remained desperately poor but the total fertility rate has fallen from 6.3 in 1975 to 3.3 today.[8]

Even in countries that have not done so well total fertility is declining. The absolute increase in numbers, however, remains high. India alone grows by one million more births than deaths every 23 days.[9] The largest cohort of young people in history is just entering the fertile years, and the momentum built into population growth means that delays in meeting the need for family planning will have a huge effect on the final population of many countries.

Lack of attention to numbers makes it likely that the world of the 21st century will divide along a new geopolitical fault line. Today only 5% of the population of developing countries outside China live in countries where fertility is below replacement level. Those countries likely to reach replacement level fertility by 2010 or 2020 can move forward economically and socially, whereas those that are not, such as Nigeria and Pakistan, will slip backwards under the weight of human numbers. In Nigeria a dramatic decline in fertility from today's six children on average to 1.6 (comparable to Europe) would still result in population doubling by 2050 to 200 million.[9] But even a decline to 2.6 children—unlikely on present showing—will triple that country's population to 300 million in just 50 years. The rich countries will damage the biosphere through global warming and other changes. The poor countries may grow short of food and water. Millions of feral young males with no hope of employment will be fodder for political or religious extremism.[10]

It is time for the population pendulum to settle nearer the mid-point, the reasonable ground. People in rich and poor countries, and the planet as a whole, will benefit if priority is given to large scale, cost effective family planning programmes that respect individual choice without losing sight of quantitative measures of success. Policymakers must look beyond the clamor of confusing voices. Anti-abortion, anti-family planning groups are not a majority. Free marketeers who insist that, because Europe's and Japan's populations have begun to decline, the world no longer has a population problem need to check their figures. Women's groups that consider attention to numbers coercive on need to find consensus with those who emphasise the opportunity to accelerate fertility decline by meeting the unmet need for family planning. The joy of family planning has always been its commitment to helping individuals as well as being concerned about numbers.

Malcolm Potts *Bixby professor*

School of Public Health, University of California, Berkeley, CA 94720, USA (potts@slip.net)

1 Campbell M. Schools of thought: An analysis of interest groups influential in international population policy. *Popul Environ* 1998;19:487-512.
2 McIntosh CA, Finkle JL. The Cairo conference on population and development: A new paradigm. *Popul Devel Rev* 1995;21:223-60.
3 Potts M, Walsh J, McAninch J, Mizoguchi N, Wade TJ. Paying for reproductive health care: what is needed, and what is available? *Int Fam Plan Perspectives* 1999;25:S10-6.
4 Potts M, Walsh J. Making Cairo work. *Lancet* 1999;353:315-8.
5 World Health Organization and United Nations Children's Fund. *Revised 1990 estimates of maternal mortality: a new approach by WHO and UNICEF*. Geneva: WHO, 1996.
6 Cleland J. Different pathways to demographic transition. In: Smith F, ed. *Population: the complex reality*. London: Royal Society, 1994.
7 Potts M. Sex and the birth rate: human biology, demographic change, and access to fertility control. *Popul Devel Rev* 1997;23:1-397.
8 National Institute of Population Research and Training, Mitra and Associates, and Macro International. *Bangladesh demographic and health survey, 1996-1997*. Calverton, MD: Macro International, 1997.
9 United Nations Population Division. *World population prospects: the revision*. New York: United Nations, 1999.
10 Mesquida CG, Weiner NI. Human collective aggression: a behavioral ecology perspective. *Ethol Sociobiol* 1996;17:247-62.

Failure of an intervention to stop teenagers smoking

Not such a disappointment as it appears

Given the recent upturn in teenage smoking,[1] would the innovative West Midlands prevention programme, described in this week's issue (p 948)[2] be the magic bullet so many have been waiting for? Alas, as the authors have convincingly shown, it turned out to be a blank. This is not surprising, since the methods used did not appear to correspond with the findings from decades of research into "effective" antismoking programmes for schools.

Papers p 948

Successful programmes have usually been based on the social influences theory, which involves persuading teenagers to develop the skills and commitment to resist cigarettes.[3] Since success depends on working with socially interactive groups, the individualised computer component of the West Midlands programme would have had little to contribute.

The programme's class lessons component focused on the "stages of change" model of behaviour change, which was developed from studies of adults who stopped smoking. It is difficult to understand the application of this to the different process of preventing teenagers from starting to smoke. It is even more difficult to believe that it would be preferable to tried and tested approaches based on the social influences theory.

Nevertheless, the programme might have been expected to have had an effect on existing teenage smokers. Its failure even in this group reinforces evidence that the acquisition and shedding of a smoking habit in the teenage years is essentially chaotic. Unlike adult quitting, it does not follow any readily definable stages.[4] The stages of change model is therefore unlikely to be relevant.

But, paradoxically, a positive result from either part of the trial might have led to a greater disaster. It has proved relatively easy to obtain favourable results from school antismoking interventions under research conditions—with their budgets for training and the prestige conferred on schools by participating.[5] But, as follow up studies in Minnesota and Britain have shown,[6 7] the favourable effects from the original trials disappear in later years. Teachers soon start to take short cuts with the protocols, while the pressure for examination success causes schools to reduce the time available for the programmes.[5]

BMJ 1999;319:934–5

The intervention reported this week by Aveyard et al was doomed from the start by the requirement that participating teachers should undertake a two day course beforehand. Schools across Britain are unlikely to release one or more teachers for two days' training each year on a topic which, to them, ranks below alcohol, drugs, and sex education in priority. And, short of a ruthlessly enforced decree from the government, few schools will allocate six lessons to smoking in a year (as required here) except as part of a trial.

So it is no surprise that, despite massive efforts since the 1980s to disseminate "effective" programmes requiring training and additional classroom time in the UK and the US, there has been little change in teenage smoking on either side of the Atlantic.[5] Schools simply cannot sustain complex programmes of this kind in the face of competing pressures.

But if the results of this trial had been positive the temptation to launch a massive dissemination programme would probably have proved irresistible. Once the initial enthusiasm had worn off, any early effects would have dissipated just as they did with earlier programmes.[5] And any NHS funding for the programme would have been at the expense of more effective interventions for adults, such as publicity and face to face advice from health professionals.[8 9]

There are no magic bullets to be found in school antismoking programmes: the methods that worked in the early trials had a delaying effect only,[5] and none have been capable of dissemination on a large scale. Is it too much to hope that this experiment marks the end of attempts to find a quick fix, school based solution to the problem of teenage smoking? If it is, these disappointing findings will be of greater benefit to public health than they appear.

Donald Reid *chief executive*

UK Public Health Association, London SW1P 2HW

1 Jarvis L. *Smoking among secondary school children in 1996: England*. Office of National Statistics for the Dept of Health. London, The Stationery Office, 1998.
2 Aveyard P, Cheng KK, Almond J, Sherrat E, Lancashire R, Lawrence T, et al. Cluster randomised controlled trial of expert system based on the transtheoretical ("stages of change") model for smoking prevention and cessation in schools. *BMJ* 1999;319:948-53.
3 Bruvold WH. A meta-analysis of adolescent smoking prevention programs. *Am J Pub Health* 1993;83:872-80.
4 Goddard E. *Why children start smoking*. London: HMSO, 1990.
5 Reid DJ, McNeill AD, Glynn TJ. Reducing the prevalence of smoking in youth in Western Countries: an international review. *Tobacco Control* 1995;4:266-77.
6 Murray DM, Perry CL, Griffin G, Harty KC, Jacobs DR, Schmid L, et al. Results from a statewide approach to adolescent tobacco use prevention. *Prev Med* 1992;21:449-72
7 Nutbeam D, Macaskill P, Smith C, Simpson JM, Catford J. Evaluation of two school smoking programmes under normal classroom conditions. *BMJ* 1993;306:102-7.
8 Parrott S, Godfrey C, Raw M, West R, McNeill A. Guidance for Commissioners on the Cost Effectiveness of Smoking Cessation Interventions. *Thorax* 1998;53 (suppl 5):part 2.
9 Reid D. Tobacco control: a losing battle? In: Griffiths S, Hunter D, eds. *Perspectives in public health*. Oxford: Radcliffe, 1999.

Fertility after treatment for cancer

Questions remain over ways of preserving ovarian and testicular tissue

An increasing number of people are being successfully treated for cancer, and for those with an expectation of long-term survival the late effects of treatment are of concern. Young people have a particular interest in the impact of chemotherapy or radiotherapy on their future fertility, and recent media reports[1] of the successful transplantation of cryopreserved autologous ovarian tissue into a previously oophorectomised woman with non-malignant disease (K Oktay et al, Annual Meeting of American Society for Reproductive Medicine, Toronto, September 1999) will have caught the imagination of many. If a technique works in this situation, why not for a woman with malignancy whose ovarian tissue might be harvested before the start of sterilising chemotherapy?

Successful transplantation of cryopreserved ovarian cortical tissue into castrated ewes was first performed by Gosden and colleagues in 1994[2]: a return of oestrus cycles was observed, and, after normal mating, conceptions occurred and lambs were born. Further work in women suggests that small pieces of ovarian tissue can be successfully transplanted to an ectopic site within the pelvic cavity (A J Rutherford and R G Gosden, personal communication), and the recently reported case shows that an additional step (a freeze-thaw cycle) before transplantation is also possible.

Is the stage then set for the reversal of treatment induced sterility in women who have had cancer? The technique itself certainly appears to work, but several questions relevant to patients with cancer need answering: What are the indications for such an approach (not all treatments lead to permanent sterility)? How much tissue should be harvested and when? And, importantly, what is the risk of transmitting disease back into the patient at autotransplantation?

Since 1997, 10 young women at our centre have had ovarian tissue harvested and cryopreserved before receiving high dose chemotherapy for Hodgkin's disease or non-Hodgkin's lymphoma. In each case one whole ovary was removed by laparoscopic oophorectomy and the ovarian cortex (containing primordial follicles) removed en bloc, flattened, trimmed, and then cut into strips before being stored at liquid nitrogen temperature (J A Radford et al, British Cancer Research meeting, Edinburgh, July 1999). Histological assessment has shown varying numbers of primordial follicles and no evidence of disease, though minimal amounts might, of course, remain undetected by these methods, and the results of experiments in which ovarian tissue from patients has been xenografted into immune-deficient NOD/scid mice are, therefore, of great importance (S S Kim et al, annual meeting of American Society for Reproductive Medicine, Toronto, September 1999). If no evidence of tumour transmission is detected, reimplantation of ovarian cortical strips into patients is likely to follow soon afterwards.

Fertility after treatment for cancer is not only of interest to women. Men under the age of 55 have the

BMJ 1999;319:935–6