

Disease forecasting platforms have the potential to monitor emerging disease patterns utilizing multidimensional data to forecast potential health events.

How Infectious Disease Platforms Power Disease Surveillance, Predict Health Trends, Improve Outcomes, and Reduce Costs

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Disease Surveillance — Looking into the Future

When the COVID-19 pandemic struck, the world was not ready, and the consequences were significant. Think of the difference it would have made if we could have predicted the onset of COVID-19 well in advance. Chaos and confusion reigned as the world tried to determine whether the adverse drug events (ADEs) associated with COVID vaccines were adverse drug reactions (ADRs) or were resulting from prevailing comorbidities or ethnicities, making specific population segments more vulnerable to the disease. Think of how valuable it would have been if we could have easily predicted the vulnerability of patients. In addition, immense value lies in predicting and managing pandemics and seasonal infectious diseases. According to the American Association of Pediatrics, historically, up to 80% of influenza-associated pediatric deaths have occurred in unvaccinated children six months and older. Predicting seasonal infectious diseases and taking proactive and preventive measures to save lives would be very beneficial.

This is where one sees the tremendous value of disease forecasting platforms (DFPs) that leverage real-world data (RWD) to power disease surveillance, identify vulnerable populations, and forecast outcomes. These DFPs have the potential to monitor emerging disease patterns utilizing multidimensional data and to forecast potential health events. Leveraging artificial intelligence/machine learning (AI/ML) to mine through volumes of data can help generate powerful insights to identify quickly and accurately leading and lagging indicators to drive accurate disease forecasting.

AT A GLANCE

KEY STATS

» IDC has predicted that by the end of 2027, 95% of pharma companies will have established strategic partnerships to access real-world data (*IDC FutureScape Predictions 2023*).

WHAT'S IMPORTANT

Infectious disease surveillance and forecasting platforms can play a critical role in a world that has been buffeted by a pandemic and a series of respiratory disease outbreaks. The importance of preparedness cannot be emphasized enough. These platforms can reduce the economic burden of care, minimize clinician burnout, build trust, and improve clinical outcomes. The world needs to prepare today for a better tomorrow, and these platforms could make all the difference.

Definitions

- » **Real-world data (RWD):** The FDA defines RWD as data relating to patient health status and/or the delivery of healthcare routinely collected from various sources. Examples of RWD include data derived from electronic health records (EHRs), medical claims data, data from product or disease registries, and data gathered from other sources (such as digital health technologies) that can inform health status.
- » **Vulnerability index/patient risk scores:** These metrics are used to determine the likelihood that a local population will be hospitalized due to a range of disease conditions.

Digging Deep into the Future with DFPs

DFPs have much to offer to multiple stakeholders across the life sciences and healthcare industries. The benefits for the multitude of stakeholders are outlined below.

Pharma and Biotechs

A continuous low-latency data feed can be used to monitor emerging health threats. This data can serve as an early indicator enabling supply chain optimization and help pharmas and biotechs design targeted marketing strategies for affected regions. According to IDC's *Life Sciences Digital Transformation Survey* (May 2023), an intelligent supply chain is the top digital transformation use case for the life sciences commercial sector. In a survey conducted by McKinsey of 121 health system C-suite and supply chain executives, cost reduction per case variability was a critical element of a high-performing supply chain. DFPs can play an important role in optimizing these targets by forecasting the onset of diseases and creating preparedness within the supply chain to meet the upcoming needs of health systems.

DFPs can help focus R&D efforts by monitoring evolving disease patterns. They can also be used to identify vulnerable populations, drive focused interventions, address health inequities, and promote medication adherence.

The surveillance data can be used to design trials based on RWD to address areas of specific interest, such as long COVID or a drug's impact on different population strata. The *IDC Perspective on Real-world Evidence, Social Determinants of Health, and Digital Biomarkers in Driving Patient Recruitment* (March 2023), cites an interesting example of how RWD can provide valuable insight into trial design. This report shares that when the Cancer Research Network analyzed a cohort of pooled data, it demonstrated that only patients with private insurance had an overall survival rate and a progression-free survival benefit from experimental therapies compared to those with Medicaid or those without insurance. It would be very valuable to factor these aspects into clinical trial design and, specifically, into patient recruitment criteria.

Pharmacy Benefits Managers (PBM) and Pharmacies

When there is a pandemic or a prevalence of a high-risk infectious disease, it becomes extremely important to ensure that the supply chain is optimized so that no patients are kept waiting when there is an urgent need. Being pre-warned regarding the risk of an imminent disease can help PBMs and pharmacies leverage this information to manage consumer demands efficiently and reduce health and economic burdens.

Targeted insights generated from DFPs can help educate pharmacists and encourage them to implement preventive measures such as vaccination and medication adherence, especially in immunocompromised high-risk and high-cost populations.

Direct-to-Consumers

Near real-time adverse health event forecasting updates on emerging local and national health threats serve as a boon to the population, enabling people to proactively execute health mitigation protocols (refill prescriptions early on or manage travel plans). These updates become even more valuable when there is an urgent need for a call to action to prevent the spread of a disease to pandemic proportions.

Payer Groups

Much of what consumers pay in health insurance is related to risk prediction and risk management. Payers can invest in building forecasting tools to proactively identify emerging health risks and execute risk mitigation initiatives (digital/offline) for at-risk populations, thereby reducing the cost of care.

Employers

Employers can leverage the insights generated from DFPs to send out SOS notifications and initiate pre-emptive mitigation plans for employees in targeted high-risk geographies. This reduces costs, ensures employees' safety and good health, and creates goodwill.

Providers/Provider Groups

Predictive insights allow the provider community to proactively reach out to at-risk patient groups for health screening and preventive measures. These insights could enable hospitals to prioritize staffing, logistics, and supply chain needs at locations that are forecasted to be at high risk.

Clinician burnout spiked significantly during the pandemic as the pressure to save patient's lives soared — and this trend is still ongoing. The WHO has projected a shortfall of 10 million health workers by 2030, primarily in low- and lower-middle-income countries. According to a 2023 survey conducted by the American Medical Association (AMA) on over 13,000 physician and nonphysician providers across 30 states, half of practicing physicians report burnout, and 40% plan to leave their current roles. These high levels of clinician burnout will adversely affect patient experience (PX). Advance notification of potential health threats can help providers proactively outline a care plan and build out contingency plans to reduce stress and minimize burnout.

Infectious diseases spread like wildfire. “If only we had known” often comes too late. Early warnings of health threats can allow implementation of risk-mitigating measures such as masking and social distancing to help reduce the spread of disease.

Public Health Entities (federal, state, or local government and agencies)

These agencies leverage disease surveillance and forecasting capabilities to monitor the occurrence and spread of diseases across cities and states. They can utilize vulnerability risk scores to customize their population health management strategies.

Considerations

While DFPs offer enormous value, it is important to keep the following in mind:

- » Industry forecasts are based on RWD, and therefore, the quality of these forecasts will only be as good as the quality of the data. The utmost care needs to be taken to identify the right sources of the data and to carefully curate the data to ensure that only meaningful insights are drawn.
- » The recency of the data is important. While historical data provides enormously valuable insights, findings cannot be based only on old historical data, as disease patterns and trends keep evolving.
- » As the industry continues to use AI/ML to build these predictive models, it is important to ensure that the algorithms are thoroughly validated and monitored for model decay over time. Organizations must establish rigorous model validation frameworks.
- » Experts who have a deep understanding of the disease condition must contribute to developing these forecasting models, prioritizing use cases, and detecting socio-economic bias introduced by claims data.
- » Transparency and audit trails should be available to determine how the predictive models were built.
- » The availability of granular data and the ability to incorporate multiple data streams into modeling efforts are important considerations to keep in mind.

Considering Optum

As a part of United Health Group, Optum is well-positioned to understand care gaps and ideate regarding needed industry solutions. Leveraging enterprise-level clinical expertise and industry knowledge, Optum, in partnership with United HealthCare, developed an infectious disease platform (IDP) to manage risk and inform critical business and patient care decisions before surges of respiratory infectious conditions. Optum's IDP provides surveillance data, analytics, and predictions to help organizations better understand the spread of diseases and their impact on healthcare services; it also helps identify vulnerable populations that may need access to urgent preventive measures.

Its surveillance system uses proprietary data comprised of billions of claims. These data sets represent about 53 million lives nationwide across 300 metro areas. Optum uses its ML models to find hidden patterns within masses of disease indicator data, and to provide insights on a multitude of clinical parameters, as well. In addition to the in-house low-latency and high-specificity claims data, the forecasting models are augmented with up to 40 private and public data sets to reflect nationwide respiratory activity more precisely and in a timely manner.

Optum utilizes its "precision forecasting" technique in which dynamic ensembles of models generate weekly predictions, mitigating inaccuracies that may result from a single model, to better predict disease levels up to four weeks in advance.

The models are trained on up to eight years of location-specific data, developing prediction models at national, state, and metropolitan statistical area (MSA) or at a zip-code level.

Challenges and Opportunities

Optum faces the following market challenges and opportunities:

- » With the increasing adoption of AI models by the life sciences industry, care should be taken to build the requisite expertise to identify model uncertainties, including parametric uncertainties (such as gaps in data regarding pathogen transmissibility) or structural uncertainties (choosing the right model for the right assessment). These

model uncertainties must be clearly outlined, and all plausible scenarios must be laid out to avoid confusion and distrust in the model.

- » Frequent recalibration is needed to account for the occasional erratic behavior of data in the case of infectious diseases or pandemics.
- » Diseases with low prevalence/number of claims can impact the degree of spatial resolution that forecasting models offer.

Conclusion

Infectious disease outbreaks have proven to be devastating, whether it was the Spanish influenza or the recent COVID-19 pandemic, and the world is still battling to be in a state of preparedness for these outbreaks. In addition to impacting patient's lives, the annual cost burden due to these upper respiratory conditions (flu/RSV/COVID-19) is significant. This is where DFPs can play a critical role in carrying out ongoing disease surveillance and forecasting — throwing out red flags in case there are signs of a potential outbreak. These platforms will help identify the vulnerable segments of society and help providers build care plans to support them in their hour of need.

To quote Benjamin Franklin, “By failing to prepare, you are preparing to fail.” This is not something the world can afford to do anymore. The economic burden of respiratory infectious diseases is huge, ranging from over \$5 billion annually for RSV to over \$11 billion for flu, according to published research reports. Timely and accurate forecasts should be integrated into real-time public health decision making and will play a role in improving public health responses to outbreaks.

If Optum continues effectively leveraging its proprietary data sets, AI/ML capabilities, and modeling expertise, its forecasts will hold significant potential for the entire healthcare ecosystem.

In a battered world still recovering from the COVID-19 pandemic, one cannot emphasize enough the enormous value that infectious disease surveillance and forecasting platforms bring to the table.

About the Analyst



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Dr. Nimita Limaye is a Research Vice President with IDC Health Insights and provides research-based advisory and consulting services as well as market analysis on key topics related to R&D strategy and technology in the life sciences industry. She also represents healthcare and life sciences on IDC's AI Council.

MESSAGE FROM THE SPONSOR

Optum is a leading information and technology-enabled health services business dedicated to helping make the health system work better for everyone. With more than 215,000 people worldwide, Optum delivers intelligent, integrated solutions that help to modernize the health system and improve overall population health.

Every day, the people of Optum bring together clinical expertise, technology and data to make health care simpler, more effective and more affordable, at scale. Connecting every aspect of health care, we are advancing whole-person health, supporting care providers with insights to deliver proactive, evidence-based care across all care settings, and creating a seamless consumer experience through our growing direct-to-consumer capabilities.

Working with partners across health care, Optum is committed to enabling a higher-performing, value-oriented health system to ensure every person, in every community, has access to the health care they need, when they need it.



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