

► to include microbiome data, but both were cancelled because of trouble recruiting participants. The US study also struggled with excessive costs and management issues.

The Chinese team has so far avoided similar problems. Its rich collection of 1.6 million biological samples includes stools, blood, placental tissue and umbilical cords. Extensive surveys also record participants' eating habits, mental health, and other lifestyle factors, such as the amount of mould in their houses.

### FIRST FINDINGS

Incense burning is common in southern China, and one study based on the Guangzhou project found that exposure to the resulting fumes increases the risk of hypertension in expectant mothers<sup>2</sup>.

Another study found that progesterone, a drug used around the world to reduce the risk of a preterm birth, was prescribed too early in pregnancy in more than 40% of women studied<sup>3</sup>. The researchers found that giving women the drug before 14 weeks of gestation did not reduce their chances of a preterm birth, but put them at higher risk of needing a caesarean section and of developing postpartum depression. The authors consider the

findings “an urgent public-health concern”.

Other studies are in progress. A team from the University of Birmingham, UK, and BGI, one of China's largest genome-sequencing institutes, in Shenzhen, is trying to characterize how the microbiomes of babies born vaginally — who are exposed to their mothers' microbes on their journey down the birth

**“The data is vast and there is space for many different groups globally to mine this information.”**

canal — differ from those of infants born by caesarean section. Although similar studies have been done on a smaller scale, Dominguez-Bello says that the Guangzhou cohort will offer statistical power to separate out other variables that could influence an infant's microbiome. These include pre- and postnatal medications and environmental pollutants.

Xiu Qiu, an epidemiologist at Guangzhou Women and Children's Medical Center and the director of the Guangzhou project, is using the cohort data to test her surprising, but tentative, finding that older mothers having a second child have a lower risk of depression during pregnancy than do women pregnant with their

first child<sup>3</sup>. She had expected that women who already have a baby when they are pregnant would be under more stress and face a higher financial burden, and so would be more likely to experience depression. The end of China's one-child policy in 2016 means the birth-cohort study offers a fresh opportunity to study an increasing number of women, many of them older, who are having a second child, she says.

Sing Sing Way, a paediatrician at the Cincinnati Children's Hospital in Ohio, meanwhile, will be looking at the data provided by the addition of grandmothers to the study to understand why cells from mothers can live on indefinitely in their offspring. Studies in mice suggest that these cells have a protective role when the offspring are pregnant, says Way<sup>4</sup>.

Xia Huimin, a co-founder of the project, says that the Guangzhou cohort has the power to answer many more questions like this. He hopes scientists around the world will use it. “We would like scientists from everywhere to work with us.” ■

1. Qiu, X. *et al. Eur. J. Epidemiol.* **32**, 337–346 (2017).
2. He, J.-R. *et al. Sci. Total Environ.* **610–611**, 1421–1427 (2018).
3. Shen, S. *et al. Lancet* **386**, S58 (2015).
4. Kinder, J. M. *et al. Cell* **162**, 505–515 (2015).

### MEDICAL RESEARCH

# Longevity data hint at no natural limit on lifespan

Death rates plateau in elderly people, reviving a debate about how long humans can live.

BY ELIE DOLGIN

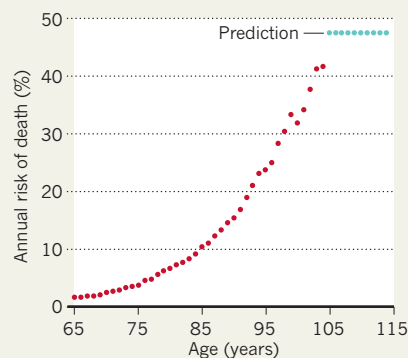
There might be no natural limit to how long humans can live — at least not one yet in sight.

That proposal — which runs contrary to the claims of some demographers and biologists — comes from a statistical analysis published on 28 June in *Science*. It examined the probabilities of survival of nearly 4,000 ‘super-elderly’ people in Italy, all aged 105 and older (E. Barbi *et al. Science* **360**, 1459–1461; 2018).

The study was led by Sapienza University demographer Elisabetta Barbi and University of Roma Tre statistician Francesco Lagona, both based in Rome. Their team found that the risk of death — which, throughout most of life, seems to increase as people age — levels off after age 105, creating a ‘mortality plateau’. At that point, the researchers say, the odds of someone dying from one birthday to the next are roughly 50:50 (see ‘Longevity unlimited’). “If there is a mortality plateau, then there is

### LONGEVITY UNLIMITED

A person's chances of dying tend to increase throughout adulthood, but a model based on data from 3,836 people aged 105 or older predicts that this trend flattens out in very elderly people.



no limit to human longevity,” says Jean-Marie Robine, a demographer at the French Institute of Health and Medical Research in Montpellier.

That would mean that someone such as Chiyo Miyako, a Japanese great-great-great-grandmother who, at 117, is the world's oldest known person, could live for years to come — or even forever, at least hypothetically.

Researchers have long debated whether humans have an upper age limit. The consensus holds that the risk of death steadily increases in adulthood, up to about age 80 or so. But there's vehement disagreement about what happens as people enter their 90s and 100s.

Some scientists have examined demographic data and concluded that there is a fixed, natural ‘shelf life’ for our species, and that mortality rates keep increasing. Others have looked at the same data and concluded that the death risk flattens out in one's ultra-golden years, and therefore that human lifespan does not have an upper threshold.

In 2016, geneticist Jan Vijg and his colleagues at Albert Einstein College of Medicine in New York City rekindled the debate when they analysed the reported ages at death for the

SOURCE: BARBI ET AL. (2018).

world's oldest individuals over half a century. They estimated that human longevity hit a ceiling at about 115 years — 125 tops.

Vijg and his team argued that given few, if any, gains in maximum lifespan since the mid-1990s, human ageing had reached its natural limit (X. Dong *et al. Nature* 538, 257–259; 2016). The longest known lifespan belonged to Jeanne Calment, a French super-centenarian who died in 1997 at age 122.

Experts challenged the statistical methods in the 2016 study, setting off a firestorm into which Barbi and Lagona now step. Working with colleagues at the Italian National Institute of Statistics, the researchers collected records on every Italian aged 105 years and older between 2009 and 2015 — gathering certificates of death, birth and survival in an effort to minimize the chances of 'age exaggeration', a common problem among the oldest old.

They also tracked individual survival trajectories from one year to the next, rather than lumping people into age intervals as previous studies that combine data sets have done. And by focusing just on Italy, which has one of the highest rates of centenarians per capita in the world, they avoided the issue of variation in data collection between different jurisdictions.

As such, says Kenneth Howse, a health-policy researcher at the Oxford Institute of Population Ageing, UK, "these data provide the best evidence to date of extreme-age mortality plateaus in humans".

Ken Wachter, a mathematical demographer at the University of California, Berkeley, and an author of the latest study, suspects that previous disputes over the patterns of late-life mortality have largely stemmed from bad records and statistics. "If we can get data of this



Emma Morano, who died in 2017 at age 117, was the last surviving person born in the nineteenth century.

quality for other countries, I expect we're going to see much the same pattern."

Robine is not so sure. He says that unpublished data from France, Japan and Canada suggest that evidence for a mortality plateau is "not as clear cut". A global analysis is still needed to determine whether the findings from Italy reflect a universal feature of human ageing, he says. Brandon Milholland, a co-author of the 2016 *Nature* paper, says that the evidence for a mortality plateau is "marginal", because the latest study included fewer than 100 people who lived to 110 or beyond. Leonid Gavrilov, a longevity researcher at the University of Chicago in Illinois, notes that even small inaccuracies

in the Italian longevity records could lead to a spurious conclusion.

Others say the conclusions of the study are biologically implausible. "You run into basic limitations imposed by body design," says Jay Olshansky, a bio-demographer at the University of Illinois at Chicago, noting that cells that do not replicate, such as neurons, will continue to wither and die as a person ages, placing upper boundaries on humans' natural lifespan.

This study is thus unlikely to be the last word on the age-limit dispute, says Haim Cohen, a molecular biologist at Bar-Ilan University in Ramat-Gan, Israel. "I'm sure that the debate is going to continue." ■

## CLIMATE CHANGE

# Cyprus asserts itself as hub for climate research

*Proposed science institute will focus on the Mediterranean and Middle East.*

BY ANITA MAKRI

The tiny island of Cyprus is reshaping itself into a regional hub for climate-change research. The country lies at the meeting point of the Mediterranean, the Middle East and North Africa — areas where climate change is expected to take a heavy toll in the coming decades, but in which research capacity to address the issue is limited.

Cyprus's President Nicos Anastasiades announced plans on 5 June to create a government initiative that will coordinate

action against global warming across the Mediterranean and support the creation of a €30-million (US\$35-million) climate-change research centre at the Cyprus Institute in Nicosia, the nation's leading multidisciplinary research institution. "This is a priority issue for the government," says Theodoros Mesimeris, head of the climate-change division of the Cypriot environment ministry. The initiative will also create a comprehensive plan for reducing Cyprus's greenhouse-gas emissions in line with goals set by the 2015 Paris climate accord.

Resources for climate research in the region

are too small to scope out even the challenges, let alone the solutions, says Costas Papanicolas, president of the Cyprus Institute, who helped to plan the initiative with government ministers and Anastasiades.

Climate models suggest that the Mediterranean and Middle East are getting warmer and drier at a rate faster than the global average; precipitation in the Mediterranean is expected to drop, especially in summer, by as much as 30–40% by the end of the century if no mitigation efforts are made, according to Filippo Giorgi, an Earth-systems physicist at the ▶