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Arsenic-Polluted Water Toxic to Bangladesh Economy

The well-reported arsenic contamination of drinking water in Bangladesh -- called the "largest mass poisoning of a population in history" by the World Health Organization and known to be responsible for a host of slow-developing diseases -- has now been shown to have an immediate and toxic effect on the struggling nation's economy.

An international team of economists is the first to identify a dramatic present-day consequence of the contaminated groundwater wells, in addition to the longer-term damages expected to occur in coming years.

According to research published online in the American Journal of Agricultural Economics, exposure to arsenic in rural Bangladesh is poisonous to the nation's economy, reducing the labor supply by 8 percent.

"This is a very large effect," says lead author Richard Carson, professor of economics at the University of California, San Diego, "larger than the increase in unemployment in the United States from the 'Great Recession.'"

The exposure has also altered work arrangements, changing how labor is allocated within a household? Bangladesh is a poor country and many of its citizens have limited access to healthcare and health insurance. Most families have to fend for themselves. As a result, the researchers say, women older than 45 are working fewer hours outside the home while men aged 25 to 65 are working more. "Essentially, what we think is happening," Carson said, "is that grandma stays home to take care of the sick people while all the able-bodied men are working longer hours to compensate?"

The arsenic problem in Bangladesh dates to the 1970s, when shallow groundwater wells were installed throughout the country, unwittingly tapping into naturally occurring arsenic in the ground. The present study uses a novel method that, according to Carson and his co-authors, could be applied to discovering the effects of other environmental pollutants in developing nations, sooner.

Previous studies, on what some say is the largest manmade environmental health disaster in the world, worse than Chernobyl, focused on the long-term health consequences of arsenic poisoning: cancers, for example, and heart problems,

diabetes and a range of skin conditions, including the growth of painful nodules on the palms of hands and soles of feet.

But, these deadly and debilitating effects all take a long time to manifest. The latency period for cancers linked to arsenic is estimated to be about 20 or more years, and of the 57 million rural Bangladeshis who have been exposed to unsafe levels of arsenic, said Carson, only a small fraction will ever get that sick. The initial (and presumably more common) effects, on the other hand, are feelings of general lethargy and sores on hands and feet, along with headaches and confusion -- effects, in other words, that are not necessarily going to show up as reported health conditions but that will, the research team hypothesized, affect the labor supply.

The deleterious and quantifiable impact on labor, Carson believes, can be immediately understood by government officials who are sometimes tempted, especially in the case of impoverished countries, to put economic development ahead of health, to think "let's get income up first, then we can clean up."

"Environment is not a luxury," Carson said. "Our paper shows that the environmentally related health problems are sufficiently large that they're holding back development."

For their study, Carson and colleagues looked at the relationship between arsenic exposure and hours worked by households as reported in the Bangladesh government's standard survey used for this purpose. Their sample included 4,259 rural households from the Household Income and Expenditure Survey carried out by the Bangladesh Bureau of Statistics in 2000 and was matched with data on arsenic contamination from a large-scale study done by the British Geological Survey.

The data, Carson said, dates to before there was any widespread intervention to mitigate the problem -- such as

painting the most unsafe well taps red. On the other hand, since the data dates back to 2000, Bangladeshis have had another decade in which to get sick. Carson is currently working on estimating the magnitude of the most recent effects.

The study's approach, Carson said, is a methodological advance that could potentially help many other public health efforts.

"We show that in some cases it is possible to use a simple labor survey to pick up widespread health problems, if you have a good way to estimate exposure," he said. "To do this in the standard public-health ways is time-consuming and expensive."

The novel method would not be a substitute for gathering blood, urine or hair samples, of course, he cautioned, but it could be a complement. It might be applied to a slew of low-level airborne and waterborne diseases in developing countries, helping epidemiologists get a big-picture view of the magnitude of a problem as well as its geographic scope. Carson notes that this method could be applied to air pollution in developing countries, for example, using simple pollution monitoring measures from which you can infer what people are exposed to.

Bangladesh is most severely affected by arsenic pollution of its groundwater. But, it is a worldwide problem, with impacts in the West Bengal part of India and parts of Taiwan, Thailand, Vietnam, Myanmar, Cambodia, China, Argentina and Chile. There are problems in some areas of the United States, too.

In Bangladesh, ironically, the problem was created by a well-meaning attempt to alleviate diseases, those caused by waterborne pathogens in surface water. Encouraged by international aid agencies, Bangladesh installed millions of tube wells throughout the country about 30 years ago to replace surface water as the primary source of drink. At first, Carson said, as diarrhea and other gastrointestinal diseases from contaminated surface water cleared up quickly, it seemed that the well-water solution had been successful. It was not until 1993 that the country's chronic arsenic poisoning was diagnosed. The massive scale of the problem was not fully known until around 2000.

Carson's coauthors on the paper are Phoebe Koundouri, of Athens University of Economics and Business, and Céline Nauges, of INRA, the French Institute for Research in Agriculture, and the Toulouse School of Economics.