

FLIGHT TO THE FUTURE: PREDICTING DRONE DELIVERY

**Potential and Infrastructure
Gaps for Critical Aid in Rural
West Virginia.**

This isn't just a dashboard—it's a feasibility study showing where drone delivery would make the biggest impact in West Virginia and how the state could implement it.



THE MISSION

Flight to the Future explores how drone technology could address medical and food access gaps in rural Appalachia — specifically in West Virginia.

The goal is to visualize where communities face the greatest barriers due to limited broadband, poor healthcare access, food insecurity, and natural hazards — and identify where drone-based delivery could have the biggest impact.



DATA OVERVIEW

I started by compiling and cleaning data from several public sources:

USDA Food Access Atlas:
for food desert information



Medical Need Index (MNI) dataset:
for healthcare shortage areas



FCC Broadband Data Collection:
for internet access by county



FEMA National Risk Index:
for natural hazard vulnerability



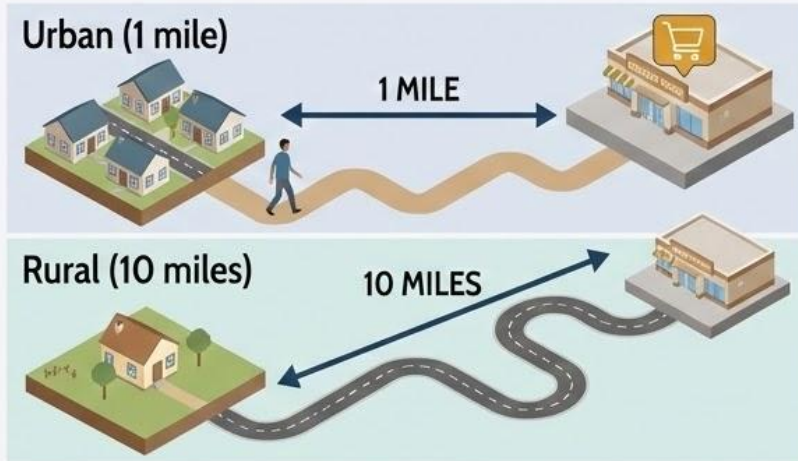
Data Cleaning & Merging
(Python & Power BI)



Each dataset required cleaning, normalization, and merging before visualization.

What Is a Food Desert Tract?

Definition & Distinction



A **food desert tract** is a Census-defined neighborhood where residents have both **low income** and **low access to healthy food**. This differs from a general Food Desert; it's not a literal desert but an area where families struggle to reach a grocery store.

Overlapping Challenges in West Virginia



**Limited Transportation
& Weak Infrastructure**



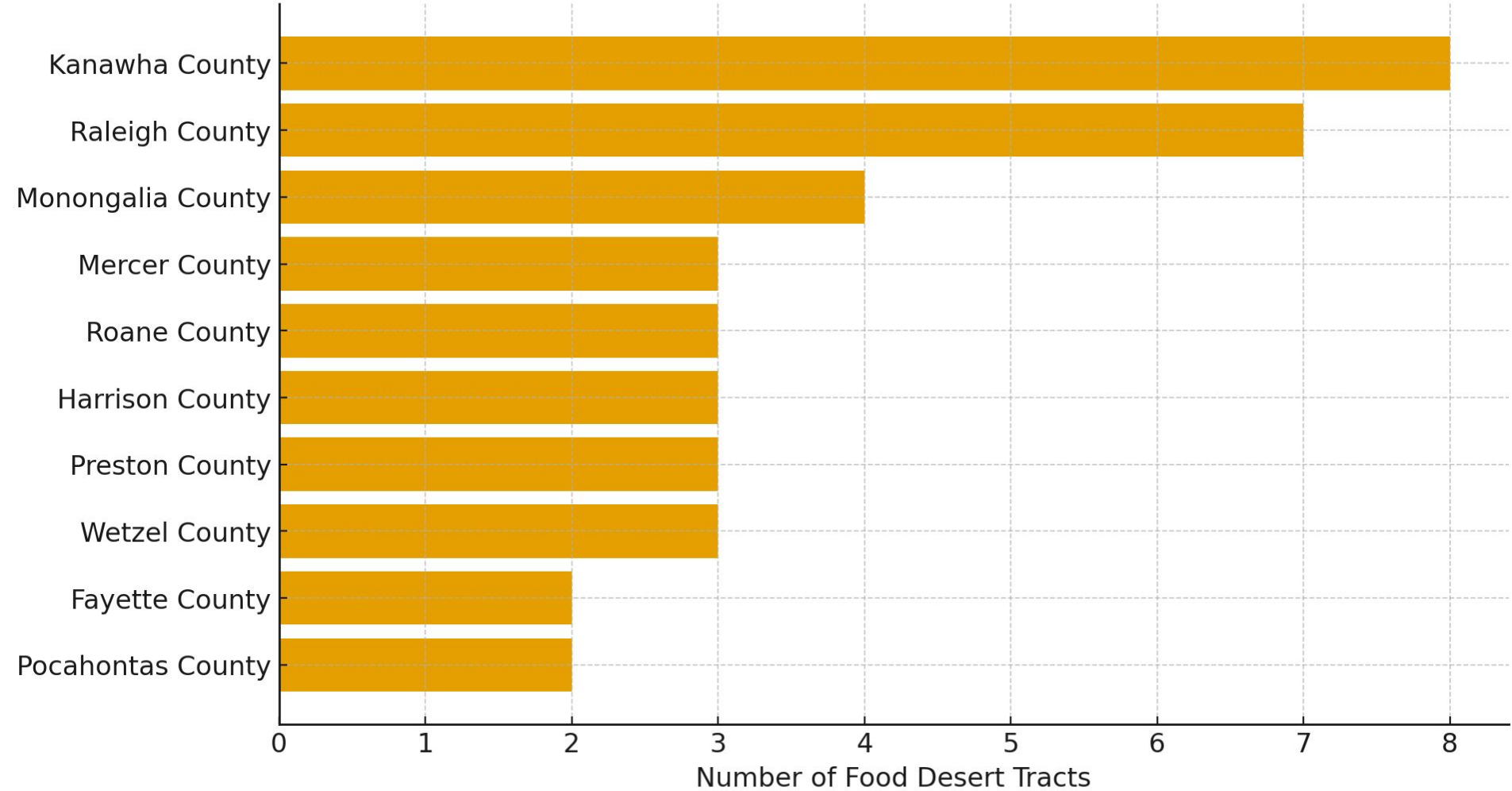
Poor Broadband Access



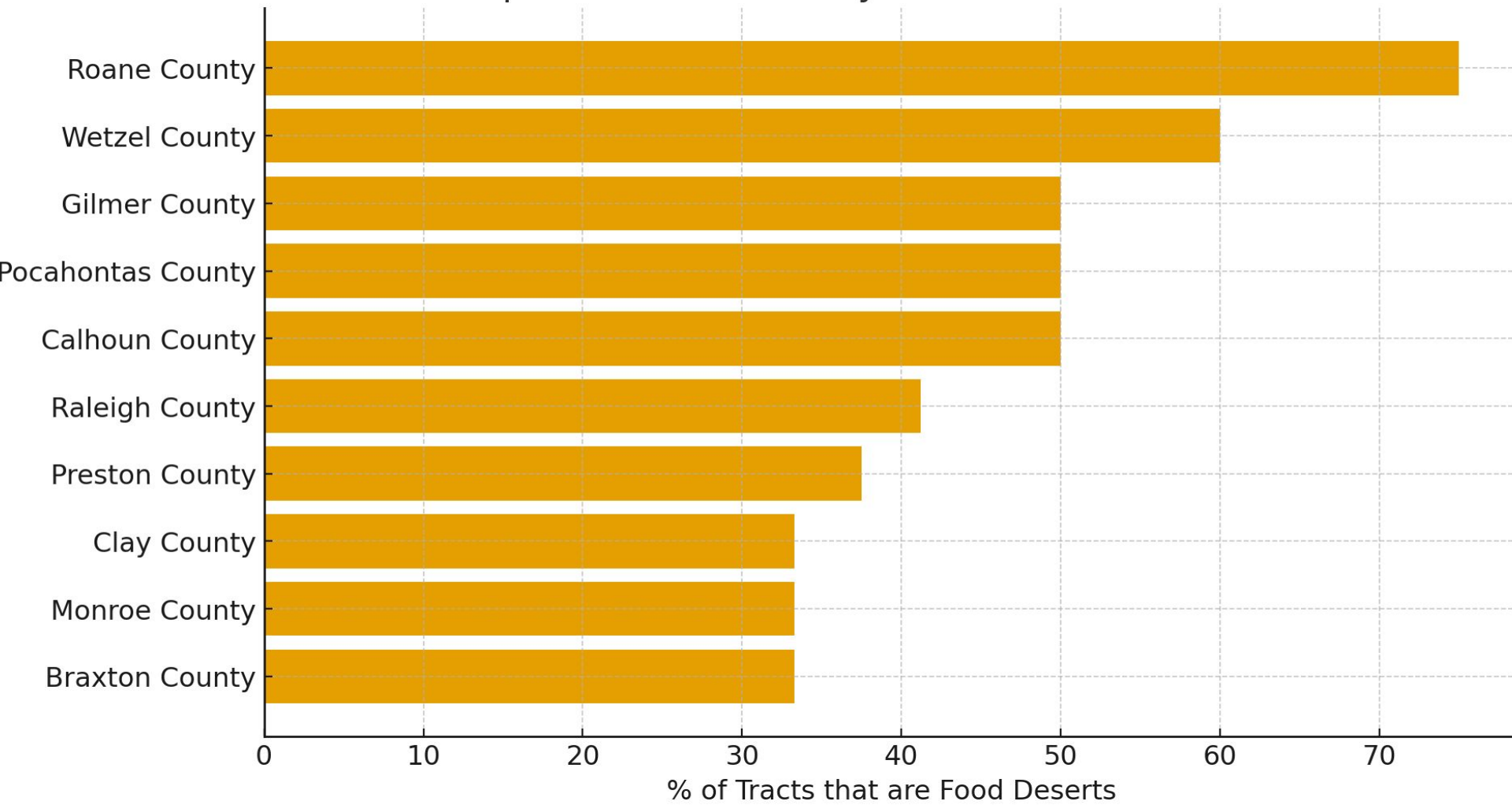
**Healthcare Shortages &
Disaster Vulnerability**

These **structural challenges** frequently overlap, creating compounded barriers to health, nutrition, and essential services for communities.

Top 10 WV Counties by Number of Food Desert Tracts






Top 10 WV Counties by % of Food Desert Tracts



What Is a Medical Need Index (MNI)?

A **composite indicator** that evaluates medical access barriers across West Virginia counties. It integrates three critical factors:

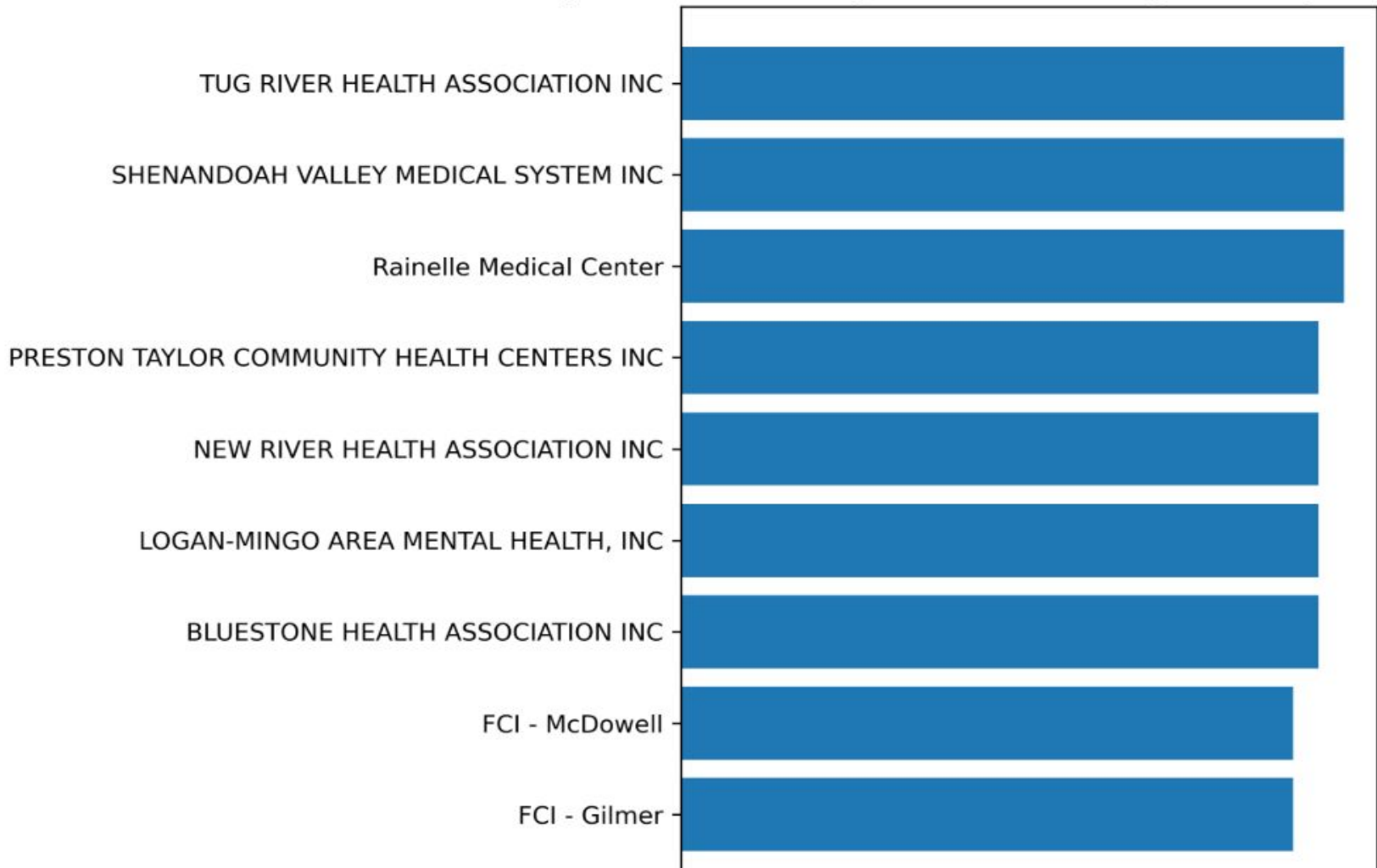
- **Food Desert Severity** 
- **Broadband Availability** 
- **FEMA Infrastructure/Hazard Risk** 

Counties with **higher MNI values** experience overlapping challenges that make it harder for residents to obtain medical services.

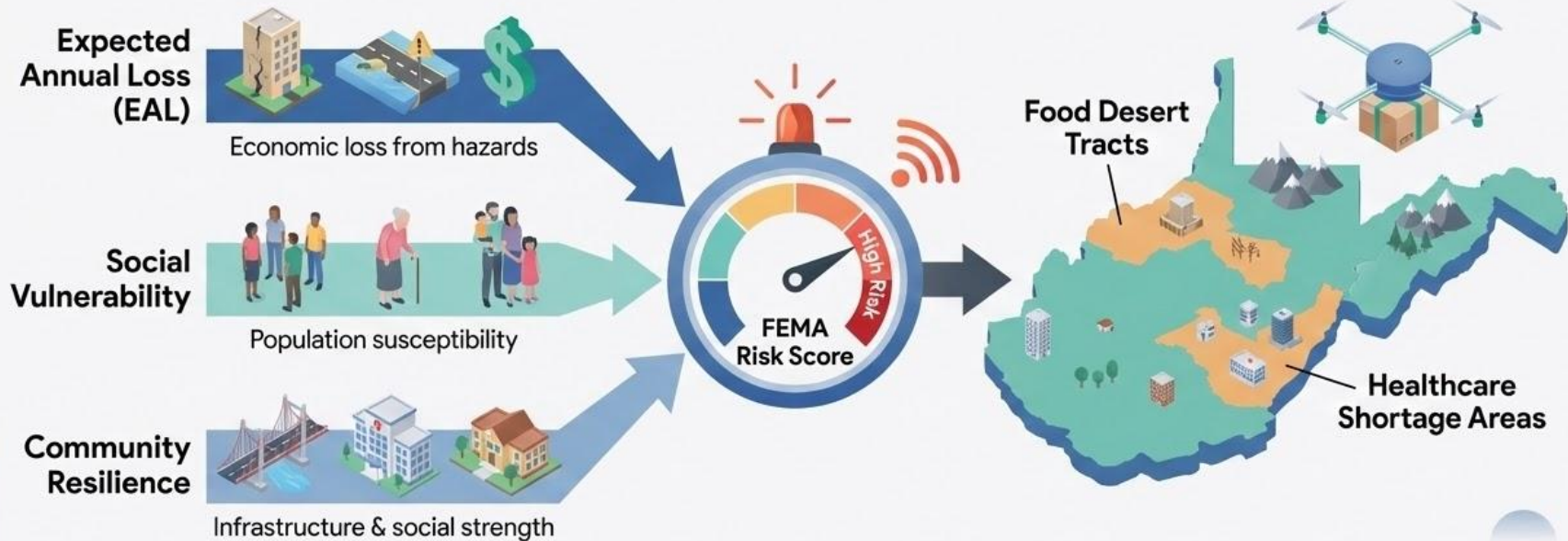
Health Professional Shortage Area (HPSA) scores are transformed into the MNI for combination with food access and disaster-risk measures in Power BI.



Top 10 WV Facilities by Healthcare Shortage Severity (HPSA Score)



What Is a FEMA Risk Score?



A higher score means greater risk of disruption. In WV, high risk often overlaps with food deserts & healthcare shortages, making drone delivery crucial.

What Is Expected Annual Loss (EAL)



Imagine you “look into the future” and estimate how much money a community could lose every year from disasters.



EAL estimates annual financial loss from natural hazards like floods, landslides, or severe storms.

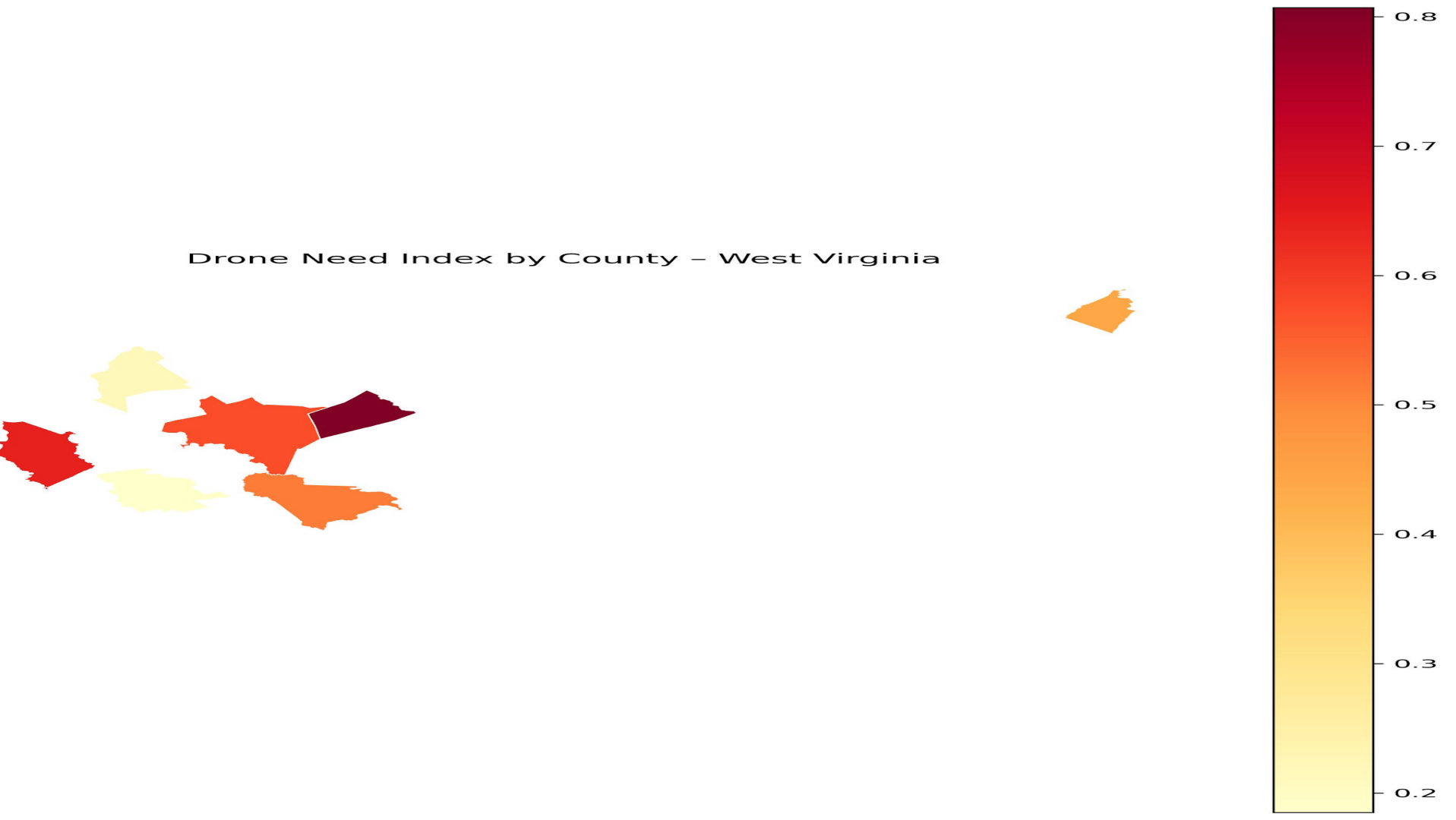


A higher EAL means the county is more exposed and financially vulnerable.



This helps identify counties where infrastructure risks compound food and healthcare access issues, making drone-based delivery models potentially more urgent and valuable.





Where Should The Drones Fly First?

These are the places I recommend for the first drone routes, because they have **stacked vulnerability** and the least traditional access. Rural counties like Roane and Wetzel with very high food-desert percentages, and larger counties like Kanawha and Raleigh that have both multiple food desert tracts and larger populations.



What type of drones are best for West Virginia?



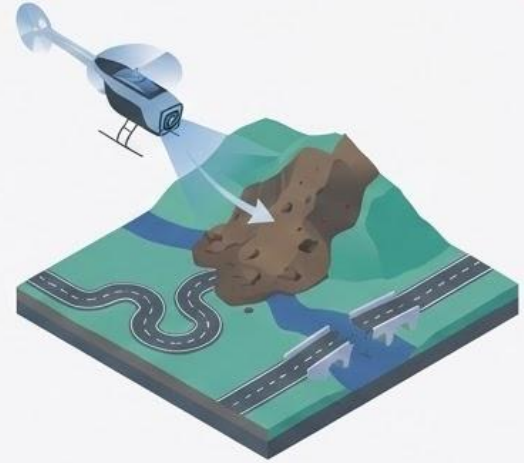
VTOL fixed-wing (hybrid) drones

- Ideal for West Virginia's long distances and mountains.
- Can launch from a small pad at a hospital or warehouse.
- Fly 20–40 miles over ridges.
- Drop a 5–8 lb box of medicine or food at a community pickup site.



Multirotor drones (quads/hexacopters)

- Perfect for the last-mile into narrow hollows and small clearings.
- Can hover and lower a package exactly where needed.
- Accesses locations with no good road.



Small "scout" drones for roads & landslides

- Used for aerial surveying and reconnaissance.
- Let counties see if a road is blocked or a bridge is out.
- Helps decide when it's safer to send a drone instead of an ambulance or box truck.

What funding model could West Virginia use to launch and sustain a drone delivery program?

In the first phase, I wouldn't ask counties to buy all this themselves. I'd stack different funding sources to run a 1–3 year pilot.

Phase 1 – Grant-funded pilots (1–3 years)

Federal

Rural health & telehealth grants (HRSA)
Rural food access & infrastructure grants (USDA)
Hazard-mitigation & resilience funding (FEMA)
Smart transportation / advanced air mobility pilot funds (USDOT-WVDOT)

State



Local



Hospitals & Insurers

Health systems pay in because of "value-based care" logistics. Drone delivery of meds can prevent ER visits and re-admissions. That's cheaper than ambulance rides or long ground deliveries.



Private & Philanthropic

Partnerships with drone companies that want real-world pilots in Appalachia.
Foundations focused on rural health, food insecurity, and Appalachia.

Phase 2 – Transition to a contracted drone-delivery service rather than owning the fleet.

Once proven, transition to a licensed drone operator service for predictable costs and improved outcomes.



Reduced hospital readmissions & ER visits.



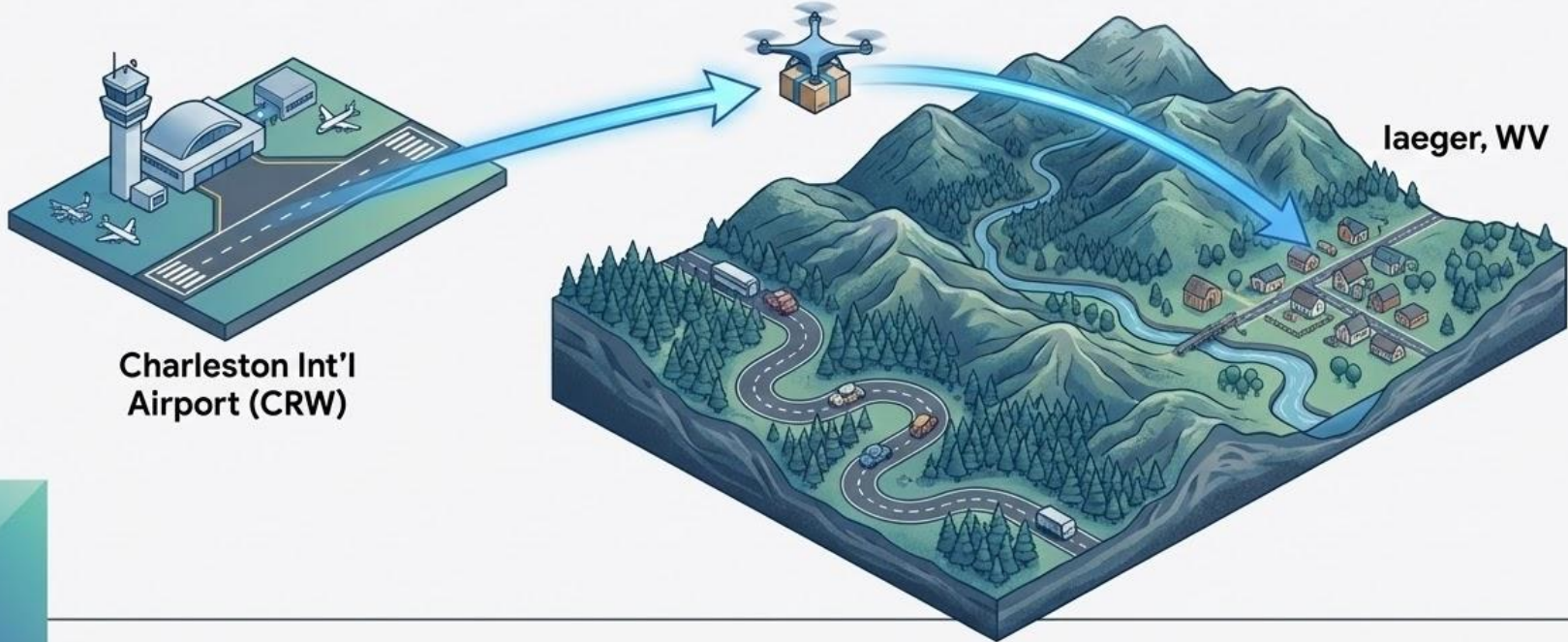
Avoided costly ambulance trips.



Predictable fees & cost offsets.

LET'S FLY

To help stakeholders visualize what drone delivery could look like, I created a short **simulated flight path from Charleston International Airport to laeger, WV**. This route highlights the exact terrain challenges drones face — mountain ridges, winding roads, and remote hollows — and shows why autonomous delivery can shorten travel time and bypass difficult ground infrastructure. This helps frame the feasibility of implementing medical and food-aid drone corridors in West Virginia





Google Earth

LET'S CONNECT

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INTERESTS

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- Business Analytics
- Data Analytics
- UAV/Drone Analytics
- Aerospace & Defense Technology
- Nonprofit & Education Technology

