

UMaine environmental health economist studies the costs of being on the road and the seas

# Safety in numbers

By Tom Weber

**DRAPED OVER A CHAIR** in Mary Davis's office at the University of Maine is a pair of bright orange nylon coveralls that bears the insignia of the Maine Marine Patrol.

A nearby duffel bag holds an orange neoprene coldwater survival suit, also the property of the water-based law enforcement wing. Both are standard-issue equipment in Davis's most recent line of work, which involves gathering safety-compliance data aboard Maine commercial fishing boats.

On a bookshelf sits a well-used air monitor that allowed her not long ago to measure the particle pollution drifting from the cigarettes she reluctantly puffed on a car trip from Bangor to Bar Harbor while researching the costly effects of secondhand smoke on children.

Not exactly the tools of the typical economists' trade, perhaps, but Davis doesn't think of herself as a typical economist.

"I would say it's rare to do this type of active sampling in economics," says Davis, an assistant professor in the School of Economics. "Most economists would rely on data that already exists."

As an environmental health economist, drawing on the natural and the social sciences, Davis looks at the impact of the environment on the development of human diseases. She believes that in order to understand the economic cost of exposure to airborne pollutants or the policies that address such public health concerns, she has to learn firsthand the nature of that exposure and whether it causes illness.

"I start with improving the underlying scientific knowledge regarding the health effects of disease," she says, "before I try to make policy recommendations or cost assessments from an economic perspective."

Being able to access large collections of data can be a valuable tool in economic research. But the issues Davis tackles in Maine don't necessarily offer an abundance of preexisting data. Sometimes, as in the case of her ongoing study of safety practices among Maine's dangerous commercial fishing industry, there are no statewide data sets available. The only way to get the data she needs is to go out and collect it herself.

"My work is looking at what's actually being done by fishermen to mitigate risks on an individual level," she says, "so that we can more efficiently determine the best course of action to prevent accidents and deaths among commercial fishermen in the state."

By analyzing numerous national and state studies on a variety of respiratory conditions in young people, Davis was able to create a relative risk estimate for childhood illnesses linked to secondhand smoke in cars, homes and other environments.

**AFTER GETTING A** bachelor's degree in economics and international studies in 1998 at the University of Miami, Davis wound up working as a U.S. Customs inspector at the city's busy airport.

"I was a drug interdiction officer, which meant I was constantly arresting people and putting my life in danger over drugs," she recalls. "I was also their data person, collecting and cataloging information. It was a life-altering experience, I'd have to say, but it wasn't for me."

Davis eventually shifted her economics focus from international to environmental, and got her doctorate in economics in 2003 from the University of Florida. For her dissertation, she examined the economic factors that influence state environmental policymaking, and developed a model to predict those decisions. She determined, among other things, that a state is more likely to adopt stricter environmental standards when compliance does not come at great economic expense.

In 2003, Davis began studying at Harvard for a second master's degree, this one in biostatistics, but changed her plans when she got a chance to do postdoctoral research for a project in environmental health at the university's School of Public Health. The project, which she is involved with still, is a comprehensive examination of the connection between elevated lung cancer rates and exposure to diesel exhaust fumes among some 55,000 unionized truck drivers.

With an epidemiologist, a physician and an occupational hygienist, Davis helped collect and analyze 5,000 air samples from 36 different trucking terminals nationwide. She is now working to create an exposure model to predict the risk of lung cancer for employees in various aspects of the trucking industry, including drivers, diesel forklift operators and loading dock workers.

Davis says the information is relevant

not only to truckers, but to the public that lives, commutes or works near diesel-fueled traffic or trucking terminals.

"It's definitely an ongoing project," says Davis, who came to UMaine in 2006 and maintains a visiting scientist appointment with Harvard. "Diesel exhaust is now considered to be a probable carcinogen. But no one has ever done so large and comprehensive a study as this. Our hope is that we can refine the risk estimates and move diesel from a probable to a known carcinogen. Increasing the level of certainty allows people who make policy to be better informed in their decisions."

**LAST SUMMER** and fall, Davis did a study that put an eye-opening number on the economic impact of secondhand smoke on children in Maine. The idea for the research came from a Bangor pediatric dentist Jonathan Shenkin, who led a successful effort to get the Bangor City Council to prohibit smoking in vehicles carrying passengers 18 and younger, and then pushed to have a similar ban enacted statewide.

By analyzing numerous national and state studies on a variety of respiratory conditions in young people, Davis created a relative risk estimate for childhood illnesses linked to secondhand smoke in cars, homes and other environments. The annual price tag for the increased doctor visits, hospitalization, medication, and work time lost to parents who care for sick children, Davis calculated, is more than \$8 million.

Davis says she prefers not to legislate personal responsibility, and doesn't usually feel comfortable in an advocate role. But she is willing to make an exception when it comes to a statewide ban on smoking in cars with children present. For Davis, the numbers simply do not lie.

"I was able to identify a clear risk regard-

ing secondhand smoke and children," she says. "Non-smoking adults have a choice to not be around secondhand smoke. Children don't have that choice, not if their parents smoke at home or in the car, and the car is certainly a peak setting for exposure."

To further drive home that point, Davis strapped the real-time air particle pollution monitor to the back seat of her car, roughly where a child's head would be, and took a ride from Bangor to Bar Harbor. Davis rolled down the window a bit and lit up in the name of science. As she smoked, the monitor registered 10 times the allowable level of particle pollution. When the cigarette was out, the particles from the smoke dropped to negligible levels after a few minutes.

Although her work examined the effects of secondhand smoke on children in general, and was not specific to cars, Davis says she did the driving experiment to emphasize the dangerously high particle levels that can build up in small spaces where children are so often confined.

**HER HARVARD** connection also led Davis to her most recent field study, and the reason for all that bright orange seagoing gear at her office. Funded by a \$200,000, two-year Maine Sea Grant, Davis has teamed up with Ann Backus, director of outreach for the Harvard School of Public Health, and the Maine Marine Patrol on a first-ever assessment of the rate of safety compliance among Maine commercial fishermen.

Although fishing is one of the most dangerous of all occupations, Davis says there is currently no way of knowing how many Maine fishermen are actually complying — and to what degree — with the regulations intended to keep them safe. Her research will be used to create an economic model of the cost of compliance, which can then help industry regulators better understand the impact of imposing new federal safety laws in the future.



**With an epidemiologist, a medical doctor and an occupational hygienist, Davis helped to collect and analyze 5,000 air samples from 36 different trucking terminals across the country. She is now working to create an exposure model that can predict the risk of lung cancer for employees in various aspects of the trucking industry.**

Davis, the project's lead investigator, and Greg Blackler, a Damariscotta lobsterman who is studying for his master's degree in economics at UMaine, began boarding vessels last November to gather data from the fishermen themselves. Their goal for 2008 is to board 300 vessels working in a variety of fisheries along the Maine coast. The initial response from fishermen was encouraging; the researchers were welcomed aboard each of the first 30 lobster boats they encountered about 10 miles off Rockland.

Davis, Blackler and Backus, who is a member of the Maine Commercial Fishing Safety Council, always begin by assuring fishermen that the survey will not lead to citations, even if safety violations are found. All information is anonymous, Davis says, and neither the fisherman's name nor the identity of the boat are ever recorded.

The survey is brief — less than 10

minutes — but thorough. There are general questions concerning the fishermen's lives and work history, as well as the lengthy list of safety equipment they're required to carry, at their own expense, by the Commercial Fishing Industry Vessel Safety Act of 1988. To avoid a fraudulent and thereby worthless collection of data, the fishermen are asked not only if they have, say, the correct number of life preservers or fire extinguishers aboard, but if they might be kind enough to show them to the researchers.

"Truckers and lobstermen are similar in some ways," says Davis. "They both tend to be rough-and-ready, independent people. There's a wide variety of types among fishermen. Some of them are all about getting help regarding safety issues, and there are those out there by themselves on rickety boats who worry that we're going to catch them doing something wrong. But we assure them that we're not out there to mess with them."

The Maine Marine Patrol, which transports the researchers to the sampling sites, are grateful for the data, Davis says.

"They're sincerely interested in safety, and would like to know what things are really like on the water," she says. "This has never been done before, in any state, and by the end we'll have a broad, one-of-a-kind understanding of safety compliance. Maybe we could use this information to develop safety-education programs. And finding out which fishery or area of the coast is least compliant can help the Marine Patrol to best use their resources."

Davis, a member of a National Academy of Sciences panel studying air pollution issues, plans to focus her considerable number-crunching skills — and that handy air particle monitor — on wood smoke in Maine at some point.

"I really like getting out there and collecting my own data whenever possible," she says. "It's exciting for me, and more the kind of thing you'd see in the natural sciences." ■

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