

more money won't help, he argues: The proportion of NIH grants going to young scientists dropped even during the 1999 to 2003 doubling of the NIH budget and didn't increase after NIH received a burst of funding from the 2009 stimulus spending.

To devise a legislative solution, Harris says he spent a year and a half meeting with biomedical leaders, including regular interactions with NIH Director Francis Collins. The result: a draft bill (shared with *Science*) that says the NIH director "shall ensure" that the median age of investigators receiving their first R grant (which includes ROIs and other research grants) falls to under 40 by 2019; under 39 by 2022; and under 38 by 2025.

To prime the fountain of youth, Harris—who serves on the spending panel that oversees NIH's budget—wouldn't divert money from existing grants. Instead, he would redirect a pool of about \$700 million (in 2013)—known as the tap—that NIH hands over to its parent agency, the Department of Health and Human Services, for other activities. A separate draft bill would channel this funding to the NIH director's office, to be used for "emerging scientists"—defined as those who finished their training within the last 15 years and are seeking their first or second research grant. Harris hopes the two bills will become part of legislation expected to emerge early next year from a bipartisan effort in the U.S. House of Representatives—known as 21st Century Cures—to support NIH and speed drug development.

NIH officials are hesitant. Sally Rockey, the agency's deputy director for extramural research, says Harris's mandate might not achieve much unless scientists' training can be shortened so that more are ready to compete for NIH grants at a younger age. For now, there may be too few proposals coming from scientists in their 30s to meet Harris's targets without dramatically propping up their success rates, says Jeremy Berg of the University of Pittsburgh in Pennsylvania, a former director of the National Institute of General Medical Sciences. "You really need to look at what's driving the numbers and understand the whole system before doing things that might be harmful in the long run," he says. Too much special treatment for young researchers could create problems down the road, worries Jessica Polka, a postdoctoral researcher at Harvard Medical School in Boston. "The glut of new [young] PIs would only further strain the funding system in the future," she predicts.

Harris stands by his plan. Researchers "at the age of peak innovation" deserve "a leg up," he says. And "if they continue to have good ideas ... they will be able to compete." ■



A son and his sick father in Monrovia.

INFECTIOUS DISEASES

Imagining Ebola's next move

As containment efforts fall short, scientists look beyond the models to envision how the epidemic might unfold

By Kai Kupferschmidt

When a traveler from Liberia came down with Ebola in Dallas on 24 September, it was a warning to the world: As the number of cases in West Africa keeps rising, so does the risk the disease will spread beyond Guinea, Sierra Leone, and Liberia. The United States was the third country, after Nigeria and Senegal, to catch a spark from the growing conflagration; it was followed by Spain, which reported the first case of Ebola contracted outside of Africa on 6 October. The patient, a nurse, had taken care of a priest who became infected in Sierra Leone.

None of these cases has triggered a widespread outbreak, and most experts are confident that wealthy nations can contain introduced cases. "My first reaction was: Well, it had to be somewhere. Better Dallas than Mumbai," says Peter Sandman, an adviser on risk communication based in Brooklyn, New York, about the U.S. case. But developing countries may not be so lucky when Ebola arrives on their doorstep. That could result in entirely new chapters in the disease's spread.

On 3 October, the World Health Organization (WHO) had reported 7470 cases and 3431 deaths in the three affected countries. Those numbers, believed to be gross underestimates, are rising exponentially, and models show they could reach the hundreds of thousands in a matter of months. But models can't forecast unpredictable things like viral mutations, changes in human behavior, the impact of new vaccines and drugs, or

where and how the disease will next become entrenched. So researchers are looking beyond the models, and at possible scenarios, to prepare for what might happen. Scientists are naturally loath to speculate, Sandman says, but "risk communication and crisis communication are all about what-ifs."

On the optimistic picture, an effective vaccine could finally check the rise in cases—something classic control methods such as isolation and quarantine have failed to do. Without a vaccine, "I think the best we can hope for is that the spread slows down a little bit," says Alessandro Vespignani, a physicist at Northeastern University in Boston who has modeled the spread of the Ebola virus. "Increasing public health measures will have a huge impact, but I believe it has gotten to the stage where we will need a vaccine as well to stop this outbreak," says Jeremy Farrar, an epidemiologist who heads the Wellcome Trust in London.

One candidate vaccine is already in phase I safety tests, and another will be soon; at a meeting at WHO on 29 and 30 September, experts discussed how to speed vaccine development and how to cope with the thorny ethical issues involved in testing a vaccine for efficacy in the affected countries (<http://scim.ag/Ebolovac>). But those tests are unlikely to start until January, and they may not yield results until April.

In the meantime, some researchers fear the virus could mutate. In an op-ed piece in *The New York Times* on 11 September, Michael Osterholm, director of the Center for Infectious Disease Research and Policy at the University of Minnesota, Twin Cities,

argued that Ebola might change in such a way “that just breathing would put one at risk of contracting” it. He was widely criticized for fear mongering. “I do not know of a viral infection whose mode of transmission has changed in this way,” Farrar says. WHO put out a statement on 6 October, calling the idea “speculation, unsubstantiated by any evidence.” Osterholm retorts that “it may be a very remote possibility, but we have to be prepared for even that.”

What is more plausible, some researchers say, is a change that makes the virus less deadly, but also harder to get rid of. The Ebola virus most likely lurks in bats and apes, occasionally spilling over into the human population, probably when infected animals are hunted and consumed. In the past, outbreaks tended to burn out in the face of aggressive containment efforts and Ebola’s sheer deadliness. In essence, human beings remain dead ends for the virus. That could change if it becomes less fatal. “There is an evolutionary advantage to reducing virulence and adapting to your host,” Farrar says. “This has happened with many other diseases.”

If it happens with Ebola, the only way to get rid of it this time around could be a massive vaccination effort similar to those used in the eradication campaigns against smallpox and polio. “We would be looking at vaccinating hundreds of millions of people in Africa,” Farrar says.

Even if the virus does not change, the sheer size of the epidemic will lead to new challenges. As the number of beds in treatment units falls short, more and more patients will be taken care of at home, where they pose a major risk to others. That could speed up Ebola’s spread and make it harder to chart its epidemiology. Home care kits, which include basic protective equipment such as gloves and bleach, have never been widely used before to fight Ebola, but they could become important for controlling infection. They would need to be accompanied by an education campaign however, and nobody is sure how much protection they will offer.

As the already crippled health care systems in the affected countries buckle under the strain, people are also more likely to die in larger numbers of other diseases like malaria, or during childbirth. “We need to start looking beyond Ebola,” Farrar says. Food shortages may occur if harvests are missed or trade is paralyzed. “The whole region might become a failed state,” Osterholm says.

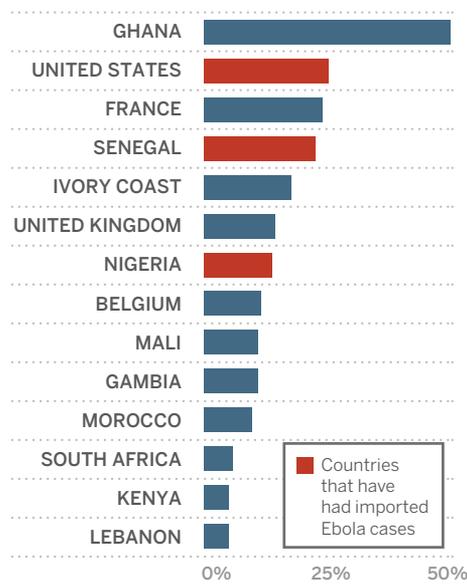
Meanwhile, the risk of spread beyond the three countries is growing, says Northeastern’s Vespignani, who listed the countries most at risk in a paper published in *PLOS Currents: Outbreaks* in September (see table). The three countries where the virus has since landed—Senegal, Nigeria, and the

United States—were in his top 16. His most recent calculations also put the chance of a case occurring in nearby Ghana by 24 October at close to 50%, even with an anticipated 80% decrease in travel. Mali and Ivory Coast are at high risk, too. If the virus gains a new foothold elsewhere, a huge effort would be needed to prevent a second firestorm, Osterholm says—even if that means diverting some resources from West Africa.

Scientists are debating the use of travel bans, which many worried U.S. citizens have called for after the Dallas case. WHO and the Centers for Disease Control and Prevention have strongly advised against closing borders because it would make it difficult to bring people and materials into the affected countries. Bans are also difficult to implement, Vespignani says, because many countries

Probability of Ebola importation

For October, using data through 23 September



would have to agree; otherwise Ebola carriers could just fly to a country that doesn’t impose restrictions and move on from there. Those who manage to circumvent a ban might then be more likely to lie about their contact history if they became sick. In the end, Vespignani says, travel bans would probably increase the risk for everyone.

But Sandman says the idea shouldn’t be dismissed entirely. “It is quite reasonable for people to ask how best to reduce the number of sparks flying out of Africa and threatening to ignite elsewhere,” he says. The world may need to buy time to test vaccine candidates, so it should look for practical ways to reduce the number of travelers carrying Ebola to other places, Sandman says. “These are discussions we need to have.” ■

U.S. POLICY

Congress, NSF spar on access to grant files

Grantees wonder what House science panel will do with private award details

By Jeffrey Mervis

Four times this past summer, in a spare room on the top floor of the National Science Foundation (NSF), two congressional staffers spent hours poring over confidential material relating to 20 research projects that NSF has funded over the past decade. The staffers work for the U.S. House of Representatives committee that oversees NSF. And their visits were an unprecedented—and some say bizarre—intrusion into the much admired process that NSF has used for more than 60 years to award research grants.

Unlike the experts who normally review proposals, the congressional staffers weren’t really there to judge their scientific merits. The Republican aide was looking for anything that Representative Lamar Smith (R-TX), his boss as chair of the House Committee on Science, Space, and Technology, could use to demonstrate how the \$7 billion research agency is wasting taxpayer dollars on frivolous or low-priority projects, particularly in the social sciences. The Democratic staff member wanted to make sure that her boss, Representative Eddie Bernice Johnson (D-TX), the panel’s senior Democrat, knew enough about each grant to rebut any criticism that Smith might levy.

The peculiar exercise is part of a long-running and bitter battle pitting Smith and many of his panel’s Republican members against Johnson and the panel’s Democrats, NSF’s leadership, and the academic research community. There’s no end in sight: The visits are expected to continue into the fall, because NSF has agreed to Smith’s request to turn over information on an additional 27 awards. (A spreadsheet of the requested grants and more details are at <http://scim.ag/NSFgrants>.)

Indeed, the feud appears to be escalating. Last week, Johnson wrote to Smith accusing him “of go[ing] after specific peer-reviewed grants simply because the Chairman personally does not believe them to be of high