Scientific Reports

NUMBER 43 APRIL 1983

SUNDAY ÜNER

Evaluation of the Turkish Fertility Survey 1978

INTERNATIONAL STATISTICAL INSTITUTE
Permanent Office. Director: E. Lunenberg
428 Prinses Beatrixlaan, PO Box 950
2270 AZ Voorburg
Netherlands

WORLD FERTILITY SURVEY
Project Director:
Halvor Gille
35-37 Grosvenor Gardens
London SW1W 0BS, UK

The World Fertility Survey is an international research programme whose purpose is to assess the current state of human fertility throughout the world. This is being done principally through promoting and supporting nationally representative, internationally comparable, and scientifically designed and conducted sample surveys of fertility behaviour in as many countries as possible.
The WFS is being undertaken, with the collaboration of the United Nations, by the International Statistical Institute in cooperation with the International Union for the Scientific Study of Population. Financial support is provided principally by the United Nations Fund for Population Activities and the United States Agency for International Development.
This publication is part of the WFS Publications Programme which includes the WFS Basic Documentation, Occasional Papers and auxiliary publications. For further information on the WFS, write to the Information Office, International Statistical Institute, 428 Prinses Beatrixlaan, Voorburg, The Hague, Netherlands.

L'Enquête Mondiale sur la Fécondité (EMF) est un programme international de recherche dont le but est d'évaluer l'état actuel de la fécondité humaine dans le monde. Afin d'atteindre cet objectif, des enquêtes par sondage sur la fécondité sont mises en oeuvre et financées dans le plus grand nombre de pays possible, Ces études, élaborées et réalisées de façon scientifique, fournissent des données représentatives au niveau national et comparables au niveau international.
L'Institut International de Statistique avec l'appui des Nations Unies, a été chargé de la réalisation de ce projet en collaboration avec l'Union Internationale pour l'Etude Scientifique de la Population. Le financement est principalement assuré par le Fonds des Nations Unies pour les Activités en matière de Population et l'Agence pour le Développement International des Etats-Unis.
Cette publication fait partie du programme de publications de l'EMF, qui comprend la Documentation de base, les Documents Non-Périodiques et des publications auxiliaires. Pour tout renseignement complémentaire, s'adresser au Bureau d'Information, Institut International de Statistique, 428 Prinses Beatrixlaan, Voorburg, La Haye, Pays-Bas.

La Encuesta Mundial de Fecundidad (EMF) es un programa internacional de investigación cuyo propósito es determinar el estado actual de la fecundidad humana en el mundo. Para lograr este objetivo, se están promoviendo y financiando encuestas de fecundidad por muestreo en el mayor número posible de países. Estas encuestas son diseñadas y realizadas científicamente, nacionalmente representativas y comparables a nivel internacional.
El proyecto está a cargo del Instituto Internacional de Estadística en cooperación con la Unión Internacional para el Estudio Científico de la Población y con la colaboración de las Naciones Unidas. Es financiado principalmente por el Fondo de las Naciones Unidas para Actividades de Población y por la Agencia para el Desarrollo Internacional de los Estados Unidos.
Esta publicación ha sido editada por el Programa de Publicaciones de la EMF, el que incluye Documentación Básica, Publicaciones Ocasionales y publicaciones auxiliares. Puede obtenerse mayor información sobre la EMF escribiendo a la Oficina de Información, Instituto Internacional de Estadística, 428 Prinses Beatrixlaan, Voorburg-La Haya, Países Bajos.

Scientific Reports

Evaluation of the Turkish Fertility Survey 1978

SUNDAY ÜNER

Institute of Population Studies
Hacettepe University, Ankara

The recommended citation for this publication is:

Üner, Sunday (1983). Evaluation of the Turkish Fertility Survey 1978. *WFS Scientific Reports* no 43. Voorburg, Netherlands: International Statistical Institute.

Typeset and printed in Great Britain by H Charlesworth & Co Ltd

Contents

FIGURES

Preface

One of the major objectives of the World Fertility Survey programme is to assist the participating countries in obtaining high quality data through national fertility surveys. The high standards set by the WFS are expected to yield better quality data than typically obtained in the past, but this expectation in no way obviates the need for a detailed assessment of the quality of the data. It is recognized that such an evaluation will not only alert the analysts by identifying defects, if any, in the data, but also may throw light on the shortcomings of the WFS approach, which can be taken into account in the design of future fertility surveys.

It is in this context that, as part of its analysis policy, the WFS has initiated a systematic programme for a scientific assessment of the quality of the data from each survey. A series of data evaluation workshops is being organized at the WFS London headquarters with the dual objective of expediting this part of the work and of providing training in techniques of analysis to researchers from the participating countries. Working in close collaboration with WFS staff and consultants, participants from four or five countries evaluate the data from their respective surveys after receiving formal training in the relevant demographic and data processing techniques.

The fourth such workshop, involving four countries — Lesotho, Syria, Trinidad and Tobago and Turkey — was held between September and December 1981. The present document reports on the results of the evaluation of the data of the Turkish Fertility Survey of 1978 and was prepared by Sunday Üner, the participant from Turkey. Ibrahim Ali, K. Balasubramanian, on behalf of Lesotho, and Desmond Hunte, the other participants, contributed to the present evaluation through their ideas and discussions.

Dr Shea Oscar Rutstein, as the co-ordinator of the workshop, assumed a major responsibility in the successful completion of the work, while many other staff members also made significant contributions to it. Maryse Hodgson provided much valuable assistance.

HALVOR GILLE
Project Director

1 Introduction

The Turkish Fertility Survey (TFS) was carried out in collaboration with World Fertility Survey (WFS) in 1978. One of the main objectives of WFS is to collect information which would enable the participating countries to assess their fertility and nuptiality accurately through execution of internationally comparable and scientifically designed sample surveys. Another concern of the WFS has been the analysis of the data collected through studies in greater depth on some of the topics covered in the first country reports. In order to fulfil these objectives the WFS promotes the further analysis of data and gives priority to evaluation of quality of information collected.

The main objective of the present paper is to evaluate the quality of data obtained by the Turkish Fertility Survey with a goal of comprehending the extent to which the estimates of the demographic measures and variables obtained through the survey are accurate and reliable.

1.1 THE POPULATION OF TURKEY

Turkey covers an area of 780 000 km^2, had a population of 40.3 million in 1975 and 44.7 million in 1980 according to respective censuses, giving a density of 57 inhabitants. Approximately half of the population lives in urban areas although the majority of the labour force is rural, occupied with agriculture.

Internal migration, from rural to urban areas and from the less developed east and north to the industrialized west, is a most important feature of the Turkish population. International out-migration, starting from the 1960s onward, is estimated to be around 2 million people, a large proportion as labourers in western Europe.

Turkey's population has expanded rapidly since the early 1950s and has almost doubled in 25 years, averaging an annual growth rate of over 2.5 per cent. Turkey has a young population: around 40 per cent of the total population is under 15 years of age. Illiteracy is high and shows marked regional and urban/rural differentials. In 1975, 75 per cent of males and 48 per cent of females aged 6 and over were literate.

1.2 THE CHARACTERISTICS OF THE TURKISH FERTILITY SURVEY (TFS)

The Turkish Fertility Survey was carried out by the Institute of Population Studies of Hacettepe University in collaboration with the Ministry of Health. The fieldwork was undertaken during September and November 1978. The sample was a nationally representative equal probability (self-weighting) sample of non-institutional households. The State Institute of Statistics carried out a special field operation to delineate area units (blocks) of an average size of around 100 households, and to list all households or dwellings within selected blocks. These blocks formed the primary sampling units, and 215 were selected with a probability proportional to a measure of population size. Within blocks, small segments of five households each were selected from the already available lists so as to yield a self-weighting sample.

The sample households were enumerated using a 'household schedule' in which usual residents (*de jure*) as well as those who were present at the time of interview (*de facto*) were listed, and data were obtained on members' age, sex, marital status, and educational level together with detailed employment and migration histories. All ever-married women aged under 50 in the sample households were eligible for the individual interview. A total of 5142 households were enumerated (with a response rate of 85 per cent). Of the 4769 eligible women identified in the households, 4431 (93 per cent) were interviewed.

The 'individual questionnaire', a modified version of the WFS 'core questionnaire', contained the following sections:

- respondent's background
- birth history
- marriage history
- contraceptive knowledge and use
- fertility regulation
- work history of the respondent
- husband's background
- events chart

Shortly after the main fieldwork was done, a response reliability survey was carried out. The study involved the reinterviewing of all respondents in approximately one sixth of the total sample blocks.

1.3 PURPOSE AND SCOPE OF THE STUDY

Social surveys are often prone to errors and biases. Errors of different types may stem from every phase of a survey, from design and sampling procedure of survey through to data processing and analysis. Only accurate data would enable researchers to estimate various demographic measures such as fertility and mortality rates and inter-birth and other intervals. It is, therefore, necessary before undertaking such analyses to examine the extent of response errors in a survey so as to determine the usefulness of these measures.

The primary concern of the present paper is to evaluate the quality of the data obtained in the Turkish Fertility Survey by focusing on the respondent errors and biases which may occur by misreporting of ages and durations, displacement and omission of vital events. Other types of errors and the effects of respondent errors on other data (such as economic and social) are beyond the purpose and scope of this paper. Nor does this paper try to measure response variance through the post-enumeration survey (PES) mentioned earlier, which is the subject of a forthcoming study (Response Reliability Survey of the Turkish Fertility Survey).

2 Sources of Data, Sources of Error and Effects of Error

2.1 SOURCES OF DATA

The information on age reporting, nuptiality, fertility and infant mortality which are the subject matters of the present paper come from both the household schedule and the individual questionnaire. There follows a brief description of the forms and ways of acquisition of data from both sources.

2.2 AGE

The household schedule provided a listing of all usual members of the household, including resident non-family members such as domestic servants, friends and lodgers, but excluding temporary visitors. The ages of these residents were asked and recorded both as year of birth and current age. It should be noted here that the interviewer then determined women's eligibility for the individual interview based upon this information.

In the individual interview, recognizing the difficulty in obtaining accurate data on age, the following procedure was used. The respondent was first asked her age, and then also her date of birth (calendar month and year). The interviewer was instructed to probe in detail when necessary (for instance, by referring to other vital events in the respondent's life) and also to ask for and consult any documents available. The reported age and date of birth were compared for consistency, and the interviewer probed further if a difference of more than two years existed. The interviewer was instructed then to fill the date of birth on an 'events chart' which was prepared to facilitate the task of obtaining dates of vital events, so that these dates could be subsequently compared with dates of other events in the respondent's life. The interviewer also recorded her comments on age reporting: whether the information was reported directly; whether it was obtained from some document; whether extensive probing was necessary; or whether the report was believed to be only an approximate estimate.

At the data processing stage, a considerable amount of imputation was used. In the imputation program, first priority was given to calendar date of the event and years ago; second priority to the age of respondent at the event; and third priority to the age of child at the time of interview. In the final run of the imputation program, the parameters were set as follows: interval data was not used with other data, interview dates were set 09-1978 to 11-1978; respondent's age was set between 10 to 49 years; minimum age at birth was decreased to 10 years and minimum birth intervals to 7 months; minimum age at marriage was reduced to 10 years and the minimum acceptable interval between marriage and first birth was 0 months. The imputation program was also introduced to interpret 'age' and 'years ago' as meaning completed years, and converted some of the month information which was given in Arabic months to the Western month code.

2.3 NUPTIALITY

The household schedule provided the first probing about the members' marital status (for those aged 8 and over), used for eligibility for the individual interview.

Rather detailed information was obtained through a marriage history of the respondent. This section recorded the dates of beginning and termination as well as the outcome of each marriage. Currently married women were asked the reason for and duration of each temporary separation from the husband which lasted at least 3 months. Attention was paid to obtaining dates in the marriage history. For the beginning of each marriage, the calendar year and month as well as the woman's age at the time were obtained. For the termination of each marriage, the date of termination and also the total duration (in months and years) for which the marriage lasted were asked.

It should be noted here that all dates in the individual questionnaires, such as marriage dates, the birth dates of children and the birth date of respondent, etc, were obtained in terms of year and month. For cases where the month was unknown, a month code was randomly imputed.

For the cases where years were unknown, either age years ago or interval information was used to impute missing years. The same method was followed for missing ages. For the imputation some constraints were employed, such as setting the minimum age of respondent and minimum age at first marriage at 10 years, the minimum birth interval at 7 months, and the minimum marriage interval at 0 months. All durations were imputed as completed years; thus 0.5 was added to the duration in the tabulation.

2.4 FERTILITY AND INFANT MORTALITY

The individual questionnaire provided information on fertility and infant and child mortality through maternity and birth histories of the respondent. To achieve as complete a record as possible of all live births, the number of living children (by sex and whether living at home) was obtained first, and then the number of dead children. This was followed by a probe to confirm that the total number of live births obtained was correct. Next, data were obtained on the name, sex, date of birth, survivorship and age at death if applicable for each live birth, starting with the first birth.

The following procedure was used for obtaining birth dates. Calendar month and year of birth were asked first. If the year was not reported, the years ago when the birth occurred was asked. Where the month could not be given, an attempt was made to obtain the information in some other form, for example as the season or religious period when the birth occurred. In all cases (except for the first birth) independent information on the interval (in months and years) since the previous birth was asked. All births were plotted on the events chart so that any gross inconsistencies could be identified during the interview itself. Once all births were recorded, the interviewer probed each birth interval for wasted pregnancies. The date of occurrence and duration of each such pregnancy was recorded. Any live births discovered here were added to the list of live births previously obtained. (The maternity history section also collected information on the length of breastfeeding of the last two births, and a question on whether the woman menstruated during the last month.)

2.5 SOURCES AND EFFECTS OF ERROR

Various types of errors may create considerable distortions in the estimates of fertility, nuptiality and other demographic measures. Error in WFS type of data may be identified as reporting error, non-reporting error, and sampling error. For the purpose of analysis, this paper will focus on the first two types of errors in the TFS data without dealing with sampling errors. More specifically, the paper will try to focus on the following types of errors:

1 Selection and non-response biases
2 Omission of vital events
3 Misreporting of dates of vital events.

Selection and non-response biases

Eligibility criteria and assumptions for both household schedule and individual interview may lead to non-coverage. Misreporting beyond the lower and upper limits of respondents' ages may create the so-called 'boundary effects'. For example, the elimination of eligible women truly aged below 50, possibly with high fertility, may cause the underestimation of CEB for the 45–49 age group. Similarly, estimates of age by the interviewer based on the physical appearance of women (ie rural, working) may cause a transference of respondents below 50 to the 50–54 group. The wrong classification of ever-married women versus never-married (ie women with no children, younger and possibly urban, separated or divorced, can be misclassified as never-married by interviewers) is a source of error which seriously affects the application of eligibility status. Another source of error resulting in non-coverage is the non-response of household members. Though less common, certain household members may not be listed for some reason or another.

Non-response to individual interview is more frequent and may occur for various reasons: eligible women may not be cooperative, may not be at home, work away, have no children or older children, may be sick or have just given birth at hospital. If important differences between interviewed and non-interviewed eligible women exist in terms of their fertility and nuptiality, biases due to differential non-response to the individual interview may lead to the miscalculation of various demographic measures.

Omission of vital events

Omission of vital events such as births and deaths in an interview may occur for various reasons: older women may not report their maternal history completely (ie memory lapse); adopted-in and adopted-out children, non-resident older children or children who died a long time ago may be omitted. Similarly, children of former unions are more prone to be omitted. Sometimes misunderstanding of the questions by the respondents may lead to omission of certain events. Usually the omission of vital events which happened a long time ago are more frequent than the omission of recent events. Whatever the cause, omissions create problems in analysis and usually lead to under-estimation (but sometimes over-estimation) of levels and trends.

Misreporting of dates, ages and durations

Sources of age misreporting are various and can occur at different stages of the data collection process. Proxy reporting for the respondent, reporting by the household head, incorrect documents, errors of questionnaire design, misjudgement by interviewers and poor interview procedures are all possible sources of error. But the majority of age misreporting is due to the respondent's ignorance of exact ages and dates.

Errors in the reporting of ages and durations can be distinguished as 'digit preference' or 'gross misstatement'. Digit preference or 'age heaping' indicates the tendency for respondents to report certain ages at the expense of others. Usually a preference for ages ending in digits 0 and 5, and to a lesser extent 2 and 8, is widespread. Similarly a tendency for rounding may be observed in answers to the 'how long ago' type of question in marital and birth history data.

Gross misstatement is indicated when there is an age transference of more than 3 years or from one age group to another. Gross misstatement is much more important than single-year misreporting for its effects on all kinds of fertility and other demographic measures. For example, misplacement of births in the maternity history can cause a concentration of births to a particular period or a cohort and may eventually lead to a distortion in the pattern of fertility.

There have been some attempts by demographers to observe patterns of misreporting of ages and durations and to develop models accordingly, specifically for some developing countries where age and date misreporting is widespread. For example, Brass (1978) argues that women tend to report the births which occurred in last periods in earlier periods, the so-called 'preference period', based on his observations on Bangladesh data. On the other hand Potter (1977) postulates rather a different pattern: women usually report their recent births quite correctly, but tend to place their first births closer to

the survey date, and tend to calculate the dates of later births using intervals which are too great. Potter found evidence for his hypothesis from data for El Salvador and Bangladesh.

Finally, it must be noted that the above-mentioned errors are frequently interrelated. In many cases, it is hard to distinguish errors which are caused by omission from errors which are caused by misplacement. Hence other checks on consistency of reporting are required.

3 Age Reporting

Correct age reporting in a survey or census is very important because demographic analyses often require data on ages for various estimates of vital rates and other measures. This chapter evaluates the quality of age reporting from the household schedule and the individual questionnaire and examines the consistency between the two.

3.1 REPORTING IN THE HOUSEHOLD SCHEDULE

The distribution of the population by single years of age according to the household schedule is shown in figures 1 and 2 for males and females, respectively. Both sexes show a clear pattern of preference for reporting ages ending in digits 0 and 5, and to a lesser extent 8 and 2. This pattern is more pronounced from age 20 onwards.

The extent of digit preference is measured by Myers' index, shown in table 1, which also provides index values for the 1970 census and various subgroups of household population. As can be noted, as measured by Myers' index, age heaping is quite high both in the 1970 census and in the TFS.[1] However, it also appears that there has been considerable improvement in age reporting over time, specifically for females. Still, men clearly report age better than women. This difference in age reporting by sex, reflected by Myers' index, is present in almost all subgroups of the household population in terms of region, place of residence and educational level. For both sexes the difference in age reporting between those who

[1] Some other values of Myers' index reported for females from the household schedule of other countries participating in the WFS are: Colombia — 5.7; Dominican Republic — 17.1; Jordan — 48.7; Malaysia — 19.0; and Syria — 17.0.

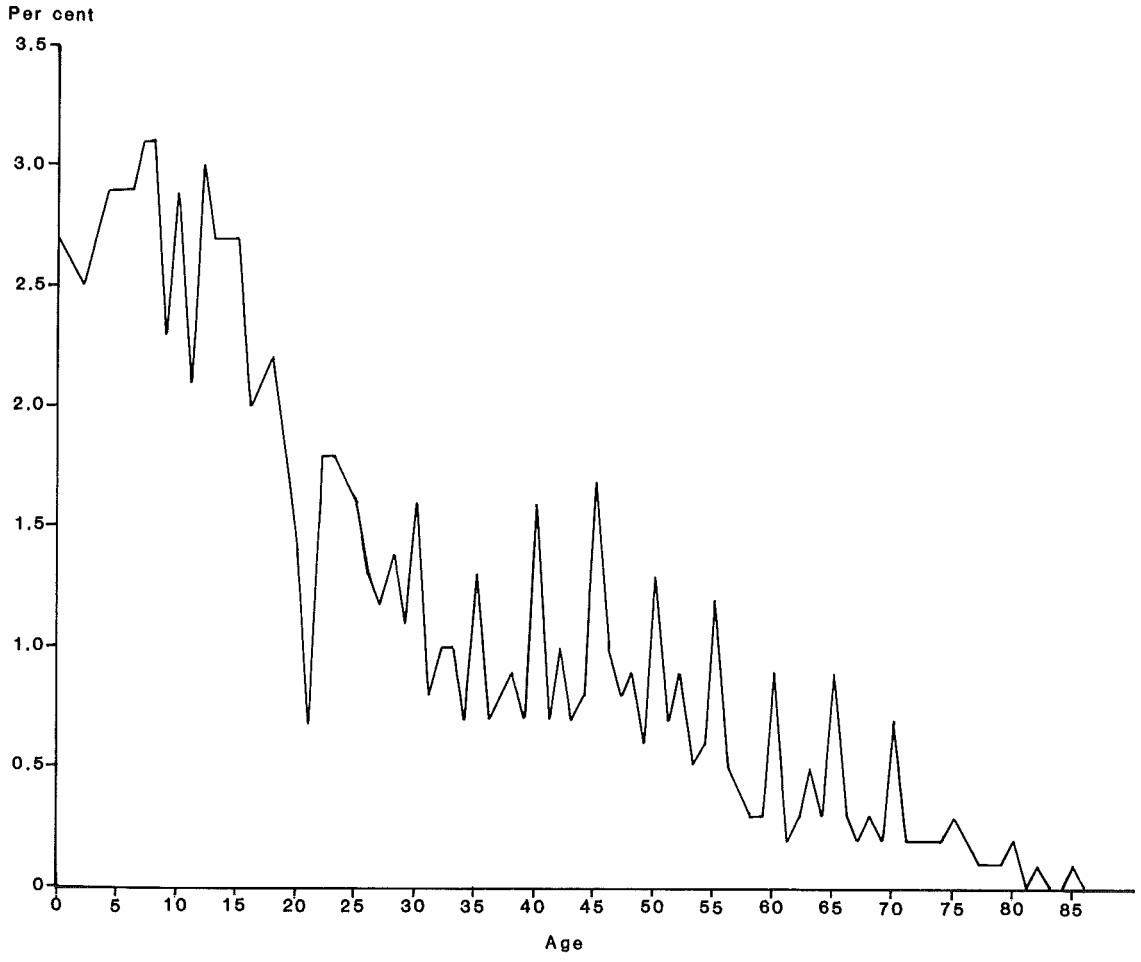

Figure 1 Reported single-year age distribution of males in per cents, household schedule, 1978 TFS

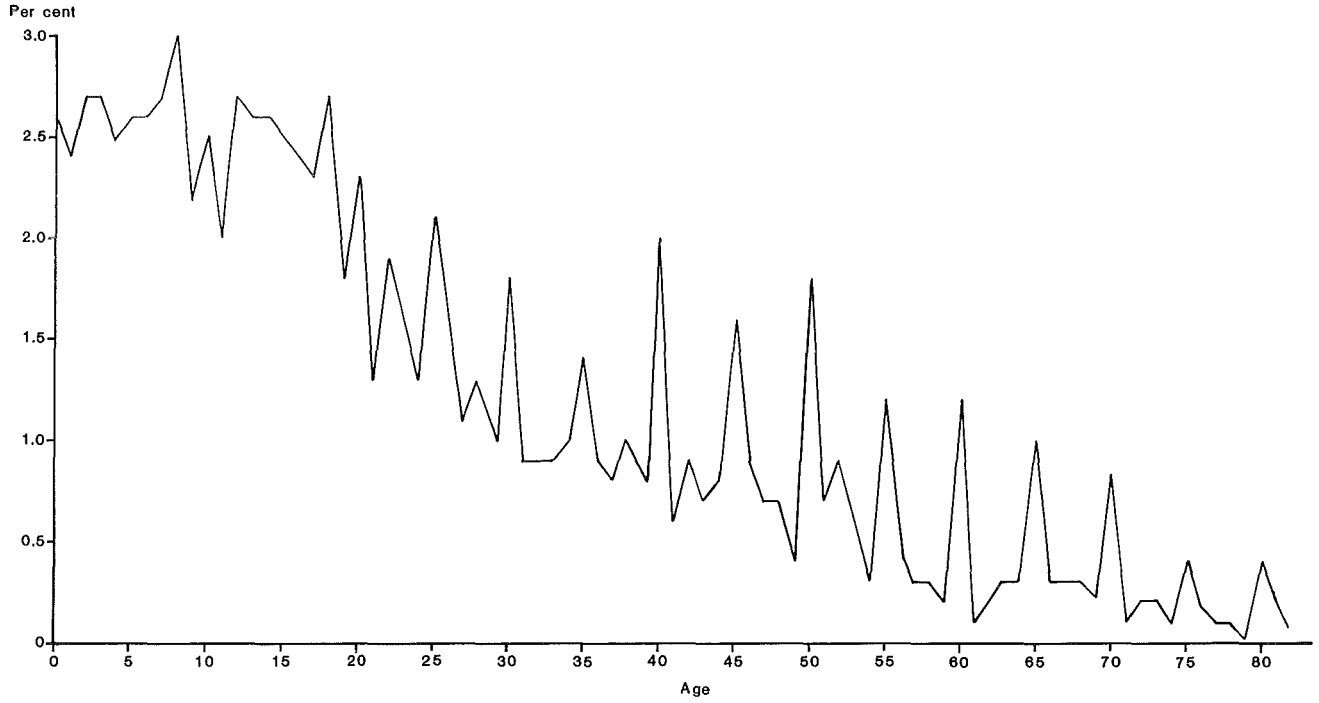

Figure 2 Reported single-year age distribution of females in per cents, household schedule, 1978 TFS

Table 1 Myers' index of digit preference for reports of age for the total population by sex (1970 census and TFS 1978, household schedule) and for selected subgroups (TFS 1978, household schedule)

Population	Male	Female
1970 census	25.0	44.6
1978 TFS, household schedule	17.0	23.8
Urban	15.0	19.2
Rural	22.7	32.8
West	11.6	17.0
South	17.3	22.6
Central	16.2	19.6
North	24.2	30.4
East and south east	37.0	48.3
Schooling 3 years or over	12.2	10.0
No schooling	42.4	38.0

NOTE: Myers' index assumes values between 0 and 180.
Sources: 1. State Institute of Statistics (1977). *25.10.1970 Census of Population, Social and Economic Characteristics of Population.* Ankara
2. TFS 1978

have gone to school and those who have not is very striking. Similarly, urban–rural and west–east differences are quite striking.

As can be expected, men and women with some education, living in urban areas or in the western and central parts of the country, report their ages much better than the rest.

The age distribution of females reported in the household schedule appears to be quite consistent with that of the two closest censuses, namely 1975 and 1980. However, some possible omissions or age misplacements can be traced from table 2 and figures 3 and 6. The proportions of females reported in age groups 0–4 and 5–9 are somewhat lower than in the 1975 and 1980 censuses. This gap becomes rather obvious when the survey age distribution is adjusted to 1975 and projected to 1980. The gap indicates either a recent decline in fertility, which we shall try to probe in later chapters, or omission or age transference to neighbouring age groups. The greater proportion at the ages of 15–19 and the respectively smaller proportions at the ages of 20–24 and of 25–29 indicate a typical age transference, though less pronounced. A similar kind of transference can be observed from the age group 45–49 to 50–54. The latter transference is more pronounced and is probably due to a deliberate shifting by interviewers. The small proportion at ages 35–39 may be due to the real effect of the second world war since similar shrinking can be observed in the corresponding age groups in 1975 census and in the preceding censuses.

Age misreporting can also be traced by examining the sex ratios for each age group. Table 3 gives the sex ratios by conventional age groups for the 1970, 1975 and 1980 censuses and the TFS household population. The TFS household population has lower sex ratios for age groups up to 45–49.

The low sex ratios for the younger age groups, such as 15–19 and 20–24, can partly be explained by the fact that TFS does not cover institutional population, ie armed forces, prisons, etc. The high sex ratio for the age group 45–49 is a clear indication of a transference of age to higher or lower groups and is consistent with table 2. On the other hand, looking at the sex ratios for three censuses, we may conclude that the 1970 and 1975 censuses are more consistent than the 1980 census. The 1980 census in all age groups has higher sex ratios which

Table 2 Per cent distribution of the female population by five-year age groups: according to the 1970, 1975, 1980 censuses, and the 1978 TFS (household schedule)

	0–4	5–9	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65+
Censuses:														
1970	14.7	14.1	12.3	10.1	7.7	6.6	6.6	6.2	5.1	3.2	2.9	2.5	3.0	4.9
1975[a]	13.5	13.5	12.6	10.9	8.6	7.0	5.5	5.8	5.4	4.2	3.3	2.0	2.8	4.9
1980[a]	13.2	13.2	12.0	10.9	9.0	7.5	6.0	5.1	4.8	4.4	4.0	2.5	1.9	5.2
1978 Turkish Fertility Survey	13.0	13.1	12.7	11.6	8.5	7.0	5.4	4.8	4.9	4.1	4.3	2.4	2.1	5.2

[a]1 per cent sample results.
Sources: 1. State Institute of Statistics (1970, 1975, 1980)
2. TFS 1978

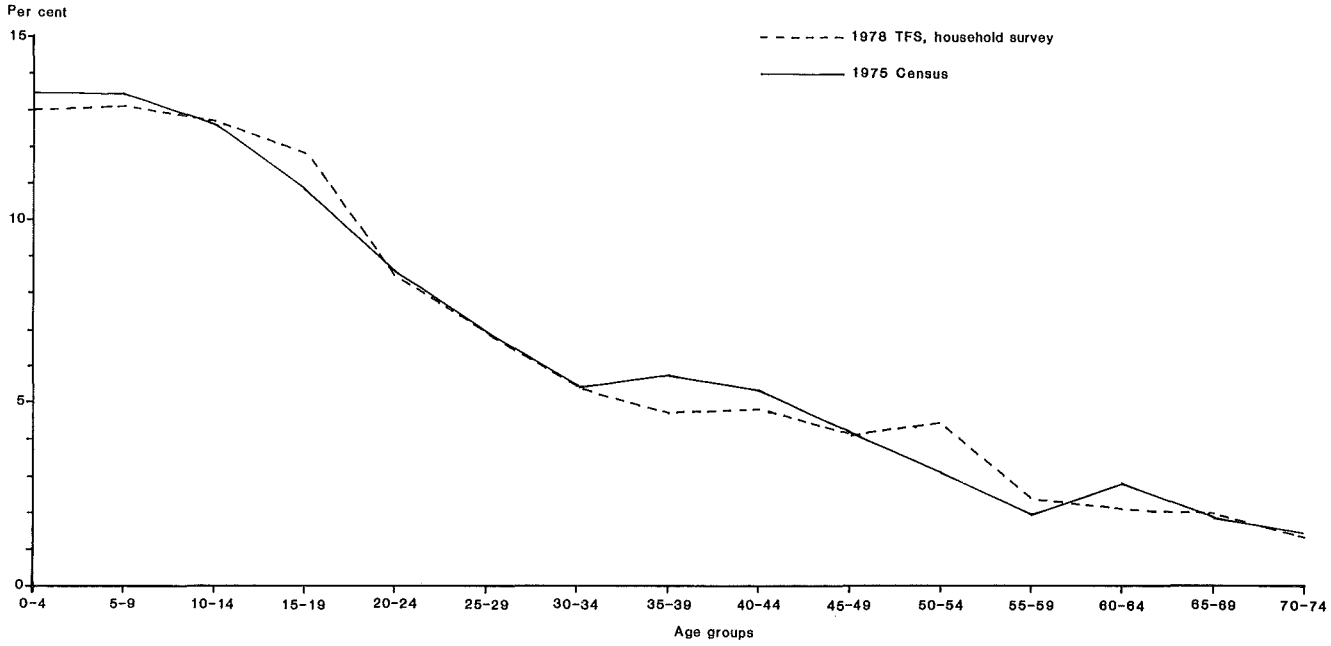

Figure 3 Per cent distribution of female population by five-year age groups, 1978 TFS household schedule and 1975 census

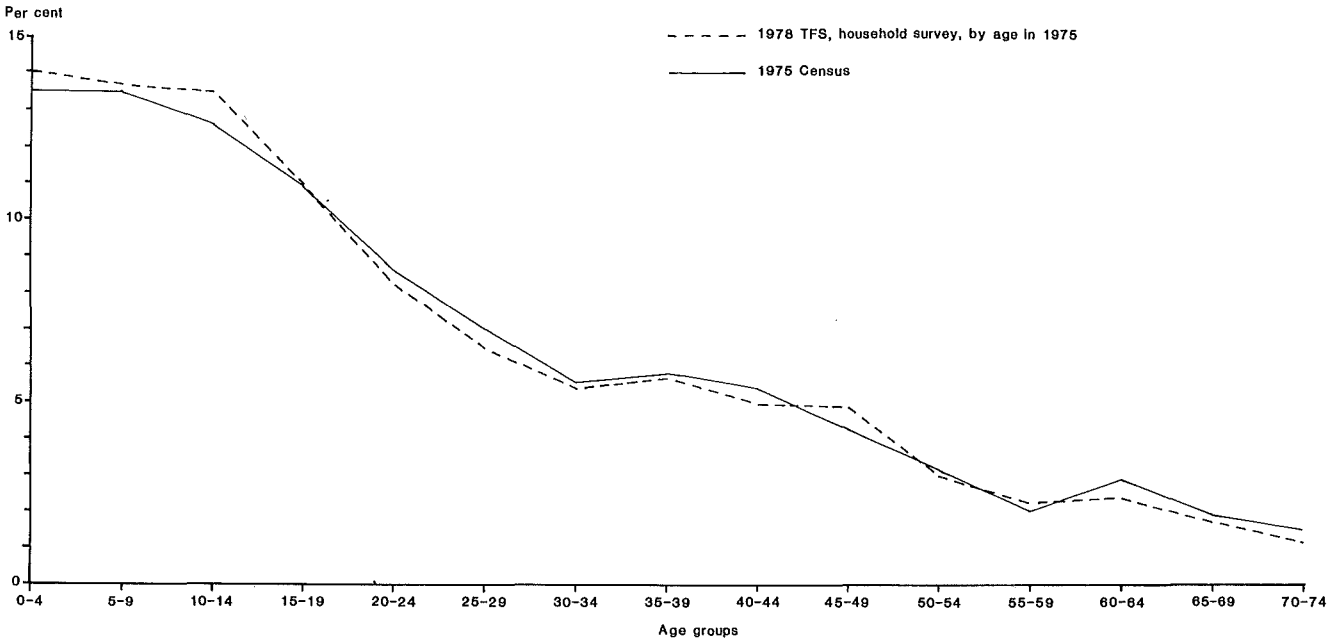

Figure 4 Per cent distribution of female population by five-year age groups, 1978 TFS household schedule by age in 1975 and 1975 census

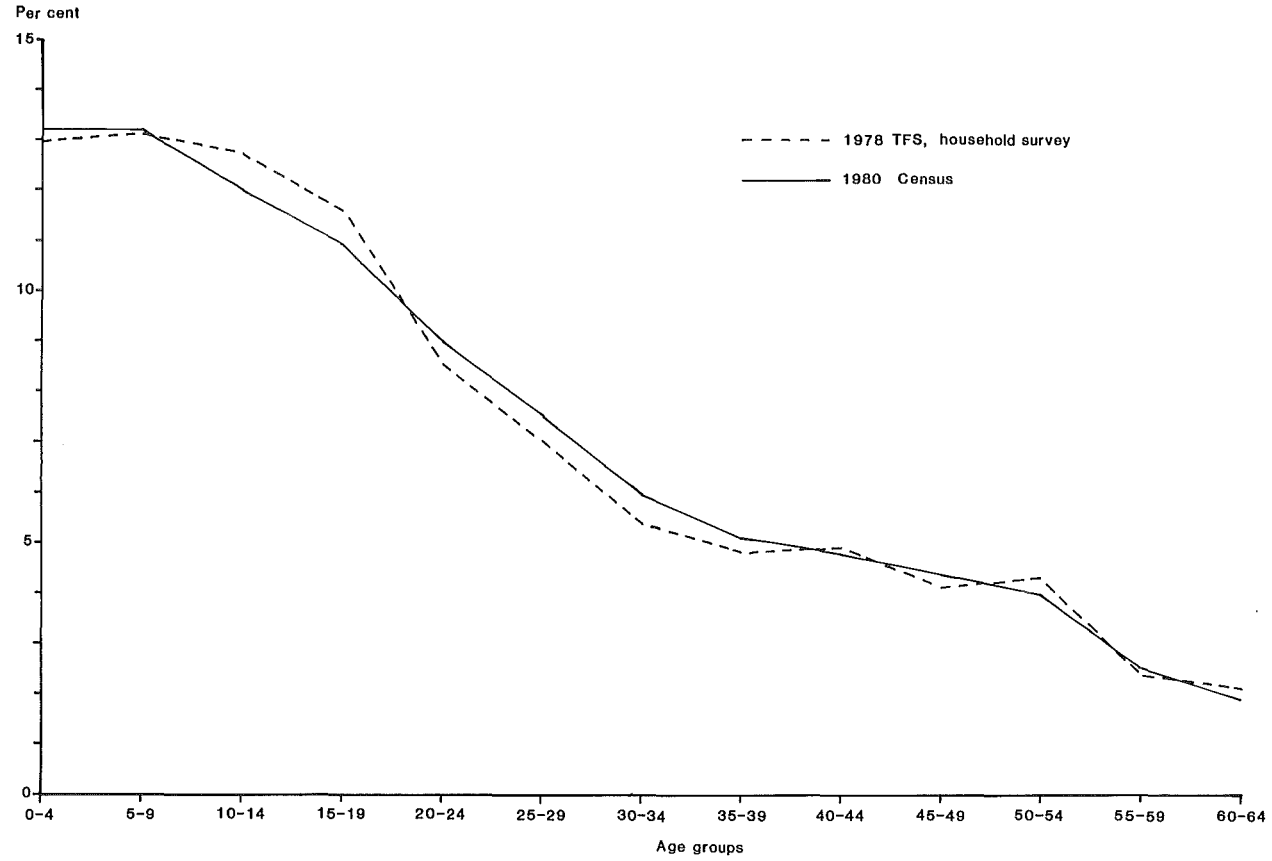

Figure 5 Per cent distribution of female population by five-year age groups, 1978 TFS household schedule and 1980 census

Table 3 Sex ratios in 1975 and 1980 censuses and in TFS for conventional age groups

Age group	Censuses			TFS 1978
	1970	1975	1980	
0–4	102.6	104.2	105.5	98.2
5–9	105.1	104.8	106.5	104.0
10–14	109.1	109.2	109.2	100.6
15–19	108.4	107.1	105.9	88.8
20–24	110.4	106.9	113.1	83.3
25–29	96.0	104.1	107.4	90.0
30–34	87.4	99.4	109.9	90.3
35–39	101.8	90.6	106.7	87.8
40–44	102.4	102.7	104.1	90.8
45–49	114.3	109.3	116.3	114.9
50–54	88.5	101.4	106.6	85.7
55–59	112.8	99.0	114.1	104.1
60–64	89.9	93.7	90.3	100.7
65+	82.5	86.1	82.7	87.8
Total	102.3	103.2	106.4	95.2

are quite dubious. It seems rather unlikely that the higher sex ratios of this census are simply due to return migration from abroad, since there are inconsistencies between older age groups such as 45–49 to 50–54 and 55–59. Similarly the 20–24 age group has a very high ratio, which possibly indicates age misreporting of adjacent groups or transferences. Another possibility is the under-enumeration of female population in the census. The overall sex ratio for 1980 of 106.4 is also too high.

Another way of comparing the censuses and the TFS household schedule for age reporting is to examine the age and sex ratio scores and the UN combined index. As can be noted from table 4, the TFS has a lower age ratio score than the previous censuses (1970 and 1975) but a higher sex ratio score, as noted previously. The sex ratio score of TFS leads to a UN combined score which is between those of the two censuses. The 1980 census, though yielding lower sex and age ratio scores, and naturally lowest UN combined score, is not consistent with the previous censuses.

3.2 AGE REPORTING IN THE INDIVIDUAL QUESTIONNAIRE

Reports of age from the individual questionnaire show patterns of digit preference similar to those we observed in the household schedule. The extent of digit preference by the individual questionnaire respondents is shown in table 5, according to various background characteristics. There are significant differences in heaping by region, area of residence and level of education. As can be expected, illiterate women with illiterate husbands and women living in the eastern and south-eastern parts of the country have the highest values on Myers' index.

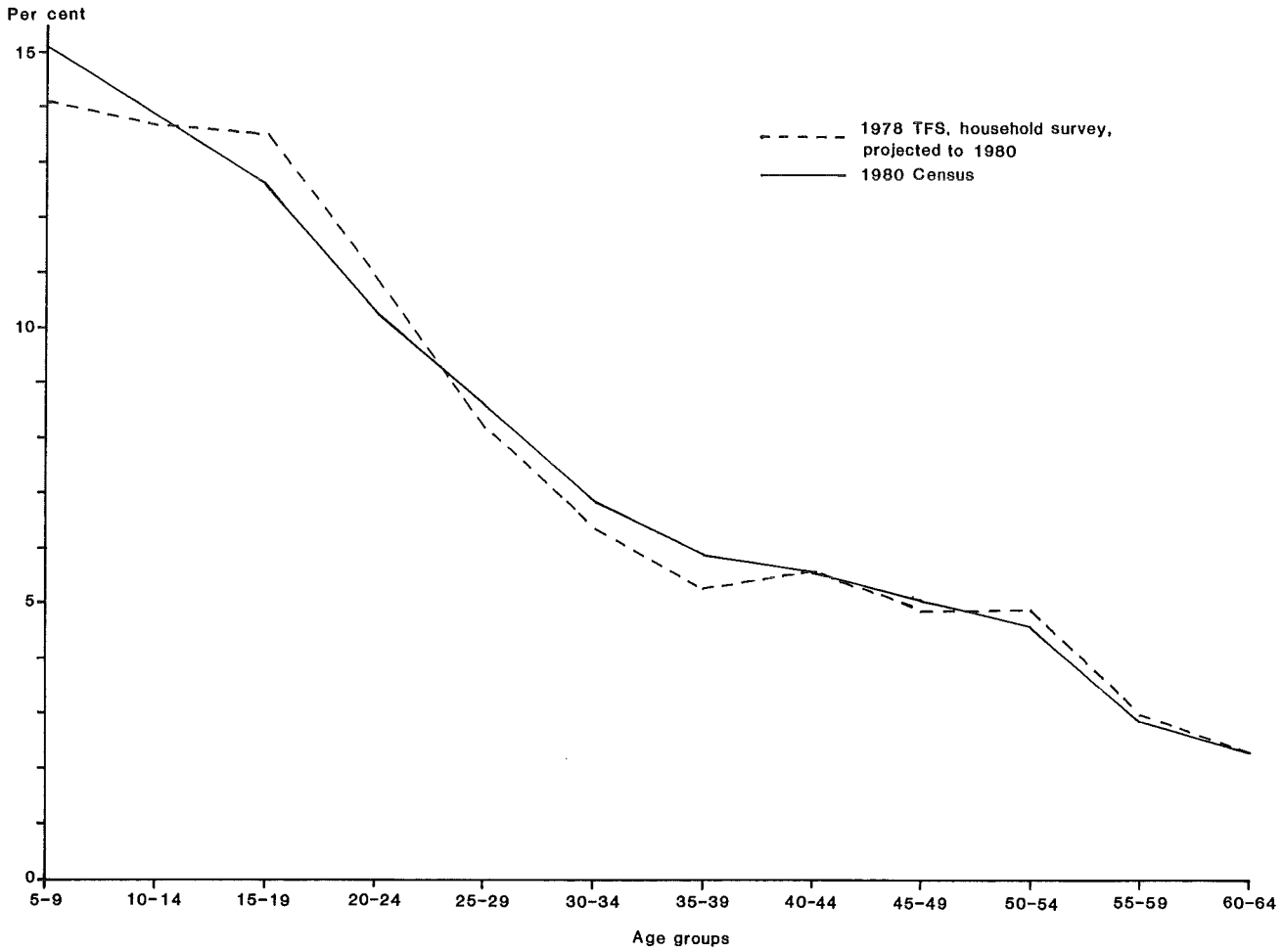

Figure 6 Per cent distribution of female population by five-year age groups, 1978 TFS household schedule projected to 1980 and 1980 census

Table 4 Sex and age ratio scores and UN combined index for 1970, 1975 and 1980 censuses and the TFS household schedule

	Overall sex ratio	Sex ratio score	Age ratio score		UN combined index
			Male	Female	
1970 census	102.3	10.96	10.48	8.15	51.51
1975 census	103.2	4.75	10.71	12.86	37.82
1978 TFS	95.2	8.82	7.16	10.46	44.08
1980 census	106.4	6.78	6.79	9.25	36.38

However, the overall age reporting of women in the individual questionnaire is slightly better than the reporting of women in the household schedule. It is interesting to note that a higher degree of co-operation by respondent, based on the interviewer's observation, corresponds to better age reporting as reflected in Myers' index. It is also interesting to look at Myers' index by the form of ascertainment of respondent's age. Ages given directly by the respondents and ages obtained from documents have lower index values than ages obtained after considerable probing or estimated by interviewer. As can be noted from the frequency distribution of age ascertainment, one-third was estimated by interviewers after long probing and they had the highest index values.

Another interesting characteristic of age reporting was revealed when single-year distributions were made specific by form of ascertainment: there was a preference for the terminal digit 3, which is normally rejected, only by women whose age was ascertained by means of a document. This unusual preference is most likely the result of a 'normal' preference for digit 0 when they first obtained their documents, as many did during a

Table 5 Index of digit preference in reports of age for selected subgroups of women interviewed by individual questionnaire

	Index[a]		
West	8.8		
South	18.1		
Central	15.8		
North	17.3		
East and south east	43.0		
City	8.8		
Town	16.2		
Village	27.4		
Wife's education:			
Completed middle +	8.2		
Completed primary	10.1		
Literate with 3 year primary	14.8		
Illiterate	30.2		
Couple's education:			
Both literate	6.5		
One illiterate	26.2		
Both illiterate	44.6		
Degree of co-operation:			
Good or very good	12.8		
Poor or fair	29.2		
Ascertainment of respondent age:		(N)	%
Age given directly	7.9	(2246)	50.7
Age obtained from document	13.2	(451)	10.2
Extensive probing	18.9	(287)	6.5
Extensive probing, estimated	41.6	(1401)	31.6

[a]Not from a 'blended' population.

campaign three years prior to the survey. Thus, even documentary evidence may be far from free of age misreporting, especially if obtained later than childhood.

3.3 CONSISTENCY IN AGE REPORTING

The information given on the household schedule has been matched with the responses of the women on the individual questionnaire. Of the 4431 women interviewed, 28 could not be identified in the household schedule from the data contained in the individual questionnaire. For the 4403 women that could be matched, the difference between the age declared in the household schedule and the age reported in the individual questionnaire has been computed, both by single years of age and by five-year age groups (see table 6). Nearly 79 per cent of the women had the same age in both questionnaires, while 16 per cent were older and 5 per cent were younger in the household schedule than in the individual questionnaire. Similar tendencies to report an older age on the household schedule were observed in all age groups; among them the 15–19 group had the highest value (26 per cent).

The impact of this transference for the conventional five-year age groups can be observed from the bottom half of the same table. Some women in all age groups are reported to be in an older age group in the household schedule, except for the women aged 45–49, since these last would have been excluded from the individual interview.

Among all women the percentage who were consistently declared in the same age group was 94 per cent. We can conclude that the observed tendency is to report a higher age in the household schedule than in the individual questionnaire. However, we do not observe the same tendency when we examine the difference in year of birth of women. Here 28 per cent of the matched women in the household schedule stated that they did not know or had not stated their year of birth. Of those who reported their year of birth, 92 per cent reported consistently, while 4 per cent reported younger and 4 per cent older in the household schedule than in the individual questionnaire.

In summary, the reporting of age in the Turkish Fertility Survey was found to be subject to moderately high amounts of digit preference (although there is a considerable improvement over the 1975 census), and of age transference, especially at the limits for interview with the individual questionnaire.

The five-year age group distribution also points to omission in the household schedule of children below age ten, when compared with both the 1975 and 1980 censuses, which could have implications for the individual survey. These distributions and the sex ratios point to a displacement of many women from ages 45–49 to 50–54, and thereby exclusion from individual interview. When matched, inconsistent responses from the household schedule and the individual questionnaire point to an over-estimation of age of women in the former, although a high level of consistency was obtained for five-year age groups. The quality of age reporting varies quite substantially according to education, area and region of residence, with much better reporting for the more educated, for those in urban areas, and for those living in the west and central regions. An interesting finding is digit preference in age even when obtained from identification documents, although coinciding with digits normally rejected, probably due to heaping on preferred digits when the document was obtained.

Table 6 Percentage difference between household schedule and individual questionnaire in the reporting of age

Difference in years	Age groups (individual questionnaire)							
	Total	15–19	20–24	25–29	30–34	35–39	40–44	45–49
Older in household								
3 or more	1.6	1.2	1.6	0.8	1.5	2.3	3.0	0.2
2	1.6	1.8	2.0	1.8	1.3	0.9	1.8	1.2
1	13.2	23.1	13.3	14.6	13.4	13.6	10.1	6.6
No difference	78.5	70.4	79.1	77.1	79.1	76.8	79.1	85.9
Younger in household								
1	2.7	2.7	2.2	4.0	2.5	1.9	2.8	2.4
2	1.2	0.9	1.0	1.1	1.0	1.4	1.8	0.8
3 or more	1.4	0.0	0.7	0.6	1.2	3.0	1.3	2.8
Difference in age groups	Age groups (individual questionnaire)							
	Total	15–19	20–24	25–29	30–34	35–39	40–44	45–49
Older in household								
2 or more	0.2	0.6	0.1	0.4	0.4	0.2	0.0	0.0
1	4.4	8.0	4.6	3.4	3.2	6.3	6.1	0.0
No difference	93.5	91.1	93.9	94.7	95.3	90.3	91.6	96.4
Younger in household								
1	1.8	0.3	1.4	1.6	0.9	3.0	1.8	3.4
2 or more	0.2	0.0	0.0	0.0	0.1	0.3	0.5	0.2

4 Nuptiality

The TFS provides information on the nuptiality of respondents based on a detailed marriage history obtained with the individual questionnaire. Marital status of all household members over age 8 had also been reported in the household schedule. The marriage history of respondents provides data on the number of marriages and dates, the dates of *de facto* beginning of cohabitation as well as the dates of formal marriage and the dates and types of dissolution. All information on dates was asked as calendar month and year. It should be noted that the TFS data do not distinguish between civil and religious marriages or consensual unions. It is known that religious marriages are still widespread in rural parts of the country.

This chapter will evaluate the nuptiality data of TFS by checks for internal consistence and by external comparisons.

4.1 DIGIT PREFERENCE

Figure 7 shows the single-year distribution of age at first marriage for all cohorts combined, and figure 8 shows the single-year distributions for rural and urban areas. Digit preference in reporting age at first marriage is small except perhaps for the age of 17, as can be seen both in rural and urban areas, as well as for all Turkey.

Figure 9 shows the single-year distribution of ever-married women according to the number of years since first marriage. It appears that there is a rather systematic pattern of digit preference, heaping on years ending 0 and 5, with an exception at 26 years, prior to the survey.

4.2 CONSISTENCY BETWEEN HOUSEHOLD SCHEDULE AND INDIVIDUAL QUESTIONNAIRE

The TFS examined marital status in the household schedules by means of two questions. First: 'Has this person ever been married?' If the reply was affirmative the interviewer went on to ask about the specific marital status: whether he/she was married, widowed, divorced or separated at the date of survey. These questions were asked before the individual interview. In the individual questionnaire the subject of marriage was investigated in greater depth. Apart from the current marital status, a complete history of the woman's nuptiality was obtained (marriage history), including questions about dates of entry and dissolutions of unions.

Table 7 shows the percentage distribution of eligible women according to current marital status, as reported in the household schedule for women interviewed in the individual questionnaire. It should be noted that there is a very high consistency between the reported marital statuses. It may be expected that the quality of information is better in the data obtained through the individual questionnaire. The very slight differences between divorced and separated are probably due to misreporting of marital status in the household schedule.

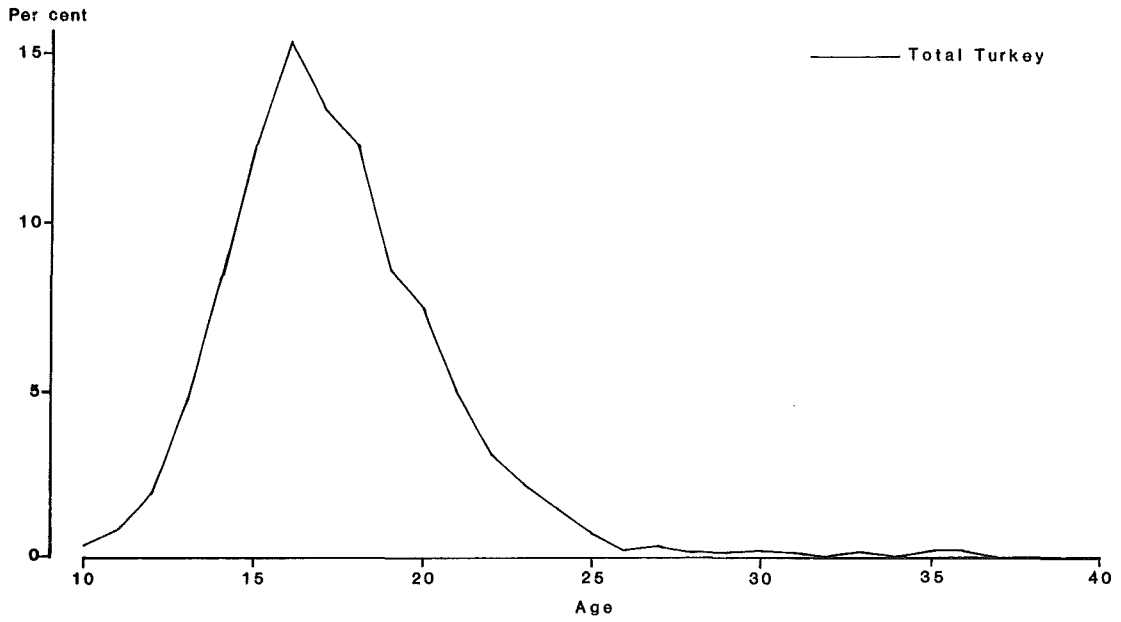

Figure 7 Percentage of ever-married women by age at first marriage (all Turkey)

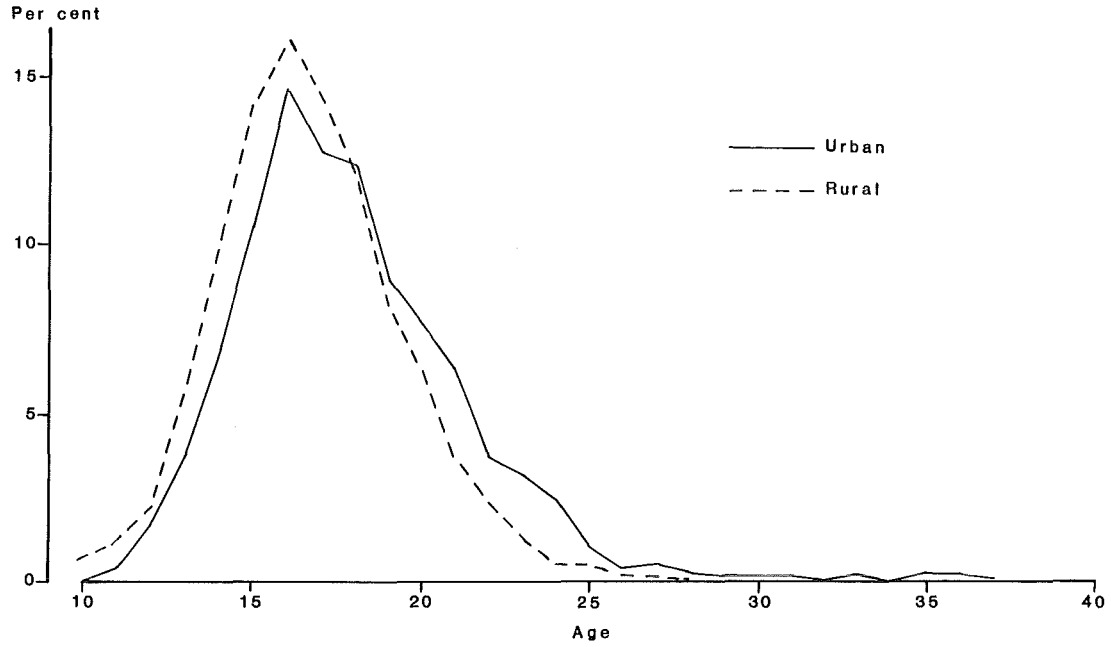

Figure 8 Percentage of ever-married women by age at first marriage (urban and rural areas)

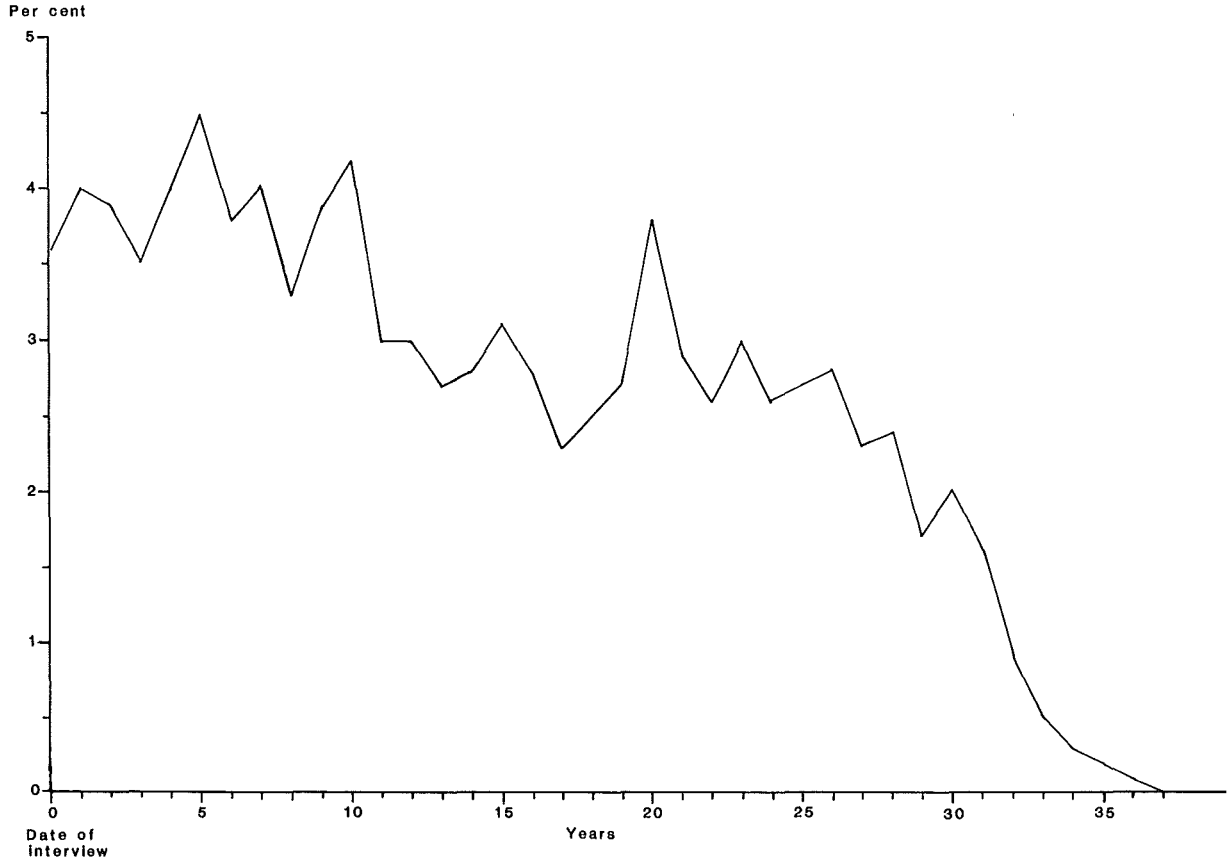

Figure 9 Percentage of ever-married women according to duration since first marriage (date of marriage)

Table 7 Percentage distribution of women according to current marital status as reported in the household schedule for women interviewed with the individual questionnaire, and in the individual questionnaire

Current marital status	Household schedule	Individual questionnaire
Married	96.0%	96.0%
Widowed	3.0	3.0
Divorced	0.4	0.5
Separated	0.6	0.5
	100.0	100.0

Table 8 presents the distribution of respondents in the individual questionnaire according to marital status and age group. It should be noted here that the percentages of the widowed women increase with age group consistently. We observe rather an irregular pattern by age for the divorced and separated.

4.3 COMPARISON WITH EXTERNAL SOURCES OF DATA

On the basis of information in the marriage histories, a direct comparison of data in the TFS with data from other sources can be made through a reconstruction of marital status distributions for the dates of censuses and surveys.

Table 9 shows the percentages of women ever-married by age group for the dates of the 1965 and 1970 censuses. It should be noted that the percentages ever-married derived from data in TFS are considerably higher than the corresponding percentages from census data. The discrepancies appear in every age group within each comparison, but are most notable for the youngest age group at the time (15–19). Additionally the discrepancies are larger for each age group when compared with the 1970 census. The differences appear to be due to the several probes in the individual survey to determine the date of beginning cohabitation by the couple, in addition to the date of formal marriage. As we noted earlier, although both the TFS and the censuses covered

Table 8 Number and per cent distribution of respondents according to age and according to marital status

Age group	Current marital status				
	Married	Widowed	Divorced	Separated	Total
Number of respondents					
<20	338	2	2	3	345
20–24	793	10	5	3	811
25–29	824	11	3	2	840
30–34	659	17	4	2	682
35–39	616	23	2	2	644
40–44	518	26	2	5	611
	449	44	2	3	498
	4257	133	20	21	4431
Per cent distribution according to marital status					
<20	97.9	0.6	0.6	0.9	100.0[a]
20–24	97.8	1.2	0.6	0.4	100.0
25–29	98.1	1.3	0.4	0.2	100.0
30–34	96.6	2.5	0.6	0.3	100.0
35–39	95.7	3.6	0.3	0.5	100.0[a]
40–44	94.6	4.3	0.3	0.8	100.0
45–49	90.2	8.8	0.4	0.6	100.0
	96.1	3.0	0.5	0.5	100.0[a]
Per cent distribution according to age					
<20	7.8	1.5	10.0	14.3	7.6
20–24	18.7	7.5	25.0	14.3	18.3
25–29	19.4	8.3	15.0	9.5	19.0
30–34	15.5	12.8	20.0	9.5	15.4
35–39	14.5	17.3	10.0	14.3	14.6
40–44	13.6	19.5	10.0	23.8	13.8
45–49	10.6	33.1	10.0	14.3	11.3
Total	100.0[a]	100.0	100.0	100.0	100.0

[a]Because of rounding some totals may not add up to 100.
Source: Individual questionnaire, TFS 1978

Table 9 Percentage of women ever married, by age group, at the date of the censuses and the TFS, reconstructed from the marriage history in the TFS (1978) and as reported in the censuses

Age group as of specified date	1965		1970		1978 TFS
	TFS	Census	TFS	Census	
15–19	38.8	27.7	38.5	24.2	22.1
20–24	88.5	83.8	82.7	78.7	74.1
25–29	97.5	95.5	96.8	93.4	92.7
30–34	97.7	97.8	98.0	93.4	97.4
35–39	99.3	98.1	98.5	96.7	99.1
40–44	—	—	99.9	96.8	98.5
45–49	—	—	—	—	99.3

Sources: 1. State Institute of Statistics (1965, 1970)
2. TFS 1978

both consensual (or religious) and legal unions in the status 'currently married', it appears that informal unions were more frequently omitted in census data.

Table 10 shows the percentages of women currently married, widowed and divorced at the census and survey dates, reconstructed from the TFS data and reported in the 1965 and 1970 censuses.

As expected, the percentages currently married are consistently higher from the TFS than from the censuses. In general the percentages widowed and divorced are also higher from the TFS data than from the censuses, except for older age groups such as 35–39 and 40–44, suggesting either a misclassification of marital status on one or more data sources (ie some separated women may actually be divorced or vice versa), or an underrepresentation of widowed women in TFS data, especially for older women.

4.4 TRENDS IN AGE AT FIRST MARRIAGE BY PERIOD AND COHORT

Calculations of marital status distributions and mean ages at marriage require total numbers of women by cohort. Numbers of ever-married women in each cohort from the individual survey were therefore divided by the proportions of all women in the corresponding cohort who have ever been married obtained from the household schedule, in order to estimate an age distribution for all women comparable to the individual survey's. These estimated numbers of all women are used in the calculation of fertility rates as well as in the reconstruction of marital status for the periods in the past.

Table 11 shows the proportions ever-married of cohorts for dates successively five years into the past. Values for different cohorts at a given age occupy the same row, whereas values for a given cohort over time and at various ages can be read along a diagonal. The declines in the percentages ever married over time have occurred at all ages but are most notable in the youngest age groups. Additionally, the declines were most rapid over the five years prior to the survey. It should also be noted from this table that the percentages ever married for the cohort 35–39 are consistently higher than the adjacent cohorts, reflecting real phenomena due to the second world war. As this cohort was born during the period 1939–43, its size is comparatively small because less births occurred during the period. Hence this cohort of women experienced relatively a higher nuptiality than the adjacent cohorts (30–34 and 40–44), since there was

Table 10 Reconstruction of marital status distribution of ever-married women (in per cents) by five-year age group for census dates (1965, 1970) and TFS (1978) from reported dates of marriage in the TFS 1978

Marital status	Age group at specified date											
	15–19		20–24		25–29		30–34		35–39		40–44	
A 1965 census	TFS	Census	TFS	Census	TFS	Census	TFS	Census	TFS	Census	TFS	Census
Married	38.6	27.3	88.4	82.7	96.5	94.0	95.9	95.4	95.8	93.9		
Widowed	0.1	0.0	0.2	0.0	0.8	0.1	1.2	1.6	3.5	3.2		
Divorced	0.0	0.0	0.0	0.1	0.3	0.1	0.3	0.1	0.0	0.1		
B 1970 census	TFS	Census	TFS	Census	TFS	Census	TFS	Census	TFS	Census	TFS	Census
Married	38.5	23.8	82.0	77.7	95.3	91.9	96.3	91.2	94.9	93.5	93.8	90.2
Widowed	0.0	0.0	0.3	0.0	1.2	0.1	1.2	1.5	2.4	2.8	5.6	5.6
Divorced	0.0	0.0	0.3	0.1	0.2	0.1	0.3	0.1	0.3	0.1	0.0	0.1

Table 11 Percentage ever married for periods by cohorts

Cohort	Years prior to survey							
	0	5	10	15	20	25	30	35
<20	22.1	0.9						
20–24	74.1	38.8	2.2					
25–29	22.7	79.5	34.7	2.2				
30–34	97.4	95.7	82.9	42.0	3.6			
35–39	99.1	98.5	97.7	89.0	51.1	5.1		
40–44	98.5	98.4	97.9	96.3	87.2	42.4	4.2	
45+	99.3	99.1	98.3	97.5	96.5	87.3	38.7	2.0

less competition for husbands, who are somewhat older.

On the other hand, we should note a deviation for the cohort of women aged 45–49 at the time of survey. Although the final proportion ever married seems to be consistent with expectation, the cumulative proportion for the period, 30–35 years prior to survey, is lower than the proportion at the similar age of 15–19 for the 40–44 cohort, which could be explained by displacement of the date of first marriage or omission of first marriage. Further evidence of omission of first marriages can be observed from table 12, where mean number of unions by current age are shown. Here we observe that the mean number of marriages for each cohort increases gradually with age up to the 35–39 age group, but ceases to increase from that age group onwards, contrary to expectations. However we must also take into account the finding of the previous chapter that many women of the 45–49 cohort were excluded from interview by misstatement of their ages, which may have been selective of women by age at marriage.

In order to obtain estimates of the mean age at marriage for each cohort for the entire childbearing period, we have fitted the Coale nuptiality model to reported proportions ever married for each cohort, since the marriage experience of each cohort is truncated at the current age of the cohort. For example, women aged 30 cannot have experienced marriages over age 30. Coale (1971) has shown that the first marriage curves in different populations can be described by a single model schedule which is characterized by three parameters: a_0, the starting age at marriage; K, the rate at which the proportion of ever-married women increases with age relative to that of a standard population; and C, the final proportion of ever-married women at the end of the childbearing period.

Table 13 shows estimated mean ages at first marriage for five-year cohorts by use of the Coale model. The values are based on a statistical fitting procedure devised by Rodríguez and Trussell (1980). Also shown are the standard deviations (equal to 6.58 × k) and the percentages eventually marrying (C). We note the same mean and standard deviations of age at marriage for the cohorts 30–34, 40–44 and 45–49, and higher mean ages and deviations for cohorts 20–24 and 25–29 indicating recent changes in nuptiality. The model, however, has overestimated C for the cohort 20–24 which would in turn slightly raise the estimated mean age at marriage. The estimates for mean and standard deviation for the cohort 35–39 look anomalous and may be due to age transference (most likely downward from 40–44). As indicated above, however, the real effect of the small size of this cohort born during the second world war may have influenced nuptiality, given that women generally marry older men. The latter seems the more plausible.

Table 12 Mean number of unions (marriages) by current age

Current age	Mean number of unions
15–19	1.00
20–24	1.02
25–29	1.03
30–34	1.05
35–39	1.07
40–44	1.07
45–49	1.07
Total	1.04

Source: TFS 1978

Table 13 Mean and standard deviation age at first marriage and percentage eventually marrying by age 50, estimated using a model nuptiality schedule[a] for cohorts of current age

Cohort	Mean age	Standard deviation	Percentage marrying by age 50
20–24	20.5	5.5	106.1
25–29	19.2	4.3	98.1
30–34	18.4	4.1	98.4
35–39	17.7	3.8	99.2
40–44	18.3	4.1	98.6
45–49	18.4	4.1	99.2

[a]A maximum likelihood estimating technique devised by Rodríguez and Trussell (1980) was used to fit the Coale model nuptiality schedule (Coale and McNeill 1972, Coale 1977).

4.5 CONCLUSIONS FOR NUPTIALITY

On the whole the data on nuptiality in the TFS appear to be of a reasonably high quality, although there is some evidence of digit preference in reports of marital durations. Comparisons with earlier censuses point to omission of religious and consensual marriages in these sources rather than problems with the TFS, although some widows may have been missed. Investigations of time trends indicate important increases in age at first marriage in the last 15 years and especially the last five, shown both by the proportion ever married by ages at given dates and from fitted values of the Coale nuptiality model.

The cohort born during the second world war, now aged 35–39, married at earlier ages and currently has a higher proportion ever married, which seem to be real consequences of the small size of this cohort relative to that of their marriage partners.

5 Fertility

Errors in reporting mothers' ages, omission of births or misreporting of dates of births can all affect estimates of current fertility levels and their past trends. The purpose of this chapter is to find out to what extent estimates made from the TFS are subject to these types of errors.

5.1 SOME CHARACTERISTICS OF THE INFORMATION ON FERTILITY

One of the most frequently used measures of fertility for comparative analysis between different subpopulations is the mean number of children ever born per woman. In this section we examine the average parity of women retrospectively and the distribution of births by years prior to survey.

Children ever born

Table 14 shows the mean number of children ever born by five-year age groups and background characteristics of women. It should be noted that, in calculating the average parities, the number of ever-married women interviewed has been divided by the proportion ever married in the age group, obtained from the household schedule, in order to estimate the number of all women in the age group (which is then used as the denominator). As may be observed, the fertility differentials by educational level are striking. The difference of average parities between women who have no schooling and those with schooling of at least primary level is more than two children. There are also marked regional and urban/rural differentials: one and a half children between residents of the west and the east and about one child between urban and rural areas.

The last column of table 14 shows the mean number of children ever born for five-year cohorts. As expected, parity increases with increasing age group of women. Mean parity by single years of age are plotted in figure 10. Again, parity increases with increasing age up to about age 35. The pattern is rather erratic in the later ages and somewhat lower than expected, especially for women over 45, which suggests some omission of births by these women. More importantly the data indicate heaps at the ages of 30, 32, 35, 40, 42 and 45. As these dips correspond to age misreporting or heaping on the specified ages, we suspect that these heaps are more likely the result of errors of age reporting than a misallocation of births around these ages or of omission.

Table 15 shows the mean number of children ever born by age group at the date of the TFS and the date of the census, as reconstructed from the birth history in the survey and as reported in the 1970 census, as well as the ratio between the last two. As can be noted the TFS has higher parity levels than the 1970 census for all age groups except 15–19. The differences, which vary between 5 and 25 per cent, except for the youngest age group, are more likely the result of an omission of children in the 1970 census than of an over-estimation in the survey. On the other hand, the parity level for the 15–19 age group is 40 per cent (but only 0.25 children) below the census level, indicating a possible omission of births in the survey.

Digit preference of birth dates

Digit preference in reporting birth dates may be observed when the data are plotted by single calendar year of child's birth, as in figure 11. Here we clearly observe dips for the years 1957, 1959, 1969 and 1974, indicating some misplacement of births.

Table 14 Mean number of children ever born by five-year age groups of women and background characteristics

Age group	Educational level				Region					Urban	Rural	Total
	No schooling	Primary	Middle	High school and university	West	South	Centre	North	East and south east			
15–19	0.19	0.13	0.15	0.15	0.17	0.11	0.15	0.11	0.16	0.14	0.16	0.15
20–24	1.70	1.25	1.00	(0.42)[a]	1.02	1.26	1.35	1.57	1.71	1.23	1.47	1.35
25–29	3.36	2.57	1.74	1.14	2.17	2.68	2.71	3.30	3.65	2.37	3.29	2.78
30–34	5.06	3.60	2.40	(1.82)[a]	3.04	4.17	4.30	4.77	5.61	3.50	4.92	4.17
35–39	6.34	4.57	3.11	(2.17)[a]	4.07	5.39	5.23	6.21	7.20	4.56	6.29	5.43
40–44	6.77	4.65	3.10	(2.79)[a]	4.47	5.29	6.01	6.51	8.13	4.71	6.76	5.87
45–49	7.10	4.79	3.23	(2.76)[a]	5.06	5.94	6.02	7.08	8.71	4.98	7.28	6.26
Total	4.46	2.05	1.34	0.92	2.33	2.59	2.87	2.82	3.78	2.37	3.50	2.92

[a]Bracket denotes less than 100 women.

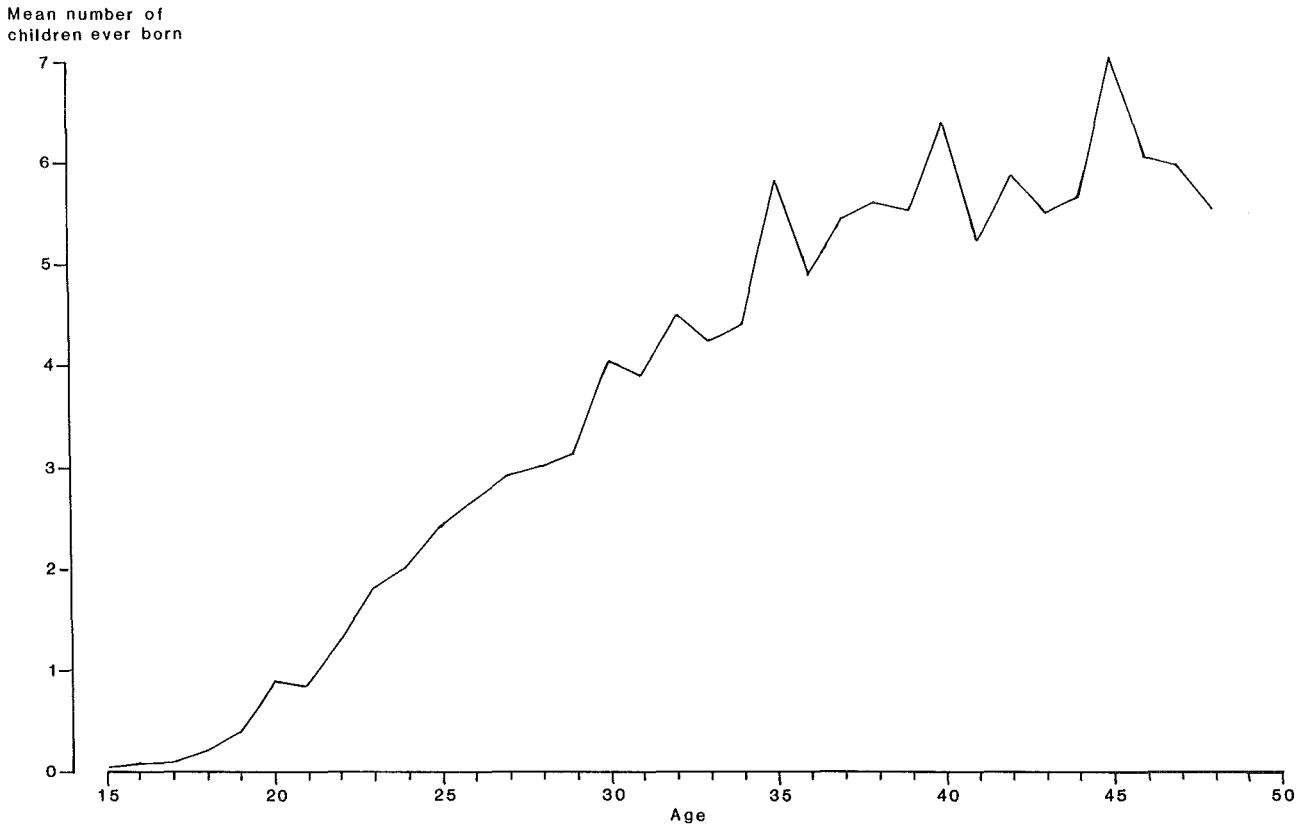

Figure 10 Reported numbers of children ever born by single years of age

Table 15 Mean number of children ever born by age groups at the date of the 1970 census, reconstructed from the birth history in the TFS (1978) and as reported in the 1970 census

Age group	TFS (1)	Census (2)	Ratio (1)/(2)
15–19	0.32	0.57	0.56
20–24	1.60	1.52	1.05
25–29	3.39	2.71	1.25
30–34	4.81	4.05	1.19
35–39	5.65	4.92	1.15
40–44	5.51	5.27	1.05

Since these birth years would correspond approximately to children 21, 19, 9 and 4 years of age respectively, at the time of the survey, we suspect that the real error that occurred was the preference for neighbouring ages ending in 5 and 0 perhaps related to the age report given in the household schedule.

5.2 AGE-SPECIFIC FERTILITY RATES BY CALENDAR YEAR

Table 16 shows age-specific fertility rates (ASFR) by single calendar years for the past 30 years, and the estimated total fertility rates (TFR) for the period 1966–1976. In the calculation of the TFRs, missing rates have been estimated as the average of the rates of the last three years for which rates are available. It should be noted that if fertility has declined in the oldest age groups, this procedure will underestimate the decline in the total fertility rate. Also note that the TFRs have been calculated as three-year moving averages in order to smooth out fluctuations in the rates, due to digit preference and sampling error.

The ASFRs presented show that peak fertility is at ages 20–24 throughout the period examined, and is especially pronounced for the 1963–77 period. During the latter period, fertility at the youngest age group (15–19) and at age groups 30–34 and 35–39 shows a general decline, although there are some fluctuations. The decline of fertility at the individual age groups can better be examined in table 17. This table presents average ASFRs for the periods 1963–7 and 1973–7 and the proportional decline of these rates between those periods. The overall decline in fertility between the two periods as shown by the estimated TFR is more than 25 per cent. The decline at the youngest ages (15–19) is rather substantial, around 30 per cent. This latter decline is most likely due to the increasing age at marriage in the recent period as we have seen, although the possibility of some omission of births cannot be ruled out.

The decline is also more marked for the ages following peak fertility: 30 per cent for ages 30–34 and 37 per cent for ages 35–39 being the largest declines observed.

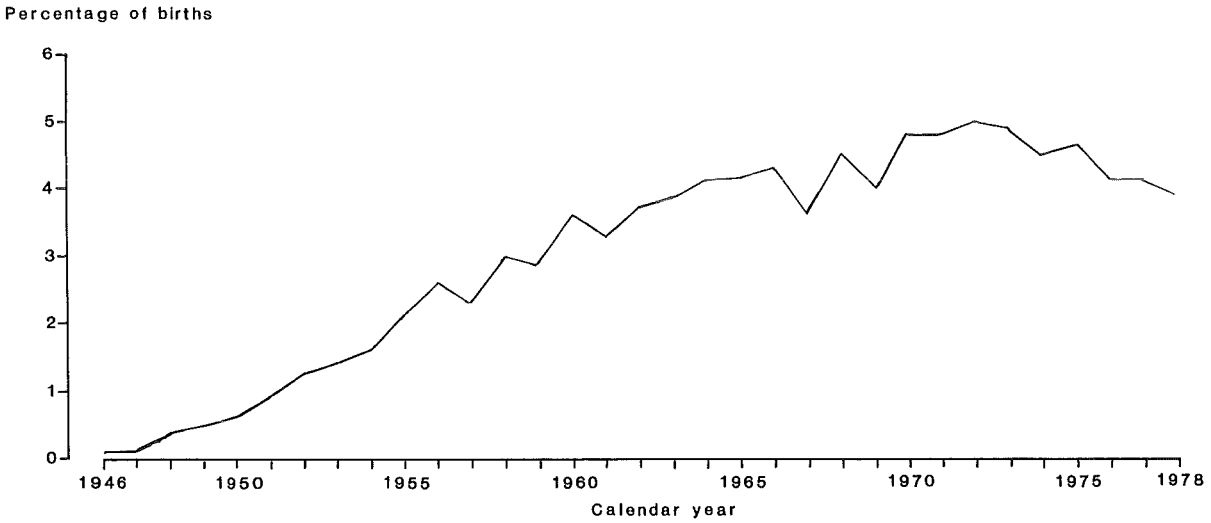

Figure 11 Distribution of births by year of child's birth

Table 16 Age-specific and total fertility rates for all women by calendar year (rates per 1000)

Calendar year	Age group year							
	15–19	20–24	25–29	30–34	35–39	40–44	45–49	TFR[a]
1977	97	231	215	132	93	28	0	3.98
1976	96	226	220	160	86	46	5	4.34
1975	125	309	248	133	98	52	(3)	4.66
1974	131	260	246	204	84	61	(3)	5.07
1973	151	301	258	199	123	51	(3)	5.40
1972	170	308	310	200	115	57	(3)	5.69
1971	177	291	286	217	130	61	(3)	5.90
1970	162	333	300	212	146	56	(3)	5.71
1969	146	278	245	195	127	56	(3)	5.81
1968	163	324	289	235	152	56	(3)	5.52
1967	150	280	246	176	130	56	(3)	5.91
1966	169	364	299	260	132	56	(3)	5.81
1965	160	352	312	249	162			
1964	178	340	331	264				
1963	191	350	309	235				
1962	183	362	334	233				
1961	177	357	272	253				
1960	207	365	364					
1959	161	339	298					
1958	205	347	367					
1957	174	292	310					
1956	209	375	385					
1955	177	356						
1954	140	313						
1953	156	295						
1952	198	316						
1951	149	289						
1950	145							
1949	114							
1948	108							
1947	70							
1946	41							

[a]In computing the TFR the empty cells are estimated by the average of the last three rates (last two for 45–49 age group) which are available for the corresponding group. Except for 1977, the TFRs shown above are three-year moving averages of TFRs for single calendar years.

Table 17 Age-specific fertility rates (per 1000 women) and percentage decline in the rates

Age group	Fertility rate		Percentage decline
	1963–7 (1)	1973–7 (2)	[(2)-(1)]/(1)
15–19	169.6	120.0	29.2
20–24	337.2	265.4	21.3
25–29	299.4	237.4	20.1
30–34	236.8	165.6	30.1
35–39	154.2	96.8	37.2
40–44	—	47.6	—
45–49	—	2.5[b]	—
TFR	6.28[a]	4.68	25.5

[a]For the 1963–7 period the empty cells (ages 40–44 and 45–49) are estimated as indicated in table 16.
[b]Mean of 1976 and 1977.

Table 18 compares the total fertility rates obtained from the survey data with those estimates from other available data. There clearly has been a substantial decline in fertility, shown not only by the TFS data, but also by other sources. However, the values of the TFRs obtained from the TFS data are somewhat higher than those estimates based on other data involving various assumptions.

Table 18 Total fertility rate derived from maternity history of TFS and from other sources of information

Calendar year	Maternity history (TFS)	Other estimates	Reference period
1977	3.98		
1976	4.34		
1975	4.66	3.79[a]	(1974–5)
1974	5.07	5.21[b]	(1974–5)
1973	5.40	4.66[c]	(1973)
1972	5.69	6.05[d]	(1973)
1971	5.90	5.00[e]	(1972–3)
1970	5.71		
1969	5.81	5.63[e]	
1968	5.52	5.30[f]	(1967–8)
1967	5.91	5.63[g]	(1967)

[a]Based on marital fertility rates reported in 1974–5 Turkish Demographic Survey (TDS) for ever-married women resulting from a retrospective question on births in the 12 months preceding the survey. These rates were adjusted at US Bureau of the Census by Dr Peter O. Way to correspond to the total female population in each age group.
[b]US Department of Commerce (1980). *Country Demographic Profiles: Turkey*. Bureau of the Census ISP-DP25, 1980, tables 7 and A-8 (pp 19 and 43).
[c]*1973 Survey of Population Structure and Population Problems* (HIPS, 1978, p 72) rates based on pregnancy history data collected in 1973 survey.
[d]Dr Sevil Cerit estimates based on 1973 data of HIPS, adjusted by Brass method (*Nufus Bilim Dergisi*, 1979, p 29).
[e]Ozbay *et al* (1977).
[f]Turkish Demographic Survey 1970, table 16.
[g]Source as in [b], rates based on results of the 1966–7 Turkish Demographic Survey adjusted using Chandrasekaran–Deming Technique.

Although the total fertility rate appears to show a consistent decline, at least in the last ten years, the fertility rates by age group may be somewhat affected by omissions, errors in the reporting of age and misplacement in the date of birth of children. These aspects will be examined more closely in the following section on the analysis of fertility by cohorts and periods.

5.3 EXAMINATION OF COHORT-PERIOD FERTILITY RATES

The examination of birth history data, through the calculation of fertility rates for cohorts of women over time, is useful in assessing the quality of fertility information as well as giving a better understanding of present and past trends in fertility behaviour.

Table 19 shows fertility rates by birth cohort and period, cumulative rates by cohort and by period and ratios of the cumulative rates. Panel A of this table shows cohort-period fertility rates for birth cohorts defined by five-year age groups at the time of survey and for five-year periods before the date of the survey. For example, the cohort aged 30–34 at the time of survey had a fertility rate of 200 births per thousand women-years of exposure in the five years preceding the survey.

It should be noted that these measures are different from conventional age-specific fertility rates, in that the conventional rates span two cohorts, while births to the cohort 30–34 in the period 0–4 years from the survey have occurred to women aged 25–34 at the time of birth of the child, a span of ten rather than five years. This rate can be compared diagonally with the rate of 246 for the cohort 35–39 in the period 5–9 years from the survey, when this cohort was also moving through the ages 25–34, ie centred on age 30. Comparison of cohort-period rates at equivalent ages, traced diagonally from the upper hand of panel A to the lower right hand corner in table 19, shows rather a continuous decline over time, except for the cohorts 40–44 and 45–49. For example, the cohort-period rates centred on age 20, which were 232 for the cohort 45–49 in the period 25–29 years before the survey, increased to 259 for the cohort 40–44 and to 295 and then declined to 264, 248 and 204 for the younger cohorts going through equivalent ages in the more recent periods. In the absence of a real rise in fertility 20–30 years ago, these data suggest that the older cohorts have either omitted some births, displaced dates of births towards the survey date, or misstated their age. We have noted however that the cohort 35–39 married earlier and to a greater extent than other cohorts which could explain its relatively high fertility. On the other hand the low rate of 232 for the cohort 45–49 appears likely to be due to error.

In Panel B of table 19 cohort-period rates accumulated over time for each cohort are shown. These values correspond to the mean parity that the cohort had achieved at the end of each period and are denoted P_i. Cumulative cohort rates show clearly a decline in fertility across cohorts. For example the cohort 25–29 had a mean parity of 2.76 at the time of survey, compared with a mean parity of 3.17 for the cohort 30–34 five years earlier. The cohort 40–44 had a mean parity of 5.87 at

Table 19 Fertility rates by birth cohort and period, cumulative rates by cohorts (P_i) and periods (F_i) and ratios of cumulative rates (P/F)

Age of cohort at survey	Estimated number of women of all marital statuses	Years before the survey						
		0–4	5–9	10–14	15–19	20–24	25–29	30–34
A Cohort-period fertility rates (per 1000 women)								
15–19	1518	29						
20–24	1099	204	60					
25–29	908	249	248	54				
30–34	701	200	293	264	72			
35–39	650	134	246	329	295	81		
40–44	620	70	172	268	337	259	64	
45–49	502	26	103	202	297	354	232	37
B Cumulative rates for cohorts (P_i)								
15–19		0.15						
20–24		1.35	0.31					
25–29		2.76	1.52	0.28				
30–34		4.17	3.17	1.70	0.38			
35–39		5.44	4.77	3.54	1.89	0.42		
40–44		5.87	5.52	4.66	3.32	1.63	0.34	
45–49		6.26	6.13	5.61	4.60	3.12	1.35	0.19
C Cumulative rates for periods (F_i)								
20–24		1.17	0.30					
25–29		2.41	1.55	0.28				
30–34		3.41	3.01	1.60	0.36			
35–39		4.08	4.24	3.25	1.84	0.43		
40–44		4.43	5.10	4.59	3.53	1.72	0.33	
45–49		4.57	5.62	5.59	5.01	3.50	1.49	0.20
D P/F ratios								
20–24		1.14						
25–29		1.15	0.98					
30–34		1.22	1.05	1.06				
35–39		1.33	1.12	1.09	1.03			
40–44		1.32	1.08	1.02	0.94	0.95		
45–49		1.37	1.09	1.00	0.92	0.89	0.90	

the time of survey, compared with a mean parity of 6.13 for the cohort 45–49 five years earlier. However, for most ages the anomalous cohort 35–39 had the highest parity.

Panel C of table 19 shows cohort-period rates accumulated over cohorts within each time period. These values correspond to the cumulative fertility that a synthetic cohort would achieve if the period rates prevailed, and are denoted F_j. Cumulative period rates show a clear decline in fertility over time which has accelerated in the past ten and particularly the last five years. For example, in the five years prior to survey, synthetic cumulative fertility up to the ages 40 to 44 was 4.43 children, compared with 6.13 children at an equivalent age of the real cohort 45–49 (in the period 5–9 years before the survey). There is no evidence here of an over-reporting of fertility for either the 5–9 or 10–14 period as predicted by Potter (1977) if birth displacement occurred.

Panel D of table 19 shows the ratios of cohort (P) and period (F) cumulative fertility rates, the so-called P/F ratios. Since in the absence of fertility change or reporting errors these ratios equal unity, the P/F ratios can be used as indicators of omission and displacement errors in reports of births and as measures of fertility change. The P/F ratios in panel D indicate a fairly large decline in fertility for both the younger and the older cohorts, though the ratios for the latter may indicate a slight amount of omission, displacement of births or age misstatement which require closer examination of data.

Table 20 shows the magnitude of the proportional

Table 20 Percentage change in cohort-period fertility rates for more recent periods, by central age

Central age	Percentage decrease between periods	
	5–9 to 0–4	10–14 to 5–9
15	−51.7	+11.1
20	−17.7	−6.1
25	−15.0	−10.4
30	−18.7	− 8.2
35	−22.1	−14.9
40	−32.0	—

Source: Table 19

decrease in fertility for the last three periods at various ages. The largest decrease in fertility between the two most recent periods is that centred on age 15 (51.7 per cent). This large drop is likely due to a rising age at first marriage but also may indicate a slight omission of births for this cohort as we observe an increase for the two periods before that (11.1 per cent). For the ratios centred on other ages fertility declines are more pronounced between the two most recent periods than between the two previous periods.

Of more importance is the large decrease observed in the rate centred on age 40, which is higher than that for any other age above 15. In general, we note that the percentage decline shows rather a regular trend with the age. However, a more detailed examination of rates for each cohort and each period is required in order to probe whether the amount of the decreases in fertility are real, especially for the older cohorts. Some authors have demonstrated that small displacements of the date of births and over-estimates of the birth interval, when cumulated, may create important biases in fertility rates (Potter 1977, Brass 1978 and 1980). If the type of displacement consists in the transfer of children's birth dates towards the date of the survey, the age curve of fertility for cohorts would be displaced towards older ages.

According to the hypothesis, this bias is greater the older the cohort and the more distant the birth from the date of survey so that a comparison between the fertility experienced by adjacent cohorts will show a greater than real decrease for the most recent period. While omission seems to mostly affect births in more distant periods, displacement of births may also cause biases for the periods close to the date of survey.

Figure 12 is derived from table 19. It shows the cohort-period rates at central ages. As can be observed, fertility peaks at the central age 25 for all cohorts. Fertility continues to decline steadily as we move from older to younger cohorts. In order to examine whether the type of displacement described above is present in the TFS data, let us focus on the fertility rates of the two oldest cohorts (45–49 and 40–44) and compare with the younger cohorts at central age 20. Centred on age 20, fertility rates of the older cohorts were 232 and 259 respectively. These values were lower than those for the 35–39 (295) and the 30–34 (264) cohorts. The rate of the 25–29 cohort was also higher (248) than the 45–49 cohort but slightly lower than the 40–44 cohort.

If these differences were due to displacement they would lead to an overstatement of births during later periods. Potter (1977) postulated that such overstatement would occur 5–9 years previous to survey, and to a lesser intent 10–14 years previous. The cumulative fertility for periods, however, reveals a steady decline since the period 15–19 years previous (table 19, panel C). Further indication of a lack of displacement comes from figure 13 where the mean length of the closed birth intervals has been plotted according to cohort and central age. If there were a serious overstatement of births in the periods 5–9 and 10–14, we would expect to see dips in the curves at the corresponding ages, but none appear.

5.4 FURTHER TEST FOR OMISSIONS OF BIRTHS

Evidence shows that certain types of events are more likely to be omitted, such as births of female children, children who died long ago, children living away from home, etc. Examinations of the sex ratio at birth for periods and of infant and child mortality rates over time may be used to detect these types of selective omission.

Sex ratios of births

The ratio of male to female births for the country as a whole was 1.032. This value is slightly lower than the expected ratio of 104–105 births for every 100 female births, but it can not be considered as an inconsistency at a global level. Table 21 shows sex ratios at birth by periods, for the total and according to various characteristics of the mothers. For periods closer to the survey the ratios should be close to the expected value and are expected to be rather high in the more distant periods, which would suggest some omission of female children in these periods.

It is also expected that the sex ratios may be higher in rural areas and among less educated women as an indication of differential omission by sex. However, the classification of births according to urban and rural areas, by level of education and by region does not give clear evidence of differential omission by sex.

The ratios for the period 20–24 years ago are quite high, especially for women 45–49, possibly indicating either omission of female children due to memory lapse of older women or sex selective birth date misplacement. Note however that sex ratios are subject to large sampling errors.

The proportion dead of children

It is commonly thought that the children most likely to be omitted in a birth history are those who died in their earliest years of life. Table 22 shows the proportion of children who died, by sex and according to the mothers' age group.

Consistent with good reporting the overall proportion dead increases with age, up to the 45–49 age group.

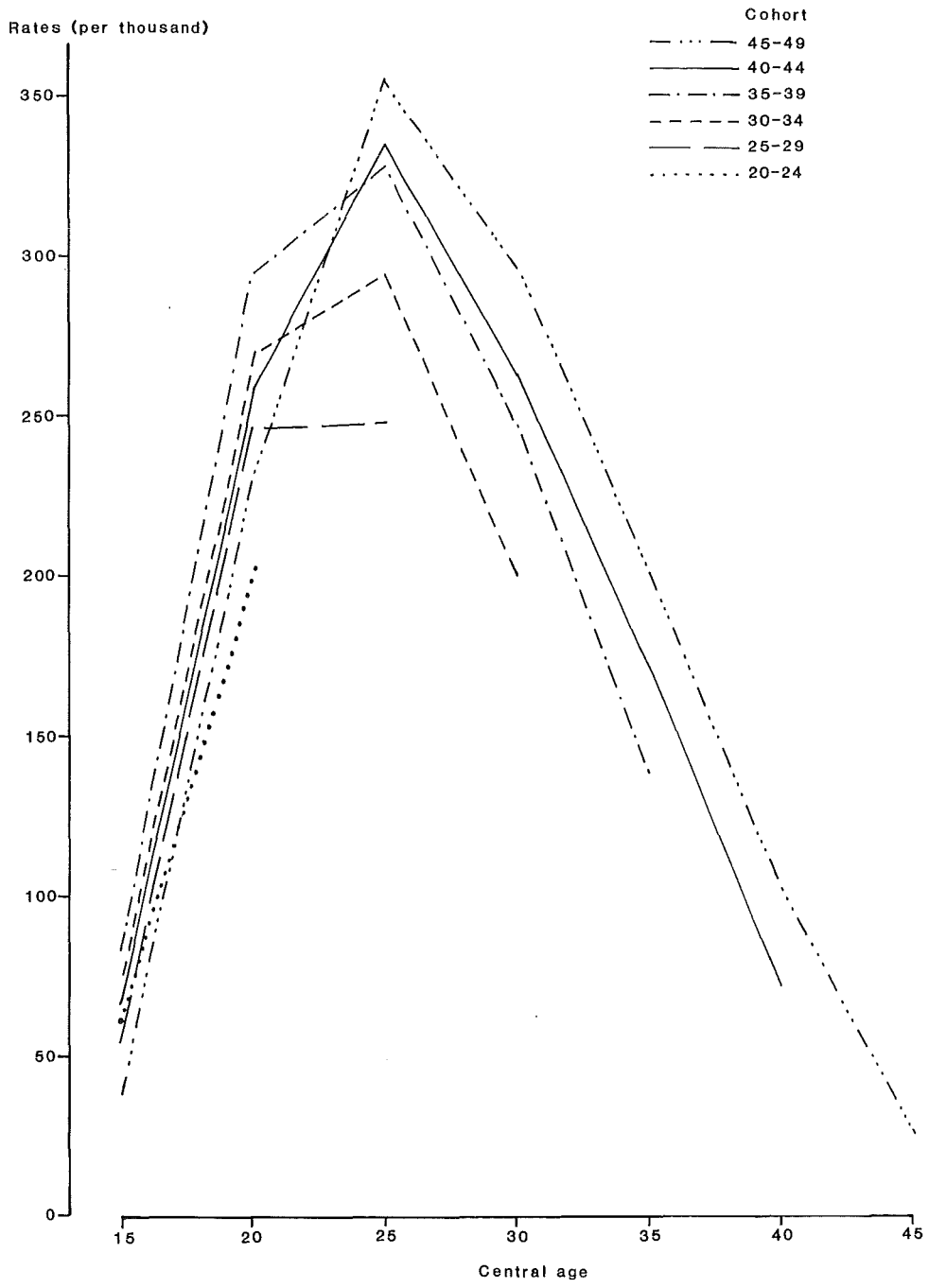

Figure 12 Cohort-period fertility rates

However, while the trend of the increase in the proportion dead for males continues in a linear fashion up to 49 years, the proportion dead for females shows a slight decline for the 45–49 age group. This could be evidence of omission of girls who have died by this cohort.

5.5 CONCLUSIONS ON FERTILITY

The data from the birth history of the Turkish Fertility Survey in general appear to be of high quality although there is some evidence of small effects of age heaping and perhaps omission.

The data show that there has been a substantial decline in fertility in Turkey over a long period of time, but particularly accentuated in the five years prior to the survey. This decline, shown by a change in the estimated total fertility from 6.3 in 1963–7 to 4.7 in 1973–7 (a fall of 25 per cent) and to a TFR of 4.0 in 1977, has come about through large decreases at younger ages, particularly 15–19, due to a rising age at marriage associated with rising levels of education, as well as large decreases at ages over 30. Our evaluation shows no reason to doubt either the levels or the trends implied by the data. Although single-year age distributions and single-calendar-year distributions of children ever born and

Table 21 Sex ratio of births by periods, according to some characteristics of the mothers

Years prior to survey	Area			Region					Educational level			Current age group			
	Total	Urban	Rural	West	South	Centre	North	East and south east	No education	Primary	Secondary and over	15–24	25–34	35–44	45–49
0–4	1.034	1.100	0.985	1.106	1.084	0.983	1.078	0.983	1.030	1.040	1.046	1.029	1.045	1.009	(0.811)
5–9	1.033	1.092	0.993	1.102	1.137	1.120	0.761	1.007	1.017	1.070	(0.899)	0.982	1.003	1.112	0.963
10–14	1.019	1.101	0.945	0.995	1.126	0.880	1.049	1.067	0.991	0.979	(1.625)	—	1.030	0.987	0.992
15–19	1.004	0.975	1.023	1.053	0.970	0.978	0.960	1.026	1.009	1.002	(0.892)	—	0.908	1.017	1.003
20–24	1.149	1.243	1.085	1.271	(1.065)	1.165	0.868	1.169	1.122	1.291	(1.000)	—	—	1.081	1.227
25–29	1.045	0.950	1.113	1.038	(1.139)	1.135	(0.739)	1.061	1.011	(1.141)	(1.273)	—	—	0.761	1.170
Total	1.032	1.085	0.997	1.092	1.086	1.011	0.929	1.030	1.022	1.046	1.068	1.013	1.017	1.029	1.077

NOTE: Ratios shown in brackets were calculated with a denominator (female births) of less than 100 cases.
Source: TFS 1978

Table 22 Proportion dead of children ever born, by sex and by current age of mother

Mother's current age group	Total	Male	Female
15–19	0.170	(0.143)[a]	0.192
20–24	0.164	0.180	0.148
25–29	0.166	0.159	0.173
30–34	0.205	0.205	0.206
35–39	0.229	0.232	0.225
40–44	0.259	0.263	0.255
45–49	0.266	0.284	0.248
Total	0.223	0.228	0.218

[a]Less than 100 births.
Source: TFS 1978

age-specific fertility rates show the effects of digit preference, grouping the data eliminates these effects and produces consistent results. Tabulations of children ever born by subgroups show large differentials between educational levels, between urban and rural areas, and between more and less developed regions. Comparisons with the 1970 census show that the TFS has produced higher and more consistent mean parity levels, pointing to omission in the census. Comparisons with other estimates of TFR show that the most plausible and consistent figures come from the TFS.

Cohort period rates and mean birth interval lengths provide no support for exaggeration of trends due to date misplacement, and the effects of potential omissions (or age selectivity) are limited to the oldest cohort 20 or more years prior to the survey. There is, however, an anomalous cohort born during the second world war which has higher nuptiality and fertility than any other.

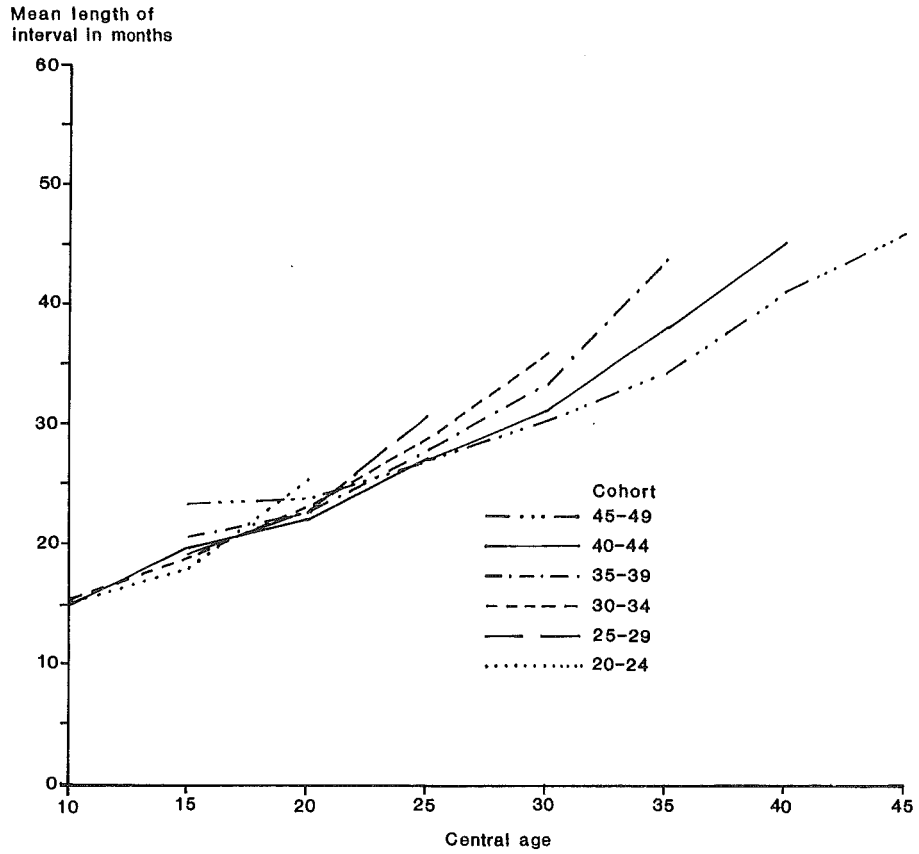

Figure 13 Mean length of closed birth intervals ending in period containing central age for birth cohorts of mothers, TFS 1978

6 Infant and Child Mortality

The individual questionnaire provides information on age at death of each child who died. This information, together with the date of each live birth reported in maternity history and the survival status of the child at the time of the survey, enables us to estimate infant and child mortality directly in the form of standard cohort measures. These measures are the probability of dying between birth and exact age 1 ($_1q_0$), the probability of dying between exact age 1 and exact age 5 ($_4q_1$), and the probability of dying between birth and exact age 5 ($_5q_0$).

The mortality information may be affected by incorrect reporting of either the date of birth or the date of death of the children and by omission of children who have died. While the omission of dead children results in infant mortality rates that are too low, the incorrect reporting of dates of births and deaths distorts the trends of mortality calculated over time.

Table 23 shows infant and child mortality rates for five-year calendar periods prior to the survey. The estimates indicate a steady decline in mortality, with the exception of the period 1948–52.

Three-year moving averages of single-year infant and child mortality rates are plotted in figure 14. Although the infant and child mortality rates are very high, a rapid decline can be observed in all rates from 1958 onwards. The declines in the probabilities of dying in the first five years of life ($_5q_0$) and between ages 1 and 5 years ($_4q_1$) are more rapid than the decline for the first year of life ($_1q_0$).

For the years prior to 1958, the overall child mortality for the first five years of life and probabilities of dying between one and five years show a sharp dip centred on the year 1953. However, the infant mortality rate shown by the survey maintains its high value although a considerable dip can be observed in the year 1953, which suggests that omission of children who died stemmed from both those who died before and after reaching one year of age, or more likely it may be due to age misreporting of living children (25 years old at survey). As the three curves shown in figure 14 reflect similar dips for the years around 1958 (children aged 20), we cannot explain the lower mortality probabilities only with incorrect reporting of age at death of children. Therefore we may strongly argue that there is evidence of heaping of dates of birth due to age misreporting for children for the years prior to 1958. However, we have noted in chapter 5 a possible omission of female children by examining the sex ratios of births for the period 20–24 years prior to survey, and we have indicated that the proportion dead for females showed a slight decline for the 45–49 age group of mothers, reflecting the evidence of omission of girls who have died for this cohort of women aged 45–49.

The data below show a comparison of the probabilities of dying in the first year of life ($_1q_0$) for five-year calendar periods, as derived from TFS and the estimates of Ayse Ergin (1975) based on a survey of pregnancy histories by Hacettepe Institute of Population Studies (1973).

Period	TFS	Estimates based on 1973 survey data[a]
1948–52	0.174	0.237
1953–57	0.190	0.200
1958–62	0.173	0.164
1963–67	0.141	0.139
1968–72	0.134	0.106

[a]Ayse Ergin: Estimation of Infant Mortality Trends From Pregnancy Histories. MSc thesis submitted to Hacettepe Institute of Population Studies, Ankara, 1975.

The two sets of estimates are rather close to one another except for the periods of 1948–52 and 1968–72. For the 1948–52 period the discrepancy may be a result of a possible omission of deceased children in TFS as

Table 23 Probabilities of infant and child death for periods prior to the survey 1943–77

Period	Probabilities of death								
	Total			Urban			Rural		
	$_1q_0$	$_4q_1$	$_5q_0$	$_1q_0$	$_4q_1$	$_5q_0$	$_1q_0$	$_4q_1$	$_5q_0$
1943–47	0.252	0.151	0.365	0.268	0.122	0.357	0.237	0.178	0.373
1948–52	0.174	0.120	0.273	0.179	0.078	0.243	0.171	0.147	0.293
1953–57	0.190	0.116	0.284	0.173	0.085	0.243	0.202	0.140	0.314
1958–62	0.173	0.085	0.243	0.163	0.060	0.213	0.180	0.099	0.261
1963–67	0.141	0.059	0.192	0.114	0.041	0.150	0.158	0.072	0.219
1968–72	0.134	0.044	0.172	0.116	0.029	0.142	0.145	0.055	0.192
1973–77	0.117	0.018	0.133	0.100	0.010	0.109	0.131	0.023	0.151

7 Summary of Conclusions

Overall, the demographic data of the Turkish Fertility Survey appear to be of reasonably high quality, producing levels and trends in fertility, nuptiality and infant and child mortality that are free from significant biases due to omission and misreporting of ages and dates. The most prevalent error found was that caused by digit preference; that error does not have a substantial effect on grouped data, except for women 45 years of age and over, who were excluded from individual interview as a result. Specifically, the conclusions may be summarized as follows.

Age reporting

The amount of digit preference varies substantially with education, type of area and development of region of residence, and has improved substantially over the 1975 census. Women 45–49 were excluded from individual interview because of overstatement of age on the household schedule. There seems to have been genuinely fewer women born during the second world war, resulting in the small cohort now aged 35–39. There seems to have been omission in the household schedule of children age less than 10.

Nuptiality

A large increase in age at marriage has taken place in the last 15 years, particularly in the last five. Comparisons of reconstructed distributions of the TFS with those of earlier censuses point to omission of non-legal unions in the census. There is some evidence for digit preference in dates of marriage from distribution of marital duration.

Fertility

A substantial decline in fertility has occurred in Turkey, especially in the last five years. Comparisons with other estimates and internal comparisons produce no evidence to doubt this trend nor the current levels of fertility. Comparisons of the household age distribution with a 1 per cent sample of the 1980 census did produce, however, an indication of possible omission of children less than ten years old, which could possibly influence the reporting of births in the birth history. On the other hand, there are indications of substantial recent changes in nuptiality and a rather high proportion of current users of contraception. There are perturbations to data on fertility: The cohort now aged 35–39 seems to have genuinely higher fertility, although fertility-selective age misreporting cannot be entirely ruled out, while the early fertility of the cohort now aged 45–49 appears affected by age misreporting resulting in some of the cohort members being excluded from the individual survey.

Infant and child mortality

The single-year estimates of past levels of mortality seem affected by misreporting, omission and for small numbers until at least the year 1958. None the less, estimates for five-year calendar periods show that remarkable declines have taken place in the mortality of infants and other children both in urban and rural areas.

References

Brass, W. (1978). Screening Procedures for Detecting Errors in Maternity History Data. WFS Technical Paper no 810.

Brass, W. (1980). Birth History Analysis. *World Fertility Survey Conference 1980: Record of Proceedings*, vol 3: 143–69. Voorburg: International Statistical Institute.

Cerit, S. (1979). *Nufus Bilim Dergisi: 29.*

Coale, A.J. (1971). Age Patterns of Marriage. *Population Studies 25(2)*: 193–214.

Coale, A.J. (1977). The Development of New Models of Nuptiality and Fertility. *Population*, numéro spécial: 131–54.

Coale, A.J. and D.R. McNeill (1972). The Distribution by Age of the Frequency of First Marriage in a Female Cohort. *Journal of the American Statistical Association 67*: 743–9.

Ergin, A. (1975). Estimation of Infant Mortality Trends from Pregnancy Histories. M Sc thesis submitted to Hacettepe Institute of Population Studies, Ankara.

Hacettepe Institute of Population Studies (1978). *1973 Survey of Population Structure and Population Problems.* Ankara.

Ministry of Health and Social Welfare (1970). *Turkish Demographic Survey.* Ankara.

Ozbay, F., F. Shorter and S. Yener (1977). Accounting for the Trend of Fertility in Turkey. Paper presented to the Expert Group Meeting on demographic transition and socio-economic development, UNPFA, Istanbul.

Potter, J.E. (1977). Problems in Using Birth History Analysis to Estimate Trends in Fertility. *Population Studies 31(2)*: 335–69.

Rodríguez, G. and J. Trussell (1980). Maximum Likelihood Estimation of the Parameters of Coale's Model Nuptiality Schedule from Survey Data. *WFS Technical Bulletins* no 7.

State Institute of Statistics (1965). *Census of Population.* Ankara.

State Institute of Statistics (1970). *Census of Population.* Ankara.

State Institute of Statistics (1975). *Census of Population.* Ankara.

State Institute of Statistics (1977). *25.10.1970 Census of Population, Social and Economic Characteristics of Population.* Ankara.

State Institute of Statistics (1980). *Census of Population: Preliminary Results.* Ankara.

US Department of Commerce (1980). *Country Demographic Profiles: Turkey.* Bureau of the Census: Washington.