

one-dose version to improve compliance. The institute is always on the lookout for research talent, says Sushant Sahastrabuddhe, a physician who heads the institute's Enteric and Diarrheal Disease Programme. Its international scientific staff of about 50 includes researchers with PhDs, medical doctorates and master's degrees.

The formation of partnerships between non-profit organizations and developing countries is also creating job opportunities. The Infectious Disease Research Institute (IDRI) in Seattle, Washington, employs about 125 people and works with nearly 100 collaborators around the world. It has helped to establish vaccine-formulation centres in South Africa and India. Manufacturing vaccines locally instead of importing them can decrease both the cost and distrust of the product, says Steven Reed, IDRI's founder.

The need to bolster public-health infrastructure in developing regions has become increasingly important. "There's minimal, almost zero, capacity to develop vaccines in the Middle East, north Africa and sub-Saharan Africa," says Peter Jay Hotez, president of the non-profit Sabin Vaccine Institute and Texas Children's Hospital Center for Vaccine Development in Houston. "And yet these are the places where we're going to see the next generation of catastrophic emerging infections." The US Department of State named Hotez as a US Science Envoy, a role designed to help promote international partnerships. For his project, he is pushing to expand vaccine infrastructure in Africa and the Middle East by focusing on countries such as Saudi Arabia and Morocco, which have an established scientific culture and PhD-level scientists. If he succeeds, programmes that increase vaccine production in these places could lead to more jobs for local scientists, as well as for international consultants.

For him, vaccinology provides the "perfect confluence" of humanitarian values and biomedical and social science. And as Hill can attest, the work is seldom boring. The past six months have been particularly "invigorating and energizing", he says, with regular enquiries about the Ebola trials from the British Prime Minister's office and other top government officials. "Going to the highest level of government with what you assayed yesterday," he says, "is pretty exciting." ■

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WORKPLACE CLIMATE

Metrics for ethics

Focus on perceived working conditions could help graduate schools to train responsible researchers.

BY MONYA BAKER

Training in research ethics is mandatory for many US graduate students and postdocs, but there is little evidence that formal classes prompt scientists to conduct research ethically. However, the workplace climate — which includes perceptions of regulatory committees, data confidentiality and treatment of trainees — influences research practices and can spawn behaviours such as poor record-keeping or plagiarism.

An interdisciplinary team has developed a survey to assess work conditions in research institutions, with a long-term goal of establishing a baseline for measurements of workplace climate across disciplines and universities. The SOuRCe (Survey of Organizational Research Climate) is a 32-question survey that divides workplace climate into seven categories, including integrity norms (such as giving due credit to others' ideas), integrity inhibitors (such as inadequate access to material resources) and adviser–advisee relations. The team hopes that such data will help institutions to craft policies that will improve research conduct.

The survey illuminates differences in attitudes held by faculty members and trainees, says Karen Klomprens, dean of the graduate school at Michigan State University (MSU) in East Lansing. When the school ran versions of the survey in 2009 and 2014, clusters

of respondents reported feeling ill-equipped to judge whether university policies support responsible research — which suggests that those topics are not discussed in meaningful ways, she says. Klomprens used the results to spur faculty members in specific departments to talk to trainees about norms in authorship, data management and peer review. "Because we use the survey data by graduate programme and by discipline, we can make recommendations," she says. To encourage participation, she emphasized to respondents that the tool is not intended to shame or punish, and responses are stripped of identifying information.

Brian Martinson studies research integrity at the non-profit HealthPartners Institute for Education and Research in Bloomington, Minnesota, and helped to develop the survey at 40 academic health centres (B. C. Martinson *et al. Sci. Eng. Ethics* 19, 813–834; 2013). He has also worked on it in a separate project with MSU, Pennsylvania State University and the University of Wisconsin–Madison. A poor workplace climate correlates with many undesirable research behaviours, even extreme forms such as data falsification, he explains (see 'Ethics in the environment'). Still, he thinks that institutions could boost integrity most effectively by focusing on common, less-attention-grabbing behaviours that are tightly tied to workplace climate, such as sloppy record-keeping. "They lower the standards that people are following over the long run," he says.

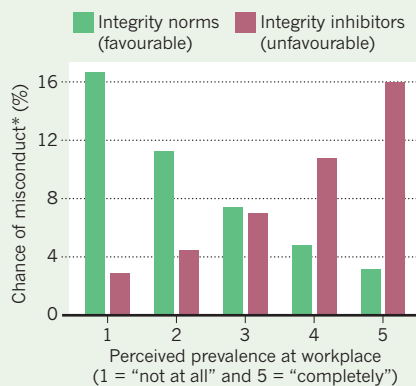
The dearth of robust, real-world research has long hampered efforts to improve integrity, says C. K. Gunsalus, director of the National Center for Professional and Research Ethics in Urbana, Illinois, who is working with Martinson's team to distribute the study online. "The climate survey provides actual empirical data," she says.

Gunsalus and others aim to aggregate results in a central database, so that a physics department at one institution, for instance, will be able to compare its climate scores with those of similar departments elsewhere.

Analysing workplace climate could be a powerful way to promote integrity, says Nicholas Steneck, a consultant for the US Office of Research Integrity in Rockville, Maryland, although he fears that institutions might find it tough to apply SOuRCe results to policy. But Gunsalus thinks that broad, quantitative survey results could make the issue more difficult to neglect. "The best thing that gets traction with scholars and scientists," she says, "is data." ■

ETHICS IN THE ENVIRONMENT

The level of self-reported fraud, fabrication and plagiarism increases as perceptions of 'integrity norms' fall and of 'integrity inhibitors' rise.



*Predicted likelihood that an individual would report engaging in fraud, fabrication or plagiarism, according to regression analysis of a large survey on research behaviour and workplace climate during the past three years.