Fertility Patterns of Adolescent and Older Women in Pacific Island Countries: Programme Implications

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Compared with some regions of the world, adolescent fertility in the Pacific island countries is certainly not high, but unmet need for contraception among older women is significant

Following the International Conference on Population and Development (ICPD) in Cairo in September 1994, much concern has been expressed about the importance of the life-cycle stage of adolescence, the powerfully formative time of transition to adulthood. What happens to the individual during this period shapes how they will live their adult lives, in the reproductive arena as well as in the social and economic realm. ICPD was especially concerned over the vulnerable reproductive health status of adolescents, particularly females between the ages of 15 and 19 years, partly due to their changing demographic and sexual behaviour. Indications are that, while the mean age at menarche has been falling, both the mean age at first marriage and age at first intercourse have been rising, but the increase in age at marriage is greater, resulting in an extended period of possible exposure to adolescent pregnancy (Bongaarts and Cohen, 1998). Adolescents, especially those aged 15 to 19 years, are believed to engage in high levels of unprotected sexual activity both within and outside marriage, leaving them exposed to the risk of unplanned and unwanted pregnancy, and contracting sexually transmitted diseases (STDs) including HIV/AIDS. Such behaviour, often resulting in early out-of-wedlock pregnancy, constitutes a major threat to the health of these adolescents, as well as retarding their potential educational, career and economic development.

Recently, organizations in many countries have created a wide range of programmes to respond to the reproductive health needs of adolescents, although it is fully recognized that existing programmes are too few and too limited to meet the global need. This need is reflected in the approximately 1 billion persons who are adolescents, 85 per cent of whom live in developing countries. Very many adolescents are sexually active and at risk of numerous reproductive health dangers, such as unsafe abortion and sexually transmitted diseases. It should be mentioned that 40 per cent of all new HIV infections occur among persons 15-24 years old.

Clearly, adolescents are a sizeable, vulnerable group. The global community, and UNFPA in particular, is justified in highlighting their specific problems. Adolescents often lack basic reproductive health information, skills in negotiating sexual relationships, and access to affordable, confidential reproductive health services. Concerns about privacy or the ability to pay, and real or perceived disapproval by service providers further limit access to services where they exist, as do legal barriers to information and services in some countries. Many adolescents lack strong stable relationships with parents or other adults with whom they can talk about their reproductive health concerns.

This increased concern for the health and welfare of young people is to be welcomed and it has been echoed repeatedly in recent years in the Pacific island countries. Indeed, much of the rationale for UNFPA's current programme in the region is premised on the belief that adolescents are increasingly sexually active, often exposed to early pregnancy and infections from sexually transmitted diseases, and frequently by-passed by the institutions and personnel responsible for the provision of reproductive health services, including family planning.

The adverse social and economic consequences for an adolescent girl who becomes pregnant and delivers a baby will depend on her particular marital, cultural, familial and community situation. However, the physical and health consequences for the mother and her child are universally recognized as problematic (Singh, 1998). From the societal and familial viewpoint, the consequences of adolescent pregnancy and childbirth, especially that of very young adolescents, are profound. In less developed countries, where health conditions are poor and anamia and malnutrition are common, and where access to health care is inadequate, adolescent pregnancy can bring forth very high risks to the immediate and long-term health status of the mother and child.

No doubt, the adverse social, economic and personal repercussions of adolescent childbearing are inversely related to the age of the teenage mother. The young mother will invariably drop out of school and any opportunities for further education will be curtailed; she is very likely to be unmarried and to become overly dependent on her family for economic support. Her lifetime opportunities for self-advancement will have been seriously damaged by the act of early motherhood.

While accepting, unequivocally, that adolescent reproductive health, particularly the deleterious consequences for the subjects of unprotected sexual activity and teenage pregnancy, should be a prime concern of UNFPA and other development agencies, the purpose of this article is to bring an element of circumspection to the often seemingly alarmist popular perceptions about trends in adolescent sexual behaviour which are widely portrayed in the local media.1 We wish to investigate whether adolescent birth rates are high and rising over time in the Pacific island

countries, as is widely believed, and whether they are high relative to past years and to other developing regions in the world. We conclude by examining the merits of also focusing financial and technical assistance on another vulnerable group of women, those exposed to pregnancy over the age of 35 years, whose claims for special treatment seem to have been subordinated by the perception of rising rates of teenage pregnancy in the subregion in recent years.

Patterns of adolescent fertility in the Pacific island countries

No doubt the societal consequences of an early age at initial childbearing are profound and can be especially adverse if the mother is unmarried. They will vary according to the timing of childbirth during the adolescent years as well as the proportion of women who start childbearing at different ages. The level of, and changes over time in, adolescent childbearing are examined here, to the extent possible, using various measures. The overall rate is best captured by the age-specific fertility rate (ASFR), particularly for females aged 15-19 years. Another indicator is the proportion of all births in a year attributable to adolescents, or more definitively, to those aged 15-19. On the other hand, the timing of childbearing is better measured by the proportion who have had a child by selected ages within the period of adolescence, say by the age of 20.

ASFR measures the annual number of live births per thousand women in each of seven age groups (15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49) and is a valuable measure of current childbearing performance by these cohorts. Very few Demographic and Health Surveys (DHS) have been conducted in the Pacific island countries and the development of a registration system of vital events (births, deaths and marriages) remains in its infancy in the great majority of the countries. Reliance on registered births from incomplete hospital records would produce very misleading results as coverage rates vary from year to year. Therefore, in most cases, we must rely on decennial population censuses for information on childbearing to trace the evolution of changing patterns of adolescent fertility.

These data are taken from the demographic analyses of past censuses. While we cannot vouch for the reliability of the data, they are likely to be the best available. It is also likely that, over time, their reliability has improved as national statistical offices have gained experience and built national capacity, often through the support of donor organizations. For the Pacific island countries, how high is current adolescent fertility, and what has been happening to the ASFR of adolescents over time? The only available source and most reliable evidence comes from national censuses. Table 1 provides the annual number of births per thousand females aged 15-19 at various times over the last 30-40 years in the Pacific island countries and major regions of the world.

Table 1. Age-specific fertility rates for females 15-19 years old, by country, for selected years

Country or area	1960s	1970s	1980s	1990s
Melanesia				
Fiji:				
Fijians	55	42	-	-
Indians	96	53	-	-
All	-	-	65	54
Papua New Guinea	69	63	41	77
Solomon Islands	-	142	101	-
Vanuatu	102	91	60	-
Micronesia				
Federated States of Micronesia	-	90	68	54
Kiribati	109	76	51	44
Marshall Islands	171	155	162	-
Palau	91	81	53	45
Polynesia				
Cook Islands	128	89	83	76
Tonga	-	32	28	28[a]
Tuvalu	-	17	-	39
Samoa	-	41	-	22
Niue	-	-	-	32
Elsewhere				
World total	-	-	-	60
Africa	-	-	-	136

Asia	-	-	-	45
Europe	-	-	-	27
Latin America and Caribbean	-	-	-	79
North America	-	-	-	60
Oceania	-	-	-	28

Source: National censuses and United Nations (1995). World Population Prospects: The 1994 Revision, New York. a Latu, R. (1996). "Reproductive health and family planning: sectoral review for the Kingdom of Tonga". UNFPA Country Support Team, Suva, mimeographed.

While the longevity of the data series differs across countries, what can we conclude from table 1 about general patterns of change in childbearing of adolescents? With a few exceptions (Marshall Islands, Papua New Guinea and Tuvalu) it can be concluded that adolescent fertility has fallen over the years in the Pacific island countries at a time when overall fertility was generally declining for all women. The lowest rates of adolescent fertility are found in Polynesia (Samoa 22 and Tonga 28) with some of the highest rates being found in Micronesia (Marshall Islands 162 in 1988) and Melanesia (Papua New Guinea 77 in 1996 and Solomon Islands 101 in the period 1984-1986). The apparent increase in adolescent fertility in Papua New Guinea and Tuvalu seems implausibly high, underlining the difficulty of monitoring demographic trends in small island populations.[2]

How does the level of adolescent fertility in the Pacific island countries compare with other major regions of the world for the most recent period for which we have data, the 1990s? The world average for adolescents in the period 1990-1995 was 60 births per thousand females, which is only exceeded by Papua New Guinea and Cook Islands of the countries in the subregion for which data are available for this period. In all likelihood, the level in Marshall Islands and Solomon Islands would currently also exceed 60 per thousand if data were available. Indeed, compared with most of the developing regions of the world, Africa, Asia, Latin America and the Caribbean, and indeed North America, adolescent fertility in the Pacific island countries appears to be relatively low.

In the Pacific island countries, where data allow, it is also of interest to contrast the proportionate decline over time in adolescent childbearing compared with overall fertility. In only a few countries can we make such comparisons over any length of time; in three of them, adolescent fertility appears to have fallen faster than adult fertility: Solomon Islands (-30 per cent for adolescents compared with -18 per cent for adults), Kiribati (-53 compared with -45 per cent) and Vanuatu (-20 compared with -19 per cent). The opposite is the case in Cook Islands (-40 per cent for adolescents compared with -58 per cent for adults) and the Federated States of Micronesia (-40 compared with -43 per cent).

From the current estimates of fertility that we have, how "high" is adolescent fertility according to the ASFR in the Pacific island countries compared with numerous other countries around the world? In table 2, we restrict the countries to data from the 1990s and again compare ASFRs for various countries with those from South Pacific countries. The comparisons are very revealing and confirm once more that adolescent fertility is relatively low in the Pacific island countries compared with some of the individual countries from other developing regions.

Table 2. Age-specific fertility rates of females 15-19 years old for South Pacific countries and selected countries in other regions

Age-specific fertility rates of females 15-19 years old	<30	30-50	51-100	100+
South Pacific	Samoa (22)	Kiribati (44)	Cook Islands (76)	
	Tonga (28)	Niue (32)	Federated States of Micronesia (54)	
	Tokelau (0)	Palau (45)	Papua New Guinea (77)	
		Tuvalu (39)	Fiji (54)	
Sub-Saharan Africa			Rwanda (60)	Burkino Faso (149)
			Zimbabwe (99)	Cameroon (164)
				Ghana (116)
				Kenya (110)
				Madagascar (157)
				Malawi (161)
				Namibia (109)

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			Niger (215)
			Nigeria (146)
			Senegal (127)
			Tanzania (144)
			Zambia (156)
Asia	Philippines (50)	Indonesia (61)	Bangladesh (140)
		Pakistan (84)	India (121)
		Turkey (55)	
Latin America and Caribbean		Bolivia (94)	
		Columbia (89)	
		Dominican Republic (88)	
		Paraguay (97)	
		Peru (61)	
		Trinidad (82)	

Source: For the Pacific island countries: national censuses and United Nations (1995). World Population Prospects: The 1994 Revision, New York. For other countries, see Singh, S. (1998). "Adolescent childbearing in developing countries: a global review" Studies in Family Planning 29(2), June, table 2.
a Restricted to data for the 1990s.

This is not to deny, of course, that the rate of adolescent pregnancy might have risen in the Pacific island countries, only to be offset by a high rate of induced abortion. Since abortion in the Pacific island countries is illegal as a means of terminating a pregnancy, other than to save the life of the mother, it is impossible to bring hard evidence to bear on the hypothesis. We would argue, however, that while such illegal abortions may be taking place, they are not so widespread as to contradict our overall conclusion. Nor is it obvious that, where induced abortion takes place, it is more prevalent among younger than older women.

Furthermore, while adolescent fertility generally has been declining at the same time as the mean age at first marriage has been rising, it could well be that the proportion of adolescent births attributable to unmarried teenagers has been rising.3 Such a phenomenon may well have led to the popular perception that overall adolescent fertility has been rising. However, no data are available to confirm or reject this hypothesis.

Alternative measures

While the overall level of adolescent fertility is best captured by the ASFR for females aged 15-19, the timing of childbearing is better measured by the proportion of women aged 20-24 who have had a birth by a certain age, say 18, 19 or 20. Very few estimates for the Pacific island countries are available and these are compared with recent data for the 1990s for selected countries from around the world and reported in table 3. While the reference periods are often slightly different, it would seem that the percentage of women 20-24 years old who had given birth to a child by age 20 were already relatively low in earlier years in the few Pacific island countries for which data are available compared with more recent estimates for other regions of the world.

Table 3. Percentage of women 20-24 years old who have had a child before age 20

Country or area	(Per cent)
Pacific islands	
Papua New Guinea (1996)	34.6
Vanuatu (1995)	38.1
Fiji:	
	30.6 (1956)
Fijians	28.2 (1966)
	20.8 (1976)
	68.5 (1956)
Indians	45.2 (1966)
	23.3 (1976)
Kiribati (1978)	29.4
Sub-Saharan Africa	

Burkino Faso (1992-1993)	62.4
Cameroon (1991)	66.8
Ghana (1993)	48.5
Kenya (1993)	52.2
Madagascar (1992)	52.9
Malawi (1992)	63.3
Namibia (1992)	41.6
Niger (1992)	75.0
Nigeria (1990)	53.5
Rwanda (1992)	24.6
Senegal (1992-1993)	51.7
Tanzania (1991-1992)	56.8
Zambia (1992)	61.3
Zimbabwe (1994)	46.9
Mean:	54.1
Asia	
Bangladesh (1993-1994)	66.0
India (1992-1993)	48.6
Indonesia (1994)	32.7
Pakistan (1990-1991)	30.5
Philippines (1993)	21.5
Turkey (1993)	25.3
Mean:	37.4
Latin America and Caribbean	
Bolivia (1993-1994)	37.7
Columbia (1995)	36.0
Dominican Republic (1991)	33.1
Paraguay (1990)	37.1
Peru (1991-1992)	26.9
Mean:	34.2

Source: Various census reports for Pacific island countries and House, W.J. (1998). "Prospects for demographic change in Vanuatu: results of a KAP survey". UNFPA Country Support Team for the South Pacific, Discussion Paper No. 17, December; for other countries, Singh, S. (1998). "Adolescent childbearing in developing countries: a global review" Studies in Family Planning 29(2), June, table 2.

Table 4. Absolute number of births and share of total number of births attributable to adolescents aged 15-19 in selected Pacific island countries and elsewhere over time

Country or area	Absolute number of births			Percentage share of births to adolescents in total annual births		
	1970s	1980s	1990s	1970s	1980s	1990s
Melanesia						
Fiji	-	2,375	2,190	-	11	11
Papua New Guinea	6,517	5,618	14,197	6	5	11
Solomon Islands	-	-	-	-	-	-
Vanuatu	553	412	-	12	8	-
Micronesia						
Federated States of Micronesia	303	257	314	10	8	10
Kiribati	262	-	161	13	-	7
Marshall Islands	-	321	-	-	15	-
Palau	-	58	30	-	13	9
Polynesia						

Cook Islands	91	93	58	17	20	11
Tonga	-	143	117[a]	-	6	5[a]
Tuvalu	9	-	11	5	-	4
Samoa	373	-	204	9	-	5
Niue	-	-	3	-	-	4
Elsewhere (1990-1995)						
World total	-	-	-	-	-	11
Africa	-	-	-	-	-	17
Asia	-	-	-	-	-	9
Europe	-	-	-	-	-	8
Latin America and Caribbean	-	-	-	-	-	16
North America	-	-	-	-	-	13
Oceania	-	-	-	-	-	6

Source: National censuses and United Nations (1995). World Population Prospects: The 1994 Revision, New York. a Latu, R. (1996). "Reproductive health and family planning: sectoral review for the Kingdom of Tonga". UNFPA Country Support Team, Suva, mimeographed.

Alternatively, it may be that heightened concern about adolescent fertility reflects concern over a growing proportion of annual total births being attributable to women under the age of 20 years. Indeed, what has happened to the absolute number of births to teenagers over time, as well as their contribution to, or share of, the total number of births annually? Table 4 shows patterns of change and compares the Pacific island countries with other regions of the world.

The direction of change in the Pacific island countries in table 4 is fairly clear. Only in Papua New Guinea is there any significant increase in the absolute number and share of total births attributable to adolescents.[4] Elsewhere, particularly in Cook Islands, Fiji, Kiribati, Palau, Samoa, Tonga and Vanuatu, the absolute number of births annually to adolescents has declined, often accompanied by a decline or constancy in their share of total annual births in their country.

Still, this evidence should not detract from the need to address the emerging reproductive health problems of adolescents, many of which are not necessarily related to childbearing per se, but which are a consequence of sexual activity, the nature and extent of which has not been measured.

Childbearing by older women -- a forgotten issue?

Patterns of fertility and infant and maternal mortality are closely interrelated. Relatively high rates of infant and maternal mortality occurring in some of the Pacific island countries can be attributed to many factors.[5] One important determinant is the pattern of fertility depending, in turn, on the age of the mother, the number of children she has had, and the length of the interval between births. Children born to teenage mothers and to mothers over the age of 35 have a reduced chance of surviving. Older mothers who have already had a number of children are also likely to be at greater risk together with their newborn child, because they are less able to withstand the stress of pregnancy, delivery and breastfeeding.[6]

How significant is childbearing among older women in the Pacific island countries relative to younger women in those countries? Table 5 brings evidence to bear on this issue.

Table 5. Age-specific fertility rates for women aged 35 and older

Country and area	1970s	1980s	1990s
Melanesia			
Fiji	-	38	35
Papua New Guinea	119	98	86
Solomon Islands	-	-	-
Vanuatu	123	98	-
Micronesia			
Federated States of Micronesia	154	170	102
Kiribati	73	91	82

Marshall Islands	-	120	-
Palau	142	82	31
Polynesia			
Cook Islands	71	56	-
Tonga	-	75	85[a]
Tuvalu	21	-	94
Samoa	78	-	98
Niue	-	-	77

Source: National censuses.
a Latu, R. (1996). "Reproductive health and family planning: sectoral review for the Kingdom of Tonga". UNFPA Country Support Team, Suva, mimeographed.

Table 6. Age-specific fertility rates of females 15-19, 35-39 and 40-44 years old in selected Pacific island countries and elsewhere in the world in the 1990s

Country and area	Age-specific fertility rates		
	15-19 years	35-39 years	40-44 years
Melanesia			
Fiji	54	61	25
Papua New Guinea	77	122	82
Micronesia			
Federated States of Micronesia	54	153	91
Kiribati	44	138	60
Palau	45	54	20
Polynesia			
Tuvalu	39	135	39
Samoa	22	153	86
Tonga	22	126	67
Niue	32	159	40
Elsewhere			
World total	60	59	24
Africa	136	149	82
Asia	45	56	22
Europe	27	23	5
Latin America and Caribbean	79	66	28
North America	60	32	5
Oceania	28	53	20

Source: National censuses and United Nations (1995). World Population Prospects: The 1994 Revision, New York.

Along with the overall total fertility rate and the age-specific fertility rate for adolescents, the rate of childbearing among older women has generally declined throughout the Pacific island countries over the last three decades. However, fertility among women aged 35 and older still remains very significant and appreciably higher than among adolescents in these countries. During the 1990s, the ASFR for women over 35 years of age, as reflected in tables 1 and 5, exceeded that for adolescents by a significant margin in Federated States of Micronesia, Kiribati, Niue, Papua New Guinea, Samoa and Tuvalu. Given the reported differences in fertility behaviour between these cohorts in earlier years, this pattern is likely to hold also in Tonga and Vanuatu in the 1990s.

A comparison is made in table 6 of the most recently estimated ASFRs for adolescents 15-19 years old with women 35-39 and 40-44 years old in the Pacific island countries and other regions of the world. It is evident that older women in the former continue to experience relatively high fertility compared with adolescents, while the stark opposite generally holds in many other regions of the world. Such high-risk behaviour by older women can be the cause of profound life-endangering reproductive health problems for such women and their families, and particularly for their children. Yet the persistently higher fertility of older women in the Pacific island countries does not appear to attract anywhere near as much attention from planners, policy-makers, donors and the media as the fertility behaviour of adolescents in the current post-ICPD era with its hightened concern about adolescent reproductive

health and sexuality.

Table 7. Absolute number of births and share of total number of births attributable to women aged 35+ in selected Pacific island countries and elsewhere over time

Country and area	Absolute number of births			Percentage share of births to women 35+ in total annual births		
	1970s	1980s	1990s	1970s	1980s	1990s
Melanesia						
Fiji	-	1,957	2,362	-	9	12
Papua New Guinea	22,908	19,305	20,473	22	21	16
Solomon Islands	-	-	-	-	-	-
Vanuatu	722	779	-	15	16	-
Micronesia						
Federated States of Micronesia	785	639	732	25	19	22
Kiribati	280	-	481	14	-	20
Marshall Islands	-	256	-	-	12	-
Palau	101	57	36	23	18	11
Polynesia						
Cook Islands	76	64	37[a]	14	14	7[a]
Tonga	-	400	476[b]	-	17	19[b]
Tuvalu	12	-	58	7	-	22
Samoa	693	-	920	17	-	22
Niue	-	-	13	-	-	17
Elsewhere (1990-1995)						
World total	-	-	-	-	-	11
Africa	-	-	-	-	-	15
Asia	-	-	-	-	-	10
Europe	-	-	-	-	-	9
Latin America and Caribbean	-	-	-	-	-	11
North America	-	-	-	-	-	10
Oceania	-	-	-	-	-	10

Source: National censuses and United Nations (1995). World Population Prospects: The 1994 Revision, New York.
a From registered births; see Katoanga, S.K. (1996). "Sectoral review of reproductive health in the Cook Islands". UNFPA Country Support Team, Suva, mimeographed.
b Latu, R. (1996). "Reproductive health and family planning: sectoral review for the Kingdom of Tonga". UNFPA Country Support Team, Suva, mimeographed.

Table 7 replicates the structure of table 4 while examining patterns of change and the relative importance of childbearing among older women. Following the overall decline in fertility, childbearing among older women, as well as adolescents, has indeed fallen over the last 30 years or so in the majority of the Pacific island countries. Yet there are exceptions in table 7. Over some part of the period, the absolute number of births to older women has increased, for example, in Federated States of Micronesia, Fiji, Kiribati, Papua New Guinea, Samoa, Tonga, Tuvalu and Vanuatu, partly reflecting an increase in the ASFR of women over 35 (Federated States of Micronesia, Kiribati, Samoa and Tuvalu) and an increase in the number of women in these age groups. Indeed, table 7 demonstrates that the share of total annual births attributable to women over 35 years of age has risen over time in some countries (Federated States of Micronesia, Fiji, Kiribati, Samoa, Tonga and Tuvalu) while still invariably far exceeding the share contributed by adolescents. Moreover, the share of total births of older women in many of the Pacific island countries exceeds the share of their peers in the world at large, and even in high fertility regions such as Africa and Latin America.

Older women: a special target group?

Given that family planning programmes in the past were concentrated on dealing with the "maternal and child health" (MCH) problems of mothers and their offspring, an issue arises as to whether the high fertility of older women in the Pacific island countries may have been inadequately addressed. Or, perhaps this relatively high fertility is wanted fertility? Where it is unwanted, a strong case can be made for public sector and NGO interventions

to address the problems of those women experiencing an "unmet need" for family planning as a group deserving of priority concern. Unmet need is usually defined on the basis of women's responses to survey questions. Those fecund and sexually active women who indicate that they would like to postpone or avoid further childbearing, but also report that neither they nor their partners are using any method of contraception, are said to have an unmet need. The standard formulation was developed by Westoff (1988a, 1988b) who defined the group with unmet need as all fecund women who are married or living in union -- thus presumed to be sexually active -- who are not using any method of contraception but they either do not wish to bear any more children or wish to postpone their next birth for at least two more years. Those who wish to bear no more children are said to have an unmet need for limiting births; those who do not want another child for at least two more years are considered to have an unmet need for spacing births.

Some of the common causes of unmet need include inconvenient or unsatisfactory services, ignorance and lack of information about their fecund state and the need to use reliable contraception and about what services are available, fear of the side-effects of contraceptive methods, a lack of long-term methods for couples who have completed their family formation, and opposition from husbands and other members of the extended family. Other important reasons include lack of access, high cost and fatalism (Bongaarts and Bruce, 1995).

Obviously, the identification of the nature and characteristics of unmet need could help the family planning programme to respond better to the demands of these women. A programme strategy focusing on such women as a distinct audience and clientele requires a comprehension of the reasons underlying the unmet need; the determination of the size and composition of sub-groups classified according to their socio-economic characteristics; the prioritizing of certain sub-groups which the programme would be capable of reaching; and the design of a strategy to deliver information and services to meet the essential and specific needs of the various sub-groups.

Only two recent surveys are available from the Pacific island countries which attempt to gauge the size of the unmet need of women, and then only the unmet need for limiting births. From a 1995 knowledge, attitude and practice (KAP) survey in Vanuatu, House (1998) estimated that at least 24 per cent of all adult women of childbearing age and 30 per cent of women with a husband or partner have an unmet need for contraception for limiting the size of their families because they claim they do not want another child but are not using any form of family planning.

Since our concern in this section of the article is with the status of older women, it is revealing to note that 47 per cent of women in the age group 35-49 years in Vanuatu are estimated to have an unmet need for family planning. This would suggest about 4,800 ni-Vanuatu women in this age category had an unmet need in 1995. Of course, some of the oldest women in this group may have experienced, or were in the process of experiencing, menopause and would not need contraception. And some, perhaps, were not sexually active. Nevertheless, despite these reservations, we can assert that the unmet need of older women for limiting additional births in Vanuatu is significant and worthy of special consideration by planners, policy makers and donors in the family planning sector.

It is also very revealing to note that over 63 per cent of the older women in Vanuatu with an unmet need for limiting further childbearing have already had five children or more. Evidently, an additional pregnancy -- especially when they did not want it -- would place their health and their families' socio-economic status in grave danger. The scope for information dissemination and education on family planning is large since 20 per cent of this group have not heard of family planning and only 36 per cent have ever used family planning before.

In contrast, the estimated number of females aged 15-19 in Vanuatu in 1995 was about 7,800, the largest possible female target group for interventions in adolescent reproduction health, including IEC and family planning services. Even if as many as half of them were sexually active and in need of reproductive health services, the resulting size of the target group would be exceeded by the number of older women having an unmet need for family planning.

The 1996 Papua New Guinea DHS generated conceptually similar estimates of the extent of unmet need and demonstrated that the proportion of currently married women not using contraception and wanting no more children increased consistently from 27 per cent for those aged 30-34 to 37 per cent for those aged 35-39, to 47 per cent for those aged 40-44 and to 66 per cent for those aged 45-49. For the group of women aged 35-49, almost half (48 per cent) had an unmet need for limiting future childbearing, almost the same proportion as in Vanuatu. They would represent just over 27,000 females in Papua New Guinea in 1996, a sizeable group of women worthy of special programmes to address their particular service needs.These scenarios may reflect the situation in many of the other island countries of the Pacific, whereby perhaps one out of every two women between the ages of 35 and 49 has no wish to bear another child but, for one reason or another, is not using a family planning method. Thus, there is a sizeable group of women who need to be the focus of researchers, health authorities and donors for interventions but who currently receive no special attention and priority and who are overshadowed by the aforementioned concern with "adolescent reproductive health".

Conclusions and recommendations

Maternal and child health and family planning programmes (MCH/FP), and more recently reproductive health

programmes, have been established in many countries of the Pacific with UNFPA assistance, but with only limited success. Fertility and population growth rates remain high, reflecting perhaps a lack of access to high quality family planning services and poor conviction on the part of the population concerned as to the health and livelihood benefits to be derived from family planning and child spacing. On the other hand, while desired family size has no doubt fallen in recent years, the desire to bear four or more children appears to be widespread. No doubt this is a reflection of the set of incentives facing the typical household, including the need for adequate family labour, the old-age support benefits to be derived from large families, some of whom migrate out of the household but continue to contribute to its welfare through regular remittance flows, and in those countries where infant mortality rates continue to be high (Federated States of Micronesia, Kiribati, Marshall Islands, Papua New Guinea, Solomon Islands, Vanuatu), the need to replace children who, it is anticipated, are likely to die before reaching maturity.

In the subregion, great reliance is still placed on the decennial population censuses, the principal source of demographic data in all the countries. Analysis of these data is very often delayed such that the information is out of date for planning purposes by the time it is made available. While demographic and KAP-type surveys have not been widely undertaken in the subregion, it is strongly recommended that such surveys be conducted more often, and in more of the island countries, if policies are to be formulated to induce a decline in fertility rates from their current high levels and if services are to be improved. Vital registration systems remain grossly underdeveloped, contributing to the poor quality of key demographic indicators. Information also needs to be generated on the current quality of services provided both from the providers' and users' perceptions. Indeed, basic information is lacking on the extent of service delivery since the age-specific modern contraceptive prevalence rate in most countries is known only with great uncertainty and is estimated usually from poorly kept service statistics. Because public sector budgets are inadequate, and national capacity for data collection and analysis remains low, we recommend that donors be prepared to invest much more in improving statistical systems which are capable of generating the requisite data and information on which to construct well-designed programme interventions.

More research is necessary in this whole area of reproductive health, gauging the extent and socio-economic characteristics of those with an unmet need for family planning services, including the prevalence of sexually transmitted diseases and reproductive tract infections, in order to generate data and information with which to design and improve services to address such problems. The overall impression is, however, that the quality of services, especially on the outer islands and in rural areas, has much room for improvement.

Using data from recent population censuses, this article has challenged the "conventional wisdom" that adolescent fertility and teenage pregnancy is high and rising in the Pacific island countries. While adolescent fertility still remains high in a few countries, the overall trend over the past 30 years has been for both a decline in the age-specific fertility rate of females 15-19 years old and for a fall in the share they contribute to the total number of annual births. Compared with many of the regions in the world, adolescent fertility in the Pacific island countries is certainly not high and, indeed, by some standards, might well be considered to be relatively low. This does not deny, however, that adolescent reproductive health, particularly morbidity resulting from reproductive and sexual behaviour, is an important policy issue that should be addressed by government planners, service providers, NGOs and donor agencies, including UNFPA. Nor can we confirm or reject the suggestion that the number of induced abortions by pregnant adolescents has risen in recent years in response to their increased sexual activity and consequent increased rate of pregnancies. Since abortion is illegal in the Pacific island countries, other than to save the life of the mother, it is impossible to gauge the extent to which such an illegal activity is taking place.

The article has concluded by bringing firm evidence to bear on the existence of relatively high fertility among women over the age of 35 in many of the Pacific island countries. Like adolescents, their fertility has declined in recent decades but still is high by world standards and, in the two countries for which data are available, they appear to have a large "unmet need" for family planning services to limit further childbearing.

In conclusion, while applauding the objective of raising the reproductive health status of adolescents, we would recommend that governments, NGOs and donor agencies not overlook the special reproductive health needs of older women in current and future reproductive health and family planning programmes. Heightened awareness-raising campaigns are required to publicize the deleterious physical, mental and economic consequences for those high parity women who continue to bear children beyond the age of 35. Public policies which raise the costs of extended childbearing of older women, for example, the waiving of school fees only for the first two or three children born, or the granting of paid maternity leave for a limited number of pregnancies for those women in formal employment, need to be considered for incorporation in comprehensive population and development policies.

Endnotes

1. The popular press contributes to the growing public concern over supposedly irresponsible teenage sexual behaviour, often in alarmist tones. For example, while teenage pregnancy is believed to be everywhere on the rise, sexually transmitted diseases are portrayed to be out of control. At a recent workshop on community education in Fiji, a health official is reported in the Fiji national press to have said: "...the rise in the number of teenagers contracting sexually transmitted diseases was alarming...in 1997, 77 per cent of Fijians, 16 per cent of Indians and 7 per cent of others contracted an STD...(the speaker said)...there was a need to make people aware that sexually transmitted diseases and teenage pregnancies were on the rise" (Fiji Times, 25 March 1999). Surely, quoting such unbelievably high figures is not the way to enlighten the general public!

2. The estimate for the 1990s for Papua New Guinea comes from the 1996 Demographic and Health Survey (DHS) while estimates for the earlier years for this country are derived from population censuses.

3. Booth (1994) reported that both the mean age at marriage and mean age at first birth increased for women in Fiji and Kiribati over the period from 1946 to 1986.

4. Again, the estimate for 1990 for Papua New Guinea is derived from the ASFR from the DHS and the number of adolescents reported in the 1990 population census.

5. Infant mortality is estimated by the 1996 DHS to be 69 per thousand live births in Papua New Guinea (Papua New Guinea, 1997). While recent estimates are not available, data from the late 1980s and early 1990s suggest that the infant mortality rate remains significant in Solomon Islands (38 in 1986), Vanuatu (45 in 1989), Federated States of Micronesia (46 in 1994), Kiribati (65 in 1990), Marshall Islands (63 in 1988) and Tuvalu (51 in the period 1991-1995); see South Pacific Commission (1997). Estimated rates of maternal mortality are more difficult to measure, particularly in such small populations. However, Papua New Guinea heads the list in the Pacific island countries with a maternal mortality rate of 370 per 100,000 (Papua New Guinea, 1997).

6. While data are scarce on the characteristics of maternal deaths, it is revealing that Cook Islands reported one maternal death during the period 1994-1998 and Tuvalu four such deaths between 1993 and 1998. These women were in their thirties at the time of death. Fiji recorded 36 maternal deaths during the period 1995-1998. Of the total, only two were adolescents, but fourteen of the dead women were aged at least 30.

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The Importance of Field-workers in Bangladesh's Family Planning Programme

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The high cost and low quality of services indicate that other models of service delivery need to be considered

Contraceptive use in Bangladesh has increased greatly from 19 per cent in 1983 to 45 per cent in 1993/94 (Mitra and others, 1994). This increase has been attributed to the initiation and expansion of a programme to provide information on family planning (FP) and maternal and child health (MCH) as well as the delivery of contraceptives to women in their homes (Cleland and others, 1994; Phillips and others, 1993; 1996). The government hired 13,500 field-workers in the period 1974-1976 to carry out this work, and supplemented their numbers by 10,000 between 1987 and 1990 (Hasan and Koblinsky, 1991). In addition to the 23,500 government outreach workers, there are an additional 7,000 who are employed by various non-governmental organizations (NGOs), bringing the total to over 30,000.

One explanation for the success of the home visit programme is that repeated visits not only provide a convenient source of family planning method supply, but also catalyse latent demand for methods through repeated dissemination of information. In support of this view, a number of studies have shown a strong statistical relationship between contact with family planning outreach workers and contraceptive utilization (Phillips and others, 1993; 1996; Hossain and Phillips, 1996), suggesting that demand for contraceptives would effectively collapse without the stimulus provided by repeated exposure to home visits. An alternative view, however, is that home visits serve primarily to lower the costs to women (in money and travel time) of using a contraceptive method, rather than to stimulate new demand for modern methods (Arends-Kuenning, 1997a). Home visits are important not because they generate demand for contraceptive methods, but because they provide a convenient source of supply for women who already are inclined to use them. While the home visit programme undoubtedly facilitated major advances in contraceptive utilization at its inception, one could argue that it now merely contributes to the continued isolation and immobility of women (Schuler and others, 1995; 1996).

Given the strong statistical relationship between on-going visits and contraceptive use that has been demonstrated in past research, one might expect to find that home visits include a good deal of discussion between field-workers and their clients, providing the kind of information that would tend to encourage adoption and continued use of contraceptive methods. Some researchers have shown, using data from the Matlab area, that some field-worker and client interactions are of high quality, involving engaged discussion of important issues (Simmons, 1996; Simmons and others, 1988). However, these high-quality interactions are probably not typical of the much larger government or NGO programmes. In a study of nine field-workers who visited 209 women, 40 per cent of women received no advice or service (Koblinsky and others, 1989; Brechin and others, 1990). In this study, the average work day was about five hours long. In a later study of six field-workers, the work day was only 3.8 hours long, so it would not be expected that the percentage of visits in which information was provided would be higher (Hasan and Koblinsky, 1991).

One reason for the conflicting evidence on the content of the interaction between field-workers and clients, and thus on the importance of the role of the field-worker, is that previous studies have been small and localized. This article fills that gap by exploring a large number of interactions among clients and field-workers over a broad geographic area, thus providing results which are more fully representative of the government programme than are previous efforts. This enables us to determine whether or not typical client and field-worker interactions include such information as would be expected to encourage acceptance and continued use of family planning. In addition, interviews with users of oral contraceptives provide their views on the quality and content of the field-worker visits.

More specifically, this article addresses what field-workers do in their interactions with clients to motivate them to adopt and continue to use contraception, and whether the clients value those interactions. Data from field-worker observations are used to determine if field-workers provide information relevant to the client's method use status. For example, the issue is addressed of whether field-workers actively promote method use and provide pertinent information on follow-up visits. Oral contraceptive survey data are used to document how clients feel about the information they receive, addressing whether clients depend upon the field-workers for counseling, or whether their needs could be met with fewer visits.

Thus, this article addresses various aspects of quality of care as outlined in the Bruce framework. We emphasize information provided to clients, including information on family planning methods and side-effects. We also consider the knowledge that the client displays of various topics that might have been covered in interactions, as

well as the client's perspective on these interactions. Koenig and others (1997) also addressed quality of care issues and focused on the information provided to clients. While their study relied on the reports of clients, our article uses data on quality of care obtained, not only from the client but also from observations of client-provider interactions.

Methods

Three separate sources of data are used to develop the analysis. The first data set provides information that was collected as part of a study to calculate the costs of both the clinic and home service delivery programme of the government (Janowitz and others, 1996). Observational data on the interactions of field-workers with clients were collected between 1993 and 1994. Trained female observers accompanied 64 family welfare assistants to the field for an average of three days each, and recorded their travel time to and from the field and between households, the number of women they contacted, the duration of contact time with clients and whether they provided contraceptives or information about family planning or maternal and child health. The sample of field-workers was nationally representative. These data provide an unusually rich perspective on the types of information and services provided by the typical government field-worker, allowing inferences to be drawn about the role of field-worker visits in promoting contraceptive use.

A second data set provided information on the perspective of the field-workers' clients. This data set was developed for a study on the knowledge and attitudes of oral contraceptive users in Bangladesh and was also based upon a nationally representative sample (Population Development and Evaluation Unit and others, 1997). A baseline survey of rural of oral contraceptive users visited by field-workers was conducted to determine the level of knowledge, attitudes and practices concerning specific issues of oral contraceptive compliance.

A third source of data provided information on willingness and ability to pay for doorstep delivery of contraceptives in two rural divisions of Bangladesh. Women who were identified as users of oral contraceptives in the log books of the field-workers were questioned about certain aspects of service delivery (Streatfield and others, 1997). Specifically, those women currently obtaining oral contraceptives from a field-worker were asked if they would find it a problem if the field-workers visited less frequently, and if so, why.

Analysis

Using data on observations of field-workers which were collected as part of the cost study, we developed a score based on the number of possible discussion and activity items that might be covered in various types of family planning visits. Each category of visits, for example those to continuing IUD users, received a score in percentage terms, with 100 denoting that all possible discussion and activity items were covered. MCH scores were also calculated, but separate scores were not calculated for different subgroups of women. An aggregate FP/MCH score was then calculated for each woman using the number of items in the component scores as weights. The impact of length of visits on the aggregate score was assessed for various subgroups of clients using Pearson's correlations.

Results

Table 1. Percentage of client visits for which various family planning topics/activities are covered, by type of client, Bangladesha

Family planning group	Screening checklist	Follow-up checklist	Motivated for family planning use	Discussed family planning	Method-specific discussion	Discussed side-effects	Motivated to go to FWC[b]/SC[c]	Gave supplies	N
Users									
Oral contraceptive acceptor	6.0	--	66.3	39.8	39.8	21.7	--	100.0	83
Condom acceptor	4.3	--	78.3	52.2	52.2	21.7	--	100.0	23
Oral contraceptive user	--	1.7	--	12.0	12.0	5.6	0.0	61.4	1,054
Condom user	--	0.0	--	11.3	12.0	2.1	4.2	60.6	142
Injectable user	--	16.9	--	7.7	7.3	13.5	18.1	--	260
IUD user	--	6.6	--	0.7	0.7	16.9	24.3	--	136
Vasectomy/tubectomy	--	--	--	0.0	0.0	3.3	--	--	269
Non-users									
Pregnant	--	--	2.3	3.3	3.8	--	--	--	213
With child (<6 months)	--	--	21.8	20.7	20.7	--	--	--	87

Other	--	--	43.8	33.2	32.6	--	--	--	644

Source: Data from research conducted in Bangladesh, presented in Janowitz, B. and others, 1996. Productivity and Costs for Family Planning Service Delivery in Bangladesh: The GOB Program (Research Triangle Park, North Carolina, Family Health International).
a = Percentages for activities deemed not relevant to the specific visit types are omitted.
b = Family welfare centre.
c = Satellite clinic.

Using information from the cost study, table 1 shows the percentage of field-workers who covered various family planning discussion items and activities for various types of family planning visits. The items that would be expected to be covered varied by type of visit; for example, women who accepted a method during the observed visit probably received motivation to use the method. These women were administered a screening checklist to determine eligibility for use and received information about methods and side-effects. In addition, each woman would be supplied with contraceptives. By contrast, a continuing user of oral contraceptives might be expected to receive additional information about family planning, to be motivated to go to a clinic for a clinical method, and to have the follow-up checklist administered by the field-worker.

Among new acceptors, most women received motivation to use family planning, but only 40-50 per cent were recorded as participating in a general discussion of family planning or a discussion about the specific method selected. Only 22 per cent were told about side-effects in that particular discussion. Although not shown in the table, such discussions were very rare among non-users. All new acceptors received supplies. Screening checklists were rarely used.

Among continuing users of condoms and oral contraceptives, about 60 per cent received supplies on the observed visit. This indicates that around 40 per cent of the oral contraceptive and condom users either were resupplied elsewhere or had supplies on hand from the previous visit. No more than 10-12 per cent received information on a topic that might have been expected to be discussed, such as general family planning, a particular method, or side-effects. Such information may have been provided on previous visits and was unnecessary, or else needed information was obtained from a source other than the field-worker. Referrals to a clinic were rarely made. Either there was little interest on the part of the field-worker in promoting clinical methods or the woman was satisfied and saw no reason for a referral. Use of the follow-up checklist was extremely rare. Similar results were found for users of injectables, although the checklist was more often used and there was a discussion of side-effects in a somewhat higher percentage of visits. In addition, referrals to a clinic were higher; this finding may be related to the greater likelihood of discussions about side-effects and therefore a greater need for clinical services.

Referral to a clinic and discussion of side-effects were highest in the IUD user group, but still occurred in only one quarter or less of the interactions. Again, these two results may be related. As would be expected, only a handful of visits with acceptors of sterilization involved any discussion of family planning.

Discussions with pregnant women about family planning were uncommon, indicating the lack of interest on the part of the woman or the worker's assessment that the woman would not be interested in such a discussion. Women with a young child who were not using family planning were more likely to receive information, but still only about 20 per cent received information on any one family planning topic. Finally, those non-users of family planning who were not pregnant and did not have a young child were the most likely to receive information, but even among this group, less than half received motivation to accept family planning on the observed visit.

Moreover, it needs to be pointed out that field-workers systematically exclude certain women from home visits. Client selection is apparent from the contraceptive use status of women visited by field-workers. Women visited by field-workers were far more likely to be practising contraception (especially pill users), and far less likely to be non-users or users of traditional methods than were women in the general population. For example, marginals of table 1 show that 39 per cent of women visited were either acceptors or users of oral contraceptives, more than twice the percentage reported in the DHS. While it may be argued that frequent home visits are a force to motivate women to use contraception, it should be mentioned that the women least likely to accept family planning, and the ones requiring the most effort to recruit, are also the least likely to be visited.

Table 2. Percentage of client visits for which various health topics are covered, by type of client, Bangladesh

Group	MCH[a]	Other health[b]	General welfare	N
Family planing user	0.9	9.0	68.5	1,967
Non-users				
Pregnant	58.2	55.9	61.5	213
With child (<6 months)	31.0	74.7	73.6	87

Other	7.9	19.7	60.1	644

Source: Data from research conducted in Bangladesh, presented in Janowitz, B. and others, 1996. Productivity and Costs for Family Planning Service Delivery in Bangladesh: The GOB Program (Research Triangle Park, North Carolina, Family Health International).
a = Includes pre/postnatal health, child health.
b = Includes expanded programme of immunization, diarrhoeal diseases, night blindness, anemia and nutrition.

Table 3. Percentage of possible family planning and health topics discussed, by type of client, Bangladesh

Family planning group	Family planning	Health	Total[a]	N
New acceptors				
Oral contraceptives/condom	46.2	22.0	38.2	106
Continuing users				
Oral contraceptives	16.3	25.6	19.4	1,054
Condom	15.0	23.7	17.9	142
Injectable	12.7	26.3	17.8	260
IUD	9.9	29.9	17.4	136
Vasectomy/tubectomy	1.1	29.1	15.1	269
Non-users				
Pregnant	3.1	58.5	30.8	213
With child (<6 months)	21.1	59.8	40.4	87
Other	36.5	29.2	32.9	644
Total	19.0	30.1	30.1	2,911

Source: Data from research conducted in Bangladesh, presented in Janowitz, B. and others, 1996. Productivity and Costs for Family Planning Service Delivery in Bangladesh: The GOB Program (Research Triangle Park, North Carolina, Family Health International).
a = Weighted by number of items in each score.

Table 2 shows the percentage of MCH and other health items covered in various types of visits. Women who were pregnant or who had a child less than six months old were far more likely than other women to receive information about MCH or health. These results might be expected, since it is pregnant women and women with young children who are most in need of health information. Family planning users rarely received health information. The category "general welfare" was about equal for all groups and appears to assess general concerns rather than to measure information on particular health items which are included in the specific health categories.

Scores for family planning, health and the aggregate for family planning and health are shown in table 3. The highest family planning scores were for acceptors and non-users with small children or other non-users. These are the visits during which women are most likely to be motivated to use family planning and in which information is provided. Scores for continuing users are low. This low score implies that either clients do not express a need for information or there is a lack of motivation to provide it on the part of the worker. It should be kept in mind that scores were low for all family planning users, indicating that of all possible topics only a small percentage was discussed. The health score was highest for those visits in which the woman was either pregnant or had a young child. For other groups, there was not much variation in the health scores.

Perhaps the most important finding is that the composite score peaks at about 40 per cent. While it could be argued that the maximum score is unduly inflated in that it contains items that do not necessarily need to be discussed, the point remains that few items are discussed.

Table 4. Average length of visit, and p-values for correlation of length and index of topics discussed, by type of client, Bangladesh

Family planning groups	Length of visit (minutes)		p-value	N
	Mean	Standard deviation		
New acceptors				
Oral contraceptives/condom	7.4	(8.3)	<.01	106
Continuing users				
Oral contraceptives	3.6	(5.2)	<.001	1,054

Condom	4.9	(5.7)	<.01	142
Injectable	3.5	(4.1)	.83	260
IUD	4.1	(5.0)	<.01	136
Vasectomy/tubectomy	3.0	(6.2)	.31	269
Non-users				
Pregnant	3.3	(3.1)	<.001	213
With child (<6 months)	5.3	(6.0)	.02	87
Other	4.2	(6.0)	<.001	644
Total	3.9	(5.5)	<.001	2,911

Source: Data from research conducted in Bangladesh, presented in Janowitz, B. and others, 1996. Productivity and Costs for Family Planning Service Delivery in Bangladesh: The GOB Program (Research Triangle Park, North Carolina, Family Health International).

Table 5. Percentage of oral contraceptive users who understand correct use of oral contraceptives and percentage who say they received information from field-workers in Bangladesh

Knowledge	Percentage correct (N=1,403)	Percentage who received information from field-workers (N=1,403)
Know correct time to start using oral pills	17.5	61.6
Takes pill every day	94.0	63.2
Know where to start in pack of pills	82.0	67.7
Know what to do if 1 pill is missed	37.2	na[a]
Know what to do if 2 pills are missed	7.7	na[a]
Know what to do if 3 pills are missed	8.8	na[a]
Know at least one contraindication	30.5	47.7[b]
Heard about side-effects before using pill	86.2[c]	45.5[d]

Source: Data from Population Development and Evaluation Unit, IME-Division, Ministry of Planning, Government of the People's Republic of Bangladesh; Department of Statistics, University of Dhaka; Associates for Community and Population Research (ACPR); Family Health International and the Population Council (1997). Oral Contraceptive Compliance: KAP Baseline, Rural Bangladesh (Dhaka, ACPR).

a = Not asked.

b = 449 people; question asked of only clients who knew at least one contraindication.

c = 1,392 people.

d = 1,203 people; question asked of only clients who had heard about side-effects.

Table 4 shows the mean visit length (in minutes) according to type of visit, and the p-values associated with bivariate Pearson's correlations between visit length and the quality score, also by type of visit. Among users of resupply methods (except injectables), IUD users and non-users, the correlation is statistically significant. Thus, there is a positive association between visit length and quality for most types of visits. This result is not surprising and underlines the fact that more time is needed with clients in order to provide higher quality visits.

We used information obtained from observations of client-provider interactions to examine the length of visits and the information provided in visits as shown in tables 1-4. We now turn to an assessment of what clients know about oral contraceptives and the importance that they place on visits from field-workers using information on users of oral contraceptives from two surveys. Information on what users know about oral contraceptives provides a gauge of the knowledge that field-workers have about oral contraceptives and their skills in transferring that knowledge to their clients. Table 5 presents information on the percentage of oral contraceptive users who had correct information about various aspects of oral contraceptives, including when to start taking them, when to start a new pack and what to do about missed pills. In addition, the table shows the percentage of clients who reported that they got information on a particular topic from the field-worker. The percentage of users with correct knowledge varies greatly, with the least knowledge demonstrated in those categories related to when to start taking pills and what to do if more than one pill is missed. Since poor compliance is associated with higher failure rates (Trottier and others, 1994; Potter, 1991), the low percentage who knew what to do if pills were missed is of concern. Somewhat surprisingly, no more

than two thirds of women responded in the affirmative that they had got information on a particular aspect of pill use from the field-worker. Since one of the jobs of the field-worker is to provide information, it might have been expected that these proportions would be higher. However, as the observational data have shown, interactions are short (table 4), and information about pills is provided in less than half of the interactions and only 12 per cent of the interactions are with continuing users (table 1).

The next two tables, from a different survey of oral contraceptive users, provide information on the importance to the client of on-going interactions with field-workers. Table 6 shows that the main reason that women say that they chose the field-worker as their source of supply is the convenience offered by field-worker visits. Although multiple responses were allowed, only about one quarter of the women responded that they chose the field-worker because they had faith in her. Table 7 shows the reactions of women to a suggestion that field-workers visit less frequently, once every six months rather than once every two months, and that they be supplied with additional pill cycles on each visit. Over 80 per cent of women saw no problem with the suggested schedule, and of the remaining 19 per cent, only a minority were concerned that getting advice on family planning would be difficult under such circumstances. Most of the respondents objecting to a different visit schedule did so on the grounds that being given more pills might result in their being lost or damaged. These findings strongly suggest that the field-worker is seen principally as a contraceptive supplier, not as a counselor. These findings agree with those in table 5 which show that a high proportion of clients of field-workers reported that they got information about the pill from sources other than field-workers. These findings are also in agreement with those in table 1 which showed that in only a minority of interactions was information on family planning provided. However, table 5 also showed that client knowledge is low. Thus, no matter where clients are getting their information about family planning, the information is not adequate.

Table 6. Reasons for choosing field-worker as source of pill supply among rural clients served by Government of Bangladesh field-workers

Reasons	Percentage[a]
Convenience of field-worker visits	96.1
Faith in field-workers	27.6
Access to other services from field-workers	6.6
Other sources not accessible	5.4
Supplies free of cost	5.1
Number of observations	497

Source: Data from Streatfield, K. and others, 1997. Increasing the Financial Sustainability of Family Planning Service Delivery in Bangladesh (Dhaka, Population Council, Bangladesh).
a = Multiple responses accepted. Percentages are weighted average of mean responses from Rajshahi Division (72 per cent weight) and Chittagong Division (28 per cent weight) based upon respective population concentrations.

Table 7. Reactions to suggestion that field-workers in Bangladesh visit once every six months and supply six cycles of pills

Reaction	Percentages[a]
No problem with suggested schedule	80.9
Pills could get lost or damaged if six cycles are received at once	14.2
Getting advice on family planning would be difficult	6.0
Number of observations	497

Source: Data from Streatfield, K. and others, 1997. Increasing the Financial Sustainability of Family Planning Service Delivery in Bangladesh (Dhaka, Population Council, Bangladesh).
a = Percentages are weighted average of mean responses from Rajshahi Division (72 per cent weight) and Chittagong Division (28 per cent weight) based upon respective population concentrations.

Discussion

Using data from three independent studies, we have shown that the length of client-provider interactions is short, that the percentage of visits in which various family planning and MCH topics are discussed is low, and that clients lack important information about the pill and that they do not put a high value on interactions with field-workers. The vast majority of clients view the field-worker programme as a convenience and not as an important source of information.

Our findings show even poorer quality of care services than those recently reported by Koenig and others (1997). In

a survey conducted among women served by field-workers, but who were also part of a special project to improve public health and family planning services, women reported that visits were short (44 per cent reported that the visits were 5 minutes or less). They also reported that visits often did not involve discussions of family planning methods (26 per cent). In the more typical areas covered in this article, the observed length of visits was shorter, and observers noted a higher percentage of interactions with no discussion of family planning methods having taken place.

One important job of field-workers is to motivate non-users to adopt contraceptive use. Since all three of the studies reported on are cross-sectional, it is not possible to determine if repeated home visits were successful in convincing some women to accept family planning. We do know that field-workers visit a disproportionately high number of users; thus, they select clients who are more likely to be users of family planning, as has been documented in previous research (Hossain and Phillips, 1996; Arends-Kuenning, 1997b). As a consequence, a high proportion of non-users do not receive visits from field-workers. Even when they are visited, interactions are short and discussions about family planning occur in less than a third of those interactions. Thus, our results indicate that field-workers are not doing a good job in motivating women to adopt contraceptive use.

Once women accept family planning, they need services to encourage them to continue use. Our results show that, with the exception of the small group of condom acceptors, a minority of women received information about a family planning method or about side-effects. In fact, over one third of users did not even receive supplies. Koenig and others (1997) point out this problem, and conclude that greater investments need to be made in improving the quality of field-worker services. They reached this conclusion because their findings indicate that quality of care is associated with higher contraceptive use. The important question is whether the cost of upgrading the quality of outreach services is worth the cost. Even if there is a positive association between quality of care and continuation of contraceptive use, the very low levels of quality found in this study indicate that the cost of quality improvements could prove to be high.

The Government of Bangladesh has two choices. It can either concentrate its resources on improving the quality of the field-worker programme, or it can change the service-delivery model. The apparent success of the home visit programme makes it difficult to scale back this programme, as there is concern that any scaling back will result in a decrease in contraceptive use. Nevertheless, its high cost and the low quality of services indicates that other models of service delivery need to be considered. There are indications that service delivery models are changing in Bangladesh. For example, Alauddin (1999) reports that small community clinics are beginning to offer both family planning and other health services, and many couples are encouraged to seek services at these locations. In the coming years, various models of service delivery are likely to be tested in Bangladesh, with a view to finding services of reasonable cost and quality, as well as high accessibility that can replace the home visit programme, particularly in areas of higher contraceptive use.

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Unmet Contraceptive Need in Bangladesh: Evidence from the 1993/94 and 1996/97 Demographic and Health Surveys

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Young married women deserve special consideration because unmet need is highest among them

Bangladesh has the highest population density in the world. It is also an extremely poor country. Resource scarcity and subsistence-level economic conditions characterize the economy (Khuda, 1991). The proportion of Bangladesh's 126.9 million people (ESCAP, 1999) living below the poverty line is quite high (UNDP, 1994). Based on caloric intake, 50 per cent of the rural population and 46.8 per cent of the urban population were below the poverty line in 1995/96 (GOB, 1997). Other indicators also reflect the poverty of the country: the literacy rate of the population aged five years and older is 45 per cent (males 48 and females 40 per cent) (GOB, 1997); and life expectancy is 59 years for both males and females (ESCAP, 1999). Although infant and child mortality levels have declined, they are still high owing to relatively weak pre- and post-natal services, less than optimum birth spacing, and widespread malnutrition among children (Mitra, 1997).

Despite these low socio-economic indicators, Bangladesh has achieved a high level of success in its family planning programme. Ever use of any contraceptive method increased five-fold during the past two decades, i.e. from 13.6 per cent in 1975 to 69.2 per cent in 1997 (figure 1). During the same period, the contraceptive prevalence rate (CPR) increased six-fold, rising from 7.7 per cent to 49.2 per cent (figure 2). Also during this period, the total fertility rate (TFR) dropped by half, from about six children per woman to about three. However, Bangladesh still has a long way to go to achieve the replacement level of fertility, i.e. about 2.1 children per woman, which the government hopes will be achieved by the year 2005. The CPR would have to rise to over 70 per cent for this target to be reached (Khuda and others, 1997; Khuda, 1998a). Therefore, the challenge for Bangladesh is not only to sustain the present level of contraceptive use, which itself implies a doubling of the number of the contraceptive users from about 12 million to over 22 million, but also to raise the CPR by at least an additional 20 per cent. The latter goal, though difficult to attain, is not altogether impossible. The CPR could be raised by 20 per cent if the programme is able to bring within its fold that segment of the population described as having an unmet contraceptive need.

Figure 1. Trends in ever use of family planning methods among currently married women aged 15-49 years in Bangladesh
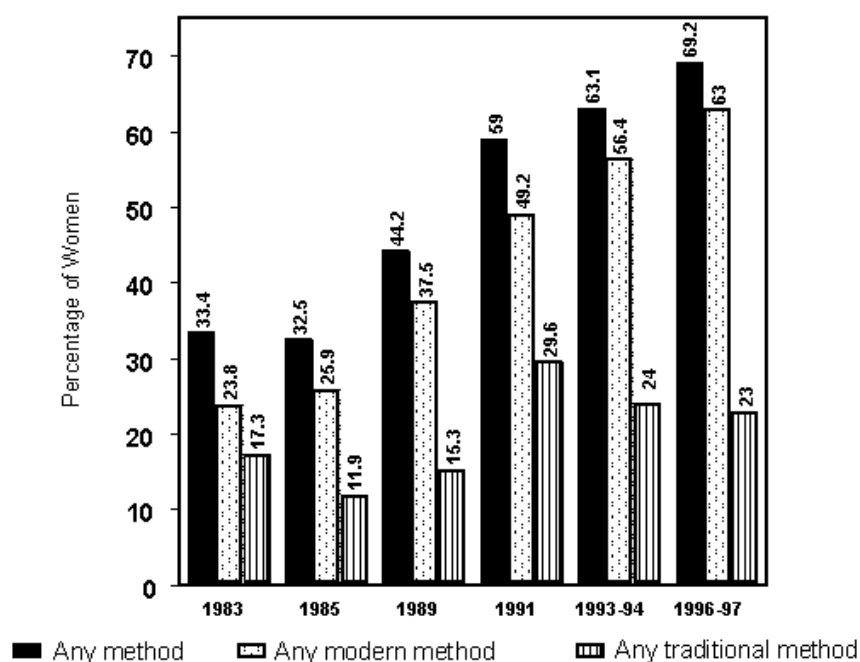
Source: The 1993/94 and 1996/97 Bangladesh Demographic and Health Surveys.

Figure 2. Trends in ever use of family planning methods among currently married women aged 15-49 years in Bangladesh
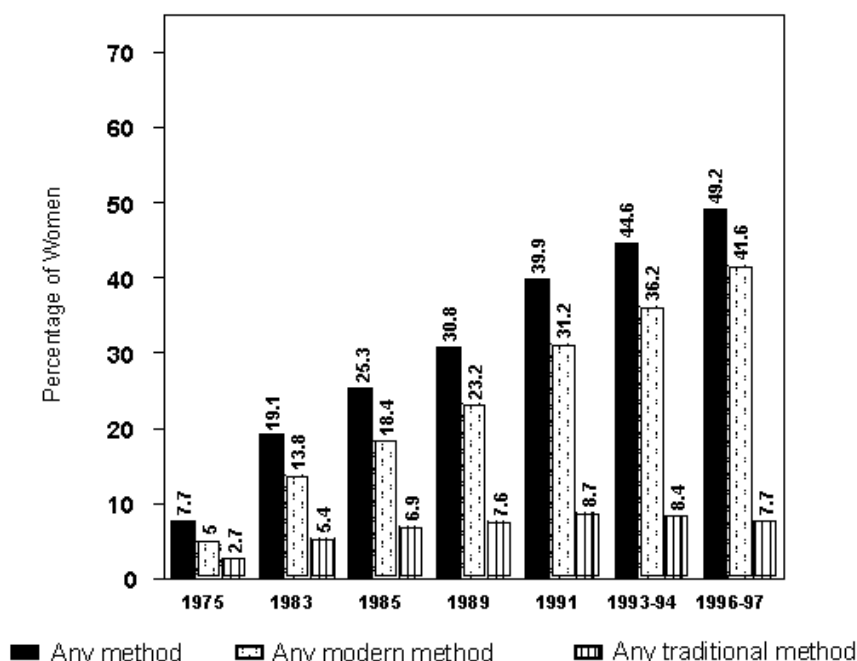
Source: The 1993/94 and 1996/97 Bangladesh Demographic and Health Surveys.

Unmet contraceptive need

The term "unmet contraceptive need" 1 is conventionally defined as the percentage of currently married women in their reproductive ages who do not want additional children and yet are not practising contraception (Westoff, 1978; 1982; Hatmadji and Pebley, 1982). The family planning needs of these women are implicit: they do not want any more children, and therefore, can be considered as having a potential demand for family planning. Further, they can be converted to users of family planning methods if the programme can devote sufficient efforts to motivate them to practise contraception.

Westoff (1978) originally proposed eight measures of unmet contraceptive need. These measures range from including all currently married women of reproductive age, regardless of their current pregnancy or breastfeeding status, who say that they do not want any more children and are not practising contraception, to only currently married non-practising limiters who are not pregnant and not breastfeeding but are fecund.

According to the standard definition, the unmet need group does not include pregnant or amenorrhoeic women whose current pregnancy or recent birth was intended, even if they do not want to become pregnant again right away. Also, women who become pregnant unintentionally because of contraceptive method failure are not considered to have an unmet contraceptive need in general, although they may be in need of more reliable contraceptives (Westoff and Ochoa, 1991).

Despite the usefulness of the concept of unmet need, it has been subject to criticism. According to Mueller-Dixon and Germain (1992), the concept is quite restrictive. They argue that the full extent of family planning need is not identified under the standard formulation, which assumes that the need is fully met, irrespective of whether the method of contraception is effective or ineffective, and appropriate or inappropriate. Foreit and others (1992) argued that contraceptive users may need a more appropriate method because their current method causes unwanted side-effects or because they are using a method best suited to birth spacing when in fact they want to limit births. Also, many women practise traditional methods of contraception; they could be considered as having an unmet need for more effective methods (Boulier, 1985; De Graff and De Silva,1991). In addition, the concept takes no account of unmet need among unmarried women who are sexually active and at risk of unintended pregnancy (Westoff, 1994). A "related" group are sexually active unmarried young adults clearly having a need for contraception (Robey and others, 1996). Furthermore, the concept does not take into account the unmet need of males (Dodoo,

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1993). Thus, while the concept of unmet contraceptive need indicates that a segment of women in the reproductive age groups have some desire to control their fertility, either by spacing or by limiting, the actual extent of unmet need could be underestimated.

Rationale of analysis

During the last two decades, much attention has been given to replacement level fertility by focusing upon unmet need. Sinding and others (1994) also suggested that the fulfillment of unmet need can raise contraceptive prevalence above the level inherent in demographic targets. To reduce a current level of unmet need, various strategies and changes have also been developed in programmes. The objectives of this analysis are to examine (a) the extent of unmet need in Bangladesh and (b) the differentials in unmet need by selected characteristics of the respondents.

Data and methodology

The analysis is based on data from the 1993/94 and 1996/97 Bangladesh Demographic and Health Surveys (BDHS), which employed nationally representative, two-stage samples of 9,640 and 9,127 eligible women (ever-married and aged 10-49 years) respectively. In our study, only currently married women of reproductive age are considered: 8,842 (7,510 rural and 1,332 urban) and 8,306 (6,995 rural and 1,311 urban) from the 1993/94 and 1996/97 BDHS respectively.

In this analysis, the dependent variable "unmet need" includes pregnant women whose pregnancy was mistimed, amenorrheic women whose last birth was mistimed, and women who were neither pregnant nor amenorrheic and who were not using any method of family planning but said they wanted to wait two or more years before having their next birth. Also included are women who were unsure whether they wanted another child or who wanted another child but were unsure when to have the birth, women whose pregnancy was unwanted, amenorrheic women whose last child was unwanted, and women who were neither pregnant nor amenorrheic and who were not using any method of family planning but wanted no more children.

In addition to data on the dependent variable, data were used on several independent variables, namely education, age, religion, employment status, landholding, access to mass media, place of residence, husband-wife communication, number of living children and geographic divisions.

The scores for the different independent variables were assigned as follows: education (no education = 0, primary education = 1, beyond primary education = 2); age (<25 = 0, 25-29 = 1, 30-39 = 2, 40-49 = 3); employment status (housewife = 0, other than housewife = 1); possession of land (no land = 0, any land = 1); mass media (those who listen to radio/watch television at least once a week = 1, otherwise = 0); husband and wife communication (those having talked to their husbands at least once about family planning during the previous three months = 1, otherwise = 0); place of residence (urban = 0, rural = 1); number of living children (no children = 0; 1 or 2 children = 1; 3 or 4 children = 2; 5 or more children = 3); division (Rajshahi/Khulna = 0, others = 1).

In this analysis, both bivariate and logistic regression estimates were used to observe the effects of different covariates on unmet contraceptive need. For this purpose, we have considered total unmet need for contraception, assigning the value 1 to those having an unmet need and 0 to those not having an unmet need. Mother's age, education and number of living children are considered as categorical variables. Mother's age under 25 years, those with no education and those having no living children are treated as reference categories. To see the effects of areal variation on unmet need, high performing divisions of Bangladesh, namely Rajshahi and Khulna, were coded as 1 and other divisions coded as 0. Other variables were coded as 1 if the event occurred and 0 otherwise.

Findings

Before going directly into the findings concerning unmet contraceptive need, it is appropriate to examine fertility preference in general. According to the 1996/97 BDHS, half of the currently married women in the reproductive age groups do not want any more children; 9 per cent of those woman were sterilized. More than one third (36 per cent) of those women wanted to have a child at some time in the future; however, most of those women (22 per cent of all married women) would like to wait two or more years before having their next birth. Only 13 per cent wanted to have a child soon; 3 per cent were undecided about whether they want another child. Thus, the great majority of women wanted either to space their next birth or to limit their childbearing altogether. These women can be considered as having a potential need for contraception.

Table 1 shows the percentage distribution of the women in the sample with an unmet contraceptive need, according to their characteristics. The results were in the expected direction for almost all the variables. Unmet need was higher among the younger women in the 1993/94 BDHS; however, data from the 1996/97 BDHS show that, except among the oldest age groups, unmet need did not differ much by age. Unmet need was higher among rural women (19 and 17 per cent) than among urban women (15 and 11 per cent) in 1993/94 and 1996/97 respectively. In the 1993/94 survey, it was highest among women in Chittagong and Barisal divisions (28 and 20 per cent respectively); in the 1996/97 survey, it was highest in Chittagong and in the newly formed Sylhet divisions (21 and 23 per cent respectively). Unmet need for contraception was lowest among women in Rajshahi and Khulna divisions (14-16 and 12 per cent respectively) in both surveys. Unmet need was slightly lower among women with some secondary schooling than among those with little or no education.

Table 1. Proportion of married women of reproductive age with an unmet need for any family planning method, by their characteristics: Bangladesh

| | Bangladesh Demographic and Health Surveys | | | |
| | 1993/94 | | 1996/97 | |
Characteristics	Percentage of total number	Number of women	Percentage of total number	Number of women
Education				
No education	18.6	(4,869)	16.5	(4,366)
Primary	19.2	(2,512)	15.9	(2,311)
Above primary	16.9	(1,455)	12.9	(1,629)
Age of women (in years)				
<25	24.3	(3,196)	15.9	(2,867)
25-29	15.3	(1,889)	15.3	(1,828)
30-39	16.3	(2,460)	14.8	(2,353)
40-49	13.0	(1,297)	17.0	(1,258)
Religion				
Muslim	19.0	(7,716)	16.1	(7,359)
Non-Muslims	15.2	(1,126)	11.8	(947)
Employment status				
Housewife	19.0	(7,535)	16.2	(5,391)
Other than housewife	15.5	(1,307)	14.6	(2,907)
Land				
No land	19.4	(3,748)	15.4	(3,477)
Has land	17.8	(5,094)	15.8	(4,810)
Mass media				
Has access	16.7	(4,011)	13.9	(4,126)
No access	19.9	(4,831)	17.3	(4,178)
Area				
Urban	15.2	(1,332)	10.8	(1,311)
Rural	19.1	(7,510)	16.5	(6,995)
Husband and wife communication about family planning				
No communication	23.0	(2,729)	22.3	(3,688)
Has communication	16.5	(6,113)	10.3	(4,618)
Ever use of family planning				
Not used	33.5	(2,826)	26.6	(2,291)
Ever used	11.4	(6,016)	11.4	(6,015)
Number of living children				
0	30.5	(953)	16.3	(806)
1-2	18.9	(2,956)	13.7	(2,949)
3-4	14.6	(2,358)	15.6	(2,328)

5+	17.1	(2,575)	18.0	(2,223)
Division				
Barisal	20.1	(931)	16.7	(864)
Chittagong	27.7	(1,832)	20.7	(1,248)
Dhaka	16.8	(2,531)	15.3	(2,290)
Khulna	15.6	(1,166)	12.1	(985)
Rajshahi	14.0	(2,382)	11.5	(2,111)
Sylhet	-	-	22.5	(808)
Total number	8,842		8,306	

Note: The number of women differs because of missing values for different variables.

Tables 2 and 3 show the logistic regression estimates of odds ratios for the effects of selected characteristics of married women of reproductive age on unmet contraceptive need for the whole of Bangladesh, and rural and urban areas of Bangladesh respectively. The odds ratios are shown in place of regression coefficients for easy interpretation of the results. An odds ratio below 1.00 means a negative effect of an independent variable; an odds ratio above 1.00 means a positive effect. The first panel of the tables gives the results based on 1993/94 BDHS data while the second panel gives the results based on the 1996/97 BDHS data. The results are in the expected direction for most variables.

Table 2 shows the factors associated with total unmet need among the study population. Unmet contraceptive need was concentrated among women in the under 25 years age group. In both surveys, the data show that as age increased unmet need gradually declined. In the 1996/97 BDHS, unmet need was significantly higher ($p < 0.01$) in rural than in urban areas; in the 1993/94 BDHS, it was also higher, but the difference was not statistically significant. Also, there were areal variations in unmet need. Compared with Rajshahi and Khulna divisions, unmet need was significantly higher in the other divisions. The number of living children emerged as the best predictor of unmet need in the 1996/97 BDHS. Unmet contraceptive need increased with the increase in the number of living children. Desire for additional children declined among women who had achieved their desired number of children, and who might need contraception for any unwanted births. Unmet need was more than two times higher among women who had five or more children than among those who had no children. In both surveys, unmet need was significantly lower ($p < 0.001$) among the ever users of any family planning method. Discussion about family planning methods between husband and wife was also a significantly important factor for unmet need in the 1996/97 BDHS, but it was not statistically significant in the 1993/94 BDHS.

No significant difference was found in unmet need among educated women and their uneducated counterparts in the 1996/97 survey; however, there were statistically significant differences by education in the 1993/94 survey.

In the 1996/97 BDHS, Muslim women were found to have a significantly higher ($p < 0.05$) unmet need than non-Muslim women. Although not statistically significant, unmet need was higher among Muslim women than non-Muslim women in the 1993/94 BDHS also.

Table 2. Logistic regression estimates of the odds ratios a of characteristics of married women of reproductive age on unmet need for contraception in Bangladesh

Characteristics	Bangladesh Demographic and Health Surveys	
	1993/94	1996/97
Education		
No education (RC)[b]	1.00	1.00
Primary	1.24[e]	1.11
Above primary	1.32[d]	1.15
Age of women (in years)		
<25 (RC)[b]	1.00	1.00
25-29	0.67[e]	0.92
30-39	0.64[e]	0.77[d]

Characteristics		
40-49	0.33[e]	0.65[e]
Religion		
Muslim (RC)[b]	1.00	1.00
Non-Muslims	0.86	0.78[c]
Employment status		
Housewife (RC)[b]	1.00	1.00
Other than housewife	0.99	0.96
Land		
No land (RC)[b]	1.00	1.00
Has land	0.92	1.03
Mass media		
No access (RC)[b]	1.00	1.00
Has access	0.93	1.01
Area		
Urban (RC)[b]	1.00	1.00
Rural	1.11	1.36[d]
Husband and wife communication about family planning		
No communication (RC)[b]	1.00	1.00
Has communication	0.90	0.52[e]
Ever use of family planning		
Not used (RC)[b]	1.00	1.00
Ever used	0.27[e]	0.44[e]
Number of living children		
0 (RC)[b]	1.00	1.00
1-2	0.91	1.28[c]
3-4	0.95	1.88[e]
5+	1.38[d]	2.09[e]
Division		
Rajshahi/Khulna (RC)[b]	1.00	1.00
Others	1.35[e]	1.34[e]
-2 Log-likelihood	7,730[e]	6,835[e]
Number	8,840	8,277
Degree of freedom	16	16
Intercept:	-0.65[e]	-1.66[e]

a = Odds ratio = exp (B); b = RC = reference category; c = p<.05; d = p<.01; e = p<.001.

Table 3. Logistic regression estimates of the odds ratios a of characteristics of married women of reproductive age on unmet need for contraception, by area: Bangladesh

Characteristics	Bangladesh Demographic and Health Surveys			
	1993/94		1996/97	
	Urban	Rural	Urban	Rural
Education				
No education (RC)[b]	1.00	1.00	1.00	1.00
Primary	0.97	1.27[e]	1.04	1.13
Above primary	1.13	1.38[d]	1.11	1.17
Age of women (in years)				

<25 (RC)[b]	1.00	1.00	1.00	1.00
25-29	0.82	0.65[e]	0.52[c]	0.99
30-39	0.59[c]	0.66[e]	0.51[c]	0.81
40-49	0.27[e]	0.35[e]	0.31[d]	0.71[d]
Religion				
Muslim (RC)[b]	1.00	1.00	1.00	1.00
Non-Muslims	0.65	0.91	1.30	0.74[d]
Employment status				
Housewife (RC)[b]	1.00	1.00	1.00	1.00
Other than housewife	1.20	0.93	0.98	0.96
Land				
No land (RC)[b]	1.00	1.00	1.00	1.00
Has land	0.87	0.92	1.54[c]	0.98
Mass media				
No access (RC)[b]	1.00	1.00	1.00	1.00
Has access	0.95	0.92	1.19	0.99
Husband and wife communication about family planning				
No communication (RC)[b]	1.00	1.00	1.00	1.00
Has communication	0.50[e]	0.99	0.40[e]	0.54[e]
Ever use of family planning				
Not used (RC)[b]	1.00	1.00	1.00	1.00
Ever used	0.37[e]	0.26[e]	0.30[e]	0.46[e]
Number of living children				
0 (RC)[b]	1.00	1.00	1.00	1.00
1-2	0.81	0.92	1.44	1.27[c]
3-4	0.68	0.99	3.24[d]	1.79[e]
5+	1.28	1.36[c]	3.60[d]	1.97[e]
Division				
Rajshahi/Khulna (RC)[b]	1.00	1.00	1.00	1.00
Others	0.97	1.42[e]	1.14	1.37[e]
-2 Log-likelihood	1,042[e]	6,661[e]	814[e]	5,903[d]
Number	1,332	7,508	1,303	6,974
Degree of freedom	15	15	15	15
Intercept:	0.01	0.64[e]	-1.46[e]	-1.37[e]

a = Odds ratio = exp (B); b = RC = reference category; c = p<.05; d = p<.01; e = p<.001.

We wanted to see if there were any factors associated with unmet need in the urban and rural areas, and if any, how much did those factors contribute to unmet need. The results are presented in table 3. For urban areas, there is no association between mother's education and unmet need in either of the surveys. However, in rural areas, women with primary schooling and those with an education beyond primary school had significantly higher (p<0.001) unmet need in the 1993/94 BDHS, but not in the 1996/97 BDHS. In both areas, younger women had significantly higher (p<0.001) unmet need than middle-aged and older women. In urban areas, non-Muslims had a higher unmet need than Muslims, but the difference was not statistically significant. By contrast, in rural areas non-Muslim women had significantly lower (p<0.01) unmet need than Muslim women in the 1996/97 BDHS. In the 1993/94 BDHS, unmet need was lower among non-Muslim women in both areas. The probability of having an unmet need was significantly lower (p<0.001) where husband and wife discussed family planning methods. Also, it was significantly lower (p<0.001) among the ever users of any family planning method. Women having more than five children had a significantly higher (p<0.001) unmet need than those who had no children, and this was true both in

rural and in urban areas. There was an areal variation in unmet need in rural areas only. Other than Rajshahi and Khulna divisions, the probability of having unmet need was significantly higher (p<0.001) among rural women. Unmet need was higher among those with landholdings in the urban area, and it was significant at the 5 per cent level.

Discussion and implications

Bangladesh has achieved considerable success in its family planning programme, resulting in a marked decline in fertility. Fertility preferences have also undergone changes. Desire for additional children declined appreciably over the past decade. Half of currently married women of reproductive age indicated that they do not want any more children; the proportion of such women rises with age and is highest in Sylhet and Chittagong divisions. Over one third of the women wanted to space their childbearing. Based on these findings, it can be seen that there is a sizeable "demand" for family planning in the country.

According to the 1996/97 BDHS, one out of every six women in Bangladesh ha an unmet need -- 8 per cent each for spacing and limiting the birth of children. The extent of unmet need was found to be higher in rural than in urban areas, and was higher in Sylhet and Chittagong divisions than in the country's other divisions.

The main predictors of unmet need were found to be ever use of family planning, husband-wife communication on family planning matters, number of living children and place of residence. It is quite evident that, if the 20 per cent gap between ever use of contraception (69.2 per cent in 1996/97) and current use (49.2 per cent) could be bridged, the CPR will be close to 70 per cent and the country will have reached the replacement level of fertility. Therefore, in order of priority, the population programme should aim at motivating "drop-outs" to resume practising contraception. The programme can do so through appropriate IEC (information, education and communication) measures, improved supervision, as well as by ensuring that the major reason for droping out (half of the users in Bangladesh stop using contraceptive methods within the first 12 months of use), namely, side-effects, is duly addressed through better counselling as well as better management of side-effects. The programme certainly needs to give due consideration to improvements in the quality of care being offered to acceptors. This issue can be better addressed under the new service delivery strategy of providing services from static clinics, attended by paramedics in addition to field-workers. Also, the providers need to be given adequate training on counselling, screening and management of side-effects. Communication between husbands and wives on family planning matters is an important intermediate step along the path to their eventual adoption and the sustained use of family planning methods. In a study by Khuda and others (1998b), the major predictors of husband-wife communication were found to be education, age, access to mass media, and ever use as well as current use of family planning. The programme should be further strengthened and intensified in Sylhet and Chittagong divisions, where unmet need is highest. There is clearly a need for more and better advocacy and IEC efforts to overcome socio-cultural resistance to the adoption of family planning in those divisions. Community leaders should be more actively involved in the programme and it should give greater emphasis to longer-acting methods in order to address the unmet needs of high parity women. Higher parity women, using temporary methods or not practising contraception at all, are potential candidates for permanent methods. The providers should motivate such women to accept permanent methods by explaining to them the relative advantages of permanent methods. The programme should intensify its efforts in the rural areas of the country in order to enhance accessibility to, and availability of, family planning methods. Young married women (less than 25 years of age) deserve special consideration because unmet need is highest among them, and their fertility is high. The programme should attach high priority to addressing the needs of these women by appropriate IEC measures and selective home visits.

Endnote

For a detailed discussion on the concept, see Khuda and Howlader, 1986; 1988; 1990, and Barkat and others, 1997.

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Levels, Trends and Determinants of Child Mortality in Matlab, Bangladesh, 1966-1994 (Demographers' Notebook)

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There has been a substantial decline in child mortality in Bangladesh since the 1940s, particularly in the last two decades (Huq and Cleland, 1990; Cleland and Streatfield, 1992; ICDDR,B, 1984; 1994). Yet, with an infant mortality rate at about 100 deaths per thousand live births, and an under-five mortality rate of about 130 per thousand (in 1994), child mortality is still a burning problem in Bangladesh. To develop interventions to reduce infant and child mortality, it is important to know the factors responsible for mortality decline, and the factors that work as obstacles to its further decline in this country.

Several studies have examined the determinants of under-five child mortality in Bangladesh. Koenig and others (1990) demonstrated that preceding short birth intervals adversely affect neonatal mortality and subsequent short birth intervals adversely affect mortality of children in the age group 2-4 years. Alam (1995) showed that the survival status of older siblings modified the adverse effect of a preceding short birth interval and the high mortality risk of closely spaced children was due to sibling competition for parental resources. Mother's education was found to be helpful in reducing child mortality in this country and other populations (Bhuiyan and Streatfield, 1991; D'Souza and Bhuiya, 1982; Caldwell, 1994). Preference for sons over daughters is very strong in Bangladesh. This preference was found to discriminate against female children in the distribution of food and health care (Chen and others, 1981). The intensity of this discrimination was aggravated during periods of crisis (Bairagi, 1986) and resulted in excess female child mortality.

Although these studies are important, they focused on a certain time period, not telling much about the dynamics of child mortality, its trends and whether the effects of any determinants of child mortality changed over time (with mortality decline) and interventions such as maternal and child health and family planning (MCH/FP).

Some attempts have been made to investigate the levels, trends and correlates of child mortality in Bangladesh from the data of three national surveys: the Bangladesh Fertility Survey 1975 (1975 BFS), the Bangladesh Fertility Survey 1989 (1989 BFS), and the Bangladesh Demographic and Health Survey 1993/94 (1993/94 BDHS) (Hill, 1995; Hill and others, 1996). The results of these studies suggest that, although child mortality did not decline during the period 1968-1975, there was a linear decline after that period at the rate of 3 per cent annually until 1993. The authors concluded that changes in mother's education, birth interval, birth order etc., had little effect on mortality decline in this country, and that other unknown factors might have been responsible for the decline. The factors of child mortality obtained from an investigation from the 1993/94 BDHS data (Hill, 1995; Hill and others, 1996) were found to be quite different from the results of other studies in this country (Koenig and others, 1990; Clemens and others, 1988; Koenig and others, 1991; Bhuiya and Streatfield, 1991; Muhuri and Preston, 1991; Alam and Bairagi, 1996). The effects on mortality of warfare in 1971 and of famine in 1974/75 also were not reflected in these studies based on data from national surveys.

A major limitation of the mortality studies based on national surveys was that the quality of data was not precisely known. An attempt was made to evaluate the quality of childhood mortality data of the 1993/94 BDHS (Mitra and others, 1995). However, that evaluation was not adequate to estimate the level and selectivity of omission of deaths and errors in the reporting of dates of deaths. Kabir and Amin (1995) showed that the sex ratio at birth in the 1989 BFS was at an unacceptable level, i.e. 113 male births per 100 female births, and this ratio was particularly high for uneducated mothers. Of course, while the estimates of under-five mortality at different periods in the three surveys mentioned were found to be the same, this was a sign of consistency in the estimates obtained in the three surveys -- not a sign of accuracy. In a validation study, it was shown that infant mortality in the 1993/94 BDHS was underestimated (Bairagi and others, 1995). Sex selective omission or underreporting of deaths may have suppressed the effect of sex as a determinant of mortality. In the retrospective data of a developing country, this type of problem is not unexpected. This kind of problem in national survey data collected retrospectively might have suppressed the effects of some variables on child mortality.

Although the Matlab Demographic Survillance System (DSS) data are free from all such errors, the data may not be nationally representative. Because of the presence of the Matlab Diarrhoea Hospital, mortality may be lower in the Matlab area than for the country as a whole; however, while this limitation may affect the level of mortality and deaths due to diarrhoea, it should have no effect on the trends and correlates of mortality, particularly in the comparison area.

Objectives

The objectives of this study are to identify the factors related to infant and child mortality in different periods, to find the levels, trends and factors of the decline in the mortality of children under five, and to examine whether the effects of any factors were modified over time and were due to the MCH/FP programme in Matlab during the period 1966-1994.

Methods and materials

Data for this study came from the Matlab DSS, and the 1974 and 1982 socio-economic status (SES) surveys in the entire DSS area. Matlab is a low-lying, deltaic flood-plain in rural Bangladesh. It is about 50 km southeast of Dhaka, the capital of the country. From July to October every year, most of the area, except for raised household courtyards, is under water. Although farming is the main occupation, 30 per cent of the families are landless. Eighty-five per cent of the people are Muslims and the remainder are Hindus.

Under the Matlab DSS, vital events information has been collected monthly since July 1966 for a population of about 200,000. The Matlab DSS is the largest longitudinal demographic data system in the developing world. To collect the information, every household in the area is visited twice a month. In 1977, the Matlab DSS area was divided into two zones, each with about 100,000 population: the MCH/FP area and the comparison area. A comprehensive health and family planning programme was introduced in the MCH/FP area phase by phase, while the comparison area has remained under the usual programme of the government.

Every individual, including the newborn, has a unique identification number identifying village and household addresses. With that identification number, the record of a child can be linked with all the independent variables, including the household characteristics. Unfortunately, at the time of this study, we did not have socio-economic data other than those collected in the 1974 and 1982 surveys in the area. However, SES data collected in 1994 from a sample of about 3,000 households were used to obtain a recent socio-economic picture of the area.

Mortality of children under five years of age was divided into infant (less than one year old) and child (1-4 years of age) mortality, because the mortality pattern and its factors differ substantially for these two age groups. Mother's education, mother's age, sex of the child, religion, birth order and preceding birth interval were the independent variables. The analysis was done separately for the MCH/FP area and the comparison area. Analyses for the two areas were done separately as well as jointly to examine the impact of the MCH/FP programme and to investigate whether the effect of any independent variable was influenced by the MCH/FP programme.

Most of the analysis was done by cross-tabulation and simple statistical tests, such as the Chi-square ($X2$) and proportion tests. We used Cox's model (Cox and Oakes, 1985) for multivariate analysis. The formula for this model is:

$$h(t) = h0(t) \exp(\beta i x i +)$$

where the hazard of death for any duration (t) is assumed to be related to a baseline risk at that time t, h0(t), by an exponential set of factors $\beta i x i$.

Mortality rates for different time periods were estimated by the life-table technique. Death was considered as an event, whereas migration, lack of follow-up for any reason, and age of child more than five years were considered items for censoring. Although the trends of under-five mortality were investigated for the entire period of 1966-1994, factors of mortality were examined by bivariate analysis for three birth cohorts of 1976/77, 1985/86 and 1988/89 for elaboration. The selection of these particular cohorts was done purposively. The 1976/77 period was a normal period after the famine of 1974/75; 1985/86 was the period when under-five mortality started to decline rapidly, and 1988/89 was the last cohort for which follow-up was possible for the survival of a birth up to five years of life before the cut-off date on 31 December 1994.

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A few limitations of this study should be underscored. First, at the time of this study, the last SES survey in Matlab was undertaken in 1982. So, other than mother's education, no recent SES information was available for this study. Some SES data that were collected from a sample of about 3,000 households in the Matlab DSS area in 1994 were used to obtain a recent picture of the area. Second, birth interval data prior to 1982 had not been cleaned at the time of this study and thus were not used for the period before 1982. Third, some irregular changes in SES, or health programmes, or natural phenomena such as epidemics and floods might be responsible for the changes in the rate of decline in mortality at different times. The effect of those changes remained mostly unknown for want of necessary data.

Results

As mentioned previously, socio-economic data were collected for a sample of 3,009 households in the 1994 Matlab DHS. The Survey results made it possible to compare the SES data on Matlab with the Bangladesh national rural area data as determined by the 1993/94 BDHS. In Matlab, 86 per cent of the households were found to own a cot or a bed, 58 per cent a table, chair or bench, 44 per cent a watch or clock, and 43 per cent a wardrobe. With regard to more valuable items, 29 per cent of the households were found to own radios, and 3 per cent televisions. In 1994, 69 per cent of the households owned agricultural land, 48 per cent of ever-married women aged 10-49 years had some education and 15 per cent had more than a primary education (six or more years of schooling). The husband's education was higher: 63 per cent had some education, and 34 per cent had more than five years of schooling. The education level of women in Matlab was higher than the national average; the ever-married female literacy rate was 48 per cent there compared with 42 per cent nationally. Overall, Matlab was slightly better off than the average rural area in Bangladesh. It may be noted that, although contraceptive use was higher by more than 20 percentage points and the total fertility rate (TFR) was lower by one child in the MCH/FP area than in the comparison area (TFR = 3.9 vs 2.9 in 1994), SES, measured by possession of items such as a radio and watch, was almost the same in the two areas in 1994. However, the education level of children improved much more in the MCH/FP area than in the comparison area during the 1978-1994 period (Razzaque and others, 1996).

It is likely that a cohort rate of under-five mortality would suppress the effect of short-term phenomena such as famines and floods, because such a rate will reflect the cumulative effect of all the phenomena that occurred during the consecutive five years since birth. To avoid this problem, a yearly period rate for under-five mortality, $5q0$ (calculated by the life-table technique), was obtained for the Matlab comparison area and the MCH/FP area as well as the national rate from the DHS. The Matlab infant mortality rate (this was also the period rate) and the age-specific death rate by area were available since 1966 from the DSS. Until 1973, the annual reporting period under the Matlab DSS was May to April. The DHS under-five period mortality rate for each calendar year was obtained from birth history and infant and child mortality data collected retrospectively from each ever-married woman in a sample of about 10,000. These rates are shown in figure 1. In the comparison area, the under-five period mortality rate was more than 200 per thousand during the period 1966-1975, with a 15 per cent increase in 1971 and 35 per cent increase in 1975 owing to the 1971 war of liberation and the 1974/75 famine respectively. For the period 1976-1982, the rate was stable at around 200 per thousand, but it rose in 1984 owing to an epidemic of dysentery. That rate subsequently started to decline and quite rapidly came down to about 135 per thousand in 1994. Before the MCH/FP project was initiated, the mortality rates in the comparison and MCH/FP areas were similar (LeGrand and Phillips, 1996); however, in 1994 the mortality rate was more than 25 per cent lower in the MCH/FP area than in the comparison area. In the mid-1960s, the national estimate obtained from national surveys was very close to the figure for the comparison area, but was lower by more than 20 per cent in the 1990s. The effects of the 1971 war, the 1974/75 famine and the 1984 outbreak of dysentery (shigellosis) are not reflected at all in the national estimates. The pattern of reduction in the national estimate and in the comparison area was not similar. In the national estimate, there was no significant reduction in under-five mortality until 1975, after which time the decline was linear at the rate of 3 per cent annually (Hill, 1995). The trend in the Matlab rate, as shown in figure 1, makes it clear that the decline in under-five mortality was not linear. In fact, the rate did not start declining significantly in the Matlab comparison area until 1986.

Figure 1. Probability (multiplied by 1,000) of death by five years of age, 1966-1993
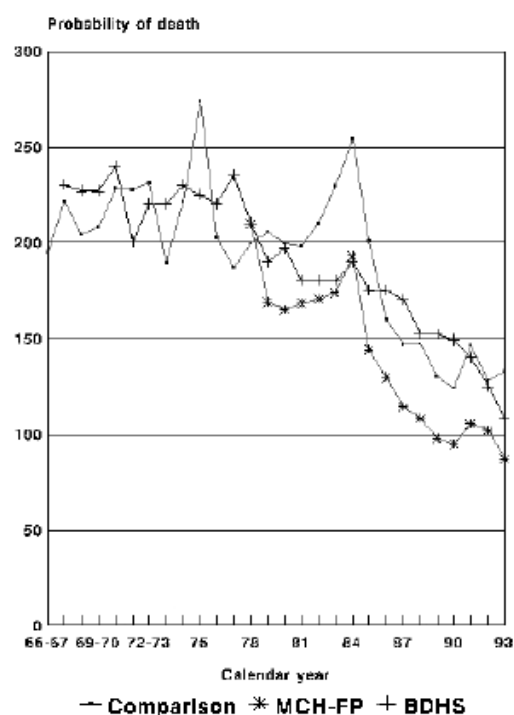
Note: Until 1973, the May-April period was used for annual reporting under the Matlab Demographic Surveilance System.

Table 1. Infant mortality according to socio-economic and demographic characteristics: birth cohorts of 1976/77, 1985/86 and 1988/89 in comparison area, Matlab, Bangladesh

Birth cohort	1976/77		1985/86		1988/89	
	Births (N)	Rate (per thousand	Births (N)	Rate (per thousand)	Births (N)	Rate (per thousand)
Mother's education						
Illiterate	5,381	109	4,920	108	4,804	98
Literate	1,788	100	1,950	92	2,044	85
Unknown	165	127	741	119	477	65
Sex of child						
Male	3,719	112	3,866	108	3,667	97
Female	3,615	103	3,745	101	3,658	87
Religion						
Muslim	6,337	99	6,859	102	6,599	89
Hindu	997	159	752	129	726	117
Mother's age						
<20	1,557	129	881	160	642	146
20-34	4,885	99	5,669	95	5,702	87
35+	892	119	1,061	110	981	87
Birth order						
1	1,316	146	1,438	133	1,493	123
2-3	2,274	98	2,627	91	2,454	83
4-5	1,682	82	1,730	98	1,739	80
6+	2,062	114	1,816	108	1,639	90
Previous birth interval (months)						
<24	914	136	1,454	133	1,415	101
24-47	1,984	89	3,806	74	3,614	75
48+	590	92	810	117	764	84

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Missing	3,846	112	1,541	145	1,532	127
Total	7,334	107	7,611	105	7,325	92

Table 1 gives the infant mortality rate for the birth cohorts of 1976/77, 1986/87 and 1988/89 in the comparison area by some of the socio-economic and demographic characteristics of the households. As seen in this table, infant mortality declined in the comparison area by 2 per cent in the 1986/87 birth cohort and by 14 per cent in the 1988/89 cohort in comparison with the 1976/77 cohort. As expected, infant mortality among educated mothers was lower, had a U-shaped relationship with the mother's age, birth order and previous birth interval, and it was lower for female infants and for children of Muslims for each birth cohort.

The infant mortality rate of the 1976/77 birth cohort in the MCH/FP area was 105 per thousand, almost the same as that of the comparison area (table 2). But, in comparison with the 1976/77 birth cohort, the decline was 21 per cent in the 1985/86 birth cohort, and 30 per cent in the 1988/89 birth cohort. The relationship of infant mortality with different variables in the MCH/FP area was similar to that in the comparison area, i.e. lower for literate mothers, a U-shaped relationship with the mother's age, birth order and previous birth interval, and lower for female infants and children of Muslims.

Table 2. Infant mortality according to socio-economic and demographic characteristics: birth cohorts of 1976/77, 1985/86 and 1988/89, MCH-FP area of Matlab, Bangladesh

Birth cohort	1976/77		1985/86		1988/89	
	Births (N)	Rate (per thousand)	Births (N)	Rate (per thousand)	Births (N)	Rate (per thousand)
Mother's education						
Illiterate	5,061	105	4,001	89	3,541	77
Literate	2,076	104	1,831	62	1,933	72
Unknown	152	125	745	105	459	59
Sex of child						
Male	3,711	111	3,320	85	3,015	76
Female	3,578	99	3,257	82	2,918	72
Religion						
Muslim	5,820	101	5,492	84	5,009	74
Hindu	1,469	119	1,085	81	924	75
Mother's age						
<20	1,522	137	853	111	541	117
20-34	4,809	93	4,952	79	4,691	67
35+	958	112	772	83	701	88
Birth order						
1	1,288	150	1,577	110	1,437	96
2-3	2,174	87	2,500	68	2,390	59
4-5	1,711	80	1,353	71	1,263	64
6+	2,116	116	1,147	94	843	93
Previous birth interval (months)						
<24	958	128	910	95	771	87
24-47	1,809	88	2,772	68	2,466	64
48+	462	93	1,240	71	1,227	51
Missing	4,060	108	1,655	113	1,469	101
Total	7,289	105	6,577	83	5,933	74

In the comparison area, the probability of death of a child before completing his or her fifth year of life, who was alive at exact age one, $4q1$, in the birth cohorts of 1976/77, 1985/86 and 1988/89 by different characteristics, is given in table 3. Child mortality, $4q1$, was 91 per thousand in the birth cohort of 1976/77. It was reduced by 40 per cent in the birth cohort of 1985/86 and by 58 per cent in the birth cohort of 1988/89. Child mortality was more than 40 per cent lower in the group of educated mothers than in the group of uneducated mothers, and increased almost linearly with both mother's age and birth order in each cohort. It was 77 per cent higher in female children in the 1976/77 birth cohort, rising to 92 per cent higher

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in the 1985/86 cohort, but decreasing 30 per cent in the 1988/89 cohort. Also, child mortality was lower among Hindu children.

Table 3. Probability of death (multiplied by 1,000) of children before they complete the fifth year of life who were alive at the beginning of one year of age (4q1), according to socio-economic and demographic characteristics, comparison area of Matlab, Bangladesh

Birth cohort	1976/77		1985/86		1988/89	
	Children	$_4q_1$	Children	$_4q_1$	Children	$_4q_1$
Mother's education						
Illiterate	4,517	99	4,121	66	3,993	45
Literate	1,472	61	1,646	34	1,690	26
Unknown	58	241	554	42	396	20
Sex of child						
Male	3,065	66	3,207	38	3,024	33
Female	2,982	117	3,114	73	3,055	43
Religion						
Muslim	5,284	93	5,731	57	5,506	38
Hindu	763	77	590	39	573	42
Mother's age						
<20	1,200	91	666	51	485	43
20-34	4,094	90	4,754	56	4,753	36
35+	753	93	901	53	841	46
Birth order						
1	985	79	1,116	53	1,122	34
2-3	1,885	88	2,200	51	2,032	34
4-5	1,428	95	1,455	57	1,499	34
6+	1,749	97	1,550	62	1,426	51
Previous birth interval (months)						
<24	738	103	1,163	53	1,188	56
24-47	1,702	88	3,308	59	3,109	34
48+	504	105	668	49	637	28
Missing	3,103	87	1,182	52	1,145	35
Total	6,047	91	6,321	55	6,079	38

Table 4. Probability of death (multiplied by 1,000)of children before they complete the fifth year of life who were alive at the beginning of one year of age (4q1), according to socio-economic and demographic characteristics, MCP/FP area of Matlab, Bangladesh

Birth cohort	1976/77		1985/86		1988/89	
	Children	$_4q_1$	Children	$_4q_1$	Children	$_4q_1$
Mother's education						
Illiterate	4,376	93	3,457	41	3,022	28
Literate	1,738	43	1,617	20	1,627	25
Unknown	58	172	614	28	401	15
Sex of child						
Male	3,132	58	2,859	28	2,556	22
Female	3,040	102	2,829	40	2,494	29
Religion						
Muslim	4,954	85	4,798	35	4,296	26
Hindu	1,218	58	890	29	754	21
Mother's age						
<20	1,188	69	703	38	427	14

20-34	4,146	80	4,095	31	4,026	26
35+	838	94	690	44	597	29
Birth order						
1	971	71	1,290	33	1,120	17
2-3	1,858	78	2,182	28	2,028	21
4-5	1,511	68	1,203	33	1,114	29
6+	1,832	96	1,013	46	736	46
Previous birth interval (months)						
<24	792	59	792	37	665	26
24-47	1,585	78	2,450	34	2,155	31
48+	406	111	1,099	32	1,086	24
Missing	3,389	81	1,347	33	1,144	18
Total	6,172	80	5,688	34	5,050	26

The probability of child mortality, 4q1, by different characteristics in the MCH/FP area is given in table 4. It was 80 per thousand in the birth cohort of 1976/77, but fell to 34 per thousand in the 1985/86 cohort and 26 per thousand in the 1988/89 cohort. In each birth cohort, mortality was lower for educated and young mothers, low birth order children, and Hindu and male children.

The results of the multivariate analysis of infant mortality are given in table 5 and child mortality in table 6. This analysis had two purposes: one was to examine the effects of selected long-term factors on the decline in mortality, and the other was to identify the determinants and the change in the effects of (a) the determinants between high mortality and low mortality situations and (b) the MCH/FP programme. Thus, only two periods were selected: 1976/77, in which mortality was high, and 1988/89, when mortality was low. The birth cohort of 1985/86 was excluded because infant mortality in 1976/77 and 1985/86 in the comparison area was almost the same. Both selected cohorts were free from any irregular effects such as famines or epidemics. The social factors included in the model were sex (its effect), mother's education and the MCH/FP programme; biological factors included in the model were mother's age and the birth order. The preceding birth interval was not included because more than 50 per cent of the birth intervals of the 1976/77 cohort were not available at the time of this study. Nevertheless, the contribution of birth interval to mortality was examined in a multivariate analysis in which all cohorts were included (results not shown here). Birth intervals of less than 12 months were taken as the reference group. The relative risk of infant mortality with a birth interval of 24-47 months to the reference group was 0.66, and for an interval greater than or equal to 48 months it was 0.89. For child mortality, the relative risks were 0.86 and 0.82 respectively. Each of these was significantly lower than 1.00, i.e. the risk in the reference group.

If the coefficients of the cohorts for different models in tables 5 and 6 are compared, it appears that about 85 per cent of the decline in infant mortality and 23 per cent of the decline in child mortality is attributable to the long-term factors considered in the model1. The contribution of the biological factors to the decline was more than the contribution of the social factors. As mentioned previously, the MCH/FP area and the comparison area were almost the same socio-economically in 1977 when the MCH/FP project was started, and also in 1994. The difference between the two areas in mortality (relative risk being significantly less than 1) that is observed in the third column in tables 5 and 6 was not, therefore, due to socio-economic reasons. On the other hand, there was a substantial increase in the relative risk of "area" in model 5 compared with model 2, which suggests that the contributions of the MCH/FP project in decreasing infant and child mortality were mediated to a considerable degree through a change in mother's age and the birth order.

Table 5. Relative risks from hazard model analysis of infant mortality, Matlab, Bangladesh, 1976/77 and 1988/89 birth cohorts

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Birth cohort[a] (T)	0.78[h]	0.79[h]	0.84[h]	0.86[h]	0.97
Area[b] (A)		0.89[h]		0.90[h]	1.03
Sex [c] (S)		0.91[h]		0.90[h]	0.90[h]
Religion[d] (R)		1.29[h]		1.31[h]	1.63[h]
Mother's education[e]					
		0.93			

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Literate (E_1)				0.91^i	0.91^i
Unknown (E_2)		0.79^i		0.76^h	0.75^h
Mother's age (M)[f]			0.89^h	0.89^h	0.89^h
(M^2)[f]			1.00^h	1.00^h	1.00^h
Birth order (B)[g]			0.94^i	0.94^i	0.93^i
(B^2)[g]			1.01^h	1.01^h	1.01^h
Interactions					
T.A.					0.82^i
A.R.					0.74^h
T.R.					0.82^i

a = Reference: 1976/77 birth cohort.
b = Reference: Comparison area.
c = Reference: Male.
d = Reference: Muslim.
e = Reference: Illiterate.
f = Years.
g = Numbers.
h = p<0.01.
i = p<0.05.

Table 6. Relative risks from hazard model analysis of child mortality, Matlab, Bangladesh, 1976/77 and 1988/89 birth cohorts

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Birth cohort[a]	0.36^h	0.37^h	0.39^h	0.39^h	0.51^h
Area[b] (A)		0.86^h		0.87^h	0.92
Sex[c] (S)		1.65^h		1.65^h	1.80^h
Religion[d] (R)		0.75^h		0.76^h	0.75^h
Mother's education[e]					
Literate (E_1)		0.55^h		0.56^h	0.52^h
Unknown (E_2)		0.79^h		0.83^h	1.53^h
Mother's age (M)[f]			0.99^i	0.98^i	0.98^i
Birth order (B)[g]			1.18^h	1.17^h	1.17^h
(B^2)[g]			0.99^i	0.99^i	0.99^h
Interactions					
T.A.					0.79^i
T.S.					0.72^h
T.E_1					1.33^i
T.E_2					0.31^h

a = Reference: 1976/77 birth cohort.
b = Reference: Comparison area.
c = Reference: Male.
d = Reference: Muslim.
e = Reference: Illiterate.
f = Years.
g = Numbers.
h = p<0.01.
i = p<0.05.

All possible second order interactions were included in the final model along with the main effects, but

only those terms that appeared as significant are given in tables 5 and 6. The results suggest that infant mortality declined significantly from the birth cohort of 1976/77 to the birth cohort of 1988/89. Infant mortality was lower in the MCH/FP area and among males, Muslims and educated mothers. It had a significantly U-shaped relationship with mother's age and birth order. The interaction terms suggest that (a) the MCH/FP project facilities were utilized more by Hindus than Muslims in reducing infant mortality, (b) the decline in mortality over time was greater among Hindus and (c) the MCH/FP programme had a significant effect on the later cohort (this point is trivial, because the MCH/FP programme was not started in the area before the end of 1977).

Child mortality declined sharply over time, and it was significantly lower in the MCH/FP area, among male children, Hindus and educated mothers (table 6). It decreased with mother's age and increased with birth order. Interaction terms suggest that the MCH/FP project reduced mortality in the later cohort, and the mortality decline was greater among female children, but the effect of mother's education in reducing mortality declined over time. If the effect of mother's education is checked in tables 3 and 4, it appears that the reduction in the impact of mother's education over time was mainly in the MCH/FP area. Some of the beneficial services of the MCH/FP project were not modified by mother's education. The main effect of the groups whose mother's education was unknown and interaction with time gave no consistent results.

A factor may contribute to mortality decline in two ways: (a) its actual contribution may change over time; for example, mother's education may be an important determinant of mortality in earlier stages but not at a later stage and (b) there may be a change in the distribution of the determinant. For example, there might be 10 per cent of mothers educated at an earlier point, changing to 25 per cent at a later time, which will bring about a change in mortality even if the effect of mother's education on mortality remains the same. The change in the effect of a determinant over time should appear in the interaction of that term with time (tables 5 and 6). The contribution of a variable to the decline in mortality due to a change in the distribution of the variable can be estimated by calculating the standardized rate for the variable (Shryock and others, 1976; Fox and others, 1971). The standardized rate was obtained under the assumption that the distribution of the variable of interest was the same over time. The results of standardization are shown in tables 7 and 8. The standardized rate of a variable is the rate that would exist if there was no change in the distribution of the variable over time or between populations. A higher standardized rate than the observed rate suggests that a change in the distribution of the variable of interest helps in reducing mortality over time. Standardized rates were obtained using the distributions of different variables in the 1976/77 cohort as the standard (tables 7 and 8). The results of these tables suggest that a change in the distribution of mother's age at birth over time helped in reducing infant mortality in both areas because, without a change in the distribution of mother's age, infant mortality in the comparison area would remain 111 per thousand instead of 105 per thousand in 1985/86, and 100 per thousand instead of 92 per thousand in 1988/89 (table 7). Similarly, it would remain 86 per thousand instead of 83 per thousand and 80 per thousand instead of 74 per thousand in the MCH/FP area during these two periods (table 8). Also, a change in the distribution of mother's education helped in reducing child mortality (from 58 to 55 per thousand) in the comparison area (table 7) and a change in the distribution of birth order helped in reducing child mortality (from 30 to 26 per thousand) in the MCH/FP area over time (table 8).

Table 7. Observed and standardized infant and child mortality rates (per thousand) in comparison area of Matlab: 1976/77 cohort as the standard population

Cohorts	Infant mortality		Child mortality ($_4q_1$)	
	1985/86	1988/89	1985/86	1988/89
Variables				
Mother's education	104	94	58	40
Sex of the child	105	92	55	38
Religion	106	93	55	39
Mother's age	111	100	55	39
Birth order	105	91	56	39
Observed rate	105	92	55	38
1976/77 cohort	107		91	

Table 8. Observed and standardized infant and child mortality rates (per thousand) in the MCH/FP area of Matlab: 1976/77 cohort as the standard population

Cohorts	Infant mortality	Child mortality ($_4q_1$)

Variables	1985/86	1988/89	1985/86	1988/89
Mother's education	82	75	35	27
Sex of the child	84	74	34	25
Religion	83	74	34	25
Mother's age	86	80	34	24
Birth order	84	77	35	30
Observed rate	83	74	34	26
1976/77 cohort	105		80	

Conclusions

This study is unique in terms of the size and accuracy of the data. The Matlab DSS data used in this study were collected through twice-monthly household visits and were checked for accuracy in the field and in the Dhaka office at several stages. In Matlab, under-five mortality declined by about 45 per cent during the period 1966-1994. Its decline was faster and more intense in the MCH/FP area, becoming more than 25 per cent lower there than in the comparison area in 1994. Mother's education, mother's age, birth order, sex and religion were determinants of both infant and child mortality. However, the nature of the effects of some of these determinants was different in infancy than in childhood. Infant mortality had a U-shaped relationship with mother's age and birth order, but child mortality increased linearly with mother's age and birth order. Infant mortality was higher for males and for Hindus, but child mortality was higher for females and for Muslims. The contribution of the long-term factors was more to a reduction in infant mortality than child mortality (85 vs 23 per cent) during the study period.

Mother's education was a strong determinant of both infant and child mortality in both areas. Its effect did not decline over time except in reducing child mortality in the MCH/FP area. High birth order, and very young and old age of mothers were risk factors of overall under-five mortality. As a long-term policy measure to reduce under-five mortality, both mother's education and fertility reduction deserve to be given greater importance.

The results of this study differ in several ways from those obtained in national surveys. Unlike national estimates, the decline in under-five mortality in the Matlab area since the 1970s was not linear. The effects of the 1971 war, the 1974/75 famine and the 1984 epidemic of dysentery were not reflected in the national estimates, but were clearly visible in Matlab. The effect of the 1984 epidemic was found in other demographic surveillance areas including Teknaf, located in the southern part of the country bordering Myanmar. On the other hand, the 1971 war and the 1974/75 famine were not local events and must have affected the mortality of the entire country. Long-term factors were responsible for 85 per cent of the decline in infant mortality and 23 per cent of the decline in child mortality. In the national estimate, these factors were reported to be of little importance in terms of mortality decline.

While a part of the difference between the national results and the Matlab results may be attributed to the fact that perhaps Matlab, and even its comparison area, may be different from Bangladesh as a whole, we feel a large part of the difference is due to differences in the quality of data and the methodology used in the two studies. Certainly, national estimates are important and essential for policy and programme, but one needs to be careful in using retrospective survey data to study trends and differentials of infant and child mortality in a developing country. On the other hand, an accurate DSS, even in a small area such as Matlab, may be immensely useful for this purpose.

Endnote

1. Relative risk of child mortality for the 1988/89 cohort, without any control, was 0.36, which means that mortality in the 1988/89 cohort was reduced by 64 per cent: 1.00 - 0.36. However, in the full model, with different long-term factors and their interactions, the relative risk of the 1988/89 cohort was 0.51. The total reduction in mortality of 64 per cent can be partitioned into two components: one part being due to the variables in the model and the remaining part due to the factors not included in the model. The proportion explained by the variables in the model was 0.51 - 0.36 = 15, which is 15/64 = 23 per cent.

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