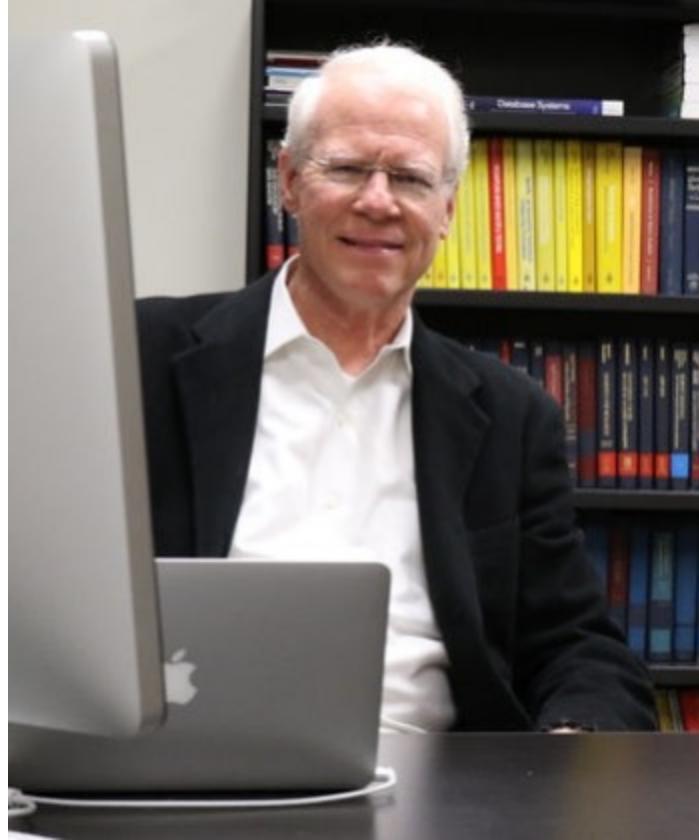


Leading with Data Science: A Key to West Virginia's Pandemic Response

Brad Price, PhD
Assistant Professor, Business Data Analytics
Co-Director, BERD, WVCTSI
Chief Data Scientist, State of WV JIATF

In Memory of E. James Harner



<https://github.com/jharner>



JOHN CHAMBERS COLLEGE OF BUSINESS AND ECONOMICS

DATA DRIVEN WV



Dariane Drake



Ryan Midkiff



Katherine Kopp



Data Driven WV supports the state of West Virginia in advancing its causes, communities, and corporate efforts through providing data-driven technical insights and analytic solutions.

West Virginia Clinical and Translational Science Institute

The project described was supported by the National Institute Of General Medical Sciences, 2U54GM104942-02. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH

Collaborators

- Hannah Bailey
- John Saldanha
- WV Department of Health and Human Resources
- MAJ Ryan Coss
- LT Oliver Weigand
- Members of JIATF
- State of West Virginia
- Salman Nazir
- Nanda Surendra
- WVCTSI BERD Core (Sally Hodder, Wes Kimble)

Major Projects

- Forecasting Personal Protective Equipment in Emerging Pandemic Setting
- Forecasting COVID-19 Outbreaks using an Epidemiological take on LSTM
- Inventory Management for Vaccine Distribution Using Shiny
- How Many Vaccines Have Been Given to WV Residents?

Spring 2020



Critical Supply Shortages — The Need for Ventilators and Personal Protective Equipment during the Covid-19 Pandemic

Megan L. Ranney, M.D., M.P.H., Valerie Griffeth, M.D., Ph.D., and Ashish K. Jha, M.D., M.P.H.

Nursing homes cite shortages of masks, gloves, gowns and other PPE

BY KHRISTOPHER J. BROOKS

OCTOBER 29, 2020 / 9:09 AM / MONEYWATCH



#StayHomeWV

OFFICE of the GOVERNOR
Jim Justice

Stay at Home Order

To further combat the spread of COVID-19 in West Virginia, Gov. Justice issued a Stay at Home Order today, directing all West Virginia residents to stay at home and limit movements outside of their homes beyond essential needs.

YOU CAN

- Go to the grocery, convenience, or warehouse store
- Go to the pharmacy to pick up medications and other healthcare necessities
- Go to medical appointments (check with your doctor or provider first)
- Go to a restaurant for take-out, delivery, or drive-thru
- Care for or support a friend or family member
- Take a walk, ride your bike, hike, jog, and be in nature for exercise – just keep at least six feet between you and others
- Walk your pets and take them to the veterinarian if necessary
- Help someone to get necessary supplies
- Receive deliveries from any business which delivers

YOU SHOULD NOT

- Go to work unless you are providing essential services or work for an essential business as defined by the Order
 - Order available at governor.wv.gov
- Visit friends and family if there is no urgent need
- Maintain less than six feet of distance from others when you go out
- Visit loved ones in the hospital, nursing home, skilled nursing facility, or other

What is the difference between "Stay at Home" and "social distancing"?

Stay at home is a stricter form of social distancing

Stay at home means:

- Stay home (stay unexposed and do not expose others)
- Only go out for essential services
- Stay six feet or more away from others
- Don't gather in groups

It Was Then We Got the Call

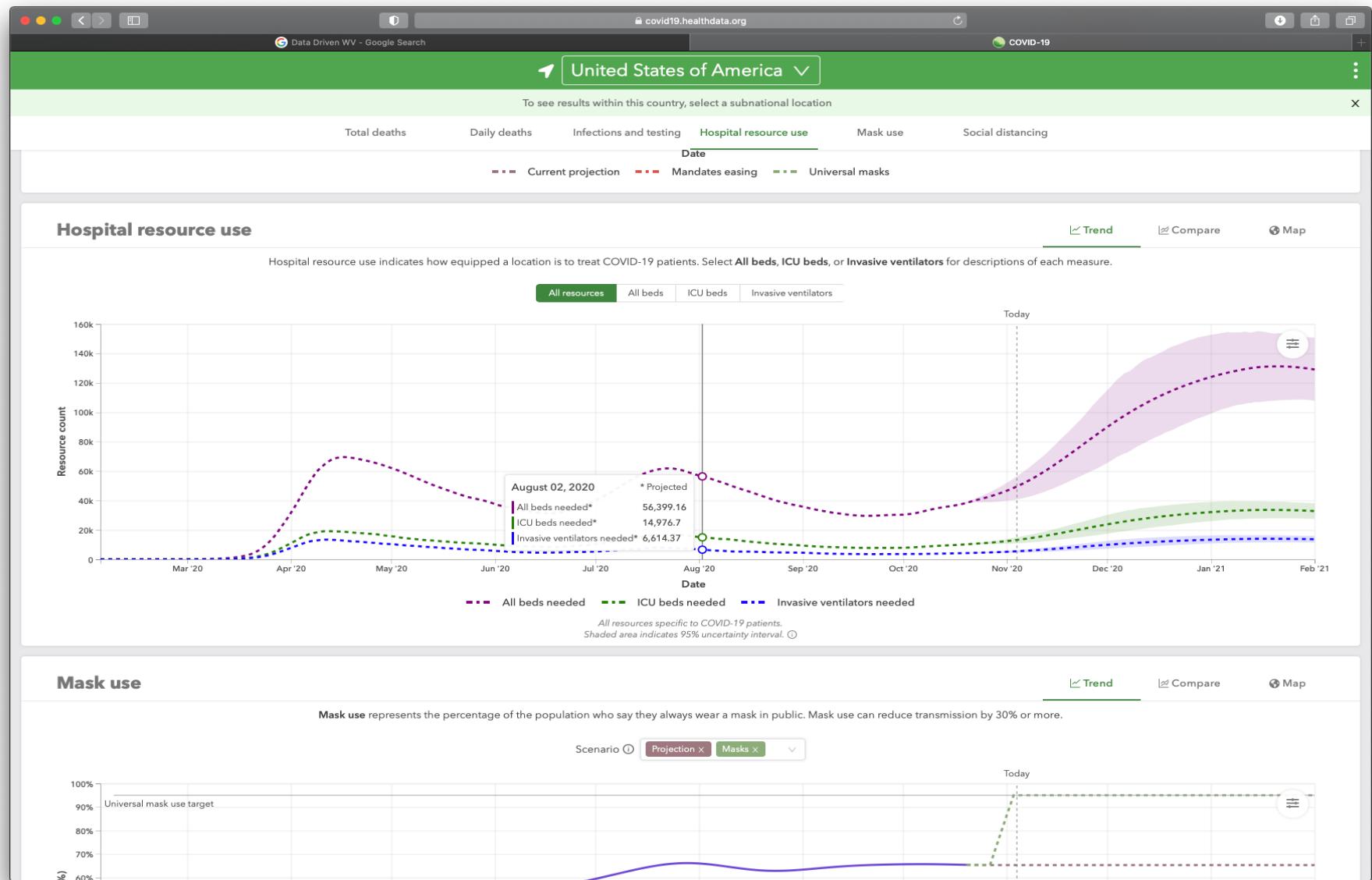
*Can we predict PPE needs at
a healthcare facility level?*

...and for about 10,000 beds at long-term care facilities?



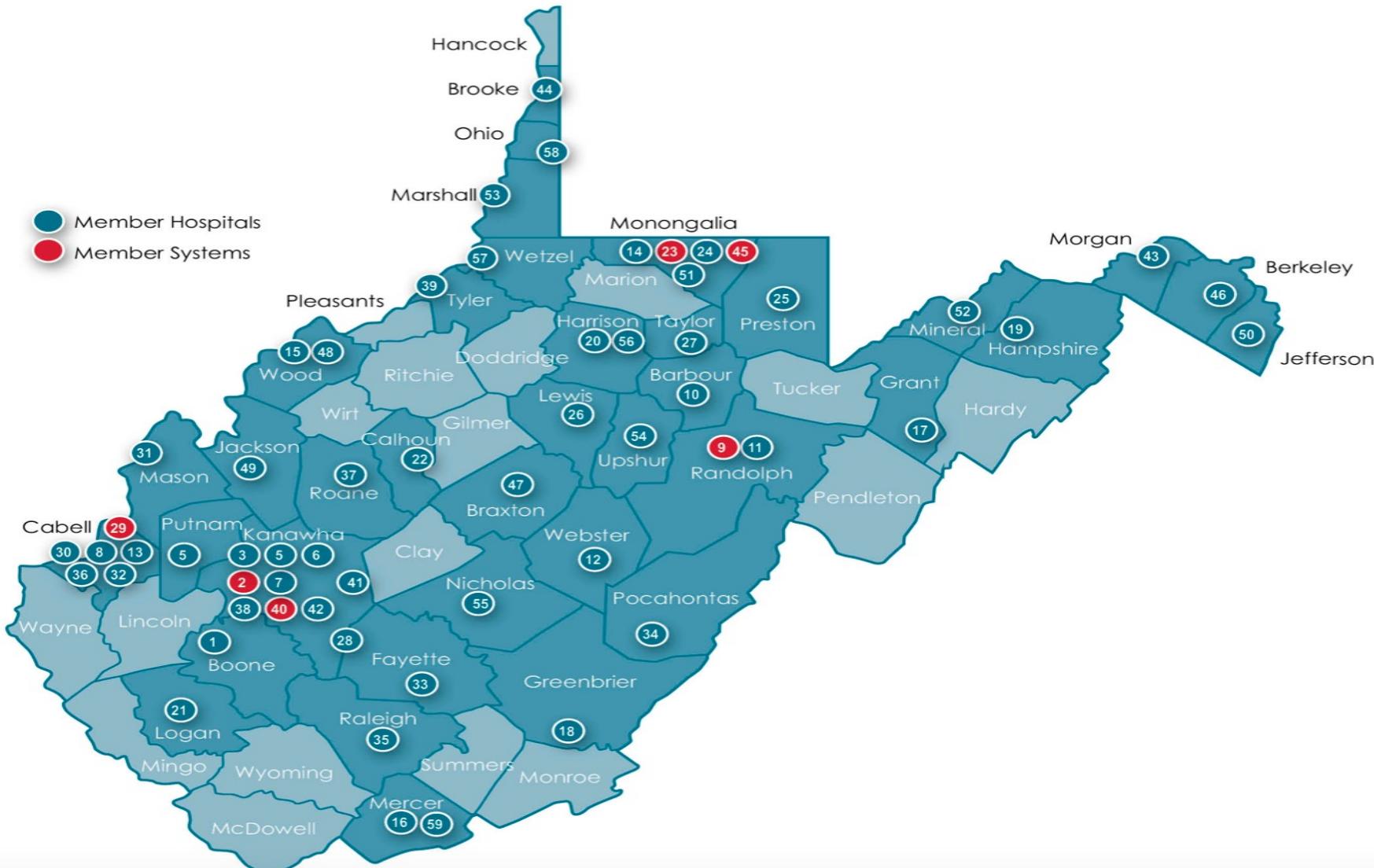
One of the areas I am proudest of is our innovation and focus on self-sufficiency. As part of the National Guard's role in the pandemic response, they coordinated acquisition of a 6 month supply of PPE and because many items were challenging to acquire early in the pandemic, we started to manufacture much of our own PPE.

- Dr. Clay Marsh, COVID Czar, JIATF Leadership, State of West Virginia



West Virginia Hospital Association

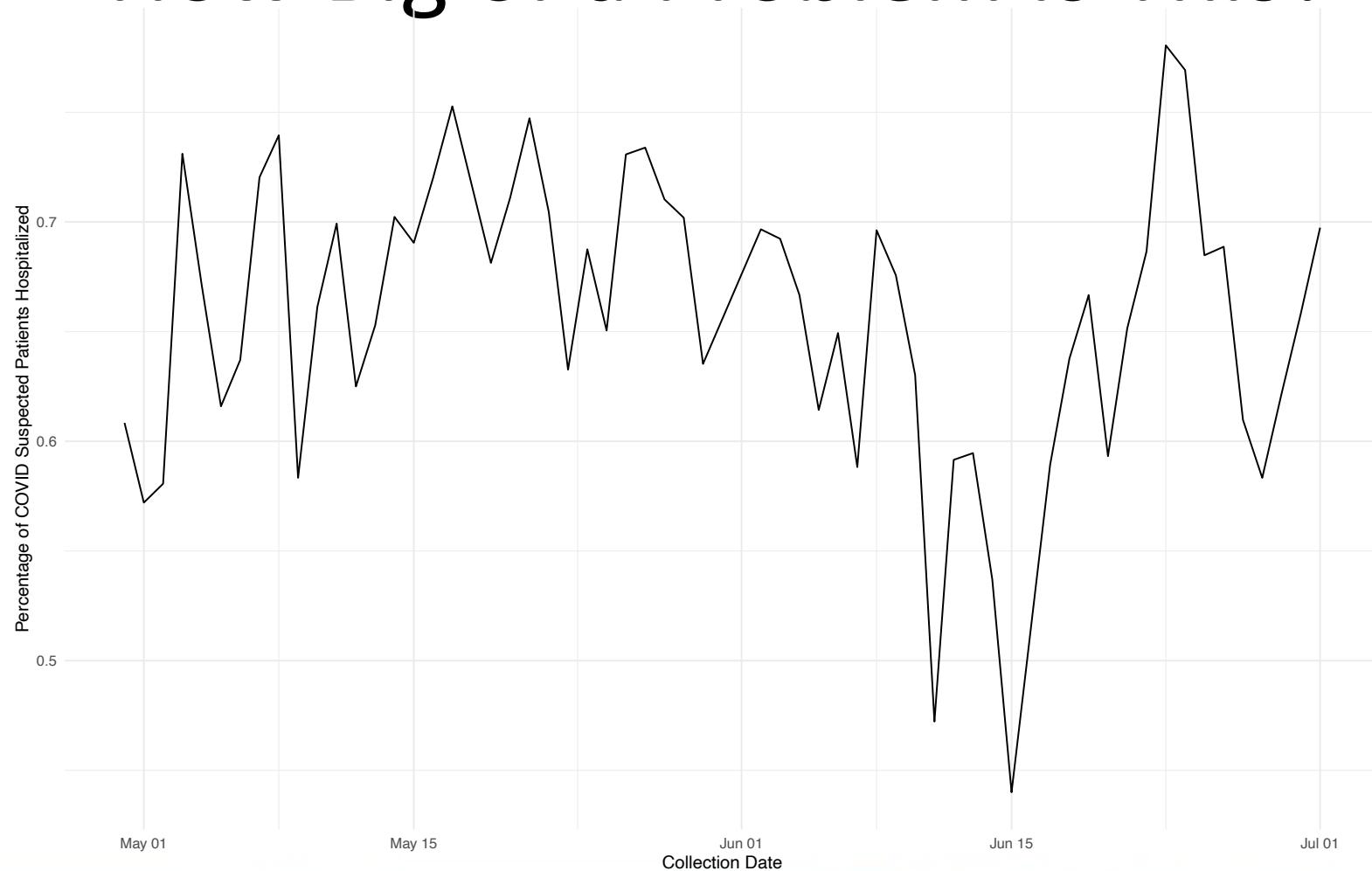
64 Member Hospitals and Health Systems



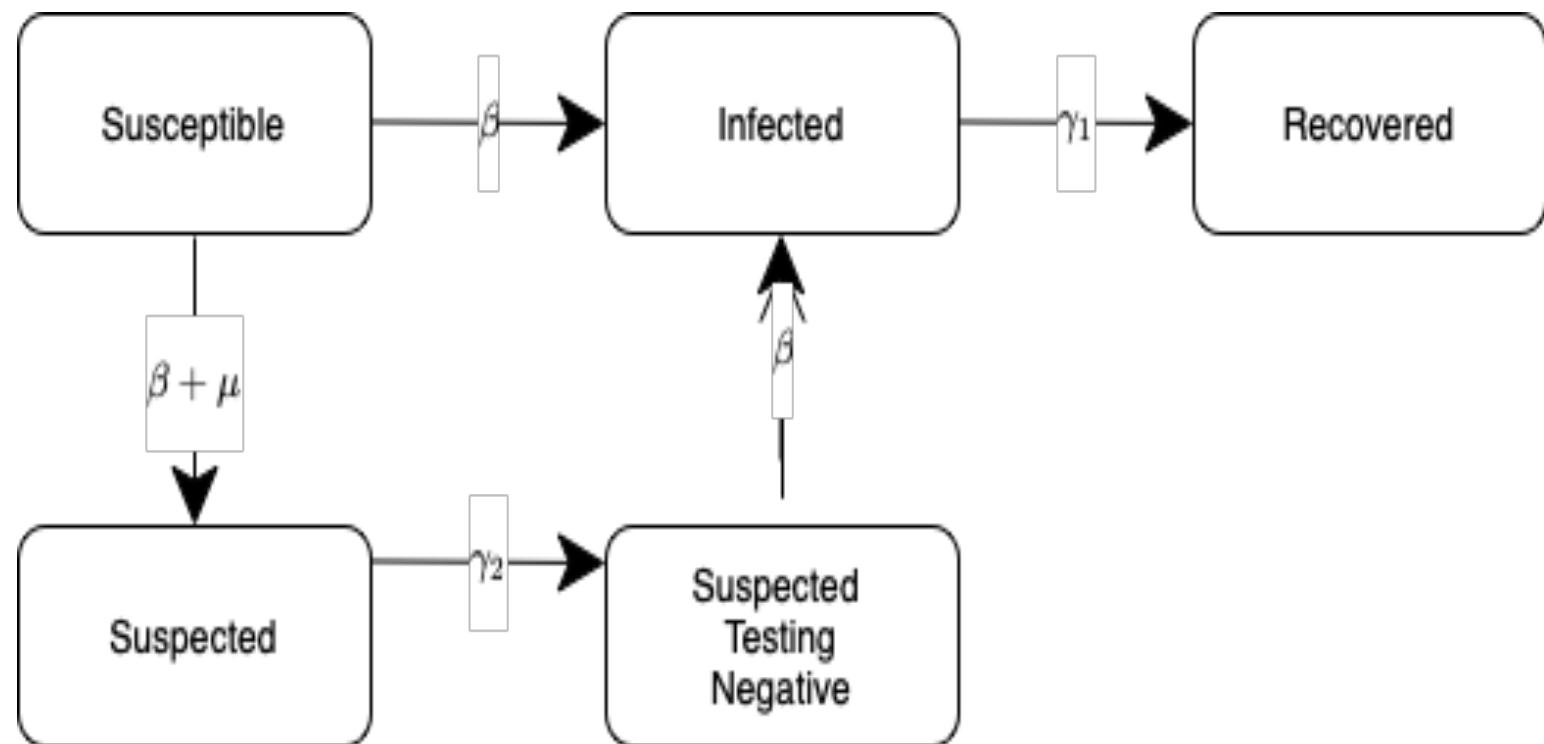
The Two Big Differences

- We needed to account for how people travel for and engage with healthcare in rural states
- PPE usage increased for more than just confirmed COVID-infected patients
 - Infected Patients
 - False Positives
 - Patients who are suspected to have COVID
 - 2/3 Aren't Accounted for in Epi Modeling!
- *PROBLEM: No guidance on usage from CDC!*

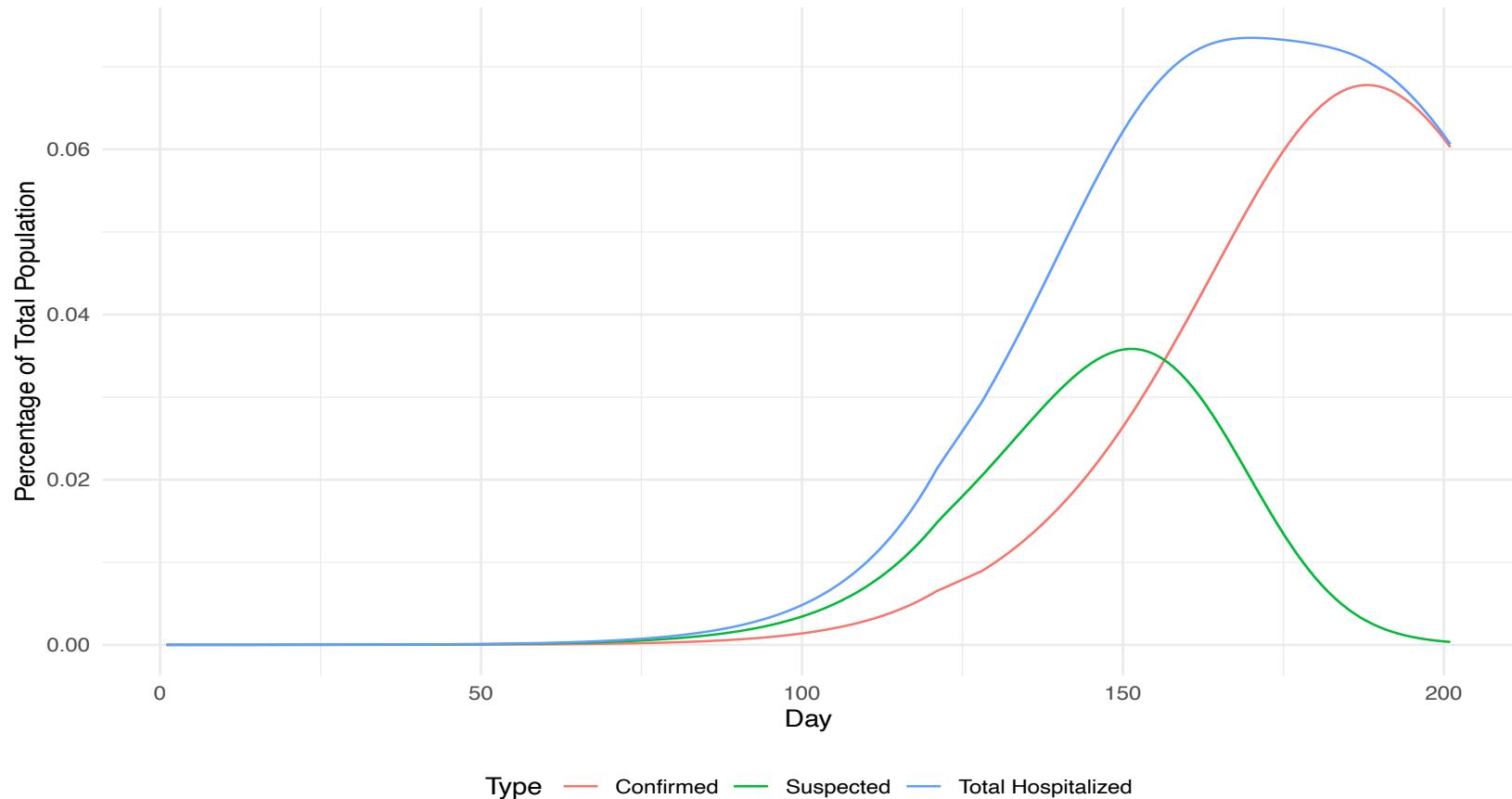
How Big of a Problem Is This?



S(HS)IR



How Does That Help?



Where's the Data Coming From?

- Daily Survey from WVHA Provides Facility Level Info
- How Do We Know the Susceptible Population at Each Facility?
 - County Level Admission Data to ER
 - Regional Market Share Info for Each Facility
 - Cross Reference with Census Population Data
 - Daily doubling rates tracked by WVNG

Data, Data, and More Data

- Rates are Calculated from Each County Department of Health and Aggregated over the footprint of the EMS regions
- Hospitalizations are then Calculated as A Rate of the Historic Infections Relative to the Hospital Footprint
- A **TON** of Local Information In This Model
 - Mixes Epidemiological and Business Concepts

Taking it Back to PPE

- WVHA PPE Supply Survey
 - How Much is On-Hand?
 - How Long Will It Last?
 - Gowns, N95 Masks, Surgical Masks, Gloves, Eye Protection
 - Data Evolved With National Priorities

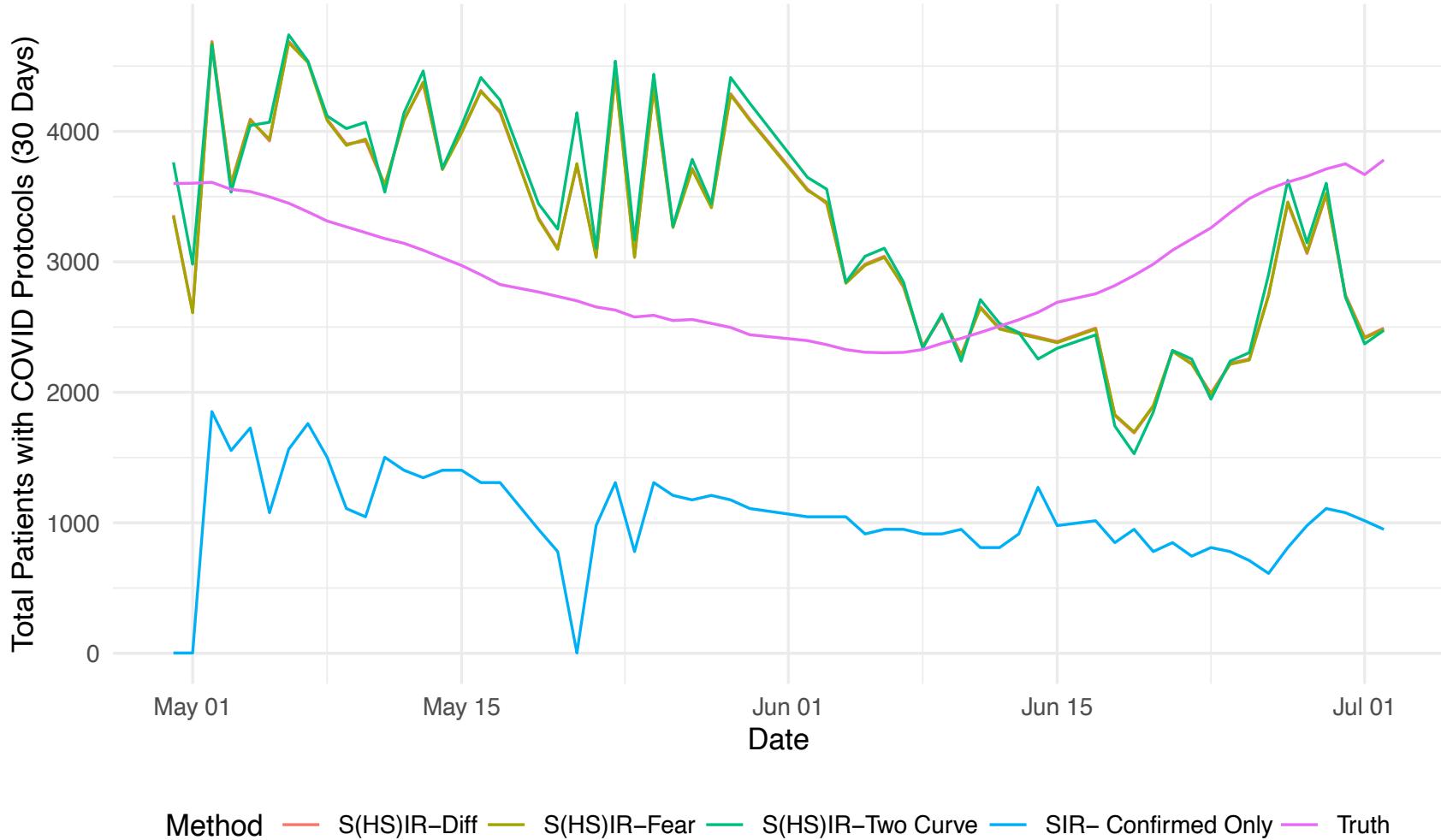
Now It's Just Math!

- Facility Level Forecasted Number of Patients
- Facility Level PPE Usage Per Patient

Outcomes

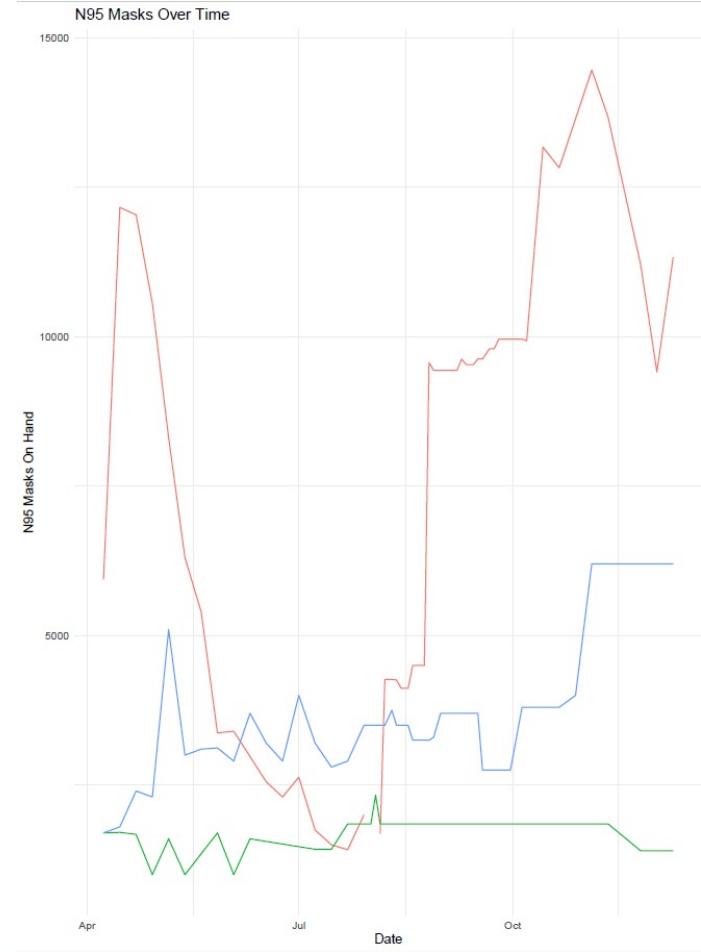
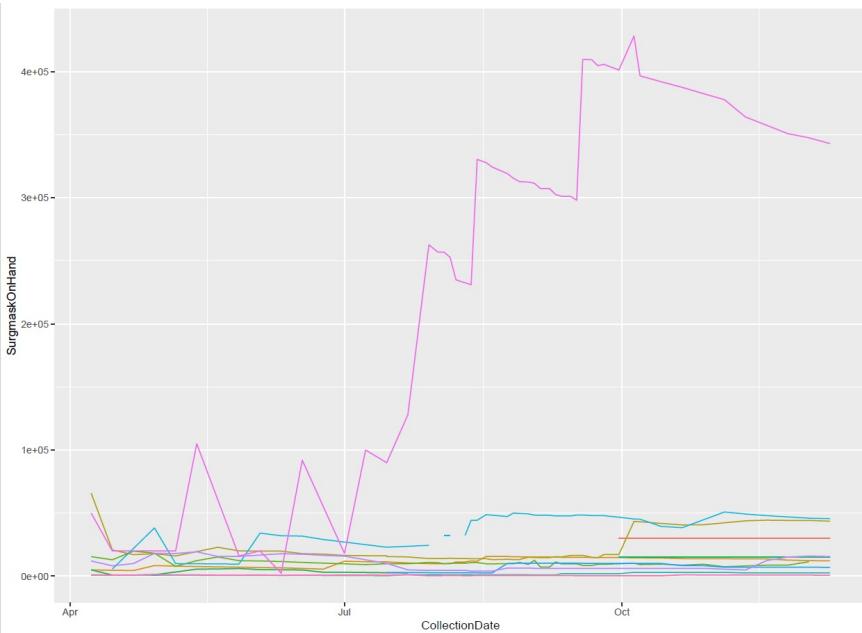
- Monitored and successfully maintained supply for 65 weeks
- No shortages in the state





Things We Learned

- National COVID-19 models are not “one size fits all”
- PPE usage varies greatly among facilities
- Large scale problems can be solved through collaborative partnerships



Speaking of Collaborative Partnerships...

State Task Force is the Engine Driving West Virginia's Vaccine Success

Release Date	Release Number
March 8, 2021	R3-21-NR-022

Release Date: March 8, 2021

PHILADELPHIA - If West Virginia's successful vaccine rollout is a speeding car, then the Joint Interagency Task Force (JIATF) is its engine – and the agencies on it are the pistons revving it up.

Once the COVID-19 vaccines became available, Gov. Jim Justice created the JIATF by executive order in December 2020 to map out a course of action for getting shots in arms.

Vaccine Distribution in West Virginia

- Opted out of the Federal Pharmacies Programs
 - CVS, Walgreens, Walmart, Target “are in town”
 - Many Long-Term Care Residents (First Priority)
- Shipments Require Boxes or Trays to be Ordered
 - Rural State (55 Counties, Hills and Hollows)
 - Demand Sparse
 - Dis/Mis-Information
- Demand Will Exceed Supply
 - Communication of Expectations and Priority Groups

Vaccine Distribution in WV

Who Needs What?

JIATF Stakeholders serve as liaisons with providers to get need



DEMAND?

Fri-Tues

FIRST PASS OF REVIEW

Wed AM

WHO GETS WHAT?

Wed PM

WHERE AND WHEN DO WE GET VACCINE?

Thur PM

DISTRIBUTE VACCINE TO PROVIDERS

Distribution Of Vaccine

Get shots in Arms!

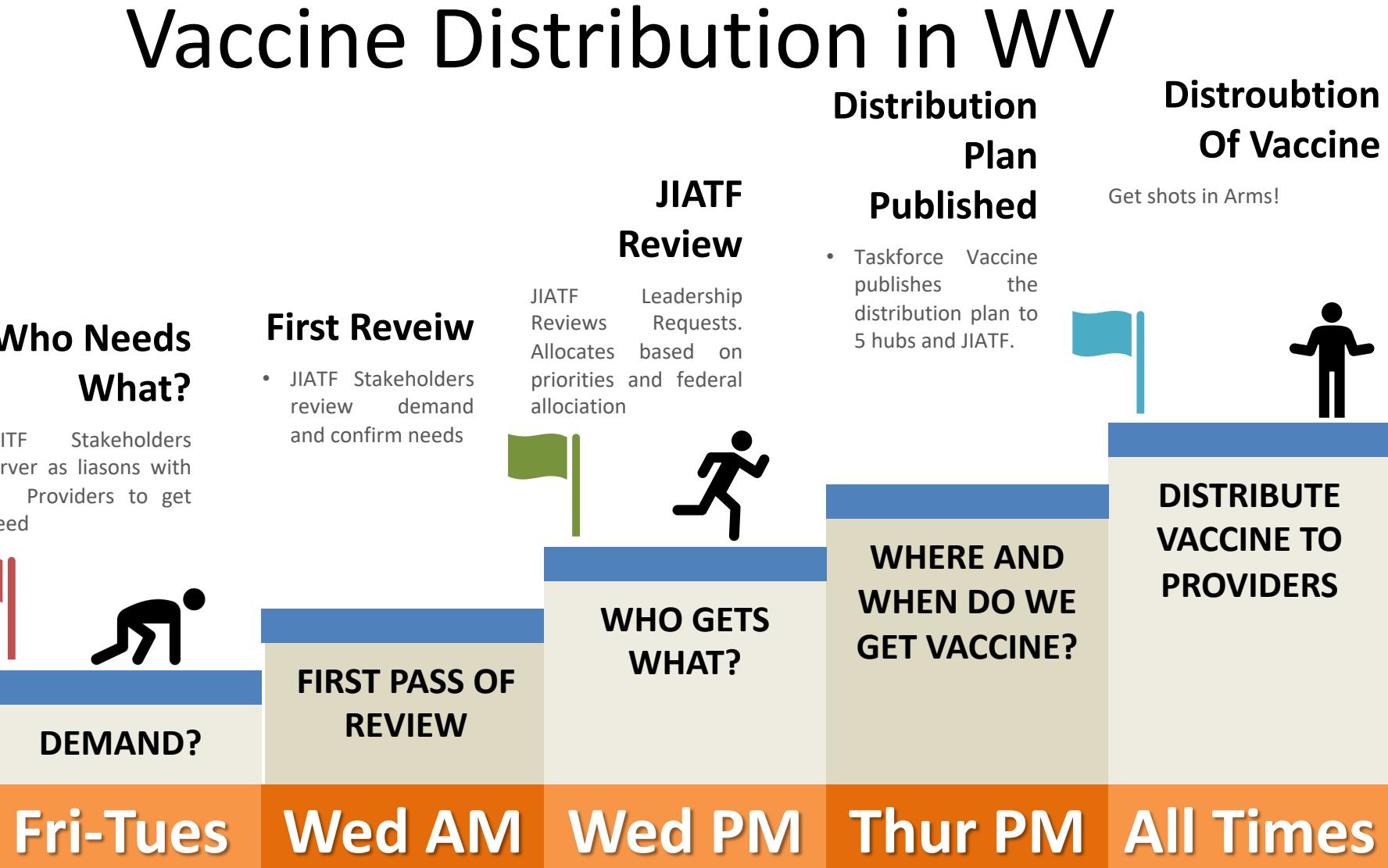


Distribution Plan Published

- Taskforce Vaccine publishes the distribution plan to 5 hubs and JIATF.

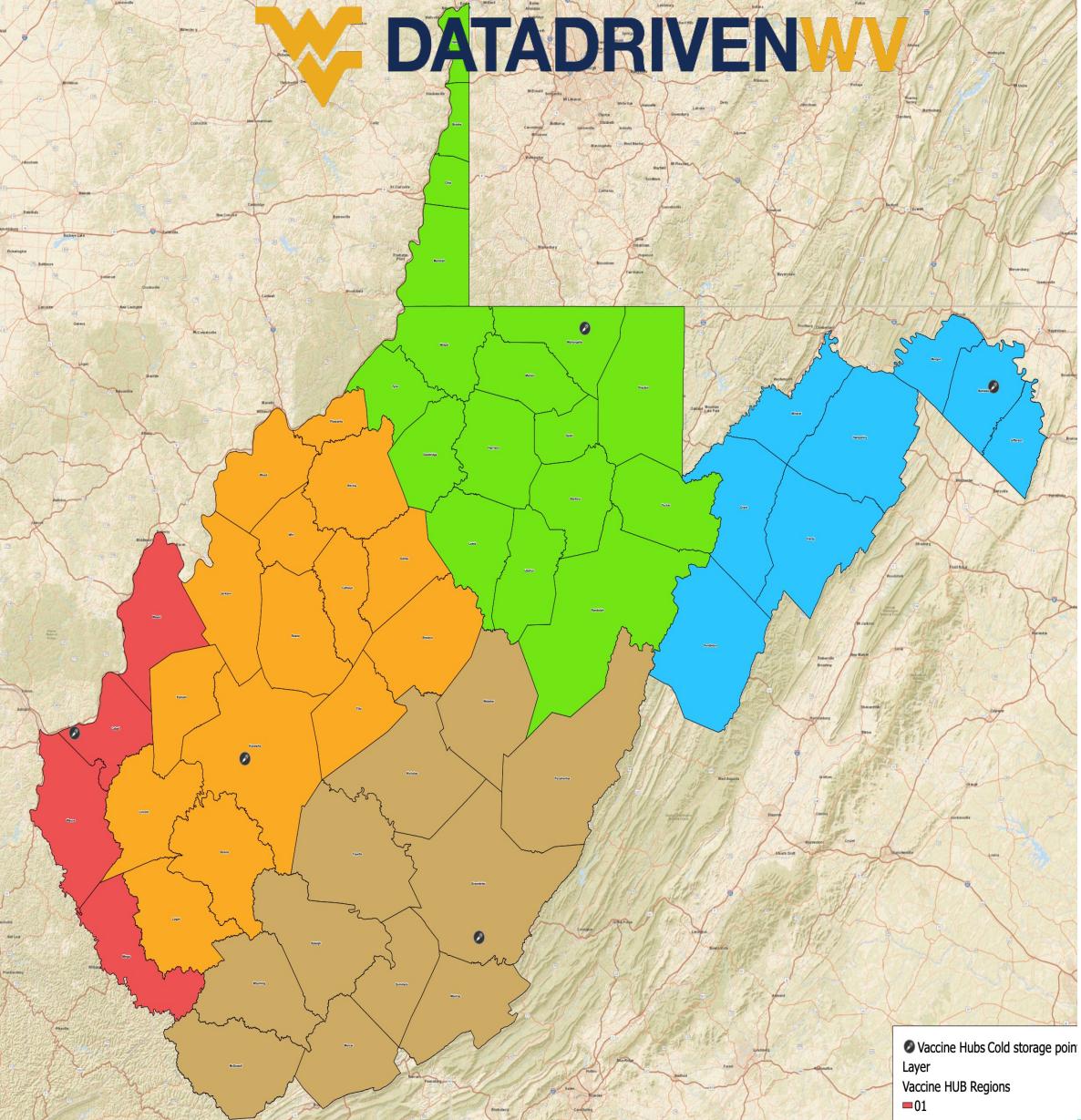
JIATF Review

JIATF Leadership
Reviews Requests.
Allocates based on
priorities and federal
allocation





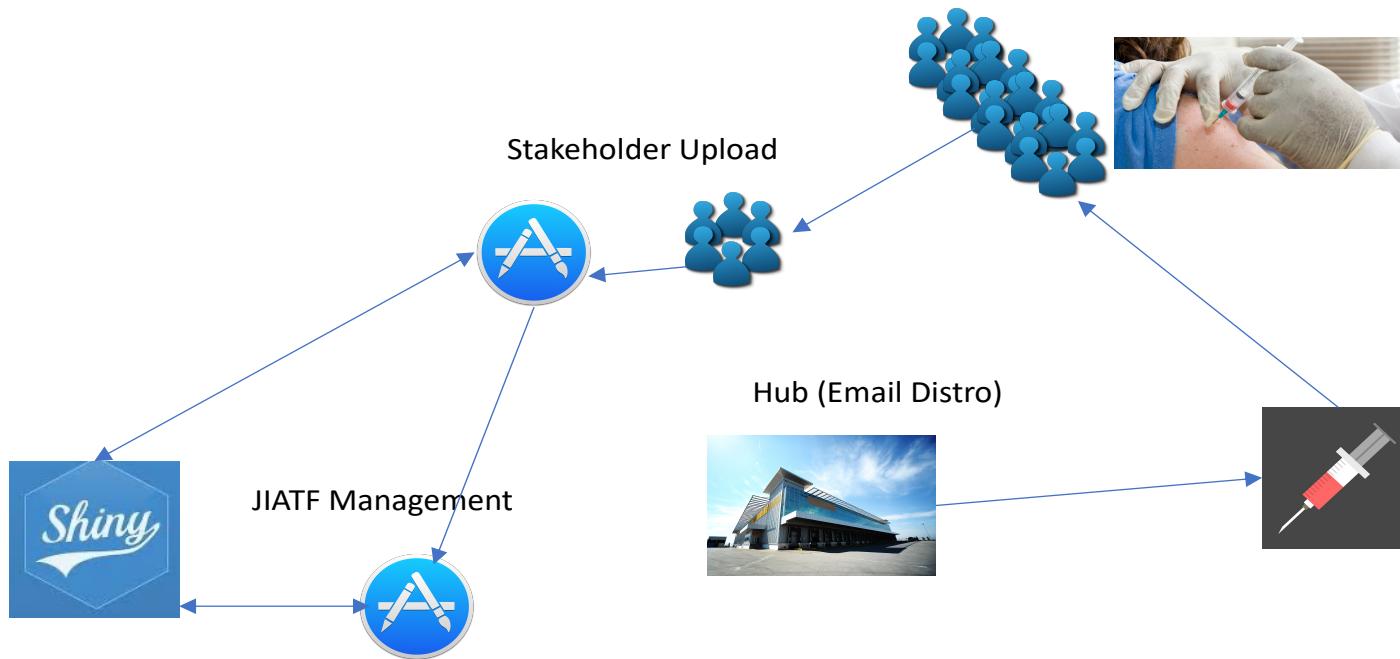
DATADRIVENWV

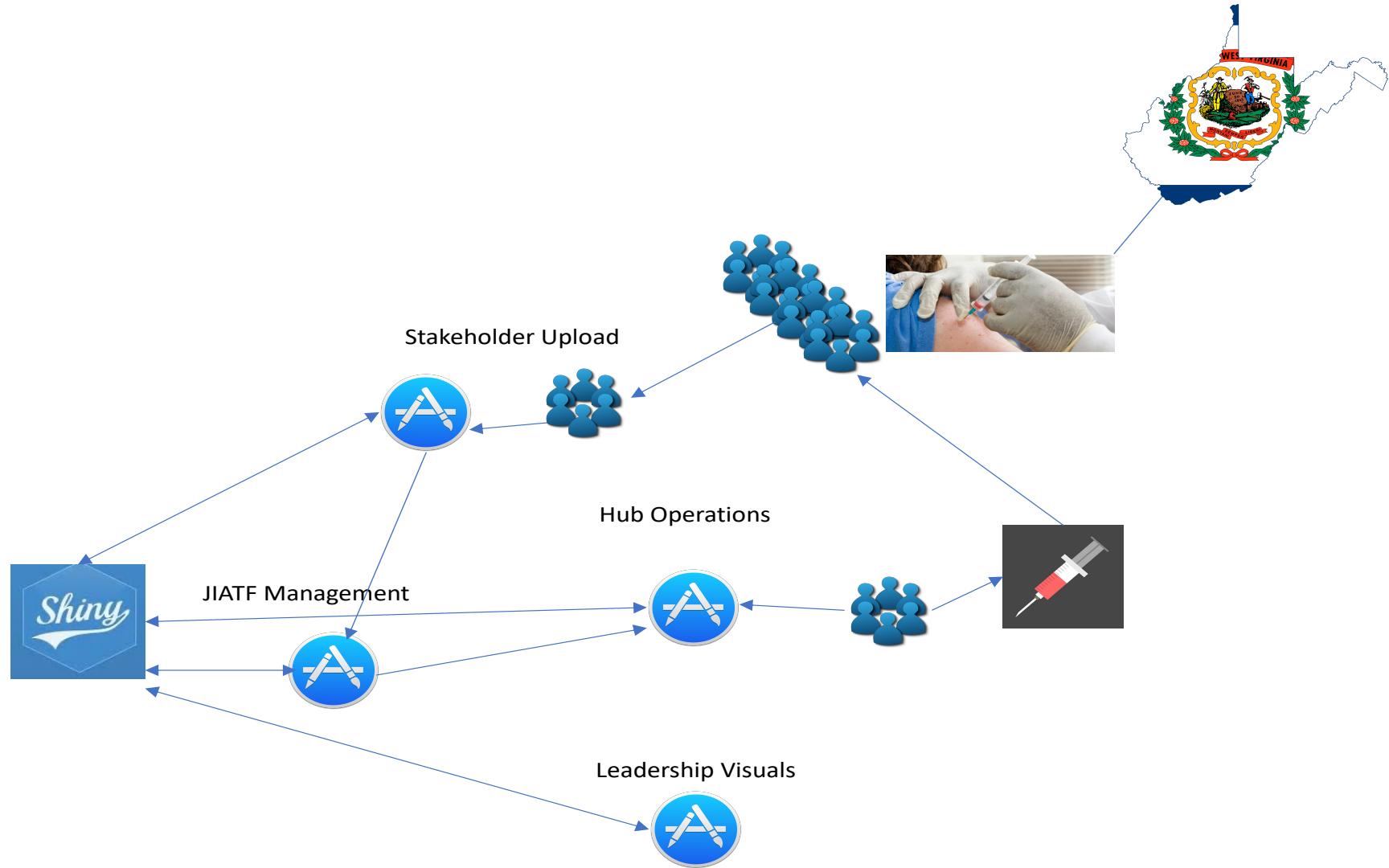


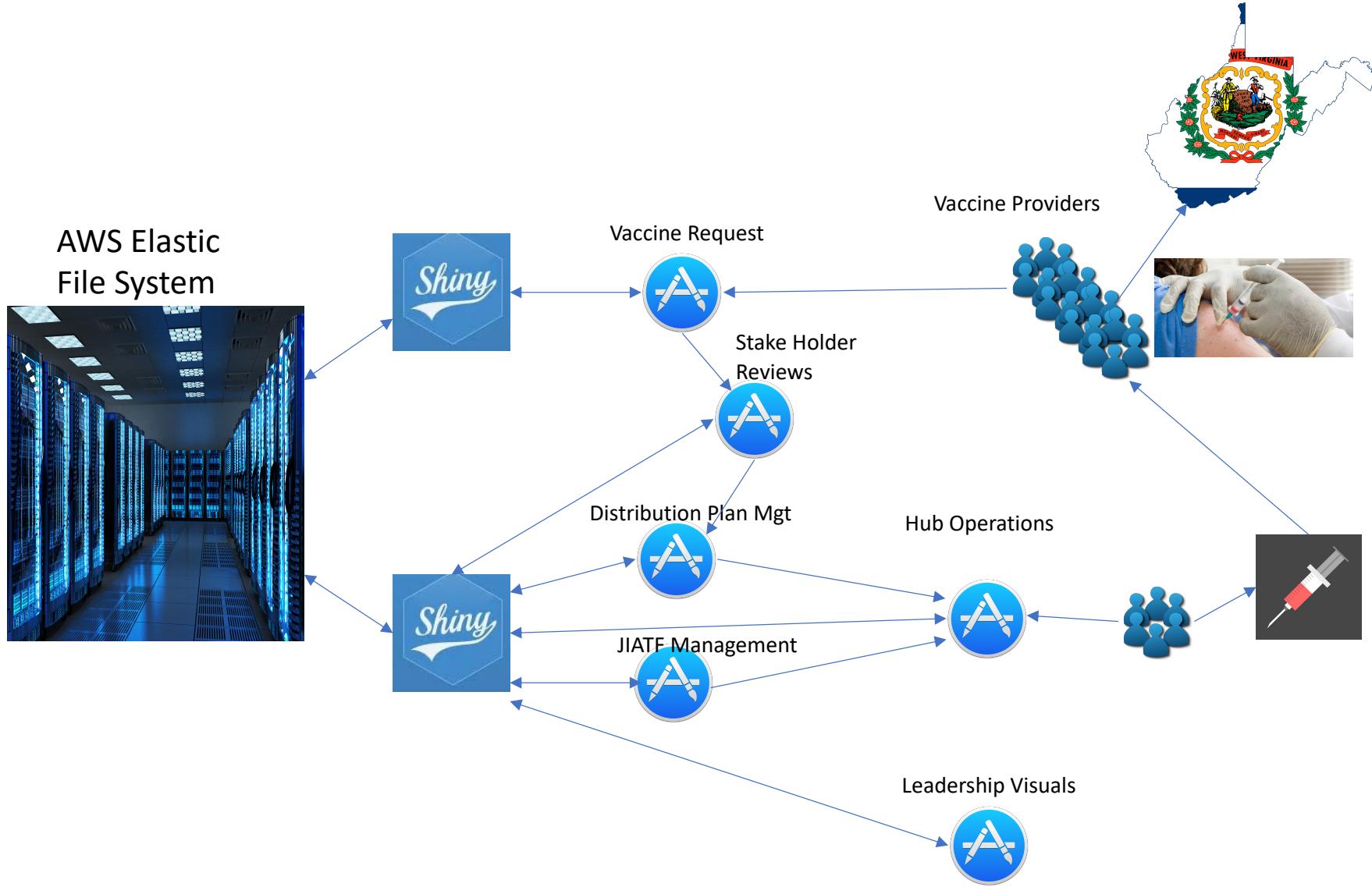
- **From Need to Needle to Arm:** WV's Emergency Inventory Management System (EIMS) is designed to provide WV leadership with fully visibility in the vaccine distribution.
- Version 1: Shiny Based solution with 9 applications in "Hyper Agile" development over a 3 week Period
- Only leadership needs access.
- Dynamic changes in vaccine distribution.
- Version 2: Shiny based solution with 6 applications.
- Management Portal and Provider Portal with over 2k users
- Assisted in over 1.6 Million Doses of Vaccines in WV Residents
- Currently partnering with other states and countries to share insights

Principles of EIMS Development

- ``Hyper Agile'' Development
 - Scope changes by the hour
 - Requirements are dynamic
 - Errors are going to occur
 - Empower the end-user
- No State or Federal Systems
 - Systems that exist aren't built for dynamic settings
- Minimal Viable Product And Then Make Nice
 - “That's a tomorrow problem”
- Small Foot Print
 - No large database structure
 - Small Servers
 - Cheap/Open Source (Taxpayer Dollars)







Thank You!

Any Questions?

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