Residents of the Brazilian city of Serrana line up for their COVID-19 vaccine doses. DIVULGAÇÃO/BUTANTAN INSTITUTE

Brazilian town experiment shows mass vaccination can wipe out COVID-19

By **Sofia Moutinho** | Jun. 1, 2021 , 4:50 PM

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A small commuter town surrounded by sugarcane fields in southeastern Brazil, one of the countries hardest hit by COVID-19, has shown that even a vaccine that had low efficacy in some clinical trials can dramatically control the pandemic virus.

As part of an unusual experiment to track the real-world effectiveness of CoronaVac, a COVID-19 vaccine made by a Chinese company, almost all adult residents of Serrana, in the state of São Paulo, received the required two shots between February and April, long before most would otherwise have become eligible for the vaccine. The results were dramatic. Symptomatic cases of COVID-19 have dropped by 80% since the start of mass vaccination, related hospitalizations fell 86%, and deaths plummeted 95%, the research team in charge of the experiment reported during **a press conference yesterday**.

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Meanwhile, cases have risen out of control in 15 other cities nearby. “Serrana is now an oasis,” says Ricardo Palacios, an epidemiologist at the Butantan Institute, a state-owned research center that produces the vaccine in Brazil. “And it has shown us that it is surely possible to control the epidemic through vaccination.”

Some other COVID-19 vaccines have demonstrated greater than 90% real-world effectiveness at preventing serious disease, and they have helped countries bring cases down to very low levels. But there has been concern about CoronaVac, which uses an inactivated copy of SARS-CoV-2 to stimulate immunity. Clinical trials conducted in several countries came up with different efficacy values for the vaccine, **the lowest being 50% in Brazil—right at the threshold established by the World Health Organization (WHO) for emergency use of a COVID-19 vaccine**. Later studies in Brazil that tried to assess the vaccine’s real-world effectiveness have **indicated similar levels** of protection.

That’s why the data from Serrana are reassuring to many scientists in Brazil, where CoronaVac makes up 80% of all vaccine doses administered. “These are very encouraging results,” says Ethel Maciel, an epidemiologist at the Federal University of Espírito Santo, Vitória, who was not part of the study. Maciel is especially relieved the vaccine protected the town because a SARS-CoV-2 variant dubbed P1, which

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originated in Brazil and is now the most prevalent in the country, was also the most common variant in Serrana during the period of the study. Lab studies had suggested P1, which WHO recently proposed renaming delta, could elude protection from vaccines.

WHO announced today that it granted CoronaVac an emergency use listing, a step that should speed the vaccine's use in many low-income countries. Brazil has the world's second deadliest COVID-19 outbreak, with more than 461,000 deaths officially, below the United States but ahead of India. Brazil's vaccination campaign, slow to get off the ground because of scarce vaccine supplies, is still only targeting the elderly and patients with comorbidities. Only 15% of the population has had at least one vaccine dose.

The mass vaccination experiment in Serrana was named Project S—not for the town, but for "secret," as the plans were initially kept quiet to avoid a massive migration to the town. When it began, one in 20 Serrana residents was infected, and more than 25% had been previously exposed to the virus. The high caseload made the town attractive as a test site, along with its modest population of just over 45,000 people and its proximity to a campus of the University of São Paulo.

The team of about 15 researchers, supported by local authorities and health professionals, first conducted a detailed census. Then they divided Serrana into 25 sections that represented microcosms of people who interact with each other—for example, residents living in the same group of buildings or shopping in the same stores. The researchers then assembled four groups of residents from these clusters and started to vaccinate each group 1 week apart, administering second doses 4 weeks after the first. Only residents 18 years and older who weren't suffering from chronic diseases and not pregnant were eligible. After 8 weeks, 96% of those, about 27,000 in total, had received two shots.

Although the town was never closed or isolated from neighboring cities, the researchers say they started to

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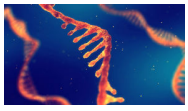

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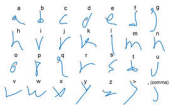

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see a reduction in transmission almost immediately after the first group got its second dose. By the time the third group received its second dose, and about 75% of the eligible population was immunized, the outbreak was effectively under control.

The researchers suggest the vaccination campaign, combined with the population's previous infections, may have gotten the town to "herd immunity," the point at which the coronavirus has difficulty finding new people to infect because so many are already immune. On day 14 after the last vaccination, there were only two cases among vaccinated people and no deaths. "It was amazing," Palacios says. COVID-19 cases, hospitalizations, and deaths also plummeted among children and teenagers, none of whom received the vaccine.

No severe side effects were reported. The team says the results will soon be submitted to a journal for publication and it may post a preprint before that. Florian Krammer, a virologist at the Icahn School of Medicine at Mount Sinai, says the experiment "sounds interesting and the outcome makes sense," but cautions that further data from a published study are necessary to draw conclusions.

Ricardo Gazzinelli, president of the Brazilian Immunology Society, says the results are good news for CoronaVac, but cautions that 2 months of analysis is too short. The research team plans to track Serrana's residents for up to 1 year to see whether their immunity wanes. If it does so quickly, ending the pandemic using CoronaVac might be hard, because Brazil would probably need to start giving booster shots even before it has fully vaccinated the entire population.

"If the vaccine's efficacy period is short and we keep the current pace of vaccination, herd immunity will never be reached because when most of the population is vaccinated, a large group won't be immune anymore," Gazzinelli says.

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