How Connecticut Used Data to Deliver COVID-19 Vaccines

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When COVID-19 vaccines first became available in the United States, the challenge of getting as many people vaccinated as quickly as possible fell into the hands of states. Social Finance worked with the state of Connecticut to support the data analytics capacity of the state's COVID-19 Vaccine Delivery Team. As part of this enhanced data analytics team, Social Finance partnered with the state to design a method for establishing predictable supply levels for COVID-19 vaccine providers and leveraged Social Finance's and the Department of Public Health (DPH)'s analytical expertise to execute on Connecticut's mission to vaccinate individuals as quickly and equitably as possible. Since analytics alone are not enough to ensure the success of a program or initiative, the team achieved measurable impact by combining quantitative data insights, intensive and customized support for vaccination providers, and coordination of cross-sector partnerships on priority vaccination campaigns.

How Social Finance supported the vaccine rollout

1. **Providing stability in allocations.** We partnered with DPH to design a baseline allocation model to provide all core COVID-19 vaccine partners with a weekly guaranteed allocation, giving vaccine providers greater inventory stability and the ability to plan clinics further in advance.

2. **Bolstering inventory management capacity.** We worked with DPH to support vaccine providers, including community health centers, hospitals, and local health departments, to manage their vaccine inventory and efficiently plan vaccine clinics.

3. **Fostering cross-sector partnerships.** We helped to define and coordinate a process for vaccine providers to work with educational institutions on mass vaccination campaigns, particularly for K-12 teachers and childcare providers.

During the COVID-19 pandemic—with infection rates soaring and vaccine supply limited—this support was essential to successful vaccine delivery. Social Finance's support helped the state of Connecticut

rank in the top 5 states in the country throughout the vaccine rollout—based on the percentage of the population covered with a COVID-19 vaccine.

Providing stability in allocations

During the first three months of the COVID-19 vaccine rollout in the U.S., vaccine supply was far less than demand, which put extreme pressure on states to distribute their limited allocation across thousands of providers as efficiently and equitably as possible. In addition, the volume of vaccines varied significantly from week to week in the early weeks of the rollout.

In response, we worked with DPH to develop a "baseline allocation" model that guaranteed each vaccine provider a minimum number of doses on a weekly basis. When combined with the team's inventory dashboard—which monitored each provider's efficiency in administering its dose allocation—the state of Connecticut was able to both provide predictability for individual providers administering vaccines and retain the appropriate level of flexibility to achieve the program's statewide goals.

Not only was vaccine supply limited, but each state's allocation from the federal government fluctuated significantly from week to week (sometimes by as much as 100%) due to manufacturing challenges and the establishment of several direct federal allocation streams for pharmacies and community health centers, which received their allocation directly from the federal government (outside of the state's allocation process). Due to the constraints of the federal allocation cycle in the early days of Connecticut's vaccine rollout, individual providers received allocations that changed significantly each week and were only communicated three days before the doses were delivered. These unpredictable conditions made it difficult to rent space, conduct outreach, hire staff, and finalize other logistics necessary to run effective clinics.

The baseline allocation model quickly became a priority solution. Social Finance and DPH analyzed projected vaccine supply increases, the geographic distribution of provider sites, and each provider's maximum potential weekly throughput to determine each provider's weekly baseline allocation. The baselines accounted for approximately 70-80% of the state's weekly allocation and were guaranteed to each provider for the following four to six weeks, contingent on its submission of a timely request for the doses and an attestation that it would use all doses requested within a week of delivery. The remaining 20-30% were allocated each week to address important gaps—including ensuring that communities with lower vaccination coverage received extra vaccine doses.

The baseline allocation offered important predictability and reduced uncertainty for Connecticut's anchor vaccination partners. For example, it allowed one of the state's largest hospital systems to streamline its clinic planning across dozens of mass vaccination sites and medical group locations. In the first few months of the rollout, the state could only provide this hospital system with a fraction of the total doses it could potentially administer due to supply constraints, which resulted in the hospital system operating well below full vaccination capacity. The streamlined operation enabled by the baseline allocation meant that the hospital system was able to spend less time scrambling to schedule clinics on a weekly basis and more time building out its strategy for equitable distribution in low-income areas when supply eventually did increase.

The baselines also allowed the state of Connecticut to retain an appropriate level of flexibility in deploying its limited vaccine supply. The remaining state allocation that was not committed to the baselines was used as supplemental allocation to providers that was tied to meeting specific state goals, from bolstering vaccine coverage in zip codes with high Social Vulnerability Index (SVI) scores to accelerating mass vaccination sites run by high-capacity providers.[1] One week, these additional doses were used to supply a 24-hour overnight vaccine event—meant to enable access for individuals who would have a hard time accessing clinics during the day—and in another week, they were used to meet the goal of ensuring that all childcare workers and K-12 teachers in low-income school districts received timely access to vaccines in the month of March.

Ultimately, the state's inventory analytics dashboard was instrumental to ensuring this critical balance of predictability and flexibility. On the one hand, it could detect a provider that was not promptly administering its weekly allocation. This would prompt DPH to conduct outreach to the provider to diagnose challenges and discuss methods to increase throughput and determine whether to reduce or skip its weekly baseline order. On the other hand, it guided DPH to increase allocations above the baseline for providers that performed particularly well on metrics of weekly throughput and coverage of high-SVI zip codes.

In a vaccine rollout with so much redirection and new information, the baseline model served as the foundation, allowing the state to course correct and remain agile in an ever-changing environment. It helped Social Finance and DPH keep an eye toward equity in the state's distribution approach, react quickly to new information, and mobilize plans within hours. As a result of the trusting relationships built with providers across the state, Connecticut became one of the first states to achieve the Biden Administration's goal of vaccinating 70% of its adult population with at least one dose of a COVID-19 vaccine.[2]

[1] The Centers for Disease Prevention and Control (CDC)'s Social Vulnerability Index (SVI) ranks each census tract in the U.S. on 15 factors ranging from socioeconomic status to housing/transportation barriers to identify communities that will most likely need support before, during, and after a public health emergency: https://www.atsdr.cdc.gov/placeandhealth/svi/at-a-glance_svi.html.

[2] CDC COVID-19 Vaccination Data Tracker: https://covid.cdc.gov/covid-data-tracker/#vaccinations.

Bolstering inventory management capacity

Unpredictable supply was a limiting factor for many providers, but smaller clinics faced a host of other challenges. Larger health systems had dedicated staff to handle many of the functions of the vaccine rollout, but several of the smaller clinics were run by a handful of medical professionals and other staff who had to still perform their usual duties on top of vaccination efforts. The smaller clinics had the daunting task of hiring and training additional vaccinators, conducting patient outreach and follow-up, and coordinating appointments for a timebound, two-dose vaccine schedule, all while managing their vaccine inventory and the ordering process of three vaccine products with different storage requirements.

These small clinics played an important role in reaching patient populations and performing necessary clinical duties. To assist them, DPH and Social Finance provided technical support across a range of operational functions: tracking inventory, forecasting vaccine need, managing weekly ordering and shipment timelines, and setting up their schedules accordingly to balance speed and efficiency. This support relied heavily on building close relationships with several of the smaller clinics to understand how to best provide additional capacity to meet their needs.

Many providers indicated it was a full-time job just to keep track of the moving inventory and appointment schedules, which was often the bottleneck in the process. In collaboration with providers, we developed supplemental toolkits that enabled them to set up a more dynamic inventory management system, greatly reducing the hours spent on operational tasks. These toolkits included a weekly vaccine ordering and delivery schedule that tracked how many vaccines each provider had received to date, outlined when it had to order doses, and made clear when quantities of first and second dose shipments would be arriving each week. The schedule included dynamic trackers that analyzed each provider's daily and weekly throughput levels to help providers build their schedules the following week and order vaccines accordingly. It also helped them refine their outreach efforts to individuals who were late in receiving their second dose. After implementing this new inventory management system, we saw the percent of total allocation used for these small clinics improve by 10-20% on average, and in some cases, over 100%. More importantly, we heard from providers that these tasks became easier to manage.

For many clinics, inventory management did not become an issue until they tried to scale their operations and increase their reach. If a clinic wanted to double the amount of first doses offered to patients, it also needed to double its capacity to administer second doses three or four weeks later, while still sustaining the higher volume of first dose appointments. This meant that a clinic would not

have to just double its capacity—it would need to quadruple it. Our dashboard helped to identify this issue for one such provider. It showed that although the provider was able to steadily administer the increased amounts of first doses ordered, it was beginning to fall behind in administering the second doses that were automatically shipped to the clinic. Through follow-up conversations, we discovered this provider had not increased its staffing and vaccinator capacity enough to sustain the combined first and second dose throughput. As a result, the provider was consistently ordering more doses than it could reasonably administer within a week and started to accumulate inventory. Our team took immediate action by not only adjusting the provider's allocations over the next few weeks to reduce this excess inventory, but also helping the clinic find volunteer vaccinators to meet demand as it continued to hire more staff. Reducing excess inventory was especially important in the early stages of the vaccine rollout to maximize access to COVID-19 vaccines as quickly as possible for the entire population. Each dose that sat unused in inventory was one less person that could have been vaccinated that week.

Fostering cross-sector partnerships

While Connecticut largely took an age-based approach to the vaccine rollout, several state priorities required working across sectors to achieve a particular state policy goal. One such priority was to offer vaccines to all pre-kindergarten through 12th grade (PK-12) educators and childcare providers during the month of March, a time when demand for vaccines still significantly outstripped supply. Critical to Connecticut's success in achieving this goal was a dual focus on leveraging data to inform vaccine distribution and fostering cross-sector partnerships between the healthcare and education sectors to effectively coordinate vaccination efforts for each educational institution. Robust data analytics capabilities formed the basis for determining: 1) how to pair individual schools and childcare centers with healthcare providers based on expected uptake and provider throughput capacity, 2) how to efficiently and equitably allocate inventory to optimize use of the limited vaccine supply, and 3) how to conduct performance management analyses that could track vaccination progress to inform continued allocation needs, outreach efforts, and other state priorities.

Achieving the mandate to vaccinate all educators and childcare providers required more than analytics to triangulate supply, demand, and provider capacity. While DPH regularly works with school districts and the state's Department of Education (SDE) to facilitate routine pediatric immunizations, Connecticut's education and healthcare sectors operate separately and have different geographic organizing structures. Each is comprised of a mix of public and private institutions sharing limited resources. As a result, a 30-day mass vaccination campaign of educators required a more intensive infrastructure for wide-scale, frequent coordination across largely separate sectors.

The COVID-19 immunization program set up frequent, recurring touchpoints with members of SDE, DPH, and state-level associations representing independent schools. Doing so set the stage for establishing partnerships across dozens of providers, hundreds of school districts, multiple education associations, and several state offices. The partnerships fostered open daily communication, which

enabled this group to ensure that every school and childcare center was matched with vaccine providers, corroborate back-end data with frontline intelligence on vaccination progress, and coordinate outreach efforts to resolve any low numbers of doses administered or low turnout rates.

Vaccinating childcare providers was particularly challenging, and in general, there was initially a lower uptake among this subset of the population. Many childcare centers had permanently or temporarily closed during the pandemic, which limited centralized communication and coordination with eligible individuals. Although there was no immediate panacea to the logistical challenges, our ability to track the doses administered in clinics for this population enabled the state of Connecticut to offer vaccines to a significant portion of this population by the end of March. Achieving this milestone, in turn, helped to inform the state's policy to open eligibility to the general population on April 1, 2021.

While robust analytical capabilities provided a critical foundation for achieving Connecticut's priority to vaccinate all educators and childcare providers, it was only through building strong relationships with stakeholders that it could become possible to determine why doses administered lagged behind expectations and collaborate with individual schools and providers to create a tailored plan to address the root issue. Data and cross-sector partnership are individually critical but most powerful when used together.

Conclusion

The combination of rigorous analytics and tailored support to vaccine providers helped to ensure an equitable and efficient vaccine rollout in Connecticut. We hope that the insights gleaned from this work can be applied by others in future public health responses. The baseline allocation model and inventory management best practices should prove useful in the event of another high-volume, supply-constrained vaccination effort, such as COVID-19 booster shots or other outbreak response activities. Local health departments, community health centers, hospitals, pharmacies, and educational institutions—with some working together for the first time to deliver COVID-19 vaccines—are now better prepared to collaborate on future public health priorities in service of Connecticut residents. We are proud of the contributions of this work to building a stronger, more resilient public health infrastructure in the state of Connecticut.

September 2021

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Acknowledgments

We'd like to thank Connecticut's Department of Public Health for its partnership in contributing to the collective recovery, healing, and rebuilding efforts necessitated by the global COVID-19 pandemic—especially the following individuals:

Commissioner Deidre S. Gifford
Deputy Commissioner Heather Aaron
Benjamin Bechtolsheim
Kathy Kudish
Michelle Gilman
Patricia Firmender
Deepa Mavani
Amanda Durante

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