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Regional and Geographical Variations in Infertility: Effects of Environmental, Cultural, and Socioeconomic Factors

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Fertility is affected by many different cultural, environmental, and socioeconomic factors, especially in developing countries where poverty and infections are commonplace. Environmental factors play a major role in infertility in Africa. One of the most important health problems in sub-Saharan Africa is the high rate of infertility and childlessness. The African society has a strong traditional heritage, and the study of the patterns of infertility in this part of the world would be incomplete without consideration of the sociocultural and environmental factors. The most cost-effective approach to solving the infertility problems in Africa is prevention and education. In Mexico, problems of reproductive health are associated with pregnancy in adolescents, sexually transmitted diseases and genitourinary neoplasms. Infertility affects 10% of couples, usually as a result of asymptomatic infection. Education, poverty, nutrition, and pollution are problems that must be tackled. The government has taken positive action in the State of São Paulo in Brazil, where gender discrimination is a major factor affecting women's health and reproductive outcomes. The implementation of new policies with adequate funding has resulted in marked improvements.

Introduction

The reproductive system is particularly vulnerable to the effects of the environment. This may be due to dramatic events such as major disasters that may be man-made or natural. However, the greatest number of reproductive failures worldwide are due to endemic conditions of the environment, which are greatly influenced by cultural, religious, political, and socioeconomic factors.

In Africa, sexually transmitted diseases produce a high infertility rate, and this is aggravated by poor education, poverty, cultural attitudes to the female status, and the adverse effects of worker migration. Agricultural pollution, more than industrial, affects reproductive health, especially due to the use of pesticides. Where the majority of agricultural workers are women, reproductive health is more vulnerable to occupational exposure, and many chemicals can be secreted into human milk.

Sexually transmitted diseases are less prevalent in China, but there is a high level of industrial pollution in this part of the world. Reproductive health is intimately associated with the strict control of family size. When couples are restricted to a single child, it is of paramount importance that the child is healthy, and the gender of the child is also of greater relevance.

Natural pollution of drinking water in Mexico with arsenic can result in contamination of milk and semen, with adverse effects on reproduction. Mexico and Brazil have problems associated with expanding populations, and steps are being taken in an attempt to control this demographic trend.

A large part of the workforce in the Middle East comprises immigrant workers. There is discrimination against this group which can cause stress and resultant oligospermia.

Localized areas of pollution may be encountered even in the most developed parts of the world such as the United States. This undoubtedly has an effect on reproductive health, but the full consequences are not known.

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This paper describes geographic variations in reproductive health and considers the different factors that have an effect, especially in developing countries.

Infertility and the African Environment

Introduction

Infertility is common in Africa. Whereas in the the United States only 8% of couples are childless, and this includes voluntary childlessness, the infertility rates in parts of Africa may reach 30–40% (*1*), and in these areas there is no such thing as voluntary childlessness within the context of married partnership. In contrast to developed countries, the most common cause of both male and female infertility in developing African countries is infection. The high prevalence of infertility in these countries has become a major public health issue. There is a progressive increase of sexually transmissible diseases (STDs) and in Cameroon, pelvic inflammatory disease may account for more than 50% of infertility (Leke, personal observation). Up to 15% of women attending the antenatal clinic are infected with gonococcus, although the infection is often asymptomatic.

The cost of treating infertility is relatively high in places like Cameroon, and the most cost-effective approach for tackling the problem is to institute programs of prevention. Such preventive programs should include improvement in diagnosis, treatment, and control of STDs; sex education for men and women; expanded family planning services for couples; and better obstetric care, which would definitely prevent unwanted pregnancies with their dreadful consequence of septic abortions. The preventive approach in the African context is also justified by the fact that the resulting tubal and ejaculatory duct damage is often so extensive as a result of infections that reconstructive surgery is most unrewarding.

There are ethnic and racial differences in the extent of infertility in various countries in Africa south of the Sahara such as Zaire, Cameroon, Gabon, and Uganda (*2*). Data from a World Health Organization multicenter study a few years ago demonstrated that the pattern of infertility in these African countries is quite different from other non-African countries. The overall rates of infertility are high in these different African countries, but within each country there is a variation in the levels of infertility in different zones: some well defined areas of marked subfertility are found.

Cultural, Environmental and Socioeconomic Factors

Political Considerations. For many years, the governments of developing countries did not believe that the demographic population explosion was a contributing factor to continuing underdevelopment. This was evident at the world conference in Bucharest in 1974, where the leaders of the developing countries held one opinion that differed from the opinion maintained by the leaders of the developed countries (*2*).

Many African governments did not start to modify their pronatalist attitude until about 1980, and only then did they adopt a policy of responsible parenthood in which the governmental objective was no longer one of population expansion. This was the case particularly in Cameroon, whose position on the desirability of population increase had been completely modified by 1981. Other African countries such as Rwanda and Algeria also embarked on a policy of reversing the trend of increasing population growth. Concurrent with this slow change of governmental attitude, it was the poorer members of society who continued to reproduce, with increasing family sizes. Some governments provided increased family allowance for increasing family size, and this produced conditions that enhanced and promoted the production of children.

Traditional Attitudes. In the African culture, the true meaning of marriage is only fulfilled if the couple conceive and bear children. Africans consider their child to be a source of power and pride, and children act as insurance for their parents in old age. The most important aspect of bearing children is an assurance of family continuity.

The traditional concept that the purpose of marriage is to produce children means that infertility is a major cause of divorce because of its frequent occurrence in Africa. A pilot study in Yaounde confirmed the paramount importance of fertility to ensure a lasting relationship (*3*): among 1000 people interviewed, 71.7% stated that the principal reason for their marriage was to have children, and the majority could not countenance living without children. When this same group of people were asked what they thought was the cause of infertility, 56.4% believed it to be caused by witchcraft and only 12.3% attributed it to STDs. A further revelation from this study was that 52.4% had never heard of modern methods of contraception, and 69% resorted to abstinence as a means of avoiding pregnancy. The matrimonial pattern of the surveyed population was monogamous in 76.1%, polygamous in 21.8%, and other attachments in 2.2%.

Polygamous Relationships. Polygamy, the marriage of one man to many wives, is common in Africa, its prevalence ranging from 12 to 40%, depending on environmental factors (*4*). The husband is usually much older than his wives, but many women in polygamous marriages are not in their first marriage: some of the wives are inherited widows from deceased relatives. It would be logical to assume that polygamy would increase the number of births because the man is enabled to acquire many wives and can divorce infertile partners. However, in reality polygamy does not appear to increase the birth rate as would be expected, as was demonstrated in a 1973 study in Tanzania (*4,5*). The reason for this is that polygamy is often linked to infertility within partnerships, and it is now known that defects in the male contribute to as much as 30% of couple infertility: in Africa the male can divorce the female on the grounds of infertility, but the female cannot divorce an infertile male partner. Population studies in the Ibo tribes of Eastern Nigeria have also shown that polygamy does not increase the birth rate in that part of Africa. Subfertility is also a problem in northern Cameroon,

where there is a large Moslem population, which is often polygamous (*6*).

A woman who is divorced because of suspected infertility will subsequently have less sexual exposure and will therefore have a further diminished chance of achieving a pregnancy. This will add to the overall reduction in total birth rate. Widows also have fewer pregnancies because of reduced sexual exposure, and the age differential between the older husband and his younger wives is likely to result in an increasing number of widows. Widows and divorced women often do not remarry until some years have passed, if at all. The African tradition used to be that a male member of a family would marry a deceased relative's widow, but this tradition is changing and it is now frowned upon. Therefore, fewer African widows are now being remarried, and this is reducing the overall birth rate because of diminishing sexual exposure.

Marital customs vary from one African country to another, but one common tendency is the high prevalence of precocious marriage: many very young females are married to their fathers' polygamous friends and to their age mates.

Induced Abortion and Fertility. The World Health Organization estimates that 40–60 million pregnancies are terminated each year by voluntary abortion, and 20 million of these abortions occur in developing countries where such actions are illegal (*7*). These abortions in developing countries take the lives of 2 million women annually and consume a major part of the meager health resources. In Cameroon, Leke and Tikum (*8*) have shown that 38.4% of maternal deaths occurring in the Central Maternity Unit were due to complications of induced abortions. At the same institution, the chances of dying from complications of septic abortion were 50 times greater than from any other disease associated with pregnancy. Morbidity caused by the common practice of induced abortion is more difficult to estimate, but it is usually estimated to be about 15 times more frequent than mortality.

Where abortion is illegal, it is often performed in septic conditions by unqualified personnel. This often occurs in parts of the world where access to contraceptive facilities is difficult because of geographic or economic considerations, and where the practice of contraception is minimal because of lack of education or awareness. There is therefore a high rate of unwanted pregnancy, and consequently a large number of illegal abortions that are frequently a direct cause of secondary infertility and ectopic pregnancy.

Induced or provoked abortions are not accepted in most African traditions. In most instances, children are welcomed into the family community regardless of their parentage. In some cultures it is expected that a mature daughter should produce a child to remain in the family to replace her when she leaves to be married. That child will ultimately be able to take on the workload previously performed by the departing daughter: furthermore, the child will act as proof of the daughter's fertility to the future husband. The practice of illegal abortion puts the future population at risk because: *a*) the methods used for achieving an abortion are poor, *b*) the abortionist is often inexperienced, *c*) abortions are often induced after 10 weeks of pregnancy, *d*) there is insufficient access to quality medical treatment when complications of abortion ensue.

Traditional Practices that Affect Fertility

Female Circumcision and Excision. Female circumcision is an old and unhealthy practice in Africa, and is a form of genital mutilation. Thomas (*9*), therefore, prefers the term "excision" to "circumcision." It is estimated that 85% of women in Sierra Leone have been so mutilated.

The practice of female circumcision still affects 80 million women, mostly in Africa (*9*). The procedure continues to be performed by villagers who have no knowledge of hygiene or anatomy. Most of the clitoris and labia are excised, leaving the vagina with little or no orifice. This surgical mutilation performed without anesthesia and under septic conditions usually results in infections during the healing process. Complications can be either immediate such as shock resulting from hemorrhage, or later because of infection, dysmenorrhoea, dyspareunia, hematocolpos, or infertility. If and when pregnancy occurs, there are frequently problems at delivery including dystocia and severe hemorrhage from vulvar scars. Most of these women have no medical assistance at delivery, and there is a high incidence of shock from hemorrhage and perinatal maternal death. Those who survive may have secondary infertility from vaginal atresia, hematocolpos, or tubal obstruction caused by pelvic infection.

Other cultural beliefs, customs, and taboos may also contribute frequently to infertility. Traditional village healers are still highly respected by the villagers, and in spite of their lack of medical knowledge they may mislead some patients with dystocia by advising them to stay in the village for their delivery. Childbirth under the care of village healers is extremely hazardous compared to the facilities offered by trained medical personnel, and most of these women either die during parturition or develop severe morbidity and infertility.

Vesico-vaginal Fistula and Fertility. Vesico-vaginal fistula is a complication of obstructed and unassisted labor in Africa, often resulting from difficult access to medical facilities. It occurs more often in young, uneducated women of low socioeconomic status in rural communities (*10*) and is a social problem that can affect fertility.

Young women who suffer from incontinence are often rejected by their husbands, families, and communities, and are frequently divorced. They remain social outcasts until they have surgical correction, but this is not always possible, and they continue to live in isolation in their community. Being young, frequently divorced, and devoid of sexual activity for prolonged periods, their reproductive potential is inevitably compromised.

The obstruction that causes the development of the fistula during labor may also be responsible for severe trauma and infection at delivery, both of which are likely to aggravate the reproductive problems of these unfortunate individuals. Surgical repair is the only realistic approach to the treatment of vesico-vaginal fistula, but many of

these rural patients do not have access to surgical facilities in time. The most cost-effective solution to this problem would be to create awareness of the condition with the prospect of eventually detecting and referring affected individuals. However, progress in this field is hampered by lack of trained health personnel and by the lack of education of the traditional midwives, who tend to be illiterate. These midwives can only be made aware of the problem by training them to recognize images of the patients at risk, such as short stature and scarring.

Effects of Modernization. Modern education, urbanization, social factors, and economic considerations all exert a great deal of pressure on African couples to reduce the number of their children. However, the limited access to family planning services will undoubtedly lead to a continued growth in the number of illegal and poorly performed abortions, with their devastating consequences of maternal mortality and morbidity.

Kenya

The problems of reproductive health in Kenya are similar to those in Cameroon and the other developing African countries (*11–20*). There is generalized poverty that accentuates the other environmental factors, and which is a barrier to the implementation of corrective measures.

There is a high level of infertility in Kenya, which is mainly caused by sexually transmitted diseases. Inadequate use of contraceptives results primarily from poor education. Sexually active individuals are not fully aware of the consequences of their actions, and few health workers in the family planning services are adequately trained. The added burden of motherhood to a poorly educated woman further prevents the proper and regular use of contraceptives, leading to a low success rate and loss of confidence in the methods used. There are also language barriers, which create problems when trying to communicate with would-be contraceptive users, and the information is seldom understood.

The severe financial constraints in Kenya, both at the individual/family level and at the national level, make it impossible to achieve adequate maternal and child health care services. Antenatal and postnatal care are inadequate, resulting in high rates of infant and child mortality and maternal death. There are marked inequalities in the distribution of the existing health care facilities between rural and urban areas, with the urban areas having more clinics and hospitals.

Social and cultural factors have a marked effect on reproductive patterns. There is a great deal of pressure to have children, particularly male children. This is such an important priority that men are forced to have two or more wives in an attempt to have children should the first marriage be barren. A wife with only female children will continue to have more children in an attempt to produce a son in order to satisfy herself and her husband.

Couple infertility is assumed to be mainly a female disorder, and husbands will therefore rarely accompany their wives to the infertility clinic in an attempt to find a solution to their reproductive failure.

Reproductive health problems affect women more than men in Kenya, and this, together with other socioeconomic problems that affect women, have resulted in the evolution of a very strong National Women's Organization. This is a central organization to which are affiliated several village, regional, and nongovernmental organizations. There is a common mandate for the improvement of the plight of women. These organizations have the full moral and financial support of the government, and they organize many self-help projects including clean water supply, income-generating activities, primary and secondary education, community health, and child care.

The government in Kenya recognizes the importance of, and plays an important role in, the organization of some traditional practices, such as traditional birth attendants and traditional medicines. However, there is a lack of standardization of these practices, and this is an impediment to their effective implementation.

Regional Variations in Infertility in Mexico

Effects of the Environment and Socioeconomic Factors

Mexico has a population of 80 million people, 60% of whom are women, and of these 45% are in their reproductive era (18–35 years old). There is an important and significant increasing proportion (20%) of women in the perimenopausal period (45–55 years). There is also an associated increased life expectancy, with a greater number of women living 78–79 years. Women in their reproductive phase, perimenopausal women, and elderly women represent populations requiring more and more attention in health care programs. The problems associated with the reproductive health of women in Mexico will be considered.

Identified Effects on Reproductive Health

There are numerous factors that have been identified as being detrimental to reproductive health: *a*) pregnancy in adolescents (10–23 years old), *b*) sexually transmitted diseases, *c*) prevalence of congenital malformations. In Mexico, 2.4/100 births are associated with congenital malformations, and in Coahuila this figure rises to 3.4/100. Neural tube defects are the most common malformations, *d*) high incidence of genitourinary neoplasms, and *e*) infertility.

Genitourinary Neoplasms. Cervical carcinoma is associated with sexual activity and is the most frequent cause of female mortality between the ages of 25 and 64. The national incidence rate of cervical cancer in Mexico is 8.53 per 100,000 per year. Colima State has the highest rate in the country (15.48), followed by Coahuila (13.75). The mortality rate from cervical cancer in the country for women between 25 and 44 years of age is 7.23 per 100,000 per year, and this increases to 30.9 for women 45–64 years of age.

Some parts of the country have an identified high incidence of cervical dysplasia. Cervical cytology was

examined from 8841 women in Coahuila over a 10-month period, and this revealed mild to moderate dysplasia [Cervical intraepithelial neoplasia (CIN) 1–2] in 63.4% of smears, severe dysplasia (CIN 3) in 0.19%, and carcinoma *in situ* (CIN 3) in 0.07%. Squamous cell carcinoma was reported in 0.04% of cases, and invasive carcinoma was specified in 0.07% of cases. Suspicious cytology was recorded in 0.06% of smears.

Infertility. About 10% of Mexican couples are infertile due to female-related factors in 60% of cases, male-related factors in 30%, and disorders of both partners in 10% of infertile couples. The most common cause of infertility is asymptomatic infection, and the next most common is anovulation. In Coahuila State, there is a higher proportion of males responsible for couple infertility: 45% of infertility in couples is due to male-related factors such as oligospermia, azoospermia, or an abnormal interaction between semen and cervical mucus.

Environmental Factors in Mexico

Demographic Population Explosion. There has been a rapid increase in the size of the population in Mexico, and it has not been possible to control this expansion even with active governmental intervention. The Mexican Government has given priority to the control of family size and has fully funded family planning programs. More than 50% of women now have free access to different methods of contraception, provided by official health institutions. The average number of children in each family is now 3. The marital status of the parents in these families is 70% married, 20% in free union, and 10% divorced.

Literacy. In Mexico, 25% of the population is illiterate in spite of free education. A basic education is compulsory, but 15% of the population work in the fields, and this is a family tradition that has lasted for several generations. The women in agricultural communities are totally committed to work in the home and are entirely dependent on their husbands' decisions. These women, therefore, have limited access to family planning services and contraception.

Malnutrition. About 10% of the population of Mexico are malnourished, which is associated with many reproductive problems, such as high rates of infant and maternal mortality, low birth weight, parasitic infections, poor mental concentration and low scholastic achievement, frequent use of bottle-feeding and infrequent practice of breastfeeding. The staple diet of the population consists of tortillas (deficient in vitamins and proteins), beans (high iron content), water with corn (atole), cola drinks, and soups.

Economic Factors. About 15% of the population have such a low income that they are precluded from an adequate standard of living. This is directly related to malnutrition, illiteracy, and large family sizes, which create a self-perpetuating circle of events resulting in an overall increase in size of the population.

Environmental Pollution. Pollution of the environment has important consequences on reproductive health. Some of the contaminants are well documented: *a)* the use and abuse of organochloride pesticides, *b)* industrialization within urban communities, *c)* natural pollution of wells used to supply drinking water, as occurred at Comarca Lagunera where a high arsenic content in the drinking water is associated with cervical dysplasia and carcinoma, congenital malformations, infertility, and other clinical effects (see below), *d)* the abuse of drugs, whether social drugs or medicinal drugs obtained without a medical prescription.

Arsenic Pollution in Comarca Lagunera

Comarca Lagunera in central-northern Mexico comprises 11 urban, suburban, and rural areas (*21*). It has the highest incidence of genitourinary and skin neoplasms in Mexico, and also has a high incidence of malformations in live newborn babies (3.44%), which exceeds the national average of 2.4%. Metal extraction factories within this region emit metallic compounds that are a health risk for the inhabitants. Chronic arsenic poisoning is endemic in some parts of this region, the concentration of arsenic in the drinking water being between 0.24 and 1.0 mg/L in comparison to an acceptable upper level of 0.05 mg/L.

The prevalence of defects attributable to chronic arsenic poisoning was studied in two rural populations comparing the effects of different arsenic concentrations in the drinking water. An exposed group of 296 individuals who had ingested contaminated water containing 0.41 mg/L of arsenic over a period of 3 years was compared with an unexposed group of 318 individuals whose drinking water contained 0.005 mg/L of arsenic. The relative risk of developing conditions caused by arsenic poisoning was increased by a factor ranging between 1.9 and 6 in the exposed group. In the exposed population, 21.6% of the individuals presented with at least one of the cutaneous signs of chronic arsenic poisoning, whereas such signs were only detected in 2.2% of the control group. A high frequency of structural chromosomal aberrations was also detected among the exposed population, with chromatid rupture being observed in 30 exposed adults who had signs of chronic arsenic poisoning. These 30 individuals had mean arsenic concentrations of 0.03 μg/L in serum, 1.8 μg/g in hair, and 1.9 μg/g in fingernails. In comparison, 30 individuals from the control (unexposed) group, all of whom did not exhibit signs of chronic arsenic poisoning, had mean arsenic levels of 0.01 μg/L in serum, 0.3 μg/g in hair, and 0.9 μg/g in finger nail.

The semen of 40 fertile men who had become fathers 3 months previously was analyzed: 89% of the semen samples were normal according to the World Health Organization standard protocol. Semen from 58% of 20 infertile men showed oligospermia. The sperm count was not correlated with the arsenic concentration of the semen. However, in four azoospermic men, the level of arsenic in the semen always exceeded 30 ng/g (range 32–113 ng/g) whereas the range found in fertile men was 0–113 ng/g.

Reproductive Health in Brazil*

The population of Brazil in 1990 was about 150 million. The main factors that affect reproductive health are related to socioeconomic status and are a consequence of poverty and its sequelae such as illiteracy, malnutrition, and poor health care services, and gender discrimination, which reduces women's accessibility to health care, education, and associated services.

State Health Services in Brazil

The Federal Constitution of Brazil states that "Health is a right of all persons and a duty of the State, guaranteed through social and economic policies to reduce risk of illness and other damages, and to assure universal and equal access to actions and services for its promotion, protection and recovery." Women and children also deserve special mention. The law insures that they must be provided with medical care during pregnancy and childbirth, that there is social support for breast feeding, that mothers have 4 months of paid maternity leave, that free day care is provided by employers of working mothers, and that there is free basic education for children.

Unfortunately, while this legislation appears progressive on paper, it is still far from being a reality within a social system that is plagued by inequality and where gender discrimination is still widespread. There are also marked regional differences in available resources within the country, and this is a further challenge to the fulfillment of the stated laws. During the 1980s the Brazilian Government developed a policy based on a model from the State University of Campines and adopted the Programme for Integral Assistance to Women's Health (PAISM), which contains comprehensive norms for all aspects of women's health care.

The PAISM clearly defines a definite stance in support of a preventive approach to women's health care, but also advocates the integration of preventive and curative services. It is expected to have far-reaching effects on reproductive health and the care of women's well being. Unfortunately, this program has not been implemented in the majority of the states of Brazil, although the State of São Paulo is one of the few states in which it has been implemented, and it is generally agreed that the PAISM is more advanced in this state than in other regions of the country.

PAISM in the State of São Paulo*

The State of São Paulo has around 33 million inhabitants and is one of the richest states in Brazil. It has suffered from the effects of rapid growth and overcrowding because of significant migration from other regions in the country. The epidemiological profile of the population is in constant change. On the one hand there is the challenge of infectious diseases associated with poverty in large urban areas, and on the other hand there are chronic diseases associated with aging and brought about as the result of the development process.

Up until 1987, women's health care in the state was fragmented and dispersed, concentrating almost exclusively on services during the pregnancy–childbirth cycle, albeit with severe deficiencies in the level of coverage. Further inefficiencies resulted from the services being provided in an uncoordinated manner by Federally funded institutions, the State health network, the public health system of individual cities, and the private sector. In an attempt to resolve these difficulties, general and specific policies were adopted with the principal purposes of improving institutional health care by unifying and decentralizing the health system and creating a local health service network and programming improvement through the practical implementation of the PAISM using a comprehensive health care strategy.

J. A. Pinotti had the responsibility of heading the State of São Paulo Ministry of Health between 1987 and 1991, and the PAISM was implemented under the directorship of A. M. Bacha. The priority goals set for this period were *a*) control of perinatal and maternal mortality, *b*) control of gynecological and breast cancer, *c*) correction of disorders of reproductive health caused mainly by the incorrect use of family planning methods, *d*) control of sexually transmitted diseases, and *e*) satisfaction of the demand and attention to women's priorities. These goals could only be achieved by investment in equipment and supplies, in addition to providing training and facilities. Much effort was also put into improving education.

Most of the measures adopted by the São Paulo State Government had positive and measurable effects on the health indexes. The coverage of antenatal care increased from 87% in 1981 to around 96% in 1990 (Table 1). Likewise, the number of hospital births increased from 87% in 1981 to 98% in 1988 (Table 2). However, the measures implemented did not accomplish a significant reduction in the

Table 1. Antenatal care coverage in the State of São Paulo from 1980 to 1990.[a]

Year	% of pregnant women receiving antenatal health care
1980–1981	87
1982–1986	86
1988	93
1990	96

[a]Data from the State Ministry of Health (Health Secretariat), State of São Paulo, Brazil.

Table 2. Hospital births in the State of São Paulo, 1981–1988.[a]

Year	% of births occurring in hospital
1981	87
1982	88
1983	89
1984	90
1985	90
1987–1988	98

[a]Data from the State Ministry of Health, State of São Paulo, Brazil.

*The material presented in this section is based on a paper by J. A. Pinott, "The Role of Government in Maternity Services." The opinions expressed are personal (A.M.B.) and do not necessarily express the position of the São Paulo State or Brazilian Governments.

Table 3. Implementation of family planning services in the State of São Paulo.[a]

Year	Number of basic health centers with family planning services
1987	100
1988	583
1989	916

[a]Data from the State Ministry of Health, State of São Paulo, Brazil.

rates of Caesarian section deliveries, which can be as high as 40% of all deliveries, in spite of much effort expended on many points in an attempt to achieve this goal.

An attempt was made to improve the reliability of data concerning maternal mortality by establishing several committees for the study and prevention of maternal mortality throughout the state. These committees covered an estimated population of 1.9 million women of reproductive age, which corresponds to 23% of all women in the state. The collected data indicated that the maternal mortality rates in the state varied from 53 to 165/100,000 live births (State Ministry of Health, State of São Paulo, Brazil). As an extension of this data collection, there has been a greater understanding of the factors affecting the pregnancy–childbirth cycle, and it has been possible to propose a general strategy for the care of maternal health.

During this period, the number of postpartum health care visits also increased, the number of visits in 1989 being twice the number in 1986. These visits provided an excellent opportunity to promote the health of women and their children because they could improve clinical gynecological care and family planning counseling, and they could be used to stimulate and encourage breast feeding. This expansion of postpartum care, together with a large scale implementation of family planning services at Basic Health Centres (Table 3), broadened the access of poorer populations to family planning facilities and also permitted proper reproductive counseling for women who were at risk if they became pregnant.

Likewise, the total number of gynecological consultations in the public health services of the State of São Paulo increased markedly and progressively over the past years. There was a 10-fold increase between 1986 and 1989 reaching almost 2.5 million.

A Programme for Cervical Cancer Control was implemented as part of the policy to provide Comprehensive Health Care. Cervical smears stained by Papanicolaou stain were performed in 10% of women in the State of São Paulo in 1986, and this had increased to 30% in 1990.

Regional Variations in Infertility: Summary and Conclusions

It is known that environmental, social, economical, and cultural factors affect the normal processes of reproduction in the male and female and that these factors act upon the individuals from birth until the end of their reproductive lives. The effects produced include genetic damage, which may have far-reaching effects on the future of the human race. It is important to implement health programs that will correct deficiencies in reproductive health, bearing in mind that the conditions and their effects are different in different countries. The problems in each country, therefore, must be tackled individually, taking into consideration local difficulties to make sure that the proposed methods for solving the problems are feasible.

Environmental, cultural, and socioeconomic factors affect fertility and reproduction in Africa. The study of fertility and its various patterns in the African environment is incomplete without serious consideration of the strong cultural and traditional components of the whole society as an entity.

Infertility is now recognized as a public health issue in the African society, and it must be given adequate attention, particularly in respect of its diagnosis, treatment, and prevention. This requires a global family planning approach. The implementation of any program aimed at solving couple infertility in Africa must not ignore the sociocultural and environmental factors that are prevalent in the society. The most cost-effective approach to solving infertility problems in Africa is prevention and education.

In Mexico there has been a population explosion in spite of government priority to provide free family-planning services. There are still major problems associated with adolescent pregnancies, sexually transmitted diseases, congenital malformations, genitourinary neoplasms, and infertility. Poor education, overpopulation, malnourishment, poverty, and environmental pollution all have their effects. A major concern is the high level of arsenic in the supply of drinking water in some areas.

The changes achieved in the health care of women in São Paulo in Brazil demonstrate that when a Government gives priority to the well being of women, policy associated with increased investment and facilities can make it possible to produce a rapid improvement in women's health and successful reproduction.

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