

by convincing people that they're better off with fewer mouths to feed.

Cleland points to Kenya, where fertility rates dropped from 8 to 4.8 births per woman after the government launched aggressive family planning efforts in the early 1980s. In comparison, in culturally and economically similar Uganda, which has a weaker family planning program, fertility has remained high, notes demographer John Bongaarts of the Population Council in New York City. He says other country comparisons also bolster the case for family planning (see p. 574).

Still, those examples don't directly show that family planning programs lower fertility rates. One of the few studies that provides such evidence was conducted in Matlab, a region of Bangladesh where Muslim practices and frequent floods discourage women

from leaving home. Starting in 1977, family planning workers regularly visited homes in half of Matlab's 141 villages to offer married women birth control methods. By 1996, while fertility had dropped across Matlab, it was 16% lower in the study villages than in control villages (or at least one fewer birth per woman over 30), according to estimates by Schultz and Shareen Joshi. Elements of the program were extended to all of Bangladesh, and women now have on average just 2.7 children, "which is astonishing for a country that poor," Bongaarts says.

Although the debate isn't over, "there's been a little bit of convergence" about the role of family planning versus education, says economist David Lam of the University of Michigan, Ann Arbor. "It was either-or. I think most people agree now it's both."

S Video featuring author Jocelyn Kaiser. www.scim.ag/pUaqth

NEWS

A Pitched Battle Over Life Span

Predicting whether life expectancies will keep rising is as much art as science. Two demographers disagree about what the coming years will bring

DEMOGRAPHERS MIGHT NOT SEEM THE SORT to engage in fiery debate—until you talk to James Vaupel and S. Jay Olshansky. The two sit at opposite poles of a dispute (although never in the same place at the same time) that has long fueled speculation: What will human life expectancy look like in the years to come? Will it continue with steady, almost linear upticks? Or will it veer in a different direction?

Vaupel, an American who works mainly at the Max Planck Institute for Demographic Research in Rostock, Germany, and Olshansky of the University of Illinois in Chicago, appear to have sourced their crystal balls from very different manufacturers. For 20 years they've been arguing, joined by demographers worldwide, trying to answer a question that is essentially unanswerable: whether the future will resemble the past. Vaupel says it will, with life expectancies at birth rising unabated by about 3 months a year in countries where residents live the longest. Olshansky counters that sober realities, such as widespread obesity, will cut life spans short.

This all might sound philosophical, with little practical value—but in fact, it has very real-world implications. For example, every

year of life expectancy costs the U.S. Social Security Administration \$50 billion. Knowing whether a 90-year-old who needs heart surgery is likely to live much longer helps determine whether she receives that care.

Meanwhile, the Vaupel-versus-Olshansky divide is so deep that it's pulled others into the fray. "I didn't really begin studying this until a decade ago," says John Bongaarts of the Population Council in New York City. "I was intrigued by the fierceness of the passions on both sides. I said, 'What the heck is going on here?'" He would quickly find out.



Caution ahead. S. Jay Olshansky says widespread obesity could boost death rates.

Pritchett says he now believes that family planning can accelerate a drop in fertility rates in countries in a "sweet spot" where desired family size has begun to fall.

As family planning makes a comeback, some researchers are calling for policy-makers to test projects with controlled experiments, such as the Matlab study. One recent example is a study in Zambia that gave about 1000 women vouchers for free contraceptives. While contraception use rose over the next year, fertility fell only among women who received the vouchers without their husbands present. In this group, births unwanted by the woman dropped 57%. This made sense because often the wives wanted fewer children than their husbands did, says study leader Nava Ashraf, an economist at Harvard.

Such studies show that "differences in design can make a huge difference in the impact," Ashraf says. **—JOCELYN KAISER**

Lighting the fires

For Olshansky, the debate over limits to the human life span began in 1990, when he published a paper in *Science* (2 November 1990, p. 634). Called "In Search of Methuselah: Estimating the Upper Limits to Human Longevity," the paper postulated that "it seems highly unlikely that life expectancy at birth will exceed the age of 85."

At the time, the idea that life span couldn't keep on rising was popular. Life expectancy had nearly doubled in some countries in the previous 150 years. Many demographers concluded "that this is not going to last forever," says Juha Alho, a statistician at the University of Eastern Finland in Joensuu. But these were gut feelings, "a judgment call," he says, assumptions not grounded in data. Life-span limits had been postulated many times in the past. Meanwhile, people just kept on living beyond when they'd been predicted to expire.

Olshansky examined how much mortality from heart disease, cancer, and other killers would need to drop in order to boost life expectancy. "Most of the past increases in life expectancy occurred because we saved the young," he says. "That can only happen once." Even a cure for cancer, he calculated, would add only 4 or 5 years of life across a population. The 85-year limit is a "soft" one, he says, guided by aspects of human biology that appear fairly fixed, such as the timing of menopause.

The idea that a population's life expectancy would be grounded in evolution, as Olshansky postulates, makes sense. Salmon,

for example, literally self-destruct after they reproduce, says Shripad Tuljapukar, a professor of biology and population studies at Stanford University in Palo Alto, California. “Evolution can do all sorts of things,” he notes. “But it hasn’t done them to us.” Tuljapukar, who falls more in Vaupel’s camp, points out that women live well beyond when they’re capable of reproducing, as do whales and some primates.

In 1990, when Olshansky published his *Science* paper, life expectancy at birth for people in Japan—record-holders in this regard—was 79. In 2009, it was a shade over 83.

Vaupel doesn’t hide his delight that, in his view, the Japanese are torpedoing Olshansky’s careful mathematics. Olshansky’s paper proposes “the prediction he’s famous for that I suppose he’d like people to forget,” Vaupel says. (Olshansky warns that “when you call Jim, you are going to get misrepresentation” and disputes that the 85-year limit was a fixed one; he also says that for Japan, getting from 83 to 85 won’t be easy.)

These days, “I think the Vaupel school is larger than the Olshansky school,” says Steven Austad, a biogerontologist at the University of Texas Health Science Center in San Antonio. Austad has a friendly wager with Olshansky: He’s betting that as of the year 2000, the first 150-year-old human had already been born.



Trending up. James Vaupel sees us living longer and longer.

late into a pill that forestalls human aging, the incremental advances happening now in people are significant, he believes. In 1970, for example, half of the 70-year-olds in Sweden had no teeth at all. In 2000, only 7% were toothless, thanks partly to fluoridated toothpaste. Tooth decay is associated with heart disease, and Austad believes that hanging on to one’s teeth translates into something meaningful across a population.

Olshansky says that’s all well and good, but other health trends are far more alarming. In 2005, he forecast in *The New England Journal of Medicine* a potential decline in U.S. life expectancy because of widespread obesity. “You can’t ignore the health of living people,” he says. Of Vaupel and his ilk, he minces no words: “It’s easy to come up with a

In 1980, epidemiologist James Fries of Stanford postulated that the percentage of people surviving past age 100 was fixed. In the late 1980s, Vaupel decided to test this. He traveled to Stockholm, which holds some of the world’s best mortality data, and found that since 1860, death rates for centenarians had fallen in half. This meant that centenarians were dying off more slowly than they used to, which ran counter to what Fries had predicted.

Along those lines, Vaupel published another experiment in *Science* in 2003 (19 September 2003, p. 1679), with his colleague Kaare Christensen, an epidemiologist and physician at the University of Southern Denmark, and entomologist James Carey of the University of California, Davis. Titled “It’s Never Too Late,” the researchers reported that mortality rates in East and West Germany converged just years after the Berlin Wall fell. Previously, mortality rates in East Germany were 20% higher. In Christensen’s view, “it’s the most frail and sick that benefit most from progress,” including better medical care and a willingness to treat the very old. He’s currently working with Vaupel to study whether centenarians today are healthier than those in the recent past.

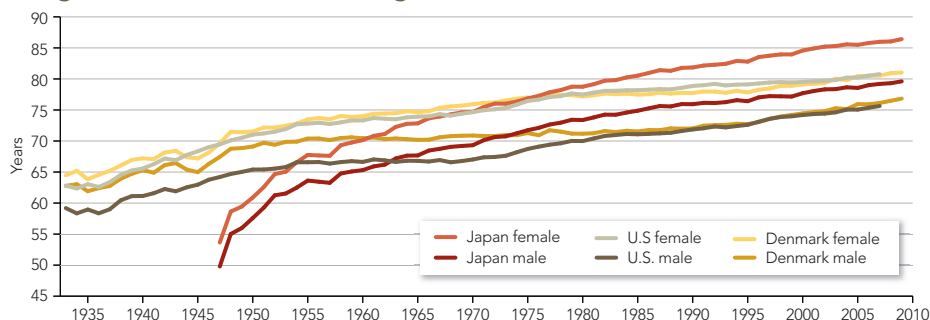
Like many demographers, Vaupel relies heavily on historical data because he considers it by far the best we’ve got. Still, even if many side with Vaupel, some consider his approach to be limiting. Vaupel does “great work [and is] very imaginative,” says Richard Miller, a biogerontologist at the University of Michigan, Ann Arbor. But he and others like him have “cut themselves off at the knees by saying, ‘If you can’t take it from a life table, don’t talk to me about it.’” Vaupel admits that one nagging question is how to incorporate ancillary data like new biological insights, which aren’t directly connected to life expectancy but could, when melded with it, prove useful.

When push comes to shove, Vaupel and Olshansky “disagree about everything, [and] they do it very articulately,” Austad says. “It took me a while before I realized, ‘Why don’t I ever see these two at the same conference?’”

Vaupel says he’s steered clear of Olshansky since they were each invited to present their case, about a week apart, at the Cass Business School in London about 6 years ago. A British member of Parliament acted as the moderator and strove for a middle ground. “Of course when you adjudicate, the truth is always in between,” Vaupel says. “I said, ‘I’m sick and tired of the truth being in between, and I’m not going to do this anymore.’”

—JENNIFER COUZIN-FRANKEL

Longer Lived With Each Passing Year



What’s next? Life span has trended up for decades. Will the pattern hold?

Olshansky doesn’t think so. The two have put \$150 each into an investment account, to be accessed in the year 2150, when the winner will become clear. “In the best-case scenario I would get the proceeds,” Austad says. “Or, more likely, my kids or grandkids.”

Like many biologists, Austad has been struck by the varied interventions, from modifying genes to restricting calories, that extend life. “We would have said that you can’t make a mouse live longer than 3.5 years; now we can make a mouse live 5 years,” he says. Even if that doesn’t trans-

life expectancy of 100 if you close your eyes, pull out a ruler, and you extend historical trends into the future.”

Deaths past and future

One reason for disagreement is that although we think of life expectancy as a single number, it’s really not. There are different mortality rates for different ages, sexes, and parts of the world. “Life expectancy is a one-number summary of 100 numbers,” Alho says. “What actually is the most relevant way of looking at these things? It’s not obvious.”