75+
0-4	7	14	13	13	9	5	2	0						63
6-9		7	12	19	19	15	9	3	0					84
10-14			5	17	27	28	22	14	5	1				119
15-19				8	24	38	44	41	26	8	1			190
20-24					13	45	67	70	56	31	10	1		293
25-29						18	55	72	63	45	26	7	2	288
30-34							18	56	71	67	51	28	13	304
35-39								19	58	73	60	44	49	303
40-44									18	51	68	51	94	282
45-49										25	62	75	199	361
50-54											24	68	344	436
55-59												26	420	446
60-64													402	402
65-67													319	319
70-74													232	232
75+													158	158
TOTALS	7	21	30	57	92	149	217	275	297	301	302	300	2,232	4,280

(Adjusted figures from Table XIV).

TABLE XVII

EMIGRANTS ESTIMATED FROM SIBLING REPORTS, AS A
PERCENTAGE OF (EMIGRANT AND RESIDENT) POPULATION

Age Group	M a l e s			F e m a l e s			B o t h S e x e s		
	Res.	Emig.	$\frac{E}{R + E} \%$	Res.	Emig.	$\frac{E}{R + E} \%$	Res.	Emig.	$\frac{E}{R + E} \%$
0-4	717	73	9.2	685	63	8.4	1,402	136	8.8
5-9	850	90	9.6	904	84	8.5	1,754	174	9.0
10-14	886	117	11.7	864	119	12.1	1,750	236	11.9
15-19	993	180	15.3	901	190	17.4	1,894	370	16.3
20-24	915	283	23.6	980	293	24.0	1,845	576	23.8
25-29	689	288	29.5	747	288	27.8	1,436	576	28.6
30-34	514	307	37.4	583	304	34.3	1,097	611	35.8
35-39	357	317	47.0	389	303	43.8	746	620	45.3
40-44	319	303	48.7	379	282	42.7	698	585	45.6
45-49	272	396	59.3	383	361	48.5	655	757	53.6
50-54	302	485	61.6	435	436	50.1	737	921	55.5
55-59	266	500	65.3	378	446	54.1	644	946	59.5
60-64	311	450	59.1	352	402	53.3	663	852	56.2
65-69	285	358	55.7	373	319	46.1	658	677	50.7
70-74	230	260	53.1	312	232	42.6	542	492	47.6
75+	243	178	42.3	467	158	25.3	710	336	32.1
TOTAL	8,149	4,585	36.0	9,082	4,280	32.0	17,231	8,865	34.0

TABLE XVIII

LIFE TABLE METHOD FOR ESTIMATING THE AGE DISTRIBUTION OF CURRENT EMIGRANTS - MALES

Age Group	% Emigrants		% Residents		Departures in interval	Annual emigration rate %	Resident population	Implied no. of emigrants per annum
	Average of sib. and child estimates	Smoothed values	In age group	At exact ages				
				100				
0-4	5.9	2.4	97.6	95.6	4.4	.90	717	6
5-9	6.3	5.6	94.4	93.0	2.6	.55	850	5
10-14	8.3	9.0	91.0	89.0	4.0	.88	886	8
15-19	12.0	13.3	86.7	84.0	5.0	1.15	993	11
20-24	19.8	19.5	80.5	76.8	7.2	1.79	915	16
25-29	26.6	27.3	72.7	68.5	8.3	2.28	689	16
30-34	36.1	36.0	64.0	59.7	8.8	2.75	514	14
35-39	46.4	44.3	55.7	51.9	7.8	2.80	357	10
40-44	48.5	51.5	48.5	45.4	6.5	2.68	319	9
45-49	58.5	56.9	43.1	41.2	4.2	1.95	272	5
50-54	59.9	59.9	40.1	39.5	1.7	.85	302	3
55-59	62.5	60.3	39.7	40.3				
60-64	55.8	58.4	41.6	43.2				
65-69	53.1	54.8	45.2	47.6				
70-74	53.3	49.3	50.7	54.3				
75+	38.1	41.3	58.7					
TOTAL								103

TABLE XFX

LIFE TABLE METHOD FOR ESTIMATING THE AGE DISTRIBUTION OF
CURRENT EMIGRANTS - FEMALES

Age Group	<u>% emigrants</u>		<u>% residents</u>					
	Average of Sibling and Child estimates	Smoothed values	in age groups	at exact ages	departures in interval	annual emigration rate %	resident population	implied number of emigrants per annum
0-4	5.2	2.2	97.8	100.0	4.1	.84	685	6
5-9	5.6	5.5	94.5	95.9	3.0	.63	904	6
10-14	8.4	9.2	90.8	92.9	4.2	.93	864	8
15-19	13.3	13.6	86.4	88.7	4.8	1.11	901	10
20-24	19.7	19.2	80.8	83.9	6.3	1.56	930	15
25-29	24.5	26.0	74.0	77.6	7.2	1.95	747	15
30-34	32.4	33.1	66.9	70.4	6.8	2.03	583	12
35-39	42.8	39.4	60.6	63.6	5.7	1.88	389	7
40-44	42.6	44.3	55.7	57.9	4.1	1.47	379	6
45-49	47.9	47.5	52.5	53.8	2.5	.95	383	4
50-54	48.4	49.6	50.4	51.3	1.6	.63	435	3
55-59	51.1	50.5	49.5	49.7	.1	.04	378	0
60-64	49.3	49.5	50.5	49.6				
65-69	43.5	45.2	54.8	52.0				
70-74	42.7	36.5	63.5	58.4				
75+	23.2	23.7	76.3	69.3				
TOTALS								92

100

100

TABLE XX
COMPARISON OF REPORTING BY MOTHERS AND SIBLINGS

Categories being compared	Reports of:			Reports of:			Reports of:		
	a Mothers with resident children	b Siblings with resident mothers	Ratio a/b	c Mothers with resident sons	d Brothers with resident sons	Ratio c/d	e Mothers with resident daughters	f Sisters with resident mothers	Ratio e/f
Resident Mothers	3,919	4,169	.94	3,010	3,050	.99	3,021	3,271	.92
Resident Sons/Brothers	6,066	6,083	.99	6,066	5,862	1.03	4,627	4,800	.96
Resident Daughters/Sisters	5,941	6,066	.98	4,533	4,258	1.06	5,941	6,172	.96
Resident Children/Siblings	12,007	12,034	1.00	10,599	10,120	1.05	10,568	10,972	.96
Abroad Sons/Brothers	1,295	1,322	.98	1,001	899	1.11	1,085	1,131	.96
Abroad Daughters/Sisters	1,244	1,247	1.00	967	881	1.10	1,019	1,036	.98
Abroad Children/Siblings	2,539	2,569	.99	1,968	1,780	1.11	2,104	2,167	.97
Dead Sons/Brothers	547	434	1.26	437	297	1.47	478	399	1.20
Dead Daughters/Sisters	429	334	1.28	335	221	1.52	375	309	1.21
Dead Children/Siblings	976	768	1.27	772	518	1.49	853	708	1.20
Total Sons/Brothers	7,908	7,838	1.01	7,504	7,058	1.06	6,190	6,330	.98
Total Daughters/Sisters	7,164	7,647	.99	5,835	5,360	1.09	7,335	7,517	.98
Total Children/Siblings	15,522	15,485	1.00	13,339	12,418	1.07	13,525	13,847	.98

TABLE XXI

COMPARISON OF REPORTS ON NUMBER OF FAMILIES WITH
AT LEAST ONE RESIDENT SIBLING OF EACH SEX

Respondent's Mother	Derived from reports of:			
	Males	Females	Both sexes	(mothers)
Living in Barbados	2,046	2,224	2,118	2,112
Abroad or dead	814	919	857	
All respondents	2,858	3,144	2,965	

TABLE XXII

PERCENTAGE DISTRIBUTION OF FAMILIES BY NUMBER AND SEX OF RESIDENT SIBLINGS,
FROM REPORTS OF MOTHERS AND SIBLINGS

Families with:	Distribution by no. of resident	Reported by:	Number of resident sons/daughters/children											Total no. of families
			0	1	2	3	4	5	6	7	8	9+		
Resident	Sons	Mothers	23.2	36.0	20.6	10.3	5.5	2.6	1.1	.4	.2	.1	3,919	
		Siblings	25.1	37.3	19.6	9.3	4.9	2.3	.9	.4	.2	.0	4,169	
Mother and	Daughters	Mothers	22.9	36.9	21.1	10.0	5.5	2.2	1.0	.3	.1	.1	3,919	
		Siblings	24.1	38.5	19.6	9.8	4.8	1.9	.9	.3	.1	.1	4,169	
Children	Children	Mothers	-	28.6	23.2	15.7	11.2	7.4	5.4	3.8	2.0	2.9	3,919	
		Siblings	-	31.7	24.0	15.2	10.1	6.8	4.7	3.3	1.8	2.5	4,169	
Resident	Sons	Mothers	-	46.9	26.9	13.4	7.2	3.4	1.4	.5	.3	.1	3,010	
		Brothers	-	50.3	20.1	12.2	6.5	3.0	1.2	.4	.2	.1	3,050	
Mother and	Daughters	Mothers	29.8	29.2	19.5	10.9	6.2	2.6	1.2	.4	.2	.1	3,010	
		Brothers	32.9	29.4	18.1	10.6	5.1	2.2	1.0	.5	.2	.1	3,050	
Sons	Children	Mothers	-	18.3	22.2	18.4	13.6	9.4	6.9	4.8	2.6	3.7	3,010	
		Brothers	-	21.2	24.1	18.0	12.1	8.6	5.9	4.3	2.5	3.2	3,050	
Resident	Sons	Mothers	30.1	28.4	19.5	10.7	6.2	2.9	1.3	.5	.3	.1	3,021	
		Sisters	32.0	28.1	18.8	10.1	6.4	2.7	1.0	.5	.2	.1	3,271	
Mother and	Daughters	Mothers	-	47.9	27.3	12.9	7.1	2.8	1.3	.4	.2	.1	3,021	
		Sisters	-	51.5	25.4	12.5	6.4	2.5	1.2	.3	.1	.1	3,271	
Daughters	Children	Mothers	-	18.8	22.8	17.7	13.6	9.2	6.9	4.8	2.5	3.7	3,021	
		Sisters	-	20.6	23.6	17.5	13.2	9.0	6.1	4.3	2.4	3.2	3,271	

TABLE XXIII

OBSERVED AND EXPECTED NUMBERS OF RESPONDENTS BY SEX AND BY NUMBER OF RESIDENT, SAME - SEX SIBLINGS,
DERIVED FROM REPORTS OF NUMBER OF RESIDENT, OPPOSITE - SEX SIBLINGS

	Number of resident brothers										Total respondents
	0	1	2	3	4	5	6	7	8	9+	
Observed distribution of females	2,958	2,466	1,636	961	609	284	100	43	22	3	9,082
Expected distribution of males		2,654	2,213	1,468	862	546	255	90	39	22	(8,149)
Observed distribution of males		2,619	2,219	1,427	910	525	265	101	54	29	8,149
	Number of resident sisters										Total respondents
	0	1	2	3	4	5	6	7	8	9+	
Observed distribution of males	2,516	2,225	1,582	945	499	210	105	40	11	16	8,149
Expected distribution of females		2,804	2,480	1,763	1,053	556	234	117	45	30	(9,082)
Observed distribution of females		3,007	2,483	1,665	1,026	495	250	97	33	26	9,082

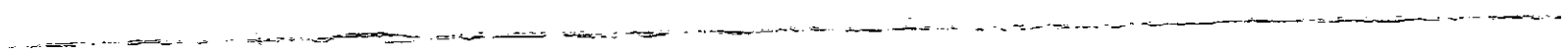
TABLE XXIV

ESTIMATED AND OBSERVED AGE STRUCTURES OF THE RESIDENT POPULATION

Age Group	Actual No. of respondents	Estimated from Mother's reports	Ratio b/a	Estimated from Sister's reports	Ratio c/a	Actual No. of respondents	Estimated from Mother's reports	Ratio e/d	Estimated from Brother's reports	Ratio f/d	Actual No. of respondents	Surviving children from Mother's reports	Ratio g/h
	(a)	(b)		(c)		(d)	(e)		(f)		(g)	(h)	
0-4	717	746	1.04	1,248	1.24	685	668	.98	990	1.45	1,402	1,449	.97
5-9	850	769	.90	1,029	1.21	904	727	.80	873	.97	1,754	1,553	1.13
10-14	886	733	.83	845	.95	864	718	.83	761	.88	1,750	1,543	1.13
15-19	993	788	.79	804	.81	901	758	.84	738	.82	1,894	1,733	1.09
20-24	915	975	1.07	913	1.00	930	931	1.00	835	.90	1,845	2,250	.82
25-29	689	809	1.17	708	1.03	747	778	1.04	644	.86	1,436	2,002	.72
30-34	514	655	1.27	554	1.08	583	655	1.12	512	.88	1,097	1,839	.60
35-39	357	516	1.45	435	1.22	389	528	1.36	412	1.06	746	1,623	.46
40-44	319	392	1.23	328	1.03	379	419	1.11	319	.84	698	1,389	.50
45-49	272	407	1.50	344	1.26	383	462	1.21	346	.90	655	1,582	.41
50-54	302	413	1.37	346	1.15	435	478	1.10	360	.83	737	1,691	.44
55-59	266	382	1.44	317	1.19	378	435	1.15	340	.90	644	1,561	.41
60-64	311	328	1.05	274	.88	352	373	1.06	297	.84	663	1,335	.50
65-69	285	290	1.02	217	.76	373	307	.82	235	.63	658	1,145	.57
70-74	230	267	1.16	158	.69	312	300	.96	171	.55	542	1,066	.51
+75	243	125	.51	108	.44	467	125	.27	117	.25	710	500	1.42
TOTAL	8,149	8,595	1.05	8,628	1.06	9,082	8,662	.95	7,950	.88	17,231	24,261	.71

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LIST OF COMPUTER PRODUCED
TABLES FOR
BARBADOS MIGRATION SURVEY

FRONT PIECE - Rounds included in tabulation run, by number of cases in each round.

TABLE I - Tables to identify population used in further tabulations and analysis.

- Part 1 - Population by sex, age-group and birthplace.
- Part 2 - Population by sex, age-group/birthplace and quality of sibling information.
- Part 3 - Female population by age-group/birthplace and quality of children information.

TABLE 2 - Barbados-born population by sex, age-group and survival/residence of mother.

TABLE 3 - Barbados-born population by sex, age-group and number of siblings of the same sex living in Barbados, with total number of siblings by their sex and residence.

- | | |
|---|-----------------------------------|
| Part 1 - Male respondents reporting on brothers | } <u>Each part in 3 sections:</u> |
| Part 2 - Male respondents reporting on sisters | |
| Part 3 - Female respondents reporting on brothers | |
| Part 4 - Female respondents reporting on sisters | |
| Part 5 - All respondents reporting on brothers | |
| Part 6 - All respondents reporting on sisters | |
- Section 1 - All persons born in Barbados.
- Section 2 - Persons with mother living in Barbados.
- Section 3 - Persons with mother abroad or dead.

TABLE 4 - Barbados-born population by sex and age-group, with weighted numbers of siblings by their sex and residence.

- | | |
|-----------------------------|-----------------------------------|
| Part 1 - Male respondents | } <u>Each part in 3 sections:</u> |
| Part 2 - Female respondents | |
| Part 3 - All respondents | |
- Section 1 - All persons born in Barbados.
- Section 2 - Persons with mother living in Barbados.
- Section 3 - Persons with mother abroad or dead.

TABLE 5 - Barbados-born population by sex and number of surviving and number of resident same sex siblings.

Part 1 - By age-group of respondent.

Page 1 - Male reports on brothers.

Page 2 - Female reports on sisters.

Page 3 - All reports on siblings.

Part 2 - By survival/residence of respondent's mother.

TABLE 6 - Barbados-born females by age-group, with numbers of children by their sex and residence/survival.

Part 1 - All women.

Part 2 - Women with resident sons.

Part 3 - Women with resident daughters.

Part 4 - Women with resident children.

Part 5 - Women with no resident sons.

Part 6 - Women with no resident daughters.

Part 7 - Women with no resident children.

TABLE 7 - Barbados-born females by age and number of surviving and resident children, and by sex of the children.

Part 1 - Sons

Part 2 - Daughters

Part 3 - Children

TABLE 8, Part 1 - Barbados-born population by sex and by number of resident brothers and sisters.

Section 1 - All respondents.

Section 2 - Respondents with mother living in Barbados.

Section 3 - Respondents with mother abroad or dead.

3 pages in each section:

Page 1 - Male respondents.

Page 2 - Female respondents.

Page 3 - All respondents

TABLE 8, Part 2 Families of Barbados-born respondents, by respondent's sex and number of resident brothers and sisters.

- | | | |
|--|-----------------------------------|--|
| Section 1 - All families. | } <u>3 pages in each section:</u> | |
| Section 2 - Families with mother living in Barbados. | | <u>Page 1</u> - Families of male respondents. |
| Section 3 - Families with mother abroad or dead. | | <u>Page 2</u> - Families of female respondents.
<u>Page 3</u> - All families. |

TABLE 9 - Barbados-born females by age and number and sex of children ever born/children surviving.

- Part 1 - Sons
- Part 2 - Daughters
- Part 3 - Children

TABLE 10 - Female population by number of resident sons and number of resident daughters.

- Part 1 - Barbados-born females.
- Part 2 - Foreign-born females.

1
2
3

4
5
6