

THIS WEEK

EDITORIALS

DATA US public health-care project needs to learn from UK mistakes **p.432**

WORLD VIEW Scientific diplomacy with Iran must respect human rights **p.433**

MIXED UP Brazilian bug is first female insect found with a penis **p.435**



A toxic legacy

Illegal dumping of toxic waste in the Italian Campania has been blamed for high rates of ill health in the region. The suspected link needs to be investigated using the most modern methods.

It is tempting to see health hazards everywhere, especially if one believes the tabloid press. From the air we breathe to the food we eat and the fun we have, the risks of normal, everyday life have never received more attention.

But the people who live in the fertile agricultural landscape of Italy's Campania region, around the historic city of Naples, have genuine reason to be anxious about their health. For decades they have lived on top of potentially lethal toxic waste, illegally and secretly dumped there by the mafia. Rates of some cancers are higher, and lifespans shorter, than elsewhere in Italy. Complaints, though, have been continually silenced.

But Italian environmental police, working closely with anti-mafia forces, have used smart technologies to discover the subterranean dumps and are now systematically excavating them. Environmental officials are analysing soil and water. The crater walls look like geological strata, each layer formed by different types of waste: asbestos from demolished buildings, dioxin-rich chemical sludge, drums of solvent, the odd motor vehicle. Black water forms pools at the bottom. No one is allowed to even look into the stinking, steaming pits without a respirator mask.

Massive street demonstrations in Naples last autumn prompted officials to take action. The national government approved funding earlier this year for a two-year programme in which the several hundred thousand people who live close to the dumps will be screened for cancers that have been linked to environmental exposure. The health ministry has analysed all the health and environment studies carried out so far and concluded that there is no evidence yet to link the dumps to cancer. Yet local people are convinced that noxious run-off from the dumps is gradually killing them and their families, loading their bodies with toxic chemicals and twisting their cells into tumours. They want answers, and they want the scientists to supply them.

TOXIC BLACK BOX

Environmental police have so far identified 32 sites containing an estimated minimum of 3.5 million cubic metres of toxic waste. But without crucial information about actual exposure, including dose levels, it is impossible to determine whether the dumped chemicals have raised cancer risk in what is a poor region, where people smoke more and have unhealthier lifestyles than in other parts of the country.

Similar issues arise whenever cancer clusters emerge around nuclear power plants or industrial sites. Attempts to prove a causal link face several dilemmas. One is that the number of cancer cases is usually too small for conclusive statistics. Another is that the cancers usually become apparent years after the hypothetical exposure to carcinogen, and such historical exposures are almost impossible to prove scientifically. But usually, the identity of the feared chemicals is known.

In Campania, the challenge is greater because the very fundamentals are unknown — not only the location and chemical content of the

dumps, but also the true local incidence of cancer. Over the past year or so, that information has started to emerge. And biologists there are wondering if they might be able to tie their whole noxious experience into the global research effort to develop methods to prove chemical exposure scientifically. Could their poisoned fields serve as a giant experiment in the new science of 'exposomics', which aims to identify biomarkers of past and present exposure to toxic environmental chemicals?

"Campania could be a perfect field study for a biomonitoring research programme," says Gennaro Ciliberto, scientific director of the National Tumour Institute Pascale in Naples.

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Precedents do exist. One is in the city of Thessaloniki in northern Greece, where newly impoverished people have started to burn more biomass for home heating, contributing to smog. A research project funded by the European Union combines regular analyses of atmospheric pollutants with analyses of urine and blood of a cohort of

people to quantitatively determine how their gene-expression, protein and metabolite profiles change as a result of pollutants entering their bodies.

Italy, in austerity mode, has little money to spare for research. So Ciliberto has a suggestion. "This is the sort of programme that should be funded from the structural funds that the European Commission has awarded the region."

He could be right. These subsidies came to a total of €6.9 billion (US\$9.6 billion) for Campania alone in 2007–13, and the commission explicitly encourages use of the funds to boost local research and development capacity. Allocations of the next tranche of structural funds within Italy (2014–20) are currently under discussion. Ciliberto's idea deserves serious consideration.

The ancient Romans called the area *Campania felix*, or fortunate countryside, because of the soil's fertility (conferred by its frequent coating with volcanic ash from Mount Vesuvius's deadly eruptions). But modern Italians call it *Campania infelix*, and its agriculture-based economy is suffering from public perception that its products could be contaminated.

Anti-mafia action made the waste-disposal racket too public to continue after 2003. But mafia domination continued to stifle public discussion about the environmental poisoning. Locals, government officials and even many academics have been reluctant to talk. Some feared retribution, but more feared that they or their friends would be exposed as having helped in the logistics of the operations, or as having accepted mafia bribes for turning a blind eye. People began setting fire to the dumps, making matters worse.

The fires are out now, but the questions of ill health remain. They should be properly investigated. Even if the results prove inconclusive, the information gained would be worth it. ■