Adolescent Pregnancy

Issues in Adolescent Health and Development

Department of Child and Adolescent Health and Development
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Preface

There is widespread acknowledgement that although adolescents share many characteristics with adults, their health-related problems and needs are different in a number of significant respects. Following on from this, there is a growing recognition among clinicians and public-health workers alike that the approaches used to prevent and respond to health problems in adults need to be tailored (to a greater or lesser extent) if they are to meet the special needs of adolescents.

The Department of Child and Adolescent Health and Development (CAH) in collaboration with other WHO departments has initiated a series of literature reviews and discussion papers, in order to identify existing recommendations on clinical management, and to assess how appropriate these are for adolescents across a wide range of health issues. This process has also led to the formulation of new recommendations on clinical management where none existed, or where existing ones are inappropriate.

This same process is also contributing to the improvement of existing WHO guidelines and algorithms and to the development of new ones to enable health-care providers to meet better the special needs of adolescents more effectively and with sensitivity. Even though WHO advocacy statements often draw attention to the particular vulnerabilities of adolescents, its guidelines on clinical management still tend to be directed towards meeting the needs of adults.

The purpose of this current review is to look specifically at data that address various aspects of ***pregnancy*** in adolescents. It is acknowledged that available data are often not disaggregated to show the special vulnerabilities and issues for adolescents.

In addition to the present work, reviews and discussion papers have also been carried out – and corresponding documents produced – in the areas of:

- Contraception
- Lung health
- Malaria
- Nutrition
- Sexually transmitted infections
- Unsafe abortion

Work is also under way to develop similar documents on HIV/AIDS care; chronic illness; mental health; and substance abuse.

PART 1
Introduction

1.1 Preamble

In recent decades adolescent pregnancy has become an important health issue in a great number of countries, both developed and developing. However, pregnancy in adolescence (i.e. in a girl <20 years of age) is by no means a new phenomenon. In large regions of the world (e.g. South Asia, the Middle East and North Africa), age at marriage has traditionally been low in kinship-based societies and economies. In such cases most girls married soon after menarche, fertility was high, and consequently many children were born from adolescent mothers. This was not considered to be a problem. In contrast, in Europe during the 18th and 19th centuries, age at marriage was relatively high, and social control strongly discouraged premarital sex; if conception occurred this was usually followed by an early marriage. Such social control by parents and family declined as economies developed and as the education and training of young people was extended and undermined parental authority. In many Western societies over the last century, the incidence of sexual intercourse among adolescents and the number of pregnancies sharply increased, especially after the Second World War. In the 1960s and 1970s both society at large and health authorities increasingly viewed the growing numbers of adolescent pregnancies as a problem. Comparable developments took place in many developing countries (e.g. in sub-Saharan Africa and Latin America) and in many of these countries there has been a gradual shift away from extended family structures and towards nuclear families. With this change in family structure and way of living, the role of members in the hitherto extended family in educating and acting as role models for young people in sexual behaviours has disappeared (Ojwang & Maggwa, 1991).

Two key events during adolescence have strongly influenced these developments. The first is the changing age at menarche, with median age varying substantially among populations (ranging from about 12.5 years in contemporary Western countries to more than 15 years in poor developing countries; Becker, 1993). Historical data from the USA and several European countries show a clear secular trend, with age at menarche declining at a rate of 2–3 months per decade since the 19th century, resulting in overall declines of about three years (Wyshak & Frisch, 1982; Bongaarts & Cohen, 1998). In developing countries, age at menarche is often inversely correlated with socioeconomic status, and significant differences exist between urban and rural populations, and between high- and low-income groups (Marshall & Tanner, 1986). The timing of menarche in populations is probably affected by a variety of environmental, genetic, and socioeconomic factors, but most analysts consider nutritional status to be the dominant determinant (Bongaarts, 1980; Gray, 1983; Bongaarts & Cohen, 1998).

The second key event influencing adolescence is schooling. Education leads to social and economic benefits for individuals, and in Western countries in the last century, the prevalence of secondary schooling during adolescence has markedly increased, and in developing countries in the past four decades school attendance has also risen substantially. One implication of these trends is that a larger proportion of the period of adolescence for boys and girls is spent in school (Bongaarts & Cohen, 1998). Such increased schooling has made adolescents less dependent on parents and family, and has postponed the age at marriage, and thereby the age of socially sanctioned sexual relations (see also section 3.8).

Both these events (declining age at menarche and increased schooling) have prolonged the period of adolescence. Together with a growing independence from parents and families, this has led in recent decades to more premarital sexual relations and increasing numbers of adolescent pregnancies.

1.2 Aims, content and methodology of this review

This document aims to examine the incidence of adolescent pregnancies and their social background, to identify the possible health problems specific to pregnant adolescents and to discuss their clinical management. In addition, the prevention of unwanted pregnancies in adolescents, the use of contraception and induced abortion are also discussed. To achieve these goals a search of the literature has been made from both developed and developing countries. This literature has been critically reviewed, with special attention given to the differences between adults and adolescents, the complications and outcomes of their pregnancies and to the care received during pregnancy, labour and the postpartum period. Attention has also been given to the literature on the social background of adolescent pregnancies, on unsafe abortion and on the prevention of pregnancies in adolescents. In selecting the relevant literature, preference has been given to population and community-based data and to methodologically sound research. Most studies that meet these conditions are carried out in large centres in the USA, Western Europe and other developed countries, but excellent research data are also available from developing countries such as India, and from some countries in Africa and Latin America. Nevertheless, confining this review to methodologically reliable research alone would still cause a regional imbalance in the available evidence; an effort has therefore been made to include other data from other countries, including hospital-based data. Although such studies (usually confined to patients in a specific hospital) can provide interesting information, they may also be biased because in many developing countries many pregnant women deliver at home and only go to a hospital in case of emergency. Even in developed countries where almost all pregnant women deliver in hospital, there are still referral biases causing differences between hospital populations. Thus hospital-based studies may not be fully representative for the population as a whole.

The contents of the current document can usefully be divided as follows:

- **PARTS 1–3** are devoted to background information on adolescent pregnancies. **PART 2** deals with incidence in various countries and regions. It is impossible to gain insights into the problems of adolescent pregnancies without knowledge of their incidence. The latest available figures from United Nations organizations are given, supplemented and illustrated by information from regional research and data from local hospitals and clinics. In a number of developed countries exact data from population registries are available, but in many other countries, quantitative population data are less accurate and the incidences given in these countries should be considered as best estimates. In **PART 3** various aspects of the social background of pregnant adolescents are described including: social deprivation in developed and developing countries; sexual and family relations; unsafe abortion; physical abuse; risk behaviour; urbanization; and education. The quantitative and qualitative data in this chapter are derived primarily from sound population-based studies, and these are indicated with an asterisk (*). In some cases, information originating from reviews or from more localized or casual observations is also given.

- **PARTS 4–7** identify the health problems encountered by adolescents during pregnancy, labour and the postpartum period, and critically review the literature on the outcomes of adolescent pregnancies compared with those of adult pregnant women. As stated above, some studies are mentioned which are based upon data from a single hospital or from other non-representative samples of a population. However, the conclusions drawn (e.g. on the incidence of specific health problems among adolescents) are founded upon selected studies meeting specific methodological requirements. Such studies are based upon a representative sample of a regional or national population, they include a representative control group of adult pregnancies (if appropriate with the same parity), and possible differences are statistically evaluated. In the text such selected studies are once again marked with an asterisk.

- **PARTS 8–10** present a review of the various aspects of care for the pregnant adolescent during the antenatal period, labour and postpartum. Aspects of care that may be different for adolescents and adult pregnant women are identified, as are differences in the incidence or seriousness of their respective problems. In **PART 11** care aimed at the prevention of pregnancies will be

discussed. Studies on the effectiveness of various forms of care are critically assessed, and therefore the availability of an adequate control group is essential. The standard here is the randomized controlled trial. Once again studies selected because of methodological quality are marked with an asterisk.

- In the final section (**ANNEX I),** conclusions and recommendations based on selected studies are drawn in relation to a range of health problems and practices, and these are classified by type of evidence; the conclusions and recommendations are as mentioned earlier.

PART 2
Incidence of adolescent pregnancies

2.1 Definitions

The term "adolescent" is often used synonymously with "teenager". In this sense "adolescent pregnancy" means pregnancy in a woman aged 10–19 years. In most statistics the age of the woman is defined as her age at the time the baby is born. Because a considerable difference exists between a 12- or 13-year-old girl, and a young woman of say 19, authors sometimes distinguish between adolescents aged 15–19 years, and younger adolescents aged 10–14 years. Birth rates and pregnancy rates are counted per 1000 of a specific population. Statistics comparing the incidence between countries often give rates per 1000 adolescents aged 15–19 years. Sometimes statistical data on pregnancies and births among younger adolescents are also available. The pregnancy rate includes pregnancies ending in births and also pregnancies ending in abortion; the abortion rate is the number of (induced) abortions per 1000 women of a specific age. The abortion ratio is the percentage of pregnancies ending in (induced) abortion.

2.2 Incidence in various regions and countries

In many countries large numbers of adolescent pregnancies and births are reported. If, as is usual in health statistics, it is births which are counted (as opposed to pregnancies) then this figure will depend to a large extent on the number of spontaneous and induced abortions. Although the number of spontaneous abortions probably does not differ substantially (even in various populations) the rates of induced abortions are widely divergent in different countries and among different social or ethnic groups. In some countries the registration of legally induced abortions is reliable, but in other countries (and in relation to illegal and unsafe abortion) figures are often based on rough estimates or even speculation.

In Table 1 and Figure 1 data on adolescent births in selected countries (assigned in accordance with UNICEF and UNFPA regional divisions) are shown. Although the statistical data published by UNICEF (1998) and UNFPA (1998) are not always identical, the differences are not fundamental. More important is the fact that registration rates differ widely between countries, especially developing countries. As a consequence, data on some developing countries shown in Table 1 are not definitive but instead represent a best estimate. In most developed countries reliable statistics are available on births, and in a number of countries data on abortions are also available (Singh & Darroch, 2000). In some countries, the figures given in Table 1 can be supplemented and illustrated by data from other (often more recent) publications as follows.

Sub-Saharan Africa

The regional average rate of births per 1000 females 15–19 years of age is 143, varying from 45 in *Mauritius* to 229 in *Guinea.* This is very high compared to the world average of 65. In some sub-Saharan African countries, one in five adolescent females gives birth each year, so almost all females are likely to have had a child by age 20. In some African countries 30–40% of all adolescent females experience motherhood before the age of 18 (Senanayake & Ladjali, 1994). From the mid–1970s to the early 1990s a trend towards lower adolescent fertility rates in a number of countries was observed – the largest changes being found in *Kenya* and *Senegal* (Singh, 1998).

- *Ethiopia* – the birth rate per 1000 females (15–19) is 168. In a survey in a teaching hospital (Tikur Anbessa) of 7385 women who gave birth 18.2% were adolescents (Yoseph, 1989).

- *Kenya* – in 1987 the incidence of adolescent pregnancy (14–19 years) in two major birth centres in Nairobi was 10.5%. Only 30.2% of these adolescents were primiparous, the rest having had at least one delivery before the index delivery (Odongo & Ojwang, 1990). From 1960 to 1979 the pregnancy rate for girls aged 15–19 years increased from 141 to 168 per 1000 (Ojwang & Maggwa, 1991). The most recent figure for the birth rate per 1000 females (15–19) is 101.
- *Uganda* – in a national fertility survey (1988–1989) 4510 young men and women (aged 15–24 years) were interviewed. Of the female respondents aged 15–19, 25.6% reported ever having been pregnant; with 15% of these pregnancies ending in termination. Of these adolescents 8.6% were pregnant at the time of the interview (Agyei & Epema, 1992). The most recent figure for the birth rate per 1000 females (15–19) is 179.
- *Zambia* – in the local population attending the University hospital in Lusaka in the 1980s, the incidence of adolescent pregnancy (12–19 years) was 22.5%. Parity 5 was observed in women at the age of 18 and 19 (Wadwahan et al., 1982). A recent figure for the birth rate per 1000 females (15–19) is 132.

Middle East and North Africa

The regional average rate of births per 1000 females 15–19 years of age is 56, varying from 18 in Tunisia to 122 in Oman. In several countries a significant decline was observed in adolescent pregnancies between the mid 1970s and the early 1990s (Singh, 1998).

- *Israel* – in the Haifa district between 1984 and 1988 the mean number of annual deliveries by adolescents 15–19 years old was 321, corresponding to a birth rate of 19 live births per 1000 adolescent girls, and 3.1% of all deliveries in the district (Hardoff et al., 1996). These rates are relatively low. Of the study population 57.7% were Jews, and 42.3% Arabs. In Israel the national birth rate per 1000 females (15–19) is 19.
- *Kuwait* – the birth rate per 1000 females (15–19) is 31. Of all women giving birth in a hospital 8.4% were adolescents and 40.5% of them were <16 years of age (Al-Sherhan et al., 1997).
- *Saudi Arabia* – the birth rate per 1000 females (15–19) is 114. The average age at marriage is 14 years, and average age at first pregnancy is 16 years (Khwaja et al., 1986).
- *Sudan* – the birth rate per 1000 females (15–19) is 52. In a rural community over a period of three years (1985–1988) 6275 pregnant women were monitored by village midwives. Of these 13% were adolescent mothers aged <20 years (Ibrahim et al., 1992).

Central Asia

The regional average rate of births per 1000 females 15–19 years of age is 59, varying from 19 in Azerbaijan to 152 in Afghanistan (UNICEF, 1998).

East/South Asia and Pacific

The regional average rate of births per 1000 females 15–19 years of age is 56, varying from 4 in Japan to 115 in Bangladesh. Since the mid 1970s, some of the higher levels observed in some countries of South Asia have decreased (Singh, 1998). In South Asia the early marriage of adolescents is common; and 25–35% of adolescent girls in Pakistan, Bangladesh, India and Nepal begin childbearing as early as 17 years (UNFPA, 2001).

- *Bangladesh* – between the ages of 15 and 19 years, 69% of females marry. Most marriages in the villages occur soon after menarche. These early marriages result in a high proportion of first pregnancies before the age of 19 (Rahman et al., 1989). Of 4634 live births in one rural area, 34% of first and 5% of second births were to adolescents <20 (Alam, 2000). The birth rate per 1000 females (15–19) is 115.
- *India* – the birth rate per 1000 females (15–19) is 107. There are however considerable differences between rural and urban regions: in rural areas the adolescent birth rate is 121/1000 while in Delhi it is 36/1000 (NFSH-2, 1998–99).
- *Pakistan* – the birth rate per 1000 females (15–19) is 89. In two hospitals in Lahore 1907 (7%) of 25,833 women who gave birth were adolescents (Malik et al., 1996).

- *Sri Lanka* – the birth rate per 1000 females (15–19) is 20. In a general hospital in Anuradhapura during 2 years 16,299 women gave birth, among whom 1600 (9.8%) were adolescents (Weerasekera, 1997).
- *Australia* – in South Australia between 1970 and 1974 and 1985 and 1989, a decline of 28.5% in the pregnancy rate per 1000 women aged 15–19 years was reported (from 53.6 to 38.3 per 1000 women). Over the same period, the abortion rate first rose but then tended to fall in the 1980s. The proportion of adolescent pregnancies that were terminated rose from 21% in 1970–1974 to 48% in 1985–1989 (Zhang & Chan, 1991). Recently the birth rate per 1000 females (15–19) is 19.8, the abortion rate 23.8 and the pregnancy rate 43.7 (Singh & Darroch, 2000).
- *New Zealand* – the birth rate per 1000 females (15–19) is 34, and the abortion rate is 20 (Singh & Darroch, 2000). In 1997 the adolescent birth rate for Maoris was nearly five times that of European adolescents (Dickson et al., 2000). In a longitudinal study of a cohort of 533 young women born in 1971 in Christchurch 26 % had been pregnant at least once by the age of 21, and 14% had become parents (Woodward et al., 2001).

Europe

The regional average rate of births per 1000 females 15–19 years of age is 25, varying from 4 in Switzerland to 57 in Bulgaria.

- *Czech Republic* – in 1988 the adolescent pregnancy rate was 72/1000, the abortion rate 22/1000 and the birth rate 50/1000 (Wadhera & Millar, 1997). More recent figures are: birth rate per 1000 females (15–19) 20.1; abortion rate 12.3; and pregnancy rate 32.4 (Singh & Darroch, 2000).
- *Greece* – the birth rate per 1000 females (15–19) is 18. In one study in Athens, of 5154 deliveries, 549 (11%) were to adolescents 13–19 years old (Creatsas et al., 1991).
- *Hungary* – from 1984 to 1988 adolescent births represented 4.25% of all births in Hungary; this figure having increased since 1950 (Jakobovits & Zubek 1991). In 1988 the adolescent pregnancy rate (15–19 years) was 68/1000; the abortion rate 24/1000; and the birth rate 44/1000 (Wadhera & Millar, 1997). Latest figures are: birth rate per 1000 females (15–19) 29.5; abortion rate 29.6; and pregnancy rate 59.1.
- *Ireland* – between 1982 and 1991 the birth rate for women aged 15–19 years decreased from 21 to 16/1000. Two thirds of adolescent births occur in the 18–19 year group (Fitzpatrick et al., 1997). The latest figure for the birth rate per 1000 females (15–19) is 15.
- *Malta* – in St. Luke's Hospital (which serves 89% of the population of Malta) 20,072 deliveries took place between 1983 and 1986; of these 666 (3.3%) were to adolescents (Savona-Ventura & Grech, 1990).
- *Portugal* – according to Silva et al., (1993) the incidence of adolescent births was 91/1000 (which is higher than in other western European countries). This rate did not change from the early 1980s to the early 1990s. However, the latest official figure for the birth rate per 1000 females (15–19) is 20.9.
- Scandinavian countries – in *Finland* in 1993 the adolescent pregnancy rate (15–19 years) was 20/1000; the abortion rate 9.5 /1000; and the birth rate 10.5/1000. There were regional differences with the lowest pregnancy rate being 18/1000 and the highest 29/1000 (in *Lapland*). Since the 1970s (and especially since 1988) both birth rate and pregnancy rate have declined as a result of good contraception services for adolescents throughout the country (Rimpelä et al., 1992; Kosunen & Rimpelä, 1996). In *Sweden* the adolescent birth rate fell from 1970 to 1975 mainly because of abortion, but later both abortion rate and birth rate declined because of the availability of contraception for adolescents (Santow & Bracher, 1999). The same occurred in *Norway* and *Denmark*. The latest figures for the birth rates per 1000 females (15–19) are 13.5 (Norway), 7.7 (Sweden), 8.3 (Denmark) and 9.8 (Finland) while abortion rates are 18.7 (Norway), 17.2 (Sweden), 14.4 (Denmark) and 10.7 (Finland).
- *The Netherlands* – from the early 1970s to 1996 the number of births to adolescent mothers (<20 years) decreased strongly from more than 9000 (4% of all births) to 1936 (1% of all births) (Garssen & Sprangers, 1998). In recent years the abortion rate for adolescents (<20 years) has increased from 4.2 in 1992 to 8.6 in 2000 (Rademakers, 2002) with the abortion ratio (i.e. the percentage of adolescent pregnancies ending in abortion) at 62.7%. This increase in the number

of abortions is caused primarily (but not exclusively) by abortions among immigrants from developing countries. Contraception and abortion are freely available for adolescents.

- *The United Kingdom* – in the United Kingdom the figures for adolescent pregnancy are relatively high compared with other countries in Western and Northern Europe. In *England* and *Wales* in 1988 the adolescent pregnancy rate (15–19 years) was 45/1000; the abortion rate 19/1000; and the birth rate 26/1000 (Wadhera & Millar, 1997). More recent figures are: pregnancy rate 46.9; abortion rate 18.6; and birth rate 28.4. The number of pregnancies in girls <16 rose during 1994–1996 to a rate of 9.4 per 1000 girls aged 13–15 in 1996, a rise of 11% since 1995 when the rate was 8.4 per 1000 (BMJ News, 1998). In *Scotland* the pregnancy rate among adolescents (13–19 years) rose from 40/1000 in 1983 to 51/1000 in 1991, falling to 46/1000 in 1993 (Boulton-Jones & McIlwaine, 1995). Recent figures (15–19 years) are pregnancy rate 41.6; abortion rate 14.5; and birth rate 27.1.

Latin America

The regional average rate of births per 1000 females 15–19 years of age is 78, varying from 56 in Chile to 149 in Nicaragua (UNFPA, 1998). In most countries of the region there is no indication of a decreasing trend, and in some an increase has been observed (Singh, 1998). In some parts of Latin America, 30–40% of all adolescent females experience motherhood before the age of 18 (Senanayake & Ladjali, 1994).

- *Mexico* – in 1990, 25.1% of the total population (85.7 million) was between 10–19 years of age. In 1986, women aged 15–19 had a birth rate of 84 per 1000, and 17% of live births occurred in those <20 years of age (Pick de Weiss et al., 1991). The latest figure for the birth rate per 1000 females (15–19) is 77.
- *Nicaragua* – the birth rate per 1000 females (15–19) is 149. In this country 24% of the entire population are adolescents (10–19 years old). By the age of 15 years around 25% of boys and girls are sexually active, and by the age of 17, 25% of women have already had a first pregnancy (Zelaya et al., 1997).
- *Brazil* – the birth rate per 1000 females (15–19 years) is 71. In the public hospitals 15–25% of the mothers delivering babies are adolescents (Pinto e Silva, 1998). The Brazilian adolescent population is approximately 35 million. Data on abortion are lacking.

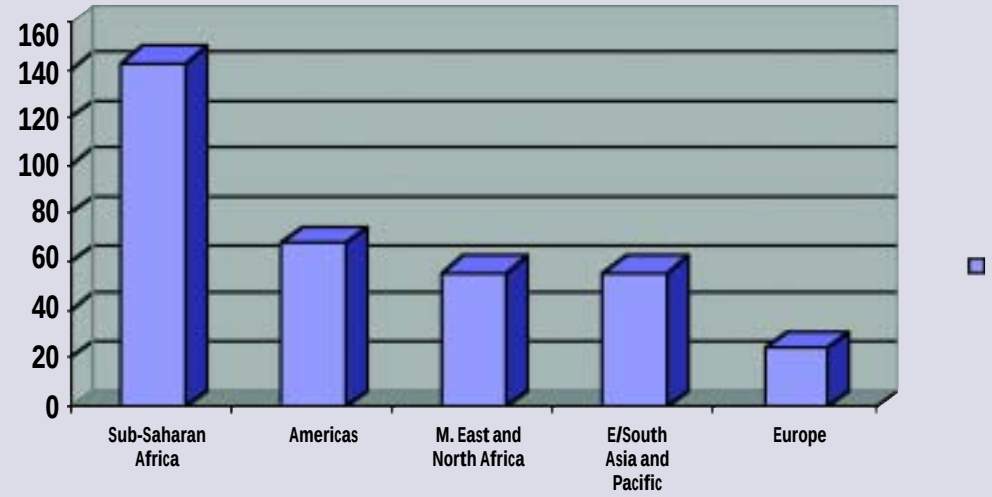
North America

- *USA* – pregnancy rates and birth rates among adolescents are among the highest in the developed countries, although in the 1990s there was some decline (Ventura & Freedman, 2000). In the mid 1990s among adolescents (15–19 years) the pregnancy rate was 83.6; the abortion rate 29.2; and birth rate 54.4 (Singh & Darroch, 2000). There are however wide differences between the states, and in 1996 the state with most adolescent pregnancies was Nevada (pregnancy rate 15–19: 140) followed by California (pregnancy rate 125), Arizona (118), Florida (115) and Texas (113). Low birth rates among adolescents were attained not only in states with low pregnancy rates (e.g. North Dakota: pregnancy rate in 1996: 50; birth rate 32) but also in states with high pregnancy and abortion rates (e.g. Massachusetts: birth rate 32, abortion rate 37) (Henshaw, 1997; Henshaw & Feivelson, 2000).
- *Canada* – although near and culturally similar to the USA, the adolescent pregnancy rate in Canada is much lower. Recent figures per 1000 females (15–19) are: pregnancy rate 45.4; abortion rate 21.2; and birth rate 24.2.

Table 1: Births per 1000 females age 15–19 years (UNICEF, 1998)

Sub-Saharan Africa		M. East & N. Africa		East/South Asia & Pacific		Americas		Europe	
Mauritius	45	Tunisia	18	Japan	4	Canada	24	Switzerland	4
Rwanda	54	Israel	19	Korea Rep	4	Chile	49	Netherlands	7
South Africa	70	Algeria	24	China	5	Trinidad	51	France	8
Botswana	83	Lebanon	26	Korea Dem	5	Haiti	53	Italy	8
Kenya	101	Morocco	28	Singapore	8	Peru	57	Belgium	9
Namibia	104	Kuwait	31	Cambodia	15	USA	60	Denmark	9
Zimbabwe	114	Turkey	43	Sri Lanka	20	Uruguay	60	Spain	10
Ghana	115	Jordan	44	Australia	22	Argentina	64	Sweden	10
Togo	119	Syria	44	Papua N Guin	24	Cuba	65	Finland	11
Mozambique	124	Iraq	45	Malaysia	26	***Reg. average***	***68***	Germany	13
Tanzania	124	Sudan	52	Myanmar	31	Mexico	69	Ireland	14
Eritrea	128	***Reg. average***	***56***	N Zealand	32	Brazil	71	Norway	16
Zambia	132	Egypt	62	Viet Nam	33	Ecuador	71	Greece	18
C. Afr. Rep.	134	U Arab Emir	73	Mongolia	39	Colombia	74	Austria	21
Congo	136	Iran	77	Philippines	40	Paraguay	76	Lithuania	22
Nigeria	138	Yemen	101	Lao Rep	50	Bolivia	79	Portugal	22
Cameroon	140	Libya	102	***Reg. average***	***56***	Panama	81	Belarus	24
Madagascar	142	Saudi Arabia	114	Indonesia	58	Dom. Rep.	88	Poland	25
Senegal	142	Oman	122	Thailand	70	Jamaica	88	***Reg. average***	***25***
Reg. average	***143***			Bhutan	84	Costa Rica	89	Estonia	27
Gambia	153			Nepal	89	El Salvador	92	Slovenia	27
Burkina Faso	157			Pakistan	89	Venezuela	98	Bosnia/Herzeg.	29
Malawi	159			India	109	Guatemala	111	Hungary	29
Ethiopia	168			Bangladesh	115	Honduras	113	Latvia	30
Chad	173					Nicaragua	133	Albania	31
Gabon	175							Croatia	31
Uganda	179							UK	31
Guinea Bissau	180							Moldova Rep.	32
Mali	181							Czech Rep.	35
Sierra Leone	201							Slovakia	35
Congo Dem Rp	206							Ukraine	36
Liberia	206							Yugoslavia	38
Niger	206							Russian Fed.	39
Somalia	208							Macedonia	40
Angola	212							Romania	43

Figure 1: Average number of births per 1000 females age 15–19 in various regions (UNICEF, 1998)



2.3 Summary

The incidence of adolescent pregnancy and adolescent birth is widely divergent. For most countries comparable figures are available on birth rates among adolescents aged 15–19 years. In some countries figures for pregnancy rates are also known. The highest adolescent birth rates occur in sub-Saharan Africa, and in some countries in South Asia and Latin America. Intermediate figures are found in the Middle East and North Africa, in the USA and Eastern Europe. In developed countries the highest incidences of adolescent pregnancies, abortions and births are recorded in the USA, with a tendency to decreases in recent years. Somewhat lower figures are obtained in Canada, Australia and the United Kingdom. Other countries in Western and Northern Europe, such as the Scandinavian countries and the Netherlands, have low pregnancy and birth rates. The lowest adolescent birth rates are found in the Scandinavian countries, Switzerland, the Netherlands, Japan, Korea and China. In the Scandinavian countries and the Netherlands pregnancy rates and abortion rates are known. In spite of the fact that in these countries abortion is free, pregnancy rates and abortion rates are remarkably low, due to the fact that contraception is also easily available for adolescents.

PART 3
Social background

3.1 Ethnic differences

As outlined in the Preface to this document much of the available population-based and methodologically sound research has been conducted in developed countries. In the USA differences between ethnic groups in the incidence and outcome of adolescent pregnancies have been studied; and among such groups birth rates differ markedly. In the youngest age groups of adolescent mothers (10–14 years) black people are disproportionately represented (*Cooper et al., 1995) and the same holds true among women who have had two consecutive pregnancies as an adolescent (*Blankson et al., 1993). *Leland et al. (1995) found that among 38,551 US resident adolescents aged 10–14 years the birth rate was 4.29 per 1000 for black people (more than 7 times the rate for white people of 0.59 per 1000). In 1997, birth rates for adolescents (15–19 years) were 36 for non-Hispanic white people, 88.2 for black people, 71.8 for native Americans and 97.4 for Hispanics (*Ventura & Freedman, 2000).

3.2 Social deprivation

In the USA, race is a predictor of poverty. In 1992, of the 14.6 million US children (21.9% of all US children under age 18) who lived in poverty, 17% were white, 47% African-American, and 40% were Hispanic (*Sells & Blum, 1996). The interaction between race, social deprivation and fertility is also very strong. In California, the proportion of families living below poverty level within a given zip-code area was highly related to the birth rate among young adolescents (*Kirby et al., 2001).

In the United Kingdom *Reading et al. (1993) measured social inequalities in health and use of health services among children in Northumberland. They found that between the most deprived and most affluent areas, the percentage of adolescent mothers varied from 18% to 3% respectively. *Sloggett & Joshi (1998) investigated the association between the level of social deprivation in electoral wards in England and Wales, and various life events. They concluded that adolescent birth showed a clear, significant and approximately linear association with social deprivation of ward of residence. They found indications that individual deprivation leads to the intergenerational transmission of social and economic disadvantage through early childbearing. *McCulloch (2001), using census records, came to similar conclusions. In Scotland during the three years 1990–1992, *Boulton-Jones et al. (1995) recorded 33,275 adolescent pregnancies and studied the relation to deprivation. At all ages (13–19 years) the pregnancy rate increased with deprivation, with a fourfold to fivefold difference in the rate between the women living in deprivation category 1 (most affluent) and those in deprivation category 7 (most deprived). *McLeod (2001) came to the same conclusion: from the 1980s to the 1990s pregnancy rates in adolescents increased in socially deprived areas but there was no change or a decrease in more affluent areas.

In Australia (Queensland) birth rates to adolescents who live in disadvantaged areas are two to four times higher than the rates for all of Queensland and 10 to 20 times higher than the rates in affluent areas (*Coory 2000).

An investigation in five developed countries (Canada, France, Sweden, the United Kingdom and the USA) was carried out by researchers of the Alan Guttmacher Institute (Singh et al., 2001). Adolescent childbearing was more likely among women with low levels of income and education than among their better-off peers. The authors concluded that comparatively widespread disadvantages in the USA helped to explain why US adolescents have higher pregnancy and birth rates than those in other developed countries.

In developing countries, comparable relations between poverty and adolescent childbearing are observed. In Nicaragua, a multidisciplinary study was conducted aimed at understanding the complex social, economic, cultural and psychological contexts of unwanted and adolescent pregnancy. The information originated from in-depth interviews with adolescent girls. One of the main conclusions was that in Nicaragua unwanted pregnancy is to a large extent just another characteristic of poverty. Almost all of the women approached (for whom an unplanned pregnancy was both a frequent condition and a serious problem) came from and still lived under circumstances that could be described as destitution. Typically these women grew up in broken families with no or very poor contact with their fathers. Poor economic conditions, low self-esteem and lack of moral support from home implied early dropout from school. Material dependency, the craving for emotional affection, lack of alternative opportunities and culturally sanctioned female subordination to machismo values leave very few options for a poor woman other than the physical and material protection of a man as a last resort (*Berglund et al., 1997).

As a general rule, poverty leads to increased childbearing among adolescents too, because the greater the disadvantage within a population, the less difference adolescent childbearing makes in determining long-term success. Poor people have few opportunities and reasons to avoid or delay childbearing, and simply see no reason not to get pregnant (Furstenberg, 1998; Mawer, 1999).

3.3 Age at marriage

In a number of countries age at marriage is an important factor determining the age at which the first pregnancy occurs. Marriage generally occurs earlier in developing than in developed regions. The age at which 50% of girls are married (median age at marriage) ranges from about 16 in South Asia, 17 in sub-Saharan Africa, 18 in Western Asia and 19 in North Africa to above 20 in Latin America (Fathalla, 1994). Countries with the earliest median age at marriage are Bangladesh (14.1), Niger (15.1), Yemen (15.8), India (16.1) and Senegal (16.4) (*Singh & Samara, 1996). However, in sub-Saharan Africa and in some South-Asian countries there is now a trend towards increased age at marriage (Westoff et al., 1994).

In the Arab world, patterns of early and near universal marriage prevail. Marriage often translates into immediate childbearing as women and their families are anxious to prove the fecundity of the newlywed. There is some evidence of a decrease in the prevalence of early marriage, yet for some countries the latest figures still show that a significant group of females less than 20 years old are married, reaching 37% in Oman and 19% in the United Arab Emirates (Zurayk et al., 1997).

In India, although the legal age at marriage is 18 for females and 21 for males, early marriage continues to be the norm (by age 15 as many as 26% of females are married). By the age of 18, this figure rises to 54%. Most reproduction in India occurs within marriage, so the low age at marriage automatically links to early onset of sexual activity, and thereby fertility (Gupta, 2000).

Although marriage at an early age provides social recognition and approval of a sexual relation and of a pregnancy, it is clear that marriages and pregnancies among very young girls (shortly after their menarche) involve great disadvantages for their education and psychological development, and are harmful to their health. In those countries and regions where early marriage is common, a pregnancy soon after marriage is often considered desirable. Even so, in the Middle East and North Africa young women aged 15–19 report that some 15–20% of their births are unwanted (Alan Guttmacher Institute, 1996). Moreover, in those countries where marriages of very young girls are common, gender discrimination against women often occurs. This means that women (especially young girls) receive less and inferior food, receive inadequate health care, and are given an additional burden of work both inside and outside the home. The main task of a woman in such settings is often assumed to be bearing children (Gupta, 2000).

3.4 Sexual behaviour, contraceptive use and unplanned pregnancy

Developed countries

Even though sexual activity starts at an early age in many developed countries in Europe, adequate contraception is often available for adolescents, as are abortion facilities in several countries. Despite differences between such countries, the number of pregnancies and births in adolescents is relatively low compared to other regions of the world. In some countries in East Asia (e.g. Japan) strong religious and political control discouraging premarital sex suppresses the levels of adolescent childbearing (with abortion probably also playing a role) but exact data are lacking. In the USA, public discourse favours abstinence for unmarried adolescents, but privately this standard is disregarded. This mixed message results in high rates of adolescent pregnancies and births (Furstenberg, 1998).

A comparison has been made of adolescent sexual behaviour and contraceptive use in five countries (Canada, France, Sweden, the United Kingdom, and the USA) (*Darroch et al., 2001). The results show that the proportion of women who had their first intercourse before age 20 (75–86%) and the median age at first intercourse (17.1–18.0) are similar in the various countries. The proportion of adolescents who began having sex before age 15 was 14% in the USA, 12% in Sweden and 4–9% in Canada, France and the United Kingdom.

The proportion of adolescents who did not use any method of contraception during their first intercourse was 25% in the USA, 21–22% in the United Kingdom and Sweden and 11% in France. The condom was the method most likely to be used at first intercourse. The proportion of sexually active adolescents who were not at the time of the interview using any method of contraception was high (20%) in the USA, intermediate (12%) in France and lowest (4–7%) in Sweden and the United Kingdom. The proportion of currently sexually active female adolescents using hormonal methods of contraception or an IUD was 52% in the USA, 56% in Sweden, 72% in the United Kingdom, and 73% in Canada. In 23–33% of the women condoms were the only method, with more women using condoms in addition to a hormonal method.

The available data indicate that variation in sexual behaviour (age at the start of intercourse) is not an important contributor to explaining differences in levels of adolescent pregnancy between the countries, and especially between the USA and other countries. Condom use does not differ much between the countries. However, the use of modern methods of contraception with the lowest failure rates (pill, injectable, implants and IUD) is lower in the USA than in the other countries. These differences are consistent with national differences in pregnancy rates and appear to be the likely cause of the higher pregnancy rates in the USA.

In combination with its higher adolescent pregnancy rate the USA also has a lower abortion ratio (number of abortions per 1000 pregnancies) than the other four study countries. This may reflect the possibly greater difficulty American adolescents have in accessing abortion services.

The family planning services in four countries (the Netherlands, Sweden, the United Kingdom, and the USA) have been compared in a study by *Cromer & McCarthy (1999). In Sweden and the Netherlands family-planning staff had good relations with local schools which they visited and instructed staff and students. In the United Kingdom there was confusion about the legality of providing family planning to adolescents under 16, but since 1993 a guideline has circulated stating that confidentiality should be maintained when contraceptive care is provided even to adolescents younger than 16. Reported barriers to the successful access of adolescents to family-planning services in the USA included the tendency of parents to closely monitor any medical care their children receive at school, as well as the political sensitivity of school boards toward providing family planning to students. In the USA the provider bills that often go home to parents may compromise confidential medical services for adolescents. In the European countries it was generally felt that a required pelvic examination was an unnecessary barrier to contraception. This view contrasted with the general opinion in the USA that a pelvic exam should be required, even for resistant adolescents. Government support in the Netherlands and Sweden seems to

have led to the adequate financing of family-planning services, while in the USA there seems to be little governmental, medical or familial support for preventive health care, including family-planning services.

Access for unmarried adolescents to contraceptive services is difficult in many countries. In the USA adolescents who wish to use contraceptives that require a prescription or insertion by a clinician often delay seeing a clinician for a contraceptive prescription until they have been sexually active for one year or more (American Academy of Pediatrics, 1999).

Developing countries

Substantial proportions of young people in all regions are sexually active; in most countries it is not the age at marriage, but the age at first intercourse outside marriage which is an important factor determining the occurrence of adolescent pregnancies. In relationships between adolescents, gender imbalances often increase the risks faced by young females. Young males are widely perceived to need premarital sexual experience and a variety of partners; females are not so perceived. The need to conform to these double standards may cause young females to fear disclosing their sexual activity, and may result in a reluctance among them to report sexual experience. This fear may also inhibit sexually active female adolescents from seeking contraceptive services. The fear of losing her partner or incurring his anger appear to be important factors inhibiting young females from exercising choice in the timing of sexual activity or negotiating the use of condoms or other contraceptives. (Jejeebhoy et al., 1999).

In Nicaragua, *Berglund et al. (1997) and *Zelaya et al. (1997) conducted a community-based study including 7789 households; 10,867 women aged 15–49 were interviewed. By the age of 15, around 25% of boys and girls have become sexually active, and by the age of 17, 25% of the women have a first pregnancy. In Nicaragua, adolescent pregnancy is not recognized as a serious problem for boys, who are encouraged by society and their families to assume little responsibility for a pregnancy. The norms of Nicaraguan machismo view having many children with different women as an expression of manhood. For a young girl, on the other hand, pregnancy may be a disaster. If it occurs outside the context of marriage, it will mean disgrace and may well lead to expulsion from family and school. However, girls are often pressured by boys to have sex as "proof of love". Not surprisingly, under the conflicting pressures both to remain chaste and to obey their partner (who is usually older) girls often have little say in the decision either to have sex or to use contraceptives. If a man is not actually opposed to the use of contraceptives, he is likely to regard it as "her problem".

In many African countries, schoolgirl (adolescent) pregnancy and the social problems it engenders is a growing public concern. In Kenya, one survey among more than 3000 unmarried youths between the ages of 12 and 19 revealed that more than 50% were sexually active, having initiated intercourse some time between 13 and 14 years of age on average. Most of the sexually active population (89%) had never used contraceptives (*Ajayi et al., 1991). Similar results were obtained in a survey among more than 4000 adolescents in Uganda; only 18.5% of sexually active girls aged 15–18 used a contraceptive method. The most important reasons for non-use were lack of knowledge, fears of adverse health effects, lack of access and a partner who objected (*Agyei & Epema, 1992). In Burkina Faso, a study based on interviews with schoolgirls was conducted in a small town. The analysis of the findings revealed the main factors that influenced student pregnancies. There was a lack of contraceptive knowledge among young girls, and ambivalent feelings about pregnancy and contraception (girls want to prove their fertility, but do not want a child). Society too gives conflicting messages: according to rural tradition, prenuptial virginity is highly valued, but on the other hand the girls are surrounded by a modern reverence for material wealth, which is attained most easily by entering into a sexual relationship with an older, wealthy man. And finally, girls are usually involved with an older and experienced partner, which makes it difficult to demand the use of contraceptives. They have too little self-esteem to oppose the partner who does not support the idea of contraception (*Görgen et al., 1993).

In a rural area in South Africa, premarital fertility accounts for 21% of all births and for 47% of births among women aged 12–26. This pattern of high premarital childbearing reflects a low incidence of contraceptive use before the first birth, especially among adolescents; a low prevalence of abortion; and a high contraceptive prevalence thereafter (*Garenne et al., 2000). Apparently contraception is considered

to be a subject only for married couples. Some adolescent girls in South Africa want to become pregnant early to prove their fertility. Although unmarried daughters may be severely reprimanded for becoming pregnant, once a baby is born, it generally is welcomed into the household, the girl usually returns to school, and because she has proven her fertility, she may in fact have increased her chances for marriage and improved her status (*Kaufman et al., 2001). However, the majority of adolescent girls want to avoid pregnancy but many male partners are not willing to practise contraception. The girls then often endure traumatizing situations (coercion or rape) and feel confused about their situation. In a matched case-control study in South Africa *Jewkes et al. (2001) compared pregnant adolescents with non-pregnant controls. The pregnant adolescents were significantly more likely to have experienced forced sexual initiation and were beaten more often. They were much less likely to have confronted their boyfriend when they discovered he had other girlfriends. Both forced sexual initiation and unwillingness to confront an unfaithful partner were strongly associated with pregnancy and also related to each other. The authors argue that the associations are mediated through unequal power relations within the relationship which are reinforced by violence. Naturally this interferes with the practising of contraception. If South African adolescents go to family-planning services they are often unwelcome; the providers of contraceptives in the national nurse-based programme are notoriously unsupportive of adolescents, scold them and refuse to provide them with contraceptives (*Kaufman et al., 2001).

In Tanzania, adolescent girls who were admitted to a hospital in Dar es Salaam because of an illegally induced abortion were interviewed. The girls were sexually active at an early age, having sex mainly with older men. Although most of the girls were in love with and enjoyed sex with their partners, they also entered these relationships to obtain money or gifts in exchange for sex. Most were not using condoms or other contraceptives though they were also at risk of STDs (including HIV). These girls were getting pregnant expecting their boyfriends to marry them, or because they did not think they could become pregnant, or failed to use contraception correctly. They were not aware of the 1994 Tanzanian policy that gave them the right to seek family-planning services and in practice these services are not generally provided. There is a need for youth-friendly family-planning services, and to make abortion safe and legal, in order to reduce unwanted pregnancies and abortion-related complications and deaths among adolescent girls (Rasch et al., 2000).

In India, knowledge (and use) of contraceptives among adolescents is very limited. In 1992–1993 no more than 5% of married women aged 13–14 years and 7.1% of married women aged 15–19 years were practising contraception. This is low compared to 21% among women aged 20–24 and 61% for women aged 35–39 years (UNFPA, 2001).

Infection by HIV and other sexually transmitted diseases (STDs)

The above patterns of sexual relations make young girls extremely susceptible to STDs, in particular infections with HIV in regions with a high prevalence of the virus. In particular, the fact that older and experienced men seek sexual relations with young girls without using barrier contraceptives leads to the dissemination of these diseases. In countries with a high prevalence of HIV some men even purposely have sex with young girls in an attempt to avoid becoming infected with HIV. In South Africa, one in five pregnant adolescents is infected with the virus (*Jewkes et al., 2001). Unprotected sexual intercourse is the risk behaviour common to both unintended pregnancy and HIV infection (Whaley, 1999). Under these circumstances young girls at the beginning of their reproductive lives are at highest risk of HIV infection and relatively often a pregnancy in a young adolescent will be combined with a recent infection and high viral load.

3.5 Unsafe abortion

In a number of countries where abortion is legalized or permitted, medically safe abortions can be performed. If the unrestricted availability of abortion is combined with good contraceptive services, the number of abortions remains limited as is shown in the Scandinavian countries and the Netherlands. However, in many countries safe abortions are not allowed, or the necessary medical facilities are not available, and this results in large numbers of unsafe abortions performed by lay abortionists, using

unsterilized equipment, herbs, etc. An estimated 20 million illegal abortions are performed worldwide, especially in Africa, Southern Asia, and Latin America (*Henshaw et al., 1999). Among the women who are exposed to these dangerous interventions, pregnant adolescents are an important group. A conservative estimate of the total number of abortions among adolescents in developing countries ranges from 2.2–4 million annually (Olukoya et al., 2001). In many developing countries, hospital records of women treated for the complications of abortion suggest that between 38% and 68% are under 20 years of age (World Health Organization, 1993). There are four major areas of difference between adolescents and adults: a longer delay in seeking abortion; resorting to less-skilled providers, the use of more dangerous methods; and a longer delay in seeking help for complications. Because of all these factors pregnant adolescents, particularly the unmarried, are more likely to suffer serious complications than other women (Archibong, 1991; Likwa & Whittaker, 1996; Thapa et al., 1992; Bott, 1998; Mundigo & Indriso, 1999).

In many countries, data on illegal abortion are lacking. In India, abortion was legalized in 1972 but the number of illegal providers of abortion services is very high and among unmarried adolescents the number of abortions in unhygienic conditions by unlicensed practitioners is estimated to be considerable (UNFPA, 2001). Some information is available on abortion in sub-Saharan Africa. *Kwast et al. (1986) conducted a population-based study of maternal mortality in Addis Ababa, Ethiopia. Of the eight deaths in the 15–19 age group, four were due to unsafe abortion. Rogo (1993) published a review on abortion in sub-Saharan Africa and found that in East and Central Africa at least 20% of maternal deaths were due to complications of abortion. The majority of abortion patients are young, single women. For young women, marital status emerged as the most important factor affecting whether a pregnancy is considered unwanted. Adolescents are aware of abortion and its complications, but strong social condemnation is of greater concern for young girls than the risk of death and illness associated with unsafe abortion (Rogo et al., 1999; Mutungi et al., 1999). At least 25–30% of maternal mortality in Uganda is caused by unsafe abortion and over 50% of these cases are among adolescents and young people (Olukoya et al., 2001). *Goyaux et al. (2001) described 969 women admitted to hospital for complications of induced abortion in three West African countries, 22 of whom died. Infection was the most important factor leading to death. In 1999 the *East African Medical Journal* published an editorial on the prevention of abortion-related deaths in Africa in which it cited the Programme of Action of the 1994 International Conference on Population and Development in Cairo (Editorial, 1999).

All governments and relevant organizations are urged to strengthen their commitment to women's health, to deal with the impact of unsafe abortion as a major public health concern and to reduce the recourse to abortion through expanded and improved family planning services. Prevention of unwanted pregnancy must always be given the highest priority. Women who have unwanted pregnancies should have ready access to reliable information and compassionate counselling. In circumstances in which abortion is not against the law, such abortion should be safe. In all cases women should have access to quality services for the management of complications arising from abortion. Post-abortion counselling, education and family planning services should be offered promptly (International Conference on Population and Development, Cairo 1994).

3.6 Physical abuse

In the USA, several authors have published data on the physical abuse of adolescents, either before or during pregnancy. *Boyer & Fine (1992) collected data on the sexual histories of 535 adolescent females in Washington State who were pregnant or had delivered. Of these women 55% had (ever) been molested; 42% had been the victim of attempted rape; and 44% had been raped. The abused adolescents were also more likely to have (ever) been hit, slapped or beaten by a partner and to have exchanged sex for money, drugs or a place to stay. *Parker et al. (1994) reported data obtained during the antenatal care of 1203 pregnant women below the poverty level in Baltimore and Houston: 20.6% of teens and 14.2% of adult women reported abuse during pregnancy. The abused adolescents and adults were more likely than non-abused women to enter into antenatal care only in the third trimester. Abuse was associated with

low birth weight, smoking and drug use. Covington et al. (1997, 2000) introduced a systematic violence-detection protocol for all pregnant adolescents; this resulted in an increase in reported violence from 5.4% to 16.2%. *Kenney et al. (1997) collected information from over 1900 women aged between 18 and 22 in a population-based study in Arizona. Over 26% were pregnant before the age of 18. Almost 36% reported one or more forms of sexual abuse before age 18, including 20% who had been raped. Adolescents are more likely than older women to be assaulted by an acquaintance or relative. The most common circumstances of adolescent assault involved a social encounter with the assailant (Peipert & Domagalski, 1994). Apparently in the USA the physical abuse of pregnant and non-pregnant adolescents is a frequent phenomenon. In Europe too, high rates of violence before and during pregnancy have been found in adolescents (Mezey & Bewley, 1997).

In a study of Xhosa women in South Africa, violence and coercive sexual intercourse were reported to be features of adolescent sexual relations (*Wood et al., 1998). In South Africa in a matched case-control study among pregnant and non-pregnant sexually active adolescents, the pregnant adolescents were significantly more likely to have experienced forced sexual initiation and were beaten more often. They were much less likely to have confronted their boyfriend when they discovered he had other girlfriends. Once again, such associations are mediated through unequal power relations within the relationship which are reinforced by violence (*Jewkes et al., 2001). In a population-based study from Bangladesh, pregnant adolescents had a three-fold increase in mortality from intentional and unintentional injuries compared with girls who were not pregnant (*Ronsmans & Khlat, 1999).

Regrettably, the young adolescent mothers who themselves have often suffered physical abuse, form a high-risk group for committing child abuse in the early months and years of their child's life (*Lealman et al., 1983; *Olds et al., 1986; see section 10.2).

Female genital mutilation

In the context of physical abuse, the tradition of female genital mutilation (FGM) or female circumcision should not go unmentioned. It comprises procedures that involve partial or total removal of the female external genitalia and/or injury to the female genital organs for cultural or any other non-therapeutic reason (WHO, 2000). The practice occurs mostly in Africa in a large number of countries from Somalia to Mali; and about 120 million women have been subjected to it. According to the information available it has psychological, sexual and obstetric consequences, among them scar formation in the vulva and stenosis of the opening to the vagina (WHO, 1998e). Although the procedure is often performed on young girls and has ill effects on the course of labour, its consequences are not specific to adolescent pregnancies. Therefore a detailed discussion of the subject is outside the scope of this review. However, it may be important that health personnel caring for adolescent pregnant girls, especially in Africa, pay attention to the possibility that they might have undergone FGM, consider the possible risks for delivery and, if necessary, take appropriate steps for referral during pregnancy.

3.7 Risk behaviour

Adolescent pregnancy itself may be considered a result of "risk behaviour" (i.e. unprotected intercourse). It is not surprising that pregnant adolescents are prone to engaging in other risk or problem behaviour too. In the USA, Rome et al. (1998) investigated the relation between several kinds of risk behaviour and pregnancy in a large group of adolescents. A significant correlation with pregnancy was found for cocaine use. A history of previous sexually transmitted disease and increasing numbers of partners added to the risk of pregnancy. Alcohol use in the past 30 days was less likely to be associated with pregnancy.

Substance use

Smoking during pregnancy causes fetal growth retardation and increased perinatal mortality rates (Simpson & Linda, 1957; Butler & Alberman, 1969; Van der Velde & Treffers, 1985). Reports on the effects of marijuana use during pregnancy are inconsistent – some studies report shortening of gestational age and lower birth weight but this has not been confirmed by others (Richardson et al., 1993; Cornelius et al., 1995; Shiono et al., 1995). Cocaine use during pregnancy has been associated with placental abruptio

(Shiono et al., 1995). Alcohol in large quantities causes congenital malformations and growth retardation, but there is no proof of a negative influence of small amounts.

In the USA, smoking and substance use during pregnancy has been studied extensively. In general smoking rates in the USA have generally decreased since the 1960s, but some data suggest that this trend is less apparent in adolescents (especially girls) and prevalence data on smoking among pregnant adolescents are controversial. In a number of studies a high prevalence of smoking during pregnancy has been found in adolescents, compared to non-pregnant adolescents and to pregnant women >20 years of age. (Davis et al., 1990 ; Fox et al., 1994 ; Cornelius et al., 1994, 1995 ; Teagle & Brindis, 1998). However, other studies show different results (Land & Stockbauer, 1993; Scholl et al., 1994). Smoking rates are generally higher in white than in black adolescents, and Scholl et al. (1992) found a lower prevalence of smoking in young (12–15) primigravidae, compared to older (>17) primigravidae. Reported rates of marijuana use in pregnant adolescents in the USA are 16.5% (Cornelius et al., 1995) and 11% (Teagle & Brindis, 1998).

3.8 Education and urbanization

The effect of education in the development of modern adolescence (referred to in section 1.1 above) has made the adolescent less dependent upon parents and family, and has postponed the age at marriage, and thereby the age of socially sanctioned sexual relations. In the context of social background and determinants of adolescent pregnancies, another aspect of improved education is that the overall level of childbearing (i.e. not just among adolescents) is usually lower in better-educated women (compared to the less-educated); and in urban (compared with rural) areas (Singh, 1998). Greater modernization – living in an urban area or having a higher level of education – is therefore expected to be associated with lower levels of adolescent childbearing, all other factors being equal. For individuals and families, modernization means that an early start to childbearing (and a large family) is less desirable because of:

- an increased need to educate girls
- young women's greater motivation to attain at least secondary schooling and to work for wages
- greater availability of work opportunities
- higher costs of rearing children and providing them with a high level of education
- changing values that give greater weight to the individual than to the family unit (Singh, 1998)

In this respect the education of girls is the most important factor, because it empowers them to decide on their own lives, it enables them to develop planning behaviour (for instance to find ways and methods of contraception). Thus better education has two opposing effects: it postpones marriage, makes the adolescent less dependent on parental influences and therefore leads to premarital sexual relations and pregnancies. On the other hand, in the long run it may stimulate planning behaviour, contraception and prevention of unwanted pregnancies. One of the important disadvantages of adolescent childbearing is that it often interrupts education, because pregnant girls are sent away from school (see sections 7.1; 8.6).

3.9 Summary

In the USA, race is a predictor of poverty with disproportionate numbers of African Americans and Hispanics being socially deprived. There is also a strong interaction between social deprivation, race and childbearing, and the percentage of pregnant adolescents who are black is relatively high, especially in the youngest groups. In the United Kingdom a correlation has been found between the incidence of adolescent birth and social deprivation in the area of residence. In Latin America there is also an association between social circumstances (poverty) and the incidence of teenage pregnancy.

In many countries young age at marriage is an important determinant of adolescent pregnancy; while in other countries it is the age at the time of first intercourse. In partnerships between adolescents,

gender imbalances often increase the risks faced by young females. Such imbalances may compel young adolescent girls to admit to unprotected intercourse. The woman's fear of losing her partner or incurring his anger appear to be important factors inhibiting young females from exercising choice in the timing of sexual activity or negotiating for the use of condoms or other contraceptives. In large parts of the world, especially in sub-Saharan Africa, South Asia and Latin America, unsafe abortion is a frequent phenomenon and a cause of illness and even death, especially among young girls. In the USA, Europe and sub-Saharan Africa, high frequencies of physical abuse are reported in pregnant adolescents. In a number of African countries female genital mutilation in young girls is a traditional practice, with possible consequences for the course of labour. The access of adolescents to contraceptive services is often difficult.

Smoking and the use of substances such as marijuana and cocaine are frequent phenomena among pregnant adolescents. Many studies from the USA report higher rates of smoking and substance use by adolescents than by older pregnant women.

Education and urbanization are important determinants of lower levels of adolescent childbearing. The education of girls especially may empower them to decide on their own lives and to develop planning behaviour.

PART 4
Pregnancy

Some complications of pregnancy may occur more frequently in adolescents than in older women; those identified in the literature as significant are discussed below, with comments on their significance. As stated in section 1.2, selected studies complying with sound methodological criteria are marked with an *. The diagnosis of such complications and the therapeutic measures that can be taken during antenatal care are discussed in PART 8.

4.1 Hypertensive disorders

According to the International Society for the Study of Hypertension in Pregnancy (ISSHP) the definition of hypertension in pregnancy is a diastolic pressure ≥90 mm Hg in the second half of pregnancy; and the definition of pre-eclampsia is hypertension combined with proteinuria. Many studies have now

Table 2: Relative frequency of hypertensive disorders in pregnant adolescents and adults

Country	Study	Year	Hypertensive disorders
USA	Hulka & Schaaf	1964	=
	Duenhoelter et al.	1975	+
	Spellacy et al.	1978	=
	Poma	1981	=
	Graham	1981	=
	Horon et al.	1983	=
	Leppert et al.	1986	+
	Saftlas et al.	1990	+
	Brown et al.	1991	—
UK	Osbourne et al.	1981	=
	*Butler et al.	1981	=
	Konje et al.	1992	+=
	*Jolly et al.	2000	=
Australia	Lee & Walters	1983	=
	*Correy et al.	1984	=
Canada	*Grindstaff & Riordan	1983	=
Malta	Savona-Ventura & Grech	1990	=
Greece	Creatsas et al.	1991	=
South Africa	Blumenthal et al.	1982	=
	Mukasa	1992	=
Saudi Arabia	Khwaja et al.	1986	=
	*Mahfouz et al.	1995	=
Singapore	Kurup et al.	1989	=
Zimbabwe	Mahomed et al.	1989	=
Ethiopia	Kumbi & Isehak	1999	=
Nigeria	Efiong & Banjoko	1975	+
	Adedoyin & Adetoro	1989	—+
Kuwait	Al-Sherhan et al.	1996	=
Turkey	Bozkaya et al.	1996	+

= no difference
— less hypertensive disorders in adolescents
—+ less hypertension, more pre-eclampsia in adolescents
+ more hypertensive disorders in adolescents
+= more hypertension in adolescents, no difference in pre-eclampsia

been carried out into the differences between adolescents and adult pregnant women and Table 2 summarizes the relative frequencies of hypertensive disorders in various countries.

Of nine studies in the USA, three showed an increased risk for adolescents and one found a diminished risk; the nine studies in other developed countries found no increased risk except for one study in the United Kingdom (Konje et al., 1992) that found an increased risk for hypertension in adolescents but no difference for pre-eclampsia. Of 11 studies in developing countries, eight found no difference, two found an increased risk for adolescents and one (Adedoyin & Adetoro, 1989) found less hypertension and more pre-eclampsia in adolescents.

However in the USA, two of the studies that indicated an increased risk for adolescents (one based on data from the USA National Hospital Discharge Survey 1979–1986: Saftlas et al., 1990; and one hospital-based study: Duenhoelter et al., 1975) did not standardize for parity. All pregnant women of different age groups were compared, but among adolescents the number of nulliparous women is much higher than among other age groups. Because in first pregnancies the incidence of hypertensive disease is much higher than in second and later pregnancies, the higher incidence of hypertension and pre-eclampsia in adolescent pregnancies in these studies can easily be explained. The same applies to two of the studies from developing countries (Adedoyin & Adetoro, 1989; Bozkaya et al., 1996) which also did not standardize for parity.

In conclusion, there remain only two hospital-based studies (one from the USA and one from Nigeria) that standardized for parity and still found an increased risk for adolescents. The patient population of these hospital-based clinical studies could easily have been biased by the selective referral of different groups of patients. However, 22 studies (of which five used population-based approaches) found no increased risk for adolescents. In the past there seemed to be a discrepancy between the incidence of hypertensive disorders among pregnant adolescents in different countries, which led to hypotheses trying to explain these discrepancies (Treffers et al., 2001). However, a careful analysis of the literature shows that there is no reason to assume that the incidence of hypertensive disease in adolescent pregnancies is higher than the incidence in adult women of the same parity; and there is also no indication of a difference between countries.

4.2 Anaemia

The increase in plasma volume and the subsequent decrease in haemoglobin concentration and haematocrit in normal pregnancy complicate the assessment of anaemia. WHO defines the minimum haemoglobin concentration in normal pregnant women as 11.0 g/dl (WHO, 1972); the minimum haematocrit level is 0.31 g/dl (Letzky, 1991). In fact there are good reasons to set the minimum haemoglobin value somewhat lower than 11.0 g/dl because haemodilution in normal pregnancies may decrease this level to 10.4 g/dl (Van den Broek, 1998). Severe anaemia is haemoglobin <7.0 g/dl.

Developed countries

A number of studies have reported on the prevalence of anaemia among pregnant adolescents, compared to older pregnant women. In their review of hospital-based studies up to 1993, Scholl et al. (1994) reported no statistically significant differences in the prevalence of anaemia in adolescents compared to adults in six studies from the USA. However in one hospital-based study in the United Kingdom, Osbourne et al. (1981) reported a two-fold statistically significant increase in the relative risk of anaemia (<10 g/dl) in adolescent pregnant women compared to adults in Glasgow. Konje et al. (1992) studied data from Hull and found a more than two-fold increased relative risk of anaemia in young adolescents (<17 years); the difference being statistically significant. More recently, in the North West Thames region, *Jolly et al. (2000) found an odds ratio of 1.82 (99% CI 1.63–2.03) for anaemia in pregnant girls <18 years compared with women 18–34 years.

Developing countries

In developing countries, the rate of anaemia varies greatly, is often severe, and in many countries is a great problem (Van den Broek, 1998). An increased prevalence of anaemia in young pregnant women was found in four of seven studies from developing countries included in the review by Scholl et al. (1994) and in two the difference was statistically significant. Other studies have been published from Mozambique (*Liljestrand et al., 1986), Zaire (*Jackson et al., 1991), South Africa (Mukasa, 1992), Saudi Arabia (*Mahfouz et al., 1995) and Tanzania (*Bergsjo et al., 1996). These studies did not find an increased risk for adolescents. Conversely, studies in Tanzania (Arkutu, 1979), Zambia (Fleming, 1989), Nigeria (Adedoyin & Adetoro, 1989; Barr et al., 1998) and Malawi (Fazio-Tirrozo et al., 1998) found an increased risk for adolescents. Apparently these differences are determined by regional or local circumstances.

The seriousness of the problem in developing countries may be underestimated by the above-mentioned statistical comparison of the *presence* of anaemia in various groups of pregnant women in most studies, without mentioning the severity of the anaemia. Because the prevalence of anaemia in *all* women in many developing countries is so high, the difference in prevalence between adolescent and adult pregnant women, if any, may be relatively small. Nevertheless, the severity of anaemia may differ between groups. Anaemia is one of the important causes of maternal mortality (including among adolescents) and there is a scarcity of data on severity of anaemia and adolescent mortality in developing countries (*Brabin et al., 2001).

Generally, the cause of anaemia is not the young age of the pregnant woman. Anaemia in pregnancy is often caused by nutritional deficiencies, especially of iron and folic acid, and in developing countries by malaria and intestinal parasites (hookworm). Acute and chronic inflammation due to infectious diseases such as tuberculosis (as well as HIV infection) are also important causes of anaemia (Van den Broek, 1998) and vitamin-A deficiency may also play a role (Hodges et al., 1978; Sharma & Sharma, 1992; Van den Broek, 1998). In some individuals genetic factors are responsible (sickle cell disease in people of African origin, and thalassaemia in people from North Africa and South Asia). Nutritional deficiencies are usually related to social and environmental circumstances, and can be adequately treated during antenatal care, if such care is available for the pregnant woman and if she indeed takes the tablets. Frequently children and female adolescents suffer most from deprived environmental and social circumstances and this is often the cause of their anaemia. As pregnant adolescents often receive inadequate antenatal care, their anaemia during labour and the postpartum period may be worse than in older women. Malaria is one of the most important causes of anaemia during pregnancy.

In conclusion, anaemia often occurs in pregnant women, and in some studies its prevalence is higher among pregnant adolescents than older pregnant women – in other studies no such difference could be found. The causes are usually nutritional deficiency and/or infectious diseases (predominantly malaria) and anaemia can be treated adequately during antenatal care if such care is available.

4.3 Malaria

In large regions of the world malaria is endemic. There is good evidence that parasitaemia is more common and heavier in pregnant than non-pregnant women, and that during pregnancy placental infection occurs. This leads to consequences for both mother and fetus (Lalloo, 2000). Nulliparous women (including many adolescents) are more prone to attacks than multiparae (Gilles et al., 1969; Jackson et al., 1991; Shulman et al., 1996; Van den Broek & Letsky, 1998). Frequently malaria is not controlled or treated well in adolescent pregnancy, because antenatal care in adolescents is often deficient (Okonofua et al., 1992; Brabin et al., 1998). In endemic areas malaria is an important cause of anaemia, especially during pregnancy, together with nutritional deficiencies. In Mozambique, malaria is one of the most important causes of maternal mortality in adolescents (Granja et al., 2001).

4.4 HIV infection and other sexually transmitted diseases (STDs)

The worldwide pandemic of HIV casts its shadow on childbirth, especially in developing countries. In some countries in Southern, East and Central Africa 20–30% of all pregnant women are infected. The infection is also spreading rapidly in South-East Asia and Eastern and Central Europe. In many countries however prevalence remains relatively low.

The main concern with respect to childbirth is the vertical transmission of HIV from mother to infant during pregnancy, labour and postnatally through breastfeeding (WHO, 1998b). In developed countries, transmission rates in untreated non-breastfeeding populations have ranged from 14–25% compared with 13–42% among breastfeeding populations in resource-poor settings (Working Group on Mother-to-Child Transmission of HIV, 1995). With the advent of antiretroviral (ARV) therapy during pregnancy in developed countries, much lower transmission rates are now described (WHO, 1998c; De Cock et al., 2000). In the USA in 1990, the transmission rate was 22.7% in the absence of ARV therapy, but in 1999 studies involving the use of ARV combination therapies starting early in pregnancy have reported a fall in the transmission rate to 3.3% (Farley et al., 2002). The available data indicate that the short-term and early long-term toxicity of ARV prophylaxis appears minimal for women and infants (Mofenson & Munderi, 2001). However, continued vigilance for any adverse effects of ARV prophylaxis on HIV-positive pregnant women and their offspring is important.

Sexually active adolescents are at increased risk of contracting HIV infection and other STDs (see section 3.3). An association has been shown between maternal viral load and the risk of transmission from mother to child postnatally (Thea et al., 1997; WHO 1998c). The presence of other STDs (such as syphilis, gonorrhoea, and chlamydia) with local inflammation may increase viral shedding, thereby increasing the risk of transmission during labour. Maternal antiretroviral therapy during pregnancy can reduce transmission, mainly through the reduction of viral load. However, combination therapy throughout pregnancy is expensive and not generally available in developing countries where it is most needed. Recently data has become available on the use of short-course ARV regimens, which are affordable in developing countries (see section 8.5).

Apparently there are many reasons why adolescents are at increased risk of contracting HIV infection (see section 3.4). Possible diagnostic and therapeutic measures, especially in developing countries, will be discussed in Parts 8 and 10.

4.5 Iodine deficiency

For an estimated 1600 million people living in iodine-deficient environments around the world, iodine deficiency is a major risk factor for impaired physical and mental development. Iodine deficiency during pregnancy can cause brain damage to the fetus; with associated mental retardation and neurological disorders. The severest form is cretinism, a combination of these disorders with severe growth retardation (WHO, 1998b).

In areas with environmental iodine deficiency, adolescent girls and women in their reproductive years are especially at risk (WHO, 1997). In countries where the iodination of salt has not been established, WHO recommends the administration of iodized oil (orally or by injection) to all women of childbearing age, including pregnant women. It is recommended that the administration of iodized oil occur before pregnancy or as early in pregnancy as possible, as otherwise a critical stage of brain development will be missed (WHO, 1996c; Delange, 1996; WHO, 1998b).

The prevalence of goitre in pregnant adolescents does not differ from its prevalence in non-pregnant adolescents. In iodine-replete regions, there is no increase in the frequency of goitres during pregnancy (Molitch, 1991). Nor is there any proof that thyroid disease occurs more often in pregnant adolescents than in other pregnant women.

4.6 Growth during pregnancy

Young adolescents may still grow during pregnancy. In Nigeria, Harrison et al. (1985b) investigated 69 adolescent primigravidae (59 of them aged between 13–16) and found that more than half of these girls increased in height by 2–16 cm between their first attendance at the antenatal clinic and 1–60 days after delivery. Iron, folic acid and placebo supplementations were given to randomized groups of girls. There was a close association between increase in height and iron or folic acid supplementation, and also between increase in height and haematocrit at 28 weeks (after an average of 10 weeks' treatment). From this study it seems probable that young girls can still continue to grow during pregnancy. In Ethiopia, Kumbi & Isehak (1999) measured maternal height in adolescents and older mothers and found that the mean height of the adolescents was significantly smaller than the height of older women, suggesting that the adolescents were not yet full-grown.

4.7 Summary

Some studies (especially from North America) have reported an increased incidence of hypertensive disorders in pregnant adolescents, compared to older pregnant women. However the majority of studies from Europe, and most studies from developing countries, do not show a corresponding increase. A careful reconsideration of the available studies leads to the conclusion that those studies which compare adolescents and older pregnant women of the same parity do not show a difference in the incidence of hypertension between adolescents and adults.

Anaemia frequently occurs in pregnant women. In a number of studies, its prevalence appears to be higher in pregnant adolescents than in older pregnant women. Other studies could not find any difference, probably because the prevalence in all pregnant women is high, especially in developing countries. The cause is often nutritional deficiency and this can be treated adequately during antenatal care, if such care is available. Infectious diseases (primarily malaria, but also hookworm and HIV infection) also play an important role. In developing countries, malaria parasitaemia occurs frequently during pregnancy, especially in primigravidae.

Adolescents are at increased risk of contracting HIV infection. Modern antiretroviral combination therapy during pregnancy considerably reduces mother-to-child transmission, but is too expensive for most pregnant women in developing countries. Short courses of antiretrovirals are less expensive and also reduce mother-to-child transmission.

Pregnant adolescents are especially at risk of iodine deficiency, with serious consequences for the fetus. Young adolescents may still grow during pregnancy; and increase in height seems to be correlated with red blood cell volume during pregnancy.

PART 5
Labour and delivery

In this section mode of delivery will be discussed as a measure of underlying pathologies which might be specific for labour at a young age. Preterm labour (a complication of pregnancy largely determining its outcome) will be discussed in PART 6. Issues and recommendations relating to care during labour and delivery are covered in PART 9.

5.1 Mode of delivery

Use of caesarean section in developed countries

The incidence of caesarean section (CS) in adolescents has been amply investigated. It is often considered a proxy measure of underlying complications, such as cephalopelvic disproportion and contracted pelvis in young women. However, this may no longer be true in those regions where CS now constitutes a high percentage of all deliveries, as is the case in many developed countries. The incidence of CS is in fact only partially a reflection of obstetric pathology; it also mirrors the opinion, the skill and the policy of obstetricians.

In Table 3, studies into the incidence of CS in adolescents compared with adults are listed with 16 of these being in developed countries. In three of these 16 studies (all conducted before 1985) the CS rate in adolescents was higher than in adults, but the differences were not statistically significant. In two studies the CS rate in adolescents was equal to the rate in adults, and in 11 studies it was lower (7 times the difference was considered statistically significant). Although only two of these studies satisfied the methodological criteria referred to above, it seems clear that in developed countries the CS rate among adolescents is not higher (and is usually lower) than among adults.

From the data it is clear that in the large majority of studies in developed countries the CS rate in adolescents is lower than in control groups of older women. Some of these studies involved very young adolescents – for instance Lubarsky et al. (1994) studied data on 261 girls aged <15 years, and for Satin et al. (1994) the corresponding figure was 1622 girls aged 11–15 years. In interpreting these data one should keep in mind that in many developed countries the CS rate has increased considerably in the last few decades. For instance, in the control group of nulliparae (20–29 years old) in Lubarsky's study the CS rate was 25.3%. In a group of women with such a high rate of CS many of the indications for CS will be marginal, and may be influenced by the attitude of the obstetrician, as well as by the patient actively asking for an operative delivery. Hypothetically, it might be possible that the attitude of the obstetrician towards adolescents is different; for instance because he will try to avoid a uterine scar in a (young) adolescent girl. The adolescent as a patient might also be different from older women; and might be less persistent in her wish to expedite or terminate labour. Thus it is not certain that the lower CS rate in adolescents is caused by an "easier" labour and delivery. On the other hand, from studies in developed countries it may be concluded that it is unlikely that labour and delivery in adolescents is more difficult or complicated.

Other aspects of labour and delivery

The characteristics of adolescent deliveries in developed countries are: a lower percentage of episiotomies (*Buitendijk et al., 1993; Lubarsky et al., 1994); and in some studies a higher number of vaginal operative deliveries (Bradford & Giles, 1989; Konje et al., 1992). In other studies however this latter incidence was lower (*Buitendijk et al., 1993; Jolly et al., 2000) or equal (Lubarsky et al., 1994). In addition, a lower incidence of inductions (*Buitendijk et al., 1993; *Jolly et al., 2000) or of oxytocin use (Lubarsky et al., 1994; Satin et al., 1994) has been reported. The duration of the active phase of labour appears to be

Table 3: Comparative incidences of CS among adolescent and adult pregnant women

Country	Study	Year	CS
USA	Duenhoelter et al.	1975	+
	Spellacy et al.	1978	—
	Poma	1981	—
	Graham	1981	+
	Horon et al.	1983	+
	Leppert et al.	1986	—
	Satin et al.	1994	—(s)
	Lubarsky et al.	1994	—(s)
Australia	Lee & Walters	1983	=
	Bradford & Giles	1989	=
Malta	Savona-Ventura & Grech	1990	—
Greece	Creatsas et al.	1991	—(s)
UK	Konje et al.	1992	—(s)
	*Jolly et al.	2000	—(s)
Ireland	Conolly et al.	1998	—(s)
Netherlands	*Buitendijk et al.	1993	—(s)
Jamaica	Roopnarinesingh	1970	+
Nigeria	Efiong & Banjko	1975	+
	Adetoro & Agah	1988	+(s)
	Harrison et al.	1985a,c	+(s)
Tanzania	Arkutu	1978	—
South Africa	Blumenthal et al.	1982	+(s)
	Fisk & Shweni	1989	= (symphysiotomy +(s)
Saudi Arabia	Khwaja et al.	1986	+(s, incl. vag op. del.)
Singapore	Kurup et al.	1989	—
	Lee et al.	1990	—
Mozambique	Bacci et al.	1993	+
Ethiopia	Kumbi & Isehak	1999	+
Philippines	Dela Cruz	1996	—
Pakistan	Malik et al.	1996	—
Kuwait	Al-Sherhan et al.	1996	—
Hong Kong	Lao & Ho	1997, 1998	—
Sri Lanka	Weerasekera	1997	—
India	Ambadekar et al.	1999	—
	Padte et al.	1989	+ (13–16 years)

+ CS rate higher in adolescents
— CS rate lower in adolescents
= CS rate equal
(s) statistically significant

shorter in adolescents, while the duration of the second stage was equal to the duration in a control group of older women (Lubarsky et al., 1994). Part of the differences found might be explained by a different attitude towards pregnant adolescents and towards the management of their delivery by the midwives and/or obstetricians, but the data on various aspects of labour and vaginal delivery in developed countries are in accordance with those on caesarean section. Once again there is no reason to assume that labour and delivery are more difficult in adolescents; in fact the course of labour is usually smoother.

Developing countries

Of the 19 studies in Table 3 comparing the incidences of CS in adolescents and adults in developing countries, the rate was higher in adolescents in 10 cases. Of these the difference was statistically significant in three, and in two more the difference became significant if symphysiotomies or vaginal operative deliveries were also included. In nine studies the CS rate in adolescents was lower, but in none of these was the difference statistically significant. All the studies in developing countries were hospital-based. The studies reporting significantly higher CS rates in adolescents were conducted in Nigeria, Saudi Arabia and South Africa.

From these data it is apparent that the CS rate in some reports from developing countries is higher in adolescents than in older women. This finding seems contrary to the trend observed in developed countries, and is not confirmed by the other studies in developing countries. It is noteworthy that increased CS rates in adolescents were reported in Nigeria and Ethiopia; two countries where other studies have reported on the occurrence of obstructed labour in young adolescents (see section 5.2). In the Ethiopian study (Kumbi & Isehak, 1999) the duration of labour was also longer in adolescents. The overall CS rate in the hospitals of some developing countries (at least in those where the research was done) seems barely lower than the rate in developed countries. This may mean that similar considerations could be valid, namely that some of the indications for CS may be marginal and could easily be affected by a different attitude among obstetricians towards a subgroup of the population. Nevertheless, the higher CS rate in adolescents in a number of studies in developing countries is probably caused in part by a higher incidence of obstructed labour in young girls with still immature pelvic bones.

5.2 Immaturity of the pelvic bones

Young adolescents are still growing, and even during pregnancy they may increase in height (see section 4.6). This raises questions about the possible immaturity of pelvic bones, and consequently about obstructed labour in young pregnant adolescents. Nelson (1978) produced data on the physiological correlates of puberty in girls in the USA. The time of onset of the pubertal growth spurt in developed countries varies over a wide range of chronological ages. In Nelson's study the average age at peak height velocity was 12 years, and at menarche 13 years. Growth in height continued until after age 15. In developing countries menarche is usually later; in urban Zulu schoolgirls in South Africa a median age of 14 at menarche was reported (Fisk & Shweni, 1989; see also PART 1).

Moerman (1982), using data from a growth study conducted prior to 1950 in which annual radiography of the pelvis was performed, studied the growth of the birth canal in adolescent girls. Growth of the birth canal was shown to be slower than growth in height. At menarche and in the first two years after menarche, a significantly greater percentage of growth to adult size was required in the pelvis as compared to stature; growth of the birth canal still continued when stature had already reached its maximum (at about 15 years). The results of this study indicate that immaturity of the pelvic bones and of the birth canal may be significant factors in obstetric risk in young adolescents.

In the USA, bone age was measured in young adolescent women during the puerperium (Stevens-Simon & McAnarney, 1993). No correlation was found between the incidence of CS and bone age. In some developing countries, where age at menarche is higher, the situation is different. In Nigeria, Harrison et al. (1985c) studied the relation between maternal age and height, and the incidence of contracted pelvis and cephalopelvic disproportion. They found an increased incidence of contracted pelvis in young (<16) and short (<1.50 m) adolescents. The diagnosis of contracted pelvis was made by digital pelvic assessment at the end of pregnancy or during labour on every woman. Cephalopelvic disproportion was diagnosed during the course of labour. A large proportion of the young adolescents with complications during labour were unbooked and referred only because of the complication; this may have resulted in referral bias. Nevertheless, Harrison's findings are remarkable. In the same subgroup of adolescents (<16 years old) in the USA, Lubarsky et al. (1994) and Satin et al. (1994) found lower CS rates than in older women. It seems probable that the pathology connected with immature pelvic bones is different in various countries or regions because of social or environmental factors, resulting in a different age at menarche.

As stated above, menarche in developing countries generally occurs at a later age compared with developed countries, and its timing depends on socioeconomic status. It is possible that a late menarche had occurred in the young adolescent Nigerian girls who experienced the cephalopelvic disproportion and obstructed labour described above (Harrison et al., 1985c). A correspondingly low gynaecological age (i.e. the interval between menarche and first pregnancy – see section 6.3) may have meant that their pelvic bones were still immature. This could explain why it is that in many countries (including some developing countries) adolescents do not experience obstructed labour more frequently than older women, whereas in other relatively poor countries and regions higher incidences of obstructed labour and CS are reported in the subgroup of very young adolescents. This hypothesis cannot be verified at present because existing reports on the course of labour do not provide data on menarche. However, data on the incidence of CS and of instrumental deliveries (Kumbi & Isehak, 1999) and of obstetric fistulas (Kelly & Kwast, 1993; see section 6.7) in Ethiopia suggest that in some regions obstructed labour more often occurs in young adolescents.

In conclusion, there are strong indications that in very young girls (<16 years) the pelvic bones of the birth canal may still be in the process of growing, and are therefore immature, especially in some of the poorer regions in developing countries where the onset of puberty is usually relatively late. There are also indications that in these young girls there are the ensuing complications of cephalopelvic disproportion and obstructed labour. It is difficult to obtain reliable figures from a well-defined population because these complications mainly occur in remote areas in poorer countries. Overall, however, pathology connected with an immature pelvis is probably relatively rare and its occurrence is confined to specific regions. The late onset of puberty, followed by an early pregnancy (at a low gynaecological age) might also play a role.

5.3 Summary

In developed countries the CS rate in adolescents is generally lower than in controls >19 years old. In a number of developing countries there seems to be the opposite trend with a higher CS rate among adolescents. In most studies from developed countries lower percentages of inductions, oxytocin use and episiotomies are reported in adolescents. The rates of CS and several other interventions both in developed and developing countries could easily be influenced by the attitude of obstetricians and midwives towards labour and delivery in young girls, and by the attitude of the girls themselves. The available data from developed countries lead to the conclusion that generally labour in adolescents is not more complicated than in older women and that the incidence of interventions is less. In developing countries, especially in some poorer regions there are however indications that in very young girls (<16 years) pelvic bones and the birth canal are still immature; this may cause obstructed labour and other obstetric complications such as fistulas.

PART 6
Outcome of pregnancy

6.1 Subdivisions of preterm birth

Preterm birth (birth before 37 weeks) is a major cause of neonatal death and infant morbidity. Preterm births can be divided into two different groups. The first group comprises births that have been preceded by various complications during pregnancy, such as pre-eclampsia, serious fetal growth retardation, placenta praevia, and abruptio placentae. Because of these complications an indication exists to artificially terminate the pregnancy before a gestational age of 37 weeks; as a consequence the infant is born preterm. Neonatal morbidity in this group of patients is related to the aftermath of the preceding complication, and also to the sequelae of preterm birth. The incidences of those pathologies preceding preterm birth in this group usually do not differ among adolescents, compared to older pregnant women. However, hypertensive disease and fetal growth retardation are more frequent in nulliparous women. As pregnant adolescents are often nulliparous the incidence of these complications in a group of adolescents is relatively high. The incidence of placenta praevia and of abruptio placentae increases with higher age and parity; and these complications are relatively rare in adolescents (Cunningham et al., 1997).

The second group of preterm births are those resulting from spontaneous preterm labour, resulting in preterm delivery. Neonatal morbidity here is primarily related to preterm birth. This morbidity includes low birth weight (LBW), but also disease caused by the immaturity of various organs, especially the lungs. The morbidity is more serious if birth occurs at a gestational age of <33 weeks; life-preserving treatment necessitates intensive care, if available.

In this section, attention is primarily given to the second group of preterm births: those preceded by spontaneous preterm labour and delivery. White et al. (1986) investigated spontaneous preterm labour in primiparae, and discovered that this group again may be subdivided into two groups: those women in whom labour starts following premature rupture of the membranes (PROM), and those in whom the membranes are intact and labour starts with contractions of the uterus. Among those with intact membranes, unmarried women and adolescents were over-represented to a significant extent compared with all primiparae. Among those with PROM, the distribution of age and marital state was similar to that in all primiparae, but the birth-weight centile distribution showed a significant shift towards light-for-dates babies. White et al. (1986) concluded that there might be two distinct categories of pregnancies that end in spontaneous preterm birth.

6.2 Incidence of preterm labour and delivery in adolescents

A great number of studies in many countries have been published comparing the risk of preterm birth in adolescent versus adult pregnant women. Table 4 lists 27 studies of which only three found no difference between adolescents and adults. The others found more preterm births in adolescents. Most of these studies are clinical, hospital-based studies and are thus liable to referral biases. However, seven studies were based upon defined populations of a region or country, six in developed countries and one in a developing country. These are the selected studies marked with an * as indicated in section 1.2. They are based upon a representative sample of a regional or national population, include a representative control group of adult pregnancies with the same parity; and possible differences have been statistically evaluated. All these studies found more preterm births in adolescents.

In the USA, several investigations made use of large databases: *Leland et al. (1995) used data from the USA National Center for Health Statistics (the Linked Birth-Infant Death Data Set) and examined

Table 4: Studies comparing the risk of preterm birth in pregnant adolescents and adults

Country	Study	Year	Preterm birth
USA	Hulka & Schaaf	1964	+
	Duenhoelter	1975	+
	Graham	1981	+
	Horon et al.	1983	+
	Brown et al.	1991	+
	Yoder & Young	1997	=
	Berenson	1997	=
	*Leland et al.	1995	+
	*Cooper et al.	1995	+
	*Fraser et al.	1995	+
	*Hediger et al.	1997	+
Canada	Jacomo et al.	1992	+
Sweden	*Otterblad Olausson et al.	1999	+
Netherlands	*Buitendijk et al.	1993	+
UK	Osbourne et al.	1981	+
Ireland	Conolly et al.	1998	+
Australia	Lee & Walters	1983	+
Malta	Savona-Ventura & Grech	1990	+
Brazil	*Ferraz et al.	1990	+
Jamaica	Roopnaresingh	1970	+
Saudi Arabia	Khwaja et al.	1986	+
Singapore	Kurup et al.	1989	+
	Lee et al.	1990	=
Grenada	Kondamudi et al.	1993	+
Hong Kong	Lao & Ho	1997; 1998	+
Ethiopia	Ali & Lulseged	1997	+
	Kumbi & Isehak	1999	+

+ more preterm births in adolescents
= no difference
* selected studies

pregnancy outcomes among 38,551 adolescents aged 10–14. A very high number of these births were preterm: among white adolescents 25% and among black adolescents 39%. *Cooper et al. (1995) used the same database to examine birth outcomes among a 1983–1986 cohort of young adolescent mothers for the age groups 10–12; 13; 14; and 15 years (Table 5). Only primiparae were studied (127,598). The proportion of preterm (33–36 weeks) and very preterm (<33 weeks) deliveries was very high in these young adolescents, but decreased significantly as maternal age increased. *Fraser et al. (1995) used another large data set in the USA. Vital-statistics data from Utah were used to produce stratified analyses of 134,088 white girls and women, 13–24 years old. In an analysis of a group of white women (who although young, lived in good circumstances, with educational levels appropriate for their ages, and received good antenatal care), it was found that younger adolescent mothers (13–17) had a significantly higher risk ($p < 0.001$) of delivering a preterm infant preterm than older mothers (20–24); with a relative risk of 1.9, 95% CI: 1.7–2.1). This confirms young age as an independent risk factor in preterm delivery. *Hediger et al. (1997) in a regional research project on 366 young adolescents (aged <16) years found an increased risk of preterm labour compared with women 18–29 year (odds ratio 1.74; 95% CI: 1.07–2.84).

In Sweden, births to nulliparous women aged 13–24 years recorded in the nationwide Medical Birth Registry 1973–1989 showed that rates of very preterm birth (<33 weeks) were inversely related to maternal age (*Otterblad Olausson et al., 1999). In the youngest group (13–15 years) the rate was 5.9%, while in the oldest group (20–24 years) the figure was 1.1%.

Table 5: Birth outcomes by maternal age: 1983–1986 single live births to American resident, black and white, primiparous mothers 10–15 years of age				
Maternal age	10–12	13	14	15
Number of births Statistics	922	6346	29,903	90,337
Gestational age				
χ^2=529.95, DF=9 *P* <0.01 % ≤32 weeks % 33–36 weeks % 37–41 weeks % ≥42 weeks % Missing data	12.24 17.70 57.45 12.61 18.11	11.15 17.29 60.20 11.36 11.65	8.33 14.98 63.23 13.45 8.90	6.36 12.86 66.64 14.14 6.84
(Cooper et al., 1995)				

In the Netherlands (which has a very low incidence of adolescent pregnancies) the outcome of 4500 adolescent pregnancies was studied using a national obstetric database (*Buitendijk et al., 1993). Women between the ages of 13–19 had an increased relative risk of 1.5 of having a preterm baby, compared to women between the ages of 20–29 (p <0.0001).

A case-control study in two health centres and three hospitals in a city in Northeast Brazil compared 429 women with preterm birth with 2555 controls who delivered at term. Maternal age <20 proved to be a determinant of preterm birth (*Ferraz et al., 1990).

In conclusion, there is overwhelming evidence from population-based and hospital-based studies both in developed and developing countries that adolescent pregnant girls are at increased risk for preterm labour and delivery, compared to older pregnant women. The youngest age groups run the highest risk.

6.3 Etiology of preterm labour and delivery in adolescents

The possible etiology of the increased incidence of preterm delivery in adolescents evokes much discussion. Although one possibility is the immaturity of the organs of young women, its frequency among adolescent pregnant girls of different ethnic groups is often disproportional, especially in developed countries (see section 3.1). Many girls are socially deprived (see section 3.2); may be physically abused (see section 3.6); and some smoke and use substances (see section 3.7). Such social and behavioural factors may adversely affect pregnancy outcome. Moreover, adolescent pregnant girls often attend antenatal care late in pregnancy or receive no care at all (Peoples et al., 1984; Singh et al., 1985; Scholl et al., 1987; Silva et al., 1993). In the developing world the availability, content and quality of antenatal care varies enormously, and is often inadequate, especially in countries with high maternal mortality (Royston & Ferguson 1985; Filippi et al., 1991; Rooney 1992). Although all these issues are possible factors influencing the incidence of preterm delivery in adolescent girls, the above-mentioned population-based studies make it clear that maternal age is a very important independent causal factor.

Chronological age and gynaecological age

Zlatnik & Burmeister (1977) introduced the concept of "low gynaecological age". They defined gynaecological age (GA) as "chronological age minus age at menarche", and found that in pregnant adolescents low GA (<2 years) increased the chance of delivering a low-birth-weight infant. This concept

was used by *Scholl et al. (1989) in a large regional research project comprising 1700 young primigravidae aged 18 or younger. After stratifying by chronological age and controlling for confounding variables, low GA was associated with almost double the risk of preterm birth. Thus low GA appears to be an independent factor influencing the outcome of adolescent pregnancy. It seems quite probable that it reflects immaturity of the maternal organs, primarily the uterus but possibly also the hypothalamic-pituitary axis. The influence of low GA has been confirmed in another cohort (*Scholl et al., 1992). In a third study by the same group (*Hediger et al., 1997) a distinction was made between preterm delivery following preterm labour (PTL), and preterm delivery attributable to other causes, such as PROM (premature rupture of the membranes) or medical indications to terminate pregnancy. Young adolescents <16 years with low (<2 years) GA had a considerably increased risk of PTL (odds ratio 2.64; 95% CI: 1.23–5.65). When GA was higher, the risk of PTL was shown to be only moderately increased. On the other hand: in young gravidas the risk of preterm delivery (with other causes) was not increased, and even non-significantly decreased (odds ratio 0.70; 95% CI: 0.28–1.75). In Hong Kong, Lao & Ho (2000) found that in pregnant adolescents (<20 years) the rate of spontaneous preterm birth was significantly and inversely correlated with maternal height. Their data also suggest that the inherent risk of preterm birth in adolescents is related to their immature physical development at the time of pregnancy.

Ethnicity

*Leland et al. (1995) investigated the influence of ethnicity. They used the same 1983–1986 National Center for Health Statistics cohort as did Cooper et al. (1995) to examine variations in pregnancy outcomes among 38,551 resident American black and white adolescents aged 10–14. Black mothers had higher proportions of preterm (33–36 weeks) births than did white mothers (28.29% versus 19.05% respectively). They also had higher proportions of very preterm (<33 weeks) births (10.87% versus 6.33% respectively). The differences between the two groups were statistically significant ($p < .01$). All these percentages are remarkably high, but the rates for black mothers are extreme. These results are in agreement with those of *Cooper et al. (1995) who in their logistic regression analysis found that being a black mother was an independent risk factor for preterm delivery.

The second pregnancy of adolescent mothers

Recently *Otterblad Olausson et al. (2001) using the Swedish Medical Birth Register investigated whether or not the increased risk of preterm birth in adolescents <18 years persists in pregnancies after the adolescent period. Mothers aged 13–15 years had a strongly increased risk of very preterm birth (<32 weeks) compared with women aged 20–24 years (odds ratio 4.8) and adolescents aged 16–17 years still had an increased risk (odds ratio 2.3). At second birth the risks of preterm birth were reduced in all the groups, but those aged 17 years or less at first birth exhibited a significantly larger reduction in the risk of very and moderate preterm birth, compared with women 20–24 years at first birth. This suggests that biological immaturity is part of the causal pathway between adolescent pregnancy and risk of preterm birth; a result in line with the above-mentioned studies on the influence of low gynaecological age.

Other factors

In the logistic analysis by *Cooper et al. (1995) other maternal factors that were independently and significantly associated with very preterm and preterm delivery included being unmarried, inadequate antenatal care, metropolitan residency, and low educational attainment. These factors apparently interrelated with poverty and deprivation, particularly in the large cities in the USA, and will be discussed in PART 8.

6.4 Low birth weight

Low birth weight (LBW) is defined as birth weight <2500 g, and very low birth weight (VLBW) as birth weight <1500 g. In some hospital-based studies from developed countries the incidence of LBW and/or VLBW in infants of adolescent mothers was higher compared to the infants of older mothers (Correy et al., 1984; Zhang & Chan, 1991; Miller et al., 1996). However, others did not find a difference (Berenson et al., 1997) or reported different outcomes in subgroups of the population (Amini et al., 1996; Reichman & Pagnini, 1997). One study from Jerusalem reported on the outcome of 421 primiparae aged 15–19

years, who belonged to an orthodox Jewish community (Mea Shearim) where girls traditionally marry young and where birth control is forbidden. The girls receive economical and social support from their communities. The incidence of LBW was significantly lower compared to a control group of adolescent pregnant women from other areas of Jerusalem (Gale et al., 1989).

A number of hospital-based studies in developing countries have shown a higher incidence of LBW among infants of adolescent mothers (Arkutu, 1978; Khwaja et al., 1986; Adetoro & Agah, 1988; Savona-Ventura & Grech, 1990; Bacci et al., 1993; LeGrand & Mbacké, 1993; Lao & Ho, 1997; Ali & Lulseged, 1997).

In addition, some epidemiological studies in large populations, particularly in the USA, have shown an increased incidence of LBW in infants of adolescent mothers, compared to infants of mothers in their twenties (Makinson, 1985; *Fraser et al., 1995). *Cooper et al. (1995) compared differences between adolescents 10–14 years of age, and 15 years old. The incidence of LBW was significantly higher in the younger adolescents. In the logistic regression analysis the risk of delivering a LBW or VLBW infant progressively increased as maternal age decreased. Black maternal race and inadequate antenatal care were also associated with LBW. Leland et al. (1995) investigated differences between black and white adolescents, and found the incidence of LBW significantly higher in infants of black mothers. Of course, LBW is closely associated with preterm birth (see section 6.5).

6.5 Small for gestational age infants

Small for Gestational Age (SGA) infants are infants below the 10th percentile of birth weight for gestational age. *Fraser et al. (1995) found an increased incidence of SGA infants in adolescent mothers compared to mothers 20–24 years of age. *Leland et al. (1995) showed a higher incidence of SGA infants among black adolescent mothers compared to white mothers. *Cooper et al. (1995) in their logistic regression analysis found that maternal age was not an independent risk factor for SGA but that black maternal race, inadequate antenatal care, and low educational attainment were. In the Netherlands, using data from a national obstetric database, among 4500 infants of adolescent pregnancies an increased incidence of preterm birth but no increased incidence of SGA was found, compared to the infants of mothers 20–29 years of age (*Buitendijk et al., 1993). An important determinant of SGA is maternal smoking (Van der Velde & Treffers, 1985).

An interrelation exists between the three factors preterm birth, low birth weight and small for gestational age infants. Preterm birth is a determinant of low birth weight, and so is fetal growth retardation, leading to SGA infants. Apparently in adolescents maternal age is an independent risk factor for preterm birth, and thus for low birth weight. However, according to several investigations (*Buitendijk et al., 1993; *Cooper et al., 1995) the association between maternal age and SGA infants is less obvious. *Ferraz et al. (1990) in a case-control study in Brazil found that maternal age <20 years was a determinant for preterm birth, but not for SGA infants.

If the standard definition of SGA used in birth-weight charts is applied to populations of different ethnic origin, it must be realized that such standards are drawn up from populations of white European origin, and are adapted to the anthropometric measures of such a population. These measures are different in populations of African, Asian or other origin. Because the stature of these non-white populations is generally smaller and their birth weights low compared to Europeans, too many infants are categorized as SGA (Doornbos et al., 1991).

6.6 Perinatal and infant mortality

Perinatal mortality (PM), according to WHO, is defined as stillbirth, and neonatal mortality from a birth weight of 500 g, and up to the end of the first week following birth. Some studies only deal with live births and consequently only report on neonatal mortality, while others only report on stillbirth.

Infant mortality is defined as mortality of liveborn infants in the first year of life. Some hospital-based studies of PM have found increased rates among the infants of adolescent mothers, compared to infants of older mothers (Ward & Biggs, 1981; Harrison et al., 1985a; Rahman et al., 1989). Others found no difference (Osbourne et al., 1981; Bradford & Giles, 1989).

An epidemiological study in the Netherlands, using data from a national obstetric database, found a significantly increased risk of stillbirth in adolescent pregnancies, compared to women 20–29 years of age (*Buitendijk et al., 1993). In the 1970s and 1980s in England and Wales, France, and Sweden, perinatal death rates in infants of adolescents were higher than in infants of women 20–24 years of age (Makinson, 1985). *Leland et al. (1995), using the 1983–1986 US Linked Live Birth-Infant Death files, found higher neonatal and infant mortality rates among infants of black adolescents compared to white adolescents. However, *Cooper et al. (1995), using the same source of data, concluded from their logistic regression analysis that black maternal race did not pose a risk for neonatal mortality. Infants of the youngest mothers (10–13 years) were at greatest risk of neonatal mortality. Inadequate antenatal care and metropolitan residence were additional risk factors. In Sweden, data from the nationwide Medical Birth Registry on all single births to nulliparous women 13–24 years old showed that infants of the youngest mothers (13–15 years) had the highest neonatal mortality, a threefold increase compared with the mothers aged 20–24 years. Infants of mothers 16–17 years exhibited a 70% increase in risk of neonatal mortality. The increase in risk in young mothers could be largely explained by increased rates of very preterm birth (*Otterblad Olausson et al., 1999).

6.7 Maternal mortality and morbidity

In developed countries maternal mortality rates are so low that age-specific rates are not easily available. In developing countries maternal mortality is much higher, but in these countries it is difficult to attain reliable age-specific data in a well-defined population. Most data are hospital-based, and the population from which they are derived remains unknown. In Nigeria, Harrison et al. (1985a) reported increased rates of maternal mortality in young pregnant girls <15 years of age (maternal mortality 27/1000 compared to 4/1000 in women 20–24 years). These data were hospital-based. Unsafe abortion as a risk factor for maternal death was studied by *Goyaux et al. (2001) who described 969 women admitted to hospital for the complications of induced abortion; 22 of whom died. Infection was the most important factor leading to death. Anaemia is one of the important causes of maternal mortality, including among adolescents (*Brabin et al., 2001). Granja et al. (2001) studied 239 cases of maternal death from 1989–1993 in Maputo Central Hospital, of which 22% were adolescents. The main causes of adolescent death were malaria, pregnancy-induced hypertension, puerperal sepsis and septic abortion. The maternal mortality ratios in adolescents (<20 years) and non-adolescents were approximated from an analysis of mother's age in all births in the same period. The maternal mortality ratio among adolescents was 387 per 100,000; in non-adolescents the figure was 294 per 100,000. Malaria and hypertensive disease were more frequent causes of death in adolescents, with haemorrhage a less frequent cause than in older women.

A number of studies were community-based and therefore can give information on maternal mortality in a defined population. In one example from a developed country a confidential enquiry into maternal mortality in the Netherlands 1983–1992 (*Schuitemaker et al., 1998) found the lowest mortality among women 25–29 years (8.3 per 100,000); the mortality in adolescents being somewhat higher (11.9 per 100,000; OR 1.4; 95% CI 0.4-4.1).

In developing countries, maternal mortality is much higher but more difficult to measure. In a community-based retrospective survey in Ethiopia *Kwast (1986) found a maternal mortality rate of 12.7/1000 in mothers 15–19 years of age, compared to 3.6/1000 in mothers aged 25-29 years. Of the eight deaths in the 15–19 year age group, four were due to unsafe abortion. A logistic regression analysis was performed on seven variables (excluding abortion) comparing cases of maternal mortality and controls (*Kwast & Liff, 1988). Young maternal age turned out not to be a predictor of maternal mortality if antenatal care and occupation were entered into the analysis. Mortality was significantly increased for women who did not book for antenatal care. In Bangladesh *Rahman et al. (1989) conducted a survey

in a population of 175,000; they reported an increased maternal mortality rate in 13–17 year-old girls compared to 18–23 year-olds, but the numbers were too small to compare these groups properly. In southern India, *Bhatia (1993) conducted an extensive study in a district with an urban population of 569,500 and a rural population of 1,090,640. Compared with a control group of women who survived their pregnancy, a significantly higher proportion of women who died were in the younger (15–19 years) age group. The women who died were of significantly lower social status, were less literate, had a lower level of education, and made less use of health facilities (including antenatal care). Although the authors do not provide a multivariate analysis, it is highly probable that many pregnant adolescents also belong to the less-educated groups who do not adequately make use of health facilities. Therefore, as described by Kwast & Liff (1988), young maternal age as such need not be a predictor of maternal death if these other factors are taken into account. Rao & Amalraj (1994) published a community-based survey among married women in southern India. In a rural area they did not find a difference in maternal mortality rates between adolescents 15–19 years and women 20–29 years, but in a semi-urban area the rate among adolescents was somewhat lower. They did not collect data on unmarried adolescents. *Bouvier-Colle et al. (2001) undertook a population-based survey of maternal mortality in all pregnant women living in seven defined areas in West Africa. The lowest mortality was found in women aged 20–24 years (203.6 per 100,000). In adolescents (15–19 years) the rate was 350.4 per 100,000 (95% CI: 175–627). Maternal mortality in the first trimester (including mortality from unsafe abortion) could not be included. In a demographic surveillance conducted in Senegal, *Ronsmans et al. (2001) found that the maternal mortality rate in adolescents 15–19 years of age was 70% higher than the rate among women 20–24 years (RR 1.7; CI: 0.9–3.5).

The most conspicuous morbidities in young women suffering obstructed labour in developing countries are vesico-vaginal and recto-vaginal fistulas, which, if not treated adequately, make the woman an outcast. The prevalence of this serious morbidity is particularly high in sub-Saharan Africa. High figures have been reported in Chad, Ethiopia, Nigeria and Sudan. Kelly & Kwast (1993) reported on 309 fistulas in Ethiopia. The etiology was neglected obstructed labour in almost all cases. The age of the women at the time of labour was <20 years in 42% of cases; 65% were under 25; and 7% were under 16. These women came from long distances to the hospital in Addis Ababa where the Fistula Hospital was situated, and therefore the population from which they came was unknown. Nevertheless, these figures strongly suggest that the risk of contracting a fistula is increased in the youngest age groups. This would mean that the risk of obstructed labour is also increased.

6.8 Summary

In many studies the outcome of adolescent pregnancies was unfavourable compared to the outcome of pregnancies in older women. Convincing evidence from developed and developing countries is available showing that adolescent pregnant girls are at increased risk for preterm delivery (<37 weeks) compared to older pregnant women. The youngest age groups run the highest risk. Possible etiological and/or associated factors are immaturity of organs (especially in girls with low gynaecological age, i.e. a short interval between menarche and pregnancy); African maternal origin; and social factors such as metropolitan residency (in the USA) and low educational attainment. The incidence of low birth weight (<2500 g) is higher in adolescents compared to older mothers, chiefly because of the increased incidence of preterm births. Although in some studies the incidence of small for gestational age (SGA) infants was also higher, several epidemiological investigations showed that young maternal age is not an independent risk factor for SGA infants. Smoking is a determinant of SGA. In several studies, perinatal or neonatal mortality was higher among infants of adolescent mothers, with the infants of the youngest mothers at greatest risk.

Most studies from developing countries reported that levels of maternal mortality were higher in young adolescents. The main causes of adolescent maternal death were malaria, pregnancy-induced hypertension, puerperal sepsis and septic abortion. However, if education, social status and use of health facilities are taken into account there remains some doubt as to whether or not young maternal age as such is a predictor of likelihood of maternal death. The risk of contracting a vesico-vaginal or recto-vaginal fistula as a consequence of obstructed labour is higher for adolescents.

PART 7
Postpartum problems

In this section the major medical and psychosocial problems which might be experienced by adolescent mothers in the postpartum period are discussed. A number of corresponding recommendations for treatment are given in PART 10.

7.1 Problems of adolescent mothers

In the WHO report *Postpartum care of the mother and newborn* (WHO, 1998b) the needs of women are outlined and a number of epidemiological studies into maternal morbidity in the postpartum period are described. The data presented in the report were obtained from general populations of postpartum women and are generally applicable to adolescent girls in the postpartum period. Nevertheless there are a number of specific issues that may particularly affect young adolescent mothers and these are outlined below.

Anaemia

This is a serious problem for approximately 2000 million people worldwide due to diets having insufficient iron and folate content, and to a reduced availability of dietary iron (and losses) following repeated attacks of malaria and hookworm infections. Acute and chronic inflammation due to infectious diseases such as tuberculosis (as well as HIV infection) are also possibly among the etiological factors of anaemia (Van den Broek, 1998; *Brabin et al., 2001; see section 4.2). The regions with the highest prevalence of anaemia are Africa, Asia and Latin America (WHO, 1998b). Nutritional deficiencies are usually related to social and environmental circumstances, and if they are not adequately treated during antenatal care the anaemia may be aggravated by the effect of maternal blood loss during labour and may increase the risk of puerperal infection. Because deprived environmental and social circumstances affect children and adolescents most, and as adolescents often also have inadequate antenatal care (and therefore cannot take advantage of iron/folate tablets and malaria treatment) they are more at risk of anaemia in the postpartum period (WHO, 1998a; see section 4.2). Adolescents are also at increased risk of acquiring HIV infection (see sections 3.4 and 4.4).

Nutrition

In many developing countries the nutritional status of large segments of the population, especially women, is inadequate. Undernutrition of women can be attributed to discrimination in terms of food allocation, to the heavy burden of physical labour, and to reproduction (McGuire & Popkin, 1989). Often the diet of adolescents during pregnancy and postpartum is particularly inadequate (for recommendations on nutrition in the postpartum period see section 10.2). Important deficiencies in the postpartum period include:

- Caloric intake – during lactation women need an extra caloric intake (WHO, 1998b) but in areas of chronic undernutrition the energy intake of lactating women is often marginal or inadequate.
- Iodine deficiency – in iodine-deficient environments, including in countries where the iodination of salt is not established.
- Vitamin A deficiency – is the most common cause of preventable childhood blindness; fruits and vegetables are the main natural source of vitamin A but in many countries regular intake is attained by the fortification of foods such as dairy products or sugar.
- Iron and folate deficiency – cause anaemia in many people worldwide, especially pregnant and postpartum women.

Pre-eclampsia and eclampsia

Although pre-eclampsia does not occur more often in young adolescents *per se* (see section 4.1) they are at risk of pre-eclampsia because they are more usually primigravidae. The symptoms may be aggravated during the first days of the postpartum period and occasionally the first symptoms are only recognized postpartum (WHO, 1998b). Eclampsia occurring more than 48 hours postpartum has traditionally been considered as exceptional but a recent study (Lubarsky et al., 1994) reports that more than 50% of their postpartum cases initially presented three or more days postpartum. Apparently regional differences in the incidence and manifestations of eclampsia exist.

Contraception

One of the main problems confronting the young adolescent girl in the postpartum period is sex and the possible prevention of future pregnancies. In many countries (including the USA) unmarried adolescents meet considerable resistance to obtaining reliable contraception, because the availability of contraception is wrongly believed to induce adolescents to have sex. Within countries, adolescent childbearing is more likely to occur among highly disadvantaged subgroups. The motivation to delay further childbearing is generally rather low in these poor minorities, because for them adolescent childbearing makes little difference in determining long-term success (Furstenberg, 1998). Lack of motivation combined with difficulties in obtaining contraceptives often results in unprotected intercourse and repeat pregnancies. In the USA, repeat pregnancy rates in adolescents of 30–50% within 24 months of delivery have been reported (Matsuhashi, 1989). Thus, obtaining contraception is one of the most serious problems confronting a new adolescent mother and caregivers should address themselves to it.

Long-term perspectives

In an extensive critique of five longitudinal studies into the consequences of adolescent childbearing compared with adults in Latin America (Barbados, Chile, Guatemala (n=2) and Mexico) *Buvinic (1998) showed that early childbearing is not associated with negative effects on future marital prospects, even though much of the adolescent childbearing took place outside of marriage. Childbearing among adolescents was, however, associated with higher levels of subsequent childbearing. Younger adolescent mothers had a shorter period of time until their next pregnancy, and they also had more future births than adolescent mothers aged 18 and 19 years.

In the studies in Latin America described by *Buvinic (1998) it was also shown that adolescent motherhood is associated with adverse socioeconomic conditions and poor earning opportunities for the adolescent mother. In Mexico 26% of the adolescent mothers surveyed lived in poverty, compared with only 4% of adult mothers. Mothers who had their first child with a 17-year-old or younger biological father were twice as likely to be poor than were mothers who had their first child with older biological fathers. Adolescent mothers originating from poor families were especially affected by these adverse socioeconomic circumstances, and thus early childbearing seemed to entrench the poverty of low-income women. The vicious circle of poverty for themselves and their children begins with early childbearing among poor adolescents. One of the determinants of poverty may be the fact that in many countries adolescent childbearing is associated with the premature termination of education, for instance in the Middle East and North Africa (Özcebe & Akin, 1995), sub-Saharan Africa (Zabin & Kiragu, 1998) and Latin America (*Buvinic, 1998).

It is not only in developing countries that adolescent childbearing predisposes to long-term socioeconomic problems (and may be an expression of existing problems). *Otterblad Olausson et al. (2001) carried out a follow-up study of women who gave birth in Sweden from 1941–1970. They compared those who were adolescents at the time of their first birth with women who were 20–30 years. Adolescent mothers had significantly increased odds of each unfavourable socioeconomic outcome in later life. For example, adolescent motherhood was positively associated with low educational attainment, with single living arrangements, with high parity, with collecting a disability pension and with welfare dependency. The analysis supports the view that childbearing during adolescence poses a risk for socioeconomic disadvantage in later life, even for adolescents from relatively comfortable backgrounds and for those who studied beyond elementary school. In the USA, Hofferth et al. (2001) also found that adolescent childbearing had a negative effect on future education.

7.2 Problems of infants

Preterm and low-birth-weight infants

Adolescents are relatively often confronted with the birth of a preterm and/or low-birth-weight infant (see sections 6.2 and 3.4). Infants born at a gestational age <33 weeks and with birth weights <1500 g are especially at increased risk of dying or of serious morbidity. In developed countries these infants are frequently cared for in neonatal intensive-care units, an expensive form of health care not generally available in developing countries. For the young mothers the confrontation with a dying (or seriously ill) infant is a stressful and distressing experience. When a preterm infant comes home it needs extra care and attention.

Tetanus

Neonatal tetanus is a serious infection only occurring in regions where basic hygienic measures during and after delivery are neglected or unknown, and where the immunization coverage of young women is still inadequate. Prevention is achieved by clean delivery, together with the immunization of children, pregnant women and women of childbearing age (WHO, 1998b). However, adolescents may not have been immunized adequately, and if they find themselves to be pregnant they may not seek antenatal care. Thus they may not be protected at the time they give birth. Moreover, they may not give birth at all, but go to an abortionist and have an unsafe abortion. Then they are at risk of tetanus infection themselves. One public-health step to reduce neonatal tetanus in this group is the delivery of tetanus toxoid in infancy and booster doses in later childhood and early adolescence.

Breastfeeding

Human breast milk is the optimal food for newborn infants. In developing countries artificial feeding is associated with a much higher infant morbidity and mortality than breastfeeding, primarily caused by infections and malnutrition (Feachem & Koblinsky, 1984; Habicht et al., 1986; Victora et al., 1986). But in developed countries too there is ample evidence of the advantage of breastfeeding, especially in the prevention of infectious diseases (Howie et al., 1990; Wilson et al., 1998). There is little knowledge of breastfeeding practices among young adolescent mothers; in the USA, Jolly et al. (2000) found that mothers under 18 years old breastfed their infants considerably less than older mothers. In other countries, data are lacking, but it seems plausible that unmarried adolescents in particular will generally have some difficulty with the regular and time-consuming availability required by their infants.

In case of HIV infection a difficult dilemma exists, because breastfeeding may transmit the virus to the infant. This problem will be discussed in section 10.2.

Long-term perspectives

In the Latin American studies described by Buvinic (1998) the nutritional status of the children 4–10 years after their birth from an adolescent mother was investigated. Children of younger mothers had a significantly poorer nutritional status than children of older mothers. This relative disadvantage was also found in the child's psychosocial development: children of adolescent mothers had lower scores on a language-development test and their mothers more frequently reported behavioural problems. These differences were only apparent in the children of poor adolescents, and not in those born to adolescent mothers who were categorized as "non-poor". Thus the condition of the children of adolescents was directly related to the adverse socioeconomic situation of their mothers.

7.3 Summary

The most important medical problems of adolescent mothers in the postpartum period are anaemia, inadequate nutrition and (in the first days) pre-eclampsia. But some psychosocial problems are even more important. Obtaining contraception is one of the most serious problems confronting a new adolescent mother and caregivers should address themselves to it.

The motivation to delay further childbearing is often rather low in adolescent girls in deprived social circumstances. This lack of motivation combined with difficulties in obtaining contraceptives often results in unprotected intercourse and repeat pregnancies. Adolescent mothers originating from poor families are affected by adverse socioeconomic circumstances; and the vicious circle of poverty for themselves and their children begins with early childbearing among poor adolescents. One of the determinants of poverty may be the fact that in many countries adolescent childbearing is associated with premature termination of education. Comparable problems are apparent for the children of adolescent mothers; in the long run they have a significantly poorer nutritional status than the children of older mothers and lower scores on a language-development test; their mothers also more frequently reported behavioural problems.

PART 8
Antenatal care

8.1 Standards and value of antenatal care

Antenatal care is an important part of obstetric and perinatal care. It is often considered one of the best examples of preventive medicine, and essential for the attainment of an optimal outcome of pregnancy. However since the 1980s critical reviews have supported the notion that the value of some medical aspects of antenatal care might be less than expected (Hall et al., 1980; Chalmers et al., 1980). In addition, the association between the number of antenatal visits and the outcome of pregnancy is not a simple causal relation (Hall et al., 1980). An important bias is caused by the fact that pregnancies ending preterm often have an unfavourable outcome; because most antenatal visits take place in the third trimester the number of visits in such pregnancies is usually small. In Finland in an extensive study a U-shaped relation was found between the number of antenatal visits and an unfavourable outcome of pregnancy. The best outcomes were found in the group of women with an average number of visits (Gissler & Hemminki, 1994).

In 1996 a European randomized controlled trial on reducing the number of antenatal visits in a low-risk population was published (Sikorsky et al., 1996). Reducing the average number of visits per pregnancy from 10.8 to 8.6 had no important consequences for the clinical efficacy of antenatal care. The intention was to reduce further the number of visits, but there was considerable opposition from pregnant women against a scheme with a reduced number of visits. The most important reason for this resistance was the need for more contact with the caregiver and for reassurance. In a randomized trial in a low-risk group of pregnant women in the USA no difference was found in outcome of pregnancy, but in this study the lowest frequency of visits (12 per pregnancy) was very high (McDuffie et al., 1996).

The above-mentioned studies and the discussions on the value of antenatal care all took place in developed countries. One randomized trial in a developing country was conducted by Munjanja et al. (1996). In a group of 16,000 pregnant women in Zimbabwe a classic scheme of antenatal care was compared with a reduced scheme with less visits and screening tests. The routine number of visits were 4–6, and the average duration of pregnancy at booking was 28 weeks. There were no differences in outcome between the groups.

In addition to this quantitative approach (i.e. the number of antenatal visits) another approach has been to assess the content of antenatal care. The value of a number of screening tests and interventions is firmly established. Examples include the prevention and treatment of malaria and anaemia, the early detection of hypertension and proteinuria, and the treatment of severe hypertension. Rooney (1992) reviewed the evidence of the various screening tests, diagnostic investigations and interventions. A WHO Technical Working Group has also produced recommendations on the content of antenatal care (WHO 1996a). In 2001 WHO then published the outcome of a randomized trial to test a new model of antenatal care (*Villar et al., 2001). For routine antenatal care in this new model four visits are recommended; details of the content of these visits are presented based on the available evidence (WHO, 2002a). A practical guide (Essential Care Practice Guide; ECPG) for skilled attendants at the primary health-care level in developing countries has now been published (WHO, 2002b). Selected subjects in this area are discussed below in the following sections.

Antenatal care is more than a technical screening procedure. The pregnant woman needs social contact with the caregiver, and needs reassurance and answers to many questions. The personal attention of a caregiver she knows and trusts may also be important for the outcome of labour. In the discussions on the value of various schemes of antenatal care it should be kept in mind that many pregnant women in

the developing world do not receive modern antenatal care at all. And even in the developed world a number of women, especially adolescents, do not receive proper care. The American College of Obstetricians and Gynecologists (ACOG) strongly recommends the provision of such health services for adolescents and other under-served women (Davidson et al., 1991).

8.2 Actual practice of antenatal care for adolescents

Developed countries

Many studies on antenatal care for adolescents are performed in the USA. The general conclusion is that antenatal care utilization in this subgroup of pregnant women is often insufficient and needs improvement. If a rather strict definition of inadequate care is used (care in the third trimester only, or no care at all) poor women (income <150% of the federal poverty level) more often receive inadequate antenatal care. Of unmarried adolescents (<20 years of age) 16.4% receive inadequate care. For comparison, only 2.0% of "non-poor" white married women (>20 years of age) received inadequate care (*Singh et al., 1985). Adolescents are more likely to enrol late for antenatal care and to make fewer visits before delivery than mature women. By the end of the first trimester less than 50% of white or black American adolescents had enrolled for antenatal care, compared with 70% (white) and 56% (black) of women aged 20–24 years (*National Center for Health Statistics, 1991; Scholl et al., 1994). If an adolescent experienced a second pregnancy as an adolescent, the antenatal care utilization was worse compared to the first pregnancy. More women had no antenatal care at all the second time, and the number of visits was less (Blankson et al., 1993; Covington et al., 1994).

Young maternal age, low educational level and living in poverty generally describe women receiving little or no care (McDonald & Coburn, 1988). Some adolescents may not differentiate vaginal bleeding early in pregnancy from normal menstruation and thus delay their entry to care (Stevens-Simon et al., 1991). Financial barriers including lack of medical insurance, no eligibility for subsidized antenatal care, and transportation costs are impediments to adequate care (Gold et al., 1987). Many adolescents do not believe they are pregnant although the signs and symptoms are apparent, and when they know that they are pregnant they often try to conceal it, hoping it will "pass over". In one study 40% of the younger adolescents (15–17 years) delayed care in order to keep their pregnancy hidden (Young et al., 1989). Several studies cite dissatisfaction with provider practices (such as clinic waiting times) as a barrier to care. Clinics which are perceived as more attractive and inviting have earlier registration for care, better compliance with clinic appointments and are more likely to have patients who receive adequate antenatal care (Wells et al., 1990; Cartoof et al., 1991).

One factor which can delay the start of antenatal care is strangely not mentioned in the extensive American literature on antenatal care in adolescence. Many adolescents, when they find out that they are pregnant, do not contemplate antenatal care at all, but instead seek ways to terminate the pregnancy. In many countries (including the USA) 30–60% of adolescent pregnancies end in abortion (see sections 2.2, 3.4 and 3.5). Under these circumstances it is plausible that many more than 30–60% contemplate abortion but many do not succeed in finding ways to terminate the pregnancy, or eventually decide to accept it. In the perception of such girls antenatal care is not of primary importance and therefore will be delayed.

In other developed countries the same kind of problems are encountered but the number of studies is less. In Dublin (Ireland) Fitzpatrick et al. (1997) described the profile of patients attending an adolescent antenatal booking clinic. The mean gestational age at booking was 16.4 weeks and 24% of the girls came after more than 20 weeks. In Finland, the care of pregnant adolescents starts with counselling at the health centre where they can go for a pregnancy test without a referral by a doctor. The health worker responsible for informing the client must refer her after counselling either to the maternity clinic or, if appropriate, to abortion counselling and to a doctor within two days. Services at health centres are provided free of charge. Counselling should clarify the life situation of the client and the various options available to her. Information on social assistance and services must also form part of the counselling, and the counselling should thus be done in cooperation with the social welfare authorities. The goal in counselling is to support the client in her decision (Utriainen, 1989). In the Netherlands care is comparable

to care in Finland. A pregnancy test and the initial counselling are often performed by the general practitioner, who the girl can go to without informing her parents. She can then be referred to a midwife for antenatal care or to an abortion clinic. Data on the timing and frequency of antenatal visits are not available, but a pregnant girl can make her decision on abortion or continuation of the pregnancy early in pregnancy; if she decides to continue the pregnancy antenatal care is usually started soon after. Young maternal age as such is not considered a high-risk situation; the midwife, and sometimes the general practitioner, can carry out antenatal and natal care (Buitendijk et al., 1993).

Developing countries

In developing countries antenatal care generally is often unsatisfactory, but the care of adolescents generally falls short even of national standards, and is insufficient. In Nigeria, Ojengbede et al. (1987) reported that young pregnant women often book late (in the second or third trimester) or do not book at all for antenatal care. In a population-based study in a small village in Nigeria *Okonofua et al. (1992) reported that young pregnant girls often did not receive antenatal care, especially if they were unmarried. The girls who did not book for antenatal care said that high cost was the major reason; in addition some of the unmarried girls did not want to be seen in public whilst pregnant. Often the clinics have a lack of privacy. In the Philippines, Dela Cruz (1996) found a remarkably high incidence of adolescents who did not receive any antenatal care: of the pregnant girls <18 years only 29% received antenatal care, while in women aged 20–30 this figure was 81%. In India, Sarkar et al. (1991) reported that 38% of adolescent mothers did not receive antenatal care, but they did not provide figures for older pregnant women.

Zabin & Kiragu (1998) presented a review of the health situation of pregnant adolescents in sub-Saharan Africa. In Africa, adequate antenatal care is scarce for women of any age. Clinics may be situated far away and transportation can be costly. Political turmoil, war and civil strife make access virtually impossible for many women. The situation is aggravated among adolescents, especially unmarried adolescents, because available facilities are often not oriented to their special needs (Kim et al., 1997). The training and social background of many health personnel tend to make them unaccommodating to adolescents' reproductive-health problems. Where health visits are (or are perceived to be) expensive, many adolescents are unable to afford the fees. Furthermore, many adolescents are reluctant to recognize that they are pregnant or to identify themselves as being pregnant. They may be denying the pregnancy, or fear the reactions of others, or they may not realize the importance of antenatal care.

8.3 The relation between antenatal care and outcome of pregnancy

As described above, adolescents frequently receive inadequate antenatal care. The outcome of their pregnancies is often unfavourable; preterm birth and low birth weight especially occur more often in adolescents than in women >19 years of age (see sections 6.2 and 6.4). The question arises as to whether preterm birth and low birth weight are related to insufficient antenatal care, or perhaps to other factors such as the immaturity of genital organs or an unfavourable family background characterized by poverty, inadequate nutrition, etc.

In a number of studies in developed and developing countries, the relation between antenatal care and birth weight has been investigated. In the USA, Slap & Schwartz (1989) found that five or fewer antenatal visits were strongly associated with low birth weight. Several other American studies have compared the outcome of adolescent pregnancies within a specific programme of comprehensive antenatal care with the outcome for other adolescents. LaGuardia et al. (1989) studied pregnant adolescents residing in a maternity shelter (a house where homeless pregnant adolescents can stay during their pregnancy). The sheltered group had significantly less infants of low birth weight than a control group not residing in the shelter. Perkins et al. (1978), Hardy et al. (1987), Heins et al. (1987) and Perkocha et al. (1995) found less low-birth-weight infants after comprehensive antenatal care. Morris et al. (1993) found more low-birth-weight infants and more infants with low Apgar scores if the mothers did not receive any antenatal care. However, Covington et al. (1990) and Rogers et al. (1996) reported that a prematurity-prevention programme for adolescents turned out to be ineffective.

In Portugal, a programme of comprehensive antenatal care of adolescents by an obstetrician was initiated; the results were compared with those of matched controls, recruited after delivery on the maternity ward. Infants of mothers from the study group had higher birth weights and were in better condition (Silva et al., 1993).

In several studies in developing countries a relation was reported between better antenatal care and birth weight in adolescents. Harrison et al. (1985c) found higher birth weights and a lower perinatal mortality in infants of adolescent mothers in Nigeria who were booked for antenatal care, compared with infants of unbooked mothers. Mahomed et al. (1989) in Zimbabwe, Nyirenda et al. (1991) and Brabin et al. (1998) in Malawi, and Ali & Lulseged (1997) in Ethiopia found higher birth weights and less low-birth-weight infants if the mother had received (better) antenatal care.

The results of the above-mentioned studies on the beneficial effect of antenatal care on birth weight and gestational age of pregnant adolescents are difficult to interpret. It can easily be understood that better antenatal care may result in less severe hypertensive disease (Hardy et al., 1987) or in a lower incidence of malaria parasitaemia and anaemia (Okonufua et al., 1992) because effective therapies for malaria and hypertension are available during pregnancy. But it is difficult to understand how antenatal care could result in less low-birth-weight deliveries and preterm births. At present there are hardly any ways of increasing fetal growth, apart from the cessation of smoking, and perhaps in special circumstances the supplementation of food (see section 8.4). Preterm birth can be postponed for a few days by tocolytic therapy, but cannot be prevented (Keirse et al., 1989). Furthermore, the methodology used by the studies into the relation of antenatal care to the incidence of preterm birth mentioned above has considerable shortcomings. All the studies were observational and lacked proper controls, which makes them liable to biases. For instance, if all adolescents who book early for antenatal care are entered into a comprehensive antenatal-care programme, it is likely that the control group of adolescents who booked late or not at all have a different, less favourable background than the study group.

An important question is therefore whether the inadequate utilization of care by adolescents and the less favourable outcome of their pregnancies (more low-birth-weight infants) are primarily related to their age or to their social and family background. In an epidemiological study in the USA, *Geronimus & Korenman (1993) investigated antenatal care utilization and outcome of pregnancy in adolescents. Their data were drawn from the USA National Longitudinal Survey of Youth, an ongoing survey of men and women who were aged 14–21 in 1979 and who remained in the survey in 1988. They compared the pregnancies of adolescents with pregnancies in the sisters of these adolescents who became pregnant at a more advanced age. They found that the unfavourable outcomes of pregnancy were often comparable between sisters, even though the attendance of prenatal care by the older sisters was better; thus family background accounted for many of the health-related disadvantages of the first-born infants of adolescent mothers, including low birth weight. The results of this study suggest that the association between inadequate antenatal care and unfavourable outcome of pregnancy (especially low birth weight) is not as close as is often assumed.

One randomized clinical trial has been published on a programme that intended to improve antenatal care and outcomes of pregnancy in socially deprived households (Olds et al., 1986). Nurses regularly visited the homes of the pregnant women in the study group, of which 47% were adolescents. The nurses were involved in parent education; the enhancement of the woman's informal support systems; antenatal education; improving diet; monitoring weight gain; eliminating the use of cigarettes, alcohol and drugs; teaching parents to identify pregnancy complications; and encouraging regular rest, appropriate exercises and good personal hygiene. On average the birth weights of infants of adolescents in the study group were 395 g higher than birth weights in the comparison group. The results of the trial are difficult to interpret however because multiple interventions were included. It is probable that the increase in birth weight is primarily related to the emphasis given to cessation of smoking during the nurse's visits.

8.4: Nutritional advice and supplementation

In the USA in recent decades a number of studies have been published on the relation of weight gain during pregnancy in adolescents and birth weight of the infants. Hediger et al. (1989), Scholl et al. (1990; 1991), Rees et al. (1992), Dubois (1997) and Story (1997) reported that inadequate weight gain during pregnancy is associated with low birth weight and preterm delivery. These data have often been interpreted as a cause-and-effect relation, and consequently nutritional advice and supplementation for adolescents have been advocated. Sometimes detailed quantities of nutrients and calories were prescribed, and frequently checked, and weight gains recommended within predetermined limits (Van Winter & Simmons, 1990).

However, the data described in these publications were obtained from retrospective studies, and do not prove that low birth weight of the infant is produced by low weight gain of the mother. In the above-mentioned studies the effectiveness of the prescription of nutritional supplementation has never been demonstrated with proper controls. On the contrary, Hytten (1991) states:

> *on present evidence it seems more likely that poor weight gain and poor fetal weight are part of an overall pattern of poor reproduction and that a simple causal relation of low weight gain producing a low birthweight is improbable.*

The influence of antenatal nutritional supplementation of pregnant women (not only adolescents) on birth weight has been investigated in several prospective studies. *Rush et al. (1980) carried out a well-known study in a poor black urban population in Harlem, New York. They randomized the participants into three groups: one received a high-protein supplementation, the second a balanced protein/calorie supplementation, and the third group were controls. Differences in mean birth weight among the three groups were not statistically significant. However, the high-protein supplement group showed an excess of early preterm births, and among the preterm infants the birth weight in the high-protein supplement group was significantly lower than birth weight in the other groups. The high-protein supplement apparently retarded fetal growth in those infants born preterm.

Kramer (1998) published a review of available evidence from controlled trials. He considered the effects of protein/calorie supplementation during gestation on the outcome of pregnancy. His conclusion was that balanced protein/calorie supplementation modestly improves fetal growth but is unlikely to be of long-term benefit to pregnant women or their infants. High-protein supplementation may be harmful.

In special circumstances of famine and serious undernutrition, nutritional supplementation may be useful. Positive effects on birth weight of energy supplementation for pregnant women in famine conditions have been shown in the Gambia (*Prentice et al., 1983; 1987). This study was not included in the review by Kramer because it was not randomized; it also had a historical control group. Positive effects of energy supplementation were also found in the Madura (East Java) randomized trial in which pregnant women received a high (or low) energy supplement in the last trimester of pregnancy. The majority of these women could be considered chronically energy deficient (*Kusin et al., 1992; 1994). Birth weight was higher in infants whose mothers received high-energy supplementation, but the difference was not statistically significant. However, up to the age of 24 months, these children were significantly heavier and taller than the children of the control group. These studies were not limited to adolescents, but the results are applicable to them. They suggest that under special circumstances of famine or severe undernutrition, energy supplementation may have a positive influence on birth weight and/or development of the infant. The fact that under these circumstances supplementation will also be useful to the mother is sufficient justification for the intervention. The diet and dietary supplementation of undernourished women should not only be considered because it might produce healthier children; the promotion of maternal health has value in itself.

WHO advises supplementation of iron and folate for all pregnant women (Mahomed, 2002; WHO, 2002a). In some trials calcium supplementation during pregnancy was shown to reduce the incidence of preterm delivery in a group of adolescents (Villar & Repke, 1990) but it is not clear how this effect is

mediated. In other trials the effect was less conspicuous. The largest trial (Levine et al., 1997) found no effect on the incidence of pre-eclampsia, or of preterm birth. Atallah et al. (2001) in a Cochrane review of calcium supplementation state that the available data support calcium supplementation for women at high risk of gestational hypertension. It is possible that the effect of calcium is only apparent in a population with a calcium-deficient diet. The effect of calcium supplementation on preterm birth needs further investigation.

8.5 HIV testing and prophylaxis against mother-to-child transmission

As stated in sections 3.4 and 4.4 pregnant adolescents are at increased risk of having acquired an HIV infection and HIV infected adolescents may transmit HIV to their infants during pregnancy, labour and delivery, or during breastfeeding . The bulk of HIV transmission is thought to occur during or around the time of delivery, but breastfeeding contributes to an additional 5-20 % of HIV infection in infants (WHO, 2002c). The main factors determining the risk of transmission are the adolescent clinical HIV disease status including viral load, CD4, stage of HIV infection , concurrent opportunistic infections or STIs. Others include breast health (e.g. mastitis); obstetric factors (mode of delivery and duration of rupture of membranes), and infant factors such as oral thrush, duration and mode of breastfeeding (exclusive or mixed) plus probably, the mode of weaning. In many developed countries interventions are made available during pregnancy and delivery to reduce mother-to-child transmission, and it has therefore become crucial to ensure women have access to voluntary HIV testing and counselling in antenatal settings to ensure women have access to these interventions .

The potential benefits of knowledge of HIV status are now recognized to be many. For the individual, these benefits include enhanced ability (a) to reduce one's risk of acquiring, being further exposed to or transmitting HIV; (b) to access HIV-specific care, treatment and support; (c) to manage one's health; and (d) to plan for the future. A recent WHO consultation firmly supported efforts to normalize HIV testing for MTCT and primary prevention, and recommended that efforts must be made to ensure that adolescents are not excluded from HIV testing (WHO 2003a).

The UN strategic approach for preventing the transmission of HIV to women and their children includes four areas (WHO, 2002c):

1. primary prevention of HIV infection in women , especially in young women;
2. prevention of unintended pregnancies among HIV-infected women;
3. prevention of HIV transmission from HIV-infected mothers to their infants; and
4. provision of care, treatment and support to HIV-infected women, their infants and family.

In developing countries, many of which are greatly affected by the HIV epidemic, widespread access to testing and counselling, antiretrovirals and access to interventions to reduce transmission through breastfeeding and delivery are rarely available. Caesarean section and artificial feeding of the baby if available will often not be affordable to people in countries with the highest prevalence of HIV (see also section 4.4).

Clinical trials have confirmed that short-course ARV regimens, which are affordable in developing countries, significantly reduce mother-to-child transmission (MTCT). Several MTCT regimens have been implemented in developing countries, including monotherapy with zidovudine (ZDV) or one dose of nevirapine (NVP) to the mother at the onset of labour, followed by one dose given to the infant in the first days of life. A WHO Technical Consultation in October 2000 concluded that implementation of any of several regimens, including ZDV alone, ZDV + Lamivudine (3TC), and NVP alone, is recommended and should be part of the minimum standard package of care for women who are known to be HIV-infected and their infants (WHO, 2001a; Brocklehurst & Volmink, 2002).

HIV testing and counselling is increasingly accessible particularly in urban areas of Southern and East Africa and Brazil. However, whether adolescents can access these services has not yet been studied. While knowledge of HIV status may enable the woman to take precautions to help prevent transmission to sexual partners, it may also stigmatize the woman within her community and may even increase the risk of violence against her (WHO, 1998c). HIV testing and counselling should be carried out on a voluntary basis only. Counselling prevents unprepared discovery of a positive HIV status, which may be devastating for the pregnant adolescent, and also provides an opportunity to HIV negative women to remain negative.

8.6 Antenatal care for adolescents – should it be different?

In many developed and developing countries the antenatal care of adolescents is inadequate. They often book late for antenatal care (in the second or third trimester) or they do not receive care at all (see section 8.2). Typical causes of this are financial barriers, embarrassment and attempts to hide the pregnancy. There is also dissatisfaction with provider practices, such as clinic waiting times, lack of privacy and unfriendly attitudes among caregivers. In some regions of the world, especially those countries where early marriage is traditional, pregnancy in a young girl will often be planned, or at least not unexpected. But many others, when they find out that they are pregnant, do not contemplate antenatal care but seek ways to terminate the pregnancy. As outlined above in section 8.2, 30–60% of adolescent pregnancies end in induced abortion in many countries, and many more girls may not view antenatal care as a priority and therefore delay seeking it (see also sections 2.2 and 3.5).

It is generally considered important that antenatal care start early, preferably in the first trimester or early in the second trimester. Gestational age can be determined more accurately, especially in those countries where ultrasound facilities are available, and preventive measures can be discussed (such as cessation of smoking and other drug use, dietary improvements and malaria prophylaxis) and the important symptoms of disease (e.g. anaemia) can be detected and treated.

If we value an early start to antenatal care so highly, then the needs of adolescents in early pregnancy should be taken into consideration. Although there are of course adolescents who are glad to be pregnant (for instance married adolescents) many of them are embarrassed, don't know what to do, and often the

first option they consider is abortion. In those countries where abortion is legal the obvious way to help them is to provide a service where open-minded counselling takes place, and where the adolescent can be assisted to take her own decision on either abortion or antenatal care (Treffers et al., 2001). In several European countries such services exist (e.g. Finland and the Netherlands; see section 8.2). Combined with good contraception facilities such services lead to low adolescent pregnancy and abortion rates, and to a decrease in (or even disappearance of) unsafe abortions (Liljestrand, 1997; Creatsas, 1997; and see section 2.2). Services of this kind for adolescents also facilitate an earlier start to antenatal care if the woman decides to continue her pregnancy. In countries where abortion is illegal it is far more difficult to reach adolescents early in pregnancy, because their first priority is not antenatal care; they want to discuss several options, among which is the termination of pregnancy.

Should the practice of antenatal care for adolescents differ from the delivery of care to older women? As shown in section 4.1, although some studies have indicated an increased incidence of hypertensive disease, careful analysis of the literature shows that there is no reason to assume that the incidence of hypertensive disease in adolescent pregnancies is higher than the incidence in adult women of the same parity. If hypertension occurs it becomes apparent in the second half of pregnancy and can easily be detected by measurement of blood pressure as practised in all antenatal care programmes. The management of this disease is not different in adolescents, if only they show up for antenatal care in time; in serious cases hospital admission is required.

Another problem is anaemia. In some countries and regions the incidence in adolescents seems to be higher and in many countries, especially developing countries, anaemia is a great problem (see section 4.2). Detection during routine antenatal care is once again easy if the pregnant woman does not book in too late. WHO has developed a colour scale for the estimation of haemoglobin in developing countries (Stott & Lewis, 1995) and advises the provision of iron and folate supplements to all pregnant women (WHO, 2002a). The management of anaemia includes the treatment of infectious diseases (malaria, intestinal parasites), correction of deficient nutrition, and supplementation of iron and folic acid. In the ECPG (Essential Care Practice Guide. WHO, 2002b) WHO advises skilled attendants in primary health-care settings to treat moderate anaemia (Hb <110 g/l) in pregnancy with iron/folate tablets (60 mg ferrous sulphate and 400 μg folate; 2 tablets daily) for three months, and to provide counselling on nutrition. In cases of severe anaemia (Hb <70 g/l) the woman should be referred to hospital. Supplementation of vitamin A together with iron has been reported to improve haemoglobin levels (Meija & Chew, 1988; Bloem et al., 1990) but further studies are necessary. Generally, diagnosis and treatment are not different for adults and adolescents.

Since malaria is so important in many developing countries (see section 4.3) prophylaxis and treatment in adolescents should ideally include chemoprophylaxis, the use of bednets and the prompt recognition and treatment of the disease (Lalloo, 2000). In endemic areas, preventive treatment with sulfadoxine-pyrimethamine is recommended during pregnancy (Geelhoed et al., 2001; WHO, 2002a).

The most important problem in adolescent pregnancies is the increased incidence of preterm labour and delivery and (related to preterm birth) the high incidence of low-birth-weight infants. The youngest age groups (<16 years) run the highest risk, particularly girls with a gynaecological age of <2 years (see sections 6.2 and 6.3). The relationship between inadequate antenatal care and preterm labour is dubious (see section 8.3). It is not clear which measures during antenatal care could prevent or stop preterm labour, and nutritional advice and supplementation have not shown to be effective in this respect (see section 8.4). If signs of preterm labour occur, there should be adequate obstetric and paediatric treatment, including hospital admission. The management of preterm labour does not differ between adults and adolescents.

Nutritional advice and supplementation are often emphasized as tools to improve the outcome of adolescent pregnancy (see section 8.4). Advice to promote healthy nutrition is part of good antenatal care for all pregnant women, and the nutrition of pregnant adolescents is often inadequate. Counselling on nutrition and supplementation of iron/folate is part of prenatal care as described in the ECPG (Essential Care Practice Guide) for attendants in primary health-care settings (WHO, 2002b).

One criterion is however specific to antenatal care in adolescents, namely the determination of gynaecological age (see section 6.3). The caregiver should ask for the age at which menarche occurred. If the gynaecological age is less than 2 years, the girl is at increased risk of preterm labour and, in some regions, of obstructed labour (see section 5.2).

The Plan for Birth

Part of good antenatal care is a "Plan for Birth" (WHO, 2002b). The plan (based on personal history, obstetric history, etc.) needs to be discussed and established with the pregnant woman during the first antenatal care visit and then revised during each of the other ANC visits, based on the particular conditions. Risk assessment is part of defining the Plan for Birth. A full plan needs to include a discussion of the delivery site, be it hospital, health centre or home delivery (with a skilled attendant). Among the subjects to be covered are transport to the health centre or hospital; the costs; who will go with the adolescent and support her during labour; when is she going there (at which signs of labour); and what should she prepare to bring with her (e.g. clothes for mother and baby). It is very important that pregnant adolescents receive clear information in plain words about what will happen during labour and delivery, as many will be very anxious in anticipation of the unknown.

In conclusion, there is no sound argument for making the content of antenatal care in adolescent pregnancies any different from antenatal care in adult women. In many countries (e.g. Finland and the Netherlands) antenatal care for adolescents is the same as the care for adults (see section 8.2). However, the delivery of that care should be adapted to the needs of adolescents. More than other pregnant women, they perceive the attitudes of medical caregivers as threatening; and they need time to feel comfortable with the provider (WHO, 2002b). They also need more explanation of the content of antenatal care (the number of visits, nutritional advice, blood tests, and questions about STD/HIV and how to prevent it, etc). As stated in section 8.2, the facilities for antenatal care in developing and developed countries are often not oriented to the special needs of adolescents. The service may be too expensive, the waiting times long, and often there is a lack of privacy and confidentiality. The training and social background of many health personnel can also make them unaccommodating in terms of the reproductive-health problems of adolescents. Among adolescents, girls are often the least respected, and health personnel may behave in an unfriendly or rude manner and may even openly disapprove of pregnant adolescents. One of the problems for adolescents who find themselves pregnant is the interruption of school education, caused by having to go to an antenatal care clinic where they often have to wait a long time. In Box 1 a summary is presented of an announcement published in a Zambian newsletter of what young people themselves want from health-care providers (UNFPA,1998).

In some countries and cities with a large number of pregnant adolescents, a good solution for antenatal care may be a special clinic for adolescents, with personnel trained in their needs. If the clinic times are

Box 1

Young people are quite explicit about what they want from health-care providers. They value their privacy and identity, and want to make decisions for themselves based on correct information. Accordingly their requirements of health workers are simple:

- Be confidential
- Provide us with information and services we need
- Accept us as we are – don't moralize or demoralize us
- Ask about and respect our opinions about services
- Allow us to decide for ourselves
- Make us feel welcome and comfortable
- Don't judge us
- Provide services at a time and within the time we have available.

In short: educate us, respect us and empower us.

adapted to school hours then girls can also attend their lessons at school. In other countries (e.g. the Netherlands) the adolescent can go to a midwifery practice in a normal house in the street and receive antenatal care in a situation offering more privacy and personal attention than in a large clinic.

8.7 Summary

In recent years there has been lengthy discussion on the value of antenatal care. In the past too much emphasis has been laid on the number of antenatal visits, but more recently attention has been directed at the content of antenatal care, and at the efficacy of the various screening and diagnostic tests, and of the interventions during pregnancy.

In developed and developing countries antenatal care for adolescents is often inadequate. They book late or not at all, their first priority is often abortion and facilities for antenatal care are sometimes expensive and not adapted to the needs of adolescents. The relationship between quality of antenatal care and outcome of pregnancy is not as direct and linear as is sometimes suggested in observational studies. There is no good argument for the content of antenatal care for pregnant adolescents to be any different from that in adults. Early booking is important, especially for the detection and treatment of diseases and complications such as anaemia, malaria and hypertension. Early booking can be encouraged by a combination of pregnancy diagnosis, counselling for abortion, and counselling for antenatal care. The caregiver should additionally determine the gynaecological age (the interval between menarche and pregnancy) in adolescent clients.

It is also of primary importance to adapt facilities for antenatal care to the needs of adolescent girls, to respect them and to behave in a friendly way towards them. Adolescents need more explanation of the content of the care than older women; essential in this is the discussion of a Birth Plan. Opening hours for the delivery of care should be adapted to school hours so that girls can attend school as long as possible.

PART 9
Care in labour and delivery

9.1 Obstetric risk assessment

One of the tasks of the caregiver during pregnancy and labour is to assess the level of risk for a particular pregnant woman during labour (WHO, 1996b). Every pregnant woman faces risk and should therefore be attended during labour by a skilled caregiver, but some face more risk than others. Factors like maternal height and parity have a low specificity and are insufficient in discriminating between high and low risk. The specificity of complications in the obstetric history or in the present pregnancy is much higher. Certainly heavy bleeding in the obstetric history is a sign of increased risk as are high blood pressure, severe anaemia, multiple pregnancy or HIV infection. The estimation of risk is important for the decisions that have to be made about providing appropriate care. Is it advisable that labour will be supervised in a well-equipped hospital (if available in the region) because of available risk factors? Or can labour take place in a more peripheral maternity home or clinic? When labour starts, a re-evaluation of the risk status takes place; risk assessment is not a once-only measure but rather a procedure continuing throughout pregnancy and labour (WHO, 1996b). In fact a large part of prenatal care (taking the obstetric history, measuring blood pressure, and haemoglobin, etc.) may be considered as risk assessment. The same applies to the monitoring of progress during labour by the use of the partograph (WHO, 1994). In this review, specialist care in hospitals for specific complications such as severe anaemia and hypertension, preterm labour and obstructed labour is not addressed. With respect to clinical problems, attention here focuses instead on primary care.

9.2 Is labour in adolescents high-risk?

Some authors state that all adolescent pregnancies are at high or increased risk during labour. It is not always clear what is precisely meant by this, but looking at the data provided in PARTS 3, 4 and 5 the main risks are apparent in the social background of pregnant adolescents, and obstetric complications primarily occur during pregnancy. Hypertensive disease does not occur more frequently during adolescent pregnancy if parity is taken into account (see section 4.1) but if this does occur it can easily be detected during routine antenatal care by measuring blood pressure. Severe cases of pregnancy hypertension and pre-eclampsia should be treated in hospital; labour is then high-risk. Anaemia (see section 4.2) is also easily detectable during routine antenatal care. If present, it can be treated and only in serious cases diagnosed late in pregnancy is labour considered to be at increased risk. Preterm labour and delivery are the main complications – the incidence of this being higher in young adolescents (see section 6.2). It is not a complication of labour, but of pregnancy; it occurs unexpectedly during pregnancy, and its main unfavourable effect is not complicated labour but the birth of a preterm low-birth-weight infant. If the symptoms of preterm labour are apparent (regular contractions and loss of amniotic fluid, or dilatation/effacement of the cervix) the infant is at risk and the pregnant woman should, if possible, be taken to a hospital where low-birth-weight infants can be adequately treated. Preterm labour occurs particularly often in young girls with a gynaecological age of <2 years (see section 6.3) who may therefore be considered high-risk during pregnancy.

Most studies report that complications in the course of labour and delivery in adolescents occur less often than in older women. Caesarean section and also vaginal operative deliveries are more frequent in older women, and induction of labour or augmentation with oxytocin is also less frequent in adolescents (see section 5.1). The exception however is that in very young girls (<16 years) in some countries or regions there are indications that immaturity of pelvic bones may cause obstetric complications. The risk of obstructed labour is especially increased in girls with a gynaecological age of <2 years (see section

6.3). This probably occurs primarily in relatively poor countries or regions where menarche is late and sexual activity starts early after the onset of the menstrual cycle. In these countries, special attention is required for pregnant girls at a very young age as they may be at increased risk of obstructed labour.

If pregnancy in an adolescent is uneventful; if complications such as anaemia can be treated adequately; if labour starts at term (between 37–42 completed weeks of gestation); and if the infant is in cephalic presentation, then labour is not at increased risk. The large majority of pregnant adolescents belong to this category and start labour at low risk.

9.3 Care during labour

In the WHO report *Care in normal birth: a practical guide* (WHO, 1996b) a number of recommendations are given for the care of low-risk pregnant women in labour, and for the behaviour of caregivers. Among these are: respecting the right of women to privacy in the birthing place; respecting the women's choice of companions during labour and birth; and giving women as much information and explanation as they desire. It should be stressed that this sort of behaviour in caregivers is also applicable to caring for adolescents; the recommendations for health-care personnel given in section 8.6 above are also applicable to care during labour.

One of the main tasks of the caregiver during labour is observation of the labouring woman and monitoring of the fetal condition. Not only the physical but also the emotional well-being of the woman should be monitored, and this applies particularly to adolescents. In normal labour, fetal monitoring can be done by auscultation, and preferably not by electronic monitoring as often occurs in hospitals in developed countries (WHO, 1996b). Electronic monitoring limits the movement and position of the woman: she is usually confined to bed, in a supine position. In low-risk labour it leads to an increased number of interventions without obvious improvement in the outcome of labour (Thacker et al., 2002). A woman should have as much freedom in position and movement throughout labour as is possible; this applies especially to normal labour.

Besides observation and monitoring, support of the woman and her partner (or companion) is very important. In a number of studies (including a number of randomized trials) it has been shown that continuous empathetic support during labour from a midwife, nurse or other person results in significant benefits. These include shorter labour; significantly less medication and epidural analgesia; fewer Apgar scores <7; and fewer operative deliveries (Klaus et al., 1986; Hodnett & Osborn, 1989; Hemminki et al., 1990; Hofmeyr et al., 1991; WHO 1996b). Heres et al. (2000) compared the circadian pattern between women cared for during normal labour by midwives and obstetricians and found that care from obstetricians prolonged the duration of labour, presumably through increased levels of stress.

Support is particularly important for adolescents, who may feel extremely isolated and unhappy in a labour room of a hospital or birthing centre. In several African countries, many women do not deliver at health-care facilities and do not get trained professional help. Fewer than half the women in 11 African countries give birth in such facilities (Zabin & Kiragu, 1998). Reasons which discourage adolescents from seeking professional care include available facilities not being oriented to their special needs; and the training and background of many health-care professionals making them unaccommodating to adolescents' problems (Zabin & Kiragu, 1998). It is important that a woman feel safe in a place where she is going to give birth. Birth should take place at the most peripheral level at which appropriate care is feasible and safe, as recommended by the International Federation of Gynaecology and Obstetrics (FIGO,1992; WHO, 1996b). It must be a place where all the attention and care are focused on her needs and safety, as close to home and her own culture as possible. Large hospitals in developed (and also developing) countries may possess all the technical facilities to treat high-risk cases, but are often crowded and not set up to offer the kind of support that is needed, especially by adolescents. This is one reason why pregnant adolescents should not unnecessarily be categorized as "high-risk". Adequate and personal support can expedite the course of labour, diminish the need for pain medication and prevent the birth process from becoming a traumatic experience for a young girl.

In HIV-positive women, early rupturing of the membranes should be avoided. As a general rule, during labour in HIV-positive women, any procedure that breaks the baby's skin (such as scalp electrodes or scalp blood sampling) should be avoided.

9.4 Summary

The large majority of pregnant adolescents should not be considered as at high risk during labour. If during pregnancy serious complications have occurred (e.g. severe pregnancy hypertension or pre-eclampsia, or severe anaemia not treated adequately) then labour is high-risk and should, if possible, take place in a well-equipped hospital. The same applies to preterm labour. In some regions, very young girls with a low gynaecological age may be at increased risk of obstructed labour. In other cases where pregnancy has been uneventful, where labour starts at a gestational age of 37–42 weeks, and where the fetus is in the cephalic position, the woman can be considered as low-risk. Adequate surveillance of mother and fetus (preferably by auscultation) are necessary, but labour can take place at the most peripheral level at which appropriate care is feasible and safe, as close to the home and her own culture as possible. The right to privacy, to the choice of companions during labour, and to information and explanation are important. Empathic support during labour expedites labour, and helps to make labour and delivery less of a traumatic experience, especially for an adolescent.

PART 10
Postpartum care

10.1 The scope of postpartum care

In the WHO report *Postpartum care of the mother and newborn* (WHO, 1998b) the aims and standards of postpartum care are described, based on the needs of mothers and newborns, and on the evidence and challenges found in the literature. Postpartum care encompasses the prevention, early diagnosis and treatment of complications of mother and infant, including the prevention of vertical transmission of diseases from mother to infant. Counselling on baby care, promotion and support of breastfeeding, contraceptive and nutritional advice, and immunization are also essential components of postpartum health care. In this section only those subjects of particular relevance to young adolescent mothers and their infants (or where their needs may differ from those of older mothers) will be addressed.

10.2 Some specific subjects

Breastfeeding

The importance of breastfeeding in developing and developed countries has already been emphasized in section 7.2. Breastfeeding has to be started as early as possible, preferably in the first hour following birth (WHO, 1998b). The woman can be prepared for breastfeeding during antenatal care, and inexperienced adolescents in particular need guidance. In India, Nielsen et al. (1998) found that women who received information about breastfeeding during antenatal care were more likely to initiate early breastfeeding. The correct positioning and attaching of the baby to the breast is a skill which the mother must acquire from observation and practice; and it is an important task of health staff to provide accurate guidance to the mother (Winikoff et al., 1987; Garforth & Garcia, 1989; Inch & Garforth, 1989; Rajan, 1993). For a successful start to breastfeeding it is also important that supplementary feeds for the baby be avoided. A young adolescent, who may not have quite got used to the idea of becoming a mother, needs help from caregivers for these new tasks.

HIV infection – to breastfeed or not?

In pregnant women with established HIV infection the additional risk of vertical transmission of the infection to the infant by breastfeeding is around 5-20% (De Cock et al. 2000). The additional risk among women with recent infection has been estimated at 29% (Dunn et al., 1992). Recent data indicate that viral load in breast milk is a major determinant of infection risk for the infant. There are some indications that exclusive breastfeeding presents a reduced risk compared with mixed feeding, but the available evidence is still insufficient. Future research should help address whether short-course antiretrovirals can substantially reduce the risk of HIV transmission in the first months of life during the period of maximum benefits of breastfeeding. (Fowler & Newell, 2001). In section 8.5, the decision whether or not to perform an HIV test is discussed. It is primarily the woman who should decide if she wants to be tested or not. Preferably an HIV test should be done before or during pregnancy, and a decision on infant feeding should be taken before labour starts.

According to current UN recommendations (WHO 2001a), infants of mothers who are HIV-negative or whose status is unknown should be exclusively breastfed for the first six months of life to achieve optimal growth, development and health. Thereafter, infants should receive nutritionally adequate and safe complementary foods while breastfeeding continues up to 24 months or beyond. However, given the need to reduce the risk of HIV transmission to infants born to HIV-positive mothers while minimizing the risk of other causes of morbidity and mortality, the guidelines also state that *"when replacement feeding is acceptable, feasible, affordable, sustainable and safe, avoidance of all breastfeeding by HIV-infected*

mothers is recommended. Otherwise, exclusive breastfeeding is recommended during the first months of life and should then be discontinued as soon as it is feasible[1]*. To help HIV-positive mothers make the best choice, they should receive counselling that includes information about both the risks and benefits of various infant feeding options based on local assessments, and guidance in selecting the most suitable option for their situation. They should also have access to follow-up care and support, including family planning and nutritional support.*" This type of guidance and support would be especially necessary for an adolescent mother.

Contraception

This problem has been described in broad outline in section 7.1 above. Young adolescent mothers often lack motivation for contraception use, often combined with difficulties in obtaining reliable contraceptives. It is a task of the caregiver to counsel them on contraceptive methods and to show them how to obtain contraceptives if they need them. Because adolescents often have irregular sexual contacts and sometimes multiple partners, the first method to consider in the postpartum period is the condom (see also section 11.5). A combination of condoms with one of the other methods should also be considered.

Counselling on postpartum contraception should be combined with counselling on breastfeeding, because the lactational amenorrhoea method (LAM) is the first method to consider (WHO, 1996d; 1998b). LAM is a reliable method of contraception in the first six months postpartum, provided that the criteria of the method are met: full breastfeeding on demand, day and night, with no supplementary feeding, and a complementary method of contraception if menstruation returns after more than eight weeks. The efficacy of the method has been studied extensively in a number of countries, but insufficient data are available on the compliance of adolescents. It is possible that some adolescents feel resistance to the method because of the strict regimen it imposes on them. If a complementary method is necessary during breastfeeding, WHO advises against the use of combined oral contraceptives (COCs) because they have a negative influence on lactation.

Progestogen-only pills, DMPA (depot medroxyprogesterone acetate), an injectable gestagen, and IUDs are recommended. IUDs are not a first choice if the adolescent has several sexual partners, because in combination with sexually transmitted diseases the IUD may stimulate pelvic infections (WHO, 1996d; 1998b). DMPA is a long-term progestogen suitable for use in the postpartum period (Polaneczky & Liblanc, 1998; Cromer et al., 1998; Templeman et al., 2000). Progestogen implants (Norplant) can also be used postpartum (Cromer et al., 1998; Stevens-Simon et al., 1999). These long-term methods are especially suitable for those women who are less motivated to take pills and/or go to a practitioner on a regular basis.

Nutrition

As stated in section 7.1, the nutritional status of postpartum (in particular lactating) women needs attention and improvement. The diet of adolescents especially, during pregnancy and postpartum, is often inadequate. To address this, WHO recommends:

- extra caloric intake during lactation
- the administering of iodized oil to women of childbearing age, including pregnant women (see section 4.4) in iodine-deficient environments, and in countries where no iodination of salt is established. It is recommended that such administration be effected before pregnancy or as early in pregnancy as possible. If this has not been done before or during pregnancy, a dose of iodized oil should be given to the mother early after delivery.
- giving a high dose of vitamin A (200,000 IU) to lactating mothers during the first month postpartum in countries where vitamin-A deficiency is endemic. It is important not to give this dose to women of childbearing age in general, or to lactating women more than two months after delivery, because high doses may be teratogenic in early pregnancy (WHO, 1998b; 1998d). Vitamin-A deficiency is the most common cause of preventable childhood blindness. Fruits and

[1] This would normally imply the same conditions as for replacement feeding from birth, that is, acceptable, feasible, affordable, sustainable and safe.

vegetables are the main natural source of vitamin A. In many countries regular intake is attained by fortification of foods, such as dairy products or sugar (see section 7.1).

- one tablet iron/folate (60 mg ferrous sulphate and 400 mg folate) per day for three months for pregnant and lactating women in areas with a high prevalence of iron deficiency anaemia. In cases of anaemia, two tablets per day should be given (WHO 1998b; 2002b).

Further details are given in the WHO report on postpartum care (WHO, 1998b) and in the Essential Care Practice Guide ECPG (WHO, 2002b).

Support to adolescent mothers and their infants

As described in section 3.2, the social circumstances of pregnant adolescents and young adolescent mothers are often distressing, and in a high percentage of cases they have been subjected to physical abuse (see also section 3.6). Such bad circumstances may lead in turn to the physical abuse and maltreatment of their own children (*Lealman, 1983; *Boyer & Fine, 1992). The preventive effect of postpartum home visits has been studied, sometimes in combination with antenatal home visits, in a number of trials including: *Siegel et al. (1980); *Larson (1980); *Lealman et al. (1983); *Olds et al. (1986; 1988).

*Roberts et al. (1996) published a systematic review of randomized controlled trials on the prevention of childhood injury. Home-visiting programmes have the potential to reduce significantly the rates of childhood injury. One drawback however is that these programmes require an enormous amount of effort from the caregivers (often nurses or social workers) and consequently are very expensive. Nevertheless, where appropriate, it may be useful to make a follow-up appointment with a relevant organization for women in difficult circumstances.

Coren & Barlow (2002) published a Cochrane review on parenting programmes for improving psychosocial outcomes for adolescent parents and their children. Of 23 studies reviewed 19 were excluded because of methodological shortcomings, and the remaining four had a limited number of participants. The review of the four studies showed that specific programmes aimed at improving maternal attitudes produced positive results on a range of maternal and infant measures of outcome including mother-infant interaction, language development, parental attitudes and parental knowledge. The setting of all studies was in a developed country, mainly the USA, the duration of the studies was long (up to two years) and apparently enough research money was available. Such conditions are not comparable with the distressing circumstances encountered in clinical practices in many countries, especially many developing countries.

Of course caregivers should keep in mind that, whenever possible, they should try to organize help for adolescent mothers without a partner or home, in conflict with her family, or with financial problems, but the possibilities open to the individual caregiver are very limited. In many countries the problems of these girls are so manifold, that only central or local government can realistically organize help at an adequate level, taking into account the needs of adolescents and the various answers to these needs suggested in this review.

10.3 Time schedule of postpartum care

The first hours

In *Postpartum care of the mother and newborn* (WHO, 1998b) the tasks of the caregiver in the critical first hours postpartum are described. The condition of mother and baby should be evaluated carefully and, if necessary, corrective measures should be taken. The first skin-to-skin contact of mother and baby should be established, and breastfeeding should be initiated. If an HIV-positive mother has not already decided during pregnancy (see section 10.2) then she now has to decide how to feed the baby. She has also to decide who she wants to inform about her HIV-positive status. At that moment she will need support and counselling in these difficult decisions.

The first week

If the birth took place in a hospital or other health facility, a decision has to be taken on the length of stay in that facility, and on the point when mother and baby go home. In most countries the duration of the stay of healthy mothers and their babies in hospital or health facilities is shortened to only a few days or even less. Generally, healthy mothers return with their babies to their own family and community. The members of that community (in particular husband or partner and other family members) should be involved in the care process (WHO, 1998b). However, if the mother is an adolescent, possibly unmarried or without a partner, she may face an uncertain future. Perhaps the relationship with her family and community is tense, because they disapprove of her behaviour, and she may even have nowhere to go. In several studies, increased levels of neonatal and infant mortality are reported among the children of adolescents. The caregiver should be aware of these problems and should try to acquaint him/herself with the likely home conditions of the young mother. If possible, assistance by the caregiver could include postpartum home care, discussion with the girl's parents (or her partner), consulting with a local physician, and so on.

The content of home care in the first week is: assessment of the condition of mother and baby; supporting the practice of baby care and breastfeeding; counselling on contraception; nutritional advice; and prescription of iron preparations, etc. If resources are limited, a home visit at least during the first 24 hours and before the end of the first week would be the most effective approach (WHO, 1998b).

The first months

After the first week, frequent support by a caregiver is usually no longer necessary. During the first months the mother will need advice on the condition of the baby and possibly on breastfeeding or on other problems that may arise. Traditionally, the mother is asked to come back for a check-up six weeks postpartum. At this check-up various investigations can be carried out, such as checking for anaemia (WHO, 1998b). Especially important for adolescents is the planning of their future and issues include contraception, breastfeeding and caring for the baby, as well as the state of affairs at home, school or work:

- Will they return to work again?
- Can they return to their schools?
- Do conditions at home or at work interfere with baby care or breastfeeding?
- Is a complementary method of contraception needed, when breastfeeding is decreasing?
- How is the condition of the baby?

The baby will also need supervision and vaccination, and integrated care is more effective than the separate care of baby and mother (WHO, 1998b).

10.4 Summary

Breastfeeding is of great importance in developing and developed countries, and its support is a task for caregivers in the postpartum period. A dilemma exists if the mother is HIV-positive because there is a risk of transmission of the virus to the baby through breastfeeding. However, in many developing countries the risk to the baby of replacement feeding may be high. The mother should take a decision, after counselling by the caregiver. Contraception is another topic of counselling in the antenatal and postpartum period. The first method to be considered is the condom, or a combination of condoms with another method, because adolescents often have irregular sexual contacts. The lactational amenorrhoea method is reliable but requires strict discipline. WHO does not recommend the use of combined oral contraceptives during breastfeeding. Long-term progestogens are a good alternative. Nutrition is often inadequate, and WHO recommends extra caloric intake during lactation, if necessary combined with iodized oil, vitamin A, ferrous sulphate and folate.

Home visits may be of special importance for adolescent mothers, because they often experience difficulties with their family and community. In children of adolescents the risk of physical abuse is increased; home visits extending after the first week can decrease the risk but are time-consuming and expensive. At the check-up consultation six weeks postpartum counselling on breastfeeding and contraception should be continued.

PART 11
Prevention

11.1 Introduction

In previous sections the potentially harmful consequences of adolescent pregnancies have been explained. These include not only biomedical aspects (e.g. preterm birth and the complications of unsafe abortion, with associated increased perinatal and maternal mortality) but also psychosocial consequences (e.g. interruption of education, poverty, disruption of family relations). In recent decades in many developed and developing countries adolescent pregnancies have become an important health problem, and their prevention is therefore a major issue.

From a biomedical point of view the solution is simple: prevention of pregnancy is possible by abstinence from intercourse or by use of contraception. Effective and relatively cheap methods of contraception are available. In PART 2 it was shown that there are large differences in the incidence of adolescent pregnancy and childbirth between countries, and research cited in section 3.4 shows that (at least in developed countries) variations in sexual behaviour (age at the start of intercourse) is not an important factor in explaining these differences. Even condom use does not differ much between most countries. However, the use of modern methods of contraception with the lowest failure rates (pill, injectable, implants and IUD) is lower in countries with higher numbers of adolescent pregnancies (*Darroch et al., 2001). This appears to be the most important factor determining the incidence of adolescent pregnancies.

In some developing countries an early age at marriage quickly followed by conception is also an important determinant of adolescent pregnancies (see section 3.3). Even in those developing countries where marriage usually takes place at an older age, many girls start intercourse soon after the onset of puberty, and the use of contraception is often problematic (see section 3.4). Traditionally young girls are not expected to be engaged in sex; the need to conform to this standard causes young females to fear disclosing their sexual activity, may result in a reluctance to report sexual experience, and may inhibit sexually active adolescents from seeking contraceptive services (Jejeebhoy et al., 1999). Often the girl knows little about contraception, and opposition to its use from male partners, and the unequal power relations within the relationship, prevent meaningful negotiation. If adolescents go to family-planning services they are often unwelcome; and the providers of contraceptives are frequently unsupportive of adolescents and refuse to provide them with contraceptives (*Kaufman et al., 2001).

Although the major problem (particularly in developing countries) appears to be the defective and inadequate practice of contraception in adolescents, the prevention of unwanted pregnancies is not a purely biomedical problem, and can be considered as primarily a psychosocial issue. In this section various aspects of prevention will be discussed in terms of the problems raised, and their possible solutions.

11.2 Increasing the age at marriage

As indicated in section 3.3, in some countries and regions an early median age at marriage is an important factor determining the age at which a girl will be pregnant for the first time. In South Asia the median age at marriage is very low – examples include Bangladesh (14.1 years) and India (16.1 years). But the same is also true in Yemen (15.8 years) and in some African countries such as Niger (15.1 years) and Senegal (16.4 years) (*Singh & Samara, 1996). Other authors give somewhat higher figures for the age at marriage in South India (Caldwell et al., 1998). In sub-Saharan Africa and in some South Asian countries there is a trend towards increased age at marriage (Westoff et al., 1994; Blanc & Way, 1998).

Many pregnancies in early marriages will not be unwanted because the couple are anxious to prove their fertility and the family is expecting that. Nevertheless, the risks of a pregnancy in a very young girl remain, such as preterm birth with increased perinatal mortality and infant morbidity. Moreover, an early marriage interferes with the educational prospects of a young girl and keeps her in a subordinate position in family and society.

Governments are in a position to raise the age at marriage, and in some countries legislative efforts are made to do so. In India, the legal age at marriage is now 18 for females but nonetheless early marriage continues to be the norm in some regions. Legal measures could be accompanied by public information on the health risks of early marriage and on the importance of girls receiving a good education.

11.3 Reduction of social deprivation

Sections 3.1 and 3.2 describe the influence of social deprivation and ethnic inequality on the incidence of adolescent pregnancies. Adolescent childbearing is clearly related to low levels of income and education. Research on this subject has been done primarily in the USA and Western Europe, but in a developing country such as Nicaragua the same phenomenon has been found. The greater the disadvantage in a population, the less difference adolescent childbearing makes in determining long-term success and the less is the motivation to make efforts to prevent a pregnancy. This is the reason why within countries, adolescent childbearing is more likely to occur among highly disadvantaged subgroups (Furstenberg, 1998). As social deprivation has been shown to be an important causal factor in the incidence of adolescent pregnancies, the improvement of social conditions for ethnic minorities and the reduction of social deprivation would, together with other measures, offer an opportunity for governments to reduce the numbers of adolescent pregnancies.

11.4 Sexuality education for adolescents

It is beyond doubt that adolescents need good information about their own bodies, their sexual development and about the ways of avoiding pregnancy. Moreover they need to be informed about sexually transmitted diseases (STDs) including HIV/AIDS, and about methods to avoid these. In the past it has often been said that this is the task of parents, but a number of studies have shown that parents do not talk to their children about these matters because they feel confused, ill-informed or embarrassed about the topics (Hughes & McCauley, 1998). It is important that young girls and boys receive information about these matters before they themselves get involved in sexual activity.

In many developed countries sex education is part of the curriculum of primary and/or secondary schools. Randomized trials of special education programmes in the United Kingdom (Wight et al., 2002); and in Canada and the USA (DiCenso et al., 2002) showed no effects of these programmes on the age at which sexual intercourse was initiated, on the use of birth-control methods, and on the incidence of pregnancies in adolescents. This lack of impact on behaviour may in part be attributed to the fact that in these schools sex-education programmes were in use before the implementation of the new method; the new programme apparently did not result in any more effect on behaviour than the conventional provision. But the fact remains that in these countries (especially the USA) the incidence of adolescent pregnancies is relatively high compared to other developed countries, and therefore the effect of sex-education remains disappointing. Another explanation for this lack of impact of the education programmes is that education can only be effective if it is combined with an adequate service delivery. Education on contraceptives is useless if it is very difficult to obtain contraceptives. In the USA in particular there are important barriers to the successful access by adolescents to family-planning services, including the tendency of parents to monitor closely any medical care their children receive (see section 3.4). One of the main aims of the education programmes was the delay of initiation of sexual intercourse; consequently the use of contraceptives may have been described as a "second-best" solution.

In developing countries, there is a great need for sex education for adolescents. Girls in the first classes of secondary school face the greatest risk from the unexpected consequences of sexual activity, and therefore the most appropriate time for offering sex-education courses would be the last grade of primary school. This would also be helpful for those children who have no chance of attending a secondary school (Görgen et al., 1993). Beyond information on reproduction and contraception, the sex-education curriculum should be expanded to include discussion of social standards and beliefs. Choice of partner, partner responsibilities, the role of emotions, and the role that is played by material interests in sexual relationships should be subjects of discussion. Contraceptives should be described, their modes of action explained, and their advantages and disadvantages openly discussed – including with respect to the prevention of STDs. Because there is a difference in developmental stage between the sexes and in order to stimulate open exchange of ideas, it will usually be preferable to offer sex-education separately to both sexes (Görgen et al., 1993).

What should be the contribution of abstinence in the education programme? Of course it should be discussed as a real possibility, especially for the very young adolescent. On the other hand portraying sexual abstinence as the only moral standard for adolescents should be avoided, especially for girls. Otherwise, it will be made more difficult for them to ask for contraception when they are in need of it because they will feel guilty about not living up to the standards expected.

Who then should be the teachers? One pre-condition is that teachers, whether they are professional teachers or belong to the health profession, participate in an appropriate training programme so that they are well-informed about sex and birth control and are able to communicate with adolescents in a confidential manner, without a moralizing attitude. They should be helped to recognize their own feelings about adolescent pregnancy, and to understand and accept the girls' needs (Görgen et al., 1993).

One interesting randomized trial to evaluate an HIV risk-reduction intervention has been conducted in Namibia. The study group of 515 youths received a 14-session education course emphasizing abstinence and safer sexual practices. After one year, the intervention group had less sexual experience, and when they had engaged in sexual activity had more often used a condom than the control group (Stanton et al., 1998).

11.5 Contraceptive service delivery for adolescents

Apart from education adolescents are also in need of actual help in sexual matters. Reproductive-health programmes or clinics seem a logical source for information and service, yet they are not always helpful towards adolescents. Case studies from several countries indicate that when adolescents approach clinics for help, they are often scolded, refused information or turned away. They fear being seen by an adult family member or neighbours. Many are simply too young and inexperienced to know how to find a clinic. As a result of these barriers, adolescents often first contact a sexual and reproductive health programme when they must deal with a pregnancy or a sexually transmittable disease (Hughes & McCauley, 1998).

Frequently, the attitude of family-planning professionals toward adolescent sexual activity mirrors the attitudes of parents and teachers – they fear that giving contraceptives to adolescents will encourage sexual activity and immorality, and they feel challenged to promote sexual abstinence. If change is to be effected, this attitude must be altered and specific skills developed for counselling the young (Görgen et al., 1993). In rural South Africa a pattern of high premarital fertility appears to reflect a low incidence of contraceptive use before the first birth (especially among adolescents); a low prevalence of abortion; and a high contraceptive prevalence thereafter (Garenne et al., 2000). It is concluded that family-planning policy until now has targeted married women and women who have been pregnant once, but has failed to address the contraceptive needs of young women before their first pregnancy.

Family-planning services can play an important role in helping girls to protect themselves from all the negative consequences of pregnancy. Conventional family-planning services are designed to receive

women or couples who have demonstrated their fertility and have nothing to hide. School-age girls are afraid of being blamed, are reluctant to admit their sexual activity, and do not want to name their partners. They need counsellors who can accept that they are sexually active and need to avert pregnancy, but also that they have limited decision-making power. Contraceptive advice directed toward members of this age-group must stress that fertility remains unaffected by contraception. The inability of girls to negotiate contraceptive use should be acknowledged, and contraceptive methods that do not require a partner's consent should be offered (Görgen et al., 1993).

Services for reproductive health and/or contraception for adolescents should be separated from the same services for adults and should be adapted to the needs of adolescents with respect to their location and the attitudes of personnel. Contraceptive information and services for adolescents must be made readily available through a variety of delivery points. Health-care personnel should have similar training and meet the same expectations formulated for teachers in section 11.4. The adolescent should be certain of the confidentiality of the health personnel. Developing a special rapport with adolescents is important, as is using language that they can understand and be comfortable with. Providers need to be patient and take the necessary time when working with adolescents (Rivera et al., 2001).

Types of contraceptives suitable for adolescents

Adolescents may have temporary sexual relationships and multiple partners, which puts them at high risk of contracting STD/HIV – with adolescent girls at even greater increased risk (see section 3.4). Therefore sexually active adolescents need to be aware of the importance of dual protection against both pregnancy and STD/HIV. When used correctly and consistently, condoms are the most effective method of preventing infections for those engaging in sexual intercourse, and can be highly effective in protecting against pregnancy as well. Another option for dual protection is to use condoms in conjunction with another method, such as combined oral contraceptives or injectables (Rivera et al., 2001).

The condom is the first choice for adolescents. The second method specifically suitable for adolescents is the low-dose combined contraceptive pill, which has few side-effects and does not interfere with future fertility. Combination with the condom is recommended. Injectable progestogens such as depot medroxyprogesterone acetate (DMPA) are very easy to apply but may have more side-effects (irregular bleeding or amenorrhoea) than the combined pill and require a clinic visit every 2–3 months. Implants of progestogens have the same side-effects as injectables and need clinic visits for insertion and removal. It is also recommended that the use of progestogens is combined with condom use. The copper intrauterine device (IUD) is not the first method of choice because many adolescents do not have a strictly monogamous relation and therefore the risk of infections is increased if the IUD is not always combined with condoms. Moreover in young nulliparous women the risk of expulsion may be higher. A more thorough and detailed discussion of contraceptive methods can be found in documentation by WHO (Rivera et al., 2001; WHO, 2001b).

Because adolescents often have unanticipated and unprotected intercourse, family-planning services should be prepared to deliver emergency contraception within 24 hours after coitus. The most effective methods make use of a high dose of oestrogens or levonorgestrel, or of mifepriston (Cheng et al., 2002). The delivery of emergency contraception also offers the opportunity to discuss with a young girl the use of more regular forms of contraception. This implies that the family-planning service should be prepared to serve clients every day. However, although these recommendations are sound, the major problem with emergency contraception is that the vast majority of women who need it (especially in developing countries) have no access to such methods, as has been pointed out in a commentary on the Cochrane review (Ellertsen, 2002). In many countries, mifepriston and tablets with the high dose of levonorgestrel are not available. Clearly, there is a need to make known to people (especially women) that emergency contraception exists as an option and that several methods are available. Public awareness campaigns for this purpose should be undertaken at the community level keeping in mind the local culture (Mittal, 2002).

Abortion

Many adolescents only seek help after they become pregnant, and often ask for an abortion. In a number of countries abortion is legal, and in some (e.g. Scandinavian countries and the Netherlands) abortion

services are to a certain extent integrated into reproductive-health and contraception services for adolescents. Young girls may know where to go for an abortion and if they do not know they will be referred by the general physician. Through the abortion service they enter into the contraceptive service, with the result that recurrence of abortion in such settings is rare. Thus the total number of abortions in these countries is low.

In other countries abortion is illegal. Pregnant adolescents may go to a neighbouring country (e.g. from Ireland to the United Kingdom) or to a neighbouring state for a legal abortion. Integration into the contraceptive service in their own country or neighbourhood is then more difficult. In many countries it is impossible for pregnant adolescents to procure an abortion; their only choice is either to become a (usually unmarried) mother or to go to a lay abortionist. Often adolescents are aware of the risks and complications, but strong social condemnation is of greater concern for young girls than the risk of death and illness associated with unsafe abortion (see section 3.5). In countries where abortion is illegal even greater efforts should be made to bring adolescents into contact with reproductive-health services and to motivate them to use reliable contraception.

11.6 Summary

The most important difference between developed countries with a high or a low incidence of adolescent births is not the median age at first intercourse but the use of modern methods of contraception with low failure rates. In developing countries too the main problem is the defective and inadequate practising of contraception by adolescents.

In some countries increasing the age at marriage can contribute to the prevention of adolescent pregnancy, and in many others to the reduction of social deprivation. The most important actions for preventing adolescent pregnancy are sex education for adolescents (including information on contraception) preferably in the last grade of primary school, and contraceptive services for adolescents. Teachers and caregivers should participate in a training programme so that they are well-informed about sex and birth control and are able to communicate with young people in a confidential manner, without adopting a moralizing attitude.

Services for reproductive health and/or contraception for adolescents should be separated from the same services for adults and should be adapted to the needs of adolescents with respect to their location and attitudes of personnel. Sexually active adolescents need to be aware of the importance of dual protection against both pregnancy and STD/HIV. When used correctly and consistently, condoms are the most effective method of preventing infections for those adolescents engaging in sexual intercourse, and can be highly effective in protecting against pregnancy as well. Another option for dual protection is to use condoms in conjunction with another method, such as combined oral contraceptives or injectables. In developing countries in particular more attention should be given to the use of emergency methods of contraception.

ANNEX
Conclusions and recommended practices

This Annex lists a number of conclusions (a) and recommended practices (c) related to adolescent pregnancy and childbirth which are based upon sound evidence. Mention is also made of a number of subjects that may be of great importance but for which the current evidence is insufficient to draw firm conclusions (b). A fourth category covers a number of practices (and interpretations) relating to the care of pregnant adolescents which are based on insufficient evidence, or are considered ineffective or harmful (d).

Those conclusions based upon good evidence are drawn from the selected studies marked with an * in the text of the respective chapters (see PART 1.2). In PARTS 2–3 and 4–7 conclusions on the incidence of specific social or health problems among adolescents are founded upon selected studies meeting specific methodological requirements. Such studies are based upon a representative sample of a regional or national population, they include a representative control group of adult pregnancies (if appropriate with the same parity), and possible differences are statistically evaluated. In PARTS 8–10 studies on the effectiveness of various forms of care are critically assessed, and therefore the availability of an adequate control group is essential. Although the standard here is the randomized controlled trial, some non-randomized studies with adequate control groups are also mentioned. Once again, studies selected because of methodological quality are marked with an *.

All numbers in brackets refer to previous sections.

a: Conclusions based on sound evidence

In Europe and the USA since the 19th century the age at menarche declined (1.1).
Wyshak & Frisch (1982) reviewed 218 reports on the age of menarche in European countries from 1795 to 1981 and seven on the USA from 1877 to the 1970s.

In developed countries a close correlation exists between social deprivation and the number of adolescent pregnancies (3.2).

In the USA *Sells & Blum (1996), in the UK *Reading et al. (1993), *Boulton-Jones et al. (1995), *Sloggett & Joshi (1998), *McCulloch (2001) and *McLeod (2001), in Australia *Coory (2000) all published population-based studies showing a close correlation between social deprivation and number of adolescent pregnancies.

In countries with a high prevalence of HIV infection sexually active adolescents are at increased risk of acquiring HIV infection (3.4).

Qualitative and quantitative research in Nicaragua (*Zelaya et al., 1997), Kenya (*Ajayi et al., 1991), Burkina Faso (Görgen et al., 1993) and South Africa (*Jewkes et al., 2001) shows that the pattern of sexual activity of adolescents puts them at risk of HIV. This pattern often includes sex with a usually older and sexually experienced partner who is opposed to the use of contraceptives.

In developed countries with reliable abortion statistics a high percentage of adolescent pregnancies (30–60%) end in induced abortion (2.2; 3.5).

*Wadhera & Millar (1997), *Henshaw et al. (1999) and *Singh & Darroch (2000) provide statistical data on a large number of countries.

In countries where induced abortion is unlawful adolescents run the highest risk of serious complications from unsafe abortion (3.5).
Bott (1998), Mundigo & Indriso (1999).

In many countries access for unmarried adolescents to contraceptive services is difficult (3.4).
Rasch et al. (2000) gave data on Tanzania, *Kaufman et al. (2001) on South Africa, Cromer & McCarthy (1999) on the USA; in all these countries adolescents have difficulties in obtaining contraceptives.

In many countries pregnant adolescent girls frequently experience physical abuse (3.6).
*Boyer & Fine (1992) and *Kenney et al. (1997) are population-based studies in the USA; they are supported by a number of hospital-based studies from several developed countries. *Ronsmans & Khlat (1999) published a population-based study from Bangladesh and are supported by studies from South Africa (*Wood et al., 1998; *Jewkes et al., 2001).

Children of adolescent mothers are at increased risk of physical abuse and maltreatment (3.6; 10.2).
*Siegel et al. (1980), *Larson (1980), * Lealman et al. (1983), *Olds et al. (1986, 1988), *Boyer & Fine 1992 and *Roberts et al. (1996) published methodologically sound research on the subject. Two thirds of the abuse of children took place in the 18% predicted to be at risk, but supportive measures are very expensive and labour-intensive.

The incidence of hypertensive disorders in pregnant adolescents and adult women of the same parity does not differ (4.1).
The studies showing a higher incidence in adolescents (e.g. Saftlas et al., 1990) did not standardize for parity. Almost all studies that did standardize for parity found a comparable incidence in adolescents and adults (*Butler et al., 1981; *Grindstaff & Riordan, 1983; *Correy et al., 1984; *Mahfouz et al., 1995; *Jolly et al., 2000).

In endemic areas malaria is one of the most frequent causes of maternal mortality among adolescents (4.3; 6.7).
*Brabin (2001), Granja (2001).

In developed countries labour in adolescents is no more complicated than in older women and the incidence of interventions is less (5.1).
This is a conclusion drawn from a large number of hospital-based studies in developed countries. In developing countries there are regional differences, probably caused by problems with immature pelvic bones in some regions.

In young girls (<16 years) the pelvic bones may be involved in the growth process and thus are still immature (4.6; 5.2).
Harrison (1985b) found in a group of 69 primigravidae aged 13–16 years in a Nigerian hospital that more than 50% increased in height between booking and 1–60 days after delivery. Nelson (1978) found in the USA that growth in height continued for more than two years after menarche. Moerman (1982) found that growth of the pelvis still continued when stature had already reached its maximum.

There is ample evidence from developed and developing countries that adolescent pregnant girls are at increased risk of preterm labour and delivery; the youngest age groups run the highest risk (6.2; 6.3).
*Ferraz et al. (1990), *Buitendijk et al. (1993), *Leland et al. (1995), *Cooper et al. (1995), *Fraser et al. (1995), *Hediger et al. (1997) and *Otterblad Olausson (1999) all found more preterm births in adolescents than in older women in population-based studies.

In the USA young black adolescents run a higher risk of preterm labour and delivery than young white adolescents (6.2).

*Leland et al. (1995) and *Cooper et al. (1995) found ethnic differences within the group of adolescents and within age groups.

Pregnant girls with a low gynaecological age (<2 years) run the highest risk of preterm birth (6.3).

*Scholl et al. (1989; 1992) and *Hediger et al. (1997) found that gynaecological age is an independent factor influencing the outcome of pregnancy.

Adolescent girls are at increased risk of a low-birth-weight (LBW) infant compared with older pregnant women, but there is no proof that they are at increased risk of a small-for-gestational-age (SGA) infant (6.5).

*Makinson (1985) gives statistical data on LBW infants from Canada, England and Wales, France, Sweden and the USA. *Fraser et al. (1995) found more LBW infants in adolescents. *Cooper et al. (1995) found more LBW infants in very young (10–14 year-old) adolescents than in older adolescents. Although *Fraser et al. (1995) found more SGA infants in adolescents compared with older mothers, *Cooper et al. (1995) in a logistic regression analysis found that maternal age was not an independent risk factor for SGA infants. *Ferraz et al. (1990) and *Buitendijk et al. (1993) found no relation between low maternal age and SGA infants.

In several countries adolescent childbearing is associated with negative long-term effects for the adolescent mothers, namely: more future (adolescent) births; adverse socioeconomic conditions; premature termination of education; and poor earning capacities (7.1).

*Buvinic (1998) described these adverse consequences in five population-based studies in Latin America. *Otterblad Olausson (2001) conducted a study in Sweden and found comparable negative long-term effects.

In some developing countries the children of poor adolescent mothers have a significantly poorer nutritional status than children of older mothers (and children of "non-poor" adolescents); poorer development of language; and behavioural problems (7.2).

*Buvinic (1998) described these long-term effects in four Latin American countries.

In developed and developing countries antenatal care of adolescents often falls short of the standard of the country and is insufficient (8.2).

*Singh et al. (1985) and the *National Center for Health Statistics (1991) provided data on the USA, and *Okonofua et al. (1992) on Nigeria. These data are confirmed by numerous reports from hospitals containing convincing data on the insufficient prenatal care of adolescents.

In developed but especially in developing countries more attention be given to emergency contraception (11.5).

Cheng et al. (2002) wrote a systematic review on emergency contraception; Ellertsen (2002) and Mittal (2002) provided comments on its implementation in developing countries.

b: Important subjects for which there is insufficient evidence to draw firm conclusions

In some poorer countries and regions very young adolescent girls may be at risk of cephalopelvic disproportion. A late menarche and a low gynaecological age leading to immature pelvic bones are possible causes (5.2).

Data on this subject originate from hospital-based studies in remote regions: Harrison et al. (1985c), Kelly & Kwast (1993).

In some regions adolescents are at increased risk of anaemia in late pregnancy and postpartum, but there is insufficient knowledge of the severity of the anaemia in adolescents (4.2; 7.1).
In a regional survey in the UK *Jolly et al. (2000) found more anaemia in pregnant adolescents than in older pregnant women. In hospital-based studies from developed and developing countries some report an increased risk for adolescents, others cannot confirm this. However, the gravity of the problem in developing countries may be underestimated because the prevalence of anaemia in *all* women in many developing countries is so high. There is a scarcity of data on severity of anaemia in adolescents in developing countries (*Brabin et al., 2001).

The most appropriate time for offering sex-education courses is the last grade of primary school. This would also be helpful for those children who have no possibility of attending a secondary school. Görgen et al. (1993) provide good arguments for this statement.

c: Practices which are based on sound evidence and can be recommended

Extra caloric intake in the postpartum period during lactation (7.1; 10.2).
Recommendation of WHO (WHO, 1998b; 2002b).

In countries with endemic vitamin-A deficiency a high dose of vitamin A (200,000 IU) should be given to lactating mothers during the first month postpartum (7.1; 10.2).
Recommendation of WHO (WHO 1998b; 2002b).

In areas of high prevalence of anaemia, ferrous sulphate (60 mg) and folate (400 mg) per day for three months for pregnant and lactating women should be given (7.1; 10.2).
Recommendation of WHO (WHO1998b; 2002b).

Balanced protein/energy or energy supplementation for pregnant women (including adolescents) in famine conditions or in regions with severe undernutrition (8.4).
*Prentice et al. (1983; 1987) studied energy supplementation during famine (non-randomized, historical controls), *Kusin et al. (1992; 1994) carried out a randomized study in a region with severe undernutrition.

Short-course antiretroviral regimens at the end of pregnancy and during labour, which are affordable in developing countries, significantly reduce mother-to-child transmission of HIV infection (8.5).
Brocklehurst P, Volmink J *Antiretrovirals for reducing the risk of mother-to-child transmission of HIV infection* (Cochrane Review). In: The Cochrane Library, Issue 1, 2002. Oxford: Update Software.

It is important that antenatal care (including the care for adolescents) starts in the first trimester or early in the second trimester (8.6).
Gestational age can be determined more accurately, preventive measures can be discussed (cessation of smoking and other drug use, dietary improvements, malaria prophylaxis), important symptoms of disease can be detected and treated (e.g. anaemia).

An earlier start to antenatal care can be facilitated by combining services for pregnancy diagnosis, abortion counselling and counselling for antenatal care (8.2; 8.6).
Many pregnant adolescents contemplate abortion; 30–60% of such pregnancies are indeed aborted. In those countries where abortion is legal the obvious way to help them is through a service where open-minded counselling takes place, and where the adolescent can be assisted to take her own decision on either abortion or antenatal care.

Determination of gynaecological age (asking for the age at menarche) during the antenatal care of adolescent girls is important (6.3; 8.6).
*Scholl et al. (1989) and *Hediger (1997) showed a close relationship between low (<2 years)

gynaecological age and preterm labour. In some regions there is probably also a relationship between low gynaecological age and obstructed labour (see section 5.2).

In countries where malaria is endemic, prophylaxis and treatment in adolescents should include chemoprophylaxis, the use of bednets and the prompt recognition and treatment of the disease (8.6).

Lalloo (2000), Geelhoed et al. (2001).

Facilities for antenatal, natal and postpartum care should be adapted to the needs of adolescents (8.6).

ECPG (Essential Care Practice Guide: WHO, 2002b).

If pregnancy in an adolescent is uneventful, or complications such as severe anaemia could be treated adequately, if labour starts at term (between 37–42 weeks), and if the fetus is in cephalic presentation, labour should be considered as low-risk (5.1; 5.2; 9.2).

In section 5.1 it was shown that generally labour in adolescents is not more difficult than in adult women. Only in some poorer countries and regions and in very young (<16) adolescents, probably with a low gynaecological age, might there be an increased risk of obstructed labour.

In normal labour fetal surveillance is preferably performed by intermittent auscultation (9.3).

Electronic fetal monitoring limits the movement and position of the woman: she is usually confined to bed, in a supine position. In low-risk labour it leads to an increased number of interventions without obvious improvement in the outcome of labour (WHO, 1996b; Thacker, 2002).

Empathic support of a woman in labour is important. This applies particularly to adolescents (9.3).

*Klaus et al. (1986), *Hodnett & Osborn (1989), *Hemminki et al. (1990) and *Hofmeyr et al. (1991) found in randomized trials that continuous empathetic support during labour improves the outcome of labour. Heres et al. (2000) found a longer duration of normal labour cared for by obstetricians, compared to labour attended by midwives.

Birth should take place at the most peripheral level at which appropriate care is feasible and safe (9.3).

FIGO (1992), WHO (1996b).

Counselling for breastfeeding should start during antenatal care (10.2).

In India *Nielsen et al. (1998) found that women who received information about breastfeeding during antenatal care were more likely to initiate early breastfeeding.

A young adolescent needs help from caregivers with the correct positioning and attaching of the baby to the breast (10.2).

The correct positioning and attaching of the baby to the breast is a skill which the mother must acquire from observation and practice; it is an important task of health staff to provide accurate guidance to the mother (Winikoff et al., 1987; Garforth & Garcia, 1989; Inch & Garforth, 1989; Rajan, 1993).

Counselling on contraception should be combined with counselling on breastfeeding (10.2).

Counselling on postpartum contraception should be combined with counselling on breastfeeding, because the lactational amenorrhoea method (LAM) is one of the methods to consider (WHO, 1996d; 1998b).

In iodine-deficient environments a dose of iodized oil should be given before or during pregnancy; in case this did not occur it should be given early after delivery (10.2).

WHO (1998b).

If in a country or region, postpartum home care is feasible, adolescent mothers are among those most in need of this care (10.3).

*Siegel et al. (1980), *Larson (1980) and *Lealman et al. (1983) and *Olds et al. (1986; 1988) published trials on the prevention of childhood injury. *Roberts et al. (1996) published a systematic review. Home-visiting programmes have the potential to reduce significantly the rates of childhood injury. This is only one of the many problems of adolescent mothers.

When used correctly and consistently, condoms are the most effective method of preventing infections for adolescents engaging in sexual intercourse, and can be highly effective in protecting against pregnancy as well. Another option for dual protection is to use condoms in conjunction with another method, such as combined oral contraceptives or injectables. Rivera et al. (2001) provide good arguments for this statement.

Teachers of sex education, whether they are professional teachers or health personnel, should participate in an appropriate training programme, so that they are well informed about sex and birth control and are able to communicate with adolescents in a confidential manner, and without taking a moralizing attitude (11.4).

Görgen et al. (1993) provide good arguments for this statement.

d: Practices (and interpretations) based on insufficient evidence or considered ineffective or harmful

The relationship between the number of antenatal visits of adolescents and the outcome of pregnancy is not as close as is often assumed (8.1; 8.3).

In 2001 WHO published a randomized trial to test a new model of antenatal care (*Villar et al., 2001). For routine antenatal care in this new model four visits are recommended. There is much misunderstanding about the relation of the number of antenatal visits and the outcome of pregnancy. In section 8.3 it is argued that a correlation is not necessarily a causal relation, although antenatal care is certainly useful.

Balanced protein/energy or energy supplementation in adolescents who are not severely undernourished may modestly improve fetal growth but is unlikely to be of long-term benefit to the women or their infants (8.4).

*Rush et al. (1980) found the above-mentioned result in a randomized trial.

High protein supplementation during pregnancy is harmful (8.4).

This is also a result of *Rush et al. (1980).

Nutritional advice and supplementation to prevent preterm labour and delivery has not been shown to be effective (8.4; 8.6).

Inadequate weight gain during pregnancy is associated with low birth weight and preterm delivery. These data have often been interpreted as a cause-and-effect relationship, and consequently nutritional advice and supplementation for adolescents have been advocated. This has never been shown to be effective.

References

Adedoyin MA, Adetoro O. Pregnancy and its outcome among teenage mothers in Ilorin, Nigeria. *East African Med Journal* 1989; 66: 448-452.

Adetoro OO, Agah A. The implications of childbearing in postpubertal girls in Sokoto, Nigeria. *International J Gynecol Obstet* 1988; 27: 73-77.

Agyei WKA, Epema EJ. Sexual behavior and contraceptive use among 15-24 year-olds in Uganda. *Int Fam Plann Perspect* 1992; 18: 13–17.

Ajayi AA, Marangu LT, Miller J, Paxman JM. Adolescent sexuality and fertility in Kenya: a survey of knowledge, perceptions, and practices. *Studies in Fam Planning* 1991; 22:205-216.

Alam N. Teenage motherhood and infant mortality in Bangladesh: maternal age-dependent effect of parity one. *J Biosoc Sci* 2000; 32: 229-236.

Alan Guttmacher Institute. *Risks and realities of early childbearing worldwide.* The Alan Guttmacher Institute, New York 1996.

Ali M, Lulseged S. Factors influencing adolescent birth outcome. *Ethiop Med J* 1997: 35-41.

Al-Sherhan WE, Al-Madany AA, El-Hussini GE. Comparative analysis of the outcome of pregnancy in young and old teenage primigravidae. *J Kuwait Med Assoc* 1996; 29: 41-44.

Ambadekar NN, Khandait DW, Zodpey SP, Kasturwar NB, Vasudeo ND. Teenage pregnancy outcome: a record based study. *Indian J Med Sci* 1999; 53: 14–17.

American Academy of Pediatrics. Committee on adolescence. Adolescent pregnancy – Current trends and issues. *Pediatrics* 1999; 103: 516-520.

Amini SB, Catalano PM, Dierker LJ, Mann LI. Births to teenagers: trends and obstetric outcomes. *Obstet Gynecol* 1996; 87: 668-674.

Archibong EI. Illegal induced abortion - a continuing problem in Nigeria. Int J Gynaecol Obstet 1991; 34: 261-265.

Arkutu AA. Pregnancy and labour in Tanzanian primigravidae aged 15 years and under. *Int J Obstet Gynaecol* 1978; 16: 128–131.

Atallah AN, Hofmeyr GJ, Duley L. Calcium supplementation during pregnancy to prevent hypertensive disorders and related adverse outcomes (Cochrane Review). In: *The Cochrane Library,* Issue 3, 2001. Oxford: Update Software.

Bacci A, Manhica GM, Machungo F, Bugalho A, Cuttini M. Outcome of teenage pregnancy in Maputo, Mozambique. *Int J Gynecol Obstet* 1993; 40: 19-23.

Becker S. The determinants of adolescent fertility with special reference to biological variables. In: Gray R (ed). *Biomedical and demographic determinants of reproduction.* 1993. Oxford, Clarendon Press.

Berenson AB, Wiemann CM, McCombs SL. Adverse perinatal outcomes in young adolescents. *J Reprod Med* 1997; 42: 559-564.

Berglund S, Liljestrand J, Marín FDM, Salgado N, Zelaya E. The Background of adolescent pregnancies in Nicaragua: a qualitative approach. *Soc Sci Med.* 1997; 44: 1–12.

Bergsjo P, Seha AM, Ole-Kingori N. Hemoglobin concentration in pregnant women. Experience from Moshi-Tanzania. *Acta Obstet Gynecol Scand* 1996; 75: 241-244.

Bhatia JC. Levels and causes of maternal mortality in southern India. *Studies in Family Planning* 1993; 24: 310-318.

Blanc AK, Way AA. Sexual behavior and contraceptive knowledge and use among adolescents in developing countries. *Studies in Family Planning* 1998; 29: 106–116.

Blankson ML, Cliver SP, Goldenberg RL, Hickey CA, Jin J, Dubard MB. Health behaviour and outcomes in sequential pregnancies of black and white adolescents. *JAMA* 1993; 269: 1401–1403.

Bloem MW, Wedel M, Van Agtmaal EJ, Speek AJ, Soawakontha S, Schreurs WHP. Vitamin A intervention: short term effects of a single oral massive dose on iron metabolism. *Am J Clin Nutr* 1990; 51: 76-79.

Blumenthal NJ, Merrell DA, Langer O. Obstetrics in the very young black South African teenager. *S Afr Med J* 1982; 61: 518-520.

BMJ News. Teen pregnancies rise in England and Wales. *BMJ* 1998; 316: 882.

Bongaarts J, Cohen B. Introduction and overview. *Studies in Family Planning* 1998; 29: 99–105.

Bongaarts J. Does malnutrition affect fecundity? A summary of the evidence. *Science* 1980; 208: 564-569.

Bott S. Unwanted pregnancy and induced abortion among adolescents in developing countries: results of WHO case studies. *Proceedings from the International Conference on Reproductive Health* 15–19 March 1998, Mumbai, India.

Boulton-Jones C, McIlwaine G. Teenage pregnancy and deprivation. *BMJ* 1995; 310: 398-399.

Bouvier-Colle MH, Ouedraogo C, Dumont A, Vangeenderhuysen C, Salanave B, Decam C. Maternal mortality in West Africa. Rates, causes and substandard care from a prospective survey. *Acta Obstet Gynecol Scand* 2001; 80: 113–119.

Boyer D, Fine D. Sexual abuse as a factor in adolescent pregnancy and child maltreatment. *Family Planning Perspectives* 1992; 24: 4–11.

Bozkaya H, Mocan H, Usluca H, Beser E, Gümüstekin D. A retrospective analysis of adolescent pregnancies. *Gynecol Obstet Invest* 1996; 42: 146–150.

Brabin L, Verhoeff FH, Kazembe P, Brabin BJ, Chimsuku L, Broadhead R. Improving antenatal care for pregnant adolescents in southern Malawi. *Acta Obstet Gynecol Scand* 1998; 77: 402-409.

Brabin BJ, Hakimi N, Pelletier D. An analysis of anemia and pregnancy-related maternal mortality. *J Nutr* 2001; 131 (2S-2): 604S- 614S.

Bradford JA, Giles WB. Teenage pregnancy in Western Sydney. *Aust NZ J Obstet Gynaecol* 1989; 29: 1-4.

Brocklehurst P, Volmink J Antiretrovirals for reducing the risk of mother-to-child transmission of HIV infection (Cochrane Review). In: *The Cochrane Library*, Issue 1, 2002. Oxford: Update Software.

Brown HL, Fan YD, Gonsoulin WJ. Obstetric complications in young teenagers. *South Med J* 1991; 84: 46-48 & 64.

Buitendijk SE, Van Enk A, Oosterhout R, Ris M. Obstetric data on teenage pregnancies in the Netherlands. *Ned Tijdschr Geneeskd* 1993; 137: 2536-2540 (In Dutch, with English abstract).

Butler NR, Alberman ED (eds). *Perinatal problems.* The second report of the 1958 British perinatal mortality survey. Edinburgh: Livingstone 1969.

Butler NR, Ineichen B, Taylor B, Wadsworth J. *Teenage mothering*. Report to the Department of Health and Social Security, London 1981.

Buvinic M. The costs of adolescent childbearing: evidence from Chile, Barbados, Guatemala, and Mexico. *Studies in Family Planning* 1998; 29: 201-209.

Caldwell JC, Caldwell P, Caldwell BK, Pieris I. The construction of adolescence in a changing world: implications for sexuality, reproduction, and marriage. *Studies in Family Planning* 1998; 29: 137–153.

Cartoof VG, Klerman LV, Zazueta VD. The effect of source of prenatal care on care-seeking behavior and pregnancy outcomes among adolescents. *J Adolesc Health* 1991; 12: 124–129.

Chalmers I, Oakley, A, MacFarlane A. Perinatal health services: an immodest proposal. *Br Med J* 1980; 281: 842-845.

Chang HKK, Park IS, Park CM. *The medical outcome and psychosocial factors in relation to adolescent child birth in Seoul/Korea.* Seoul, no date.

Cheng L, Gülmezoglu AM, Ezcurra E, Van Look PFA. Interventions for emergency contraception (Cochrane Review). In: *The Cochrane Library*, Issue 1, 2002. Oxford: Update Software.

Conolly G, Kennely S, Conroy R, Byrne P. Teenage pregnancy in the Rotunda Hospital. Irish Med J 1998; 91: 209-212.

Cooper LG, Leland NL, Alexander G. Effect of maternal age on birth outcomes among young adolescents. *Soc Biol* 1995; 42: 22-35.

Coory M. Trends in birth rates for teenagers in Queensland, 1988 to 1997: an analysis by economic disadvantage and geographic remoteness. *Aust NZ J Public Health* 2000; 24: 316-319.

Coren E, Barlow J. *Individual and group-based parenting programmes for improving psychosocial outcomes for teenage parents and their children* (Cochrane Review). In: The Cochrane Library, Issue 2, 2002. Oxford: Update Software.

Cornelius MD, Geva D, Day NL, Cornelius JR, Taylor PM. Patterns and covariates of tobacco use in a recent sample of pregnant teenagers. *J Adolesc Health* 1994; 15: 528-535.

Cornelius MD, Taylor PM, Geva D, Day NL. Prenatal tobacco and marijuna use among adolescents: effects on offspring, gestational age, growth and morphology. *Pediatrics* 1995; 95: 738-743.

Correy JF, Kwok PC, Newman NM, Curran JT. Adolescent pregnancy in Tasmania. *Med J Aust* 1984; 141:150–154.

Covington DL, Daley JG, Churchill MP, Carl JC. The effects of a prematurity prevention program on births to adolescents. *Adolesc Heath Care* 1990; 11: 335-338.

Covington DL, Churchill MP, Wright BD. Factors affecting number of prenatal care visits during second pregnancy among adolescents having rapid repeat births. *J Adolesc Health* 1994; 15: 536-542.

Covington DL, Dalton VK, Diehl SJ, Wright BD, Piner MH. Improving detection of violence among pregnant adolescents. *J Adolesc Health* 1997; 21: 18-24.

Covington DL, Justason BJ Wright LN. Severity, manifestations, and consequences of violence among pregnant adolescents. *J Adolesc Health* 2000; 28: 55-61.

Creatsas G, Goumalatsos N, Deligeoroglou E, Karagitsou T, Calpactsoglou C, Arefetz N. Teenage pregnancy: comparison with two groups of older pregnant women. *J Adolesc Health* 1991; 12: 77-81.

Creatsas G. Improving adolescent sexual behavior: a tool for better fertility outcome and safe motherhood. *Int J Gynecol Obstet* 1997; 58: 85-92.

Cromer BA, Berg-Kelly KS, Van Groningen JP, Seimer BS, Ruusuvaara L Depot medroxyprogesterone acetate (Depo-provera) and levonorgestrel (Norplant) use in adolescents among clinicians in Northern Europe and the United States. *J Adolesc Health* 1998; 22: 74-80.

Cunningham FG, Macdonald PC, Gant NF, Leveno KJ, Gilstrap LC, Hankins GDV, Clark SL. *Williams Obstetrics*, 20th edition. Stamford, Appleton 1997.

Darroch JE, Singh S, Frost JJ. Differences in teenage pregnancy rates among five developed countries: the roles of sexual activity and contraceptive use. *Family Planning Perspectives* 2001; 33: 244-250.

Davidson EC, Gibbs CE, Chapin J. The challenge of care for the poor and underserved in the United States. An ACOG perspective on access to care for underserved women. *Am J Disease of Child* 1991; 145: 546-549.

De Cock KM, Fowler MG, Mercier E, De Vincenzi I, Saba J, Hoff E, et al., Prevention of mother-to-child HIV transmission in resource-poor countries. *JAMA* 2000; 283: 1175–1182.

Davis RL, Tollestrup K, Milham S. Trends in teenage smoking during pregnancy. *Am J Dis Child* 1990; 144: 1297–1301.

Dela Cruz AC. Experience with teenage pregnancy at Eulogio Rodriguez, Sr. Memorial hospital. *J Philippine Med Association* 1996; 71: 255-259.

Delange F. Administration of iodized oil during pregnancy: a summary of the published evidence. *Bull World Health Organ* 1996c; 74: 101–108.

DiCenso A, Guyatt G, Willan A, Griffith L. Interventions to reduce unintended pregnancies among adolescents: systematic review of randomised controlled trials. *Br Med J* 2002; 324: 1426.

Dickson N, Sporle A, Rimene C, Tahu N. Pregnancies among New Zealand teenagers: trends, current status and international comparisons. *N Zealand Med J* 2000; 113: 241-245.

Doornbos JPR, Nordbeck HJ, Van Enk AE, Muller AS, Treffers PE. Differential birthweights and the clinical relevance of birthweight standards in a multiethnic society. *Int J Gynecol Obstet* 1991; 34: 319-324.

Dubois S, Coulombe C, Pencharz P, Pinsonneault O, Duquette MP. Ability of the Higgins nutrition intervention program to improve adolescent pregnancy outcome. *J Am Diet Assoc* 1997; 97: 871-878.

Duenhoelter JH, Jimenez JM, Baumann G. Pregnancy performance of patients under 15 years of age. *Obstet Gynecol* 1975; 46: 49-52.
Dunn DT, Newell ML, Ades AE, Peckham C. Risk of immunodeficiency virus type 1 transmission through breastfeeding. *Lancet* 1992; 340: 585-588.
DuPlessis HM, Bell R, Richards T. Adolescent pregnancy: understanding the impact of age and race on outcomes. *J Adolesc Health* 1997; 20: 187–197.
Editorial. Urgent need to prevent abortion-related maternal deaths in Africa. *East African Med J* 1999; 76: 539-541.
Efiong EJ, Banjko MO. The obstetric performance of Nigerian primigravidae aged 16 and under. *Br J Obstet Gynaecol* 1975; 82: 228-233.
Ellertson C. Interventions for emergency contraception. *WHO Reproductve Health Library* 5, WHO Geneva 2002.
Farley T, Buyse D, Gaillard P, Perriëns J. Efficacy of antiretroviral regimens for prevention of mother to child transmission of HIV and some programmatic issues. *AIDS* 2002; 15: *in press.*
Fathalla MF. Women's health: an overview. *Int J Gynecol Obstet* 1994; 46: 105–118.
Feachem RG, Koblinsky MA. Interventions for the control of diarrhoeal diseases among young children: promotion of breast-feeding. *Bull World Health Org* 1984; 64: 271-291.
Ferraz EM, Gray RH, Cunha TM. Determinants of preterm delivery and intrauterine growth retardation in North-East Brazil. *Int J Epidemiol* 1990; 101–108.
FIGO. Recommendations accepted by the General Assembly at the XIII world Congress of Gynecology and Obstetrics. *Int J Gynecol Obstet* 1992; 38(Suppl): S79-S80.
Filippi VGA, Graham WJ, Campbell OMR. *Utilizing survey data on maternity care in developing countries.* Maternal and Child Epidemiology Unit Publication No.3, London, London School of Hygiene and Tropical Medicine.
Fisk NM, Shweni PM. Labor outcome of juvenile primiparae in a population with a high incidence of contracted pelvis. *Int J Gynecol Obstet* 1989; 28: 5-7.
Fitzpatrick CC, Fitzpatrick PE, Turner MJ. Profile of patients attending a Dublin adolescent antenatal booking clinic. *Irish Med J* 1997; 90: 96-97.
Fleming AF. Aetiology of severe anaemia in pregnancy in Ndola-Zambia. *Annals Trop Med Parasitol* 1989; 83: 37-49.
Fowler MG, Newell ML. Breastfeeding, HIV transmission and options in resource poor settings. *AIDS* 2001; 15: *in press.*
Fox SH, Koepsell TD, Daling JR. Birth weight and smoking during pregnancy - Effect modification by maternal age. *Am J Epidemiol 1994*; 139: 1008–1015.
Fraser A, Brockert JE, Ward RH. Association of young maternal age with adverse reproductive outcomes. *N Engl J Med* 1995; 332: 1113–1117.
Furstenberg FF. When will teenage childbearing become a problem? The implications of Western experience for developing countries. *Studies in Family Planning* 1998; 29: 246-253.
Gale R, Seidman DS, Dollberg S, Armon Y, Stevenson DK. Is teenage pregnancy a neonatal risk factor? *J Adolescent Health Care* 1989; 10: 404-408.
Garenne M, Tollman S, Kahn K. Premarital fertility in rural South Africa: a challenge to existing population policy. *Studies in Family Planning* 2000; 31: 47-54.
Garforth S, Garcia J. Breast feeding policies in practice - "No wonder that they get confused". *Midwifery* 1989; 5: 75-83.
Garssen MJ, Sprangers AH. Strong decrease in teenage fertility. *Maandstatistiek Bevolking* (CBS). 1998; (05): 12–13. (In Dutch).
Geelhoed DW, Visser LE, Addae V, Asare K, Schagen van Leeuwen JH, Van Roosmalen J. Malaria prophylaxis and the reduction of anemia at childbirth. *Int J Gynaecol Obstet* 2001; 74: 133–138.
Geronimus AT, Korenman S. Maternal youth or family background? On the health disadvantages of infants with teenage mothers. *Am J Epidemiol* 1993; 137: 213-225.
Gilles HM, Lawson JB, Sibelas M, Voller A, Allan N. Malaria, anaemia and pregnancy. *Ann Trop Med Parasitology* 1969; 63: 245-263.
Gissler M, Hemminki E. Amount of antenatal care and infant outcome. *Eur J Obstet Gynecol Reprod Biol* 1994; 56: 9–14.

Gold RB, Kenney AM, Singh S. *Blessed events and the bottom line: financing maternity care in the United States.* Allan Guttmacher Institute, New York, 1987.

Görgen R, Maier B, Diesfeld HJ. Problems related to schoolgirl pregnancies in Burkina Faso. *Studies in Family Planning* 1993; 24: 283-294.

Graham D. The obstetric and neonatal consequences of adolescent pregnancy. *Birth Defects original article series,* March of Dimes Birth Defects Foundation 1981; 17: 49-67.

Granja AC, Machungo F, Gomes A, Bergström S. Adolescent maternal mortality in Mozambique. *J Adolesc Health* 2001; 28; 303-306.

Gray R. The impact of health and nutrition on natural fertility. In: Bulatao R, Lee R (eds). *Determinants of fertility in developing countries.* 1983. New York, Academic Press.

Grindstaff CF, Riordan R. *Teenage pregnancy and health complications in Canada*. Report to the Ontario Ministry of Health No. DM409, Ontario, 1983.

Gupta JA. Windows of opportunity. The girl child in India at the dawn of the twenty-first century. World Health Organization 2000.

Habicht JP, Davanzo J, Butz WP. Does breastfeeding really save lives, or are apparent benefits due to biases? *Am J Epidemiol* 1986; 123: 279-290.

Hall MH, Chng PK, MacGillivray I. Is routine antenatal care worthwhile? *Lancet* 1980; ii: 78-80.

Hardoff D, Tamir A, Weizman T, Peretz AB. The adolescent parturient: a study of an Israeli population. *J Adolesc Health* 1996; 19: 362-365.

Hardy JB, King TM, Repke JT. The Johns Hopkins adolescent pregnancy program: an evaluation. *Obstet Gynecol* 1987; 69: 300-306.

Harrison KA, Rossiter CE, Chong H, Lister UG, Bano Q, Briggs ND et al., The influence of maternal age and parity on childbearing with special reference to primigravidae aged 15 years and under. *Br J Obstet Gynaecol* 1985a; Suppl 5: 22-31.

Harrison KA, Fleming AF, Briggs ND, Rossiter CE. Growth during pregnancy in Nigerian teenage primigravidae. *Br J Obstet Gynaecol* 1985b; Suppl 5: 32-39.

Harrison KA, Rossiter CE, Chong H. Relations between maternal height, fetal birthweight and cephalopelvic disproportion suggest that young Nigerian primigravidae grow during pregnancy. *Br J Obstet Gynaecol* 1985c; Suppl 5: 40-48.

Hediger ML, Scholl TO, Belsky DH, Ances IG, Salmon RW. Patterns of weight gain in adolescent pregnancy: effects on birth weight and preterm delivery. *Obstet Gynecol* 1989; 74: 6–12.

Hediger ML, Scholl TA, Schall JI, Krueger PM. Young maternal age and preterm labor*. Ann Epidemiol* 1997; 7: 400-406.

Heins HC, Nance NW, Ferguson JE. Social support in improving perinatal outcome: the resource mothers program. *Obstet Gynecol* 1987; 70: 263-266.

Hemminki E, Virta AL, Koponen P, Malin M, Kojo-Austin H, Tuimala R. A trial on continuous human support during labor: Feasibility, interventions and mothers' satisfaction. *J Psychosom Obstet Gynaecol* 1990; 11: 239-250.

Henshaw SK. Teenage abortion and pregnancy statistics by state, 1992. *Fam Plann Perspect* 1997; 29: 115–122.

Henshaw SK, Singh S, Haas T. The incidence of abortions worldwide. *Int Family Planning Perspectives* 1999; 25(Supplement): S30-S38.

Henshaw SK, Feivelson DJ. Teenage abortion and pregnancy statistics by state, 1996. *Fam Plann Perspect* 2000; 32: 272-280.

Heres MHB, Pel M, Borkent-Polet M, Treffers PE, Mirmiran M. The hour of birth: comparisons of circadian pattern between women cared for by midwives and obstetricians. *Midwifery* 2000; 16: 173–176.

Hodges RE, Sauberlich HE, Canham JE, Wallace DL, Rucker RB, Meija LA et al., Hematopoietic studies in vitamin A deficiency. *Am J Clin Nutr* 1978; 31: 876-885.

Hodnett ED, Osborn RW. A randomized trial of the effect of monitrice support during labor: mother's views two to four weeks post partum. *Birth* 1989; 16: 177–183.

Hofferth SL, Reid L, Mott FL. The effects of early childbearing on schooling over time. *Family Planning Perspectives* 2001; 33: 259-267.

Hofmeyr GJ, Nikodem VC, Wolman WL, Chalmers BE, Kramer T. Companionship to modify the clinical birth environment: effects on progress and perceptions of labour, and breastfeeding. *Br J Obstet Gynaecol* 1991; 98: 756-764.

Hollingsworth DR. Kotchen JM, Felice ME. Impact of gynecologic age on outcome of adolescent pregnancy. In: McAnarney (ed), *Premature adolescent pregnancy and parenthood*. 1983, Grune & Stratton, New York.

Horon IL, Strobino DM, MacDonald HM. Birth weights among infants born to adolescent and young adult women. *Am J Obstet Gynecol* 1983; 146: 444-449.

Howie PW, Forsyth JS, Ogston SA, Clark A, Du V Florey C. Protective effect of breast feeding against infection. *Br Med J* 1990; 300: 11–16.

Hughes J, McCauley AP. Improving the fit: adolescents' needs and future programs for sexual and reproductive health in developing countries. *Studies in family planning* 1998; 29: 233-245.

Hulka JF, Schaaf JT. Obstetrics in adolescents: a controlled study of deliveries by mothers 15 years of age and under. *Obstet Gynecol* 1964; 23: 678-685.

Hytten FE. Weight gain in pregnancy. In: Hytten FE, Chamberlain G (eds). *Clinical Physiology in Obstetrics,* 2nd ed. Oxford, Blackwell 1991.

Ibrahim SA, Omer MIA, Amin IK, Babiker AG, Rushwan H. The role of the village midwife in detection of high risk pregnancies and newborns. *Int J Gynecol Obstet* 1992; 39: 117–122.

Inch S, Garforth S. Establishing and maintaining breastfeeding. In: Chalmers I et al., (eds). *Effective care in pregnancy and childbirth.* Oxford, Oxford University Press 1989; 1359–1374.

Jackson DJ, Klee EB, Green SD, Mokili JL, Cutting WA. Severe anaemia in pregnancy: a problem of primigravidae in rural Zaire. *Transactions of the Royal Society of tropical Medicine and Hygiene* 1991; 85: 829-832.

Jacomo JJ, Jacono BJ, Onge MS, Van Oosten S, Meiniger E. Teenage pregnancy: a reconsideration. *Can J Public Health* 1992; 83: 196–199.

Jakobovits Á, Zubek L. The adolescent childbirth rate in Hungary. *J Adolescent Health* 1991; 12: 427-429.

Jejeebhoy SJ, Shah IH, Yount KM. Sexual and reproductive health of adolescents. WHO Department of Reproductive health and research, Annual Technical Report 1999.

Jewkes R, Vundule C, Maforah F, Jordaan E. Relationship dynamics and teenage pregnancy in South Africa. *Soc Sci Med* 2001; 52: 733-744.

Jolly MC, Sebire N, Harris J, Robinson S, Regan L. Obstetric risks of pregnancy in women less than 18 years old. *Obstet Gynecol* 2000; 96: 962-966.

Kaufman CE, De Wet T, Stadler J. Adolescent pregnancy and parenthood in South Africa. *Studies in family* planning 2001; 32: 147–160.

Keirse MJNC, Grant A, King JF. Preterm labour. In: Chalmers et al., (eds). *Effective care in pregnancy and childbirth.* Oxford, Oxford University Press 1989.

Kelly J, Kwast BE. Epidemiologic study of vesicovaginal fistulas in Ethiopia. *Int Urogynecol J* 1993; 4; 278-281.

Kenney JW, Reinholtz C, Angelini PJ. Ethnic differences in childhood and adolescent sexual abuse and teenage pregnancy. *J Adolescent Health* 1997; 21: 3–10.

Khwaja SS, Al-Sibai MH, Al-Suleiman SA, El-Zibdeh MY. Obstetric implications of pregnancy in adolescence. *Acta Obstet Gynecol Scand* 1986; 65: 57-61.

Kim, Young M, Marangwanda C, Kols A. Quality of counseling of young clients in Zimbabwe. *East African Med J* 1997; 74: 514-518.

Kirby D, Coyle K, Gould JB. Manifestations of poverty and birthrates among young teenagers in California zip code areas. *Family planning perspectives* 2001; 33: 63-69.

Klaus MH, Kennell JH, Robertson SS, Sosa R. Effects of social support during parturition on maternal and infant morbidity. *Br Med J* 1986; 293: 585-587.

Kondamudi VK, Bhattacharyya A, Noah PK, Noel D. Adolescent pregnancy in Grenada. *Ann Trop Pediatrics* 1993; 13: 379-383.

Konje JC, Palmer A, Watson A, Hay DM, Imrie A. Early teenage pregnancies in Hull. *Br J Obstet Gynaecol* 1992; 99:969-973.

Kosunen EA, Rimpelä MK. Towards regional equality in family planning: teenage pregnancies

and abortions in Finland from 1976 to 1993. *Acta Obstet Gynecol Scand* 1996; 75: 540-547.
Kramer MS. Balanced protein/energy supplementation in pregnancy. (Cochrane Review). In: *The Cochrane Library*, Issue 3, 1998. Oxford: Update Software.
Kumbi S, Isehak A. Obstetric outcome of teenage pregnancy in Northwestern Ethiopia. *East African Med J* 1999; 76: 138–140.
Kurup A, Viegas O, Singh K, Ratnam SS. Pregnancy outcome in unmarried teenage nulligravidae in Singapore. *Int J Gynecol Obstet* 1989; 30: 305-311.
Kusin JA, Kardjati S, Houtkooper JM, Renqvist UH. Energy supplementation during pregnancy and postnatal growth. *Lancet* 1992; 340: 623-626.
Kusin JA, Kardjati S, Renqvist UH. Maternal and child nutrition among women of reproductive age. In:Kusin JA & Kardjati S (eds). *Maternal and child nutrtion in Madura, Indonesia*. Amsterdam, Royal Tropical Institute 1994; (KIT) 125–147.
Kwast BE, Rochat RW, Kidane-Mariam W. Maternal mortality in Addis Ababa, Ethiopia. *Studies in Family Planning* 1986; 17: 288-301.
Kwast BE, Liff JM. Factors associated with maternal mortality in Addis Ababa, Ethiopia. *Int J Epidemiol* 1988; 17: 115–121.
LaGuardia KD, Druzin ML, Eades C. Maternity shelter care for adolescents: its effect on incidence of low birth weight. *Am J Obstst Gynecol* 1989; 161: 303-306.
Lalloo D. *Malaria in adolescence.* Paper prepared for the department of Child and Adolescent Health and Development of WHO. Geneva, WHO 2000.
Land GH, Stockbauer JW. Smoking and pregnancy outcome: trends among black teenage mothers in Missouri. *Am J Public Health* 1993; 83: 1121–1124.
Lao TT, Ho LF. The obstetric implications of teenage pregnancy. *Human Reproduction* 1997; 12: 2303-2305.
Lao TT, Ho LF. Obstetric outcome of teenage pregnancies. *Human Reproduction* 1998; 13: 3228-3232.
Lao TT, Ho LF. Relationship between preterm delivery and maternal height in teenage pregnancies. *Human Reproduction* 2000; 15: 463-468.
Larson CP. Efficacy of prenatal and postpartum home visits on child health and development. *Pediatrics* 1980; 66: 191–197.
Lealman GT, Haigh D, Phillips JM, Stone J, Ord-Smith C. Prediction and prevention of child abuse - an empty hope? *Lancet* 1983; i: 1423–1424.
Lee PYA, Walters WAW. Adolescent primigravidae and their obstetric performance. *Aust NZ J Obstet Gynaecol* 1983; 23: 3-7.
Lee ST, Chaudhuri P, Tay BL. Obstetric outcome of the unwed adolescents. *Singapore Med J* 1990; 31: 553-557.
LeGrand K, Mbacké CSM. Teenage pregnancy and child health in the urban Sahel. *Studies in Family Planning* 1993; 24: 137–149.
Leland NL, Petersen DJ, Braddock M, Alexander GR. Variations in pregnancy outcomes by race among 10–14-year-old mothers in the United States. *Public Health Reports* 1995; 110: 53-58.
Leppert PC, Namerow PB, Barker D. Pregnancy outcomes among adolescent and older women receiving comprehensive prenatal care. *J Adolescent Health Care* 1986; 7: 112–117.
Letsky E. The haematological system. In: Hytten F, Chamberlain G (eds). *Clinical Physiology in Obstetrics.* Blackwell, Oxford 1991.
Levine RJ, Hauth JC, Curet LB et al., Trial of calcium to prevent preeclampsia. *N Engl J Med* 1997; 337: 69-76.
Likwa RN, Whittaker M. The characteristics of women presenting for abortion and complications of illegal abortions at the University Teaching Hospital, Lusaka,
Zambia: an explorative study. Paper presented at the Conference on Unsafe Abortion and Post-abortion Family Planning in Africa. Afr J Fert Sex Reprod Health 1996; 1: 42-49.
Liljestrand J, Bergstrom S, Birgegard G. Anaemia of pregnancy in Mozambique. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 1986; 80: 249-255.
Liljestrand J. Reproductive health beyond Cairo and Beijing. *Acta Obstet Gynecol Scand* 1997;

76: 291-293.
Lubarsky SL, Barton JR, Friedmann SA, Nasredinne S, Ramadan MK, Sibai BM. Late postpartum eclampsia revisited. *Obstet Gynecol* 1994; 83: 502-505.
Lubarsky SL, Schiff E, Friedman SA, Mercer BM, Sibai BM. Obstetric characteristics among nulliparas under age 15. *Obstet Gynecol* 1994; 84: 365-368.
Mahfouz AAR, El-Said MM, Al-Erian RAG, Hamid AM. Teenage pregnancy: are teenagers a high risk group? *Eur J Obstet Gynecol Repr Biol* 1995; 59: 17-20.
Mahomed K, Ismail A, Masona D. The young pregnant teenager - why the poor outcome? *Central African J Med* 1989; 35: 403-406.
Mahomed K. Iron and folate supplementation in pregnancy (Cochrane Review). In: *The Cochrane Library,* Issue 1, 2002. Oxford: Update Software.
Makinson C. The health consequences of teenage fertility. *Family Planning Perspectives* 1985; 17:132–139.
Malik R, Mouzzam S, Bokhari ZH. Adverse effects of teenage marriages. Pakistan *J Med Research* 1996; 35: 42-43.
Marshall WA, Tanner JM. Puberty. In: *Human Growth.* Marshall WA, Tanner JM (eds). 1986; London, Plenum Press.
Matsuhashi Y, Felice ME, Shragg P, Hollingsworth DR. Is repeat pregnancy in adolescents a "planned" affair? *J Adolesc Health Care* 1989; 10: 409-412.
Mawer C. Preventing teenage pregnancies, supporting teenage mothers. *Br Med J* 1999; 318: 1713–1714.
McCulloch A. **Teenage childbearing in the United Kingdom and the spatial concentration of poverty households.** *J Epidemiol Community Health* **2001; 55: 16-23.**
McDonald TP, Coburn AF. Predictors of prenatal care utilization. *Soc Sci Med* 1988; 27: 167–172.
McDuffie RS, Beck A, Bischoff KJ, Cross J, Orleans M. Effect of frequency of prenatal care visits for low-risk women on perinatal outcome. *JAMA* 1996; 275: 847-851.
McGuire J, Popkin BM. Beating the zero-sum game: women and nutrition in the third world. *Food Nutr Bull* 1989; 11: 38-63.
McLeod A. Changing patterns of teenage pregnancy: population based study of small areas. *Br Med J* 2001; 323: 199-203.
Meija LA, Chew F. Haematological effect of supplementing anemic children with vitamin A alone and in combination with iron. *Am J Clin Nutr* 1988; 48: 595-600.
Mezey GC, Bewley S. Domestic violence and pregnancy. *Br J Obstet Gynaecol* 1997; 104: 528-531.
Miller HS, Lesser KB, Reed KL. Adolescence and very low birth weight infants: a disproportionate association. *Obstet Gynecol 1996; 87: 83-88.*
Mittal S. Practical aspects of emergency contraception interventions. *WHO Reproductive Health Library* 5. WHO, Geneva 2002.
Moerman ML. Growth of the birth canal in adolescent girls. *Am J Obstet Gynecol* 1982; 143: 528-532.
Mofenson LM, Munderi P. Safety of antiretroviral prophylaxis of perinatal transmission on HIV-infected pregnant women and their infants. AIDS 2002; 15: *in press*.
Molitch ME. Pituitary, thyroid, adrenal, and parathyroid disorders. In: Barron WM, Lindheimer MD, eds. *Medical disorders during pregnancy.* Mosby, St Louis 1991.
Morris DL, Berenson AB, Lawson J, Wiemann CM. Comparison of adolescent pregnancy outcomes by prenatal care source. *J Reprod Med* 1993; 38: 375-380.
Mukasa FM. Comparison of pregnancy and labour in teenagers and primigravidas aged 21-25 years in Transkei. *S Afr Med J* 1992; 81: 421-423.
Mundigo AI, Indriso C, (ed). Abortion in the developing world. London: World Health Organisation Zed books, 1999.
Munjanja SP, Lindmark G, Nyström L. Randomised controlled trial of a reduced-visits programme of antenatal care in Harare, Zimbabwe. *Lancet* 1996; 348: 364-369.
Mutungi AK, Karanja JG, Kimani VN, Rogo KO, Wango EO. Abortion: knowledge and perceptions of adolescents in two districts in Kenya. *East African Med J* 1999; 76: 556-561.
National Center for Health Statistics. Advance report of final maternity statistics, 1989. *Monthly*

Vital Statistics Report 1991; 40 (Suppl): 1-55.
Nelson RM. Physiological correlates of puberty. *Clin Obstet Gynecol* 1978; 21 (4): 1137–1149.
NFSH (National Family Health Survey; India). 1998-99.
Nielsen BB, Hedegaard M, Thilsted SH, Joseph A, Liljestrand J. Does antenatal care influence postpartum health behaviour? Evidence from a community based cross-sectional study in rural Tamil Nadu, South India. *Br J Obstet Gynaecol 1998*; 105: 697-703.
Nyirenda T, Cusack GS, Mtimuni BM. The effect of mother's age parity and antenatal clinic attendance on infant birth weight. *Malawi Med J* 1991; 7: 110–112.
Odongo F, Ojwang SBO. Some aspects of teenage pregnancy in Nairobi: a prospective study on teenage mothers at Kenyatta National Hospital and Pumwani Maternity Hospital. *East African Med J* 1990; 67: 432-436.
Ojengbede OA, Otolorin EO, Fabanwo AO. Pregnancy performance of Nigerian women aged 16 years and below, as seen in Ibadan, Nigeria. *Afr J Med Sci* 1987; 16: 89-95.
Ojwang SBO, Maggwa ABN. Adolescent sexuality in Kenya. *East African Med J* 1991; 68: 74-80.
Okonofua FE, Feyisetan BJ, Davies-Adetugbo A, Sanusi YO. Influence of socioeconomic factors on the treatment and prevention of malaria in pregnant and non-pregnant adolescent girls in Nigeria. *J Trop Med Hygiene* 1992; 95: 309-315.
Olds DL, Henderson CR, Tatelbaum R, Chamberlin R. Improving the delivery of prenatal care and outcomes of pregnancy: a randomized trial of nurse home visitation. *Pediatrics* 1986; 77: 16-28.
Olds DL, Henderson CR, Chamberlin R, Tatelbaum R. Preventing child abuse and neglect: a randomized trial of nurse home visitation. *Pediatrics* 1986; 78: 65-78.
Olds DL, Henderson DR, Tatelbaum R, Chamberlin R. Improving the life-course development of socially disadvantaged mothers: a randomized trial of nurse home visitation. *Am J Public Health* 1988; 78: 1436–1445.
Olukoya AA, Kaya A, Ferguson BJ, AbouZahr C. Unsafe abortion in adolescents. *Int J Gynecol Obstet* 2001; 75: 137–147.
Osbourne GK, Howat RCL, Jordan MM. The obstetric outcome of teenage pregnancy. *Br J Obstet Gynaecol* 1981; 88: 215-221.
Otterblad Olausson P, Cnattingius S, Haglund B. Teenage pregnancies and risk of late fetal death and infant mortality. *Br J Obstet Gynaecol* 1999; 106: 116–121.
Otterblad Olausson P, Haglund B, Ringbäck Weitoft G, Cnattingius S. Teenage childbearing and long-term socioeconomic consequences: a case study in Sweden. *Family Planning Perspectives* 2001; 33: 70-74.
Özcebe H, Akin A. Adolescent health: a Middle East and North African perspective. *Int J Gynecol Obstet* 1995; 51: 151–157.
Padte K, Pal MN, Pavse J. Review of teenage pregnancy in Goa. *J Obstet Gynaecol India* 1989; 39: 472-474.
Parker B, McFarlane J, Soeken K. Abuse during pregnancy: effects on maternal complications and birth weight in adult and teenage women. *Obstet Gynecol* 1994; 84: 323-328.
Peipert JF, Domagalski LR. Epidemiology of adolescent sexual assault. *Obstet Gynecol* 1994; 84: 867-871.
Peoples MD, Grimson RC, Daughtry GL. Evaluation of the effects of the North carolina improved pregnancy outcome project: implications for state-level decision-making. *Am J Public Health* 1984; 74: 549-554.
Perkins RP, Nakashima II, Mullin M, Dubansky LS, Chin ML. Intensive care in adolescent pregnancy. *Obstet Gynecol* 1978; 52: 179–188.
Perkocha VA, Novotny TE, Bradley JC, Swanson J. The efficacy of two comprehensive perinatal programs on reducing adverse perinatal outcomes. *Am J Prev Med* 1995; 11 (Suppl 1): 21-29.
Pick de Weiss S, Atkin LC, Gribble JN, Andrade-Palos P. Sex, contraception, and pregnancy among adolescents in Mexico City. *Studies in Family Planning* 1991; 22:74-82.
Pinto e Silva JL. Pregnancy during adolescence: wanted vs. unwanted. *Int J Gynecol Obstet* 1998; 63 (Suppl 1): S 151-S156.
Polaneczky M, Liblanc M. Long-term depot medroxyprogesterone acetate (Depo-provera) use in

inner-city adolescents. *J Adolesc Health* 1998; 23: 81-88.
Poma PA. Effect of maternal age on pregnancy outcome. *J Natl Med Ass* 1981; 73: 1031–1038.
Prentice AM, Cole TJ, Foord FA, Lamb WH, Whitehead RG. Increased birth weight after prenatal dietary supplementation of rural African women. *Am J Clin Nutr* 1987; 46: 912-925.
Prentice AM, Whitehead RG, Watkinson M, Lamb WH, Cole TJ. Prenatal dietary supplementation of African women and birth weight. *Lancet* i 1983: 489-492.
Rademakers J. Abortion in the Netherlands 1993-2000. In Dutch with a summary in English. Stisan, Heemstede 2002.
Rahman S, Nessa F, Rahman S, Ali R, Ara Ali H. Reproductive health of adolescents in Bangladesh. *Int J Gynecol Obstet* 1989; 29: 329-335.
Rajan L. The contribution of professional support, information and consistent correct advice to successful breast feeding. *Midwifery* 1993; 9: 197-209.
Rao PSS, Amalraj A. Maternal mortality in southern India. *Trop Geogr Med* 1994; 46: 302-304.
Rasch V, Silberschmidt M, Mchumvu Y, Mmary V. Adolescent girls with illegally induced abortion in Dar es Salaam: the discrepancy between sexual behaviour and lack of access to contraception. Reprod Health Matters 2000; 8: 52-62.
Reading R, Jarvis S, Openshaw S. Measurement of social inequalities in health and use of health services among children in Northumberland. *Arch Dis Child* 1993; 68: 626-631.
Rees JM, Engelbert-Fenton KA, Gong EJ, Bach CM. Weight gain in adolescents during pregnancy: rate related to birth-weight outcome. *Am J Clin Nutr* 1992; 56: 868-873.
Reichman NE, Pagnini DL. Maternal age and birt outcomes: data from New Yersey. *Family Planning Perspectives* 1997; 29: 268-272 & 295.
Richardson GA, Day NL, McGauhey. The impact of prenatal marijuana and cocaine use on the infant and child. *Clin Obstet Gynecol* 1993; 36: 302-318.
Rimpelä AH, Rimpelä MK, Kosunen EA. Use of oral contraceptives by adolescents and its consequences in Finland 1981-91. *BMJ* 1992; 305: 1053–1057.
Rivera R, Cabral de Mello M, Johnson SL, Chandra-Mouli V. Contraception for adolescents : social, clinical and service-delivery considerations. *Int J Gynecol Obstet* 2001; 75: 149–163.
Roberts I, Kramer MS, Suissa S. Does home visiting prevent childhood injury? A systematic review of randomised trials. *Br Med J* 1996; 312: 29-33.
Rogers MM, Peoples-Sheps MD, Suchindran C. Impact of a social support program on teenage prenatal care use and pregnancy outcomes. *J Adolesc Health* 1996; 19: 132–140.
Rogo KO. Induced abortion in Sub-Saharan Africa. *East African Med J* 1993; 70: 386-395.
Rogo KO, Bohmer L, Ombaka C. Developing community-based strategies to decrease maternal morbidity and mortality due to unsafe abortion: pre-intervention report. *East African Med J* 1999; 76 (Suppl): S1-S4.
Ronsmans C, Khlat M. Adolescence and risk of violent death during pregnancy in Matlab, Bangladesh. *Lancet* 1999; 354: 1448.
Rooney C. *Antenatal care and maternal health: how effective is it?* A review of the evidence. Geneva, World Health Organization 1992 (WHO/MSM/92.4).
Roopnarinesingh SS. The young negro primigravida in Jamaica. *J Obstet Gynaecol Br Commonwlth* 1970; 77: 424-426.
Royston E, Ferguson J. The coverage of maternity care: a critical review of available information. *World Health Stat* 1985; 38: 267-288.
Rush D, Stein Z, Susser M. A randomized controlled trial of prenatal nutritional supplementation in New York City. *Pediatrics* 1980; 65: 683-697.
Saftlas AF, Olson DR, Franks AL, Atrash HK, Pokras R: Epidemiology of preeclampsia in the United States, 1979–1986. *Am J Obstet Gynecol 1990*; 163; 460-465.
Santow G, Bracher M. Explaining trends in teenage childbearing in Sweden. *Studies in family planning* 1999; 30: 169–182.
Sarkar CS, Giri AK, Sarkar B. Outcome of teenage pregnancy and labour: a retrospective study. *J Indian Med Ass* 1991; 89: 197–199.
Satin AJ, Leveno KJ, Sherman ML, Reedy NJ, Lowe TW, McIntire DD. Maternal Youth and pregnancy outcomes: middle school versus high school age groups compared with women beyond the teen years. *Am J Obstet Gynecol* 1994; 171: 184–187.

Savona-Ventura C, Grech ES. Risks in pregnant teenagers. *Int J Gynecol Obstet* 1990; 32: 7–13.
Scholl TO, Miller LK, Salmon RW, Cofsky MC, Shearer J. Prenatal care adequacy and the outcome of adolescent pregnancy: effects on weight gain, preterm delivery, and birth weight. *Obstet Gynecol* 1987; 69: 312-316.
Scholl TO, Hediger ML, Salmon RW, Belsky H, Ances G. Association between low gynaecological age and preterm birth. *Paediatric Perinatal Epidemiology* 1989; 3: 357-366.
Scholl TO, Hediger ML, Ances IG, Belsky DH, Salmon RW. Weight gain during pregnancy in adolescence: predictive ability of early weight gain. *Obstet Gynecol* 1990; 75: 948-953.
Scholl TO, Hediger ML, Khoo CS, Healey MF, Rawson NL. Maternal weight gain, diet and infant birth weight: correlations during adolescent pregnancy. *J Clin Epidemiol* 1991; 44: 423-428.
Scholl TO, Hediger ML, Huang J, Johnson FE, Smith W, Ances IG. Young maternal age and parity. Influences on pregnancy outcome. *Ann Epidemiol* 1992; 2: 565-575.
Scholl TO, Hediger ML, Belsky DH. Prenatal care and maternal health during adolescent pregnancy: a review and meta-analysis. *J Adolescent Health* 1994; 15: 444-456.
Schuitemaker N, Van Roosmalen J, Dekker G, Van Dongen P, Van Geijn H, Bennebroek Gravenhorst J. Confidential enquiry into maternal deaths in the Netherlands 1983–1992. *Eur J Obstet Gynecol Reprod Biol* 1998; 79: 57-62.
Sells CW, Blum RW. Morbidity and mortality among US adolescents: an overview of data and trends. *Am J Public Health* 1996; 86: 513-519.
Senanayake P, Ladjali M. Adolescent health: changing needs. *Int J Gynecol Obstet* 1994; 46: 137–143.
Sharma V, Sharma A. Health profile of pregnant adolescents among selected tribal populations in Rajasthan, India. *J Adolescent Health* 1992; 13: 696-699.
Shiono PH, Klebanoff MA, Nugent RP, Cotch MF, Wilkins DG, Rollins DF et al., The impact of cocaine and marijuana use on low birth weight and preterm birth: a multicenter study. Am J Obstet Gynecol 1995; 172: 19-27.
Shulman CE, Graham WJ, Jilo H, Lowe BS, New L, Obiero J et al., Malaria is an important cause of anaemia in primigravidae: evidence from a district hospital in coastal Kenya. *Trans Roy Soc Trop Med Hyg* 1996; 90: 535-539.
Siegel E, Bauman KE, Schaefer ES, Saunders MM, Ingram DD. Hospital and home support during infancy: impact on maternal attachment, child abuse and neglect, and health care utilization. *Pediatrics* 1980; 66: 183–190.
Sikorski J, Wilson J, Clement S, Das S, Smeeton N. A randomised controlled trial comparing two schedules of antenatal visits: the antenatal care project. *Br Med J* 1996; 312: 546-553.
Silva MO, Cabral H, Zuckerman B. Adolescent pregnancy in Portugal: effectiveness of continuity of care by an obstetrician. *Obstet Gynecol* 1993; 81: 142–146.
Singh S, Torres A, Forrest JD. **The need for prenatal care in the United States: evidence from the 1980 National Natality Survey.** *Family Planning Perspectives* **1985; 17: 118–124.**
Singh S. Adolescent childbearing in developing countries: a global review. *Studies in Family Planning* 1998; 29: 117–136.
Singh S, Samara R. Early marriage among women in developing countries. *Int Family Planning Perspectives* 1996; 22: 148–157.
Singh S, Darroch JE. Adolescent pregnancy and childbearing: levels and trends in developed countries. *Family Planning Perspectives* 2000; 32: 14-23.
Singh S, Darroch JE, Frost JJ. Socioeconomic disadvantage and adolescent women's sexual and reproductive behavior: the case of five developed countries. *Family planning perspectives* 2001; 33: 251-258.
Slap GB, Schwartz JS. Risk factors for low birth weight to adolescent mothers. *J Adolesc Health Care* 1989; 10: 267-274.
Sloggett A, Joshi H. Deprivation indicators as predictors of life events 1981–1992 based on the UK ONS longitudinal study. *J Epidemiol Community Health* 1998; 52: 228-233.
Spellacy WN, Mahan CS, Cruz AC. The adolescent's first pregnancy: a controlled study. *South Med J* 1878; 71: 768-771.
Stanton BF et al., Increased protected sex and abstinence among Namibian youth following a HIV risk-reduction intervention: a randomized, longitudinal study. *Aids* 1998; 12: 2473-2480.

Stevens-Simon C, Roghmann KJ, McAnarney ER. Early vaginal bleeding, late prenatal care and misdating in adolescent pregnancies. *Pediatrics* 1991; 87: 838-840.

Stevens-Simon C, McAnarney R. Skeletal maturity and growth of adolescent mothers: relationship to pregnancy outcome. *J Adolescent Health* 1993; 13: 428-432.

Stevens-Simon C, Kelly L, Singer D. Preventing repeat adolescent pregnancies with early adoption of the contraceptive implant. *Family Planning Perspectives* 1999; 31: 88-93.

Story M. Promoting healthy eating and ensuring adequate weight gain in pregnant adolescents: issues and strategies. *Ann NY Acad Sci* 1997; 817: 321-333.

Stott GJ, Lewis SM. A simple and reliable method for estimating haemoglobin. *Bull World Health Organization* 1995; 73: 369-373.

Taha TE, Biggar RJ, Broadhead RL et al., The effect of cleansing the birth canal with antiseptic solution on maternal and newborn morbidity in Malawi: clinical trial. *Br Med J* 1997; 315: 216-219.

Teagle SE, Brindis CD. Substance use among pregnant adolescents: a comparison of self-reported use and provider perception*. J Adolescent Health* 1998; 22: 229-238.

Templeman CL, Cook V, Goldsmith J, Powell J, Hertweck SP. Postpartum contraceptive use among adolescent mothers. *Obstet Gynecol* 2000; 95: 770-776.

Thacker SB, Stroup D, Chang M. *Continuous electronic heart rate monitoring for fetal assessment during labor* (Cochrane Review). In: The Cochrane Library, Issue 1,
2002. Oxford: Update Software.

Thapa PJ, Thapa S, Shrestha N. A hospital based study of abortion in Nepal. Stud Fam Planning 1992; 23: 311-317.

Thea DM, Steketee RW, Pliner V et al., and New York City Perin HIV Transm Coll Group. The effect of maternal viral load on the risk of perinatal transmission of HIV-I. *Aids* 1997; 11: 437-444.

Treffers PE, Olukoya AA, Ferguson BJ, Liljestrand J. Care for adolescent pregnancy and childbirth. *Int J Gynecol Obstet* 2001; 75: 111–121.

UNFPA. *The new generations*. UNFPA 1998.

UNFPA. *Adolescents in India. A profile.* UNFPA 2001. *www.un.org.in/adolescentsprofile.pdf*).

UNICEF. The Progress of Nations. UNICEF 1998.

Utriainen S. Adolescent pregnancy: Standards and services in Finland. *Child Welfare* 1989; 68: 167–182.

Van den Broek NR. Anaemia in pregnancy in developing countries. *Br J Obstet Gynaecol* 1998; 105: 385-390.

Van den Broek NR, Letsky EA. Etiology of anemia in pregnancy in South Malawi. *Am J Clin Nutr* 2000; 72: (1 Suppl): 247S-256S).

Van der Velde WJ, Treffers PE. Smoking in pregnancy: the influence on percentile birth weight, mean birth weight, placental weight, menstrual age, perinatal mortality, and maternal diastolic blood pressure. *Gynecol Obstet Invest* 1985; 19: 57-63.

Van Winter JT, Simmons PS. A proposal for obstetric and pediatric management of adolescent pregnancy. *Mayo Clin Proc* 1990; 65:1061–1066.

Ventura SJ, Freedman MA. Teenage childbearing in the United States, 1960–1997. *Am J Prev Med* 2000; 19 (1S): 18-25.

Victora CG, Vaughan JP, Lombardi C et al., Evidence for protection by breast-feeding against infant deaths from infectious diseases in Brazil. *Lancet 1987*; ii: 319-322.

Villar J, Repke JT. Calcium supplementation during pregnancy may reduce preterm delivery in high-risk populations. *Am J Obstet Gynecol* 1990; 163: 1124–1131.

Villar J et al., for the WHO Antenatal Care Trial Research Group. WHO antenatal care randomised trial for the evaluation of a new model of routine antenatal care. *The Lancet* 2001; 357: 1551–1564.

Wadhera S, Millar WJ. Teenage pregnancies, 1974 to 1994. *Health Reports* 1997; 9: 9–17.

Wadwahan S, Narone RK, Narone JN. Obstetric problems in the adolescent Zambian mother studied at the University Teaching Hospital, Lusaka. *Med J Zambia* 1982; 16: 65-68.

Ward PM, Biggs JSG. Trends in adolescent pregnancies. *Aust NZ J Obstet Gynaecol* 1981; 21: 88-92.

Weerasekera DS. Adolescent pregnancies - is the outcome different? *Ceylon Med J* 1997; 42: 16–17.

Wells RD, MCDiarmid J, Bayatpour M. Perinatal health belief scales: a cost-effective technique for predicting prenatal appointment keeping rates among pregnant teenagers. *J Adolesc Health Care* 1990; 11: 119–124.

Westoff CF, Blanc AK, Nyblade L. Marriage and entry into parenthood. DHS Comparative Studies No. 10. Calverton, Maryland: Macro International Inc.

Whaley AL. Preventing the high-risk sexual behavior of adolescents: focus on HIV/AIDS transmission, unintended pregnancy, or both? *J Adolesc Health* 1999; 24: 376-382.

White DR, Hall MH, Campbell DM. The aetiology of preterm labour. *Br J Obstet Gynaecol* 1986; 93: 733-738.

Wight D, Raab GM, Henderson M, Abraham C, Buston K, Hart G, Scott S. Limits of teacher delivered sex education: interim behavioural outcomes from randomised trial. *Br Med J* 2002; 324: 1430.

Wilson AC, Forsyth SA, Greene SA, Irvine L, Hau C, Howie PW. Relation of infant diet to childhood health: seven year follow up of cohort of children in Dundee infant feeding study. *Br Med J* 1998; 316: 21-25.

Winikoff B, Myers D, Laukaran VH, Stone R. Dynamics of infant feeding: Mothers, professionals, and the institutional context in a large urban hospital. *Pediatrics* 1987; 80: 423-433.

Wood K, Maforah F, Jewkes R. "He forced me to love him": putting violence on adolescent sexual health agendas. *Soc Sci Med* 1998; 47: 233-242.

Woodward LJ, Horwood LJ, Fergusson DM. Teenage pregnancy: cause for concern. *NZ Med J* 2001; 114: 301-303.

Working Group om Mother-to-Child Transmission of HIV. Rates of mother-to-child transmission of HIV-1 in Africa, America and Europe: results from 13 perinatal studies. *Journal of Acquired Immune Deficiency Syndrome* 1995; 8: 506-510.

World Health Organization. Nutritional anaemias. *Technical Report Series* No. 503. WHO, Geneva 1972.

World Health Organization. The health of young people. A challenge and a promise. WHO Geneva, 1993.

World Health Organization. Maternal Health and Safe Motherhood Programme. World Health Organization partograph in management of labour. *Lancet* 1994; 343: 1399–1404.

World Health Organization. *Antenatal Care.* WHO, Geneva, 1996a (WHO/FRH/MSM/96.8).

World Health Organization. *Care in normal birth: a practical guide*. WHO, Geneva, 1996b (WHO/FRH/MSM/96.24).

World Health Organization. Safe use of iodized oil to prevent iodine deficiency in pregnant women. A statement by the World Health Organization. *Bull of the World Health Organization* 1996c; 74: 1-3.

World Health Organization. *Improving access to quality care in family planning.* Medical eligibility criteria for initiating and continuing use of contraceptive methods. Geneva; WHO 1996d (WHO/FRH/FPP/96.9).

World Health Organization. *Nutritional status of adolescent girls and women of reproductive age*. New Delhi, WHO 1998a (SEA/NUT/141).

World Health Organization. *Postpartum care of the mother and newborn.* Geneva, WHO 1998b (WHO/RHT/MSM/98.3).

World Health Organization. *HIV in pregnancy: a review.* Geneva, WHO 1998c (WHO/RHT/98.24).

World Health Organization. *Safe vitamin A dosage during pregnancy and lactation.* Recommendations and report of a consultation. WHO, Geneva, 1998d (WHO/NUT/98.4).

World Health Organization. *Female genital mutilation. An overview.* Geneva, WHO 1998e (ISBN 92 4 156191 2).

World Health Organization. *A systematic review of the health complications of female genital mutilation including sequelae in childbirth*. Geneva, WHO 2000 (WHO/FCH/WMH/00.2).

World Health Organization. *New data on the prevention of mother-to-child transmission of HIV and their policy implications.* WHO Technical Consultation on behalf of the UNFPA/UNICEF/

WHO/UNAIDS Inter-Agency task team on mother-to-child transmission of HIV. Geneva, WHO 2001a.

World Health Organization. *Improving access to quality care in family planning: medical eligibility criteria for contraceptive use*, 2nd Edition. Geneva, WHO 2001b.

World Health Organization. *WHO antenatal care randomized trial: manual for the implementation of the new model.* Geneva, WHO 2002a.

World Health Organization. *Essential Care Practice Guide for pregnancy, childbirth and newborn care.* Geneva, WHO 2002b, in press.

World Health Organization. *Prevention of HIV in infants and young children: review of evidence and WHO's activities.* Geneva, WHO 2002c.

World Health Organization. *WHO consultation on increasing access to HIV testing and counselling.* Geneva, WHO 2003a, unpublished.

Wyshak G, Frisch RE. Evidence for a secular trend in age of menarche. *N Engl J Med* 1982; 306: 1033–1035.

Yoder BA, Young MK. Neonatal outcomes of teenage pregnancy in a military population. *Obstet Gyneco*l 1997; 90: 500-506.

Young CL, McMahon J, Bowman VM, Thompson D. Adolescent third-trimester enrollment in prenatal care. *Adolesc Health Care* 1989; 10: 393-397.

Zabin LS, Kiragu K. The health consequences of adolescent sexual and fertility behavior in Sub-Saharan Africa. *Studies in Family Planning* 1998; 29: 210-232.

Zelaya E, Marín FM, García J, Berglund S, Liljestrand J, Persson LA. Gender and social differences in adolescent sexuality and reproduction in Nicaragua. *J Adolescent Health* 1997; 21: 39-46.

Zhang B, Chan A. Teenage pregnancy in South Australia, 1986–1988*. Aust NZ J Obstet Gynaecol* 1991; 31: 291-298.

Zlatnik FJ, Burmeister LF. Low "gynecologic age": an obstetric risk factor. *Am J Obstet Gynecol* 1977; 128: 183–186.

Zurayk H, Sholkamy H, Younis N, Khattab H. Women's health problems in the Arab world: a holistic policy perspective. *Int J Gynecol Obstet* 1997; 58: 13-21.