

# Whither human reproduction?

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No commandment of the Lord has been so meticulously obeyed as the one in Genesis 1:28: 'and God blessed them and said to them: Be fruitful and fill the earth'. Of all the species on this planet, man has really proved to be the survivor of the fittest, mainly because of his extraordinary adaptability to changing circumstances, his higher intellect, and his ability to plan ahead for his own protection and safety.

It is hard to believe that two human beings could have reproduced 4,4 billion times by the year 1980 — and if the projections for the year 2000 are to be believed then 6 billion people will have to find room on the same planet that this couple originally roamed. When the population explosion reaches the 8-10 billion mark there will be standing room only. A few analysts, however, have suggested that population growth will then cease (Table I).

TABLE I. POPULATION DENSITY, 1970

	Hectares per person
The world	3,76
Africa	8,61
Asia	1,41
Japan	0,36
South America	7,27
Europe	1,06
North America	9,52
Russia	9,26

As a gynaecologist I naturally have considerable interest in this subject — gynaecologists have a positive contribution to make to both the limitation and the promotion of reproduction. On the one hand we are charged with an extensive family planning programme, while on the other hand infertility is rapidly being brought under control (Tables II and III).

TABLE II. FAMILY PLANNING SERVICES

1. Stimulation towards smaller families:
  - (a) Increased expectation of life
  - (b) Improved educational facilities
  - (c) Improved facilities for education outside school
2. Education:
  - (a) 940 educators
  - (b) Mass media — pamphlets and 9 languages, radio and TV (R1,2 million), independent states — RHOSA
  - (c) Doctors
3. Availability of contraceptive methods:
 

9 000 service centres
4. 1979 sterilizations:
 

Blacks 571  
Coloureds 542  
Asians 250  
1980 Tygerberg Hospital — 3 000 country cases

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TABLE III. FINANCIAL IMPLICATIONS

1976-1977 R5,5 million

1980-1981 R12,4 million

Success figures:

1980 — 1 075 700 women protected monthly

= 40% in reproductive phase

(ideal equals 70%)

Adolescent births (15-19 yrs) in the RSA

1976: Whites 28/1 000

Illegitimate 4,5%

Coloureds 67/1 000

Illegitimate 50,5%

Indians 36/1 000

Illegitimate 12,9%

(Comparative figures: UK 40/1 000; USA 58/1 000; Malawi 132/1 000; Swaziland 120/1 000; Nigeria 195/1 000.)

Without going into too great detail, there are two aspects of human reproduction which I would like to discuss, i.e. the quantitative and the qualitative aspects.

## Quantitative aspect of human reproduction

Population growth depends upon two factors, namely (i) an increase in births; and (ii) the overall mortality rate. If we look at the two maps in Figs 1 and 2 we are struck by the point that the *developed* countries with their low growth figure will probably experience a population increase of 12% by the year 2000, whereas the *developing* countries may expect an increase in population of 50% in this period. This despite the fact that the mortality figures are reversed.

Fig. 3 and Table IV illustrate the situation in our own country. Again it is the developing population groups which show the greatest growth rate. The question is, therefore, whether education and development in all areas of service and human dignity can keep pace with this mass growth. Has South Africa the economic and manpower potential to provide for the requirements of such an educational programme and to what extent will such a development programme be hindered by ethnic mores, traditions, beliefs and superstitions? It is necessary to draw attention to the fact that the target figure for successful family planning is at its greatest in the population group in which ethnicity is most closely linked, namely the Black populations. Successful family planning removes our best genes. With this alarming fact in mind, the further question arises: 'What is being

TABLE IV. OFFICIAL BIRTH RATES (PER 1 000 POPULATION)\*

	1960	1978	2000
Whites	23	17	13
Coloured	46	26	20
Indians	29	24	20
Blacks	45	38	34

\* This means that: (a) the White population doubles in 79 years, the Coloured population doubles in 44 years, the Indian population doubles in 37 years, the Black population doubles in 29 years; (b) 1 000 new recruits for the labour market daily.

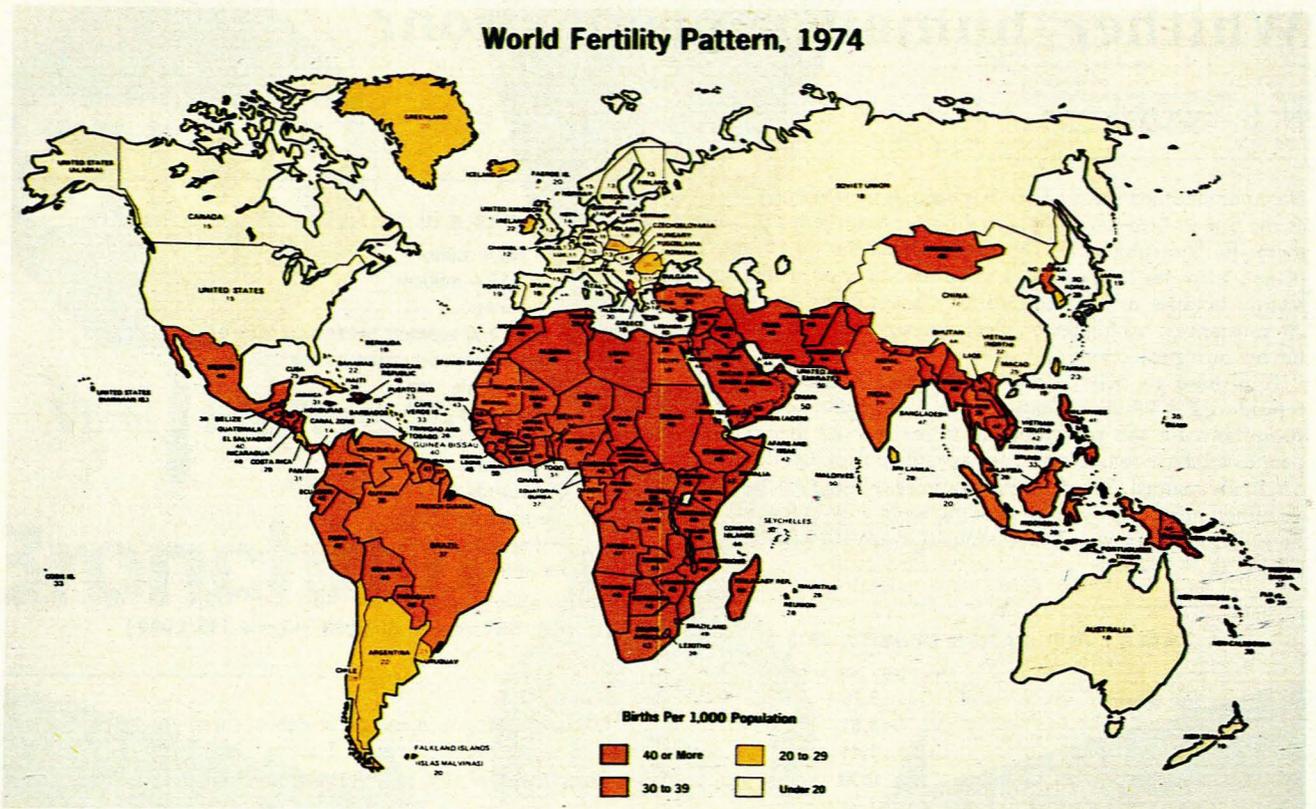


Fig. 1. World fertility pattern, 1974.

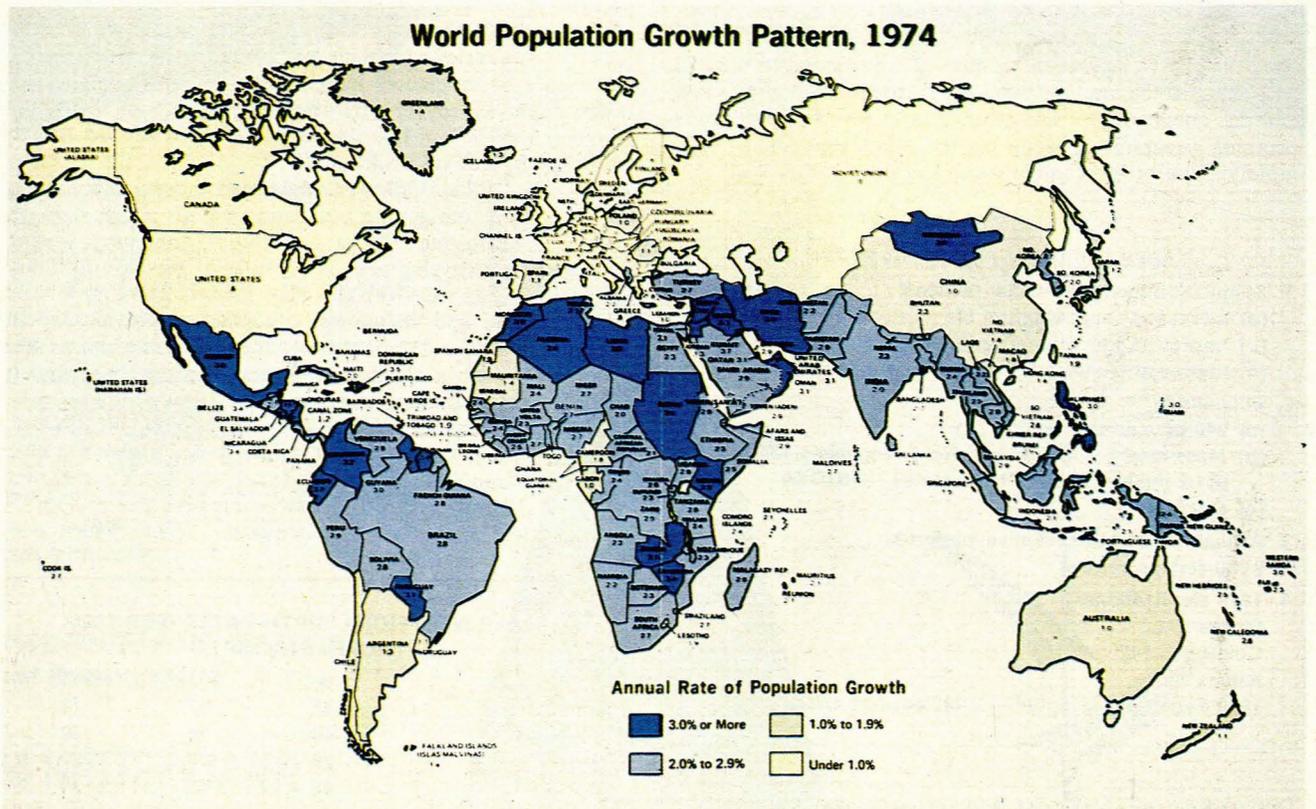


Fig. 2. World population growth pattern, 1974.

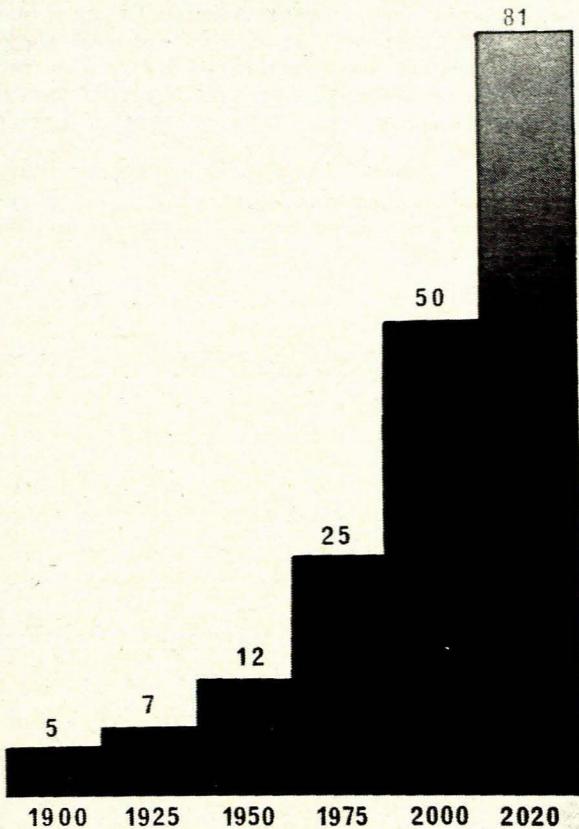


Fig. 3. Population of RSA in millions: 1900-2000.

done to prevent mankind from destroying itself through numbers?<sup>7</sup>

### International developments

Apart from the family planning programmes already being applied in various countries, the WHO has given special attention to the development of long-acting steroid contraceptives since 1975. Laboratories in twelve countries have already synthesized 220 such preparations which are now ready for testing. Interestingly enough, work on the control of male fertility has temporarily been suspended because the effective substances suppress sex drive in the male.

With the latest experimental progress in the contraceptive field one might hope to read the following announcement, probably within a decade or so: 'Beginning next month, interested persons may be vaccinated against both tetanus and pregnancy with one injection!' This may sound far-fetched, but in 1903 Dobrowolski first disrupted animal pregnancies with specific antiplacental serum, although such efforts never materialized in human experiments for fear of cross-reactions between a given antigen and various body tissues and organs.<sup>1</sup> Only in 1970 did large-scale practical experiments with vaccines begin.

Human chorionic gonadotrophin (HCG), a hormone which is synthesized by the pituitary gland and the placenta, has been the focus of most of this work. Its  $\beta$ -subunit has a different amino acid sequence, which minimizes the likelihood of cross-reactions; this has been used as a basis of a vaccine. Normally HCG is made by the trophoblastic layer of the newly fertilized ovum, even before implantation of the latter into the uterus; it stimulates the production of progesterone by the corpus luteum of the ovary. If HCG production and consequently progesterone production are prevented, the embryo dies and is aborted before implantation. 'Contraceptive vaccine' is technically a misnomer,

since in fact the vaccine is an abortifacient. This vaccine has been administered to human subjects by Stevens *et al.* at the Ohio University College of Medicine in Columbus, Ohio, USA.<sup>1</sup> (Obviously this was done only after extensive testing on laboratory animals including primates.)

However, even the  $\beta$ -subunit HCG vaccines have presented a problem in that they are not sufficiently antigenetic. Vigorous efforts are now under way to develop a suitable adjuvant to boost the antigenicity, and 1,2 million dollars per annum have been allocated to this work in the USA. Chang, one of the experts in this field, cautions that 'it may take many years before a vaccine comes into general use in human beings', and adds 'if we can't come up with a good adjuvant, I think the whole idea of a vaccine will be aborted'.<sup>1</sup>

### South Africa's contribution

In spite of limited research funds, South Africa has also made a contribution. As early as 1977 Henk Rall obtained his Ph.D. for work demonstrating that ovulation in baboons could be successfully suppressed by prostaglandin analogues. This aroused the expectation that a technique employing one pill per month could be successfully developed. Further research in this area is now being carried out in the USA.

### Qualitative aspect of human reproduction

Without getting involved in the dispute about when a fetus is viable, and without seeking to defend the viewpoint of the world-renowned British paediatrician, Hugh Jolly, that 'poor quality fetuses should not be resuscitated', I would like to consider for a moment the problem of infertility due to poor-quality spermatozoa or ova. Unfortunately our knowledge about the assessment of quality of the female cell is still limited. It is true that we know that the ovum may be a carrier of many genetic deviations and may also be the cause of a large percentage of early abortions, but we have no precise parameters to measure the quality of an ovum. In contrast, the specialty of andrology, i.e. male fertility, has developed dramatically since 1972. Before that year infertility in the male (17% of males in childless marriages are infertile) was determined only by the number of sperms per ejaculate. Less than 20 million (some had believed 60 million) were considered to denote infertility. In 1972, Santomoro<sup>2</sup> in New York reported that 10 million was the threshold of fertility, and 1 month later, Van Zyl<sup>3</sup> confirmed this. In 1975, after analysing 557 childless couples who had been treated at the Tygerberg Hospital unit, Van Zyl<sup>4</sup> again confirmed that this threshold count was correct. Last year, at the world congress in Rome, 5 million was taken as the limit of fertility.

What appears to be of importance now is not so much the count, but the quality of the sperm as an index of fertility. The parameters by which this is measured are: (i) motility, i.e. the mobility of the spermatozoa; (ii) speed of forward progression — 0-4 arbitrary units; and (iii) normal or abnormal forms. The prognosis with regard to the procreation of children has therefore assumed another pattern. Persons with low sperm counts but with sperms of good quality are thus being declared fertile where formerly they would have been labelled as infertile. Tests of quality are now being developed. In a number of infertile couples the usual tests show normality and yet conception cannot be achieved. After extensive research it was found that antibody reaction either in the semen of the husband or in the cervical mucus of the wife, or in both, was responsible for agglutination or immobilization of the sperms with the result that they could not progress through the mucus plug to reach the ovum.

With the availability of mixed antiglobulin reaction and sperm-cervical mucus contact tests, this problem can be

identified and solved. (These tests were originally described by Kremer.) Should the female partner be the cause of antibody reaction, then intra-uterine artificial insemination, that is penetration of the mucus barrier by a pipette filled with sperms and deposition of the healthy sperms inside the uterus can be used. If the male is at fault, the sperms may be washed and again success may be ensured by artificial insemination.

For the sake of completeness, it is necessary to mention such specific tests as the Kibric, the Freiberg and the Isojoma test, all of which are specifically directed at pinpointing the quality defect in this complex problem of failure of reproduction. Donor insemination is a topic on its own and can hardly be discussed here.

As regards test-tube babies I will only say at this point that of 210 women who have undergone *in vitro* fertilization and embryo transfer only 6 pregnancies and 3 living infants have been

obtained. If we now put the question: 'Whither human reproduction?', the answer can only be: 'For those who only demand lives without accepting responsibility for them, ruin is staring them in the face, while the more responsible can enjoy good fortune and happiness from the greatest of all gifts of the Almighty'.

It is my personal belief that man, with his unique adaptability and inventiveness, will once more succeed in finding an acceptable solution to this, the world's most pressing problem, and thus save himself from annihilation.

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## Chédiak-Higashi syndrome in a 'Black' child

### Clinical features, immunological studies, and optics of the hair and skin

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#### Summary

A case of the Chédiak-Higashi syndrome in a Black baby is recorded. Attention was given to the disturbances in neutrophil function and the aggregated pigment deposits with their optical effects in the skin and hair.

*S. Afr. med. J.*, **60**, 108 (1981).

The Chédiak-Higashi syndrome, known already for several decades, originally gained attention as a curious and very rare condition in man which is inherited as an autosomal recessive disorder. The syndrome includes deficient colouring of the skin,

hair and eyes, a ready liability to pyogenic infections, and an early death from an obscure haematological collapse which may resemble lymphoma.

The syndrome is no longer merely an untreatable clinical oddity, but has attracted attention because it seems possible to unify the diverse manifestations of the syndrome through a shared fault in subcellular organization of the affected tissues. Best known is the condition of the neutrophils, which show highly abnormal giant granules that presumably interfere with their cellular function in the body's defence, and predispose to infection. In a similar way the pigment granules of the skin, hair and eyes are abnormally large and irregularly clumped. One can appreciate that any grouping of the pigment into outside conglomerate masses will reduce the net colour absorption of melanin in such an area and produce a pallor. It has been proposed that the final lymphoma-like phase may be brought on by a subcellular inability to handle potential chemical or viral carcinogens. In this way the clinical symptoms can be made seemingly rational, although the genetic control of subcellular particle assembly requires elucidation in the clinical context.

Closely similar disorders are known in other mammals where artificial inbreeding can provide enough study material. The human syndrome has been recognized in most continents, but has not been reported from Africa or in a 'Black' African, if indeed a specially pale individual may still be called black.

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