#19

THE APPLICATION OF THE OWN CHILDREN METHOD TO MEASURE FERTILITY
IN LATIN AMERICA,
CELADE'S PROGRAM

#13 Carmen Arretx
October, 1976.

INTRODUCTION

This paper is organized in two parts and it refers to a program of
the Latin American Demographic Center (CELADE) to promote an extensive
utilization of the own children method to measure fertility in Latin
American countries.

Section A summarizes the action undertaken since September 1975
and gives an outlook of the future work. Section B informs about the
three first, small-scale, applications of the method already carried out.

The paper has been written at a very short notice, and it does not
provide demographic analysis of its own but rather draws from other
papers recently written at CELADE or presently being elaborated. It
should be taken as a progress report of the above mentioned CELADE's pro-
gram on the subject.

SECTION A

CELADE's involvement in the application of the own children method to measure fertility started last year when a meeting was convened in Santiago, in September, to examine different procedures that have been devised to estimate fertility from information collected in a population census or a demographic survey. Dr. Lee-Jay Cho, Prof. Robert Retherford and Mr. Howard Brunsman attended that meeting, that was jointly sponsored by CELADE and the International Statistical Programs Center. They presented the own children method together with an illustrative application to Latin American data.

As a consequence of conversations held during that meeting, Mr. Jorge L. Somoza, of CELADE' staff, was invited to visit the East West Population Institute, EWPI, in April 1976 and in this occasion a program was set up to make a systematic application of the method to census information refering to years around 1970, available at CELADE Data Bank. Quoting from Mr. Somoza's report on that trip:

"a) The present knowledge on the level of fertility in Latin American countries is not satisfactory. Less satisfactory, of course, is the knowledge of differences among socio-economic categories of the populations or between areas within countries. The application of the own children method to Latin American data could provide valuable results both on levels and differentials for periods some five years prior to the time of the population censuses. The estimates on levels should permit checking the present estimates; the ones on differentials would disclose, for the first time in several countries, the existence of very distinct situations within countries. Due to serious omissions in the enumeration of very young children in Latin American censuses it would

not be expected to obtain trends in fertility (age misreporting would probably also hinder the derivation of fertility trends)."

"b) It seems appropriate for CELADE to start the application of the method as an extension of a project, now underway, aimed at establishing and comparing levels of child mortality from information collected in the 1970 round of population censuses, rather than to build up a new project specifically designed to measure fertility using the own children method. This is so because several of the results of the investigation on child mortality are important inputs in the application of the own children method to estimate fertility."

"c) The above mentioned research on mortality (Investigación sobre Mortalidad Infantil en América Latina, IMIAL) aims at determining the level of child mortality in some 15 Latin American countries, that have taken population censuses in or after 1970. Samples from most of these censuses are available in the CELADE Data Bank, facilitating the tabulation of the census results according to classifications of particular interest for the study, i.e. by socio-economic categories and by regions within countries. The investigation will produce estimates on child mortality for these categories. The investigation, which is being conducted in CELADE-San José, should be completed by the end of 1976. All these efforts (to 'clean' the information on the samples, to obtain estimates on child mortality, and to define socio-economic and geographic categories of the population) would be very useful in the application of the own children method to estimate fertility and differentials."

- 4 -

Those tentative plans set at the EWPI during Mr. Somoza's visit were fully supported by CELADE. It was decided that the systematic application of the own children method would be undertaken by CELADE-San Jose immediately after the completion of the IMIAL project, now scheduled for March 1976.

The problem of facing the financial support for the investigation was quickly solved as it could be included in the Exchange and Cooperation Program CELADE-Canada with funds granted to CELADE by the Canadian International Development Agency (CIDA). The plans are that during one year, starting in April 1977, the own children method will be applied to the census information analyzed in the IMIAL project.

There is an important training component in the program: it is planned to bring to San Jose demographers from the countries involved in the investigation and to train them in the utilization of the method analyzing the information of their own countries. This is a feature that is also included in the IMIAL project.

As a result of these exercises a large number of applications of the method will be completed by early 1978, with the participation of demographers from Latin American countries, and the circumstances will probably be very favorable to hold a meeting in order to discuss the results obtained, as well as, to make plans about how the use of the method can be facilitated and extended with information of the 1980 round of population censuses.

The main contribution of the EWPI to this project, in addition to having promoted the idea, has been to provide CELADE with the computer programs developed by the EWPI that facilitate the application of the own children method. Mr. Julio Ortúzar, Chief of the Computer Section of CELADE, was invited to Honolulu by the EWPI during May 1976 in order to become

acquainted with the programs. Since then he has already made three appli-
cations of the programs, adapting them, to Latin American information.
The results of these first elaborations are mentioned in Section B. The
Computation Section of CELADE is now ready to deal with the computer pro-
grams received from the EWPI.

During 1976 and 1977 CELADE will experiment, in surveys or pilot
censuses, with questions that might help in the application of the own
children method. Several possibilities were discussed during Mr. Somoza's
visit to the EWPI (identification of the mother of every child when she
is enumerated in the same household, inclusion of a question on time of
the first marriage, a rather detailed investigation on "relationship to
head of the household"). In 1976 some actions have already been taken:

- recommendation to the Instituto Nacional de Estadística (INE) of
  Bolivia to include a detailed question on "relationship to head
  of the household" in the population census that was taken on
  last September 29,

- identification of mothers living with their children, in the
  survey undertaken in Posadas (April-May 1976),

- identification of children living with their mother, in the
  experimental census taken in Atenas, Costa Rica (July, 1976).

The future work can be briefly summarized as follows:

- to start in April 1977 the application of the own children
  method to census information of the 1970 round of population
  censuses available in CELADE Data Bank. This work will be done
  with the participation of demographers coming from Latin
  American countries,

- to continue testing new questions that might facilitate the
  application of the method in the future. This exercise will be
  done in surveys and pilot censuses,

- to convene a meeting in early 1978, say April 1978, to present the results of the systematic application of the method to Latin American information and to promote its utilization to the data collected in the 1980 round of population censuses, recommending alternative possibilities of facilitating the application of the method.

SECTION B

As mentioned at the Introduction this section deals with the three first applications of the own children method undertaken by CELADE using the computer programs provided by EWPI. They are:

- the Demographic Retrospective Survey in Posadas, Argentina, carried out in April-May, 1976, and covering a total population of 10 thousand persons (1),

- the National Demographic Survey in Bolivia, conducted from June up to October, 1975, which investigated around 50 thousand people (2), and

- the Census Sample of Argentina, 1895, available at CELADE Data Bank, with a total of around 100 thousand persons (3).

1. The Demographic Retrospective Survey in Posadas (EDERP, 1976).

Two objectives were present when the EDERP was planned, in relation to the utilization of the own children method (4):

(a)   to evaluate the estimation that could be derived by that procedure, by comparing it with the best that could be obtained by another independent method,

(b)   to investigate if the fertility estimate could be improved when mothers were identified, by means of an additional question in the form.

With reference to (a) the independent estimate was derived using Brass' method (5) based on information on children ever born and on births occurring twelve months prior to the date of the survey. Both sources of information were consistent, for women in the age groups 20-24 and 25-29, since it was necessary to correct the current rates by a factor of only 1.02 in order to make them coincident with the retrospective data, a very minor correction indeed. The resulting Total Fertility Rate (TFR), i.e. the mean number of children per woman at age 50, was 3.27. This estimate refers to the year 1975-1976.

Using the own children method it was possible to produce the other estimate, for the same year, that can be compared with the one mentioned above. In order to facilitate the description of the application of the own children method it is convenient to consider separately the derivation of the numerator and of the denominator of the rates.

Numerator of the rates. On the basis of the number of enumerated children, classified by single years of age and by quinquennial age groups of mothers, it was calculated the annual number of births in the past. The reverse survival ratios, utilized for this purpose, were taken from a life table representing the mortality of Posadas.

- 8 -

Most of the children under age 12 could be assigned to a presupposed mother. Those that could not be assigned, some of them orphans, were distributed by age of mother following the same pattern shown by those that were assigned.

As pointed in (b) two ways were available to assign mothers to children:

i)   one using the information in the EDERP identifying mothers living with the enumerated children, and

ii) the other, that does not used that information, consisting simply in utilizing the computer programs prepared by the EWPI.

Denominator of the rates. The female population, classified by quinquennial age groups between 15 and 49 years, was calculated by reverse surviving the population enumerated in the survey, using a female life table representative of the mortality of Posadas.

In Table 1 and Figure 1 are presented the estimated fertility rates obtained by:

-   the Brass method,

-   the own children method, with identification of mothers for most children,

-   the own children method, without identification of mothers.

From the examination of these results it can be concluded that the three set of values are very similar showing that:

-   the own children method, in any of the two versions considered, has produced an estimate of fertility rates as good as the best that could be derived from the data. This has happened, of course, because in this case the enumeration of children below age 1 has been rather complete, quite an unusual fact in Latin American experience,
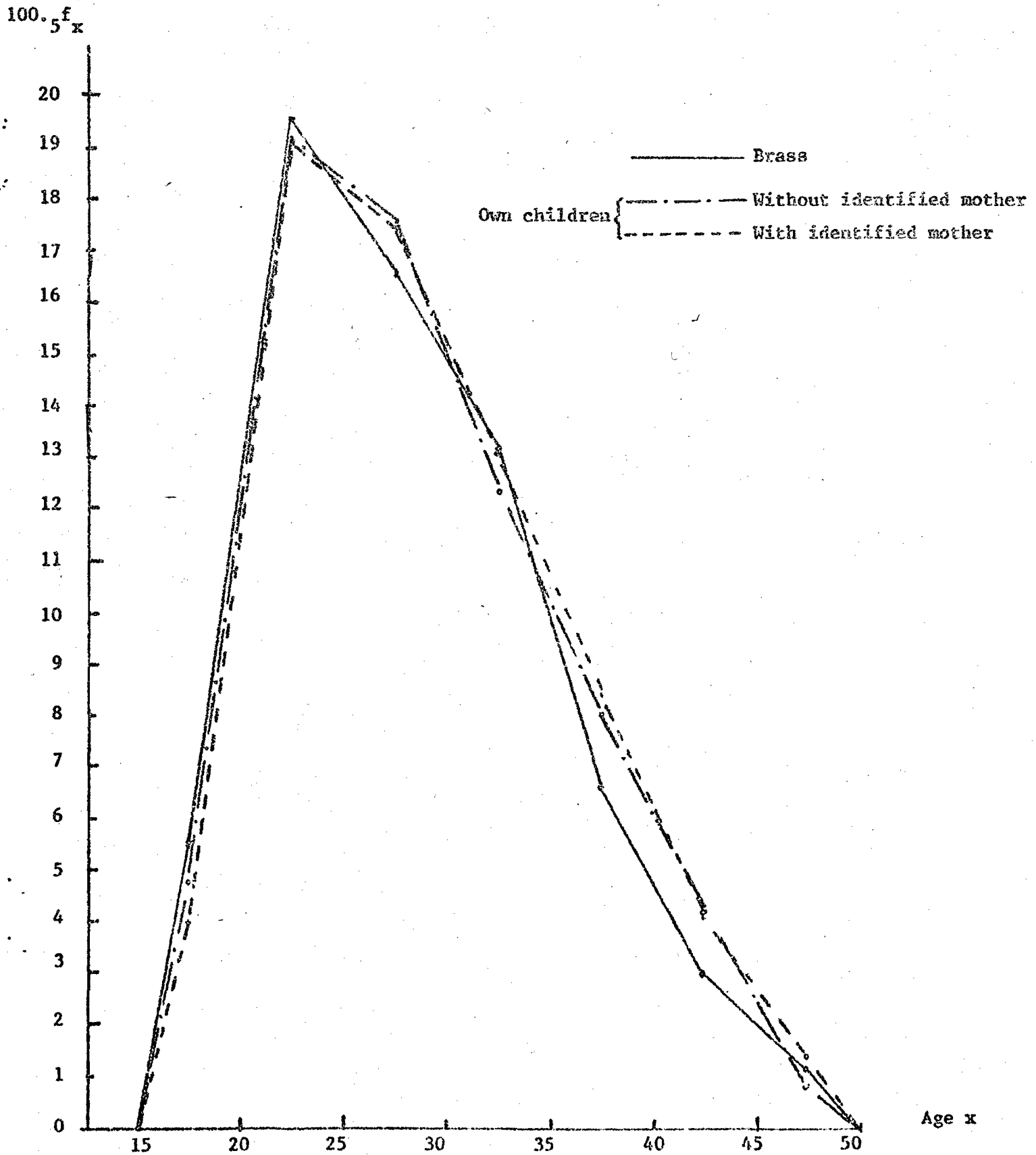
Table 1

POSADAS (1976). FERTILITY RATES 1975-1976.

| Age groups x-x+4 | Fertility rates $_5f_x$ (per cent) | | |
| | Own children method | | |
	Without identified mother	With identified mother	Brass method
15-19	3.96	4.75	5.53
20-24	19.03	19.08	19.46
25-29	17.40	17.51	16.48
30-34	13.11	12.32	13.21
35-39	8.37	7.96	6.58
40-44	4.11	4.18	2.96
45-49	1.39	0.78	1.16
TFR	3.37	3.33	3.27
GRR	1.64	1.62	1.59

Figure 1

POSADAS (1975). FERTILITY RATES 1975-1976.

—   there has been, in this case, no relevant improvement in the
results whether the mother of a child was identified or not.

The encouraging results obtained allowed the extension of the analysis
of fertility into the past, by means of the own children method. In order
to simplify the elaboration and to reduce random fluctuations, that are
shown by the annual births series, the information on births was grouped
in triennial periods.

In Table 2 and Figure 2 are presented the results of this elaboration,
i.e. the fertility rates for four triennial periods. A clear trend in
fertility is disclosed: during the last 12 years a persistant decline
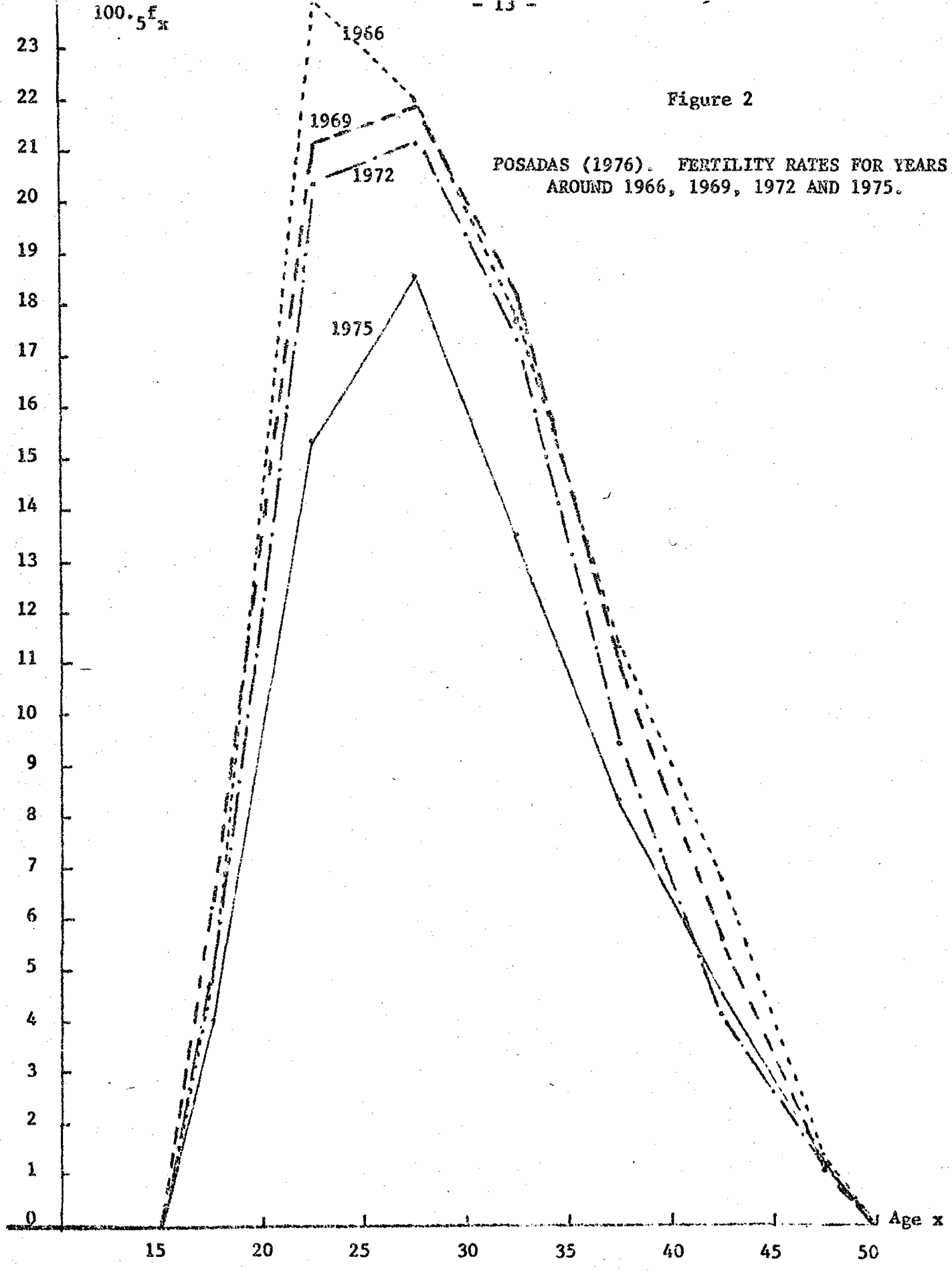has occurred.

Table 2

POSADAS (1976). FERTILITY RATES FOR YEARS AROUND 1966, 1969, 1972 AND 1975.

Age groups	Fertility rates $_5f_x$ (per cent)							
	With identified mother				Without identified mother			
	1966	1969	1972	1975	1966	1969	1972	1975
15-19	4.71	6.19	4.66	3.98	6.51	7.51	5.80	4.83
20-24	23.85	21.14	20.29	15.30	23.40	20.80	19.64	16.16
25-29	21.94	21.82	21.10	18.48	21.25	21.03	20.46	17.65
30-34	17.69	18.11	17.31	13.51	17.36	17.57	15.86	12.53
35-39	11.33	10.96	9.38	8.27	10.67	9.96	8.62	7.77
40-44	6.75	5.55	4.13	4.53	6.29	5.74	3.48	4.25
45-49	1.34	1.03	1.23	1.33	1.49	1.74	1.27	0.87
TFR	4.38	4.24	3.90	3.27	4.35	4.22	3.76	3.22
GRR	2.14	2.07	1.90	1.60	2.12	2.06	1.83	1.57

Figure 2

POSADAS (1976). FERTILITY RATES FOR YEARS
AROUND 1966, 1969, 1972 AND 1975.

2. The National Demographic Survey in Bolivia (EDEN-Bolivia, 1975).

The main objective of the EDEN-Bolivia was to produce a set of basic demographic estimates on fertility, mortality and population growth. When it was planned, early in 1975, it was not contemplated to apply the own children method to its results and, consequently, no special arrangement was done in the form for that purpose. In fact, the set of categories defined, in the classification by relationship to the head of the household, includes only a few, hindering the use of the computer programs available to assign children to presupposed mothers.

The estimates on fertility that were derived from the results were obtained using Brass' method. As explained in the report on this subject (2), the estimated fertility level and the structure of the fertility rates by ages, are considered plausible, reasonably good estimates, though subject to a wide margin of error. The correction factors employed to place the current fertility at a level consistent with the one implied in the information on past fertility, vary in a range from 1.36 up to 1.43. Consequently, the estimates of the TFR show a wide dispersion from 6.6 to 7.1, with an adopted value of 6.81.

It is interesting to compare these results with the ones obtained by the use of an independent method of analysis, a possibility that is offered by the own children method, even though the circumstances for its application, as stated above, are not favorable. Furthermore, the data collected in the survey presented serious shortcomings due to omissions in the enumeration of very young children and mis-reporting of ages.

In successive points are discussed the estimate of the level of fertility and of the age distribution of the fertility rates, in comparison with the ones available.

Level of fertility.

Two sets of annual births, from 1960 up to 1974, were computed on the bases:

(a) of reverse survival of children, by single ages, enumerated in the survey below age 15,

(b) of the estimated female population in past, obtained by reverse surviving the female population enumerated in the survey, and the estimated fertility rates by age, obtained by use of the Brass method.

In both cases life tables were used, that had been constructed from information collected in the same survey.

The results of this elaboration appear in Table 3 and Figure 3. Bearing in mind, on the one hand, that series (a) is affected by omissions mainly in very young ages, and fluctuations that can be attributed to age mis-reporting, and, on the other, that series (b) is obtained from a set of fertility rates that are only approximately determined, as illustrated by the fact that the level might be between 6.6 and 7.1, it can be concluded that both series are consistent.

Distribution of the fertility rates.

In order to apply the own children method, the population enumerated with ages below 15 was distributed by single years and by quinquennial age groups of mothers. For this purpose the EWPI computer programs were used, after being adapted to the circumstances. The proportion of children that could not be assigned to a presupposed mother was high: nearly one half of the children, in any age category, was in .his condition. The situation contrasts with the one of the EDERP (1976), where more than 80 per cent of the children, at any age below 12, could be assigned to a woman. This negative feature, in the application of the method to information in Bolivia, should be borne in mind.
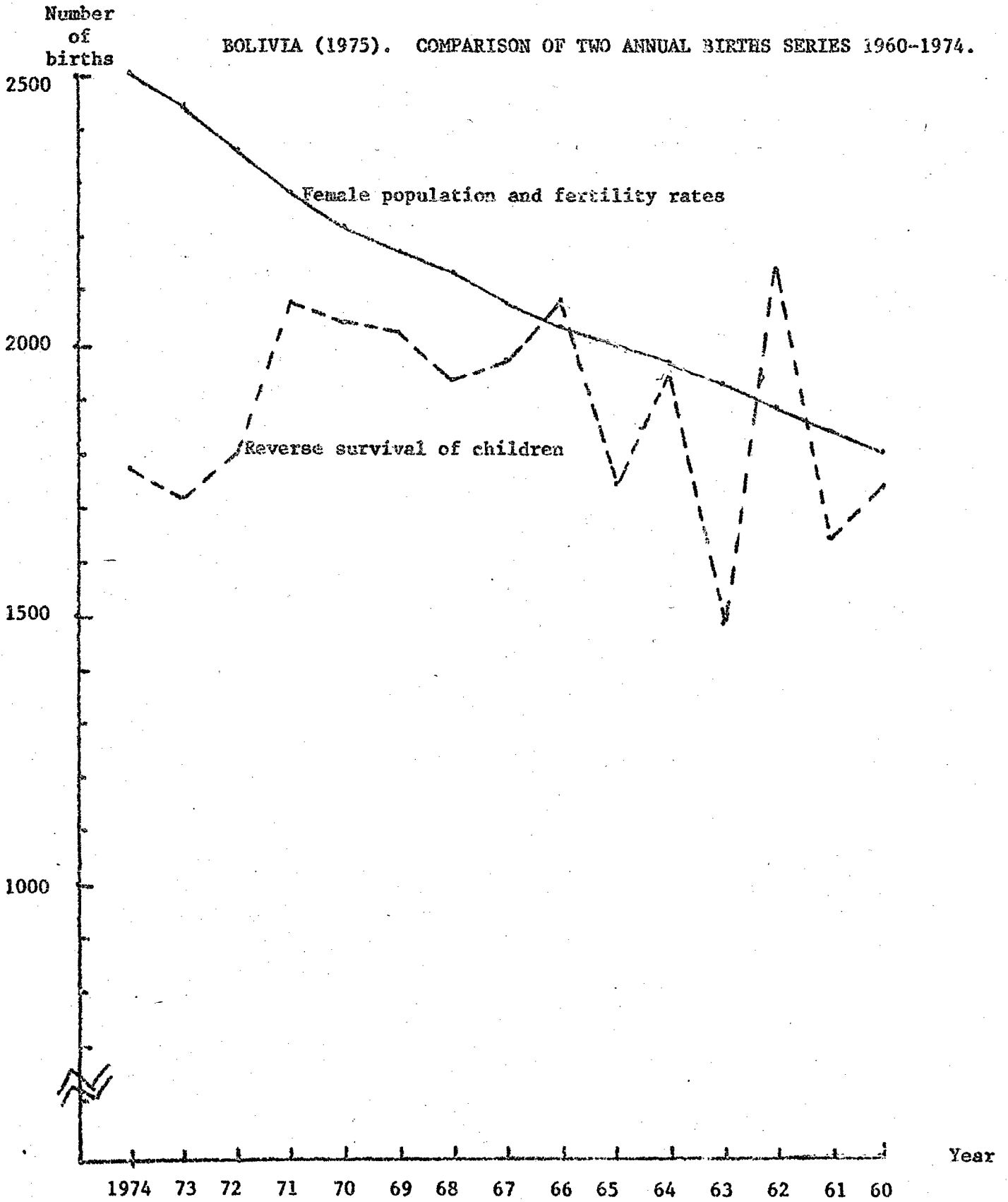
Table 3

BOLIVIA (1975). COMPARISON OF TWO ANNUAL BIRTHS SERIES 1960-1974.

| Year | Estimation based on: | |
	Reverse survival of female population and fertility rates derived by Brass method	Reverse survival of children
1960-1961	1 805	1 736
1961-1962	1 843	1 643
1962-1963	1 883	2 135
1963-1964	1 929	1 486
1964-1965	1 965	1 944
1965-1966	1 999	1 740
1966-1967	2 034	2 080
1967-1968	2 081	1 972
1968-1969	2 133	1 936
1969-1970	2 170	2 026
1970-1971	2 218	2 042
1971-1972	2 283	2 076
1972-1973	2 358	1 795
1973-1974	2 438	1 715
1974-1975	2 499	1 769

Figure 3

BOLIVIA (1975). COMPARISON OF TWO ANNUAL BIRTHS SERIES 1960-1974.

When the proportion of children to which no mother can be assigned is large there is no doubt that the estimate of fertility rates by age is affected by possible errors in the assignment. In the case of Bolivia, for instance, the resulting TFR is 6.3, if those children are distributed by age of mother using the structure of the children with mother assigned, but the level would increase up to 7.4, or decline to 4.6, in the extreme cases if they were assigned to the oldest, or youngest, age groups, respectively. This exercise illustrates the error implied in the estimates when the mentioned proportion of children with no assigned mother is large.

In order to reduce the effect in the estimates of random fluctuations, due to mis-reporting of ages, and to avoid the consequences of serious omissions in the enumeration of very young children, the estimate of fertility rates was derived from the analysis of the number of children in a five year age group, those aged 3 to 7 at the time of the survey.

The results of this elaboration and of the estimate derived from the use of Brass' method, are presented in Table 4 and Figure 4. It can be concluded, from the analysis of the contents of the said table, that the own children method, applied under unfavorable circumstances, has produced results that are consistent with the available estimates, derived by an independent method, both in terms of level and structure of the fertility rates by age.
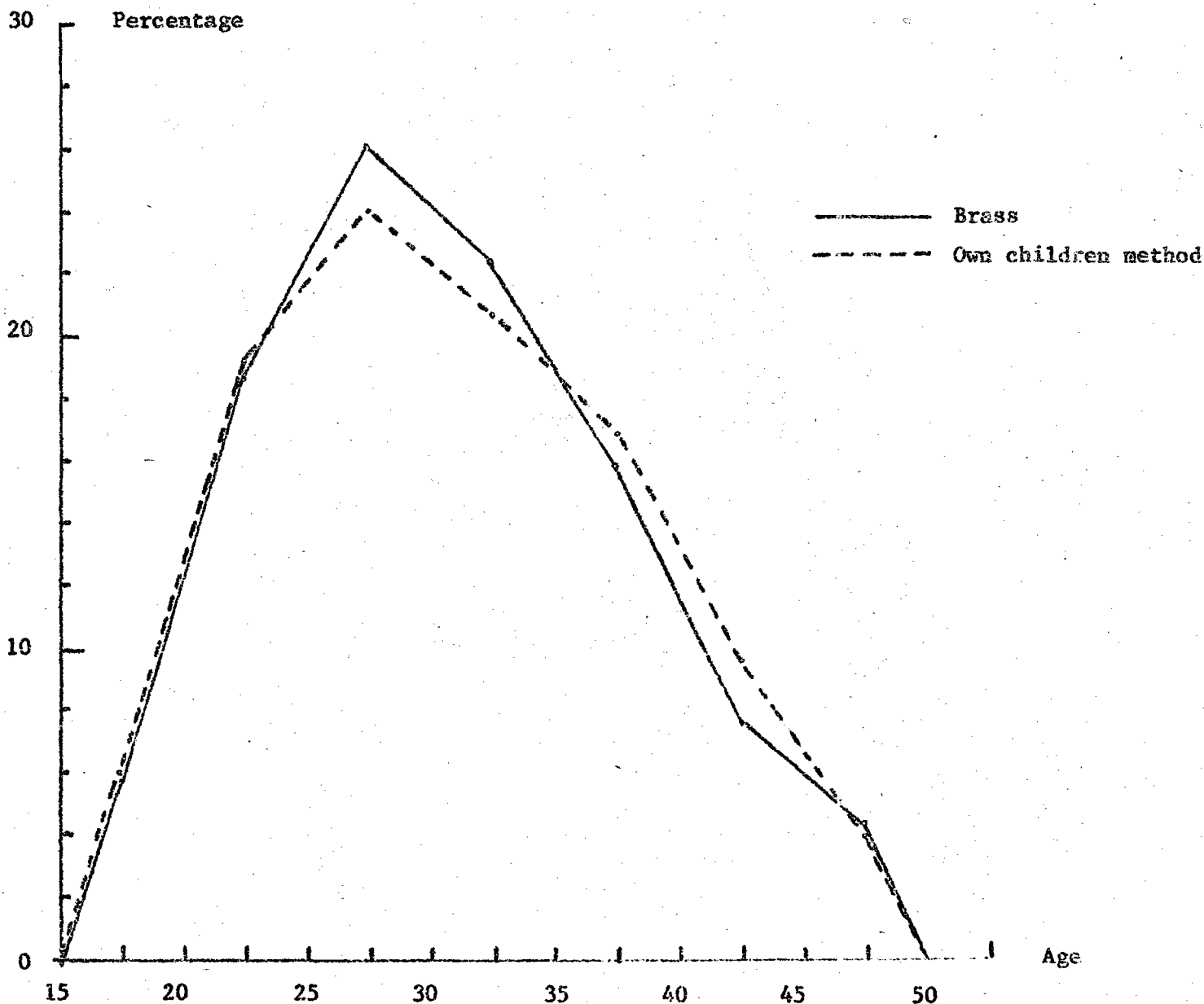
Table 4

BOLIVIA (1975). COMPARISON OF FERTILITY RATES DERIVED BY TWO METHODS:
(A) BRASS (1974-1975) AND (B) OWN CHILDREN (AROUND 1970).

| Age groups | Fertility rates | | Distribution (per cent) | |
| | Method: | | Method: | |
	Brass	Own children	Brass	Own children
15-19	.077	.075	5.65	5.95
20-24	.254	.242	18.65	19.24
25-29	.356	.302	26.14	23.91
30-34	.300	.260	22.03	20.62
35-39	.215	.212	15.79	16.80
40-44	.103	.121	7.56	9.59
45-49	.057	.049	4.18	3.89

Figure 4

BOLIVIA (1975). COMPARISON OF FERTILITY DISTRIBUTIONS DERIVED BY TWO METHODS.

3.   Census sample of Argentina (1895).

An estimate of the fertility rates for Argentina, for years prior to
1895, based on information on children ever born collected in that census
from the ever-married female population is available. Somoza in 1967 (6)
derived that estimate that should be considered only as a rough approxima-
tion to the true values that are, of course, unknown.

The availability of the basic records of a sample made it possible
the application of the own children method to check that existing estimate.
It was necessary to make important changes in the computer programs availa-
ble, since, in this instance, there was no information on "relationship to
the head of the household" (all people enumerated in a dwelling were
considered as forming a family). In spite of this serious limitation the
computer programs provided by the EWPI, duly modified, permitted the
"assignment" of most children, aged below 15 years old, to presupposed
mothers.

As in the analysis of the data from Bolivia, two comparisons were
made between the existing estimates and the ones resulting from the own
children method: (a) of the annual births series, and (b) of the structure
of the fertility rates by ages.

The information of the sample of the population census of Argentina
(1895) presents serious shortcomings, heavy omission in the enumeration of
very young children and important age mis-reporting, that are reflected in
the annual series of births resulting from reverse surviving the enumerated
children. In spite of this problem and of the inadequacy of the basic
information for the application of the own children method, mentioned above,
the examination of the results shown in Table 5 and Figure 5, permits to
conclude that the fertility rates that had been estimated, when applied to
the reverse survived female population, imply numbers of annual births that
fall short from the numbers resulting from reverse surviving the enumerated
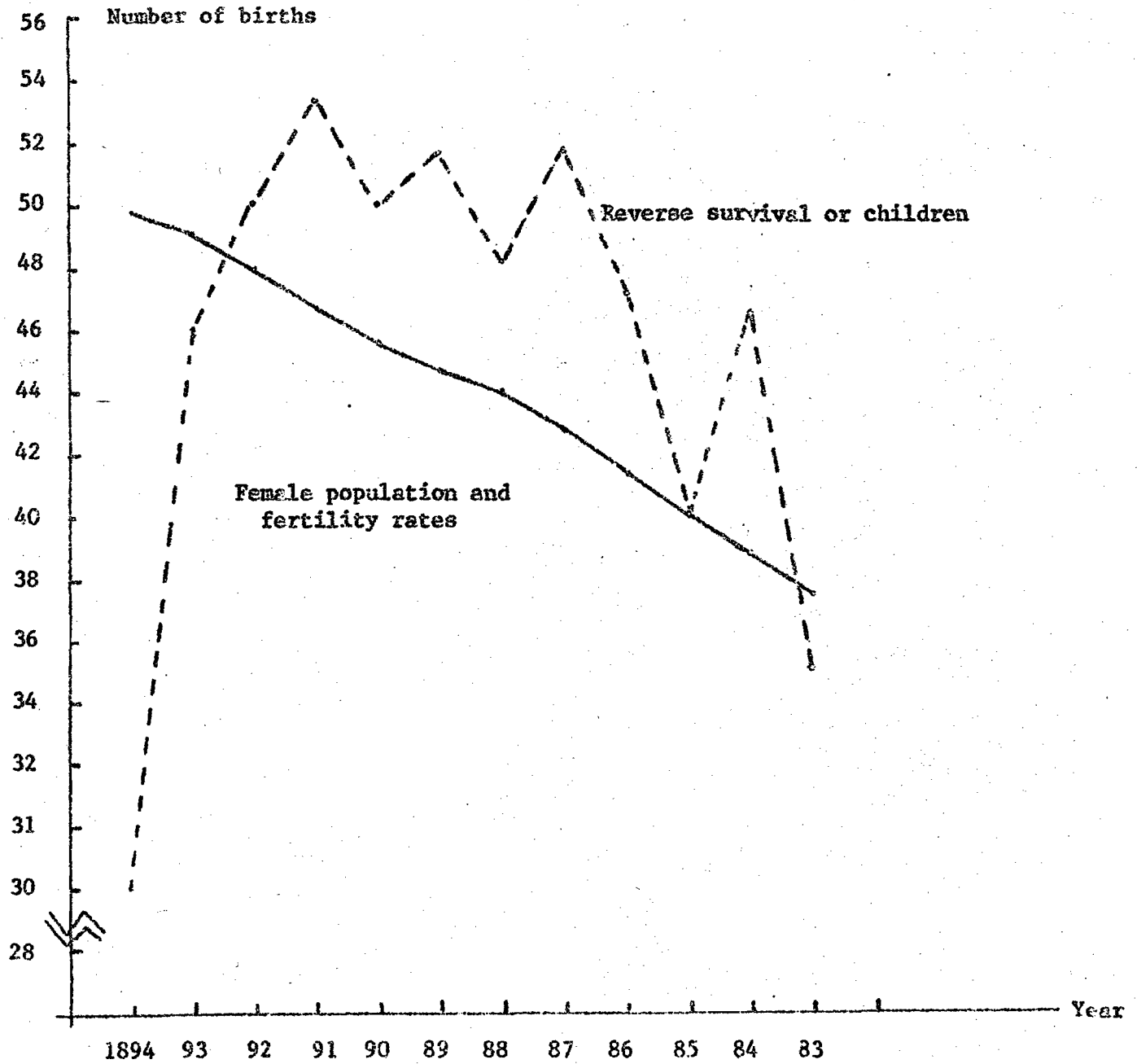
Table 5

CENSUS SAMPLE OF ARGENTINA (1895).
COMPARISON OF TWO ANNUAL BIRTHS SERIES. 1883-1894.

Year	Reverse survival of female population and fertility rates derived by Somoza	Reverse survival of children
1883-1884	3 744	3 505
1884-1885	3 878	4 655
1885-1886	4 022	4 007
1886-1887	4 140	4 723
1887-1888	4 277	5 170
1888-1889	4 399	4 818
1889-1890	4 473	5 161
1890-1891	4 550	5 007
1891-1892	4 667	5 340
1892-1893	4 797	5 036
1893-1894	4 918	4 598
1894-1895	4 975	2 802

Figure 5

CENSUS SAMPLE OF ARGENTINA (1895).
COMPARISON OF TWO ANNUAL BIRTHS SERIES. 1883-1894.

children. There is in this excercise implied the use of an estimate of mortality that has no great relevance in the results.

The total fertility rate, TFR, that was estimated at 6 (children per woman at age 50) is now, with the own children method based on information of children aged 3, 4, 5 and 6, estimated at 7.5, a clearly higher value.

In Table 6 and Figure 6 a comparison is done of the age distribution of the estimated rates showing, again, a different pattern. The results obtained by the own children method, in spite of their limitations (due to shortcomings of the basic data) are probably better than the existing estimates. The study of this subject is still underway in CELADE within the program of Historical Demography.

It is of interest to point out, as a final point, that the own children method permited in this case also a check on the existing estimate of mortality between ages 0 and 5. After having assigned children to women in the age group 20-24, it was possible to compute the proportion dead among children ever born, a rather rough estimate of course. The resulting proportion was used to derive an estimate of mortality below age 2, following Brass-Sullivan procedure (7), and from that to calculate an estimate of mortality below 5. The existing estimate was 0.3176, the new one is 0.3102, quite a satisfactory agreement among two very rough estimates.
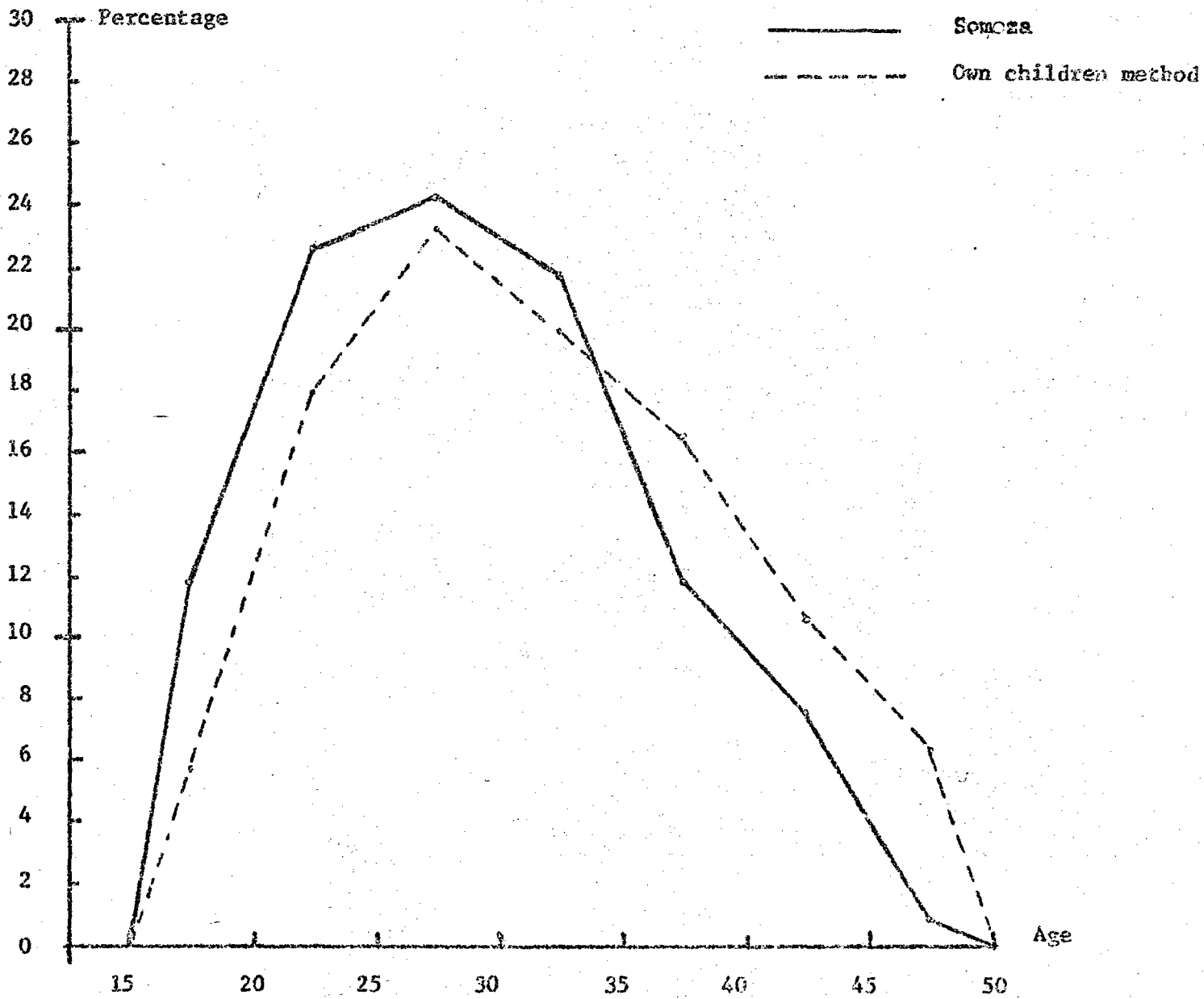
Table 6

CENSUS SAMPLE OF ARGENTINA (1895).
COMPARISON OF FERTILITY RATES FOR AROUND 1890 DERIVED
BY TWO METHODS: (A) SOMOZA AND (B) OWN CHILDREN

Age groups	Fertility rates		Distribution (per cent)	
	Method:		Method:	
	Somoza	Own children	Somoza	Own children
15-19	.140	.086	11.67	5.75
20-24	.270	.267	22.50	17.86
25-29	.290	.347	24.17	23.21
30-34	.260	.297	21.67	19.87
35-39	.140	.247	11.67	16.52
40-44	.090	.157	7.50	10.50
45-49	.010	.094	0.82	6.29

Figure 6

CENSUS SAMPLE OF ARGENTINA (1895).
COMPARISON OF FERTILITY DISTRIBUTIONS DERIVED BY TWO METHODS.

REFERENCES

(1)   Análisis de la Fecundidad en Posadas, Provincia de Misiones,
       Argentina, by Carmen Arretx and Marta de Palou, September 1976.
       (Dirección General de Estadística y Censos de Misiones, in
       press).

(2)   Encuesta Demográfica Nacional de Bolivia. Informe sobre aspectos
       demográficos, by Jorge L. Somoza. Instituto Nacional de Estadís-
       tica, La Paz, Bolivia, June 1976.

       Análisis de la Fecundidad de Bolivia basado en los datos de la
       Encuesta Demográfica Nacional de 1975, by Carmen Arretx, October
       1976. (Instituto Nacional de Estadística, La Paz, Bolivia,
       in press).

(3)   Muestra de los dos primeros censos nacionales de población 1869 y
       1895, by Jorge L. Somoza y Alfredo E. Lattes. Instituto Torcuato
       Di Tella. Centro de Investigaciones Sociales, Buenos Aires,
       Argentina, December, 1967.

(4)   The own children approach to fertility estimation: an elaboration
       by Lee-Jay Cho. International Population Conference, Liege,
       1972, Volume 2.

(5)   Métodos para estimar la fecundidad y la mortalidad en poblaciones
       con datos limitados. Selección de trabajos de William Brass,
       CELADE Serie E N°14, 1974.

(6)   Fertility and Differentials in Argentina in the nineteenth
       Century by Jorge L. Somoza. The Milbank Memorial Fund Quarterly,
       Volume XLVI, Number 3, July 1968, Part 2.

(7)   Models for the Estimation of the Probabilities of Dying between
       birth and exact ages of early childhood by Jeremiah M. Sullivan,
       Population Studies, Vol. 26, Part I, 1972.