Biobanks, American style

Genomics leaders in the United States think the benefits of population databases will likely outweigh these risks. But federally funded projects are still in the early planning stages. At the National Institutes of Health, officials are thinking about a project like BioBank UK but even bigger, says Lisa Brooks of the genome institute there: "Something that looks at a lot of people and a lot of diseases. Something that's big and pretty comprehensive."

The obvious way to create a large population database in a country without a national health care system is to work with health care providers, as Marshfield is doing on a small scale, says Stanford geneticist Neil Risch. Indeed, in some ways, the Marshfield Personalized Medicine Research Project is out in front, because Marshfield Clinic—whose research foundation is conducting the study—already has electronic health records on more than 1.2 million patients and began collecting DNA samples this fall. Patients won't learn their results, but they will help advance health care in general, the clinic tells donors. The project has strong support in Wisconsin, where the state has contributed $2 million of $3.8 million in initial funding. Although the nonprofit clinic expects to patent discoveries, it will funnel any profits back into research or donate them. Companies will not be directly involved: "The hope is to keep funding in the public domain and have this become a national resource," Caldwell says.

Some other health care providers are also moving ahead on their own: The Mayo Clinic is building a database of the health records for 4 million of its patients and members; it plans eventually to add genetic data stored in the clinic's many tissue banks. A research database is also "in the early discussion stages" at Kaiser Permanente's division in Northern California, which has 3.1 million members, says Kaiser Permanente epidemiologist Cathy Schaefer.

But U.S. researchers are proceeding cautiously, wary of running into the controversy that Iceland's deCODE and other projects have encountered. Says Risch: "We're not going to have many opportunities. It will be very expensive, and it really needs to be done right."

–JOCELYN KAISER

PROFILE BRIAN TUCKER

Bracing for the Shocks Of the Future

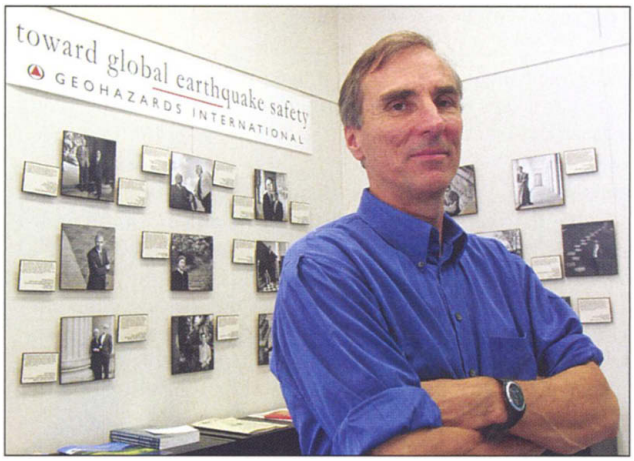
From Ecuador to Nepal, a geoscientist leads a hands-on crusade to help city dwellers survive earthquakes

The news photos from San Giuliano di Puglia were heart-wrenching: a rainbow of backpacks brightening the cold ground; piles of concrete rubble strewn amid unscathed apartment buildings. Until last week the litter was an elementary school. Then an earthquake struck southern Italy, leveling the building and killing dozens of its youngest pupils.

To Brian Tucker, the horror was all too familiar. He spends his days trying to stave off such disaster. Tucker heads GeoHazards International (GHI), a nonprofit group that helps the developing world brace for earthquakes. With a staff of five and a few phones based in spartan offices above a tuxedo rental shop in Palo Alto, California, GHI has taught masons how to strengthen schools in Quito, Ecuador, and in Katmandu, Nepal. The group has counseled community leaders about quake risk across Latin America and Asia. And there is plenty of risk: Over 85% of the world's quake-prone cities are in developing countries, often overlooked by researchers.

At 57, Tucker, a seismologist, looks like a softer version of actor Anthony Perkins. He's tall and lanky, with a sharp nose, brown eyes, and short hair in need of a comb. Tucker chooses his words carefully, although his voice cracks with enthusiasm. Colleagues call him a dreamer with a practical streak. "Brian is completely committed to the safety of people we'll never know," says L. Thomas Tobin, a GHI adviser and earthquake consultant in Mill Valley, California.

That commitment has begun to pay off. In September, Tucker was named a MacArthur Fellow, winning a $500,000 genius award for his work at GHI. Still, Tucker describes his success as "a very slow creep." And there have been surprises along the way. "When I started, I felt I could do this because I knew something about seismology in California," Tucker says. "That took me about a tenth of the way."



Catalyst for change. Seismologist Brian Tucker left research to save lives in developing countries.

CREDIT: GEORGE NIKITIN/AP

A formula for success

Tucker's journey began 27 years ago, with a cup of tea. In 1975, while a postdoctoral associate at the Massachusetts Institute of Technology, he studied quake prediction with Soviet scientists in Tajikistan. One afternoon, he visited a Tajik villager at home. Sitting inside the adobe house, Tucker noticed telephone pole–like posts supporting each corner—a uniquely sturdy design. "My dad was a real kook, and he thought houses should be built this way," his friend shrugged.

In fact, the posted house had withstood a 1949 quake that crushed neighboring homes with snow and rock. Impressed, Tucker quizzed his Tajik friend: How would *he* build a house now? The startled reply: "In the traditional way, of course! I'm not nuts." That exchange, Tucker says, convinced him that earthquake defense is about belief as much as building codes: "The moment was seared into my brain."

Tucker brought that lesson to his next job, a 7-year stint heading the geohazards program for what is now called the California Geological Survey. While he was improving quake readiness at home, however, his thoughts often traveled. "Year after year, conference after conference, my colleagues and I would shake our heads and say, 'Gosh, the real problem is in developing countries,' " Tucker says. "I was almost 45 when I began to think I'd spend the rest of my life saying, 'Somebody should help these people.' "

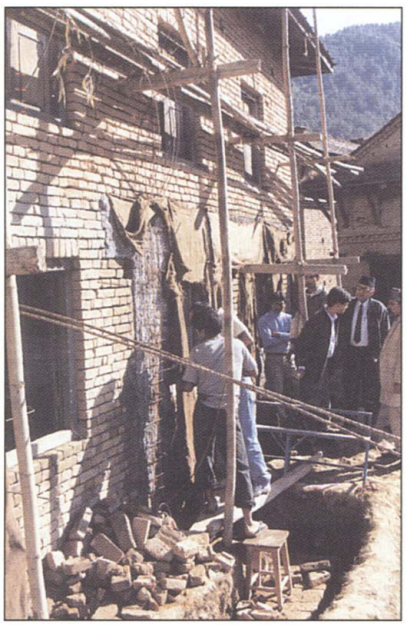
Finally, disaster jolted Tucker into action. In the winter of 1988, an earthquake struck Armenia, killing over 30,000 people. A year later, a comparable temblor—the 1989 Loma Prieta quake—hit the San Francisco Bay area. It killed 66. Haunted by the asymmetry, Tucker left his job, enrolled at Harvard University to learn public policy and business basics, and then leased a San Fran-

cisco loft. "I sat on the floor of this office loft," Tucker recalls, "with no furniture, carpet, or phone, thinking, 'What have I done?' " His wife was expecting their first child.

So Tucker got busy. In 1993, with a staff of two and a promise of $200,000 in annual funding from the OYO Corp., a Japanese technology firm, he launched GHI. Its kickoff project took place in Ecuador's capital, Quito, a city of about 1.5 million. Like Tucker, the city's mayor was a graduate of Harvard's Kennedy School and welcomed an earthquake study.

In Quito, GHI discovered a formula for success. At first, the project made only modest gains. Tucker and his collaborators did some basic seismology and engineering: Evaluating soils, building styles, potential ground shaking, and other factors, they estimated Quito's damage if a quake hit. Before a crowd of cameras, the mayor lauded GHI's results and announced a new quake-response office. And that was it. "We soon realized all we'd done was create another bureaucrat," Tucker says.

They needed a new strategy. "We decided to become like the Godfather, making them an offer they couldn't refuse," Tucker says. In 1995, GHI returned to Quito, publishing a report with the names, addresses, and photos of the city's most vulnerable schools—along with a list of simple repairs needed to shore up the buildings. Happy to become heroes, local politicians jumped at the suggestions. "Before the project was half over," Tucker says, "we had money committed by the city and the World Bank to strengthen several schools." Since then, GHI has brought the "Godfather principle" to every project.



Pitching in. Working with donated labor and supplies, GHI helped a community strengthen this school in Katmandu, Nepal.

By the numbers

There have been other lessons. In Katmandu, GHI learned how to inspire everyday people. Invited to a village by Amod Dixit, head of Nepal's National Society for Earthquake Technology, Tucker's team confronted a poorly built two-story school. The cheapest solution: Bulldoze the building and fly in plywood. But Tucker resisted. "Our job is not just to build safe schools," he notes. "That wouldn't be teaching people how to help themselves in the future."

Instead, GHI offered to pay a third of the cost to strengthen the school, if village masons agreed to work cheaply and local businesses donated materials such as steel and paint. They did. Together, the team retrofitted the school building, tying the walls together, wrapping them in steel mesh, and strengthening the roof. "Earthquake preparedness is so simple that even Nepal, one of the weakest economies of the world, can afford it," says Dixit. "Brian helped us prove it." The former king of Nepal awarded Tucker a medal for his efforts.

A year later, Tucker returned to the village. Visiting with the masons, he learned that homeowners had begun seeking their services, hoping to build or modify houses more safely. That, collaborators say, illustrates GHI's lasting contribution. "Working as a catalyst, Brian and GHI wake the people, giving them the first push, encouraging them, showing the way," says Vitaly Khalturin, a senior research associate at Columbia University's Lamont-Doherty Earth Observatory in Palisades, New York. "He works for the future."

No matter what the location, GHI brings the same basic technology. To explore a city's quake risk, GHI calculates its "earthquake lethality potential," or the probable number of lives that would be lost to a temblor, and then finds ways to reduce it. Better buildings and emergency plans are key. "Our end product is not a published report or a meeting," Tucker explains. "It's a higher number of kids studying in safe schools in our target city."

To test its method on a broader landscape, GHI recently spearheaded an 18-month pilot project—the Global Earthquake Safety Initiative—comparing quake risks and solutions in 21 vulnerable cities, from Tokyo to Santiago, Chile. The international effort, involving a dozen earthquake scientists, city teams, and the United Nations Centre for Regional Development, painted starkly realistic scenarios. According to the analysis, for instance, collapsing buildings would cause most of the deaths in a Delhi, India, earthquake; however, in San Salvador, landslides would cause far more casualties.

Tucker wishes others could see the logic of quake safety. "When I was a kid, nobody wore a seat belt," he says. "People wouldn't stand for that today. Well, I look forward to the day when people won't stand for the buildings we see in Katmandu." According to GHI's pilot project, a schoolchild in Katmandu is 400 times more likely to die during an earthquake than a child in Kobe, Japan.

And the stakes grow ever higher, as cities swell. GHI estimates that 60 cities in highly seismic zones now house at least 2 million people. Most are in developing countries. There, developers hastily build housing for booming populations, often neglecting safety codes. And there are more pressing concerns, including widespread hunger and poor health. "All this technical work we've studied in California doesn't touch the real problems overseas," says Laura Dwelley-Samant, a GHI project director. "How does earthquake preparation compare, say, to life-threatening diarrhea?"

Even after a disaster, improvements come slowly. Last year, a magnitude 7.7 quake ripped through western India, claiming over 20,000 lives and destroying or damaging 1 million homes, mainly in cities. "Much has been [said] about urban vulnerability since then," says Manu Gupta, co-director of New Delhi's Sustainable Environment and Ecological Development Society. "There is very little that has actually been done."

But that could change. In September, the U.S. Agency for International Development (USAID) awarded GHI a 3-year, $15 million grant to assess quake risks and solutions in 20 major Indian cities. The USAID budget, Tucker says, includes money for safety measures—a key component to the project's success. Similarly, GHI has won a USAID grant to improve quake safety in three Central Asian republics.

These grants—and the recent $500,000 MacArthur prize—are also key to GHI's shoestring budget, points out seismologist James Brune of the University of Nevada, Reno, a GHI adviser. "Brian wouldn't have much hope of going to [the National Science Foundation] or [the U.S. Geological Survey] to get funding for these projects," Brune says. "He's saving anonymous lives."

But Tucker says the MacArthur prize's prestigious reputation is the real reward. "The people who get the most visibility for working on earthquakes in the U.S. don't get tenure or bonuses doing what we do," he says. "So we've been viewed as this eccentric, hippie bunch of do-gooders. That the MacArthur people value what we're doing is exhilarating." And as GHI presses ahead, its value is sure to grow.

–KATHRYN BROWN

CREDIT: GEOHAZARDS INTERNATIONAL