

The world in 2050: more crowded, urban and aged

The world's population — with today's 6.1 billion already more than twice the 1950 figure — is likely to grow by another 3 billion in the next half-century, according to a recently released UN projection. Most of the population growth will occur in the less developed countries of Africa and Asia, despite the staggering death toll of the AIDS epidemic in these countries. In contrast, populations in all but a few industrialized countries will remain stable or even shrink. What's more, medical progress will allow people to live longer and thus steadily increase the percentage of retirees in the years to come. These are the conclusions of *World Population Prospects: the 2000 Revision*, the sixteenth round of global demographic estimates and projections made by the UN Population Division since 1950.

Altogether, Mr Joseph Chamie, director of the UN Population Division that compiles the population projections, told the *Bulletin* "the world's population will be very different in 50 years. It will be substantially larger, especially in the developing countries, significantly older and much more urbanized."

The world's population is currently growing at a rate of 1.2%, or 77 million people, per year with six countries accounting for half of the growth: India (21%), China (12%), Pakistan (5%), Nigeria (4%), Bangladesh (4%), and Indonesia (3%). Although fertility rates are coming down in every region and in virtually every country of the world, Chamie points out, by 2050 the overall figure is anticipated to swell to 9.3 billion, and nearly nine of every ten people will be living in a developing country — one out of six in India alone, which will replace China as the most populous nation. Taken together, the population of the world's less developed nations is expected to grow from 4.9 billion to 8.1 billion. In sub-Saharan Africa, the number of people could even triple.

But this is only one side of the coin. For the more developed countries as a whole, population growth is likely soon to come to a standstill at the current 1.2 billion level, according to the UN projection. Notable exceptions, however, are several industrialized countries, such as Australia, Canada and the US, that are projected to be at least a third larger by 2050 than they are today. By mid-century the populations of 39 developed

countries are likely to be even smaller than today, e.g. Japan and Germany by 14%, Italy and Hungary by 25%, and countries of the former Soviet Union by 30–40%, leading to a shift in balance. Fifty years ago, when Europe claimed about 20% of the world's population, Africa amounted to just 8%. In 50 years, however, Africa will have three times as many people as Europe, even though AIDS is anticipated to cut Africa's population growth by 15%.

"The engine that determines these differences is the vast difference in fertility rates (between less developed and industrialized countries)," says Chamie. In virtually all countries of the more developed regions fertility is currently below the replacement level of 2.1 children per woman — the level needed to ensure that a population will replace itself in the long run. Countries with the lowest fertility rates include Bulgaria, China, Spain (all 1.1) and Italy (1.2), while Niger (8.0), Somalia (7.25) and Angola (7.2) top the high-fertility roster.

A noteworthy exception among major industrial nations is the US, expected to grow from 283 million today to nearly 400 million at mid-century. By then, the US will be the only developed country among the world's 20 most populous nations. In 1950, at least half of the top 10 were industrial nations. About 70% of population growth in the US will be due to immigration. Without migration, the populations of more developed regions as a whole would start declining in 2003 rather than in 2025, the UN report notes.

But the Earth is not only going to be much more crowded: the UN projection also predicts that the industrialized world — most European countries, plus Australia, Canada, Japan, New Zealand, and the US — will be confronted with an ageing population. Globally, "we will see a tripling in the number of people 60 years or older", increasing from 606 million today to nearly 2 billion by 2050, says Chamie. In more developed regions, people 60 or over currently constitute about 20% of the population. In 50 years, they will account for 33%. In Europe that figure could even jump to 37%.

With fewer people in the workforce and more people living off retirement funds and pensions, an ever older population will represent a major strain for social security systems, Mr Paul Hewitt, project director for the Global Aging Initiative at the Center

for Strategic and International Studies, commented to the *Bulletin*. "An ageing population is probably *the* main challenge for the world economy in the next century. Soon the industrial world will face chronic labour shortages and shrinking populations. Retirement as we know it will probably cease to exist in a number of countries," he says.

The UN's Chamie agrees. "Now is the time to prepare," he says. "I offer people three pieces of advice: Prepare for your retirement and old age, prepare for your retirement and old age, and prepare for your retirement and old age." ■

Michael Hagmann, *Zurich, Switzerland*

News Feature

AIDS vaccine research riding high

The announcement in March that the first AIDS vaccine candidate designed primarily for use in East Africa is entering human trials in Kenya, is just the latest in a series of encouraging events that has marked AIDS vaccine research over the past year or so. Hopes are running high that the current flurry of activity will produce a truly effective vaccine. Some experts, though, still licking the wounds of past disappointments, urge caution.

The Kenya vaccine was developed by a team of researchers from the University of Oxford, in the UK, and the University of Nairobi, in Kenya. It is based on the "clade A" variety of HIV, which is responsible for about 60% of HIV infections in East Africa. The Kenya trial is in the first, or Phase 1, stage of human tests and aims to determine the vaccine's safety. A preliminary human trial was begun last August in Oxford, where the vaccine has been administered to 18 volunteers with no adverse effects to date. Work on the vaccine has been coordinated and funded by the New York-based International AIDS Vaccine Initiative (IAVI).

The vaccine will be given in a two-shot, "prime-boost" regimen. The first, priming, shot consists of HIV genes (naked DNA) injected directly into the vaccine recipient. The second, booster, shot uses a viral vector to carry HIV genes into the recipient. This vector, called "Modified Vaccinia Ankara", is a version of vaccinia, the virus used to make the smallpox vaccine, but modified to prevent it from replicating in human cells.

The prime-boost approach is all the rage among vaccine researchers at the moment, as it shows good results in monkeys. A US research team from the National Institute of Allergy and Infectious Diseases (NIAID) and Emory University, in Atlanta, Georgia, recently reported that 23 of 24 monkeys given a prime-boost vaccine and then challenged with very high doses of SIV — the monkey version of human HIV — remained alive and well, whereas unvaccinated controls quickly developed AIDS-related infections. The vaccinated animals were still infected, but had 2000 times lower levels of virus than the controls.

Professor Andrew McMichael, head of the Medical Research Council's human immunology unit at Oxford, where the Kenya vaccine was designed, says: "The 'prime-boost' approach is currently being tested in animal studies on several candidate vaccines which induce cellular immune responses, with or without antibodies. If two or three of these vaccines go all the way to Phase 3, we'll learn whether or not the approach works. It may be only partial protection. It may only be short-lived. But I think as soon as we get our foot in the door, we can lever it open. At the moment we've got nothing."

Commenting on the hopes raised by the launch of the Kenya vaccine trial, Dr José Esparza, coordinator of the WHO/UNAIDS HIV Vaccine Initiative, warns against going overboard: "I've been working in this field for ten years," he commented to the *Bulletin*. "So I'm a bit more cautious, and we should try to avoid creating too high expectations. This is just the first step of what could be a long journey".

Dr Peggy Johnston, director of AIDS vaccine research at the NIAID and, with a US\$ 214 million annual budget for AIDS vaccine research and development, by far the largest funder of AIDS vaccine research worldwide, adds: "We've made tremendous strides in identifying several different candidate vaccines that induce good cellular immune responses in animal models. What we don't know is first of all, if they work in humans; second, if protection lasts; and third, and most important, if vaccinated

individuals can still transmit infection. We want a vaccine that not only saves individuals but stops the virus spreading." Johnston says she'd like to see more work on broadly reactive antibody responses. They could prevent initial infection, but "that's a nut that hasn't been cracked yet" she says.

Meanwhile, AIDS vaccine research, after several years in the doldrums, is on a roll, with funding on an upward spiral and the whole field flush with enthusiasm. The European Union has launched a new AIDS vaccine initiative, Eurovac, and France and Japan have their own programmes, along with the NIAID, IAVI, the Centers for Disease Control and Prevention, and the Walter Reed Army Institute of Research in the US, plus several groups in developing countries, including Brazil, India and South Africa. Pharmaceutical companies, such as Merck, GlaxoSmithKline and Wyeth Lederle, have also returned to the scene. And an African AIDS Vaccine Programme, uniting African researchers, is soon to be launched by WHO and UNAIDS.

With AIDS vaccine research burgeoning, both the NIAID and WHO see a

growing need for coordination, especially for trials in Africa and other developing regions. The NIAID's Johnston is pressing for international coordination, especially on developing common trial sites, while encouraging healthy competition amongst agencies and vaccine concepts.

As for WHO, Esparza says, "we are an honest broker, bringing industry, agencies and countries together to do the trials, and building capacity for this long-term effort. But we need a system to make decisions, because in the past we have had products and even sites for trials, but no decision to move. The international community should have more to say on moving ahead with trials." These trials, Esparza says, should cover many more types of vaccine than the few currently in the research pipeline. "Unfortunately, though, many of the labs and agencies are after the same products. This happens in the scientific community. Consensus is reached very quickly because everybody is reading the same scientific articles and following the same paradigms." ■

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Photograph Giacomo Pirozzi/UNICEF

A 15-year-old Tanzanian girl in a street in Dar es Salaam, waiting, like countless others, for a vaccine to prevent HIV/AIDS, a too common feature of today's urban Africa.