

In Peru, a race to vaccinate dogs as two epidemics collide

April 9 2021, by Lauren Ingeno



Vaccination in peri-urban communities (regions in the process of urban growth) is very important, according to Castillo-Neyra. In these areas, people tend to have more dogs, usually that roam free during the day, to protect their

households — putting them at high risk for rabies infection. Credit: University of Pennsylvania

Reggaeton music, mobile clinics, and mathematical algorithms have all played a role in the implementation of a unique vaccination campaign in Peru's second-largest city.

Last July, [public health experts](#) in Philadelphia debated with Peruvian government officials about how to address a growing epidemic in Arequipa. The scientists warned that without a vaccination campaign, disease would spread throughout the city of 1 million. But the country's Ministry of Health officials worried that outdoor clinics could put [health workers](#) in danger and lead to mayhem in the streets—fights would break out as the aggressive patients waited to receive their shots, they said.

The epidemic? Rabies. The patients? Canines.

Until last spring, there had been major progress toward eliminating rabies in Latin America, thanks to rabid dog surveillance and removal, along with annual mass vaccination campaigns. In Arequipa, Ricardo Castillo-Neyra, Ph.D., DVM, MPSH, an assistant professor of Epidemiology in the Perelman School of Medicine at the University of Pennsylvania, has collaborated with local public health authorities to lead such efforts for the past six years.

But the introduction of a different infectious disease—COVID-19—threatened to reverse that progress.

Lessons learned during the convergence of the two epidemics have implications, not only for other Latin American countries addressing

rabies during a pandemic, but also for U.S. officials mapping out their own COVID vaccine distribution plans.

As a New Virus Emerges, a Familiar Threat Reappears

Despite lockdown ordinances, a weak health system coupled with deep poverty led Peru to suffer from one of the highest COVID-19-related death rates in the world.

"More than 60 percent of the working population in Peru have informal jobs, meaning they're not salaried. If they don't go to work, then they don't get a paycheck," Castillo-Neyra said. "Telling those people to stay home is telling them to starve."

Popular street markets with hundreds of sellers and buyers in close proximity also contributed to COVID spread, Castillo-Neyra said.

As COVID began to take a devastating toll on Peru, the country's Ministry of Health shifted its focus from rabies prevention to the more immediate threat. Arequipa's public [health officials](#) told Castillo-Neyra that they planned to halt its annual rabies vaccination campaign.

"The vaccine is only effective for one year. After that, antibodies decline quickly. So if you skip an annual campaign, most of the dog population becomes susceptible," Castillo-Neyra said.

To measure the impact of COVID-19 on rabies reemergence in Arequipa, Castillo-Neyra and Brinkley Raynor—a dual VMD/Ph.D. candidate in the Perelman School of Medicine and School of Veterinary Medicine—created an epidemiological model to predict the "long-term effects of short-term changes" to the rabies prevention protocols that had

been maintained over the past three decades.

The researchers' preliminary findings showed that a cancelation of rabies vaccine distribution, control, and surveillance for one year would lead rabies cases to grow exponentially. Conversely, the modeling found that even a 60 percent vaccination rate—well below the 80 percent recommended by the Pan American Health Organization—could have a significant impact on suppressing the rise in infected dogs, compared to no vaccination coverage at all.

Castillo-Neyra presented the models to the Ministry of Health in the spring of 2020. Government officials agreed to donate 20,000 vaccines to Castillo-Neyra's research group. But who would run the campaign? "You're on your own," they told him.

Local Health Workers Get Creative to Vaccinate the Masses



In past years, dog fights commonly broke out at mass vaccination clinics in Peru. Social-distancing largely prevented that problem in 2020. Credit: University of Pennsylvania

Under the direction of Castillo-Neyra in Philadelphia, his [team members](#) in Arequipa got to work.

Their first goal was to design an inexpensive, portable, and protective barrier between vaccinators and dog owners. Within an hour, the team had an idea: booths—or so-called "cabi-cans" (a fusion of the Spanish word for "cabin" and "canine")—made of plastic with a window cut-out. These would allow a health worker to reach through the hole and give a shot to the dogs without any face-to-face interaction.

In lieu of paper vaccination certificates, the research team created a [Cabi-can website and mobile app](#), which dog owners could use to receive a digital certificate and to upload demographic information about their pets.

Second, the team needed to decide where to set up their clinics. They wanted to target parks and soccer fields, but with limited vaccine doses and staff, they needed to be strategic about location.

Castillo-Neyra turned to Bhaswar Bhattacharya, Ph.D., an assistant professor of Statistics at the Wharton School of the University of Pennsylvania, who he has been collaborating with for two years to develop algorithms that would optimize locations for the vaccination sites

"We would tell the computer, "We have staff for 10 vaccination sites, and we have these 20 potential locations." Then, we would plug in different functions, like asking to minimize distance that people would have to walk, while maximizing coverage," Castillo-Neyra said. "The computer would choose 10 sites based on that algorithm."

However advanced, computers are still two-dimensional, meaning Castillo-Neyra needed to cross-reference the computer's "optimized locations" with what his field workers in Arequipa were seeing on the ground.

Once the team had chosen their sites and hired staff, they needed to reach their patients. While the Ministry of Health typically relies upon community health workers (Arequipa has more than 1,000 of these volunteers) to spread the word about vaccination locations, the COVID-19 pandemic made it difficult for these workers to reach people in their communities.

To fill the gap, Castillo-Neyra's team created radio advertisements and fliers. But the single biggest driver to the vaccination sites turned out to be as grassroots as it gets: The day before a vaccine site would launch in any given district—there are 29 in Arequipa—team members would spend two hours driving through the district's neighborhoods, while announcing the vaccine clinic location and times from a megaphone through the car window. One team member even wrote customized songs, set in the style of reggaeton, to make the announcements.

On the day of a vaccination event, staff members arrived at a central meeting spot around 7 a.m., where a bus picked them up and drove to the park or sports field where they were setting up the clinic for the day. The team set up their booths around the site, along with cones to enforce social-distancing. As owners arrived with their dogs, they were guided through the line to a booth, where a health worker met the dog to administer a quick shot between its shoulder blades.

Lessons Learned for Latin America—and the United States

In total, Castillo-Neyra's team set up 251 vaccination sites between August and October, vaccinating 16,000 dogs in Arequipa during a global pandemic.

That number amounts to about 10 percent of the estimated population of 150,000 canines. But the veterinarian-turned-epidemiologist knows that 10 percent is better than zero when it comes to preventing zoonotic disease spread.

"It was huge for us," he said.

Moreover, the success of the campaign proves what can be achieved

with a bit of creativity, community input, and meeting people where they are at.

And when it comes to distributing COVID-19 vaccines in the United States, Castillo-Neyra said American public health officials and policymakers might have a lot to learn from a developing country like Peru.

"Planning and implementing any public [health](#) campaign without input from the community, or without involving people who are on the ground, is a mistake," Castillo-Neyra said. "There are many neglected populations who would be left behind. I think that's what's happening right now in many cities in the U.S."

More information: Brinkley Raynor et al. The Impact of the COVID-19 Pandemic on Rabies Reemergence in Latin America: the case of Arequipa, Peru, *medrxiv* (2020). [DOI: 10.1101/2020.08.06.20169581](#)

Provided by University of Pennsylvania

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