



Data Modernization
INITIATIVE
Stories from the field



Cross-agency data sharing



Communication strategies



Innovative uses of data

A FOCUS ON PEOPLE AND INNOVATION HELPS KEEP THE COMMUNITY HEALTHY

Fairfax County Health Department transforms data exchange and workplace culture

Like many public health agencies, Fairfax County Health Department struggled with efficiently accessing and sharing data. During the COVID-19 pandemic, the Fairfax County informatics and IT team implemented an electronic health record (EHR) which connected lab orders and state systems, such as the Immunization Information System, more effectively. This project was the start of many data interoperability initiatives.



Noel Clarin

“When we looked at systems, **interoperability was key**. We asked: How do we make it work with other existing systems or future systems that we anticipate bringing to our agency?” says Noel Clarin, Informatics and IT Manager. The team began improving other systems, including

Fairfax County’s lab information management system. Then, in 2023, Fairfax County began working with the Virginia Department of Health on a Fast Healthcare Interoperability Resources (FHIR) pilot project to access vital records from the state more efficiently. Along with these initiatives, the informatics and IT team recognized they needed a central source for data, and hypothesized a data warehouse could be the answer.



A COVID-19 community testing clinic. During the pandemic, the Fairfax County health department implemented a new EHR which connected to lab orders and state systems.

Implementing a data warehouse

Prior to the creation of the data warehouse, Fairfax County relied on disparate systems and downloads of comma-separated values (CSV) files that were transformed or cleaned manually by the user in the health department, and then pulled into the user's analytical system such as R Studio, SAS or Microsoft Power BI. In contrast, a data warehouse would allow team members to pull the data directly into an analytical system without the extra steps of transforming it or saving it to their individual computers. **The warehouse also represents "a single source of data truth,"** according to Pooja Tewari, Council of State and Territorial Epidemiologists applied public health informatics fellow.



Pooja Tewari

As a fellow, Tewari observed the informatics and IT team launch the data warehouse. She explains that health department staff wanted to be able to query data that was already transformed, which is why a data warehouse was preferred over a solution like a data lake. The team chose Microsoft's Azure solution because Microsoft products were already being used in the agency, and it was easier to get buy-in. Plus, their enterprise Department of IT team was already working with the Azure cloud platform and engaged closely with the educational experts at Microsoft.

Alida Laney, public health data manager at Fairfax County, says scalability was also a factor in choosing

When should organizations consider data warehouses, i.e., data repositories with cleaned and standardized data vs. data lakes, which contain raw data?

The data structure of a warehouse is predefined by business needs and is optimized for queries and reporting, saving time for the end user, while the flexibility and variety of unstructured data in a lake offers the ability for exploratory and predictive analytics. ^{2,3}

Microsoft Azure. She says scalability is often thought of as vertical only, meaning processing power can be added or scaled down as needed. However, the Azure platform allows vertical—and horizontal scalability.



Alida Laney

"Horizontal means we can add new databases at any time, just by going through the user interface. So, the startup time and cost are minimal." She says its capacity allows the team to add storage, or even spin off to a data lake. "It was made to work with what you already have, and you can move it to create what you want it to do, without restarting and reimplementing hardware and software. It all moves seamlessly."

Impact of the data warehouse

Currently, Fairfax County's data warehouse includes data sources such as electronic health records, lab orders and results, disease surveillance data from the state, immunization records, and vital records. An immediate use case of how the data warehouse will help improve public health involves identifying non-reported congenital syphilis cases. Through the data warehouse and a daily data exchange of birth records via FHIR, the team will be able to match syphilis cases to mothers' names in birth records. Ben Klekamp, epidemiology manager for Fairfax County, says the matching of the mother's name adds another surveillance layer, and "will help our investigators confirm a case to ensure the child receives the treatment they need."

Tewari says **the new data warehouse can also lead to health equity.** "With the improved informatics infrastructure, we can use data to drive action. And that could consist of improving internal case management, setting program priorities, creating sustainable data analyses, and looking at disease burden across program areas."

The data warehouse allows the team to easily build data dashboards for different audiences. Tewari gives the example of a dashboard that is available for public view, which could help the community feel empowered to make decisions and engage in different preventative measures. She also says another dashboard could



Ben Klekamp

“Working in public health at the county level, you need to get really granular with your analysis if you’re going to have a tangible impact, especially in emergency situations.”

Promising practices

- Set up standing meetings to build relationships with leaders and staff. Understand their perspectives, goals and processes before offering a solution.
- Centralize informatics requests to prioritize them strategically; a project management tools can help track risks and progress.
- When hiring, look for people who want to learn different skills. Learning informatics and IT can be done on the job.
- Celebrate the small wins. Small proof-of-concept projects can build trust and show leaders and colleagues the power of data modernization.

be created for community providers to have actionable data and offer preventative measures to their patients who are identified as having the greatest need. **“The data warehouse can allow for the ability to analyze and disseminate public health data. And through these dashboards, it promotes health equity, and it demonstrates a commitment to addressing public health problems and disparities in a collaborative manner.”**

Innovative use of GIS data

Along with improved data sharing, Fairfax County looks for new ways to use data to drive public health action. During the COVID vaccine rollout, the epidemiology team found an association with living in a crowded environments, such as large numbers of people living together in apartments, and have a higher risk of getting infected.

Klekamp says their team sat down together and asked, “How can we identify those apartment complexes that we know need additional assistance and outreach?” They geolocated the different addresses of people that had received vaccines from our vaccine immunization system. They also found parcel data for their county, which are used for city planning, but not as much for public health.

Demographers at Fairfax County had done some estimates based on parcels, noting an average number of individuals that might live at a parcel (e.g., single family dwelling, townhouse, apartment complex.) “We put those estimates down as the denominator, and then we used our vaccine counts, of how many people got vaccinated, as the numerator. And now you have a percentage vaccinated by parcel,” says Klekamp. For the apartment complexes with low vaccination rates (<50%), it was an opportunity for outreach for health education and to dispel misinformation. “And it was a really great way to use data to drive public health action. “Working in public health at the county level, you need to get really granular with your analysis if you’re going to have a tangible impact, especially in those emergency situations.”

Post-COVID, a Geographic Information System (GIS) is being used to map hotspots and clusters of human immunodeficiency virus (HIV) and syphilis. The team is looking at specific areas in their health district that have a high sexually transmitted infection (STI) burden. They are using this information to engage and inform community-based organizations that offer sexual health education, testing, and treatment to improve efficient use of limited resources to reduce disease burden.

Coordinating data efforts with the state

Klekamp says **in the past, public health data modernization resulted from responding to emergencies, which can often break down political, operational, and financial barriers.** That allowed public health to move quickly and do things rapidly. “Unfortunately, though, these efforts may not



Fairfax County Laboratory Scientist Nancy Yeomans preparing a microplate for TP-PA testing. (Photo credit: Will Schermerhorn)

always be done in a way that is thought through, and they do not serve a greater purpose...or solve a larger data modernization effort.”

Klekamp says in non-emergency times, data modernization efforts “come from a shared goal.” A recent example involved transferring rabies animal testing results from the local to state level.

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Fairfax County has its own locally operated public health lab, and the lab performs animal rabies testing on site. The data were stored locally, “and then once in a while, every quarter, every six months or something like that, we would send a static file down to the state, and then they would sit there and manually enter that data into their system.” This process was a burden for Fairfax County to remember to send the file and for the state to manually enter data.

The Fairfax County informatics and IT team and the Virginia Department of Health worked together to find a solution. The rabies data were stored on a Microsoft Dynamics database, and the informatics and IT team created their own Microsoft Power App, which automatically formatted the data into the structure that the state requested. Laney explains, “It moves on

a timeline. It is timed weekly, and it moves seamlessly, to create the file, and then we use Rhapsody, an integration engine. This helps move that data securely to the state, in the format they’re requesting, so now people don’t have to hand-enter the data...and the state uploads it into the state surveillance system.”

Community strategies

The informatics team required buy-in for their interoperability initiatives from many different leaders, including Fairfax County executives, division leaders, department leaders in Fairfax County as well as state health officials. Clarin says there is no secret formula to getting buy-in from so many different leaders, but “what has helped for us has been a lot of communication and engagement with each of these different leaders. **I think it is important to understand that each of us plays a different role within public health, and within our own agency, and within the county, and it helps to get a good understanding of the different perspectives that each of these leaders has.**”

He says their team has worked hard at building relationships with these different influencers and partners, as well as gaining an understanding of their needs and goals within their own division or environment. The questions his team asks are: “How do we align all our goals together to really look at a strategic vision? And how do we make technology work

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for us, to move towards that vision?”

The informatics team increased their opportunities to communicate, setting up standing division and program meetings. Clarin says his team’s efforts “resulted in opening doors” and making it clear they were available for brainstorming or questions.

Laney says in the meetings **they try to understand their colleagues’ pain points and needs before offering a technological solution.** Meeting with colleagues helps her learn how much the staff was doing for each program and the passion they have for the work. It also helps her understand how much time they’re spending gathering data, transforming data, and doing statistical analysis, which drives policy and outreach. She says these conversations were a good way to understand the work of programs, telling colleagues, “Let us take this pain point, that could be solved with technology, out of your process so that you have more time to do the work you need to do, like creating policies and planning outreach and/or support for your program.”

Workplace culture changes

The interoperability initiatives allowed Fairfax County to implement new solutions and technology, which allowed for **more efficient work processes.** “It also built trust and a relationship with our individual programs, because they started to see how informatics and IT could work for them and what it could do for public health,” says Clarin.

Klekamp explains that he’s seen big changes during his 12 years of working in public health. When he first



Epidemiology and the informatics and IT teams work together to find the best path forward for data modernization. (Photo credit: Will Schermerhorn)

started working, there was no dedicated informatics staff. Epidemiologists often had to figure out informatics solutions on their own. He says the mindset was, “What are we going to do, as epi’s, because nobody else is coming to help us out?” (He notes that this can still be a reality for many health departments.)

Now he says epidemiologists are more strategic about how the data are being processed and are more closely aligned with IT and informatics. “Instead of just jumping in and trying to implement a solution on their own, epi’s gather requirements and work with IT and informatics staff to understand the best path forward.” He adds, **“Now we have personal relationships with the people that can help us get the data, move the data, transform the data, and then that way, we can take the data and do things with it.”**

Project management and process mapping

Along with increased communications, the informatics team worked on organizing and prioritizing informatics requests. During COVID, the interaction between different programs and the effects on each other’s technologies became more evident. So, **they centralized requests, assessing them strategically on how the technology request may affect other programs.**

According to Clarin, the informatics team would ask: “Who needs to be at the table when deciding this change? And then, working together to implement that change, how do we train users? How do we educate them, and then, how will we maintain it afterwards?”

One way the informatics and IT team understands the work of their colleagues is to use the visual power of process mapping. These visual diagrams help program staff better understand work processes and bottlenecks and help the informatics team find efficiencies and decide on solutions.

To track requests, the informatics and IT team uses Smartsheet as a tool to understand all the project tasks and timelines. It helps with transparency, so team members and colleagues can see progress and understand project risks. “You’re not reliant on someone’s email or someone’s availability. You could go and just see the high-level picture of where we are

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in the project,” says Laney. She notes that the type of project management tool doesn’t matter. “For us, Smartsheet works. But other tracker software would also work. An Excel spreadsheet would work. If you are keeping track of the steps that need to happen, there are many tools that would work.”

Challenges

One of the challenges for Fairfax County has been bringing different entities and people to the idea of data modernization initiatives. Laney says, “We have program-level folks we’ve got to bring in. We’ve got enterprise information technology. We have leadership. We have policy. We have laws that we have to abide by, especially for security. And we also have our state health department too, that we must interact with and work with for data modernization.” She says an important challenge was addressing security, “making sure that we’re following the letter of the law to protect the information that we have. So, that was top priority, and we worked with our enterprise IT folks to build in all the security that we needed to ensure that all our data were kept safe.”

Laney says obstacles can be delays in data sharing agreements, funding, and staff bandwidth. “The staff has set job requirements, and then the modernization adds more to the daily workload.”

Changes in leadership and policy can also be a challenge. “You have buy-in in the beginning, and there could be change of staff, change of leadership, change of policy, and so you have to be able to pivot and work with what is happening right now, and what you see is going to happen in the future. And then, we just adjust to new policies as we move forward to enable data modernization.”

Small wins and learning to adapt

Clarín says a factor that has helped with obstacles, particularly to build buy-in or collaboration, is looking for “**small wins, where some of these new ideas work.**” Laney says these little wins also help leaders and staff members see the value of data modernization. She says, “We can give data on the efficiencies that have now been built into the staff, so they can focus on

other areas, like policy work and outreach, instead of downloading and transforming files.”

She thinks **small proof-of-concept projects can help get staff on board.** “Showing someone who is not in informatics, and is not in IT, who maybe doesn’t understand the back end of how this, all of this is coming together, having something concrete to show them, that helps them in their work, really builds excitement and trust.”

Clarín says **an adaptable attitude is important.** “There is always going to be a need to pivot and there will always be obstacles. As you go down this path of data modernization or implementing new technologies, there’s not one way to do things ... being flexible and being able to pivot is going to be key.”

Tewari agrees that adaptability is important and that **learning informatics skills is achievable.** At conferences, she often asks about the educational background of people she meets, and usually finds out that informatics skills are learned on the job. “I think that’s validating, because people might be afraid to try it if they’re just like, ‘Oh, I didn’t do my education in this.’” In her own fellowship, she has taken advantage of training and even learned programming languages to help implement some of the data modernization initiatives. other areas, like policy work and outreach, instead of downloading



Ben Klekamp (left) and Noel Clarín (right) meet with Dr. Gloria Addo-Ayensu, director of health for Fairfax County. (Photo credit: Will Schermerhorn)

and transforming files.”

Power of the people

For Fairfax County, **the biggest factor in their success is the people.** “We are fortunate to have leaders who support our efforts, our goals, and individual projects. And we have users that want to change and want to adapt,” says Clarin.

He adds that **technology shouldn’t be the one solution that solves everything.** “Technology is what should support the people and support the processes that are in place, and when we can align the people and the processes and put in a piece of technology that supports it, and provides efficiencies, I think that’s where we find wins with our programs, and they can see the value of how it all comes together. And it’s seeing the tangible effects of having it all in place.”

Leaders optimistic about data modernization efforts

The Fairfax County Health Department is hopeful about the changes they are seeing from data modernization initiatives. Klekamp says data modernization helps local health department staff work from data to inform their decisions instead of relying on perceptions. He says

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when you work in a community for a long time, “assumptions about the community start to kind of take hold.”

In certain locations, he says, “there are a lot of historical, and sometimes very negative things about what happened in that area to those individuals in that area. But I think it’s really important to use data to confirm or dispel those perceptions.”

These efforts also help ensure that public health professionals are spending their time on what’s most important. “The data modernization effort is making sure that we don’t spend our time and our resources

sitting there just managing data all day long. It’s about freeing up staff time, so we can get into the community more.” says Klekamp.

Tewari says data modernization is the ability to address public health problems because the right tools and solutions are now becoming available. She says informatics can “help answer these questions that have been posed for years, or that the community is saying that there’s a need for, and now can act on it, analyze it and disseminate it.”

For Laney, data modernization means secure and clean data. “It means you’re less likely to get different calculations or metrics from the data because **everyone is using the same central set of data that’s already been validated.** Data modernization is the ability to do complex processing and calculations on the back end, to have it available for the programs to use it.”

Clarin says **data modernization allows their health department to think differently.** He adds he has been fortunate to work with people who are willing to “push the envelope,” examine their program processes, change, and adapt when needed. “You know, in order for us to modernize, we have to step outside of the box. We have to think differently and approach things in a different way to find those new opportunities.”

Key takeaways

- A data warehouse makes combining data easier, offering potential solutions to complex public health issues.
- A data warehouse contains cleaned and categorized data. These data can be sourced for analytical reporting, potentially saving staff the extra steps of transforming the data first.
- Technological solutions should be offered only after understanding work processes, goals, pain points and perspectives. Conducting process mapping and requirements gathering at the start of a new project results in a more stable and sustainable solution at the end.
- Successfully implementing data modernization comes from a foundation of shared goals and partnership-building.

Sources

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See additional resources, such as examples of Fairfax County's process maps, at phii.org/dmi-stories.