

► monitoring about 5,000 adults in Massachusetts in 1948. Over the next few decades, it revealed links between heart disease and high cholesterol, elevated blood pressure and smoking.

In Project Baseline, participants will wear Verily's proprietary Study Watch, which will transmit their heart rate, movements and other information to the company's database. Another sensor below people's mattresses will monitor their sleep patterns. Verily will also collect genomic data, information on participants' feelings (gathered through self-reported surveys), health records, family histories and the results of periodic lab tests on urine, saliva and blood. In-person appointments will mainly take place at clinics at Duke University and at Stanford University in California, which are collaborating on the project.

Jessica Mega, chief medical officer at Verily in South San Francisco, California, says that a key goal is to help the company test and refine its platform for integrating multidimensional health data. "We are building infrastructure that others can use to test hypotheses, tools and technologies," she says.

Verily will make its participants' anonymized data available to researchers from universities and companies on a case-by-case basis. This

may involve companies sponsoring studies that test new technology, says Mega.

The NIH study, called All of Us, received \$230 million in the current fiscal year and is part of the agency's Precision Medicine Initiative. Some participants will have an option to send researchers data collected through smart wristbands, sleep sensors, environmental monitors, genetic and microbiome sequencing and other technologies.

The two massive studies follow smaller ones such as a project led by Stanford genomicist Mike Snyder, who has been collecting more than 250,000 daily measurements from about 100 people in an ongoing project called iPOP (integrated personal omics profiling). In January, Snyder published a paper reporting how sensors he wears clued him in to abnormalities, such as elevated skin temperature and decreased oxygen in his blood, that prompted him to visit a doctor (X. Li *et al.* *PLoS Biol.* 15, e2001402; 2017). The clinician diagnosed him with Lyme disease.

Leroy Hood, co-founder of the Institute for Systems Biology in Seattle, Washington, has

also completed a deep-data study, this one with 108 people. He used lessons from the project to co-found biotechnology company Arivale, which charges \$3,500 per year to evaluate people's data over time from a range of sources, including wearables, genome sequencing and blood biomarkers. Users also repeatedly talk to a coach who looks at the data, and makes recommendations on how to improve their lives.

Some people who sign up for the programme are at risk of diseases such as Parkinson's and Alzheimer's, and Hood says that pharmaceutical companies may be willing to pay for information on these individuals to learn how their chemistry changes if they start to become ill. "This information can indicate biomarkers," he says, "and the idea is that you could then make drugs that would prevent the disease."

One challenge in all these efforts is keeping people engaged over many months. Verily is considering using games to sustain participation. But Hood doubts the long-term efficacy of that approach.

He says Arivale's clients stick with their programme because of the monthly visits to a coach. "It's a lot like therapy," he says, "they become your mother or father." ■

## PUBLIC HEALTH

# Ebola outbreak halted

*The virus's emergence in the Democratic Republic of the Congo was brief, but researchers say that it revealed lingering gaps in public-health preparedness.*

BY ERIKA CHECK HAYDEN

Epidemiologist Anne Rimoin boarded a flight to Kinshasa on 19 May with a precious cargo in her luggage: the components of a diagnostic test for Ebola.

Rimoin hoped that the test, the GeneXpert Ebola assay, would help officials to track cases in the latest Ebola outbreak, which was declared in the Democratic Republic of the Congo (DRC) on 11 May. The test was developed during the disastrous 2014 Ebola epidemic in West Africa.

The existence of the Ebola assay is a sign that the world's ability to respond to outbreaks of the virus has improved. But the test was not available where it was needed when Ebola erupted in the DRC, says Rimoin, of the University of California, Los Angeles, who has worked with the Congolese Ministry of Health for 15 years. "The fact that I had to go out there with diagnostics in my briefcase is an example of the fact that we're not fully prepared on that score," she says.

On 2 July, the World Health Organization (WHO) declared an end to the DRC outbreak — but public-health officials caution that its low death toll doesn't prove that the world has learnt all the lessons of the West African crisis.



They credit the fact that only four people died to the expertise of Congolese officials, who had dealt with seven previous Ebola outbreaks, and to the remoteness of the northern Bas Uele province where the outbreak occurred.

"The response was good, but it would not be valid to say that this shows that we're ready for a larger response in a bigger context — that remains to be seen," says Daniel Bausch, director of the UK Public Health Rapid Support Team, an agency created to fill some of the gaps exposed by the 2014 crisis.

International agencies sent personnel and equipment in response to the most recent outbreak much faster than they did in 2014, when months of delays allowed the West African epidemic to spiral out of control and eventually claim more than 11,000 lives.

That failure led to calls for drastic improvements in the world's public-health safety net, some of which have been heeded.

**A health worker at a Congolese Ebola quarantine unit.**

JOHN WESSELS/GETTY

The WHO, which was widely criticized for responding too slowly to the 2014 outbreak, has created a Health Emergencies Programme in response. The agency deployed 50 people to the DRC, starting 3 days after the most recent outbreak was declared.

But other parts of the response came too slowly. Although an experimental Ebola vaccine was shown to be effective against the disease in the 2014 outbreak, its use in the DRC wasn't approved until 29 May. The vaccine was ultimately never shipped to the country because no new cases emerged after that date.

### SLOW PROGRESS

The latest outbreak apparently began in April, when a 39-year-old man began vomiting and bleeding after handling the carcass of a dead wild boar in a forest in Likati in Bas Uele. The man died while en route to a hospital; within days, two people who had helped to transport him fell ill themselves, as did their contacts.

Health workers shipped blood samples from contacts of these three people to a lab at the National Institute for Biomedical Research in Kinshasa, which found two tested positive for Ebola; a total of five people ultimately tested positive. Samples were also shipped to the International Centre for Medical Research in Franceville, Gabon, which analysed the viral genetic sequences of one of the samples.

The lab found that the Ebola strain that caused the Congolese outbreak is similar to one first seen in 1995 in Kikwit, DRC, a few thousand kilometres southwest of Likati, says Jean-Jacques Muyembe-Tamfum, director of the National Institute for Biomedical Research.

By contrast, when the 2014 Ebola outbreak began with a suspected case in Guinea, there were no labs in the country that could test for the virus. So public-health officials had to ship viral samples out of Africa for sequencing.

But the most crucial difference between the two outbreaks may have been the level of community engagement with efforts to halt Ebola's spread. Muyembe-Tamfum was on the team that investigated the 1995 Kikwit outbreak, as well as on the team that worked on the very first Ebola outbreak in Yambuku, DRC, in 1976. The people of his country are no strangers to Ebola, whereas in West Africa, communities hid from and even killed officials seeking to track the disease in Sierra Leone, Guinea and Liberia.

"We are lucky because our population will collaborate with medical teams," Muyembe-Tamfum says. "In the West African epidemic, community engagement came too late." ■



Sales of wild owls have soared in Indonesia since the boy-wizard fantasies hit cinemas and bookshops.

### CONSERVATION

# Harry Potter linked to rise in owl trade

*Boom in illegal sales in Indonesia worries conservationists.*

BY INGA VESPER

**T**he number of owls traded illegally on Indonesian markets has risen sharply in the past two decades — and researchers think the popularity of the Harry Potter books and films could be fuelling the trend.

Anecdotal evidence from countries including India had hinted that Pottermania might explain similar spikes in demand, but a study of Indonesia's bird markets — which are known for selling wild-caught birds as pets — puts numbers on the trend.

Researchers surveyed 20 bird markets on the islands of Bali and Java and say that the number of owls being sold has risen from perhaps a few hundred each year before 2001 to 13,000 by 2016 (V. Nijman and K. A.-I. Nekaris *Glob. Ecol. Conserv.* **11**, 84–94; 2017).

Vincent Nijman, a wildlife-trade researcher at Oxford Brookes University, UK, who co-authored the study, says he feels sure there is a link between the rise in owl sales and the popularity of Harry Potter, in which the titular character keeps a pet owl named Hedwig. The first novel was translated into Indonesian in 2000, and the first film adaptation was released in 2001.

Although it's difficult to prove direct causation, says Nijman, "Harry Potter normalized keeping owls as pets." Owls are called *burung hantu* in Malay, but are now known colloquially as *burung Harry Potter*, he says.

Richard Thomas from the UK-based network Traffic, which monitors wildlife trade, says it's "not possible to say unequivocally" that the Potter craze is to blame. However, a 2015 report from Traffic on Indonesia's bird markets also noted the jump in owl sales, and suggested the same link.

Nijman says that owls can usually be bought for US\$6–30 in Indonesia's bird markets — making them affordable for most people with a job. The most popular variety is the scop owl, and endangered species in the same genus (*Otus*) are still being discovered on the country's many islands. That makes the owl trading a conservation issue, the researchers warn, because nearly all the birds for sale are caught in the wild.

Indonesian law forbids the trade of wildlife for which there is no official catch quota — and there isn't one for owls. But according to the researchers, state authorities have failed to act. The Indonesian government did not respond to repeated requests for comment by *Nature*. ■