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AI-Driven One Health Security

Preventing Patient Zero
NASEM January 15, 2025

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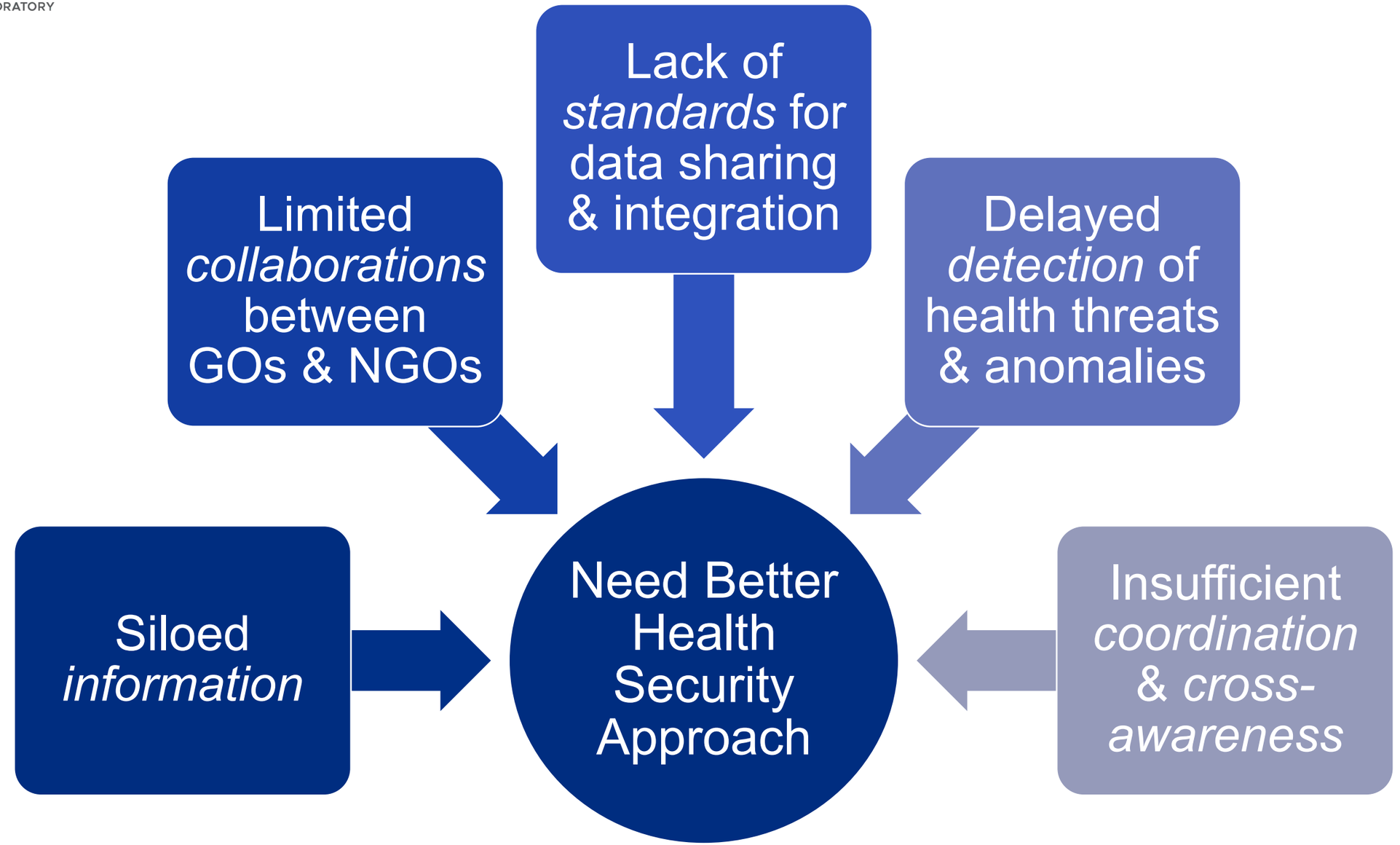
Lesson's Learned from COVID-19 Pandemic



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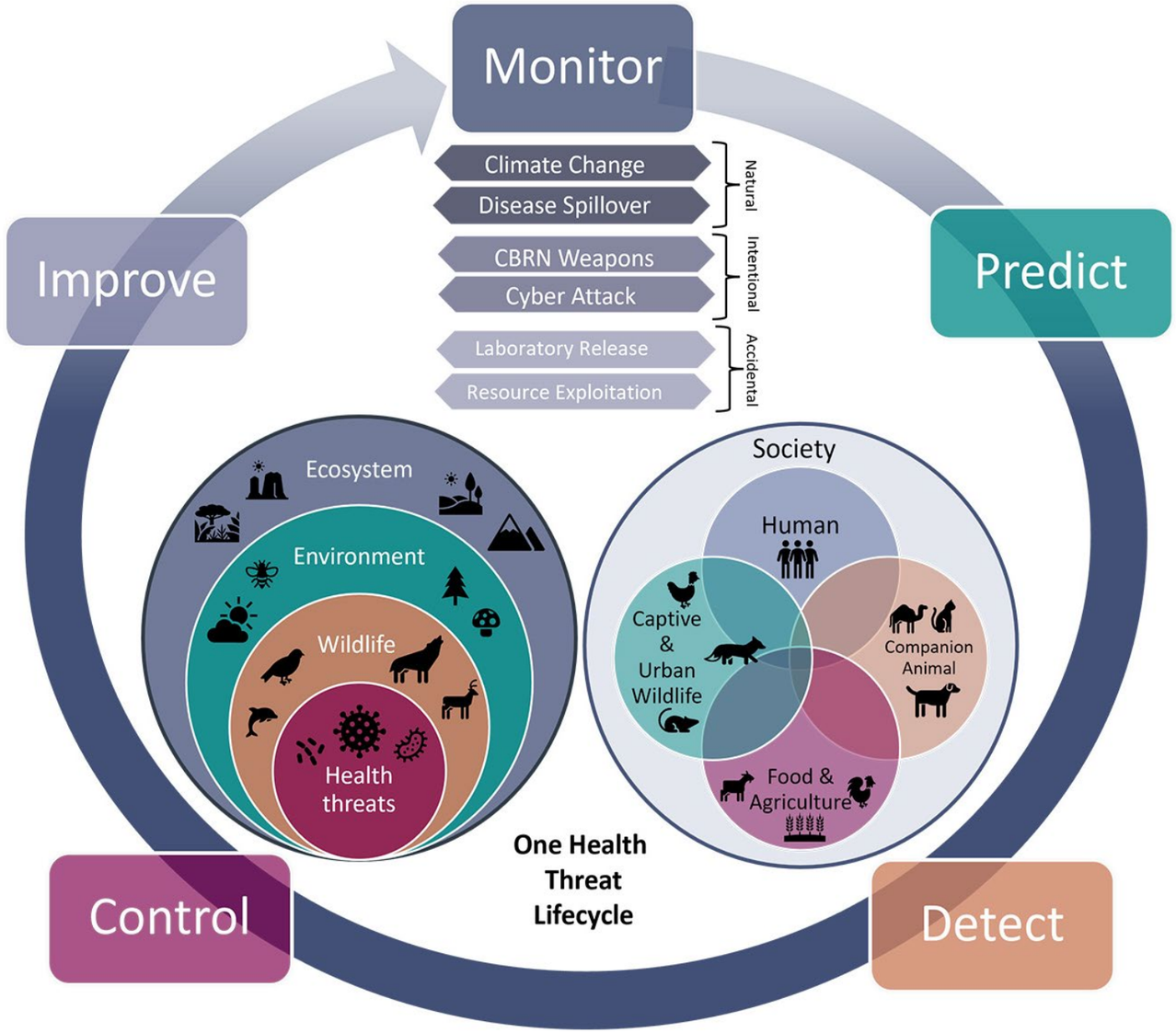
What is AI-Driven One Health Security?

The health and security of humans, society, animals, plants, and the environment are all intimately connected through complex interrelationships.

AI algorithms can amplify our ability to detangle, monitor, predict, detect, and control elements of this threat lifecycle enabling early warning and prevention of national security threats.



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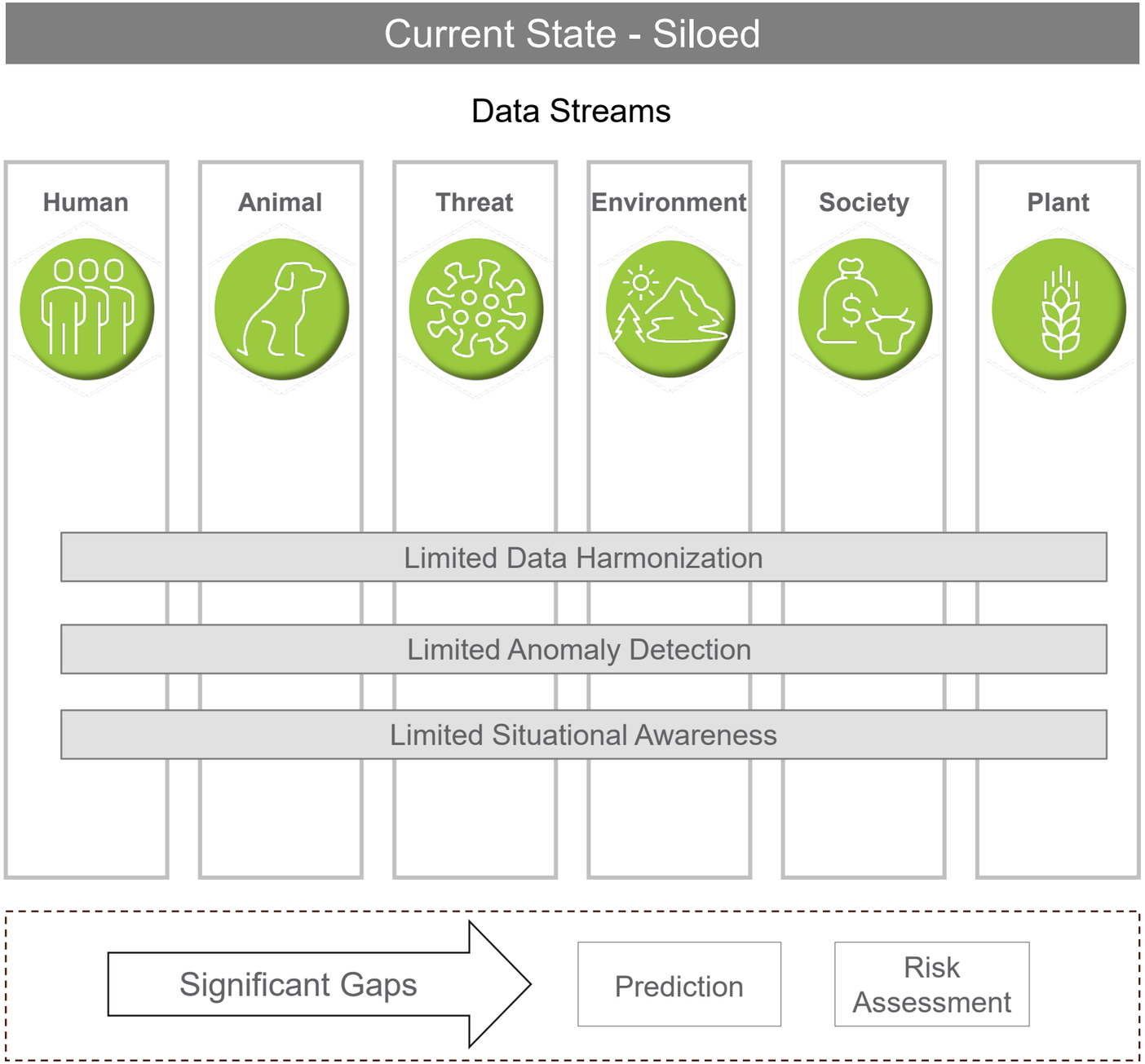
How is early warning and biosurveillance done today?

- Most approaches are single
  - Species (human-centric)
  - Data type (test results, social media, etc.)

- Limited data sharing and communication across…
  - Governmental, public, and private entities
  - Local, regional, state, and country-levels



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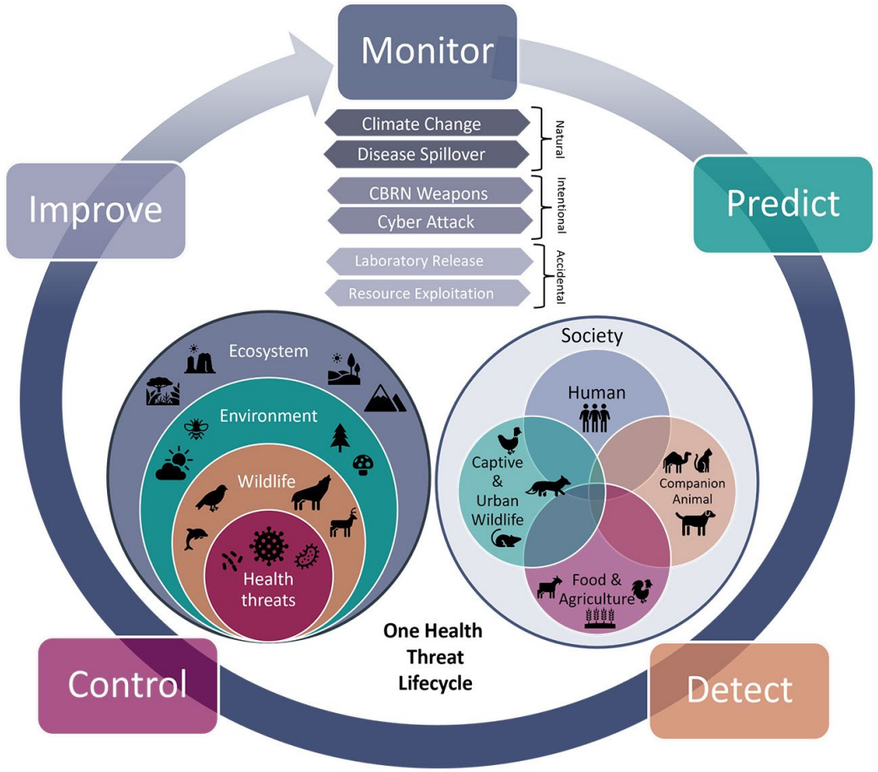
Incorporating the One Health Lens

- Humans, animals, plants, and environmental health are all linked
- All living beings/systems react to any ecosystem change
- Animals, plants, and environment can be *early warning sensors* for human health threats



Zoonotic Diseases

- ✓ 60% all human pathogens are zoonotic
- ✓ 75% new emerging infectious diseases are zoonotic
- ✓ 80% potential bioterrorism agents are zoonotic
- ✓ 85% of all pandemics are zoonotic
- ✓ 100% of pandemics since 1970s are zoonotic

e.g., HIV, West Nile, SARS, Influenza H1N1, Ebola, MERS, COVID, Anthrax, Plague, Tularemia, VHF

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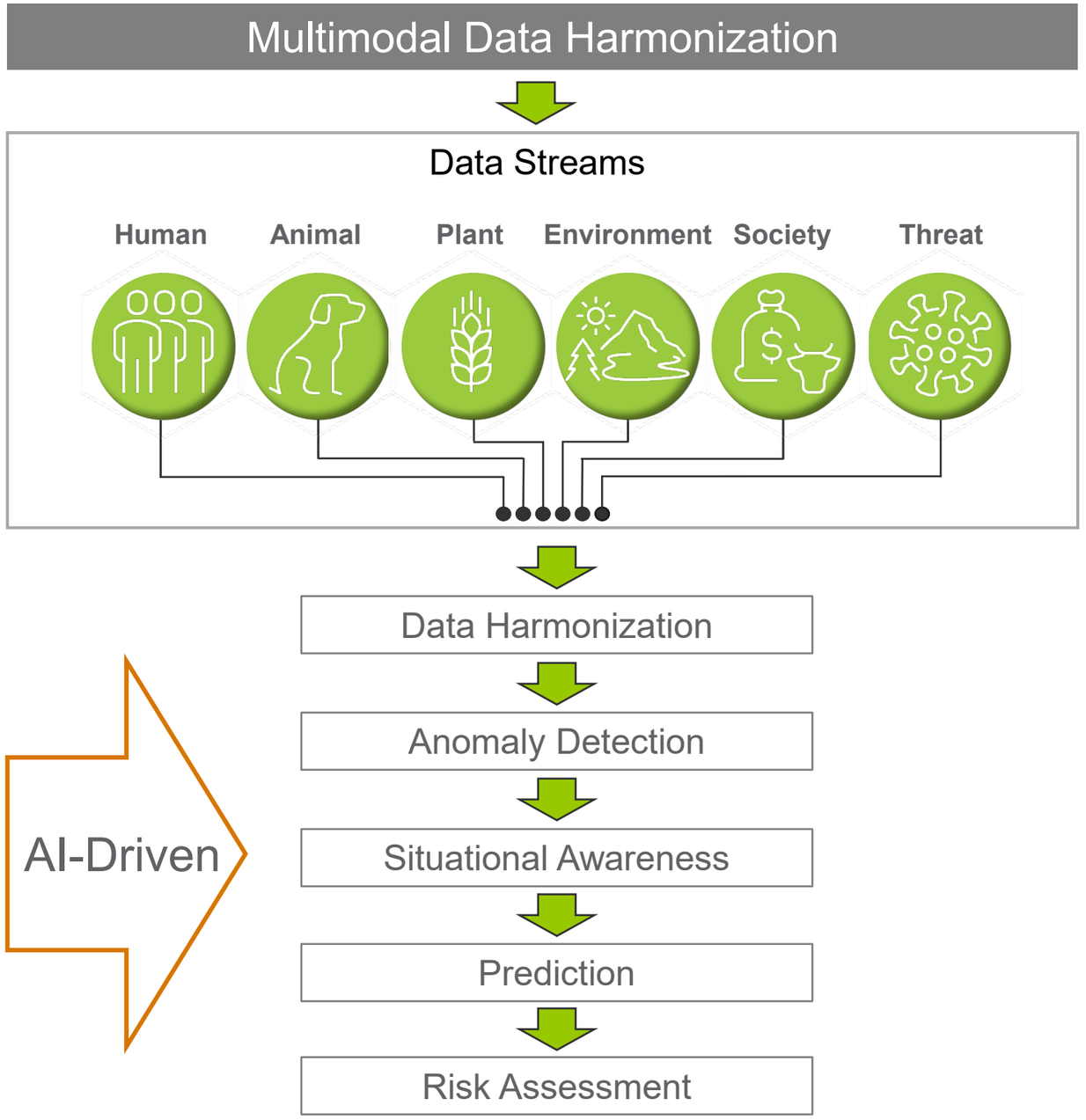
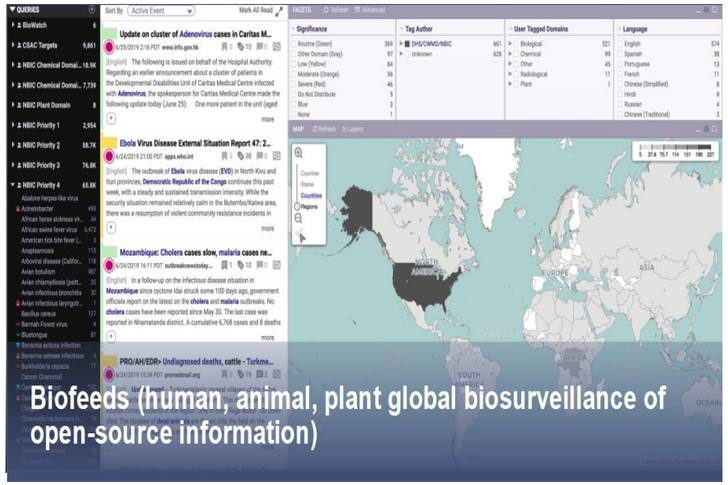
AI-Driven One Health Security (AI-DOHS) Approach

Utilize novel multimodal data harmonization techniques to analyze, detect, and interpret vast arrays of heterogeneous data from various domains.

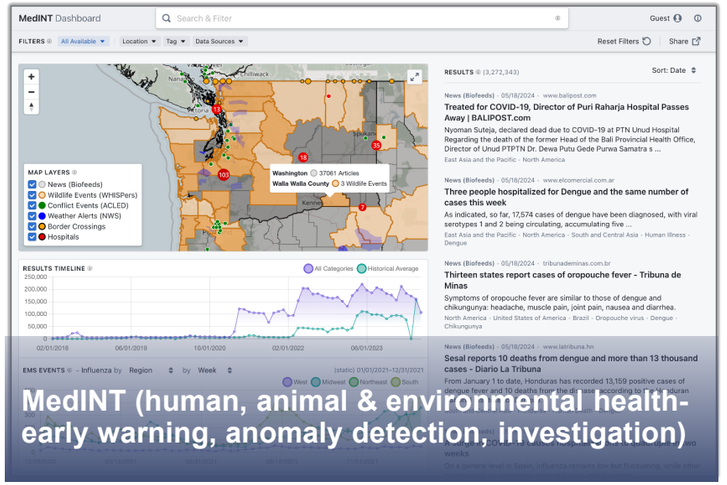


Combating emergence of infectious diseases through a One Health lens

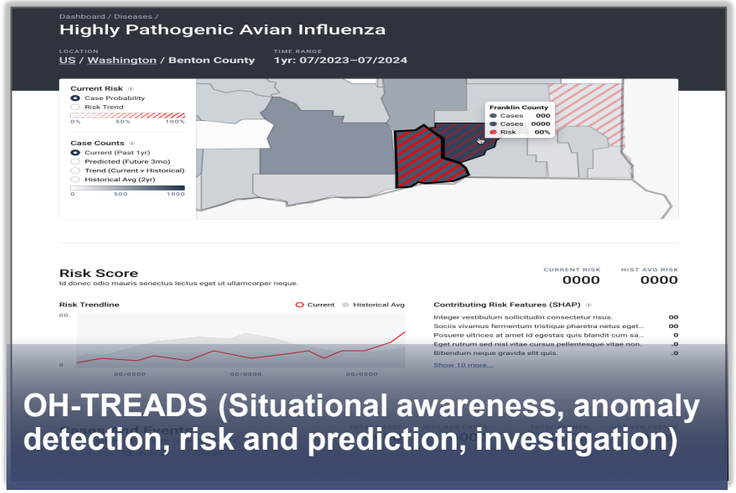
PNNL uses a OH approach for situational awareness, early warning, and disease forecasting.



Biofeeds (human, animal, plant global biosurveillance of open-source information)

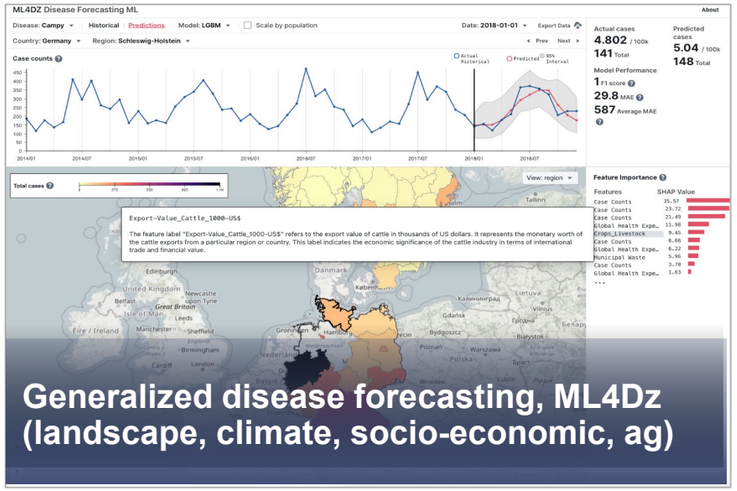


MedINT (human, animal & environmental health-early warning, anomaly detection, investigation)

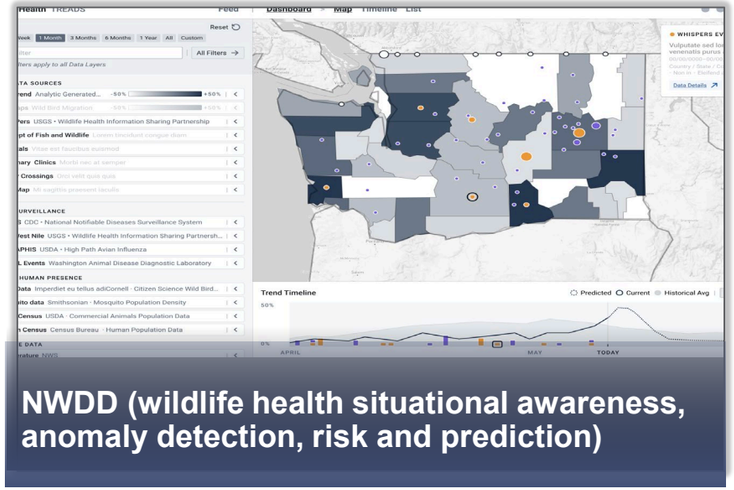


OH-TREADS (Situational awareness, anomaly detection, risk and prediction, investigation)

Zoonotic Spillover Risk (Open-source news, live-stock events, human and animal population)



Generalized disease forecasting, ML4Dz (landscape, climate, socio-economic, ag)



NWDD (wildlife health situational awareness, anomaly detection, risk and prediction)

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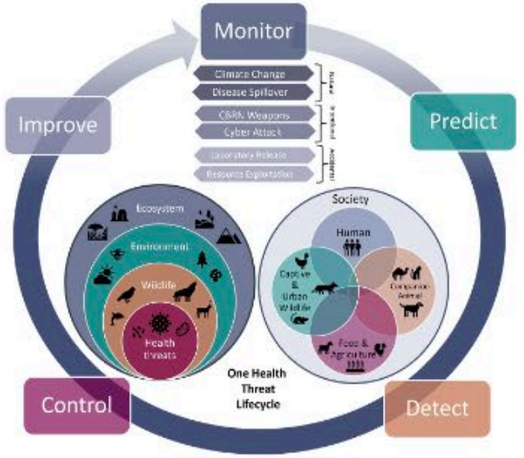

Thank you

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