The effects of contraception on obstetric outcomes

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World Health Organization
Geneva, 2004

WHO Library Cataloguing-in-Publication Data

Marston, Cicely.
The effects of contraception on obstetric outcomes / Cicely Marston and John Cleland.

1.Contraception 2.Pregnancy outcome 3.Pregnancy, Unwanted 4.Abortion, Induced 5.Evidence-based medicine 6.Review literature I.Cleland, John G. II.Title.

ISBN 92 4 159225 7 (NLM classification: WP 630)

Printed in

Contents

Acknowledgements

This document was prepared by Cicely Marston, Department of Social Science and Medicine, Imperial College London, United Kingdom and John Cleland, Centre for Population Studies, London School of Hygiene and Tropical Medicine, London, United Kingdom, for the Department of Reproductive Health and Research, World Health Organization.

The authors would like to thank the following for their contributions: Patricia Butler for her thorough editing, Svetlin Kolev for layout and figures, and Mohammed Ali, John Bongaarts, Oona Campbell, Sarah Harbison, Herbert Peterson, Iqbal Shah, Jeff Spieler, John Townsend, José Villar for their comments on sections of this document.

Introduction

The contribution of contraception to reductions in obstetric mortality and morbidity is universally acknowledged. One major pathway is by reducing the number of unwanted births. Each pregnancy and childbirth carry a health risk for the woman, and where obstetric services are poor, maternal mortality is still very high. In most Asian and Latin American countries for which relevant evidence exists, it is estimated that about 20% of births were unwanted at the time of conception. In Africa, where desired family sizes tend to be relatively high, the prevalence of unwanted births is typically lower, closer to 10%. On the assumption that unwanted births carry the same risk to the health of the mother as wanted births, it has recently been estimated that the global burden of disease attributable to unwanted births amounts to 4.6 million disability-adjusted life years (DALYs) (Collumbien et al., 2002). Better use of effective contraception would reduce this substantial burden. In the extreme scenario, where all women who wanted to stop having children used effective methods of contraception, the burden would be eliminated, but for a small residue resulting from contraceptive failure.

Does contraception contribute to better maternal health beyond its potential to reduce the proportion of births that are unwanted? The answer depends on the extent to which births averted by contraception would otherwise pose a greater risk to the mother than wanted or intended births. The risks of childbirth are known to vary with the mother's age and may also be linked to her parity and to the interval since the previous birth. Contraception is likely to change the age pattern of childbearing, particularly by reducing fertility at older ages, and will certainly affect parity-specific fertility. The first section of this paper reviews the evidence for the assertion that contraception benefits maternal health by reducing the number of high-risk births. The second section examines a related possibility—that unwanted births represent a greater threat to the mother's health than wanted births because less time and money are invested in antenatal and natal care. Lack of antenatal care and, to a greater extent, lack of skilled medical supervision during delivery are established risk factors for poor obstetric outcomes. This section presents new evidence on the link between unwantedness and obstetric care.

The second major contribution of contraception to reducing obstetric mortality and morbidity is related to its potential to diminish recourse to unsafe abortion. Globally, it is estimated that 22% of pregnancies are aborted (Alan Guttmacher Institute, 1999). By definition these pregnancies are unwelcome, in the sense of being either absolutely unwanted or mistimed (i.e. the mother may want to have a child at some future date but not at the time of conception). In most industrialized countries, abortion is legally permitted for a wide variety of reasons, is performed by properly trained staff and carries very little risk to the physical well-being of the mother. Conversely, in most African and Latin American countries and in many Asian countries, abortion is legally permitted only in extreme circumstances and the vast majority of abortions performed are illegal. It has been estimated that in 2000 19 million illegal/unsafe abortions were carried out, of which 18.5 million were in developing countries (Ahman & Shah, 2002). Abortion legality and safety are strongly correlated. When a pregnancy is terminated by someone lacking the necessary skills or in an environment that does not conform to minimum standards of hygiene, the woman is at a higher risk of serious complications. Globally, it is estimated that about 13% of pregnancy-related and birth-related deaths in women are caused by unsafe abortion. While it might seem self-evident that greater use of contraception will lead to a reduction in abortions—both safe and unsafe—this link has been challenged and, indeed, it is true that rising levels of contraceptive use can be accompanied by a rising incidence of abortion. The third section of this paper uses published data to re-examine the relationship between changes in contraceptive practice and abortion rates.

Section 1: Composition of childbearing

In section 1, we focus on the relationship between contraception, "composition" of childbearing, and obstetric outcomes. It is commonly asserted that maternal and child health is adversely affected when pregnancies are "too early, too late, too many, and too close", and it has also frequently been claimed that family planning is an essential element of efforts to improve maternal health. The putative health benefits of family planning for maternal and child health have been discussed at length in the literature. Yet, despite the fact that a huge body of research exists on the effects of composition of childbearing on neonatal, infant and child health, markedly fewer studies have been conducted on maternal effects. This section reviews the literature on the relationships between obstetric outcome and the three main elements of the composition of childbearing: maternal age, parity, and birth-spacing. Contraception can lead to some or all of the following: fewer pregnancies, with fewer high-parity and relatively more low-parity births; changes in age at pregnancy, with fewer births to younger mothers, fewer births to older mothers, and potentially proportionally more births to older mothers; changes in pregnancy spacing, with fewer short birth intervals and possibly more long birth intervals. All of these consequences, and their potential effect on overall obstetric outcomes, are discussed in terms of current knowledge.

Section 2: Effects of unwantedness on pregnancies carried to term

In order to assess the potential effect of contraception on pregnancies carried to term, we use data from five recent Demographic and Health Surveys in Bolivia, Egypt, Kenya, Peru, and the Philippines to test the hypothesis that unwanted or mistimed pregnancies that end in live births will have poorer health-related outcomes than pregnancies reported as wanted. Two obstetric outcomes are examined using logistic regression analysis: receipt of antenatal care before the sixth month of gestation, and supervision of delivery by trained health care workers. Two further outcomes are examined that pertain to longer-term effects: full immunization of the child, and growth of the child. We show that wantedness has a measurable effect on the outcomes in Peru but not in the other countries. Birth order, on the other hand, has a strong effect in all countries, with higher order births having negative outcomes compared with lower order births.

Section 3: Relationship between contraception and induced abortion

Unsafe induced abortion is responsible for a large proportion of maternal deaths worldwide (McCauley et al., 1994; Starrs, 1987). Given that the occurrence of induced abortion invariably indicates an unwanted or mistimed pregnancy, the potential role of contraception in reducing maternal deaths is of considerable importance. Both common sense and an elementary understanding of the biological determinants of human fertility indicate that a rise in contraceptive use or effectiveness must lead to a decline in numbers of unwanted pregnancies and therefore a decline in induced abortion. Despite this, some data show that rising levels of contraceptive use can be accompanied by a rising incidence of abortion.

The notion that use of effective contraception and induced abortion are inversely related is implicit in a model proposed by Bongaarts & Westoff (2000). Section 3 provides empirical illustrations to support the validity of the model, using a detailed examination of abortion trends in countries with reliable published data and where contraceptive use has increased.

In some countries the expected inverse relationship between contraception and abortion holds (Bulgaria, Kazakhstan, Kyrgyzstan, Switzerland, Tunisia, Turkey, Uzbekistan). In others (Cuba, Denmark, Netherlands, Republic of Korea, Singapore, USA) a simultaneous rise in abortion and in contraceptive use has been seen. However in all these countries, overall levels of fertility were falling at the same time.

No exception was found to the expectation that rising contraceptive use results in fewer abortions in settings where fertility is constant. The explanation for the counterintuitive parallel rise in abortion and contraception in some countries is that, as people start to want much smaller families, increased contraceptive use alone is unable to meet the growing need for fertility regulation. In several of the countries that have had simultaneous rises in contraception and abortion, fertility has now stabilized, contraception has continued to increase and abortion rates have fallen. The most clear-cut example of this trend is the Republic of Korea.

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1. Relationships between contraception, composition of childbearing, and obstetric outcomes

Introduction

This section focuses on the effects of changes in the "composition" of childbearing on maternal mortality. The three main elements of composition of childbearing are maternal age, parity, and birth spacing, and all may be affected by contraceptive use. It is commonly asserted that maternal and child outcomes are negatively affected when pregnancies are "too early, too late, too many, and too close" (e.g. Choolani & Ratnam, 1995; Black, 1987), and it has also frequently been claimed that family planning is an essential element of improved maternal health (e.g. Upadhyay & Robey, 1999; Abou-Zahr & Ahman, 1998; Starrs, 1987; Rosenfield & Maine, 1985). The putative health benefits of family planning for maternal and child health have long been discussed in the literature. Yet, despite the fact that a huge body of research exists on the effects of composition of childbearing on neonatal, infant and child health, markedly fewer studies have looked at effects on the health of the mother. In this section, studies that shed light on the relationship between obstetric outcomes and the three elements of the composition of childbearing will be reviewed. The possible impact of contraceptive use on obstetric outcomes will then be discussed in terms of this knowledge.

For the purposes of this section, only pregnancy outcomes pertaining directly to the mother will be considered, with the main emphasis on maternal mortality because this is the principal focus of the studies reviewed. Maternal morbidity is not well documented, but can be expected to be affected by the elements of the composition of childbearing under examination in similar ways to mortality. For example, if maternal mortality were reduced by a particular change in one element of the composition of childbearing, it is likely that maternal morbidity would also be reduced. It is worth mentioning here that use of specific contraceptive methods may help reduce maternal morbidity other than simply by preventing pregnancy. For example, users of oral contraceptive pills are less likely to develop iron deficiency anaemia than non-users because the pills tend to reduce menstrual blood flow (Blackburn et al. 2000). Because the focus of this document is on maternal mortality, morbidity effects will not be considered in detail.

Maternal mortality and morbidity and the effect of composition of childbearing

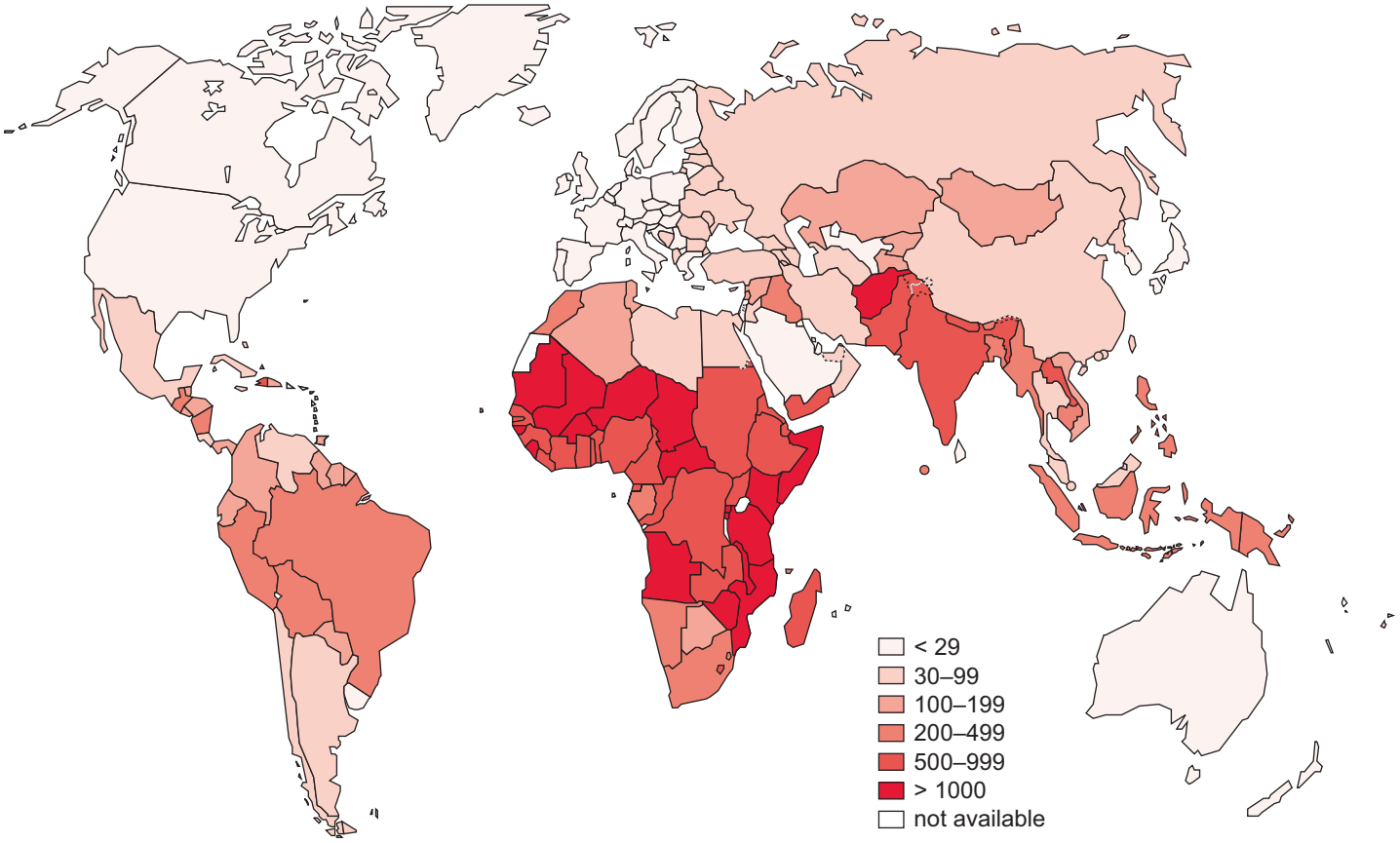
"A maternal death is the death of a woman while pregnant or within 42 days of termination of pregnancy, regardless of the site or duration of pregnancy, from any cause related to or aggravated by the pregnancy or its management" (WHO/UNFPA/UNICEF/World Bank, 1999). Thus causes of maternal deaths may be either direct—such as obstetric complications—or indirect—such as pre-existing diseases that are worsened by the pregnancy (Khlat & Ronsmans, 2000; Ahmed et al., 1999; Graham & Newell, 1999; WHO/UNFPA/UNICEF/World Bank, 1999; McCauley et al., 1994).

The most recent estimates indicate that, in 1995, around 515 000 women died of complications of pregnancy, childbearing or unsafe abortion (Hill et al. 2001). Maternal deaths are not uniformly distributed, and there are large disparities between regions. In 1995, over half (273 000) of all maternal deaths occurred in Africa, while comparatively few (2000) occurred in Europe (Hill et al., 2001). According to estimates from WHO/UNICEF/UNFPA (2001), approximately 95% of all maternal deaths occur in Africa and Asia, with the remaining 5% occurring in Latin America, the Caribbean and Oceania. North America and Europe account for an extremely small proportion of maternal deaths—approximately 0.005%. Maternal mortality ratios (the ratio of maternal deaths to live births) are also far higher in poor than in rich countries. In 1995, the maternal mortality ratio in Africa was estimated to be over 1000 per 100 000 pregnancies and in Europe 28 per 100 000 pregnancies (Hill et al., 2001); this means that any one pregnancy in Africa is over 35 times more likely to kill the woman than a pregnancy in Europe. The distribution of mortality ratios in the world is shown graphically in Fig. 1.1. Most maternal deaths are caused by five major obstetrical problems: haemorrhage, infection, hypertensive disorders of pregnancy (pre-eclampsia/eclampsia), obstructed labour, and induced abortion (Starrs, 1997; Rinehart et al., 1984). Because information on causes of death is often not reported (Campbell & Graham, 1991), it is difficult to assess the contribution of individual causes to the total number of deaths.

The fact that maternal mortality is so low in rich countries implies that the majority of maternal deaths in poorer countries would be avoided if socioeconomic conditions improved, although McCarthy & Maine (1992) point out that wealth alone is not sufficient to explain differences in obstetric risk. It is likely that the risk would be reduced with adequate antenatal and delivery care (Robinson & Wharrad, 2001; de Bernis et al., 2000; Loudon, 2000; Nagaya et al., 2000; Onwuhafua et al., 2000; FCI/IAG, 1998b; Papiernik, 1995).

Increased use of contraception has an obvious and direct effect on the maternal death rate per 1000 women of reproductive age and on the lifetime risk of mater-

Fig. 1.1 Maternal mortality ratios around the world



Source: WHO, UNICEF and UNFPA (2004).

nal death, by reducing the number of pregnancies (Royston & Armstrong, 1989; Herz & Measham, 1987; Fortney, 1986). It has been estimated that if all women who say they want no more children were able to stop having children, the number of births would be reduced by 35% in Latin America, 33% in Asia and 17% in Africa (Maine et al., 1986). The number of maternal deaths and the maternal mortality rate would fall by at least these proportions (Abou-Zahr & Royston, 1991). In addition, the maternal mortality ratio may be reduced to some extent by increased levels of contraception (Schwarcz & Fescina, 2000). Given the relative ease of introducing family planning in a population compared with improving overall socioeconomic levels, the extent to which the maternal mortality ratio is affected by changes in use of contraception is of considerable importance.

The relationship between lifetime risk of dying from pregnancy-related causes, fertility and prevailing maternal mortality ratio is shown in Fig. 1.2. When the risk of dying in pregnancy or childbirth is 800 per 100 000 births, and the fertility level is 8 births per woman, the lifetime risk of maternal death is 1:16. A fall in fertility level from eight to two births, in the absence of any change in the risk per pregnancy, improves the lifetime risk from 1:16 to 1:63. The same improvement is achieved by a reduction in the risk of death per pregnancy from 800 to 200 per 100 000, without any change in fertility. Clearly, when both factors operate together, more striking gains in lifetime risk are made.

Limitations to studies of maternal mortality

Data on maternal mortality come from vital registration systems (Abou-Zahr & Royston, 1991), population-based studies (e.g. Fauveau et al., 1988; Koenig et al., 1988; Alauddin, 1986; Khan et al., 1986; Kwast et al., 1986; Chen et al., 1974), hospital studies and case series (reports about series of maternal deaths) (e.g. Granja et al., 2001; Chan & Lao, 1999; Mhango et al., 1986; Mtimavalye et al., 1980; Ngoka & Mati, 1980). Recent work suggests that national censuses may also be used (Stanton et al., 2001). All types of studies are limited by the relatively small numbers of maternal deaths that occur even in populations with high mortality (Hill et al., 2001; FCI/IAG, 1998c).[1] There is a severe paucity of data, particularly in poorer countries (Buekens, 2001; Winikoff & Sullivan, 1987). Data that are community- rather than hospital-based are particularly rare (see,

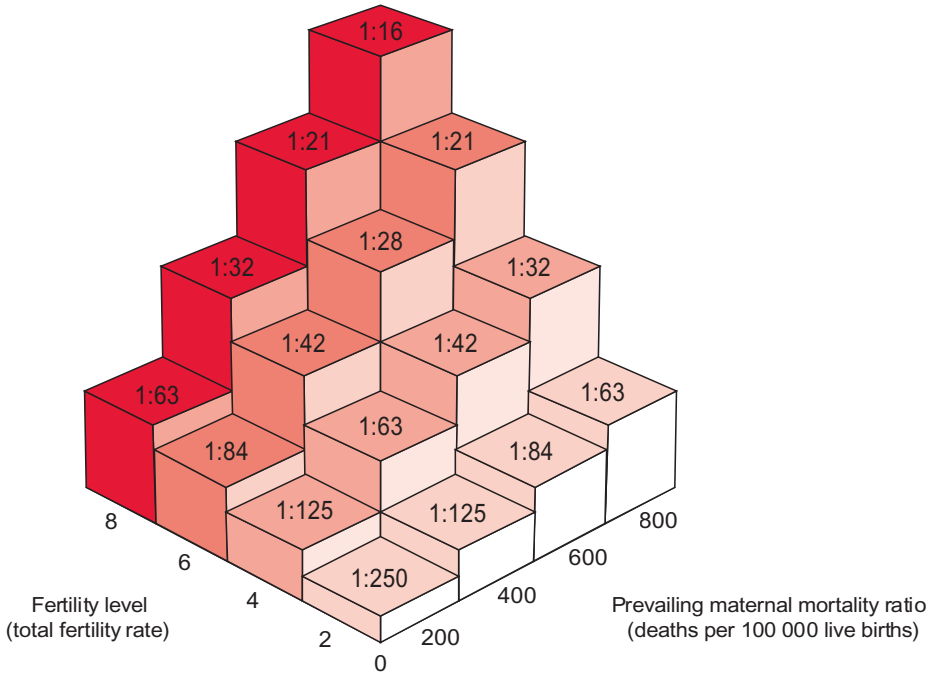
[1] The numbers of deaths included can be increased using the "sisterhood" method, where survey respondents are asked about the deaths of their sisters, although this method also has limitations (see Smith et al., 2001; Walraven et al., 2000).

for example, Abou-Zahr & Royston, 1991; Gadalla et al., 1987). Even where systems for data capture exist, omission of maternal deaths may seriously affect estimations of levels of mortality (Abou-Zahr & Wardlaw, 2001; FCI/IAG, 1998c; Mtimavalye et al., 1980). This is particularly problematic for hospital-based studies, since even if most deliveries take place in hospital, some deaths after delivery that occur out of hospital are likely to be missed (Zimicki, 1989). On the other hand, where many women deliver outside hospital, as in the majority of poor countries, hospital data may overestimate mortality because of the increased likelihood of women with complications coming to hospital and then subsequently dying, compared with women without complications (Zimicki, 1989). In addition, deaths may be misclassified and hence not included in the overall figures (Abou-Zahr, 1998; FCI/IAG, 1998c; Loudon, 1992). In general, there is great uncertainty regarding many estimates of maternal mortality, and the upper and lower estimates in some populations are so far apart that it may be nearly impossible to distinguish genuine changes over time from fluctuations due to chance (Hill et al., 2001). The small numbers of cases also mean that it is difficult to examine the multiple potential causes of death. In addition, studies are often limited to describing crude rates, making it extremely difficult to identify causal factors at the individual level (see discussion in Sloan et al., 2001). Published data on maternal mortality are sometimes disaggregated by parity or maternal age, but usually ignore socioeconomic factors (e.g. see collected statistics in Abou-Zahr & Royston, 1991). Some studies simply assume that there are age- and parity-related differences in obstetric risk, but do not attempt to measure them (e.g. Dildy et al., 1996; Opaneye, 1986).

Maternal age

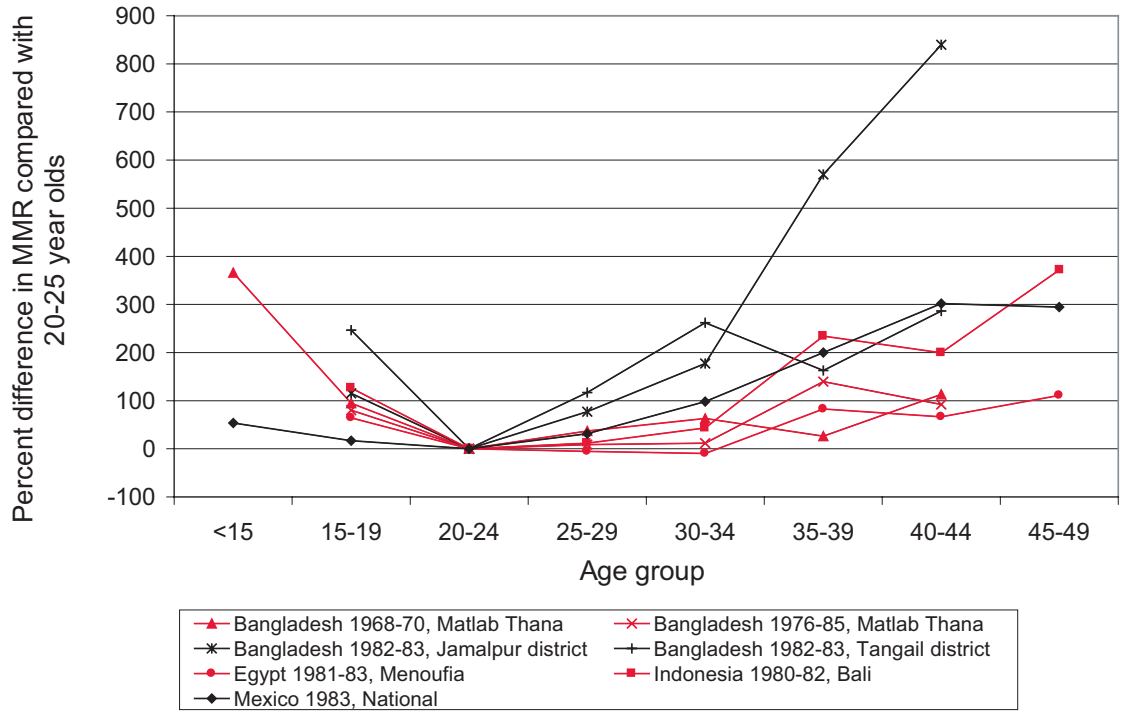
Maternal mortality is usually clearly related to age when crude figures are examined. Mortality is relatively high at young maternal ages, is lowest at age 20–29 years, then increases as maternal age increases, forming a J-shaped curve. Fig. 1.3 illustrates the relationship of mortality between age groups for populations with different overall levels of maternal mortality. Mortality is particularly high for mothers under 18 years or over 35 (Harrison et al., 1985; Rinehart et al., 1984; Maine, 1981). Young maternal age has been associated with various adverse pregnancy outcomes, such as obstructed labour and pre-eclampsia (Starrs, 1997), and young women's pelvises may not yet be large enough to accommodate birth (McCauley et al., 1994). The extent to which young age is associated with a higher risk of negative obstetric outcomes is not clearly established, however. One retrospective hospital study, for example, found that young patients had a lower incidence of certain complications than the general obstetric population (Ngoka & Mati, 1980) and most studies do not attempt to control for possible confounding factors such as socioeconomic status or education levels. Conversely, the grouping of all teenage births in a single category may dilute, or even mask, the effect of physical immaturity on obstetric risk because mothers under the age of 18 are typically outnumbered by those aged 18 or 19 years.

Fig. 1.2 Lifetime risk of dying from pregnancy-related causes, according to fertility and prevailing maternal mortality ratio



Source: Recalculated figures based on an idea by Royston & Armstrong, 1989

Fig. 1.3. Percentage difference in maternal mortality ratios (MMRs) of different age groups compared with 20–24- year-olds, for various populations



Sources: Bangladesh 1968-70, Chen et al. (1974); Bangladesh 1976-85, Koenig et al. (1988); Bangladesh 1982-83, Khan et al. (1986); Egypt 1981-83, Gadalla et al. (1987); Indonesia 1980-82, Fortney et al. (1985); Mexico 1983, del Carmen (1988). For Bangladesh Jamalpur district, maternal age category 15–19 years includes all maternal deaths among women under age 20, and 40–44 years includes all deaths among women over age 40.

Older women are far more clearly at increased risk of maternal death (National Research Council, 1989). As women get older, they are at higher risk of haemorrhage (Maine, 1981), pregnancy-induced hypertension, and uterine prolapse[2] (Rinehart et al., 1984; Omran, 1983). Studies in Bangladesh, as shown in Fig. 1.3, show the typical pattern of higher risk in the older and younger age groups. Jamalpur district had higher maternal mortality in the older age groups than the other two areas. This may simply be an artefact of the small numbers of women dying, or could indicate that, even in relatively similar areas, age is far from the only factor responsible for variation in risk.

Age effects such as those illustrated above are particularly pronounced where levels of maternal mortality are high; where mortality is lower, age effects are not as great. Evidence from Sweden and the United States, for example, indicates that older women are not at markedly increased obstetric risk (Winikoff & Sullivan, 1987).

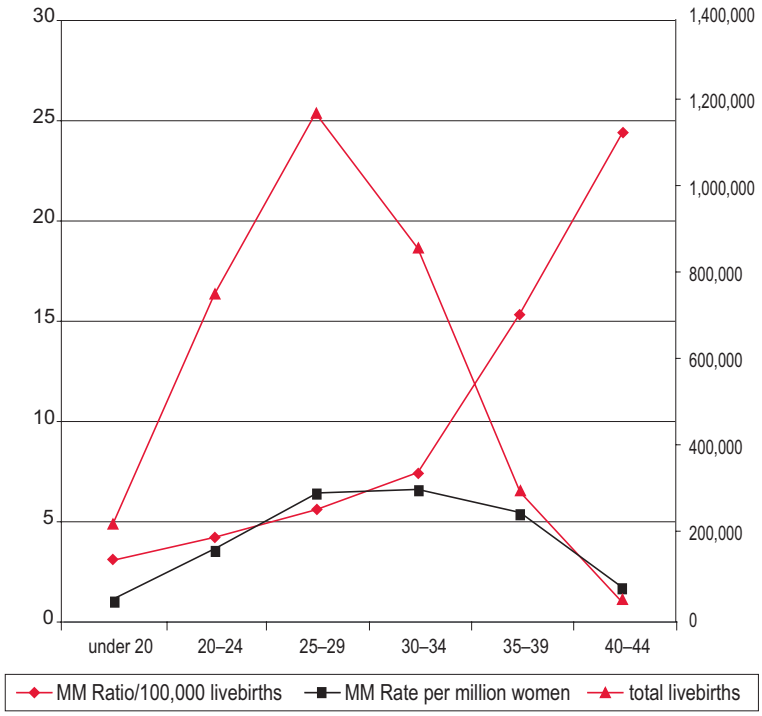
It is important to note that, while mortality ratios are higher at the extremes of age, the number of births to women at these ages is relatively small compared with those in the middle of the age range. As a result women in the middle of the age range contribute the majority of the maternal deaths, and death rates per woman (rather than per pregnancy) are higher in the middle age groups (Graham & Airey, 1987). This is shown graphically in Fig. 1.4.

Parity

The effects of parity are often difficult to distinguish from those of maternal age, because older women tend to have higher-order births. It is likely that obstetric risk is influenced by both factors, and by the interaction between them (Trussell & Pebley, 1984). In most studies of crude rates, higher-order births—fourth birth and higher—are associated with substantially increased risks of negative outcome compared with birth orders two and three (Maine, 1981). Uterine prolapse, for example, is much more common among high-parity women, as is postpartum haemorrhage (Rinehart et al., 1984). First births, however, also appear to be more risky than second and third births (Younis et al., 1987; Rinehart et al., 1984; Chen et al., 1974). Women having a first birth are more likely to suffer from pre-eclampsia and eclampsia than women having a second or later birth. Fig. 1.5 shows the relationship between parity and mortality in Matlab, Bangladesh, in two different

[2] Uterine prolapse occurs when ligaments supporting the uterus become thinner or injured and the uterus descends into the vagina.

Fig. 1.4 Maternal mortality and number of live births in England and Wales 1990–1995, by age group



Source: Campbell (personal communication), calculated from data from the Office of National Statistics of the United Kingdom

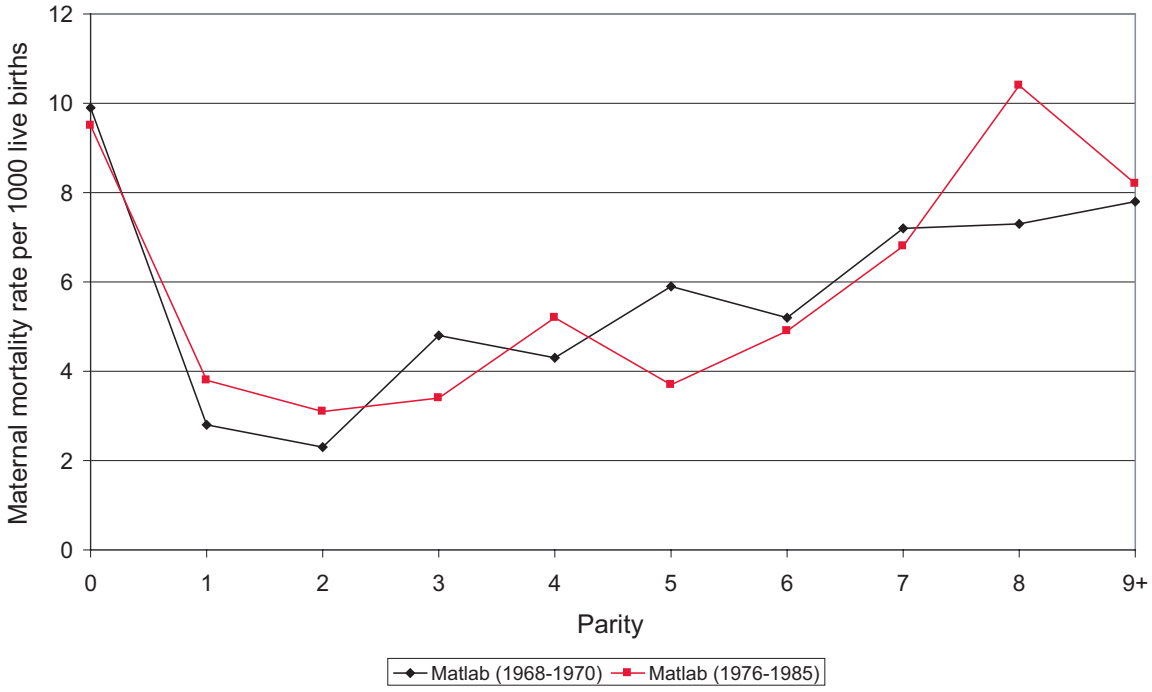
periods, with the typical pattern of initial high risk, then a drop, then increasing risk of death as parity increases.

There is an effect of birth order net of other factors on uptake of antenatal care and supervised delivery. Higher birth order is associated with less antenatal care, and less likelihood of supervised delivery (see section 2). It is possible that these factors also contribute to the higher maternal mortality at higher birth orders.

Age and parity effects: potential problems with the analysis

While age and parity have both been shown to affect overall maternal mortality ratios, very few studies have attempted to assess the effects of either variable adjusted for potential confounding factors such as wealth, region of residence, education level, etc. It has been pointed out that women who have many children, for example, may also have low education levels, or may be from less wealthy backgrounds, both of which may confound the crude relationship between parity and maternal mortality (Trussell & Pebley, 1984). Similarly, it has been suggested

Fig. 1.5. Maternal mortality rate per 1000 live births by parity in Matlab, Bangladesh.



Sources: 1968-1970, Chen et al. (1974), 1976-1985, Koenig et al. (1988). Chen et al. data include all women aged 10-49, Koenig et al. data include only women aged 15-45.

that pregnancies in young teenagers may be more risky because of confounding socioeconomic factors, rather than their young age per se. One case–control study in Matlab, Bangladesh (Ronsmans & Campbell, 1998), however, showed that even when adjusted for potential confounding factors (including, for example, age, education, area of residence, religion, outcome of previous pregnancy), the age and parity relationships described above remained significant. Older and high-parity women, as well as young and nulliparous women, are at higher risk of maternal death. This age and parity pattern also exists in rich countries, but the level of maternal mortality at each age/parity is far lower, and the curve flatter (National Research Council, 1989; Winikoff & Sullivan, 1987). In other words, there are not such extreme differences in maternal mortality ratios in different age groups or at different parities

The consensus in the literature is that parity and maternal age affect risk of maternal death. External socioeconomic factors may confound the relationship to some extent, but it appears highly probable that genuine age and parity effects exist, particularly in terms of older, higher-parity women being at greater risk. The case for a causal link is strengthened by the existence of plausible biological mechanisms. For example, post-partum haemorrhage is often caused by the failure of the uterus to contract adequately after delivery and close the blood vessels that fed the placenta. Repeated childbearing increases the risk that the uterus will not contract properly (Rinehart et al., 1984). Uterine rupture may be due to changes in the uterine muscle as a result of childbearing (Rinehart et al., 1984). It has also been suggested that women with fewer children to care for may be under less physical and psychological stress than women with large families, which could indirectly influence the parity effect (Dixon-Mueller, 1989). A thorough understanding of most specific pregnancy-related conditions, however, is lacking (Villar & Hoff 1999).

In addition to these biological and social causal pathways from age or parity characteristics to maternal mortality, multiple other interrelated variables complicate the association. The general health of the woman or her nutritional status, for instance, will influence obstetric outcome (Rinehart et al., 1984). There may also be other factors that affect parity, age at childbearing and mortality (Harrison, 1986). Women who limit their fertility, and hence do not attain high parity, may be different from women who do not limit their fertility, in ways that confound the association with mortality: for example, because they use contraception they may be more familiar in general with health care systems and so be more likely to deliver in hospital (National Research Council, 1989).

Birth spacing

While it is generally accepted that age and parity have some influence on risk of maternal death, there is no consensus on the effects of birth spacing. A large number of studies have shown that birth spacing has an impact on infant and child health, specifically that short birth intervals have negative effects. By contrast, there has been little research into the effects on maternal health. Using a nested case–control study design for population-based data from Matlab, Bangladesh, Ronsmans & Campbell (1998) found no association between birth spacing and maternal death, after controlling for various confounding factors.[3] They further argued that there was no compelling evidence in the literature for the plausibility of an association between short birth interval and maternal death, a finding also reported in an earlier literature review (Winikoff, 1983). A later study of hospital data from Latin America, however, showed that both short (less than six months) and long (more than 59 months) interpregnancy intervals[4] were associated with increased risk of adverse maternal outcome (Conde-Agudelo & Belizán, 2000).

The differing results in the two studies are open to several possible explanations. First, in both studies the lengths of the intervals between pregnancies were difficult to assess. The hospital data are likely to allow more accurate calculation of these intervals than the population-based study: in fact, the gestational age was unknown in 44% of the pregnancies in Bangladesh. Second, Conde-Agudelo & Belizán point out that the Bangladesh study includes women dying within 90 days after the end of pregnancy and from external causes e.g. induced abortion and suicide. They claim that this may have masked any association (Conde-Agudelo & Belizán, 2000, p.1258). Third, long birth intervals in Latin America were associated with hypertensive disorders of pregnancy. However, it is possible that a common external cause was responsible for both the delay in pregnancy and the adverse outcome. Fourth, the authors of the Latin American study acknowledge that the apparent effect of short birth intervals may be due to confounding factors, but suggest that it could be linked to the micronutrients lost during pregnancy, which may not be regained between pregnancies if the interval is too short (Conde-Agudelo & Belizán, 2000; National Research Council, 1989). Finally, the Latin American study was based on hospital data only, which may have meant that maternal deaths were over-represented because women with obstetric complications were more likely to seek hospital care. This would not have affected the results unless the likelihood of delivering in hospital was different for women with particularly short or long birth intervals than for other women. In conclusion, it appears that, among women who deliver

[3] A separate case-control study also showed no association (Fortney & Zhang, 1998).

[4] The authors define interpregnancy interval as “the time elapsed between the woman’s last delivery and the date of the last menstrual period for the index pregnancy” (Conde-Agudelo & Belizán, 2000, p.1256).

in hospitals in Latin America, there is an effect of birth interval on maternal mortality and morbidity. The extent to which this effect may be caused by external factors, however, is not clear.

Possible consequences of increased contraceptive use on the composition of childbearing and on maternal mortality

One of the objectives of family planning programmes in developing countries has been to improve maternal and child health. The precise consequences of increased contraceptive use in terms of maternal health are difficult to assess, although it has been asserted that, in countries with high maternal mortality, changes in the pattern of childbearing could bring about significant reductions in mortality without any other changes taking place (Rinehart et al., 1984). Scenarios in which changes in the composition of childbearing—fewer pregnancies, changes in age at pregnancy, and changes in spacing of pregnancies— are related to possible changes in mortality are discussed below.

Consequence 1: Fewer pregnancies

Fewer deaths in pregnancy

One of the most obvious sequelae of having fewer pregnancies in a population is that the overall number of women dying because of complications of pregnancy and childbirth will decrease. This will occur whether or not the risk of maternal death per pregnancy changes. In fact, it is entirely plausible that the risk per pregnancy would remain constant if the only change was in contraceptive use. This appears to have been the case, for example, in Bangladesh (Lindpainter et al., 1982). As Winikoff & Sullivan (1987) point out, to reduce mortality risk per pregnancy, it is necessary either to change the risk profile of women who become pregnant (e.g. through family planning), or to improve health care of pregnant women—in particular the pregnant women at higher risk of dying (older women, those of low socioeconomic status, etc.). Fortney (1987) notes that where fertility is high, the maternal mortality rate (i.e. maternal deaths per woman of reproductive age) may be high even if the maternal mortality ratio (or obstetric risk per pregnancy) is low. In this situation, the potential for family planning to avert deaths is high, particularly if a high proportion of maternal deaths are due to illegal abortion, given that abortion indicates an unwanted pregnancy that could have been avoided with adequate contraception (see section 3).

Fewer high-parity births and more low-parity births

One of the consequences observed in all populations that have experienced mass adoption of contraception is that, over time, fewer women have large numbers of children; hence the number of high-parity births decreases. As mentioned above, high-parity births are particularly risky. It is to be expected that, as these decrease, so would associated levels of maternal mortality.

One result of a reduction in high-parity births in a population is a corresponding increase in the proportion of low-parity births. Specifically, the proportion of first births would increase. First births have also been associated with higher levels of maternal mortality. Somewhat counterintuitively, then, if the proportion of these births increases, maternal mortality ratios (per live birth) would increase, even if the absolute number of maternal deaths decreases. In fact, by modelling the effects of age–parity distributions on mortality using data from Bangladesh, it was found that while elimination of high-parity births led to a reduction in mortality ratio, this was only the case for fourth births and higher. The elimination of third-order births had little effect on the mortality ratio because of the higher risk associated with the increased proportion of first births (Trussell & Pebley, 1984). This effect is immutable: that is, inevitable in the circumstances described.

Changing age structure

Another possible consequence of a declining number of births is a change in the age structure of the population. Fewer births would mean a lower proportion of the population in the younger age groups. As the fertility decline progresses, and this smaller generation of women reaches reproductive age, overall levels of maternal deaths per live birth might increase even if age-specific rates remain constant. This would happen, for example, all else being equal, as the smaller generation of women reached the “low-risk” age group (20–29 years), while the larger generation of women born before the fertility decline simultaneously reached the “high-risk” age group (over 35 years). The older women would contribute proportionally more to the maternal mortality ratio, which could rise as a result, even if there were fewer maternal deaths. This effect is also immutable.

Consequence 2: Changes in age at pregnancy

Contraception may change the ages at which women have children. It is likely that the main change would be to move births away from either end of the reproductive age span. Data from Demographic and Health Surveys show that, in countries where contraceptive use is widespread, women tend to be older when they have their first child, and complete their childbearing earlier (McCauley et al., 1994).

Fewer births to young women

In many countries, age at marriage is an important determinant of age at first pregnancy. If age at marriage is low and women do not wish to limit their fertility until after they have had children, the number of births to young mothers is unlikely to decline even if contraception is widely accepted (Fortney, 1987; Starrs, 1987). On the other hand, where pregnancy at young ages is not desired, contraception may lead to a decrease in these pregnancies. Young age, as we have seen, is considered to be associated with increased risk of maternal mortality; if births to young mothers were re-

duced, a corresponding decline would be expected in overall levels of maternal mortality.

Fewer births to older women

Pregnancies at older ages might be avoided more with increased contraceptive use. Any effect is likely to be strongly related to parity, with women preventing further births once they have their desired number of children. These women are likely to be those who, without contraception, would have continued to have children. Women over 35 years old are at increased risk of maternal mortality, so reducing the number of pregnancies to older women would be expected to decrease mortality levels, all else being equal.

Proportionally more births to older mothers

Increased control over fertility is often associated with other social changes, such as increased education for women, and increased participation of women in paid work. As a consequence, increased control over fertility, as well as reducing high-parity births to older women, might lead to some first births being postponed to later "riskier" ages, thus increasing the proportion of first births contributed by older women. Because both first births and births to older women are considered to be risky, this might increase maternal mortality. If this occurred, however, it would probably apply only to a relatively small group of women, and the effects would be likely to be offset by corresponding improvements in socioeconomic conditions.

Consequence 3: Changes in spacing of pregnancies

Fewer short birth intervals, more longer birth intervals

Avoidance of short birth intervals is increasingly possible with increased levels of contraception. If short birth intervals have an adverse effect on maternal mortality, reducing the number of such intervals would be expected to reduce mortality. Limited evidence from a number of countries suggests that, as fertility declines, short birth intervals become less common (National Research Council 1989), but very little information is available. With effective contraception, women might wait for increasingly longer periods between births as contraceptive use increased. If long birth intervals themselves cause increased maternal mortality, mortality levels would increase with this increased spacing.

Magnitude of the effects

It is difficult to assess the magnitude of the effects of varying the different components of the composition of childbearing, because all the elements are highly correlated and associated with other potential confounding variables, such as education and economic status (Ronsmans & Campbell, 1998). Data are seldom available in sufficient detail to allow calculation of effects of changes in maternal age and parity, even less of birth spacing. Community-based data of any type are rarely available and hospital data are not representative of the population as a whole. Nevertheless, some attempts have been made to estimate the impact that parity and age may have on maternal mortality, and hence the effect of family planning.

Trussell & Pebley (1984) examined the hypothetical magnitude of changes in maternal mortality that might result from the effect of increased contraceptive use on the composition of childbearing. Using data from Bangladesh (Chen et al., 1974), they estimated that if childbearing were limited to women aged 20–39 years, the maternal mortality ratio in the population would be reduced by 11%. The elimination of fifth and higher order births would reduce the ratio by 4%.

Using historical data from Sweden, Högberg & Wall (1986) showed that between 3% and 5% of the reduction in maternal mortality rate from 1781 to 1980 was due to changes in age and parity distributions. In other words, other factors accounted for the vast majority of the reduction. In the latter part of the period, these other factors appeared to be less important. Between 1965 and 1980, about 50% of the reduction was attributable to a decrease in maternal age, presumably because mortality rates were already low, the absolute number of deaths was very small,[5] and there was less scope for other (e.g. socioeconomic) improvements than in the past. Changes in parity distribution over the period increased mortality somewhat, as first births increased as a proportion of all births. This increase, however, was more than offset by the reduction caused by changes in age at childbearing.

Winikoff & Sullivan (1987) discuss the possible effects of family planning in reducing maternal mortality, taking into account the findings of the above studies. They point out that it is extremely difficult to predict the magnitude of future effects of family planning on the maternal mortality ratio, because the impact will vary widely from population to population according to the numerous interacting factors that contribute to maternal risk. Nevertheless, they point out that, because most births occur to women in the "safer" age group, most deaths also occur among these women. Reducing births to older and younger women, therefore, may not have a large impact on maternal mortality ratios in populations where health care is still poor. Improved health care for pregnant women, on the other hand, would reach the women in the "safer" groups, and hence a greater number of the women at risk of dying. They conclude that family planning may have an important impact on mortality, but that because of the limited numbers of women having "high-risk" pregnancies, it is not by itself an efficient approach to the problem (Winikoff & Sullivan,

[5] In the period 1966–1980, there were 121 deaths in the age group 15–34 years and 61 in the age group 35–49 years— a total of 189 deaths over 15 years (Högberg & Wall, 1990, p.327).

1987, p.135).[6] The evidence from Sweden (Högberg & Wall, 1986), however, suggests that where maternal mortality is already low, changes in the composition of childbearing could potentially have a considerable impact, although the absolute numbers of women affected will be relatively small.

Discussion

The existing evidence indicates that family planning could play a role in reducing maternal mortality ratios by changing the composition of childbearing – an additional justification for provision of family planning to all women. Undoubtedly, if pregnancies among younger and older women, and those at high parity, could be reduced, there would be a reduction in mortality. The size of this reduction, however, would depend on the characteristics of the population in question. On the basis of the limited data available from Bangladesh (Alauddin, 1986; Khan et al., 1986; Chen et al., 1974), Nigeria (Harrison et al., 1985) and Sweden (Högberg & Wall, 1986), the proportion of deaths that could potentially be averted worldwide by changes in maternal age and parity distributions was estimated at 20–25% in one study (Winikoff & Sullivan, 1987)—a larger proportion than the estimates for Bangladesh alone described earlier (Trussell & Pebley, 1984). Winikoff & Sullivan (1987) do not present their calculations but, given that the data sources they cite are extremely limited, the extent to which a global estimate can be made from these data is questionable. A literature search performed for this review with the aim of producing a more robust estimate, however, revealed insufficient published data for the task.[7] Despite the difficulty in ascertaining the magnitude of the effect, the cumulative evidence that age, parity and possibly spacing affect mortality risk, along with the studies by Winikoff & Sullivan (1987) and Trussell & Pebley (1984), suggests that some reduction in maternal mortality would be expected if there were changes in composition of childbearing.

While such changes would, in theory, provide a simple means of reducing maternal mortality ratios, in practice it might be extremely difficult to bring about widespread use of contraception sufficient to have a large impact on mortality levels. The first women to adopt contraception may be those at lowest risk of maternal death, such as educated, urban residents. In addition, the simple availability of contraceptives is not sufficient to ensure their use. Women who are subject to high levels of sexual coercion and violence, for example, may be at increased risk of maternal death (Rizzi et al., 1998) and may also be unable to use contraceptives because of their social situation. Where women need to obtain permission from their husbands to use contraception, or where mothers-in-law make decisions about maternal care, far wider social changes would be required before women could act autonomously regarding reproductive choices (FCI/IAG, 1998a). Unwanted teenage pregnancy is relatively common, even in countries where contraception is widely available and used, such as the United States of America. A reduction in maternal mortality, then, is likely to require social change over and above simply increasing the availability of contraceptives (Jejeebhoy, 1997), although availability itself could help increase women's autonomy by permitting choices about reproduction (McCauley et al., 1994; National Research Council, 1989). In any case, there is a clear potential benefit of family planning in countries with high maternal mortality, not only in terms of the more obvious prevention of unwanted pregnancy and hence illegal abortion, but also by allowing changes in the composition of childbearing. This latter function is further support for the notion that provision of family planning is a key element in the fight to reduce maternal mortality.

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[7] Search strategy: search of Popline and Medline for "maternal" "mortality" and "parity" or "age"; hand search of libraries; consultation with experts in maternal mortality at London School of Hygiene and Tropical Medicine, the United Nations and WHO.

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2. Effects of unwantedness on pregnancy outcomes: pregnancies that end in live births[1]

Introduction

Unintended pregnancies, comprising those that are unwanted either at that time or at any time in the future and those that come sooner than desired, are a common feature of human reproduction. Many such unintended pregnancies are terminated, by either legal or illegal procedures (Henshaw et al., 1999). Many, however, are carried to term. In Asia and Latin America, it is estimated that about 20% of pregnancies that end in live births were unwanted by the mother at the time of conception, and a similar proportion occurred sooner than desired (Adetunji, 1998; Bankole & Westoff, 1998). In sub-Saharan Africa, the prevalence of unwanted births tends to be lower (<10%) but the prevalence of mistimed births is somewhat higher than in other regions. Over the course of the fertility transition—the decline from six or seven births per woman to about two births per woman— unwanted childbearing typically rises before eventually falling (Bongaarts, 1997). The reason for the initial rise is that, as desired family sizes fall, couples are exposed to increased risk of unwanted pregnancy. This shift in attitudes often outstrips the ability of couples to regulate their fertility and it is only in the later phase of transition that contraceptive use, and abortion, become sufficiently common to bring about a reduction in unwanted births.

The effects of the "intention status" of a pregnancy on subsequent outcomes of that pregnancy have not been widely studied. Unintended pregnancies are frequently considered to pose social or economic problems, but their association with specific negative consequences has rarely been assessed, particularly in developing countries. We examined the effects of a mistimed or unwanted pregnancy on four separate outcomes: uptake of antenatal care, delivery of the pregnancy under medical supervision, full immunization of the child, and child growth. The analysis used survey data from five countries—Bolivia, Egypt, Kenya, Peru, and the Philippines.

Background

Little research has been published on the possible effects of intention status of pregnancies carried to term. This neglect is surprising in view of the high prevalence of unintended births in developing countries, the abundance of relevant data available from the Demographic and Health Surveys, and a priori expectations that unwelcome pregnancies may face discrimination compared with welcome pregnancies.

Most research has been conducted in the United States. Studies have found that women who report not wanting their pregnancy tend to initiate antenatal care (ANC) later than women who want their pregnancy (Joyce et al., 2000; Pagnini & Reichman, 2000; Kost et al., 1998; Joyce & Grossman, 1990; Marsiglio & Mott, 1988; Weller et al., 1987). One study found that women's reports of wantedness of pregnancy was the single factor with the greatest impact on timing of ANC (Pagnini & Reichman, 2000). This, however, may reflect the fact that unwanted pregnancies are recognized later than wanted pregnancies, thereby delaying the start of ANC (Joyce et al., 2000). Studies rely on retrospective reporting of intention status at the time of pregnancy and may thus be subject to retrospective rationalization, i.e. after the birth, mothers may report a different intention status than the one they would have reported at the time of the pregnancy.

A study of a cohort of pregnant women enrolled between 1959 and 1966, when abortion was illegal in the USA, found that infants born to women whose pregnancy was unwanted were twice as likely to die in the first 28 days of life than wanted children (Bustan & Coker, 1994). Other outcomes, such as low birth weight, have been associated with wantedness in some groups studied (Sable et al., 1997), but other studies have found no effect (Joyce et al., 2000; Marsiglio & Mott, 1988). Child development was investigated at two separate points in two longitudinal studies. One study found that wantedness had a positive effect on development (Baydar, 1995); the other found no effect (Joyce et al., 2000). Studies of various social consequences of unwanted pregnancy in the USA have also found contradictory results: some have suggested that children who were unwanted at the time of conception suffer more neglect and abuse than wanted children (e.g. Barber et al., 1999), but other studies have found no such association (Brown & Eisenberg, 1995).

Evidence from countries other than the USA is meagre. Unintended pregnancies were associated with late or no antenatal care in Kenya (Magadi et al., 2000), Ecuador (Eggleston, 2000), Sri Lanka (De Silva & Ban, 2001), the United Kingdom (Cartwright, 1988),

[1] An abridged version of this section appears as: Marston CA, Cleland J. Do unintended pregnancies carried to term lead to adverse outcomes for mother and child? An assessment in five developing countries. *Population studies,* 2003, **57**(1):77–93. The authors thank Mohammed Ali, Iqbal Shah, and two anonymous reviewers for their comments on earlier versions of this section.

and Zimbabwe (Fawcus et al., 1992), but no other outcomes were examined in these studies. The results of the study in the United Kingdom suggested that children from unwanted pregnancies had disadvantages, but the analysis presented only bivariate results and did not control for any potentially confounding factors. A large longitudinal study in Finland, however, showed that unwantedness was linked to lower educational attainment, when background family variables such as social class, mother's education and family size were controlled (Myhrman et al., 1995). In a study by Montgomery et al. (1997), Demographic and Health Survey data were used to examine child survival, nutritional status, and education in the Dominican Republic (1991), Egypt (1988), Kenya (1993), the Philippines (1993), and Thailand (1987). They found that mortality was weakly linked to unwantedness in Egypt, the Philippines and Thailand, but was linked only to nutritional status in the Dominican Republic. Educational attainment of siblings was found to be negatively linked to the presence in the family of unwanted children in the Dominican Republic, the Philippines and Thailand, though the effects were small.

The mechanisms through which pregnancy intentions might affect child development are not straightforward, and many intervening factors are likely to modify any effects. For example, a child in a wealthy family may suffer fewer adverse effects of being unintended than one in a poorer family, where economic factors are likely to mean that an extra child is a heavier burden (see Lloyd, 1994). An additional consideration is that the disadvantages, if they exist, may not accrue to one individual, but may be spread among siblings. It is plausible, however, judging from the few studies available, that there are differential consequences for intended and unintended births.

Aims and objectives

The aim of this study was to examine the effect of intention status of pregnancy on health-related outcomes before, during and after the birth. Four key factors were selected for analysis: antenatal care received by the pregnant woman, delivery conditions, immunization of the child, and growth of the child. We hypothesized that, compared with intended pregnancies, unwanted or mistimed pregnancies would be less likely to receive antenatal care or be supervised at delivery, and the child would be less likely to be adequately immunized, or have satisfactory growth. Furthermore, we expected that these outcomes would be less favourable for unwanted than for mistimed births.

Three of the four factors studied relate to uptake of routine preventive health care. Lack of antenatal care may adversely affect birth outcomes (Daponte et al., 2000; Shiffman, 2000; Starrs, 1997), although the benefits of such care depend very much on its quality (Carroli et al., 2001; McDonagh, 1996). Supervised delivery, on the other hand, is generally agreed to be very important for the health of both the mother and the child, and is one of the main operational goals of the Safe Motherhood movement (Robinson & Wharrad, 2001; de Bernis et al., 2000; Loudon, 2000; Starrs, 1997). If uptake of antenatal care is affected by wantedness of pregnancy, as previous studies have suggested, it is important to establish whether delivery care is also affected because this potentially has a greater impact on maternal and child health than antenatal care. Full and timely immunization is a well established component of preventive health care. Finally, the measure of growth selected for study is stunting (low height for age). Stunting is used as a proxy for chronic undernutrition or illness, which may reflect ongoing disadvantage faced by particular children (ACC/SCN, 2000).

Data and methods

The data used in this paper are from the nationally representative Demographic and Health Surveys (DHS). We selected countries where surveys had been conducted recently (1995 or later), where preliminary analysis revealed at least a 25% difference between total fertility and wanted fertility, and where around 50% of births took place in a health care facility.[2] These criteria were chosen so that there would be sufficient numbers of both unwanted and wanted children to allow the two groups to be examined separately, and so that there would be relatively large numbers of women giving birth with and without supervision. Five recent surveys fitted the criteria: Bolivia 1998, Egypt 1995, Kenya 1998, Peru 1996, and the Philippines 1998. Details of these surveys are published in the main reports (which are available on www.measuredhs.com). Data pertaining to children born in the five years preceding the survey were examined (three years in the case of Kenya). Each child was analysed as a separate case, and for multiple births, only the first born was included.

The outcome measures we examined were as follows: (1) whether the mother received any antenatal care or tetanus toxoid injections before the sixth month of pregnancy; (2) whether the delivery was supervised (i.e. took place in a medical institution or was supervised by trained medical personnel—doctors, nurses, or midwives); (3) whether the child received a full set of immunizations (as recommended by WHO guidelines); this analysis was restricted to children who survived for at least 12 months; (4) whether the child was stunted (height more than two standard deviations below the median of the reference population defined by the US National Center for Health Statistics); this analysis was restricted to surviving children. The outcomes were chosen to reflect the different stages at which the intention status of the pregnancy might have an effect, on the basis of the results of previous studies.

[2] In fact, in order to obtain a reasonable geographical spread, we included countries where 30–60% of births were delivered in health care facilities.

We first examined these outcomes in relation to the intention status of the pregnancy alone, using the chi-squared test for association. Intention status was measured from the women's reports that the pregnancy was wanted then, later, or never. The precise question posed in the DHS enquiries was: "At the time you became pregnant with (*name of child*), did you want to become pregnant ***then***, did you want to wait until ***later***, or did you want ***no more*** children at all?" Throughout this report, we term these births "wanted", "mistimed" and "unwanted", respectively. We also use the term "unintended" to describe both unwanted and mistimed births. It is unlikely that the women themselves would use these terms, however, and while they are used for convenience here, they should be interpreted carefully with the original answers to the survey question in mind (see Barrett & Wellings, 2002). The limitations of the measurement of intention status are discussed below (see "Discussion").

As mentioned above, health care and child growth are not affected solely by pregnancy intentions: they are also highly dependent on the sociodemographic characteristics of the mother and the household, and the accessibility of health services. We therefore used logistic regression modelling to calculate odds ratios adjusted for potential confounders (described below) to reassess the bivariate association between intention status and outcomes. We calculated 95% confidence intervals for these adjusted odds ratios, taking into account the geographical clustering of the sample.

Few first and second births were reported as unwanted (see below), and there is thus an argument for excluding them from the analysis. We included them, however, because we were interested in mistimed births of all orders. In fact, as will be demonstrated later, excluding first and second births from the analysis had little effect on the results.

DHS enquiries do not obtain information on all factors that might influence the selected outcomes. For example, distances or travel times to health care facilities were not available. Where this was the case, proxy measures were used. The variables included in the final models were: mother's education, residence, ethnicity or language spoken (country-specific), and wealth. These control variables were selected for the following reasons. Mother's education was included because it is known to be a predictor of use of health services. Wealth has the potential to affect all the outcomes, particularly supervision of delivery, which is often expensive. Wealth is notoriously difficult to assess, however. We followed the recommendation of Morris et al. (2000), in using a weighted sum of durable goods possessed by households. Weights were assigned according to current values of the goods in the country. This allowed the creation of a variable that could be used for all five countries, while still taking into account the specific country situation in the types of durable goods included. Region of residence and urban-rural classifications were used as proxy for service access, which was not directly measured in most of the surveys. We also included ethnic group and language spoken, in countries where this was appropriate, as a further attempt to control for possible differences in access to, and propensity to use, services. It is reasonable to expect that outcomes for lower- and higher-order pregnancies may be different: for example, a woman who has had a number of previous pregnancies may be less likely to seek antenatal care than a first-time mother. Birth order of the child was therefore included in the model, but maternal age was omitted because of its close association with birth order. For the postnatal outcomes, we added the sex and age of the child to the model, to control for possible confounders: girls might be treated differently from boys, for example, and older children may be more likely to have been immunized. Once we had defined the additional explanatory variables in the model, we assessed whether the effect of wantedness on outcomes was modified by other predictors, by examining first-order interactions.

Results

Table 2.1 shows the prevalence of unintended births in the five countries. The proportion of births declared as unwanted ranged from 10% in Kenya to 37% in Peru. The prevalence of mistimed births ranged from 10% in Egypt to 30% in Kenya. These values are typical of countries going through fertility transition, and underscore the contrast between sub-Saharan Africa and other regions, noted earlier. As expected, the prevalence of unwanted births rose sharply with birth order, although an appreciable proportion of second births were reported as unwanted in the two Latin American

Table 2.1. Proportion of births reported as wanted, mistimed or unwanted

Country	Pregnancy intention status			
	Wanted	Mistimed	Unwanted	Total number
Bolivia	47.9%	18.8%	33.3%	6690
Egypt	70.7%	9.7%	19.5%	11155
Kenya	50.1%	39.4%	10.5%	3231
Peru	42.4%	20.4%	37.2%	16450
Philippines	53.2%	27.8%	19.0%	7595

Source: Demographic and Health Surveys (Bolivia 1998, Egypt 1995, Kenya 1998, Peru 1996, Philippines 1998).

countries (Fig. 2.1). Also as expected, the percentage of births declared as mistimed was strongly related to the length of the preceding birth interval (Fig. 2.2).

The unadjusted associations between each of the outcomes and the intention status of the pregnancy in each of the countries are presented in Table 2.2. Intention status was significantly associated with antenatal care and delivery conditions in all five settings. Without exception, unwanted pregnancies were least likely to receive care before the sixth month or to have the benefit of a supervised delivery. However, the link was much more pronounced in Bolivia and Peru than elsewhere, and the differences between mistimed and wanted births were variable in direction and modest in size. There was a less clear association with immunization status: in Kenya and Peru the association was strong, but it was less strong in Egypt and the Philippines, and there was no significant association in Bolivia. Intention status was strongly associated with stunting in Bolivia and Peru but not in Egypt and Kenya. Where the relationships are significant, intention status had an effect in the expected direction: positive outcomes were associated with wanted pregnancies and negative outcomes with unwanted pregnancies. No differences were evident between wanted and mistimed births.

To investigate further the relationship between intention status at pregnancy and outcomes, we conducted logistic regression analysis after adjustment for possible confounding factors. The variables included are listed in the tables.

Inadequate antenatal care

Table 2.3 shows adjusted odds ratios for the probability of receiving no antenatal care in the first six months of pregnancy, in the five countries. The adjusted effects of intention status were strongest in Peru, where the odds ratio of inadequate antenatal care was 1.34 for mistimed and 1.39 for unwanted pregnancies compared with wanted pregnancies. Similar but less pronounced effects were seen in Kenya and the Philippines, where unintended pregnancies were 20% more likely to receive inadequate antenatal care. In Bolivia, effects were in the same direction but of borderline statistical significance. In Egypt, by contrast, significant differences in the opposite direction were found.

Other strong predictors of antenatal care are evident in Table 2.3. The mother's education had a large monotonic effect in all countries. In comparison, the effect of household wealth was less striking, though significant in all countries except Kenya. In all countries except Peru, birth order was an important influence with higher-order births receiving less antenatal care. Finally, as expected, residents of rural areas were at increased risk of inadequate care compared with residents of urban areas (except in Kenya), the former group presumably having less access to care facilities. The urban–rural gradient was particularly striking in Egypt.

Unsupervised delivery

The adequacy of intrapartum care was measured by distinguishing births that were supervised and those that were unsupervised. The former group comprised all deliveries that took place within a medical institution plus all deliveries attended by a trained professional whether or not they took place in a medical institution (e.g. births at home supervised by trained midwives). Unsupervised deliveries were those that took place outside a medical institution either unattended or attended by a traditional birth attendant, a friend, or

Fig. 2.1 Proportion of births wanted "never", by birth order

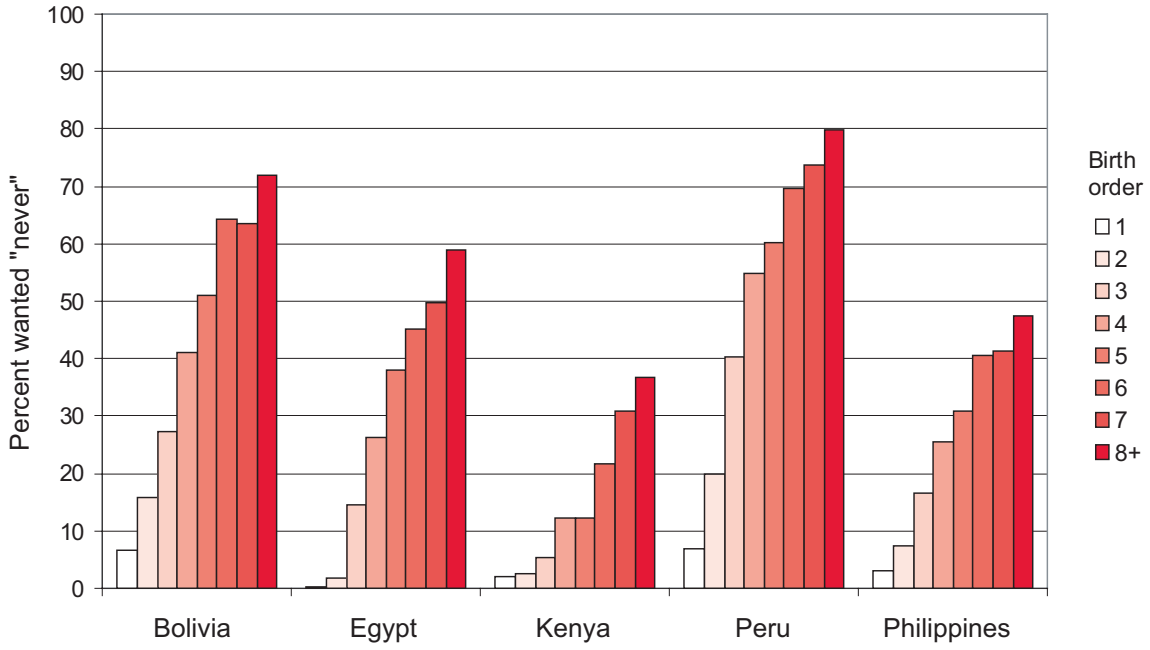
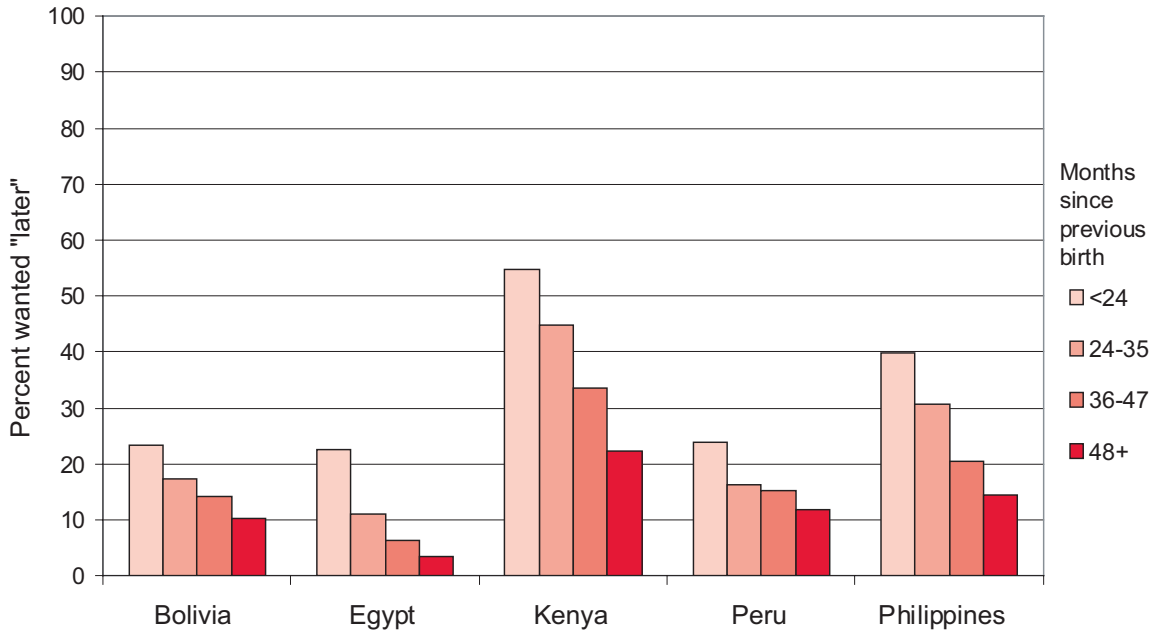


Fig. 2.2 Proportion of second or later births wanted “later”, by time since previous birth



other non-medical person. Results are shown in Table 2.4. The pattern is less straightforward than for antenatal care. Intention status had an effect on delivery conditions only in Peru, where unwanted births were 1.21 times more likely to be unattended than wanted births, and possibly in Kenya, though differences were of only borderline statistical significance. In Egypt, as with antenatal care, the relationship appeared to be in the opposite direction to that expected, with unwanted births more likely to be supervised. Birth order, education, wealth, and residence were all significantly associated with delivery outcome in the same direction as for antenatal care. Unsupervised deliveries were more common for women who were poorer, who had lower educational level, and who lived in rural areas. The education effect was strikingly large in Kenya and Bolivia. Higher birth order was also associated with a higher likelihood of unsupervised delivery.

Immunization status

Because of missing information on dates of immunization, we used immunization status at the time of the survey, but introduced current age as a control. We excluded from the analysis children who had not reached their first birthday, and divided the remainder into those who had received a full set of vaccines and those who had not. In addition to the confounding factors incorporated in the previous two models, we added the child’s sex to allow for possible sex-selective differences in immunization. The results are shown in Table 2.5.

Intention status of pregnancy was significantly associated with immunization in Egypt, Kenya, and Peru, but not in the Philippines or Bolivia. In Kenya and Peru, children who were unwanted at conception were 1.60 and 1.24 times, respectively, less likely to have received the full set of vaccinations than wanted children. In Egypt, mistimed children were 1.40 times less likely to have received adequate immunization but there is no difference between wanted and unwanted children. There was no effect of birth order in Peru or Bolivia, but in the other three countries, the same relationship applied as for antenatal care and supervised delivery: higher-order births were less likely to have positive outcomes – in this case, the children were less likely to have received a full set of vaccinations. There was no difference by sex but, as would be expected, older children were more likely to have received the full set of vaccinations than younger children. Mother’s education had the expected effect of increasing the likelihood of full immunization in all countries except Kenya, but wealth had a significant effect only in the Philippines and Egypt. Children in urban areas of Egypt and Kenya were more likely than those in rural areas to have received full immunization, but the effect was reversed in Bolivia and the Philippines. As for delivery and antenatal care outcomes, there were regional and/or social group differences in child immunization status in every country (results not shown).

Stunting

Data on children’s height were not available for the Philippines, so the analysis was possible only for Bolivia, Egypt, Kenya, and Peru. Results are shown in Table 2.6.

The only country for which there was any significant effect of intention status at pregnancy was Peru, where unwanted children were 1.15 times more likely than wanted children to be stunted. In Bolivia, similar results were apparent but they were not significant at the 95% confidence level. In Egypt there was a significant

Table 2.2. Percentage of births with specified adverse health-related outcomes, by intention status

Outcome and country		Intention status of pregnancy				Pearson chi squared variable	p
		Wanted	Mistimed	Unwanted	Total		
Late or no antenatal care							
Bolivia		38.8%	37.7%	54.4%	43.8%		
	N	3185	1256	2222	6663	152.6	0.000
Egypt		65.3%	61.6%	71.3%	66.1%		
	N	7877	1087	2174	11 138	38.2	0.000
Kenya		43.4%	50.0%	54.3%	47.1%		
	N	1616	1270	337	3223	20.3	0.000
Peru		39.5%	42.9%	57.2%	46.7%		
	N	6952	3351	6088	16 391	433.5	0.000
Philippines		21.0%	24.2%	27.4%	23.1%		
	N	4028	2092	1436	7556	26.1	0.000
Unsupervised deliveries							
Bolivia		39.6%	35.6%	56.3%	44.4%		
	N	3193	1257	2229	6679	198.1	0.000
Egypt		54.5%	52.5%	59.2%	55.2%		
	N	7886	1087	2176	11 149	18.7	0.000
Kenya		43.0%	46.4%	57.9%	45.9%		
	N	1618	1273	337	3228	25.0	0.000
Peru		41.8%	39.7%	62.3%	49.0%		
	N	6974	3355	6118	16 447	691.3	0.000
Philippines		48.2%	50.3%	56.5%	50.4%		
	N	4042	2109	1441	7592	29.1	0.000
Child not fully vaccinated							
Bolivia		62.5%	58.8%	60.8%	61.3%		
	N	2510	932	1689	5131	4.2	0.121
Egypt		18.2%	18.6%	21.0%	18.8%		
	N	6262	801	1712	8775	6.6	0.037
Kenya		36.4%	38.8%	51.9%	38.9%		
	N	1090	811	216	2117	18.1	0.000
Peru		32.9%	32.5%	38.3%	34.8%		
	N	5604	2652	4833	13 089	42.3	0.000
Philippines		24.1%	27.4%	25.6%	25.3%		
	N	3307	1645	1094	6046	6.1	0.047
Child stunted							
Bolivia		23.7%	23.5%	33.5%	26.9%		
	N	3202	1258	2230	6690	73.3	0.000
Egypt		28.6%	26.7%	29.3%	28.6%		
	N	7891	1087	2177	11 155	9.2	0.055
Kenya		27.4%	27.1%	30.2%	27.6%		
	N	1619	1274	338	3231	3.4	0.494
Peru		22.4%	22.5%	34.2%	26.8%		
	N	6977	3355	6118	16450	284.2	0.000

Source: as Table 2.1.
N = total number of births in each category.

effect in the opposite direction to that expected. High birth order (fifth birth and above) was associated with stunting in all countries except Kenya. Female children were slightly less likely to be stunted than male children in Egypt, Kenya and Peru. Mother's education had an effect as expected in all sites except Egypt, with children born to more educated mothers less likely to be stunted. Wealth also had the expected effect: children from poorer households were more likely to be stunted than richer children. There was an urban/rural differential only in Peru, where rural children were 1.19 times more likely to be stunted than children in large cities.

Interactions

Significant interactions were found between intention status and the other explanatory factors, i.e. they were not independent in terms of their effect on the

Table 2.3 Adjusted odds ratios for probability of receiving no antenatal care in first six months of pregnancy, by intention status and other predictors.

	Bolivia			Egypt			Kenya			Peru			Philippines		
	Odds ratio	95% confidence interval		Odds ratio	95% confidence interval		Odds ratio	95% confidence interval		Odds ratio	95% confidence interval		Odds ratio	95% confidence interval	
Pregnancy intention status															
Wanted	1			1			1			1			1		
Mistimed	1.12	0.92	1.38	0.83	0.68	1.00	1.24	1.05	1.48	1.34	1.18	1.52	1.21	1.02	1.42
Unwanted	1.17	0.98	1.40	0.79	0.66	0.95	1.20	0.90	1.59	1.39	1.24	1.56	1.21	1.01	1.46
Birth order															
1st or 2nd birth	1			1			1			1			1		
3rd or 4th birth	1.21	1.03	1.42	1.46	1.28	1.68	1.11	0.89	1.37	1.04	0.92	1.17	1.23	1.05	1.45
5th or higher birth	1.22	1.01	1.47	1.79	1.45	2.21	1.36	1.10	1.70	1.11	0.96	1.28	1.52	1.25	1.84
Education of mother															
No education	16.83	10.02	28.26	10.68	7.30	15.64	4.69	1.80	12.21	7.22	5.35	9.75	5.32	3.25	8.70
Primary	11.38	7.08	18.27	7.16	4.90	10.47	6.16	2.39	15.89	6.12	4.83	7.76	2.48	1.88	3.27
Secondary	4.97	3.10	7.96	3.37	2.33	4.87	4.03	1.57	10.34	3.32	2.67	4.12	1.53	1.16	2.00
Higher	1			1			1			1			1		
Household wealth (quartiles)															
1st (poorest)	3.38	2.46	4.64	1.74	1.37	2.22	1.25	0.90	1.74	2.63	2.15	3.22	2.11	1.56	2.84
2nd	2.29	1.73	3.03	1.64	1.32	2.04	1.15	0.83	1.59	1.97	1.66	2.34	2.28	1.75	2.98
3rd	1.77	1.36	2.29	1.23	1.03	1.47	1.07	0.74	1.54	1.22	1.07	1.40	1.63	1.23	2.14
4th (richest)	1			1			1			1			1		
Type of place of residence															
Capital/large city	1			1						1			1		
Small city	0.99	0.76	1.28	1.46	1.10	1.94	1			1.08	0.88	1.32	1.00	0.65	1.53
Town	0.85	0.60	1.20	1.70	1.22	2.38				1.17	0.97	1.41	1.15	0.70	1.87
Countryside	1.39	1.09	1.77	5.44	3.21	9.20	1.17	0.82	1.67	1.53	1.29	1.82	1.20	0.78	1.84

Note. Odds ratios in this table are also adjusted for additional variables (not shown): ethnic group (Philippines), language (Bolivia, Kenya), region (Bolivia, Egypt, Kenya, Peru).

Table 2.4 Adjusted odds ratios for probability of delivery being unsupervised, by intention status and other predictors.

	Bolivia			Egypt			Kenya			Peru			Philippines		
	Odds ratio	95% confidence interval		Odds ratio	95% confidence interval		Odds ratio	95% confidence interval		Odds ratio	95% confidence interval		Odds ratio	95% confidence interval	
Pregnancy intention status															
Wanted	1			1			1			1			1		
Mistimed	1.15	0.92	1.45	1.03	0.86	1.23	1.08	0.89	1.31	1.10	0.95	1.28	0.96	0.81	1.14
Unwanted	0.96	0.78	1.17	0.80	0.67	0.96	1.35	0.96	1.90	1.21	1.06	1.38	0.92	0.76	1.13
Birth order															
1st or 2nd birth	1			1			1			1			1		
3rd or 4th birth	1.78	1.48	2.13	1.47	1.27	1.71	1.41	1.11	1.80	1.33	1.14	1.55	1.48	1.27	1.74
5th or higher birth	1.83	1.49	2.25	1.76	1.46	2.12	1.84	1.42	2.39	1.39	1.16	1.67	1.98	1.63	2.40
Education of mother															
No education	48.93	17.86	134.09	10.34	6.39	16.72	506.89	15.85	16208.57	14.52	9.74	21.66	8.77	4.50	17.10
Primary	30.90	11.49	83.06	6.97	4.29	11.33	437.09	13.93	13712.54	9.96	7.15	13.87	4.49	3.54	5.70
Secondary	7.80	2.87	21.23	3.52	2.22	5.60	130.58	4.17	4084.52	3.36	2.43	4.64	1.99	1.59	2.49
Higher	1			1			1			1			1		
Household wealth (quartiles)															
1st (poorest)	6152	4.06	9.32	1.90	1.51	2.38	3.76	2.53	5.59	2.95	2.37	3.68	3.35	2.57	4.37
2nd	4.44	3.09	6.37	1.70	1.39	2.07	2.40	1.62	3.55	2.38	1.96	2.90	3.38	2.67	4.27
3rd	2.13	1.51	3.00	1.17	0.97	1.40	3.06	1.98	4.72	1.34	1.13	1.58	1.86	1.48	2.33
4th (richest)	1			1			1			1			1		
Type of place of residence															
Capital/large city	1			1						1			1		
Small city	1.32	0.91	1.92	1.15	0.75	1.76	1			2.03	1.41	2.90	1.72	1.10	2.69
Town	1.62	1.03	2.57	1.85	1.08	3.17				2.49	1.92	3.22	2.76	1.70	4.49
Countryside	2.83	2.02	3.97	6.15	3.01	12.56	2.82	1.99	4.00	5.41	4.30	6.81	5.70	3.73	8.71

Note. Odds ratios in this table are also adjusted for additional variables (not shown): ethnic group (Philippines), language (Bolivia, Kenya), region (Bolivia, Egypt, Kenya, Peru).
Source: as Table 2.1

Table 2.5 Adjusted odds ratios for probability of child being fully immunized by age 12 months, by intention status and other predictors.

	Bolivia			Egypt			Kenya[a]			Peru			Philippines		
	Odds ratio	95% confidence interval		Odds ratio	95% confidence interval		Odds ratio	95% confidence interval		Odds ratio	95% confidence interval		Odds ratio	95% confidence interval	
Pregnancy intention status															
Wanted	1			1			1			1			1		
Mistimed	0.92	0.77	1.10	1.40	1.08	1.82	1.01	0.79	1.29	0.96	0.85	1.109	1.15	0.97	1.36
Unwanted	1.01	0.84	1.22	1.11	0.89	1.39	1.60	1.12	2.28	1.24	1.09	1.41	0.97	0.79	1.20
Birth order															
1st or 2nd birth	1			1			1			1			1		
3rd or 4th birth	1.10	0.91	1.33	1.12	0.94	1.33	0.90	0.68	1.18	0.87	0.85	1.10	1.07	0.90	1.28
5th or higher birth	1.11	0.91	1.36	1.49	1.18	1.88	1.46	1.12	1.90	0.93	0.80	1.08	1.35	1.11	1.64
Sex of child															
Female	0.98	0.85	1.12	1.09	0.94	1.27	1.18	0.95	1.47	0.96	0.987	1.05	0.94	0.82	1.07
Male	1			1			1			1			1		
Age of child (completed years)[b]															
1	1			1			1			1			1		
2	2.24	1.83	2.74	1.39	1.16	1.66	1.04	0.84	1.28	0.98	0.87	1.11	1.70	1.41	2.06
3	1.10	0.92	1.31	0.76	0.62	0.92				0.87	0.76	0.98	1.18	0.99	1.41
4	1.16	0.97	1.39	0.83	0.69	1.00				0.91	0.80	1.03	1.25	1.02	1.52
Education of mother															
No education	1.65	1.07	2.26	2.59	1.54	4.35	2.22	0.65	7.56	1.54	1.19	2.00	8.38	4.74	14.82
Primary	1.06	0.77	1.45	1.56	0.92	2.66	1.86	0.57	6.09	1.47	1.20	1.80	2.06	1.57	2.69
Secondary	1.01	0.75	1.37	1.13	0.66	1.92	1.50	0.46	4.96	1.27	1.06	1.53	1.14	0.89	1.47
Higher	1			1			1			1			1		
Household wealth (quartiles)															
1st (poorest)	1.13	0.81	1.56	1.38	1.04	1.83	1.20	0.80	1.82	1.14	0.94	1.37	1.96	1.46	2.64
2nd	0.93	0.71	1.23	1.14	0.88	1.48	1.03	0.71	1.50	0.99	0.82	1.18	1.93	1.47	2.54
3rd	1.09	0.86	1.39	0.80	0.61	1.05	0.97	0.64	1.45	0.97	0.83	1.13	1.61	1.25	2.06
4th (richest)	1			1			1			1			1		
Type of place of residence															
Capital/large city	1			1			}			1			1		
Small city	0.83	0.63	1.10	1.14	0.77	1.71	} 1			0.77	0.60	0.99	0.54	0.36	0.83
Town	0.90	0.63	1.28	0.85	0.48	1.51	}			0.81	0.67	0.98	0.67	0.42	1.07
Countryside	0.73	0.57	0.95	4.97	2.15	11.48	1.28	0.86	1.89	0.78	0.66	0.92	0.65	0.43	0.98

Odds ratios in this table are adjusted for additional variables (not shown): ethnic group (Philippines), language (Bolivia, Kenya), region (Bolivia, Egypt, Kenya, Peru).

[a] *Data obtained only for children under 3 years old.*

[b] *All children aged under 1 year were excluded from this analysis.*

Source: as Table 2.1

Table 2.6 Adjusted odds ratios for probability of child being stunted, by intention status and other predictors.

	Bolivia			Egypt			Kenya[a]			Peru		
	Odds ratio	95% confidence interval		Odds ratio	95% confidence interval		Odds ratio	95% confidence interval		Odds ratio	95% confidence interval	
Pregnancy intention status												
Wanted	1			1			1			1		
Mistimed	1.15	1.97	1.37	0.81	0.68	0.96	0.96	0.80	1.17	1.05	0.92	1.20
Unwanted	1.10	0.94	1.29	0.84	0.71	0.99	0.89	0.66	1.21	1.15	1.02	1.29
Birth order												
1st or 2nd birth	1			1			1			1		
3rd or 4th birth	1.16	0.97	1.38	1.08	0.95	1.24	0.86	0.69	1.06	0.98	0.88	1.10
5th or higher birth	1.24	1.03	1.49	1.28	1.09	1.51	1.01	0.79	1.329	1.21	1.06	1.39
Sex of child												
Female	0.94	0.83	1.06	0.86	0.78	0.95	0.83	0.70	0.98	0.91	0.84	0.99
Male	1			1			1			1		
Age of child (completed years)												
0	1			1			1			1		
1	0.38	0.30	0.47	1.12	0.93	1.35	0.42	0.34	0.52	0.36	0.30	0.42
2	1.05	0.87	1.27	2.38	2.00	2.83	1.19	0.98	1.44	0.96	0.84	1.10
3	0.96	0.80	1.16	2.54	2.16	2.98				0.78	0.69	0.88
4	0.88	0.73	1.07	2.36	1.98	2.82				1.00	0.88	1.13
Education of mother												
No education	1.70	1.32	2.19	1.07	0.91	1.26	1.88	1.31	2.69	2.02	1.68	2.43
Primary	1.34	1.11	1.62	1.04	0.87	1.24	1.65	1.26	1.91	1.49	1.31	1.70
Secondary	1.06	0.77	1.46	1.08	0.81	1.43	0.61	0.26	1.41	0.70	0.58	0.85
Higher	1			1			1			1		
Household wealth (quartiles)												
1st (poorest)	1.95	1.44	2.63	1.30	1.07	1.57	2.16	1.49	3.11	1.93	1.61	2.32
2nd	1.71	1.33	2.20	1.16	0.897	1.39	1.57	1.11	2.22	1.69	1.44	1.99
3rd	1.43	1.16	1.78	1.12	0.94	1.32	1.86	1.27	2.73	1.17	1.01	1.36
4th (richest)	1			1			1			1		
Type of place of residence												
Capital/large city	1			1			}			1		
Small city	0.78	0.61	0.99	0.90	0.64	1.26	} 1			1.19	0.97	1.45
Town	0.76	0.58	0.99	0.95	0.65	1.41	}			1.17	0.99	1.39
Countryside	1.11	0.90	1.39	0.70	0.39	1.26	1.05	0.75	1.48	1.19	1.01	1.41

Note: Odds ratios in this table are adjusted for additional variables (not shown): language (Bolivia, Kenya), region (Bolivia, Egypt, Kenya, Peru).

[a] *Data obtained only for children under 3 years old.*

Source: Demographic and Health Surveys (Bolivia 1998, Egypt 1995, Kenya 1998, Peru 1996).

outcomes. In most cases, the strongest interactions with wantedness were seen for residence and educational level of the mother (see Table 2.7). In order to investigate the nature of these interactions, we again performed logistic regression analysis, but stratifying each sample into four subgroups: urban women with relatively high educational level, urban women with relatively low educational level, rural women with relatively high educational level, and rural women with relatively low educational level. This stratified analysis showed no consistent pattern and, except in Egypt, did not differ greatly from the main model. This analysis is therefore not shown in full. As an illustration, however, results of the stratified analysis for one of the outcomes—delivery conditions—are shown in Table 2.8. Significant effects in the expected direction were found for Peru and Kenya, and significant effects in the opposite direction for Egypt. For Peru, the link between wantedness and unsupervised delivery held for all four strata, though confidence intervals were wide and most differences were not significant. In Kenya, the effect of wantedness was much larger for the urban uneducated stratum than for other strata, though full results for urban educated women could not be obtained because of small cell

Table 2.7. Interactions between wantedness of pregnancy and other explanatory variables. Boxes marked ✓ indicate presence of an interaction.

Explanatory variables	Outcome			
	Antenatal care	Delivery	Immunization	Stunting
Bolivia				
Birth order	x	x	x	x
Education	✓	✓	x	x
Wealth	✓	✓	x	x
Urban/rural residence	✓	x	✓	x
Region	✓	✓	✓	x
Language	✓	✓	x	✓
Sex of child	-	-	x	x
Child's age	-	-	x	✓
Egypt				
Birth order	x	x	x	x
Education	✓	x	x	x
Wealth	x	✓	x	x
Urban/rural residence	✓	✓	✓	x
Region	✓	✓	x	x
Type of flooring	✓	✓	x	x
Sex of child	-	-	x	x
Child's age	-	-	x	✓
Kenya				
Birth order	x	x	x	x
Education	✓	✓	✓	x
Wealth	✓	x	x	x
Urban/rural residence	x	✓	x	x
Region	x	✓	x	x
Language	x	x	x	x
Sex of child	-	-	x	x
Child's age	-	-	x	x
Peru				
Birth order	✓	✓	x	✓
Education	✓	✓	✓	✓
Wealth	✓	✓	✓	✓
Urban/rural residence	✓	x	✓	x
Region	✓	✓	✓	✓
Sex of child	-	-	x	x
Child's age	-	-	x	✓
Philippines				
Birth order	✓	✓	✓	-
Education	✓	x	✓	-
Wealth	✓	✓	x	-
Urban/rural residence	x	x	x	-
Ethnic group	✓	x	✓	-
Sex of child	-	-	x	-
Child's age	-	-	x	-

Source: as Table 2.1

Table 2.8 Adjusted odds ratios for probability of delivery being unsupervised, by intention status within educational–residential strata.

	Urban educated		Urban, not educated		Rural, educated		Rural, not educated	
Pregnancy intention status	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval
Bolivia								
Wanted	1		1		1		1	
Mistimed	1.51	0.93 2.45	1.30	0.87 1.93	0.76	0.37 1.52	0.89	0.62 1.28
Unwanted	1.13	0.64 2.00	1.15	0.78 1.769	1.10	0.51 2.36	0.79	0.61 1.03
N		2061		1425		461		2745
Egypt								
Wanted	1		1		1		1	
Mistimed	1.39	0.94 2.05	1.12	0.59 2.13	0.90	0.69 1.19	0.89	0.63 1.24
Unwanted	1.01	0.69 1.48	0.80	0.51 1.24	0.55	0.39 0.77	0.89	0.69 1.15
N		2976		940		2804		4436
Kenya								
Wanted	1		1		1		1	
Mistimed	3.50	0.71 17.14	1.20	0.64 2.28	1.25	0.75 2.08	1.00	0.79 1.27
Unwanted(only five women)		6.97 1.48	32.91	0.82 0.34	1.98	1.22 0.82	1.82	
N		203		283		596		2149
Philippines								
Wanted	1		1		1		1	
Mistimed	0.92	0.66 1.27	1.23	0.73 2.07	0.96	0.75 1.23	0.92	0.65 1.30
Unwanted	1.18	0.77 1.80	0.64	0.40 1.02	0.96	0.67 1.37	0.90	0.62 1.31
N		2268		652		2303		2374
Peru								
Wanted	1		1		1		1	
Mistimed	1.09	0.82 51.4	0.95	0.68 1.32	1.37	0.93 2.03	1.19	0.93 1.53
Unwanted	1.42	1.06 1.91	1.18	0.90 1.56	1.24	0.85 1.80	1.11	0.92 1.35
N		5827		2764		1563		6302

Note: Odds ratios in this table are adjusted for confounding variables as before (not shown).

sizes. In Egypt, the counterintuitive result is attributable largely to the rural educated stratum, a pattern for which there is no ready explanation.

Effect of excluding first and second births

To assess the robustness of the results to the exclusion of first and second births (few of which were unwanted), we conducted the same analysis for third-order births and higher in each of the five countries, for each outcome. The results were very similar to those obtained for all births (Table 2.9). Results for all births are repeated in the Table to facilitate comparison.

Discussion

The merit of this analysis depends on the validity and reliability, or stability, of the women's own retrospective reports of the wantedness of their pregnancies. With regard to validity, it may be doubted whether simple survey questions can capture subtle emotional states. It has been shown that women's understanding of elements of "planning", "intendedness", and "wantedness" are complex (Barrett & Wellings, 2002). In particular, attitudes before conception are likely to differ from attitudes after recognition of pregnancy, which reflect the more emotional reaction. Thus a study in the USA showed that an appreciable minority of women who became pregnant as a result of contraceptive failure were nevertheless happy or very happy about the pregnancy (Trussell et al., 1999). One study in the United Kingdom used a detailed qualitative approach to develop more appropriate measures of pregnancy wantedness, and concluded that a six-question scale was necessary to capture the basic dimensions in that particular study setting (Barrett, 2002). The complexities of the concepts involved are further reflected by the fact that women in the Philippines gave inconsistent answers about wantedness of pregnancy in in-depth versus structured interviews (Williams et al., 2001). A single survey question may not allow a woman to express her feelings about the pregnancy, and the question of wantedness may not even arise if the woman has a fatalistic outlook with regard to her childbearing. Fatalism, however, is not a major concern here, because contraceptive practice is well established in all five study countries.

A further limitation of the concept of "wantedness" is that it may be different for the woman than for the spouse or other family members who may also be responsible for child care. Wantedness itself may be related to the resources available to the family, in which case its intensity might change with changing family size. Poor measurement of wantedness is likely to act against the hypotheses of this study. Given all of these factors, we accept that the categories "wanted", "unwanted", and "mistimed" are imprecisely measured and vary in intensity in ways that cannot be distinguished with the data available. Nevertheless, the facts that the proportion of births declared as unwanted rises steeply and monotonically with birth order and that the proportion mistimed is clearly related to length of birth interval demonstrate that these concepts are understood by many women and thus do merit serious analysis.

With regard to the stability of the wantedness measure, it is likely that positive shifts in attitude occur once the child is born. Indeed, the fact that in most DHS enquiries current pregnancies are more likely to be defined as unwanted or mistimed than previous pregnancies that ended in live births supports this supposition (Westoff & Ryder, 1977). Because we only looked at children in this study, we avoided complications arising from this form of retrospective rationalization, but accept that there may be a general bias towards reporting pregnancies as wanted. Kaufmann et al. (1997) have pointed out that women may be ambivalent about pregnancy, and that responses may not be stable over time even after birth, because of changes in objective circumstances and in the strength of the woman's feelings at different times. This would lead to unstable measures of wantedness, but not necessarily bias in a particular direction. Panel data from Morocco, however, showed that many births declared as unwanted at a first interview were reported as wanted at a second interview, conducted three years later (Bankole & Westoff, 1998). This effect is likely to bias the reporting in favour of wanted births particularly for older children. On the other hand, Montgomery et al. (1997) found no evidence that unwantedness was associated with children's ages in their five study countries. Thus it is uncertain whether the results for Morocco can be generalized. One study in the USA even suggested that reports of unwantedness increased over time – the opposite of the findings from the Morocco study (Rosenzweig & Wolpin, 1993). Joyce et al. (2002), however, have shown that this result reflected a design flaw in the study, which failed to account for the fact that wanted pregnancies tend to be recognized sooner than unwanted pregnancies. Once they had adjusted for this factor, Joyce et al. showed that there was no effect of time on reports of wantedness. In conclusion, instability of responses is a legitimate concern that will act to dilute the effect of wantedness on outcomes.

Other limitations of measures used in this analysis should be noted. Immunization status was assessed from health cards or, where these were not available, from mothers' reports of vaccinations received, and the figures may therefore be subject to recall bias. It is not possible to say whether this would result in systematic over- or under-reporting. The part of the analysis looking at postnatal outcomes only accounts for children who survived for at least one year (immunization) or who were still alive at the time of the study (stunting). If unwanted children suffer higher mortality than wanted children (as suggested in the study by Montgomery et al. (1997)), this would also bias the results though probably in only a minor way. Any bias introduced by excess deaths among unwanted children would be very small because they are so few compared with the numbers still living. In addition, it should be noted that proportions of unintended pregnancies will not reflect the genuine proportions occurring in the population, because unwanted pregnancies are more likely to be terminated than wanted pregnancies.

Table 2.9 Adjusted odds ratios for specified adverse health-related outcomes: unwanted versus wanted births, whole sample and births of order three or more.

	No antenatal care			Unsupervised delivery			Not having received full immunization			Stunting		
	Odds ratio	95% confidence interval		Odds ratio	95% confidence interval		Odds ratio	95% confidence interval		Odds ratio	95% confidence interval	
Bolivia												
All births	1.17	0.98	1.40	0.96	0.78	1.17	1.01	0.84	1.22	1.10	0.94	1.29
Birth order 3+	1.11	0.90	1.35	0.94	0.75	1.19	1.11	0.89	1.38	1.06	0.88	1.27
Egypt												
All births	0.79	0.66	0.95	0.80	0.67	0.96	1.11	0.89	1.39	0.84	0.71	0.99
Birth order 3+	0.74	0.61	0.89	0.76	0.64	0.91	1.14	0.90	1.44	0.82	0.69	0.97
Kenya												
All births	1.20	0.90	1.59	1.35	0.96	1.90	1.60	1.12	2.28	0.89	0.66	1.21
Birth order 3+	1.13	0.82	1.55	1.34	0.92	1.95	1.40	0.94	2.08	0.85	0.60	1.20
Peru												
All births	1.39	1.24	1.56	1.21	1.06	1.38	1.24	1.09	1.41	1.15	1.02	1.29
Birth order 3+	1.35	1.17	1.55	1.12	0.95	1.32	1.20	1.03	1.40	1.02	0.88	1.17
Philippines												
All births	1.21	1.01	1.46	0.92	0.76	1.13	0.97	0.79	1.20	-	-	-
Birth order 3+	1.08	0.87	1.33	0.90	0.73	1.12	0.98	0.77	1.24	-	-	-

Note: Odds ratios in this table are adjusted for the following variables (not shown): pregnancy intention, birth order, education of mother, household wealth and type of place of residence. Odds ratios also adjusted for ethnic group (Philippines), language (Bolivia, Kenya), region (Bolivia, Egypt, Kenya, Peru). Immunization and stunting odds ratios also adjusted for child age and sex. In all cases, wanted pregnancies have odds ratio = 1.

The key finding from the analysis is a negative one. After adjustment for other relevant factors, pregnancy intention status was not consistently related to the probability of a supervised delivery, full immunization, or satisfactory child growth. Inadequate antenatal care was the only outcome assessed to be related to intention status in a broadly consistent way across the five study countries. The important exception was Peru. In this country, significant differences between wanted and unwanted pregnancies were found for all four outcomes. Because Peru had the highest prevalence of unwanted pregnancies among the five study countries (37%), the result carries important policy implications: future reductions in unwanted pregnancies by means of more effective contraceptive use should lead to improvements in obstetric and child care, and in child growth.

The results for Peru may be related to the prevailing circumstances that lead to unwanted births. Peru records a higher overall contraceptive prevalence among married women (64%) than the other countries (which range from 33% to 47%), but within this high prevalence, periodic abstinence and withdrawal predominate (33% of the total): these methods are particularly prone to failure (United Nations, 1998). Given that there is likely to be a spectrum of "unwantedness" that is not captured in the data, it seems plausible that pregnancies resulting from contraceptive failures could be more "unwanted" than those resulting from contraceptive avoidance.

Measurement error, in our view, is unlikely to be the main reason for the unexpectedly negative results in the remaining four countries. The difficulty of disentangling the effects of birth order from those of pregnancy intention is a more plausible reason. As shown in Fig. 2.1, the proportion of pregnancies reported as unwanted rose steeply with ascending birth order, and it is possible that the birth order variable captures a part of "wantedness": an unwanted seventh child, for example, might be more unwanted than an unwanted third child. It is clear that birth order has a stronger influence on the health outcomes studied here than wantedness as assessed by the survey question. The effects of birth order on delivery care are particularly striking, but they are also significant for child growth in three out of four surveys. It seems reasonable to conclude that parents in most developing countries do not discriminate against, or selectively underinvest in, pregnancies and children that were unwelcome at the time of conception (as measured by the survey), but rather that children born into families with many older siblings receive less antenatal and maternity care than first- and second-order children. With regard to stunting, we speculate that the effect may have less to do with birth order than with family size.

Our results are broadly consistent with other evidence on the implications of high fertility for parental investment in health care, education, and nutrition (Desai, 1995; Lloyd, 1994). Public sector provision of contraceptive services and information certainly facilitates and often accelerates the fertility transition in populations, from six or so births per woman to two births or thereabouts. This transition brings large benefits both for the obstetric care of mothers and for their children's welfare.

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3. Relationships between contraceptive use and abortion rates[1]

Introduction

It is obvious, both from common sense and from an elementary understanding of the biological determinants of human reproduction, that contraception and induced abortion represent alternative means of achieving the same aggregate level of fertility in a population. If fertility and its other determinants (sexual exposure, lactation, pathological infertility, etc.) remain constant, a rise in contraceptive use or effectiveness must lead to a decline in induced abortion and vice versa.

Why then does the relationship between level of contraceptive use and incidence of induced abortion continue to provoke heated discussion?[2] And how has it been possible for anti-abortion groups to claim that increased contraceptive use causes increased recourse to abortion (Cohen, 1998)?

The reason for the confusion stems from the observation that, within particular populations, contraceptive prevalence and the incidence of induced abortion can, and indeed often do, rise in parallel. The explanation for these counterintuitive trends is clear (e.g. Bongaarts, 1997; Westoff, 1981). In pretransitional societies, achieved fertility is high and desired family sizes are also high (or, alternatively, childbearing is not yet considered to be a matter of choice). In such a situation, couples are unlikely to view pregnancies as "unwanted". The advent of modern contraception is associated with a destabilization of the prevailing preferences for large families and of fatalistic attitudes. Thus as contraceptive use rises and fertility starts to fall, an increasing proportion of couples want no more children (or want to wait some time before having the next child); as a result, the risk of unintended pregnancy also increases. In the early and middle phases of fertility transition, the adoption and sustained use of effective methods of contraception by couples who wish to postpone or limit childbearing is still far from universal. Hence the growing need for contraception may outstrip use (Westoff, 1978), with the net effect that the incidence of unintended and unwanted pregnancies rises, leading to an increase in unwanted births and/or induced abortion. In this scenario, contraceptive use and induced abortion may rise simultaneously.

As fertility transition progresses towards the replacement level of two births per woman, or even lower, the period of potential exposure to unwanted pregnancies increases further. For instance in a society where the average woman is both fertile and sexually active from 20 to 45 years of age and wants two children, approximately 20 of these 25 years will be spent trying to prevent pregnancy. If use of highly effective contraceptive methods continues to rise to very high levels—say about 80%—the demand for abortion, and its incidence, will fall. Demand for abortion falls to near zero only in the "perfect contraceptive" population when women are protected by fully effective contraceptives at all times, except during the relatively short periods of wanting to conceive, pregnancy and protective breastfeeding (Bumpass & Westoff, 1977).[3] Because such perfect protection is never actually achieved, a residual demand for abortion always exists, although its magnitude varies considerably among low fertility societies, according to levels of contraceptive use and choice of methods.

This section summarizes current knowledge of the abortion–contraception relationship, starting with a description of a recently proposed model (Bongaarts & Westoff, 2000). Empirical illustrations are provided to assess the validity of this model. Time trends in the incidence of abortion and contraceptive use for specific countries, based on published papers, are then reviewed. Finally, we examine the trends in a number of countries for which reliable data are available and where major changes in contraceptive prevalence or effectiveness have been recorded.

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[1] An abridged version of this paper appears as: Marston C, Cleland J (2003). The relationship between contraception and abortion: a review of the evidence. International family planning perspectives, 29(1): 6-13. The authors thank John Bongaarts, Sarah Harbison, Iqbal Shah, John Townsend and Charles Westoff for their comments on earlier drafts.

[2] See, for example, US Senate debate, 105th Congress, 1st Session, 25 February, 1997, Vote No. 13 on Mexico City Policy. Those in favour of passing the bill declared that "it is a very arguable assumption at best to say that the declining abortion rates [seen in selected developing countries] are a direct result of pregnancy prevention services." Synopsis on Internet at: http://www.senate.gov/~rpc/rva/1051/105113.htm#HEADING.

[3] Demand will not fall completely to zero because of the possibility of demand for "therapeutic" abortion.

The model and empirical illustrations

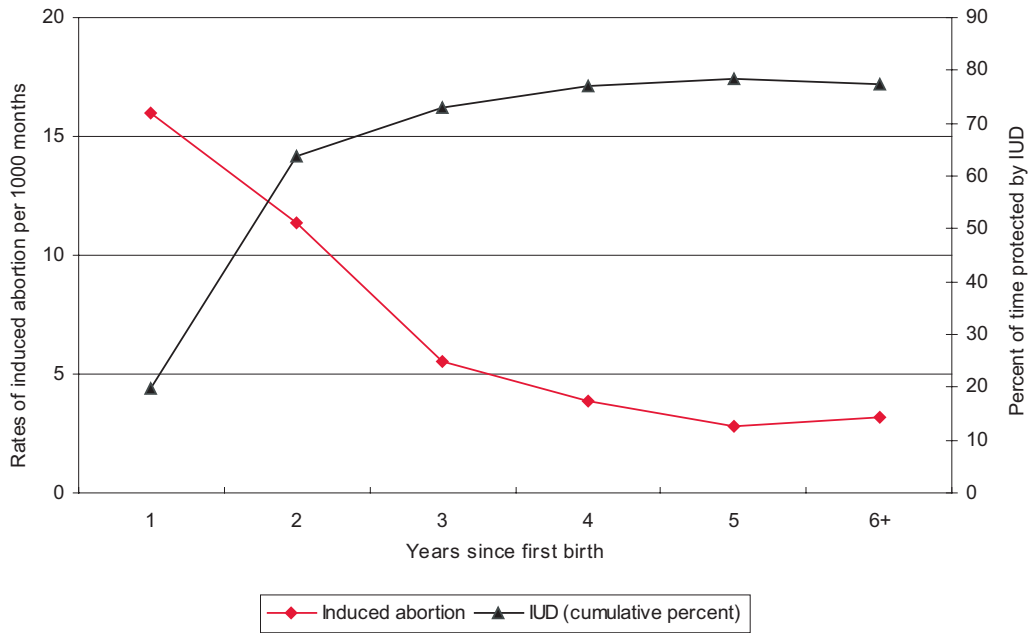
Bongaarts & Westoff (2000) have described mathematically the relationship between contraception and abortion. They show that abortion rates (number of abortions per 1000 women of reproductive age) in a population are related to the following parameters: number of years for which women are both fecund and sexually active, the reproductive time taken for each live birth, and the reproductive time for each abortion. "Reproductive time" includes waiting time to conception, pregnancy, and post-pregnancy period of infertility. Abortion rates are also related to the prevalence and effectiveness of contraception, and the probability of aborting unintended pregnancy. The total fertility rate (TFR) is the number of births a woman would expect to have over her lifetime under the prevailing fertility conditions, and comprises unintended and intended births. The total abortion rate is the number of abortions a woman would expect to have under the prevailing abortion conditions, and can be linked mathematically to the TFR using the parameters described above.

The mathematical links between TFR and abortion rates and the derivation of these links are described in detail by Bongaarts & Westoff (2000). By varying the different parameters one by one, the authors examined the effects on the abortion rate of each individual factor. The model predicts that: early onset of sexual activity, leading to a longer sexual/reproductive span, is positively related to the abortion rate: the number of children desired and the length of lactional amenorrhoea are negatively related to the abortion rate; and, at a given TFR, contraceptive effectiveness exerts an increasingly important effect on abortion rates as prevalence increases (in other words, as contraceptive prevalence rises, contraceptive failure or misuse becomes a more important factor in determining abortion rates).

The expected relationship can be seen in the following example from a prospective study of married couples in Shanghai, China, where, because of the "one child policy", second births are extremely rare. The women in the study had all had one child. Following the birth of the first child, many women initially used relatively ineffective methods: withdrawal, periodic abstinence, and condoms. With each successive year following childbirth, use of these methods was progressively replaced by use of intrauterine devices (IUDs)—a highly effective method. The proportion of women using IUDs rose from 20% in the first postnatal year to 75% in the fifth postnatal year (Fig. 3.1). In the first year following childbirth, the induced abortion rate was 16 per 1000 months of exposure. By the fifth year, the rate was close to zero, thus providing a vivid demonstration of the trade-off between contraceptive effectiveness and induced abortion.

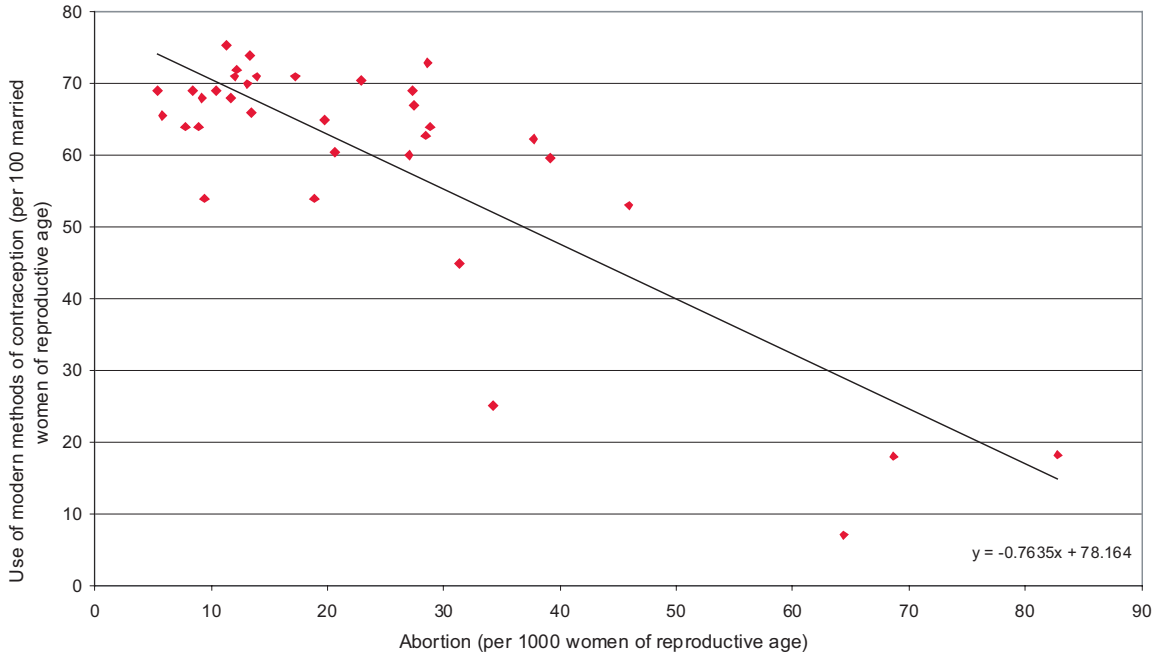
The second illustration involves a compilation of data on abortion and contraceptive use for a number of countries with similar fertility levels and reliable information on contraception and abortion. The fertility band chosen was a TFR of between 1.7 and 2.2 births per woman, to maximize the number of countries and years that could be included. Relevant information was obtained from 11 countries for a total of 36 time points (see Table 3.1 for figures, dates, and countries). All available data points were included from all periods in which the TFR was within the specified band. Fig. 3.2

Fig. 3.1. IUD use and abortion rate in Shanghai, China



Source: Che & Cleland (2001).

Fig. 3.2. Use of modern methods of contraception and abortion rates in various countries with TFR between 1.7 and 2.2 children per woman



shows a scatter plot of abortion rate against prevalence of use of modern contraceptives. The least-squares regression line shows the expected inverse relationship between contraceptive prevalence and abortion rate. When the prevalence of modern method use is around 70%, the abortion rate is typically in the range of 10–30 per 1000 women of reproductive age. When prevalence is 40–60%, abortion rate rises to 30–50 per 1000. Considerable scatter around the regression line is evident, reflecting in part the different denominators used for the two sets of data. Contraceptive use was measured among married or cohabiting women, while abortion rates are based on all women. Nevertheless, Fig. 3.2 provides convincing support for the Bongaarts-Westoff model. Further support is contained in Fig. 3.3, which shows the use of traditional contraceptive methods (e.g. withdrawal, rhythm) against abortion rate, for countries and periods where total contraceptive prevalence exceeds 65%, and where TFR is, again, between 1.7 and 2.2 children per woman. It can be clearly seen that, the greater the relative use of traditional contraceptive methods, the greater the reliance on abortion to arrive at the same TFR. Where modern contraceptives are the principal methods used, abortion rates are far lower.

The third and final illustration comes from the well known Matlab intervention area in Bangladesh. Trends in abortion rates were examined in two areas using longitudinal data collected over the period 1979 to 1995 (Rahman et al., 2001). These were matched with data on fertility preferences from two surveys conducted in 1984 and 1990, to examine differences between intended and unintended pregnancies. In one area (the intervention area), there was a highly active family planning service, and in the other (the comparison area) only the normal government services were in place. At the beginning of the study period, abortion rates were similar in the two areas. From 1983, the abortion rate increased in the comparison area while decreasing in the intervention area. At the end of the study period, the comparison area had an abortion rate more than three times that in the intervention area. From the survey data from 1984 and 1990, the authors report that unintended pregnancies declined in both areas in the intervening period, but the rate of unintended pregnancy was significantly lower and the decline greater in the intervention area. As would be expected, in both areas and both time periods, abortion was much more likely for unintended than for intended pregnancies. In the intervention area, however, women were much less likely to abort intended pregnancies than in the comparison area. Women in the intervention area had better access to reliable contraceptive methods, and the authors suggest that this assisted them in spacing and timing their births as they wished, hence decreasing the proportion of pregnancies aborted due to mistiming. In both areas, the percentage of pregnancies aborted increased significantly between the early 1980s and the late 1990s but in both time periods, the percentage was significantly lower in the intervention area than the comparison area. The role of fertility decline is key in explaining these results: fertility declined in both areas over the period of the study, but the declines were achieved in different ways. In the intervention area, where there was more access to family planning services, contraception was the main method of fertility regulation. In contrast, in the comparison area, where these services were lacking, there were more unintended pregnancies and more abortions. In addition, despite similar desired family sizes in the two areas, at the end of the study fertility was still higher in the comparison area.

Table 3.1. Contraceptive use and abortion rates, selected countries with a TFR of between 1.7 and 2.2

Country	Year	Contraceptive prevalence (per 100 married women of reproductive age)		Abortion rate (per 1000 women of reproductive age)
		All methods	Modern methods	
Bulgaria	1976	75.55	7	64.4†
England and Wales	1976	68	64	8.9
	1983	75	69	10.4
	1986	71	68	11.7
	1989	69	66	13.4
	1991	70	70	13.1
	1993	72	72	12.2
	1995	73	71	12
	1997	74	74	13.3
	1998	72	71	13.9
Scotland	1976	68	64	7.8
	1983	75	69	8.4
	1986	71	68	9.2
	1991	70	70	13.1
Czech Republic	1970	66	25	34.2‡
	1991	78	53	45.9*
	1993	68.9	44.9	31.3‡
Denmark	1970	67	54	9.4†
	1975	63	60	27†
Finland	1971	78	54	18.9†
	1989	77.4	75.4	11.3*
Hungary	1958	58	18	68.7†
	1966	66.6	18.2	82.8†
	1986	73.1	62.3	37.7§
	1992	77.4	59.6	39.1§
Netherlands	1975	75	69	5.35*
	1977	73	65.5	5.8*
Norway	1977	69.2	65	19.7†
	1988	73.8	71	17.2*
Singapore	1977	71.3	62.8	28.4†
	1982	74.2	73	28.6*
United States of America	1976	67.8	60.5	20.6†
	1982	69.7	64	28.8*
	1988	74.3	69.1	27.3*
	1990	70.7	67	27.4*
	1995	76.4	70.5	22.9*

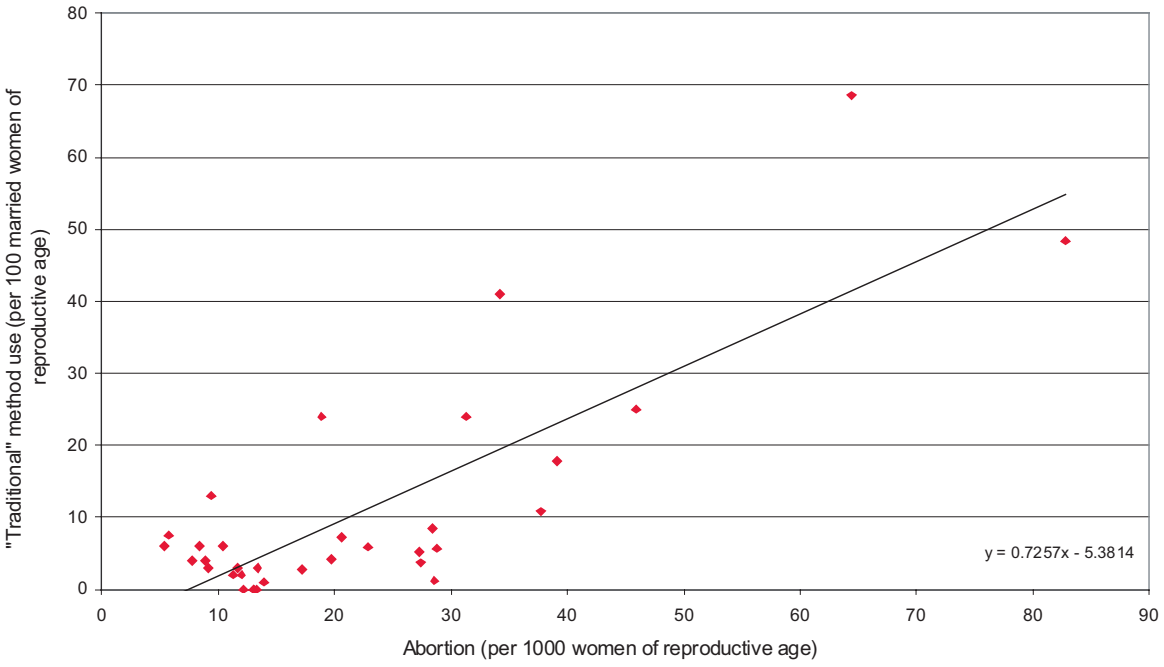
*Sources: all contraception data from UN (1998), except England and Wales and Scotland, from Macfarlane et al. (2000). Abortion data: England and Wales and Scotland from Macfarlane et al. (2000). Other abortion data marked as follows: † = Tietze (1979); ‡ = Wynnyczuk & Uzel (1999); * = Henshaw & Singh (1999); § = David (1999).*

Similar results were obtained in a separate study of Matlab from 1982 to 1995, also using longitudinal data for intervention and control areas (Ahmed et al., 1998).

Trends in different countries—published studies

The relationship between abortion and the change from traditional to modern contraceptive methods was examined in a study in Turkey, based primarily on data from the nationally representative Demographic and Health Surveys in 1993 and 1998 (Senlet et al., 2000; Senlet et al., 2001). The authors found that abortion levels rose sharply after legalization in 1983, but later showed a steady decline from 45 per 1000 married women in 1988 to 25 per 1000 in 1998. During this period of decline in abortion rates, there was a moderate shift away from traditional methods of contraception and an increase in use of modern methods. The authors found that unmet need for contraception did not change during the period, suggesting that the falling abortion rates were partly due to the shift to more effective methods. By simulating different scenarios and comparing them

Fig. 3.3. Use of "traditional" contraceptive methods by married women, and abortion in countries where overall contraceptive prevalence is greater than 65% and TFR is between 1.7 and 2.2 children per woman



with the empirical data, the authors concluded that the principal causes (in order of importance) were: lower propensity to abort pregnancies resulting from failure of traditional methods, decline in failure of traditional methods, and finally, a shift towards modern contraception.

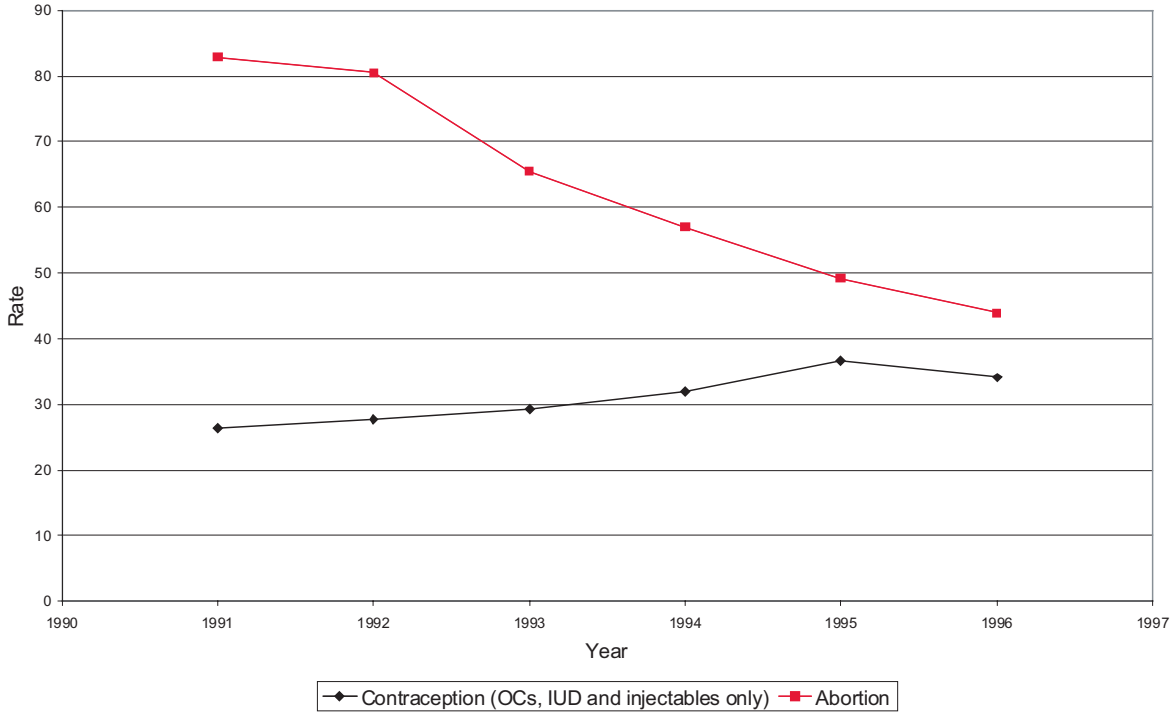
The direct impact of the shift to modern methods was less important in this analysis than the decline in failure of traditional methods. The authors point out, however, that the shift in method use may have contributed indirectly both to the decline in failure rate of traditional methods and to the decline in the propensity to abort pregnancies resulting from such failures: women at particularly high risk of traditional method failure, or particularly likely to abort a pregnancy resulting from such failure, may have been more likely to switch to modern methods.

A detailed examination of the extent to which abortion can be replaced by contraception has been carried out by Westoff et al. (1998), who examined trends in abortion and contraception in the populations of three central Asian republics that were previously part of the USSR (Kazakhstan, Uzbekistan, and Kyrgyzstan). In the Soviet Union, abortion was legal and widely available, while contraceptives were in limited supply. This led to a preference for abortion over contraception in some groups, and high rates of abortion, estimated in 1990 to have reached around 181 per 1000 women of reproductive age (Henshaw, 1990). Abortion rates in the three republics declined over the 1990s, while at the same time there was a rise in use of modern contraceptive methods (see Fig. 3.4–3.6). Westoff et al. showed that abortion rates within the population varied by ethnic group, age, and parity. Ethnic Russians had higher rates of abortion than other groups, and older women and those of higher parity were also more likely to abort their pregnancies. Abortion was found to be used for both spacing and limiting births approximately equally (Westoff et al., 1998, p.27).

In order to analyse the abortion rate in these populations in more detail, the authors divided women into two groups: users and non-users of contraception. Non-users were further subdivided into: (1) those who had never had sexual intercourse so had never been pregnant and never had an abortion; (2) currently pregnant women, some of whom would be expected to abort; (3) women trying to become pregnant, some of whom might abort if they changed their mind after becoming pregnant; (4) women who were at low risk of pregnancy because of infrequent sex or for other reasons; (5) women at risk of pregnancy, who wanted to avoid pregnancy, but who were not using any method of contraception, i.e. those with an unmet need (Westoff et al., 1998, p.37). Of women who had aborted their last pregnancy, the largest group in each population was of women with an unmet need for contraception (Fig. 3.7), suggesting that improved uptake of contraception was probably an important component in reducing the abortion rate in these populations.

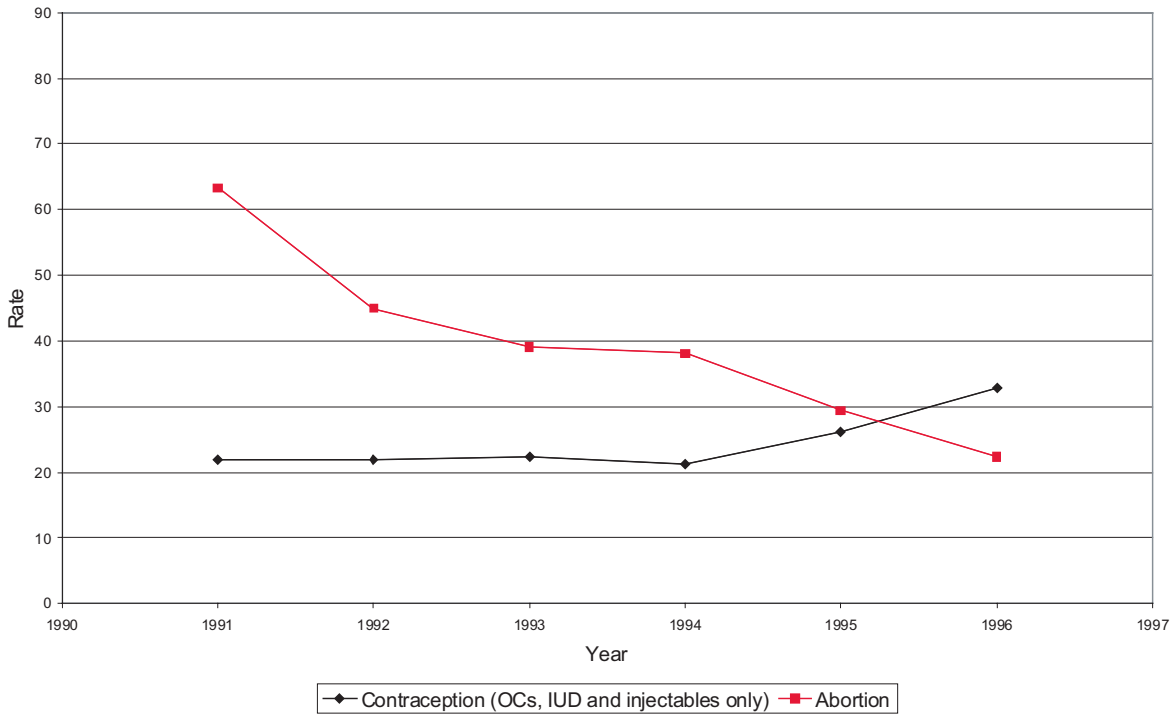
Subsequent analysis using data from the 1999 Kazakhstan Demographic and Health Survey revealed evidence both of a continuing increase in use of modern contraception and of declining use of abortion: contraceptive prevalence in Kazakhstan increased by 50% in the 1990s, while abortion decreased by the same amount (Westoff, 2000).

Fig. 3.4. Trends in abortion and contraception in Kazakhstan



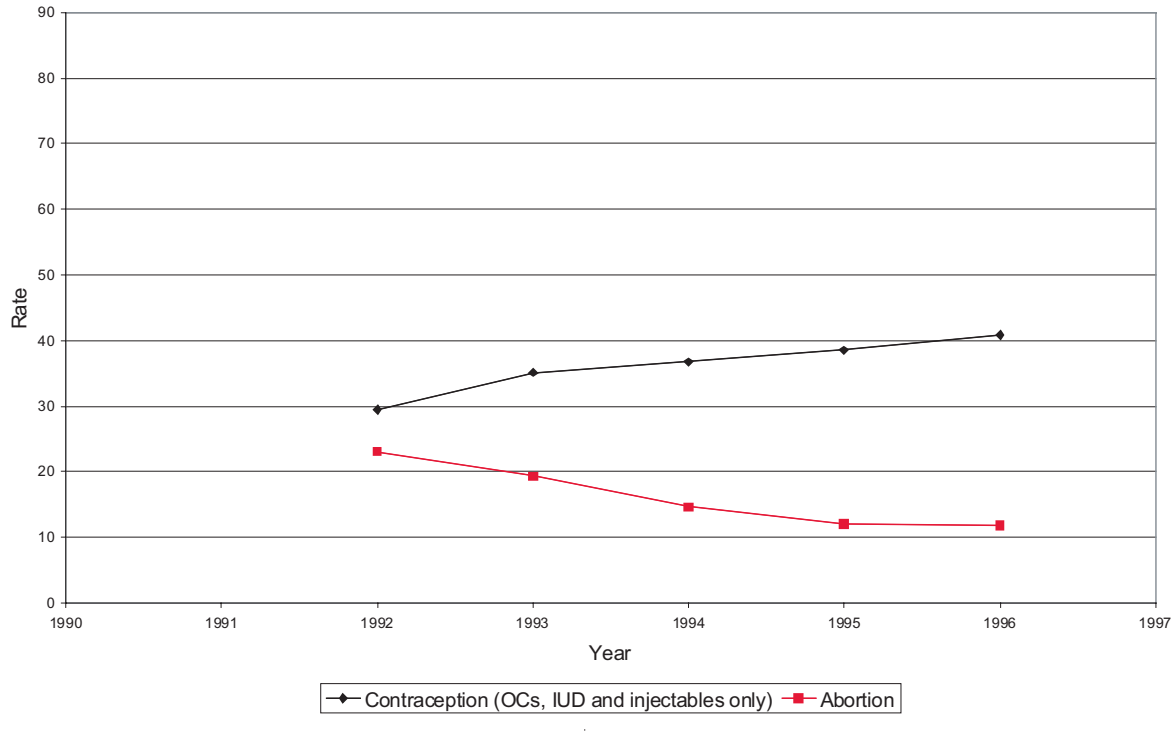
Sources: abortion data from Henshaw et al. (1999), contraception data from Westoff et al. (1998). Abortion per 1000 women of reproductive age, contraception per 100 married women of reproductive age.

Fig. 3.5. Trends in abortion and contraception in Kyrgyzstan



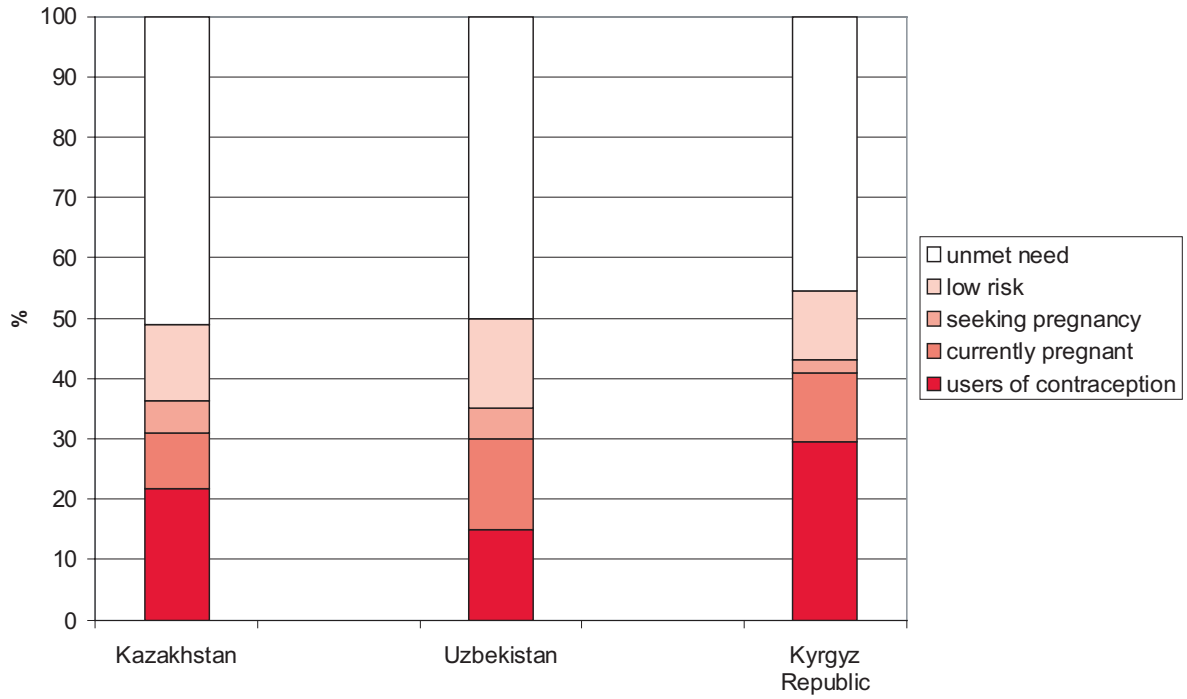
Sources: abortion data from Henshaw et al. (1999), contraception data from Westoff et al. (1998). Abortion per 1000 women of reproductive age, contraception per 100 married women of reproductive age.

Fig. 3.6. Trends in abortion and contraception in Uzbekistan



Sources: abortion data from Henshaw et al. (1999), contraception data from Westoff et al. (1998). Abortion per 1000 women of reproductive age, contraception per 100 married women of reproductive age.

Fig. 3.7. Components of abortion: percentage of recent abortions contributed by different categories of women



Source: Westoff et al. (1998), p.38 (slightly adapted). Data refer to abortions in a three-year period: Kazakhstan 1993-95; Uzbekistan 1993-95; Kyrgyzstan 1994-96.

Trends in abortion and contraception—new evidence

The data included in this part of the study had the following characteristics. First, countries were selected if they had reasonable abortion data; in this regard, we followed the judgement of Henshaw et al. (1999). In addition, for the analysis of trends, it was necessary to have data on contraceptive prevalence in the population as a whole for at least two points in time, to reflect any change that may have taken place. These criteria effectively excluded many countries where the accuracy of abortion reporting is questionable, for example where abortion is illegal, or where there is no central reporting system. In addition, for many countries contraceptive prevalence data for many countries were unavailable for the same period as abortion data. As can be seen from the figures presented below, for many countries data on contraceptive prevalence were available for only two points in time, and any fluctuations between the two points are therefore invisible. Countries where data were available but where contraception levels had changed little were also excluded (although some were included in the scatter plots shown in Fig. 3.2 and 3.3). Data were obtained from a range of sources, as listed in the main text. The final selection of 11 countries for analysis is shown in Table 3.2.

Rise in contraceptive use accompanied by fall in abortion

Trends in abortion and contraception levels over time in Bulgaria, Switzerland and Tunisia are consistent with evidence presented earlier that modern contraception can replace abortion. The trends are shown in Fig. 3.8–3.10. In Bulgaria (Fig. 3.8), modern methods of contraception were difficult to obtain until around 1975 (Vassilev, 1999). The relatively high abortion incidence in 1980 dropped over the 1980s and 1990s as the use of modern contraception increased. Since fertility levels were steady for much of this period, it appears that use of modern methods reduced the need for induced abortion in the population.

This pattern of abortion apparently being replaced by contraception is also seen in trend data for Tunisia (Fig. 3.9). Switzerland may also provide an example of this type of trend (Fig. 3.10). The levels of abortion are very low in Switzerland, however, and changes over time are so small that it is difficult to reach any firm conclusions.

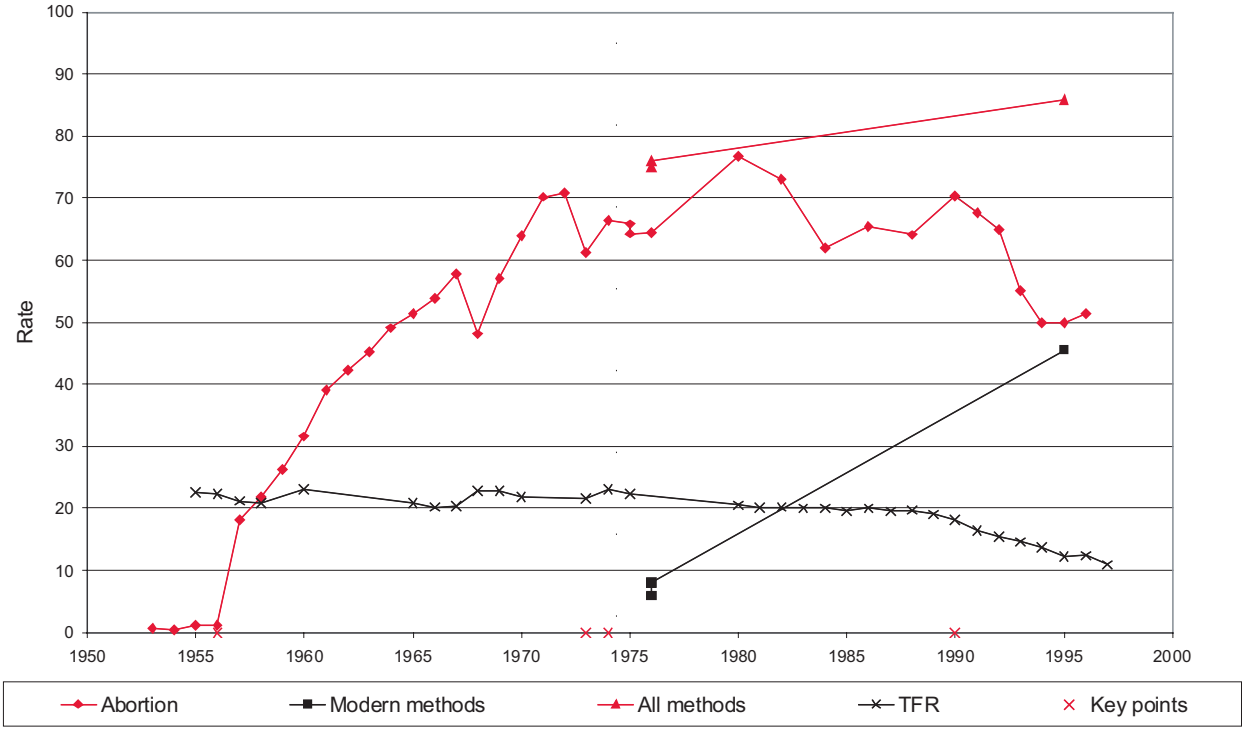
Simultaneous rises in abortion rate and contraceptive use

Many populations do not show the expected inverse relationship between contraception and abortion; in other words, rising levels of contraception are not associated with falling levels of abortion. It is likely that this can be largely explained by simultaneous changes in the TFR, so that contraceptive supplies cannot keep pace with people's desire for smaller families. The graphs in Fig. 3.11–3.16 show trends in levels of abortion, contraceptive use, and TFR in a number of countries, to illustrate this situation.

Table 3.2. Inclusion criteria for countries in investigation of trends in contraceptive use

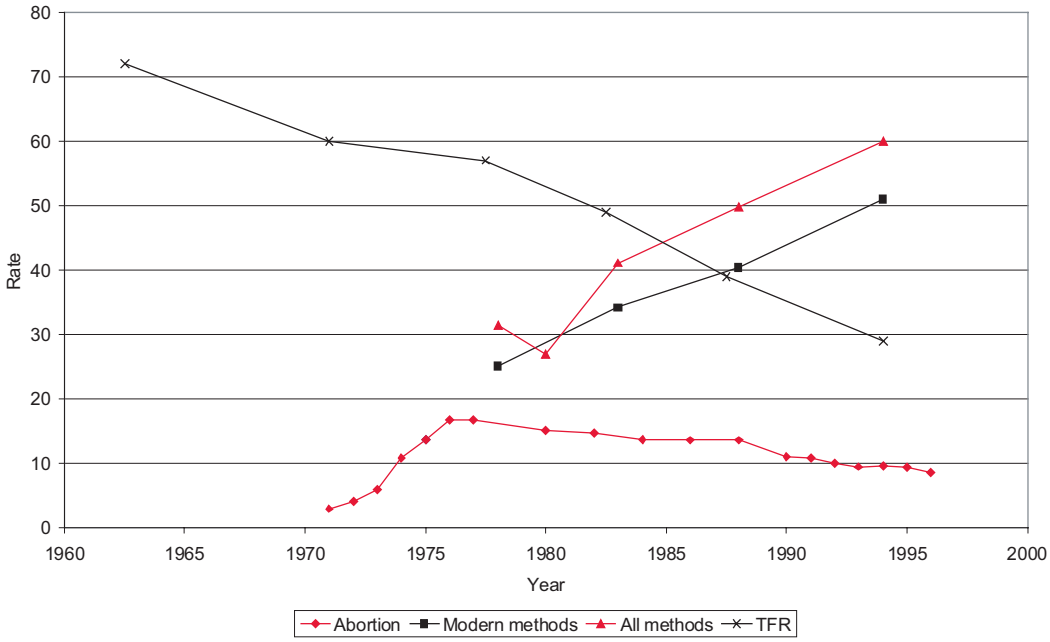
Countries with relatively reliable abortion data	Data available on trends in levels of contraception	Change in level of contraception over time
Belarus		
Belgium		
Bulgaria	✓	✓
Canada	✓	
Cuba	✓	✓
Denmark	✓	✓
Estonia		
Finland	✓	
Great Britain	✓	
Hungary	✓	✓
Israel		
Kazakhstan	✓	✓
Latvia		
Netherlands	✓	✓
New Zealand	✓	
Norway	✓	
Republic of Korea	✓	✓
Singapore	✓	✓
Slovak Republic	✓	
Slovenia		
Sweden		
Switzerland	✓	✓
Tunisia	✓	✓
United States	✓	✓

Fig. 3.8. Trends in abortion, contraception, and fertility in Bulgaria



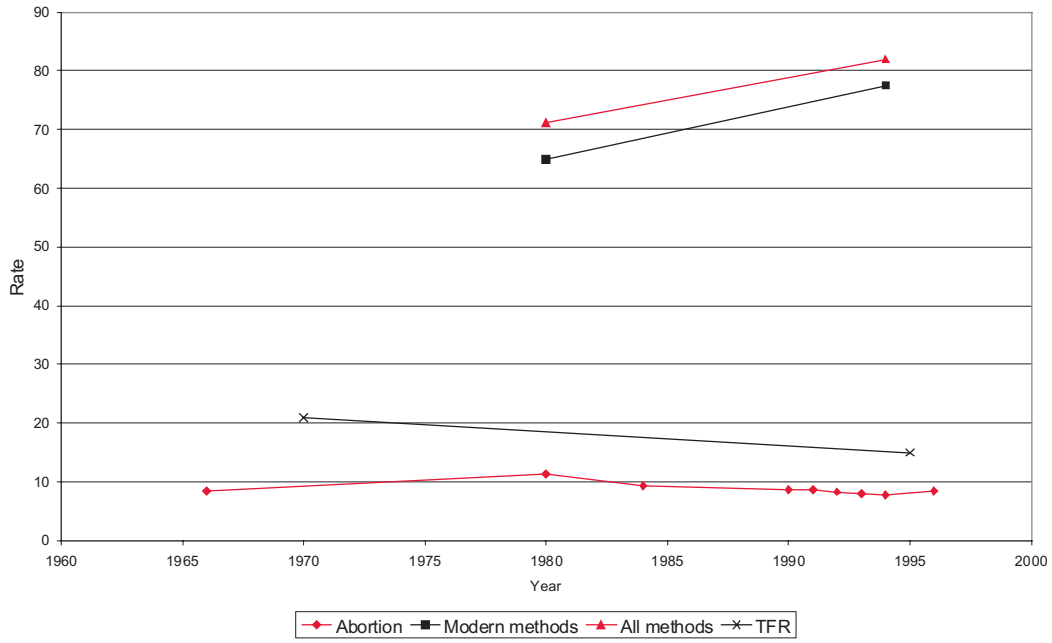
Key points: abortion on request 1956; abortion for childless women restricted 1968; restrictions tightened further 1973; restrictions relaxed 1974; first-trimester abortions available on request 1990 (Vassilev, 1999).
Sources: abortion data from Tietze (1979), Henshaw et al. (1999), and Vassilev (1999); contraception data from United Nations (1998); TFR from Vassilev (1999). Abortion per 1000 women of reproductive age, contraception per 100 married women of reproductive age, TFR per 10 women of reproductive age.

Fig. 3.9. Trends in abortion, contraception, and fertility in Tunisia



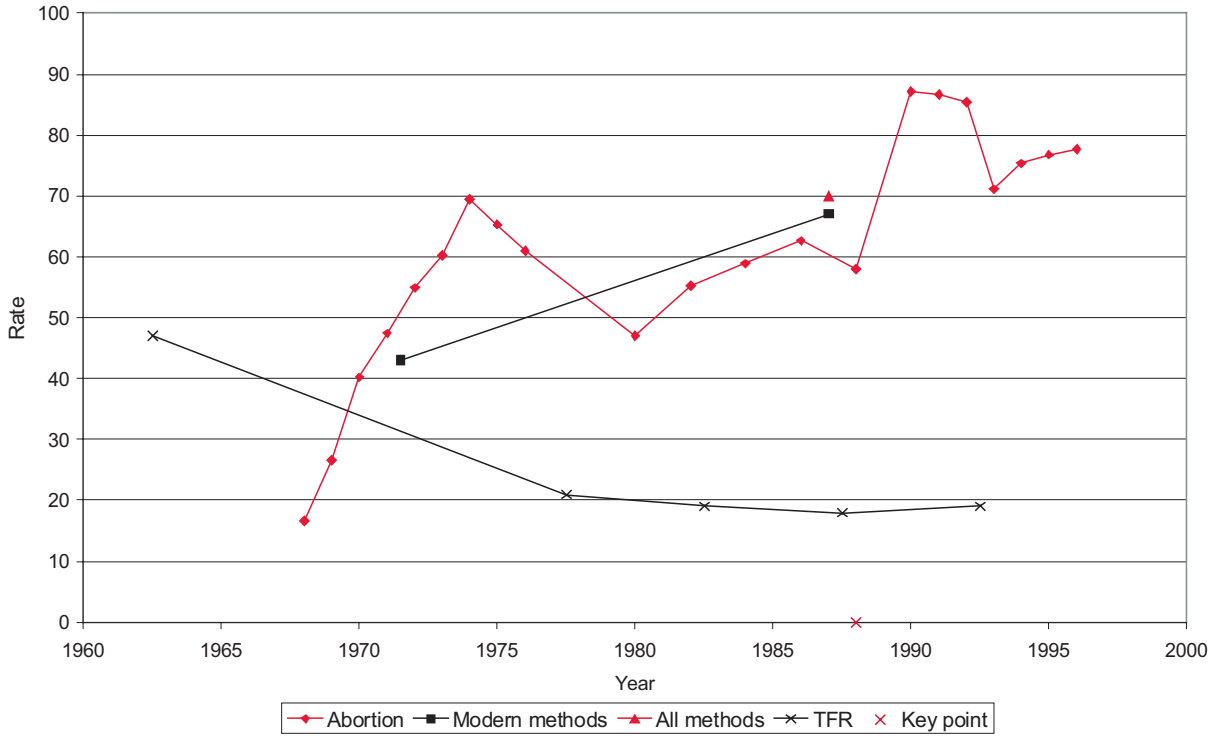
Sources: abortion data from Tietze (1979) and Henshaw et al. (1999); contraception data from United Nations (1998); TFR from Ross et al. (1993) and UN website. Abortion per 1000 women of reproductive age, contraception per 100 married women of reproductive age, TFR per 10 women of reproductive age.

Fig. 3.10. Trends in abortion, contraception, and fertility in Switzerland



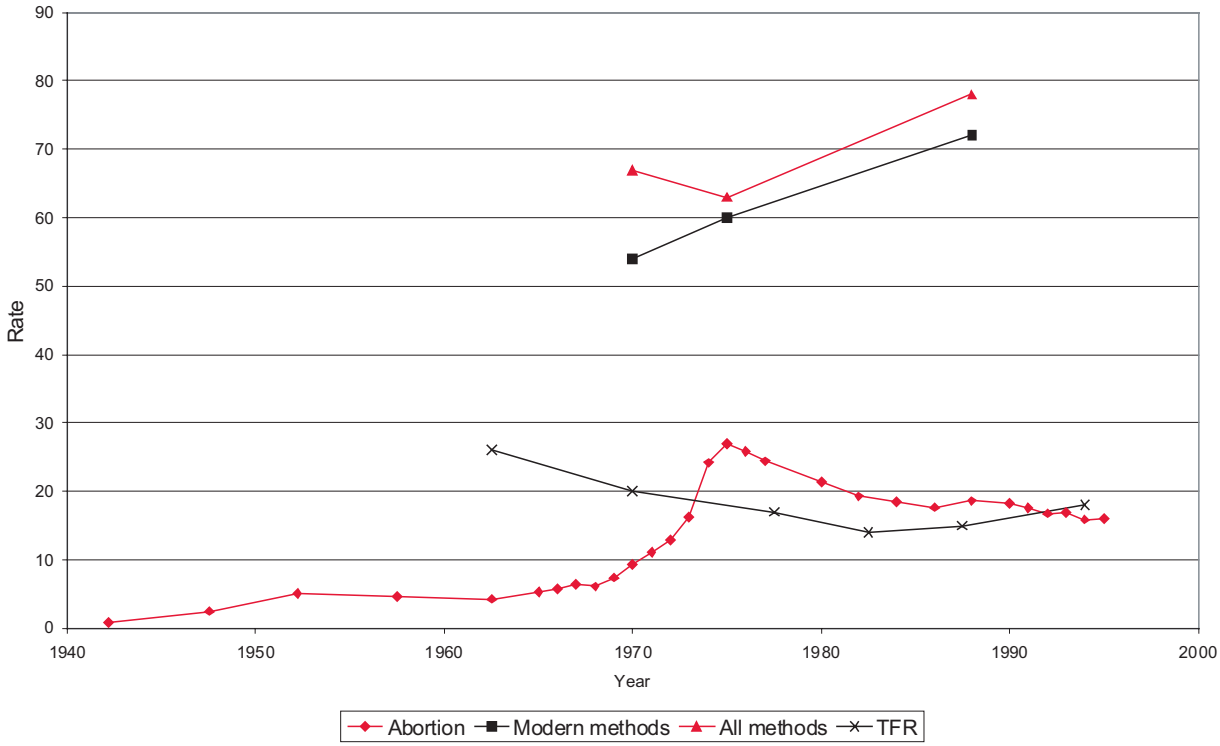
Sources: abortion data from Tietze (1979) and Henshaw et al. (1999); contraception data from United Nations (1998); TFR from Ross et al. (1993) and UN website. Abortion per 1000 women of reproductive age, contraception per 100 married women of reproductive age, TFR per 10 women of reproductive age.

Fig. 3.11. Trends in abortion, contraception and fertility in Cuba



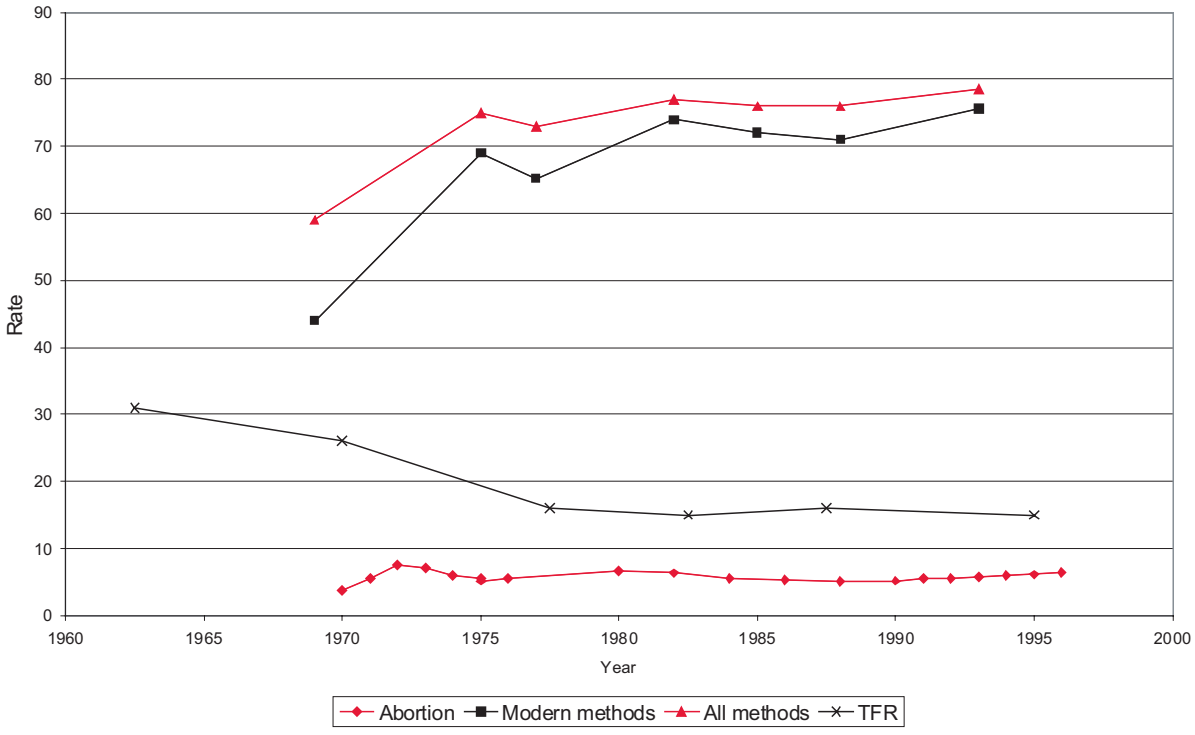
Key point: introduction of menstrual regulation in the late 1980s. Sources: abortion data from Tietze (1979) and Henshaw et al. (1999); contraception data from Noble & Potts (1996) and United Nations (1998); TFR from Ross et al. (1993). Abortion per 1000 women of reproductive age, contraception per 100 married women of reproductive age, TFR per 10 women of reproductive age.

Fig. 3.12. Trends in abortion, contraception, and fertility in Denmark



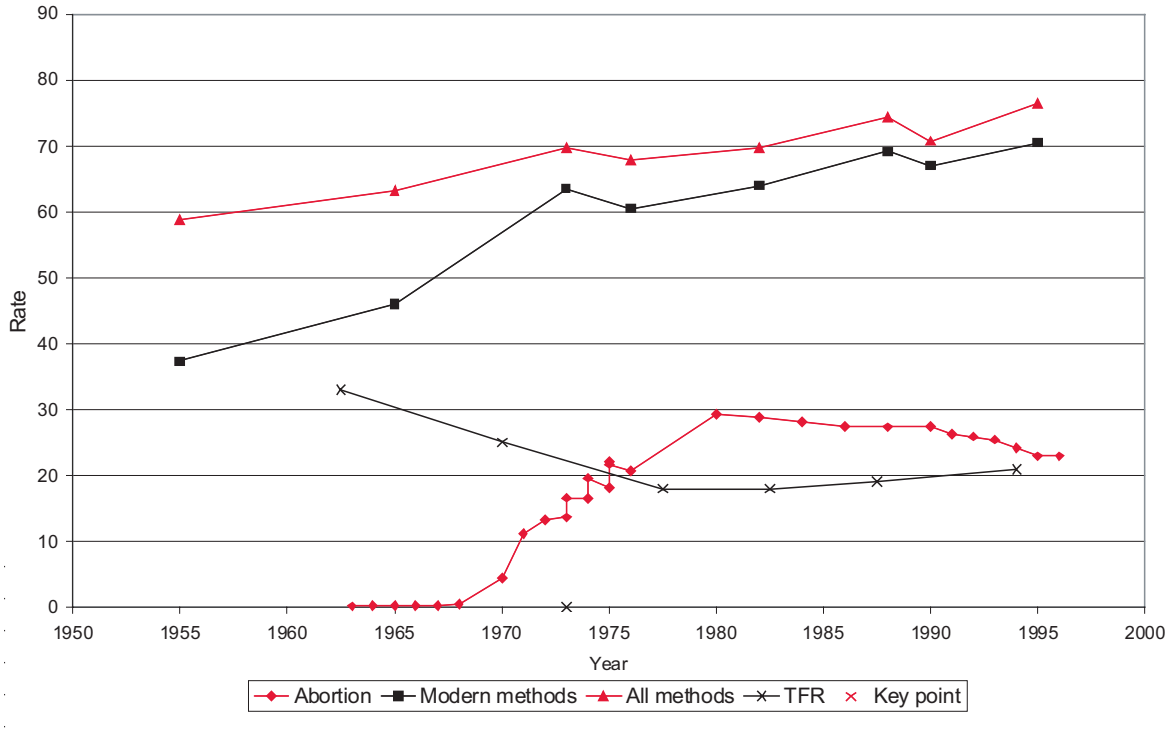
Sources: abortion data from Tietze (1979) and Henshaw et al. (1999); contraception data from United Nations (1998); TFR from Ross et al. (1993) and UN website. Abortion per 1000 women of reproductive age, contraception per 100 married women of reproductive age, TFR per 10 women of reproductive age.

Fig. 3.13. Trends in abortion, contraception, and fertility in the Netherlands



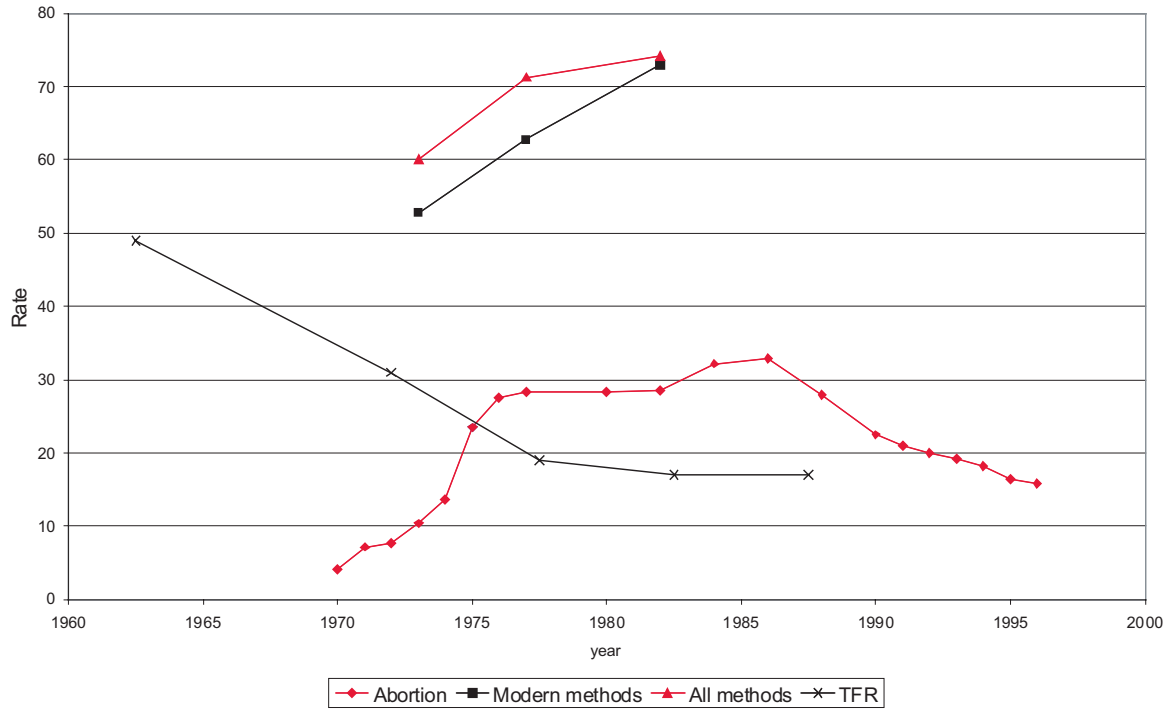
Sources: abortion data from Tietze (1979) and Henshaw et al. (1999); contraception data from United Nations (1998); TFR from Ross et al. (1993) and UN website. Abortion per 1000 women of reproductive age, contraception per 100 married women of reproductive age, TFR per 10 women of reproductive age.

Fig. 3.14. Trends in abortion, contraception, and fertility in the United States



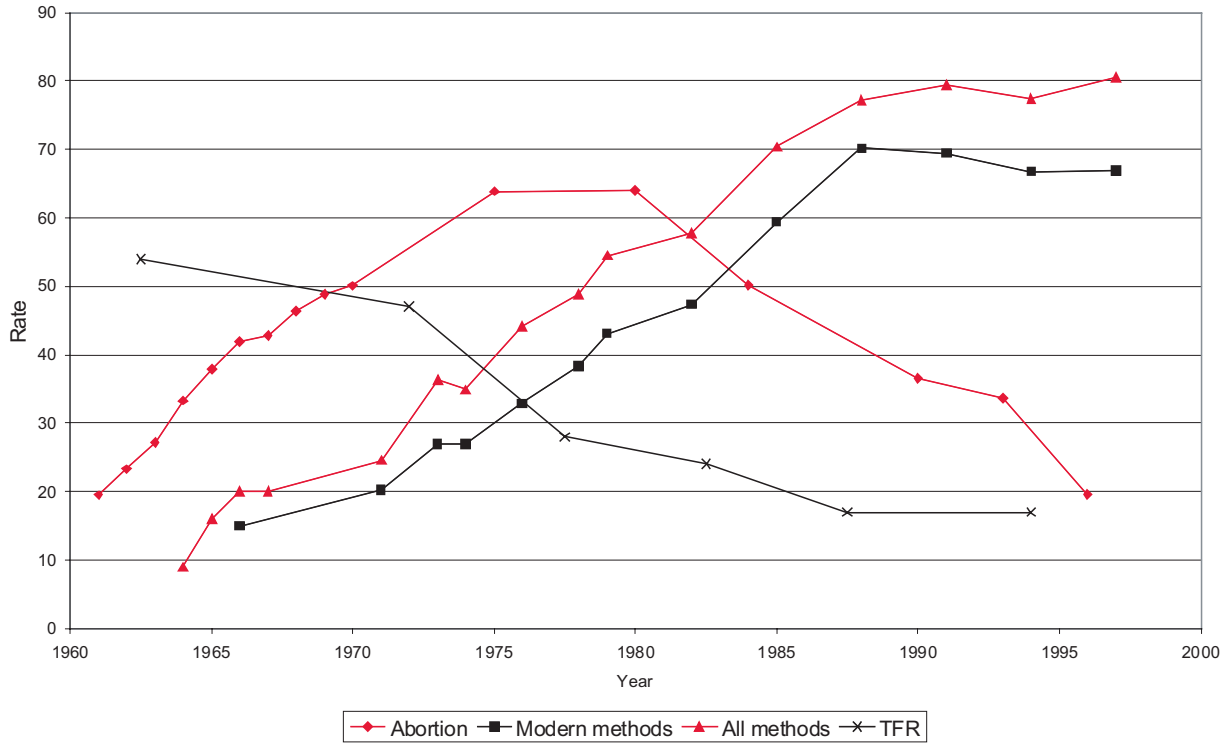
Key point: legalization of abortion 1973. Sources: abortion data from Tietze (1979) and Henshaw et al. (1999); contraception data from United Nations (1998); TFR from Ross et al. (1993) and UN website. Abortion per 1000 women of reproductive age, contraception per 100 married women of reproductive age, TFR per 10 women of reproductive age.

Fig. 3.15. Trends in abortion, contraception, and fertility in Singapore



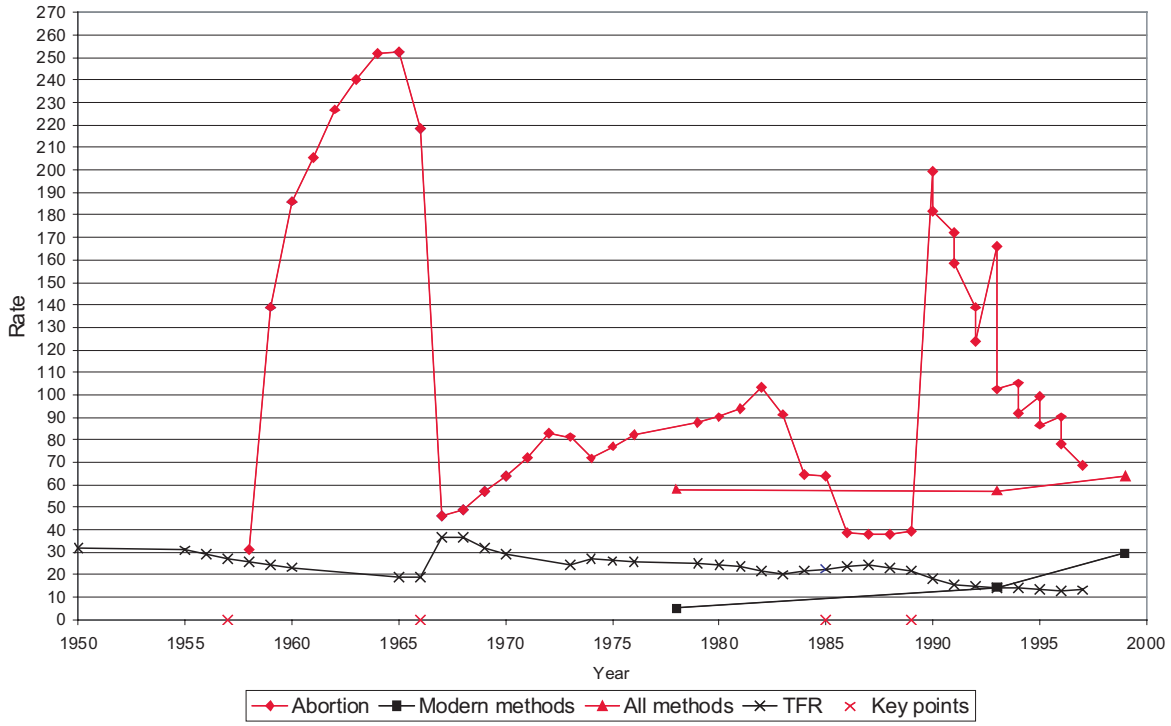
Sources: abortion data from Tietze (1979) and Henshaw et al. (1999); contraception data from United Nations (1998); TFR from Ross et al. (1993) and UN website. Abortion per 1000 women of reproductive age, contraception per 100 married women of reproductive age, TFR per 10 women of reproductive age.

Fig. 3.16. Trends in abortion, contraception, and fertility in the Republic of Korea



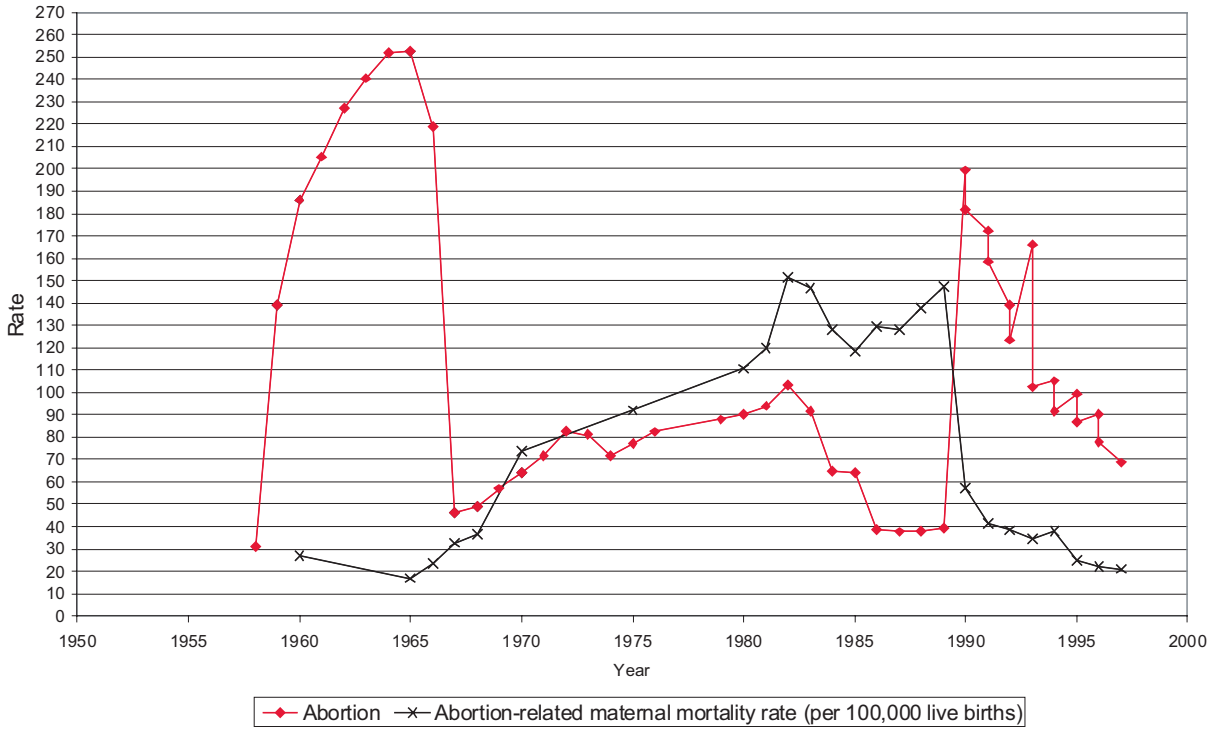
Sources: abortion data from Tietze (1979) and Henshaw et al. (1999); contraception data from United Nations (1998); TFR from Ross et al. (1993) and UN website. Abortion per 1000 women of reproductive age, contraception per 100 married women of reproductive age, TFR per 10 women of reproductive age.

Fig. 3.17. Trends in fertility, abortion and contraception in Romania



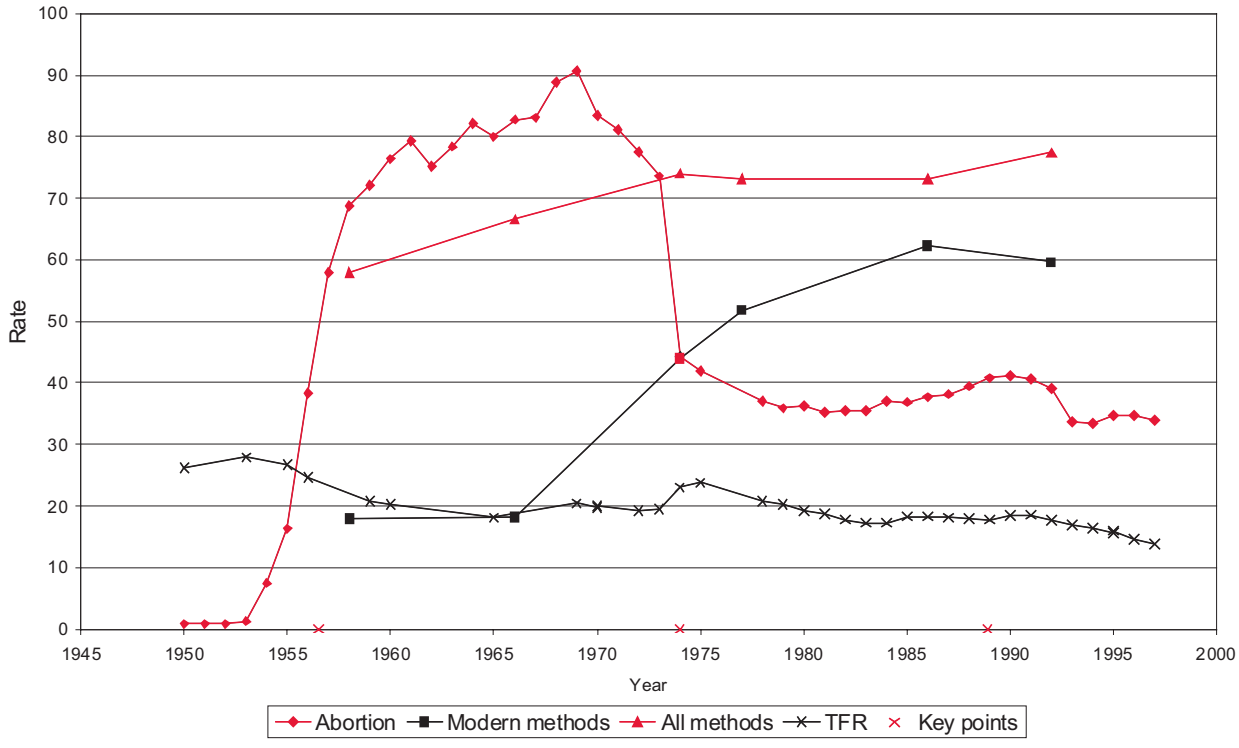
Key points: abortion on request legalised 1957, abortion restricted 1966, further restricted 1985, abortion legalized 1989 (Baban 1999). Sources: abortion data from Baban (1999) and Henshaw et al. (1999); contraception data from United Nations (1998); TFR from Baban (1999). Abortion per 1000 women of reproductive age, contraception per 100 married women of reproductive age, TFR per 10 women of reproductive age.

Fig. 3.18. Trends in abortion and in abortion-related maternal mortality in Romania



Sources: abortion data from Baban (1999) and Henshaw et al. (1999); maternal mortality ratios from Baban (1999). Abortion per 1000 women of reproductive age.

Fig. 3.19. Trends in abortion, contraception, and fertility in Hungary



Key points: abortion law liberalized 1956; restrictions on abortions imposed 1974; abortion committees abolished 1988.
Sources: abortion data from David (1999), Tietze (1979) and Henshaw et al. (1999); contraception data from United Nations (1998); TFR from David (1999) and UN website. Abortion per 1000 women of reproductive age, contraception per 100 married women of reproductive age, TFR per 10 women of reproductive age.

In Cuba (Fig. 3.11), use of contraception increased over the period 1970–1985, while abortion levels also increased between 1967 and 1995. This simultaneous rise in the two means of fertility regulation, however, coincided with a dramatic drop in fertility in the country from over four births per woman in 1965 to under two births per woman in the 1990s. It is likely that the increase in modern contraceptive use alone was not sufficient to attain these lower levels of fertility and women still resorted to induced abortion. Eventually abortion should be replaced by contraception if levels of the latter continue to rise and fertility remains stable.

The same pattern is seen in Denmark (Fig. 3.12), the Netherlands (Fig. 3.13), and the United States (Fig. 3.14). In these countries, as in Cuba, there was a noticeable rise in abortion incidence as contraception levels increased, while fertility levels dropped. Unlike Cuba, however, this initial simultaneous rise in abortion and contraception levels was followed in these countries by a decline in abortion. This occurred in the early 1970s in the Netherlands, the mid-1970s in Denmark, and the early 1980s in the United States. This decline was accompanied in each country by a continued rise in levels of contraception, and the stabilization of fertility at a lower level than before.

In Singapore (Fig. 3.15), the same pattern of an initial rise in both abortion and contraception under conditions of fertility decline (1970–1985) was followed by a decline in abortion levels (1985–1997). Data on levels of contraception were not available for this latter period.

One country for which long time series of data on both contraception and abortion are available is the Republic of Korea (Fig. 3.16), although the abortion data are not considered to be of very high quality (Henshaw et al., 1999). Nevertheless, the trends represent a complete example of the pattern described above for Denmark, Netherlands and the United States. As the graph shows, contraception levels and rates of abortion rose simultaneously until the late 1970s, when the abortion rate reached a peak and subsequently fell, while contraceptive prevalence continued to rise. This phenomenon can be explained, at least in part, by the fact that from the early 1960s to the late 1970s, the Republic of Korea was in transition from high to low fertility. People were starting to want smaller families, and the TFR was falling. As discussed earlier, the simultaneous rise in both contraception and abortion may be explained by the fact that contraceptive uptake could not match the growing need for fertility regulation, and women resorted increasingly to abortion.

Government legislation and abortion levels

The legal status of abortion affects levels of abortion in a population in a complex way: for example, some of the lowest abortion rates in the world occur where abortion is legal (e.g. western Europe) and some of the highest where it is illegal (e.g. many Latin American countries) (Dailard, 1999). Nevertheless, changes in legislation can have dramatic effects on rates of legal abortion. If these are not accompanied by corresponding changes in levels of contraception or fertility, it is likely that legal abortions replace illegal abortions or vice versa, rather than that the abortion levels overall change. Fig. 3.17 shows the case of Romania, where abortion was the principal method of limiting fertility after its legalization in 1957. The effects of the sudden legislative change in 1966, which restricted legal abortions, can be seen in the subsequent dramatic decrease in the abortion rate and the near doubling of the TFR. The restrictions on abortion were part of a set of pronatalist policies that also included restrictions on divorce and access to contraception, special taxes on childless individuals, and limitations on incentives for childbearing, such as paid medical leave during pregnancy (Baban, 1999).

One of the first acts of the new government in December 1989 was to reverse many of these restrictions, making legal abortion more accessible again (Baban, 1999). Access to contraceptives, however, was still restricted (Baban, 1999). While the general trends shown in Fig. 3.17 and Fig. 3.18 are likely to resemble what occurred in the Romanian population, data on abortions were politically sensitive during the Ceausescu regime (1974–1989), and the precise levels reported, particularly during the 1980s, are likely to be inaccurate (Baban, 1999). In Romania, as in other countries where abortion is illegal or very restricted, maternal mortality and morbidity increased considerably as soon as the restrictions were implemented. Fig. 3.18 shows the relationship between reported abortion levels and maternal mortality related to abortion. The fact that abortion-related mortality increased during the 1980s when legal abortions were highly restricted, from the low levels in the 1960s when abortion was available on demand, suggests that many women may have resorted to illegal, unsafe abortion during the 1980s. It has been estimated that 87% of all maternal deaths in the period were attributable to illegal abortions (Hord et al., 1991).

Other examples exist of the link between legality of abortion and maternal mortality. In Sweden, abortion-related mortality in the 1970s was 99.9% lower than in the 1930s. This change has been linked to the legalization of abortion (Högberg & Wall, 1990).

A similar change in abortion rates occurred in Hungary as abortion laws changed (Fig. 3.19). In Hungary, however, the situation is less clearly related to legislative change, first because abortions could be obtained despite restrictions (David, 1999), and second because the decrease in abortion rates following legislative restrictions was also accompanied by an increase in use of modern contraception that would be expected to reduce the need for abortion. Hungary was the only socialist country in Eastern Europe actively to promote family planning, and it has been suggested that this promotion and consequent increase in use of modern methods was directly responsible for the subsequent decline in abortion rates (David, 1999).

Conclusion

Empirical study of the aggregate relationships between contraceptive use and induced abortion has to be limited to those few countries where reasonably reliable information exists on both variables. Despite this severe limitation, there is ample evidence of the truism outlined in the first paragraph of this section: if other factors are constant, a rise in contraceptive use or effectiveness must lead to a decline in induced abortion and vice versa. When fertility levels in a population are changing, the relationship between contraceptive use and abortion may take a variety of forms, frequently involving a simultaneous increase in both. This paper has referred to countries where contraception and abortion have risen in concert (Cuba, Denmark, Netherlands, Republic of Korea, Singapore and USA). Without exception, however, total fertility was falling over the same period of time.

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