The cane toad, whose skin is toxic, is an invasive species in Australia.

IAN WALDIE/GETTY

Farmers first introduced about 100 cane toads (*Rhinella marina*) to Australia from their native range in South America in 1935 to control cane beetles (*Dermolepida albohirtum*), which were wreaking havoc on sugar-cane plantations. The giant toads failed to knock down the beetle populations, but they succeeded in multiplying astronomically. Because of their poisonous skin, which is coated in bufotoxins, they had no natural predators and went on to invade large swathes of the northern and eastern parts of the country.

Tadpole terror

Although adult cane toads are fearsome — they grow to up to 25 centimetres long — it's their tadpoles that are usually the cannibals. A group of tadpoles can gobble up more than 99% of the hatchlings that emerge from the tens of thousands of eggs in a single clutch (J. L. DeVore *et al. Ecol. Monogr.* **91**, e01426; 2020).

DeVore and colleagues were curious to see whether the cannibalistic behaviour was common across all cane toads, or if it was due to how invasive the Australian ones are. So they collected cane toads from Australia and from French Guiana, and bred them, producing hatchlings and older tadpoles. The team then exposed a single tadpole to 10 hatchlings from its group — either from Australia or South America — hundreds of times and found that invasive Australian tadpoles were 2.6 times as likely to cannibalize hatchlings as were native South American ones.

Researchers have long known that the Australian tadpoles are attracted to the hatchlings because of the scent of the younger animals' toxic skin. "You'll get this huge avalanche of thousands and thousands of tiny cane-toad tadpoles coming toward this chemical," says Rick Shine, an evolutionary biologist at the University of Sydney in Australia, and a co-author of the study. DeVore, Shine and their co-workers saw this play out in their experiments: the Australian tadpoles were nearly 30 times as likely to swim towards a trap containing hatchlings as towards an empty trap, whereas the South American tadpoles showed no preference for either.

Although the speed with which the toads evolved this behaviour is impressive, the team was even more surprised by how fast the animals had evolved a defence to protect against it. The researchers found that when invasive Australian hatchlings shared a tank with caged, older tadpoles from the same group, the hatchlings were more likely to have a shorter developmental period than that of the South American hatchlings.

Older tadpoles don't tend to eat older tadpoles — so the toads might have evolved to speed up their hatchling phase, the researchers found. This would limit the amount of time they spend vulnerable to cannibalism, even if the adaptation eventually stunts their growth, says DeVore.

Roshan Vijendravarma, an evolutionary biologist at the Curie Institute in Paris, who has studied cannibalism in fruit flies, says the differences between the invasive and native toads' behaviour probably have a genetic basis, given how extreme they are and how quickly they evolved over relatively few generations of toads. Shine and his colleagues think this idea is worth exploring and are studying it now.

THE VENEZUELAN HEALTH-CARE WORKERS SECRETLY COLLECTING COVID STATS

Fearing detainment, doctors and nurses are quietly working to report reliable data.

By Luke Taylor

"The hardest part of watching my colleagues and patients suffer is not being able to say anything about it," says Gabriel Romero, an attending physician at one of Venezuela's largest public clinics.

Romero, who asked that *Nature* not use his real name for fear of punishment by the Venezuelan government, is one of the many healthcare workers in the country fighting COVID-19 despite a lack of basic medical equipment, a steady power and water supply, and adequate pay. When they have spoken out about what they say are unacceptable conditions, some have been detained by government forces.

Included in their list of complaints is a lack of reliable COVID-19 data.

Officially, Venezuela reports that it has had about 135 COVID-19 fatalities per million people. By contrast, its next-door neighbours Colombia and Brazil report about 2,440 and 2,700 fatalities per million people, respectively (see 'Questionable COVID data').

In looking at the data for South America, Romero and others say it's obvious that Venezuela's numbers do not reflect reality, and that the drastic undercount is driven by a lack of testing and infrastructure — but also by a deliberate effort by the government to downplay the pandemic. Because accurate statistics are crucial for aid organizations deciding where to send resources, and for local officials mulling whether to open schools and businesses, many doctors and nurses have taken matters into their own hands, collecting data from hospitals and reporting the numbers secretly to various research networks and non-governmental organizations (NGOs). These numbers are

much higher than those appearing in official government reports.

"It's a lot of pressure," says Romero, who coordinates a clandestine network that collects these data. "I always worry that we could get detained. But I cannot live in a country where the official narrative is that everything is fine when we are living a totally different reality."

Venezuela's economy has collapsed in the past decade because of corruption, financial mismanagement and the price of oil — its key export — plummeting. At least 5.4 million people have fled the country as a result, according to the United Nations.

It's possible that this economic collapse has slowed the spread of the coronavirus SARS-CoV-2, say epidemiologists interviewed by *Nature*. It has made travel across the country difficult, and few Venezuelans have the means to go out to restaurants or bars, where superspreader events might occur.

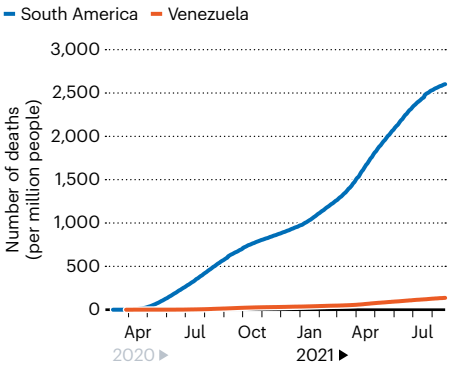
But the government data still do not line up with reports collected at hospitals, they point out. According to Médicos Unidos Venezuela, a collective of Venezuelan doctors monitoring the situation, more than 736 Venezuelan health-care workers have died from COVID-19 since last year. The collective sometimes reports higher weekly death rates for Venezuela's health-care workers than the government reports for the entire country.

"Looking at all these indicators, the government figures are impossible," says Maria Eugenia Grillet, an epidemiologist at the Central University of Venezuela in Caracas.

Venezuela's Ministry of Health declined to comment when asked by *Nature* about discrepancies in its data compared with those reported by groups such as Médicos Unidos Venezuela and NGOs.

QUESTIONABLE COVID DATA

Venezuela's government has reported many fewer cumulative deaths due to COVID-19 than the three nations that border it, adjusted for population — it is an outlier in South America. Epidemiologists say the drastically lower number signals inaccurate counting.



SOURCE: OUR WORLD IN DATA

Venezuela's true COVID-19 infection and death statistics are at least five to seven times as high as those the government is reporting, says Julio Castro, an infectious-diseases researcher at the Central University of Venezuela. He makes this estimate on the basis of data submitted to the National Hospital Survey in Venezuela, which he coordinates.

In their spare time and in secret, nurses and doctors such as Romero collect data about patient admissions and deaths at Venezuela's 40 major hospitals to provide to the survey.

Castro says one of the reasons the government's official statistics are low is a lack of COVID-19 diagnostic tests in the country. Gold-standard tests for determining whether a person is infected — polymerase-chain reaction (PCR) tests — can be processed only at two approved laboratories in Caracas, he says. The labs are working at capacity, causing delays for weeks. And what's more, for people outside Caracas, testing centres are unreachable because of fuel shortages, he adds.

Because of the lack of diagnostic tests, doctors and nurses submitting data to the National Hospital Survey instead evaluate whether a person has COVID-19 by assessing whether they have an acute respiratory infection — the main symptom of COVID-19. Health-care workers agree that although it isn't a perfect indicator of the disease, it provides a more-trusted picture of reality than the government's statistics, which are based on PCR tests.

Beyond borders

Venezuela isn't the only country to struggle with its COVID-19 statistics. In May, Peru updated its official death statistics after researchers warned they were not representative of the true situation in the country. After taking into consideration excess deaths — the number of people who died over a certain period, compared with the number of deaths researchers would expect based on a pre-pandemic baseline — the Peruvian government nearly tripled its official death tally.

Even wealthy nations such as the United States have an excess death count that is 20% higher than the government is reporting, probably owing to a variety of factors, such as misdiagnosis. But researchers especially use this method to get a more accurate view of COVID-19 statistics in places such as Venezuela, where tests are sparse or where government data are deemed untrustworthy.

But in Venezuela, the method can't be used because the Ministry of Health hasn't published mortality statistics since its last national epidemiology report in 2016.

"It's not just epidemiological data, we don't have data for any indicator", says Grillet, whether it's the economy or public health.

At least 12 health-care professionals have been detained for speaking out about the situation in Venezuela during the pandemic, according to the human-rights-focused NGO Amnesty International. And last year, Diosdado Cabello, a senior government official in President Nicolás Maduro's administration, suggested on national television that the Venezuelan Academy of Physical, Mathematical and Natural Sciences (ACFIMAN) — to which Grillet belongs — should be raided for releasing models that predicted an increase in coronavirus infections and deaths.

Health-care workers in particular are under a lot of pressure just from doing their jobs, says Margarita Lampo, an ecologist who studies infectious diseases at ACFIMAN. Add that stress to the fear of getting fired, or worse, for sharing their data, she adds, and it's much more difficult. "We are very thankful for what they do. They should know that their work has been so important for our country."

YURI CORTEZ/AFP VIA GETTY

Health-care workers in Venezuela protest for better salaries and supplies amid the pandemic.