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THE VOICE OF ARTIFICIAL INTELLIGENCE IN MEDICINE

ON THE FRONTLINE

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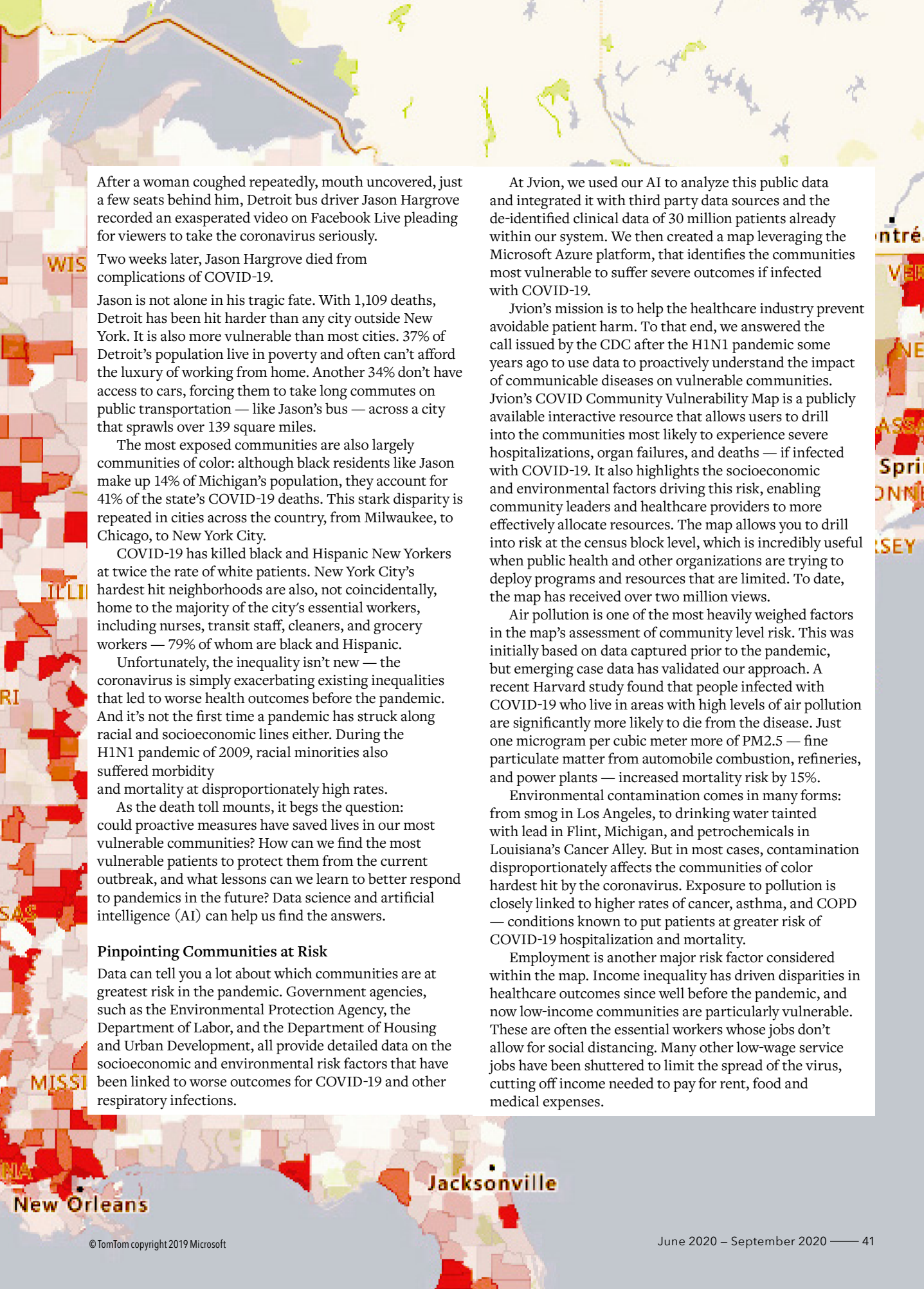
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AIMed
Artificial Intelligence
in Medicine

DATA LEADS THE FIGHTBACK

AI can protect the vulnerable from COVID-19, save lives and prepare us for future pandemics. Jvion's Chief Product Officer Dr. John Showalter explains how.



After a woman coughed repeatedly, mouth uncovered, just a few seats behind him, Detroit bus driver Jason Hargrove recorded an exasperated video on Facebook Live pleading for viewers to take the coronavirus seriously.

Two weeks later, Jason Hargrove died from complications of COVID-19.

Jason is not alone in his tragic fate. With 1,109 deaths, Detroit has been hit harder than any city outside New York. It is also more vulnerable than most cities. 37% of Detroit's population live in poverty and often can't afford the luxury of working from home. Another 34% don't have access to cars, forcing them to take long commutes on public transportation — like Jason's bus — across a city that sprawls over 139 square miles.

The most exposed communities are also largely communities of color: although black residents like Jason make up 14% of Michigan's population, they account for 41% of the state's COVID-19 deaths. This stark disparity is repeated in cities across the country, from Milwaukee, to Chicago, to New York City.

COVID-19 has killed black and Hispanic New Yorkers at twice the rate of white patients. New York City's hardest hit neighborhoods are also, not coincidentally, home to the majority of the city's essential workers, including nurses, transit staff, cleaners, and grocery workers — 79% of whom are black and Hispanic.

Unfortunately, the inequality isn't new — the coronavirus is simply exacerbating existing inequalities that led to worse health outcomes before the pandemic. And it's not the first time a pandemic has struck along racial and socioeconomic lines either. During the H1N1 pandemic of 2009, racial minorities also suffered morbidity and mortality at disproportionately high rates.

As the death toll mounts, it begs the question: could proactive measures have saved lives in our most vulnerable communities? How can we find the most vulnerable patients to protect them from the current outbreak, and what lessons can we learn to better respond to pandemics in the future? Data science and artificial intelligence (AI) can help us find the answers.

Pinpointing Communities at Risk

Data can tell you a lot about which communities are at greatest risk in the pandemic. Government agencies, such as the Environmental Protection Agency, the Department of Labor, and the Department of Housing and Urban Development, all provide detailed data on the socioeconomic and environmental risk factors that have been linked to worse outcomes for COVID-19 and other respiratory infections.

At Jvion, we used our AI to analyze this public data and integrated it with third party data sources and the de-identified clinical data of 30 million patients already within our system. We then created a map leveraging the Microsoft Azure platform, that identifies the communities most vulnerable to suffer severe outcomes if infected with COVID-19.

Jvion's mission is to help the healthcare industry prevent avoidable patient harm. To that end, we answered the call issued by the CDC after the H1N1 pandemic some years ago to use data to proactively understand the impact of communicable diseases on vulnerable communities. Jvion's COVID Community Vulnerability Map is a publicly available interactive resource that allows users to drill into the communities most likely to experience severe hospitalizations, organ failures, and deaths — if infected with COVID-19. It also highlights the socioeconomic and environmental factors driving this risk, enabling community leaders and healthcare providers to more effectively allocate resources. The map allows you to drill into risk at the census block level, which is incredibly useful when public health and other organizations are trying to deploy programs and resources that are limited. To date, the map has received over two million views.

Air pollution is one of the most heavily weighed factors in the map's assessment of community level risk. This was initially based on data captured prior to the pandemic, but emerging case data has validated our approach. A recent Harvard study found that people infected with COVID-19 who live in areas with high levels of air pollution are significantly more likely to die from the disease. Just one microgram per cubic meter more of PM2.5 — fine particulate matter from automobile combustion, refineries, and power plants — increased mortality risk by 15%.

Environmental contamination comes in many forms: from smog in Los Angeles, to drinking water tainted with lead in Flint, Michigan, and petrochemicals in Louisiana's Cancer Alley. But in most cases, contamination disproportionately affects the communities of color hardest hit by the coronavirus. Exposure to pollution is closely linked to higher rates of cancer, asthma, and COPD — conditions known to put patients at greater risk of COVID-19 hospitalization and mortality.

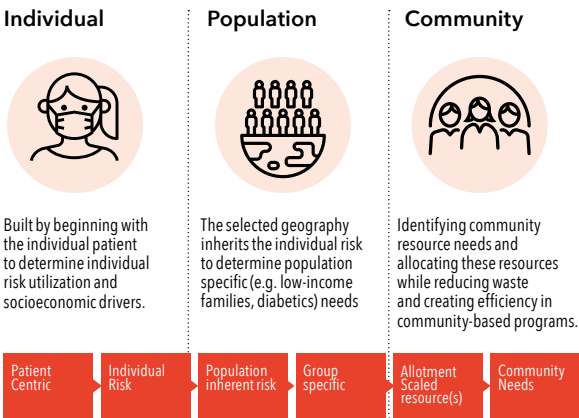
Employment is another major risk factor considered within the map. Income inequality has driven disparities in healthcare outcomes since well before the pandemic, and now low-income communities are particularly vulnerable. These are often the essential workers whose jobs don't allow for social distancing. Many other low-wage service jobs have been shuttered to limit the spread of the virus, cutting off income needed to pay for rent, food and medical expenses.



SPECIAL REPORT: COVID-19

“Resources may be strained, but with data-driven insights, we can make the most of our resources by directing them to the communities that need them most.”

Addressing social determinants of health with AI



Low-income populations are also less likely to have health insurance, which leads many patients to delay treatment they can’t afford. This ultimately worsens outcomes, as patients don’t seek treatment until it’s too late. This effect will only worsen as the pandemic ravages the economy and millions more lose their jobs — and their health benefits.

Understanding the dominant industries in a community can also help predict COVID-19 risk. For example, mining workers are exposed to crystalline silica, which increases the risk of silicosis and lung complications from COVID-19. Data can also show which areas have high concentrations of retail jobs, which either leave workers more exposed to the virus if businesses remain open, or without a job if businesses close. The psychological stress of dangerous or unstable working conditions will likely have a negative impact on COVID-19 outcomes as well.

As illustrated by Jason Hargrove’s death in Detroit, transportation is another important risk factor for COVID-19. Communities that rely heavily on public transportation, particularly those residents with long commutes, are at increased risk of exposure to the virus. Transportation limitations may also restrict access to testing sites, healthcare services, and grocery stores, which could create a need for delivery services and mobile clinics to close the gaps in access.

We also looked at housing instability when we developed the map. Workers who lose their jobs may sacrifice nutrition in order to pay rent, which in turn increases their susceptibility to severe infection. Furthermore, residents of crowded living spaces, such as public housing projects and apartment complexes, share common spaces and surfaces with many others, increasing their risk of exposure. Inadequate housing is also closely linked to environmental health hazards, such as mold, lead, and extreme temperatures, that can weaken defenses against infection.

Saving Lives with Proactive Interventions

Knowing which communities are at risk of severe outcomes, and understanding the socioeconomic and environmental factors driving their risk, can go a long way toward saving lives. As healthcare resources are pushed to their limits by the surge in cases, insights on geographic vulnerabilities can help healthcare providers and community leaders target their resources towards communities that would benefit from them the most.

Community level insights can also assist partnerships of healthcare providers, public health officials, and community aid groups to address the socioeconomic risk factors. This could include providing food delivery and mail-order pharmacy services to keep vulnerable patient populations from leaving their homes. It could also include directing personal protective equipment (PPE) to vulnerable workers, as Detroit has done for bus drivers in the weeks since Jason Hargrove’s death.

As valuable as community level insights can be, we can unlock even more targeted interventions by looking at risk at the level of individual patients. Leveraging the claims data already within Jvion’s AI, we have been able to support our provider customers with COVID Patient Vulnerability Lists, which rank patients by their risk of severe cases of COVID-19, and provide insight on the clinical, socioeconomic and environmental factors driving their risk.

Some of our customers are already using the Patient Vulnerability Lists to deploy mobile testing centers in areas where patients are at increased risk of severe outcomes. Although it comes somewhat late in the city’s crisis, New York City has also adopted this approach, establishing testing centers in the hardest hit neighborhoods in an effort to reduce the disparity in outcomes devastating working class black and Latino communities.

So far, 70% of our customers have received these lists and used them to great effect. Providers have tapped local medical school students to accelerate outbound calls to vulnerable patients, with education and guidance on isolation practices based on their risk. The lists have also supported telehealth initiatives to meet vulnerable patients’ medical needs remotely, without requiring them to leave their homes and potentially exposing themselves to the virus.

As capacity and supply of PPE and ventilators is strained by unprecedented demand, allocating these resources to the communities that will need them most can be a challenge. Near-real time decision making is necessary when patients present in the hospital. Physicians should not, and morally cannot, be put in the position of arbitrarily determining who should and should not receive life-saving care. Jvion’s CORE can be leveraged to help direct patients to the right care near the point of admission to help with the most efficient allocation of critical resources.

As tragedy unfolds in communities across the country, it’s not too late to take action to protect our most vulnerable populations from the devastating consequences of COVID-19. Resources may be strained, but with data-driven insights, we can make the most of our resources by directing them to the communities that need them most. And when the coronavirus pandemic eventually ends, we will be better prepared to save lives in future pandemics. ■



Identify

At-Risk Patients

Analyzing clinical, socioeconomic, environmental, and behavioral data.



Assess

Modifiable Patients

Pinpointing the patients whose outcomes can be changed.



Intervene

Change the Outcome

Providing evidence-based patient-specific interventions integrated into existing clinical workflows.

Jvion enables clinicians and healthcare organizations with the power to predict patient harm, then intercept and course-correct to improve outcomes and save lives.

The impact of our clinical expertise and technology is truly transformative, both in empowering our clients as they care for human life, and in significantly improving operations and financial outcomes for their organizations.

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