

Precision Epidemiology, Human Behavior, and the Future of One Health

NASEM Workshop on Systematizing the One Health
Approach in Preparedness and Response Efforts for
Infectious Disease Outbreaks

Jonathan D. Quick, MH, MPH
Managing Director, Pandemic Prevention
The Rockefeller Foundation



February 25, 2021



The 2035
Pandemic
that wasn't

Ongoing

ROUTINE ZOOONOTIC SURVEILLANCE

ONSITE
ANIMAL VIRAL
GENOMIC
SURVEILLANCE

ROUTINE RISK-BASED



NATIONAL
+GLOBAL
MONITORING
and ANALYSIS



BIG DATA
and AI
GEO RISK
ASSESSMENT



ROUTINE
SURVEILLANCE of
HUMANS in
CONTACT with AT RISK ANIMALS



-30

WORRISOME VIRUS SUSPECTED in BATS

MORE
INTENSIVE
ANIMAL
SEQUENCING

PATTERNS
ASSOCIATED with
PAST DEADLY STRAINS

MORE
INTENSIVE
SURVEILLANCE
OF HUMANS

IN CONTACT
WITH AT RISK
ANIMALS

PATTERNS
ASSOCIATED with
TRANSMISSION
to HUMANS

BASED on
GENOMIC
SEQUENCING

BAT
VIRUS



-15

INCREASED ALERT LEVEL
and SURVEILLANCE

WIDER
GEOGRAPHIC AREA

TARGETING
TESTING
and GENOMIC
SEQUENCING

GLOBAL RISK
ASSESSMENT and ALERT





FIRST CASE REPORTED



**ASTUTE
CLINICIAN**

AWARE OF ALERTS
SUSPECTS NOVEL
VIRUS

**INDIVIDUAL
RECEIVES
HEALTH
ALERT**



FROM WEARABLE DEVICE to
NOTIFY HEALTHCARE PROVIDER

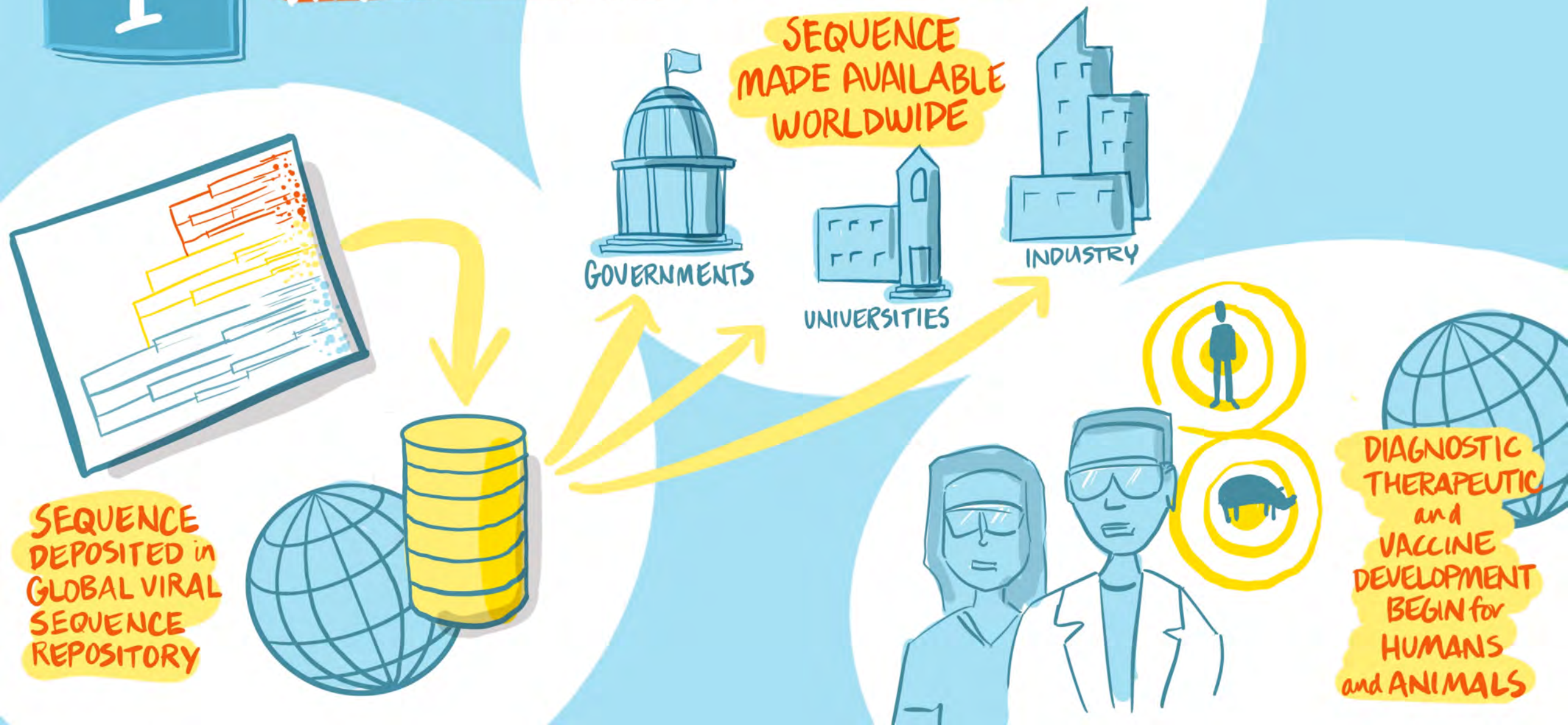
**PREVIOUSLY
UNKNOWN VIRUS**



GENOMIC
TESTING
CONFIRMS

1

VIRUS SEQUENCE SHARED



7

HUMAN to HUMAN TRANSMISSION and DEATHS

CONFIRMED
AIRBORNE



HIGHLY
TRANSMISSIBLE
AMONG HUMANS



FIRST
DEATHS



EXTENDED
HOSPITALIZATION

DIAGNOSTIC
TESTS BECOME
AVAILABLE



7

GLOBAL and LOCAL ALERTS



GLOBAL

TARGETED
BIG DATA TRAVEL
PATTERNS



GENERAL
TRAVEL ALERT



SOCIAL
DISTANCING



MASKS



QUARANTINE



LOCAL



HOME
TEST

POINT OF
ENTRY
SCREENING



HIGH RISK
ARRIVAL LOCATIONS



60

AVAILABILITY OF THERAPEUTICS and VACCINES

ACCELERATED
SAFETY and
EFFICACY
TESTING



ORGANS
ON A CHIP



ANIMAL
SAFETY
TESTS

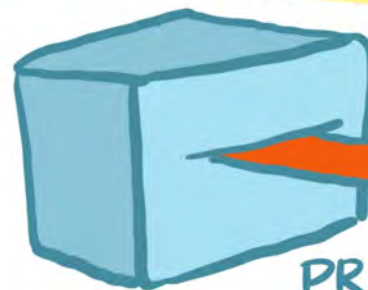
RAPID
DEPLOYMENT



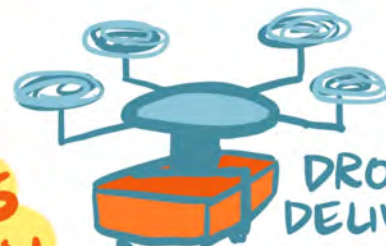
HOT SPOT
VACCINATION
PLANS



VACCINES
for HOT SPOTS
PRODUCED ON
DEMAND



3D
PRINTING



DRONE
DELIVERY

PATCH



100

LAST REPORTED CASE



OUTBREAK
DECLARED OVER
SHORTLY AFTER



Containing outbreaks requires informed, targeted action by a range of actors, and yet, our systems to detect and respond to outbreaks are weak

2



'100 days' Pandemic Timeline

First case reported

First cluster reported

First death reported

Speed and scope of
emerging spread

Emerging magnitude of
mortality and morbidity



Critical Actions

Investigate and confirm
outbreak

Scale up testing,
contact tracing

Introduce voluntary
quarantine

Suspend movement
within containment zone

Implement social
distancing measures

Shut down travel



Response Actors



Policymakers
like governments and
normative bodies



Researchers
in academia and NGOs



Communicators
like journalists and civic
leaders



Private sector
like business owners and
execs



General public i.e. private
citizens



We need to strengthen three steps of the data pathway from source to user

COLLECT DIVERSE DATA INPUTS

AGGREGATE, COORDINATE AND SYNTHESIZE DATA

LEVERAGE DATA TO DRIVE ACTION



Timely, high-quality data inputs

Investments in cutting-edge data acquisition approaches...

- Enable higher-quality, more timely data with greater global coverage
- Facilitate free and unimpeded flow of public information (e.g. via sentinel networks, novel sensors, etc.)

Shared, open data for enhanced analytics

Aggregated, synthesized, and open data streams...

- Unlock richer insights based on health, economic, environmental, demographic socio-behavioral factors
- Enable more proactive alert systems, accurate predictions of spread, equitable response and context-specific messaging, and more

Targeted delivery of insights for action

Clear communication and amplification of alerts and information...

- Ensure that relevant actors are equipped with the information to make timely and targeted decisions
- Drive more coordinated, precise, and effective interventions where they are needed most



We will achieve these objectives challenges through a world-class Pandemic Data and Action Platform



We envision a global platform that will become a leading force for amplifying warning signals and containing the spread of pandemic-potential outbreaks within their first 100 days

- delivering the best information to the actors positioned to take action that averts the most devastating human and economic impacts of pandemics

*We can make the world much safer
from devastating global pandemics*

But will we?