



Food
Standards
Agency
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Session 3

Biosurveillance landscape



UK Health
Security
Agency



Department
for Environment
Food & Rural Affairs

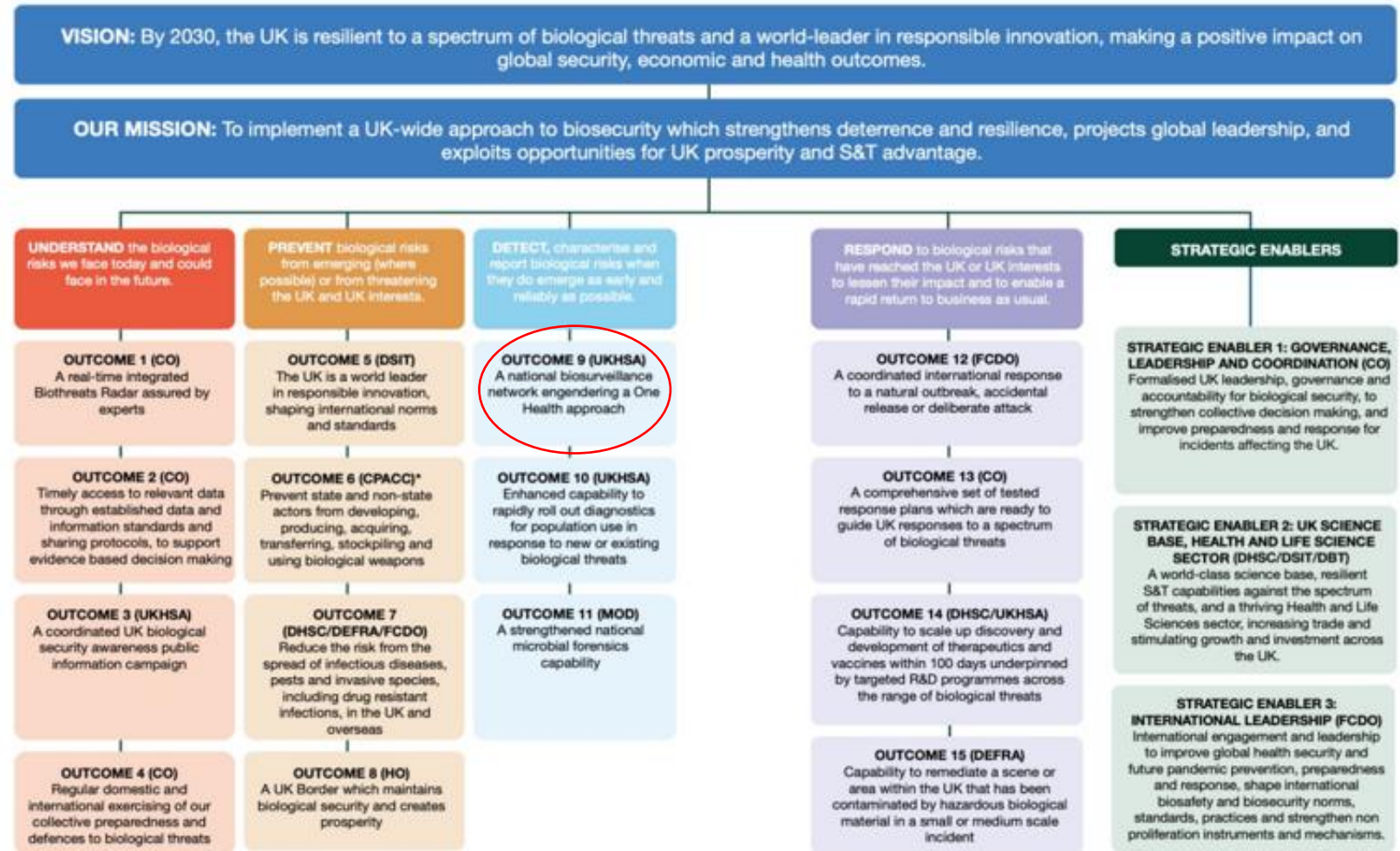
National Biosurveillance Network (NBN)

Jon Vodden

Programme Director February 2024

Background

- Key component of the Biological Security Strategy (BSS) 2023 refresh
- Cross-Government mission and vision
- One health agenda



*The Counter Proliferation and Arms Control Centre (CPACC) consolidates expertise and policy-making on international counter proliferation and arms control issues. It is made up of the DSIT, FCDO and MOD.

The National Biosurveillance Network

Vision & Definition

The NBN will help protect the UK from known and emerging high-consequence biological threats



One Health approach and culture of collaboration

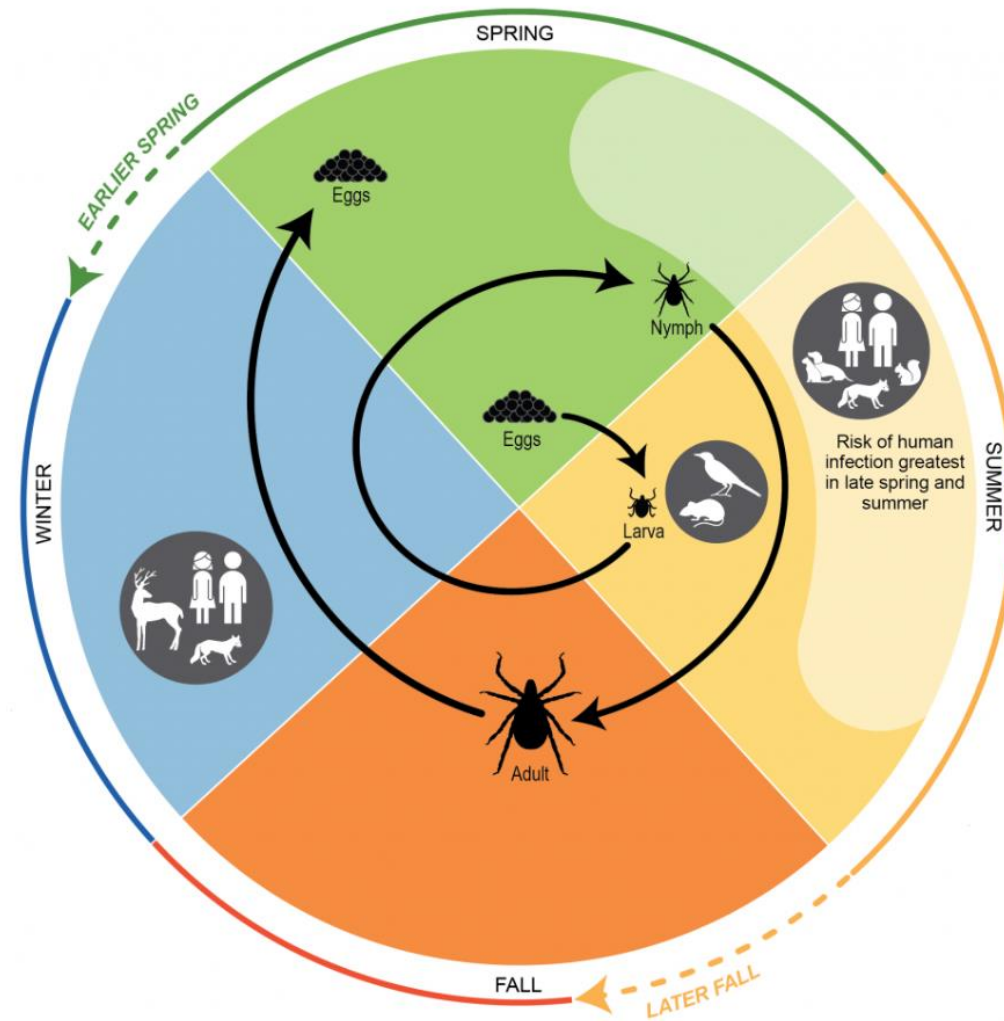
Faster and more efficient

Assess and characterise the threat level

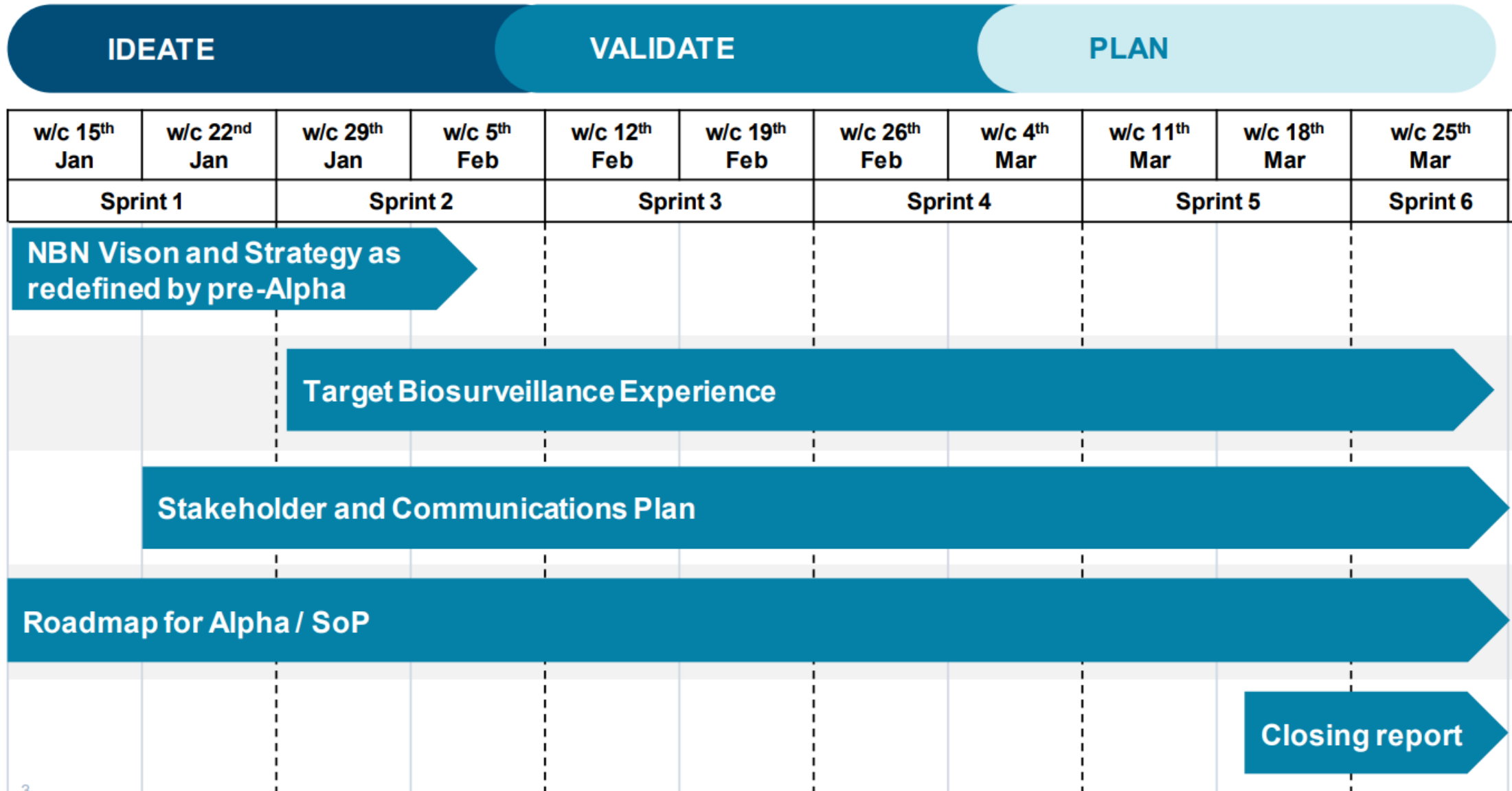
Provide decision-makers with the information they need, when they need it

Case Study Approach

Vector Borne Disease: Tick-Borne Encephalitis



NBN Alpha Q1 Deliverables



One team



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GAPDC2



Genomics for Animal and Plant Disease Consortium



Department
for Environment
Food & Rural Affairs



UK Research
and Innovation

Yogesh Kumar Gupta
Animal & Plant Health Agency, Weybridge

PATH-SAFE Biosurveillance Conference

28th-29th February 2024



Animal &
Plant Health
Agency



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Plant Health
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Forest Research



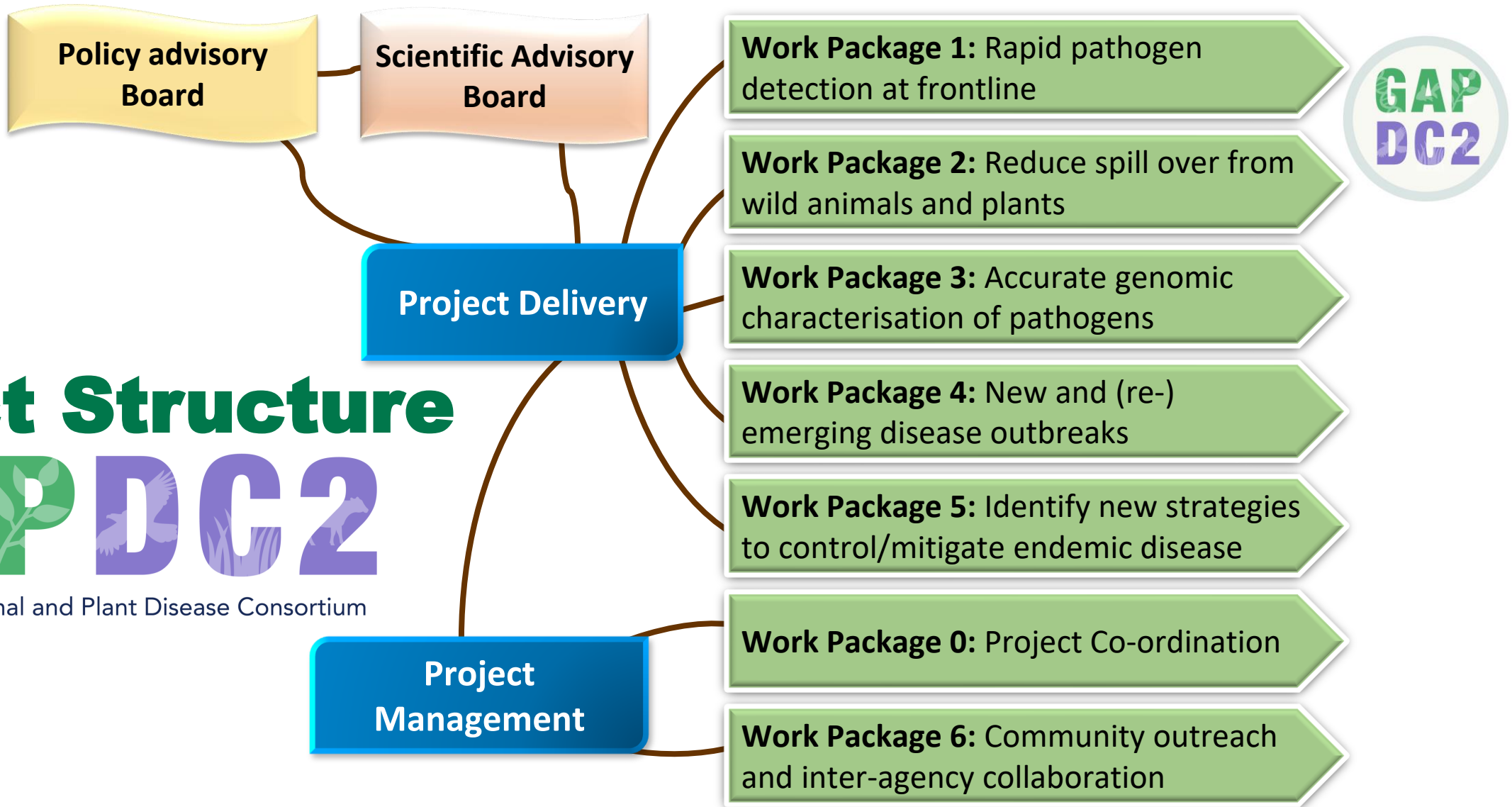
ROYAL
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COLLEGE



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Plant Health
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Project Structure


GAP DC2

Genomics for Animal and Plant Disease Consortium

WP1

Rapid pathogen detection at frontline



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Fisheries and Aquaculture
Science

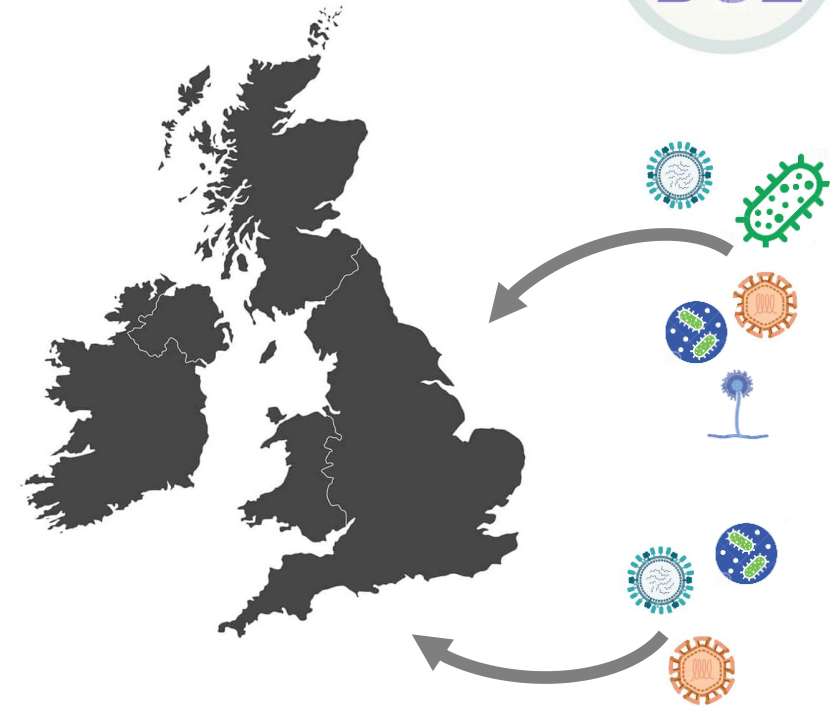
 Animal &
Plant Health
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 THE
Pirbright
INSTITUTE

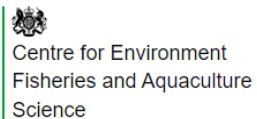


- Ensure secure borders with rapid pathogen pathogen detection
- Identify HTS testing methods appropriate for border biosecurity, BIPs /Mobile labs
- Map and integrate plant-health inspection with the Animal and Fish health requirements to maximize the cross-sector benefits



WP2

Reduce spill over from
wild animals and
plants



- Establish capability for metagenomic analysis in the wild species
- Assess the environmental DNA/RNA methods that can inform about pathogen risk



WP3

Accurate genomic characterisation of pathogens



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Science

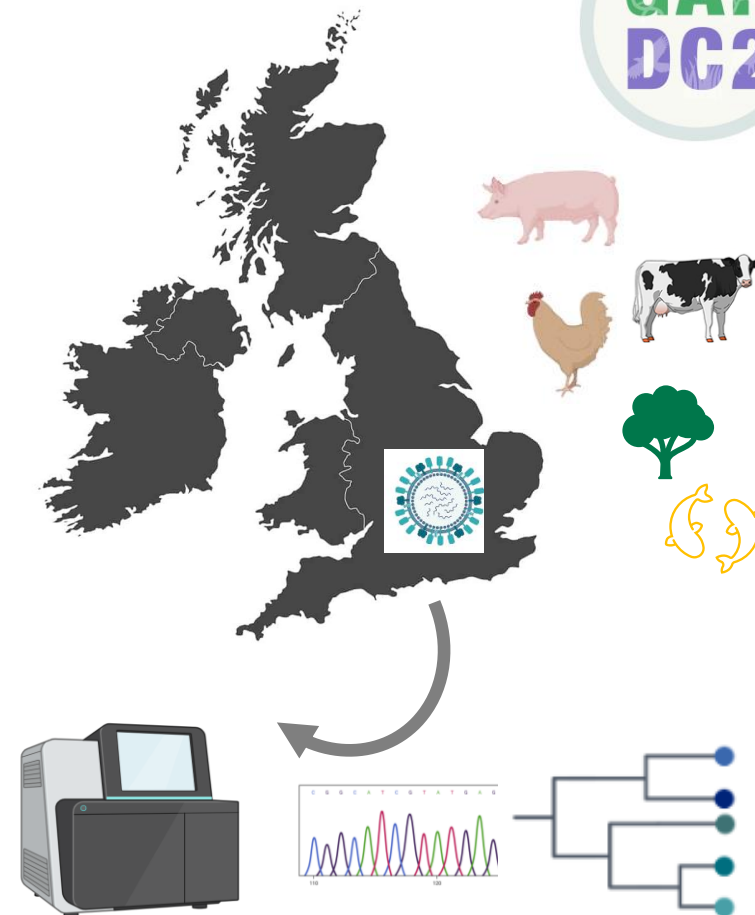
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Forest Research

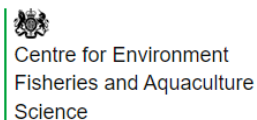


- **Develop pathogen agnostic/targeted genomic approaches, facilitating high confidence confirmatory diagnosis** for DNR (diagnosis is not reached) samples
- **Use of archival sample panels representative of syndromic and complex diseases to validate the approaches**
- **Implement harmonised approaches to validate and accredit these sequencing pipelines**



WP4

Characterisation and control of (re-) emerging disease outbreaks



- Refining (meta)genomic methods for rapid and taxonomically accurate pathogen characterisation
- Genomic data to support the evolution and epidemiology of emerging pathogens
- Informatics dashboard to support visualisation of pathogen genomic data



WP5

Identify new strategies to control/mitigate endemic disease



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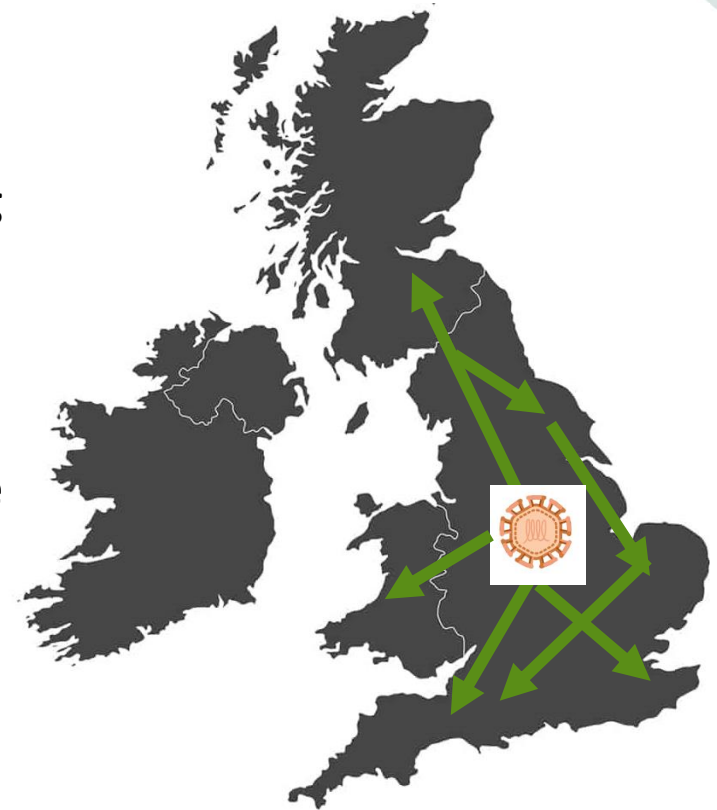


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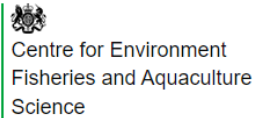
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- Improving endemic disease understanding and control
- Monitoring endemic diseases through the analysis of water system



WP6




Community outreach and inter-agency collaboration



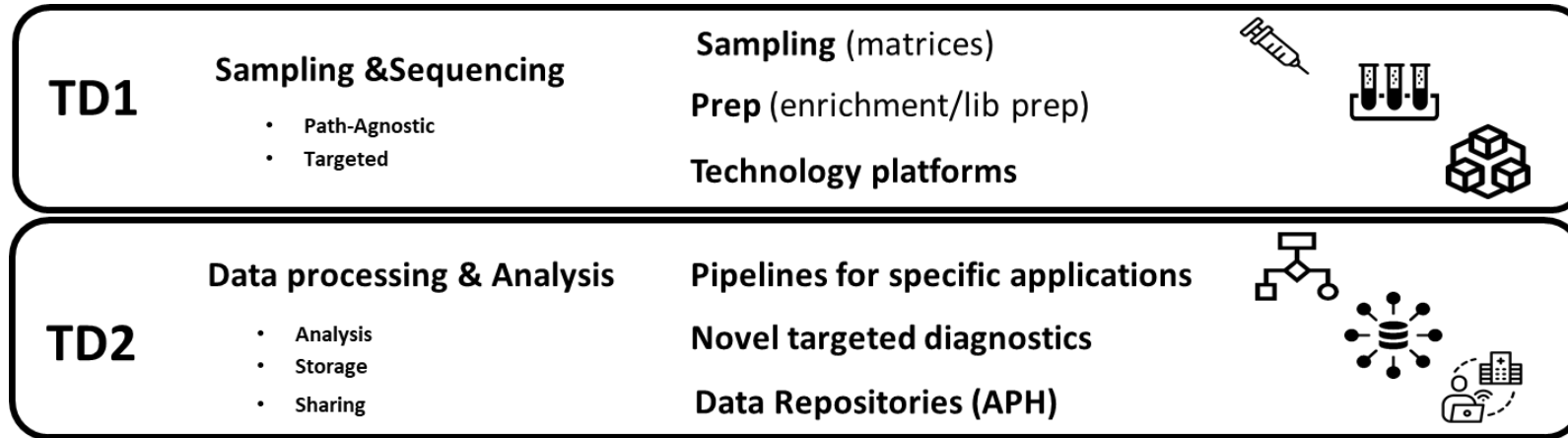
- Establish communication channel between inter-agency partners
- Cross-discipline rapid response Simulation Exercises (Sim-Ex)
- Establish Terms of Reference for reporting to policy and evidence teams
- Develop guidance and action plans with other genomic surveillance programmes
- Develop data sharing plans
- Outreach activities

Cross-cutting Technical Domains

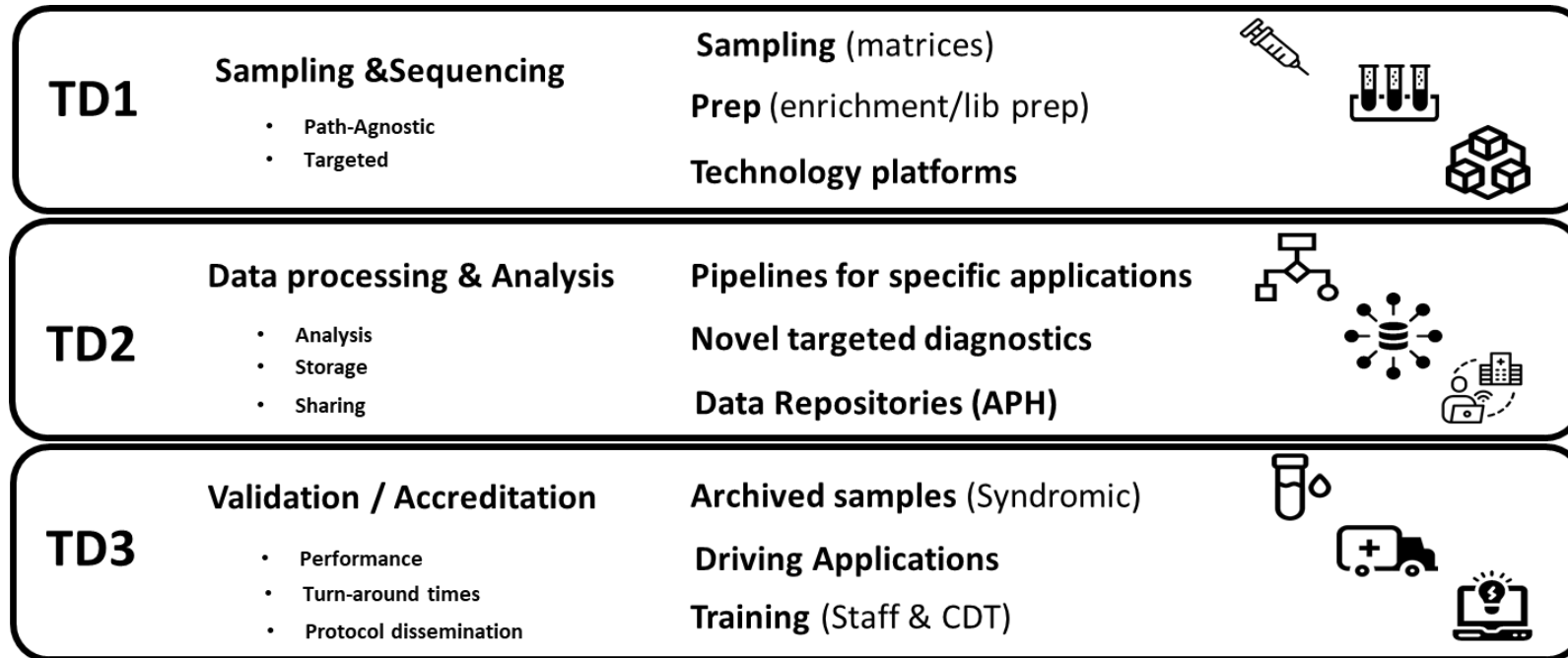


TD1	Sampling & Sequencing	Sampling (matrices)	
	<ul style="list-style-type: none">• Path-Agnostic• Targeted	Prep (enrichment/lib prep)	
		Technology platforms	

Cross-cutting Technical Domains















Cross-cutting Technical Domains



Cross-cutting Technical Domains



TD1	Sampling & Sequencing <ul style="list-style-type: none">• Path-Agnostic• Targeted	Sampling (matrices) Prep (enrichment/lib prep) Technology platforms	  
TD2	Data processing & Analysis <ul style="list-style-type: none">• Analysis• Storage• Sharing	Pipelines for specific applications Novel targeted diagnostics Data Repositories (APH)	  
TD3	Validation / Accreditation <ul style="list-style-type: none">• Performance• Turn-around times• Protocol dissemination	Archived samples (Syndromic) Driving Applications Training (Staff & CDT)	  
TD4	Communication / Policy <ul style="list-style-type: none">• Relevance to policy• Cost-Benefits• Public interaction	Translating data > Policy Data Accessibility – GUI/Dashboards Communicating data to stakeholders	  

Acknowledgements

APHA

Bhudipa Choudhury
Sharon Brookes
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Marco Benucci
Ines Vazquez
Neil Taylor
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Forest Research

Lisa ward
Bridget Crampton

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Helen Roberts



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UK Research
and Innovation

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Oliver Pybus
Sarah Hill
Jayna Raghwani

The Pirbright Institute

Graham Freimanis
Donald King
Caroline Wright
Andrew Shaw
Chris Netherton
Antonello Di Nardo



Thank you for your attention

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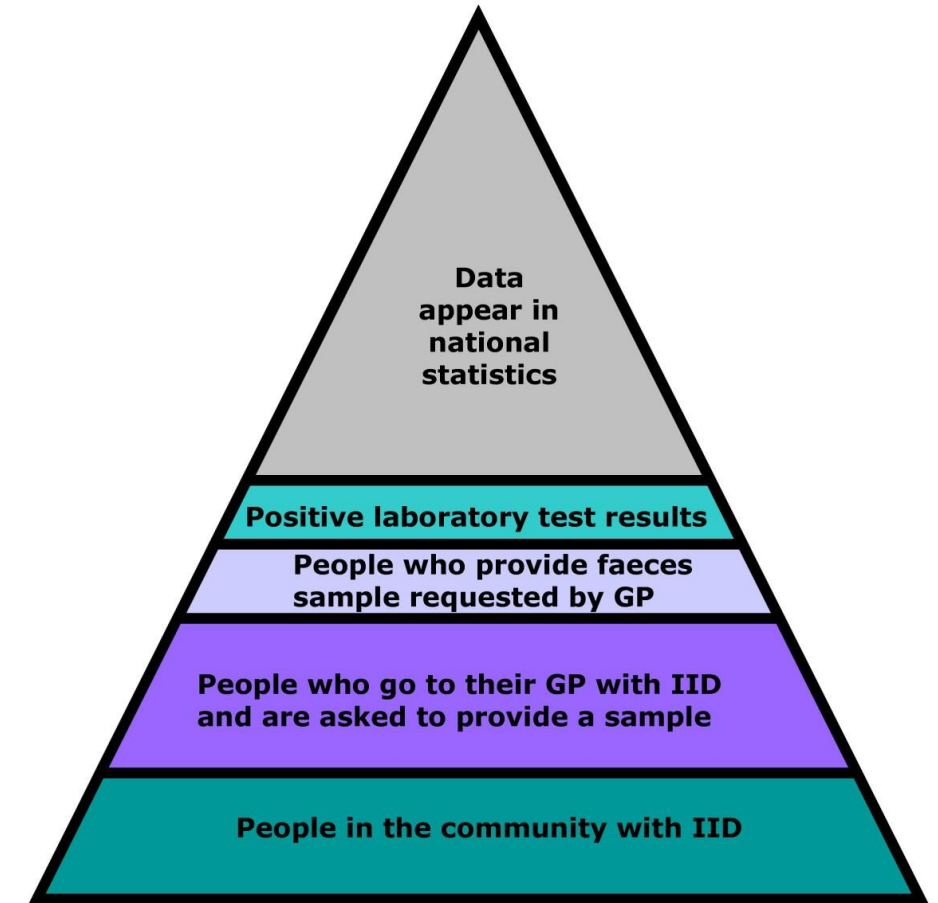




Erica Kintz
Food Standards Agency
28/02/2024

Background

- IID in the UK
 - Typically self-limiting V&D
 - High cost associated with infections
- Difficult to know true burden of IID

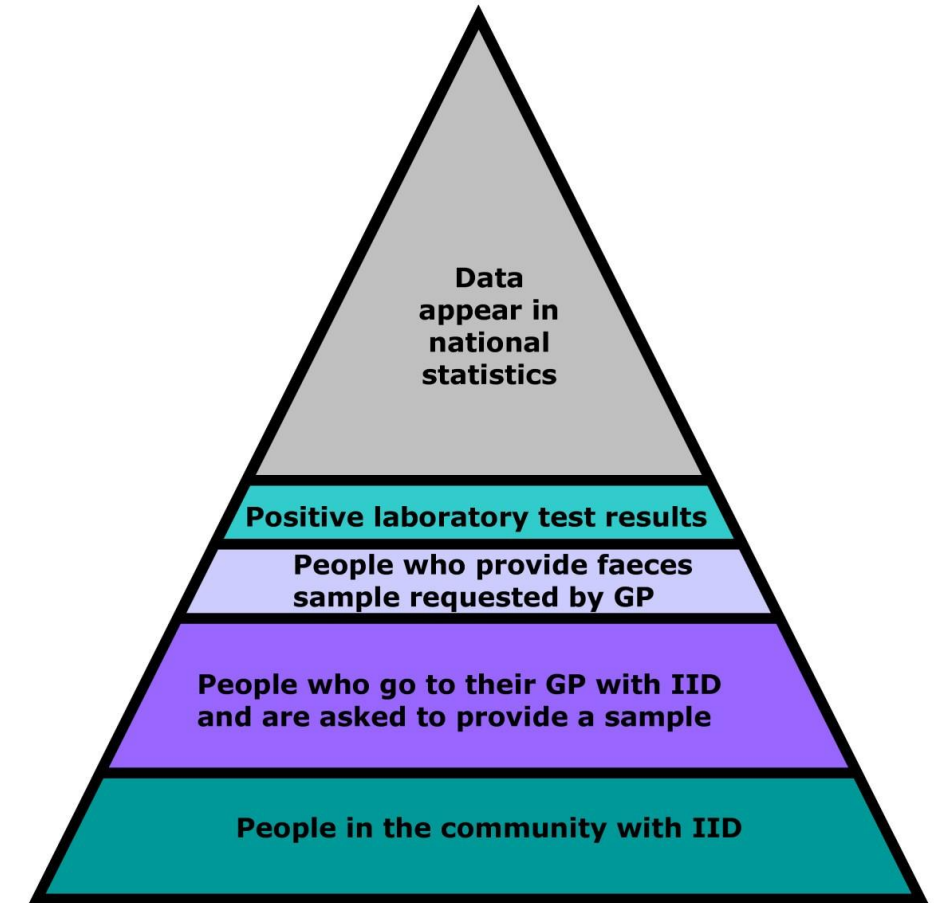


IID surveillance pyramid¹

¹O'Brien, Sarah J., et al. "BMC Medical Research Methodology 10.1 (2010): 1-13.

Background

- IID in the UK
 - Typically self-limiting V&D
 - High cost associated with infections
- Difficult to know true burden of IID
 - IID1 (1993 - 1996)
 - IID2 (2007 - 2009)
 - IID3 (2023 - 2025)

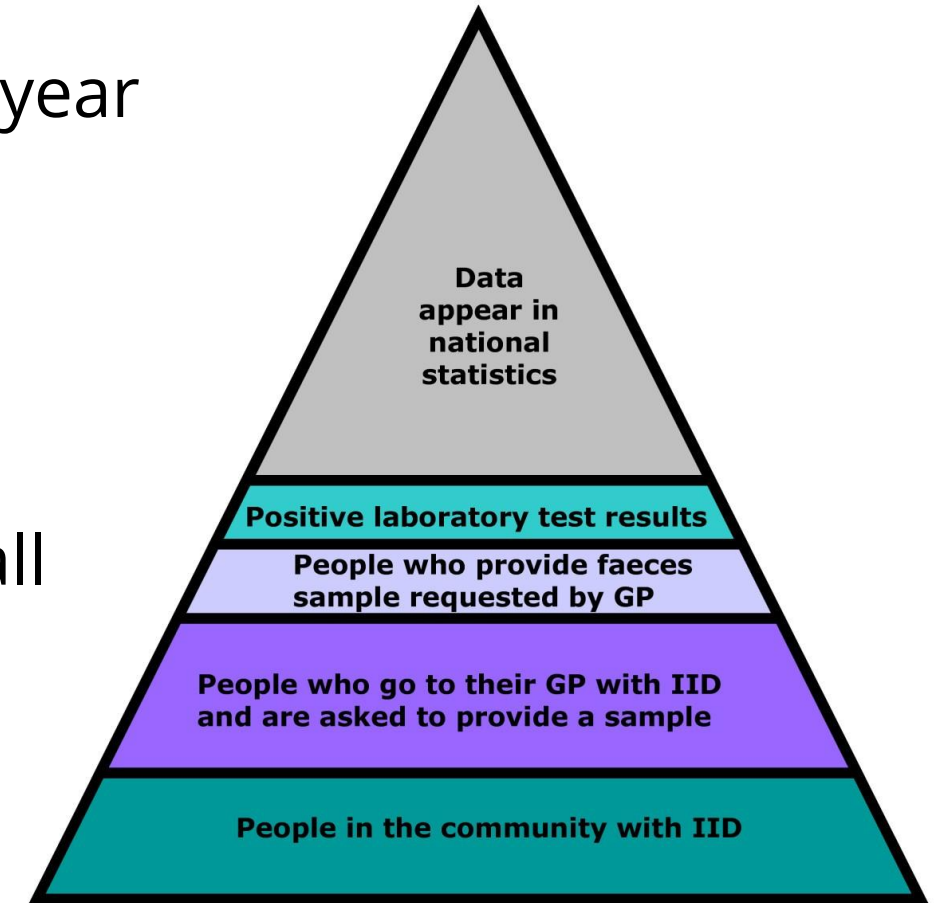


IID surveillance pyramid¹

¹O'Brien, Sarah J., et al. "BMC Medical Research Methodology 10.1 (2010): 1-13.

Results of IID2

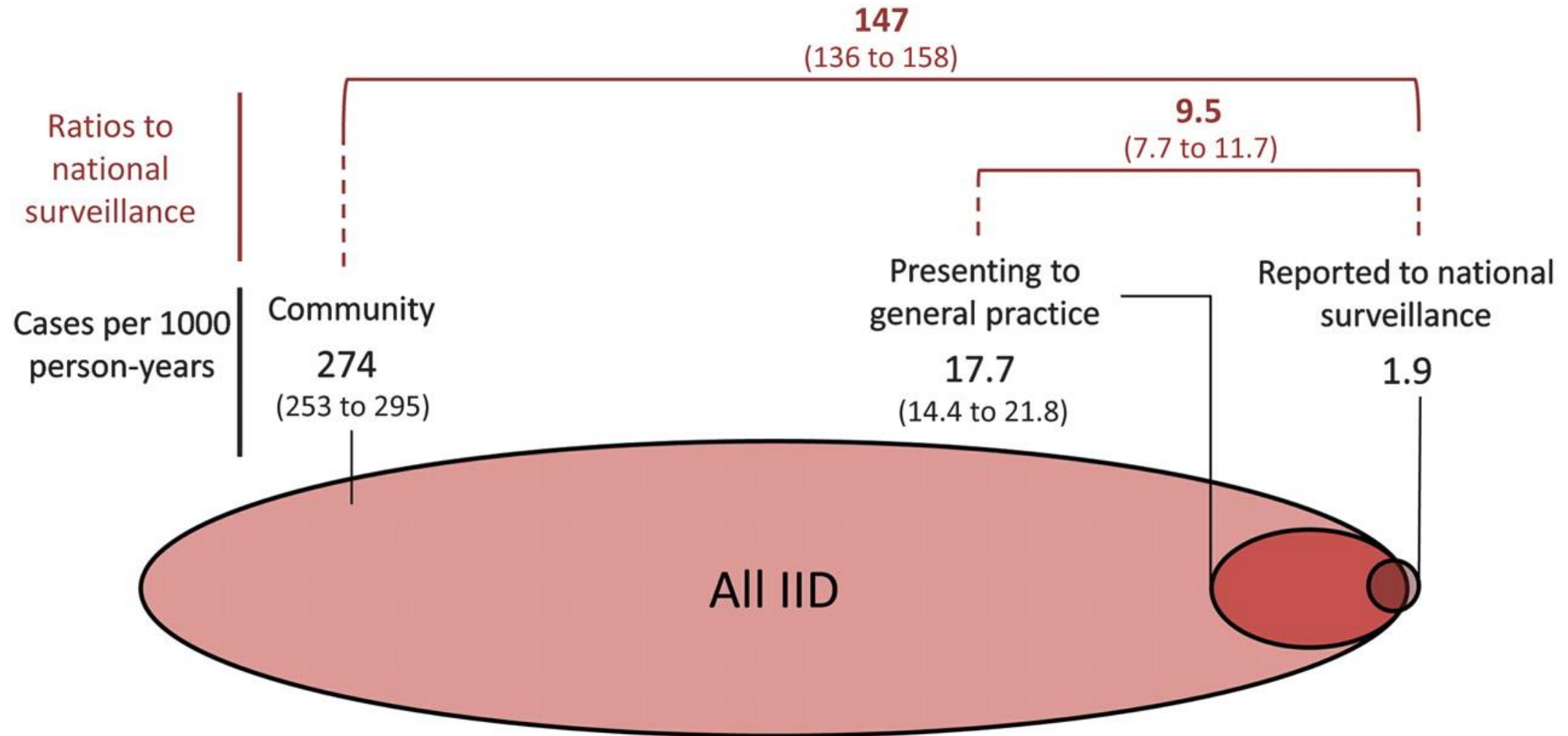
- 25% of UK population experiences IID in a year
 - Up from 20% in IID1
- 50% of cases reported time off
- Most common pathogens in community:
 - noro (12.4%)
 - Campy (13%)
- Up to 60% of samples tested negative for all included pathogens



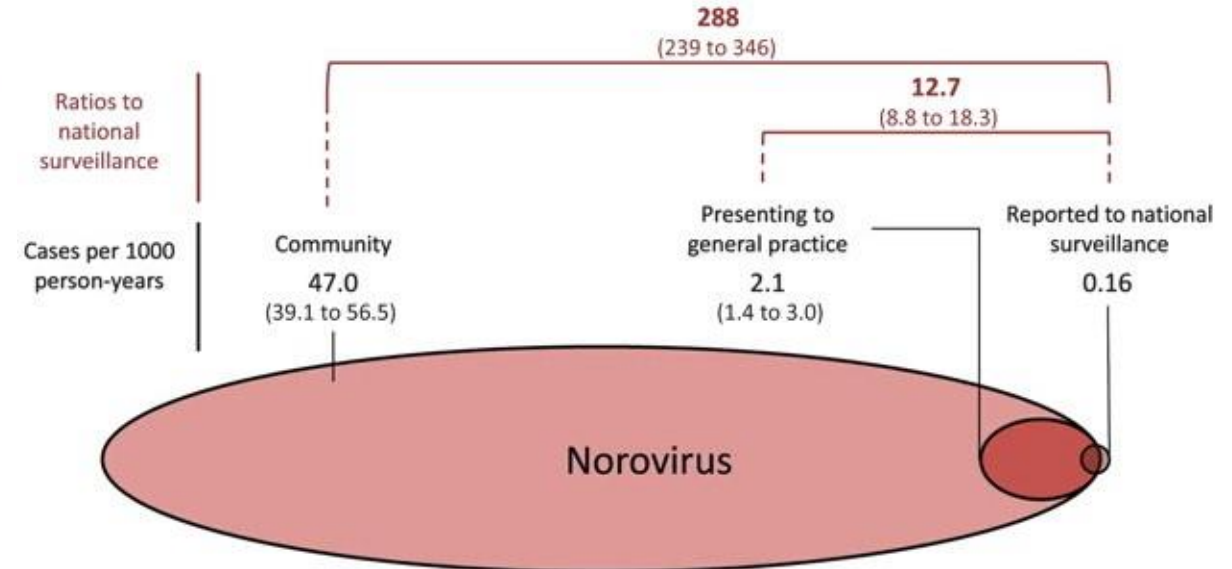
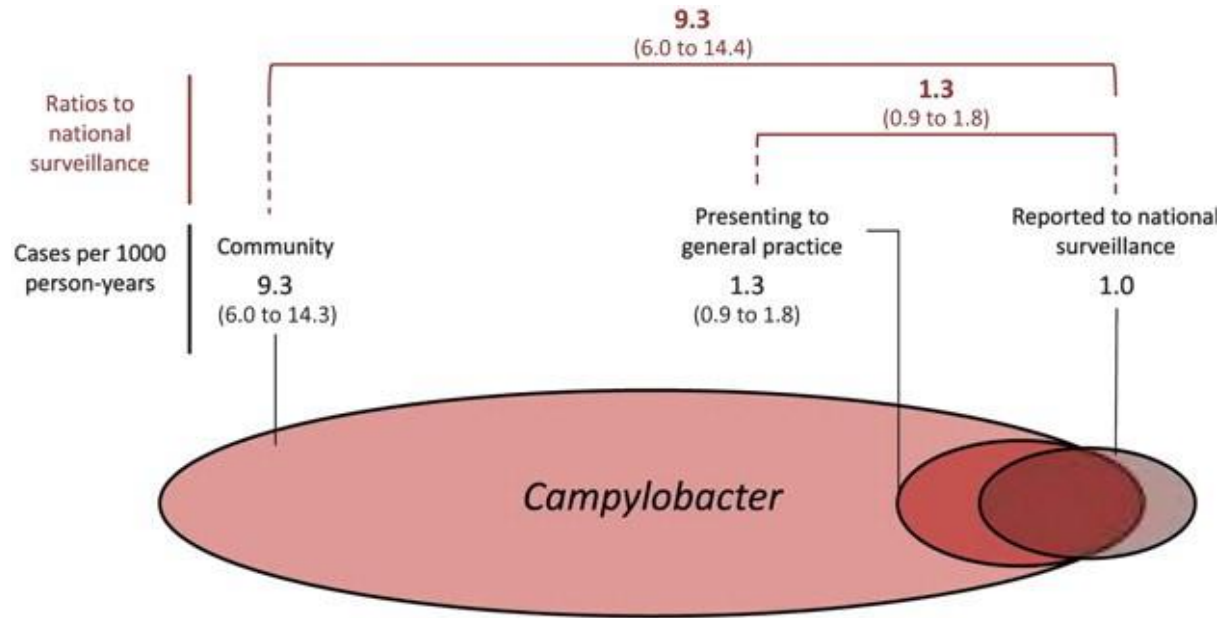
IID surveillance pyramid¹

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Results of IID2

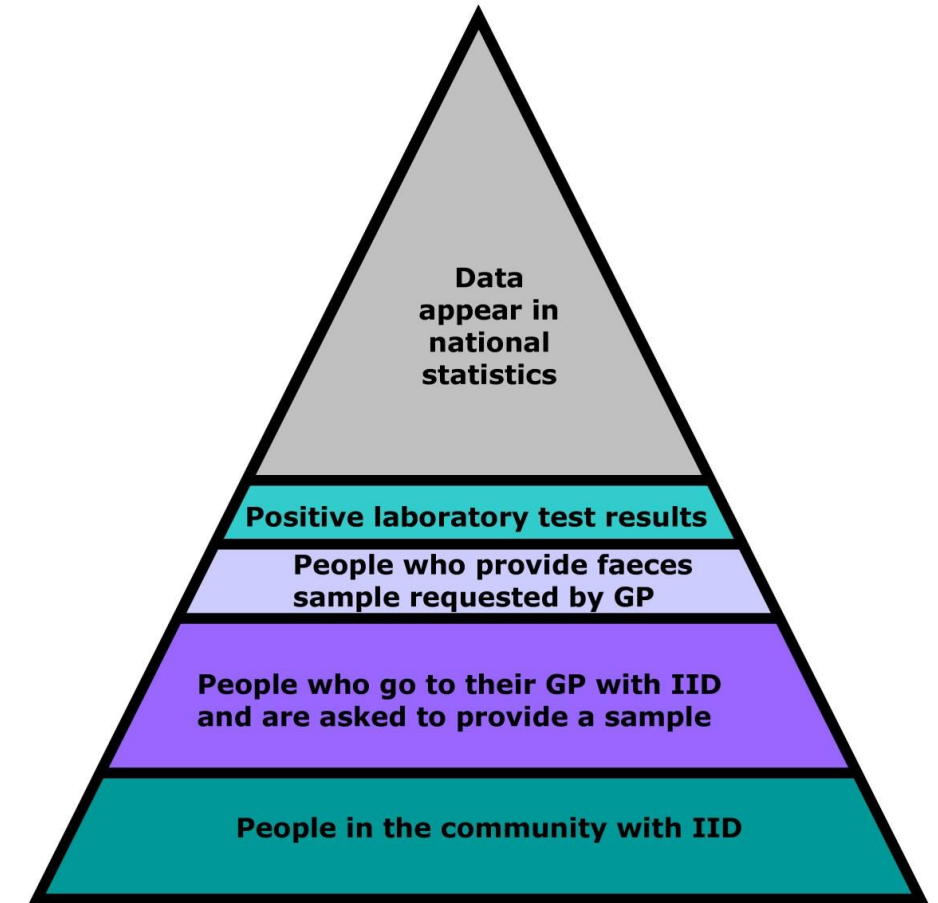


Results of IID2



Aims of IID3

- Assess overall burden of IID in the UK
 - Under-reporting at each step
- Pathogens associated with IID
 - Associated AMR
 - Under-reporting by pathogen
- UK-acquired IID

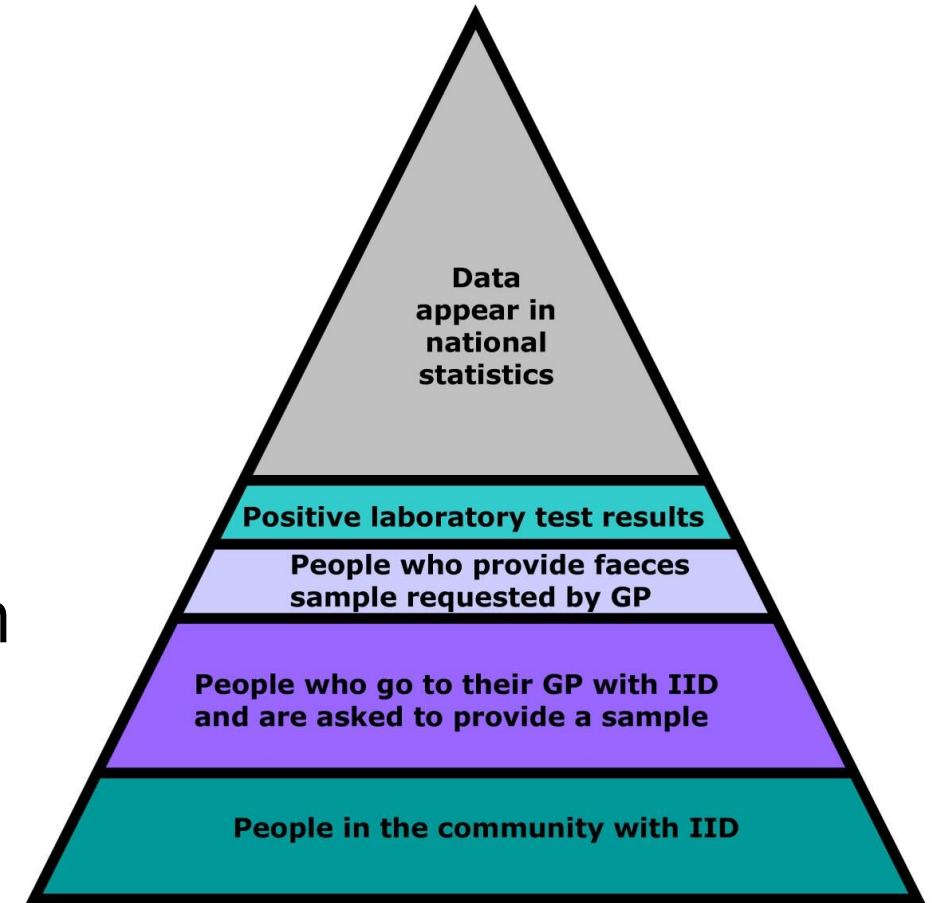


IID surveillance pyramid¹

¹O'Brien, Sarah J., et al. "BMC Medical Research Methodology 10.1 (2010): 1-13.

Why update IID data?

- New molecular techniques (PCR & WGS)
 - Reduce % unattributable?
 - AMR data
- Changes in way people interact (socially and with medical assistance)
- Only way to understand infection dynamics for pathogens not recorded in national surveillance (sapovirus, *C. perfringens*)



IID surveillance pyramid¹

¹O'Brien, Sarah J., et al. "BMC Medical Research Methodology 10.1 (2010): 1-13.

IID3 Consortium

- FSA and FSS co-funded project
- Led by Newcastle University



IID3 Study Design

Three parallel cohort studies

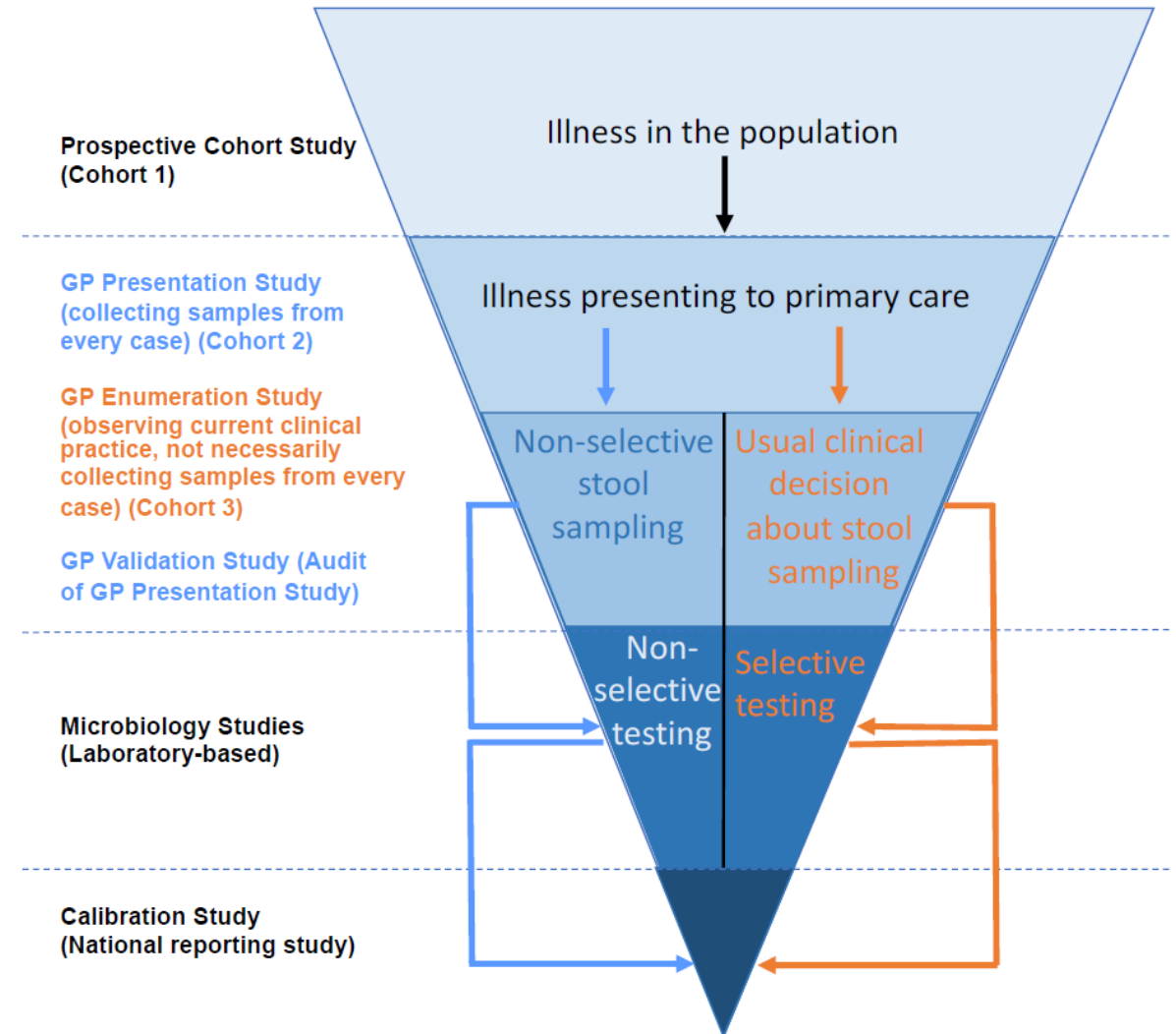
- Population cohort study
- GP presentation study
- GP enumeration study

Study will collect data for 2 years

- “Participant” follow-up of 1 year

Aiming to recruit 150 cohort 1
GP practices

(~60 participants per practice)



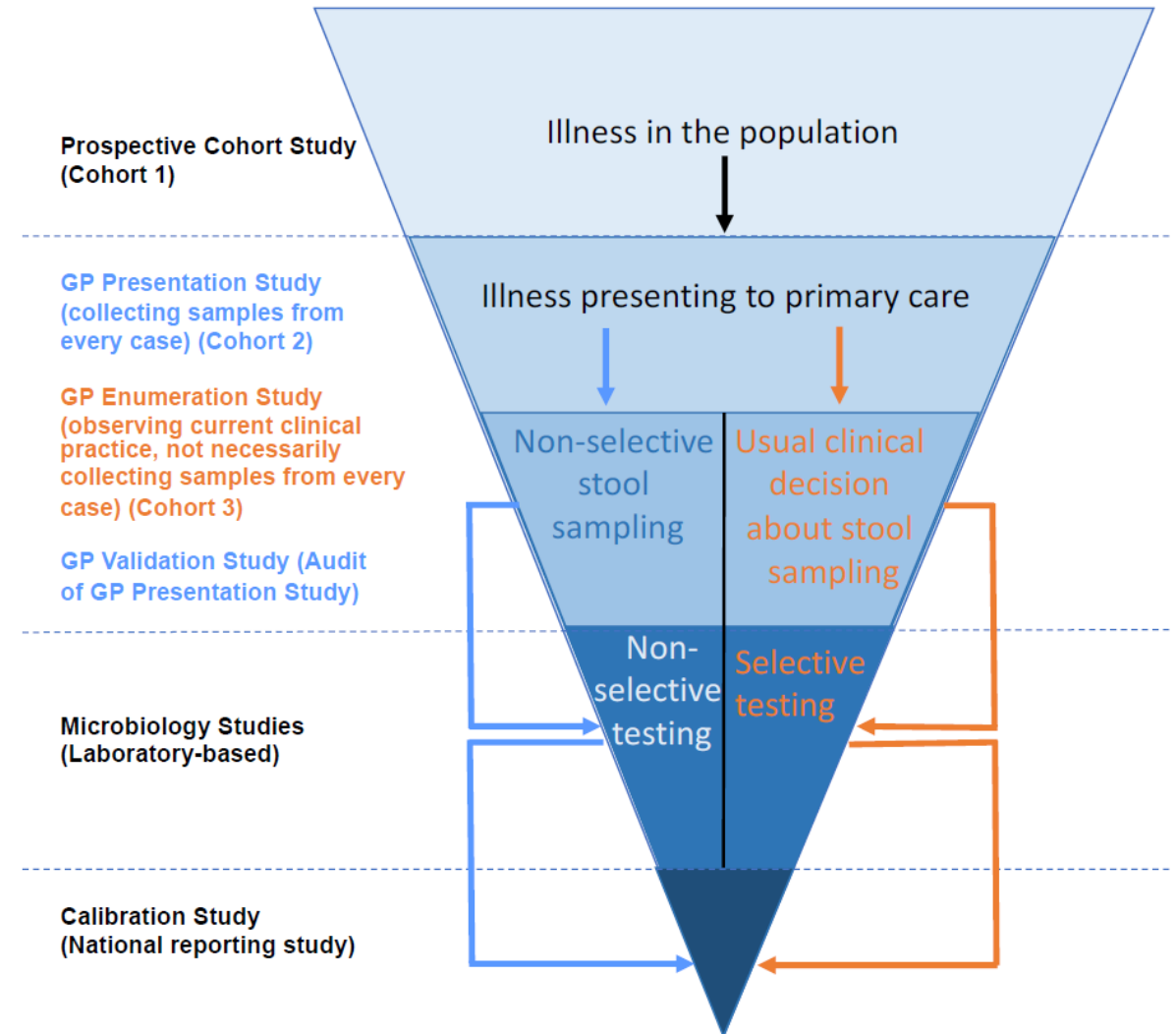
IID3 Study Design

Cohort 1 & Cohort 2

- Questionnaire completed
 - Socioeconomic data
 - Household transmission
 - Travel

All Cohorts

- Linked with HES/ONS data



IID3 Study Design

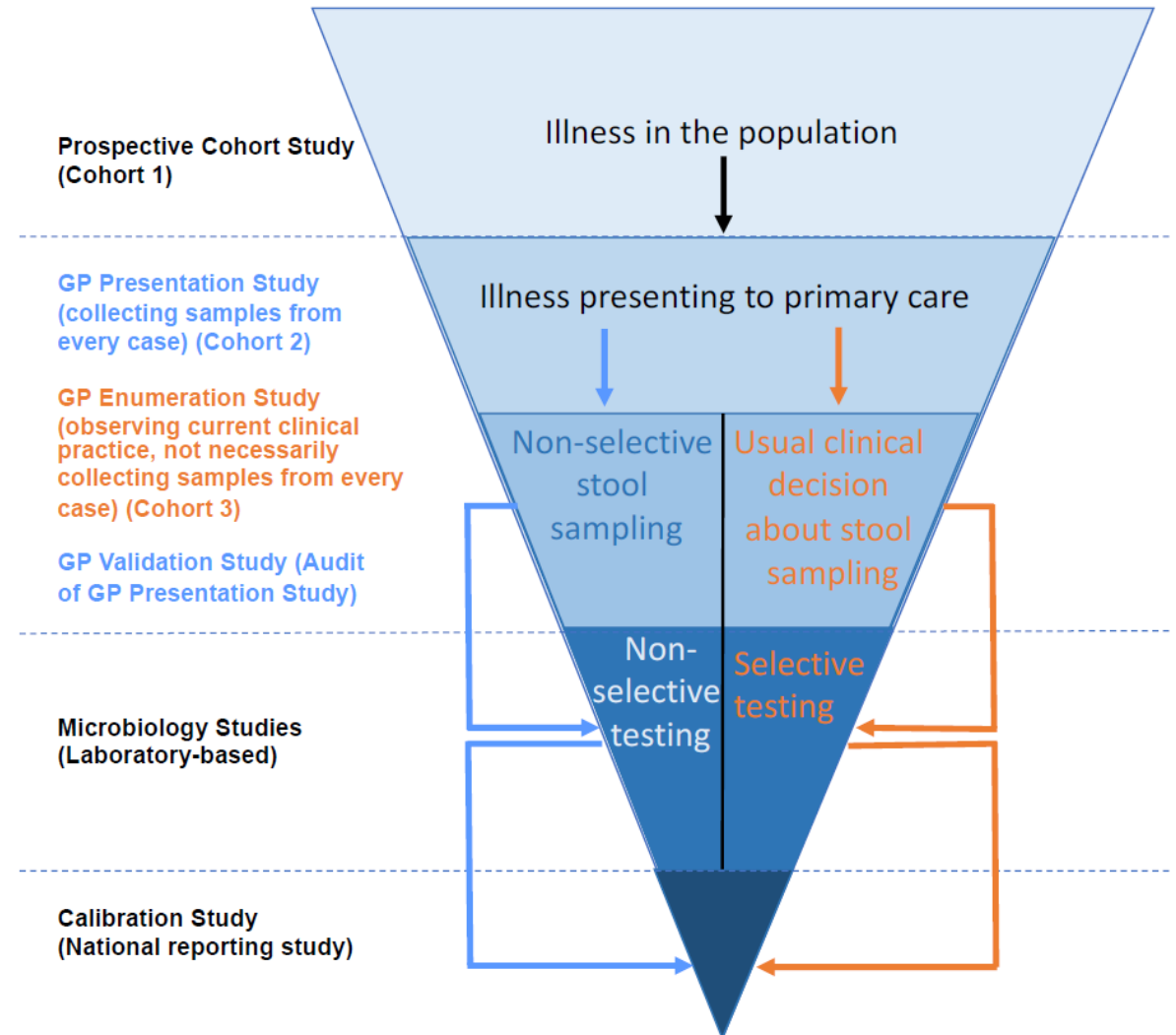
Cohort 1 & Cohort 2

- Questionnaire completed
 - Socioeconomic data
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All Cohorts

- Linked with HES/ONS data

**Data collection began
September 2023**



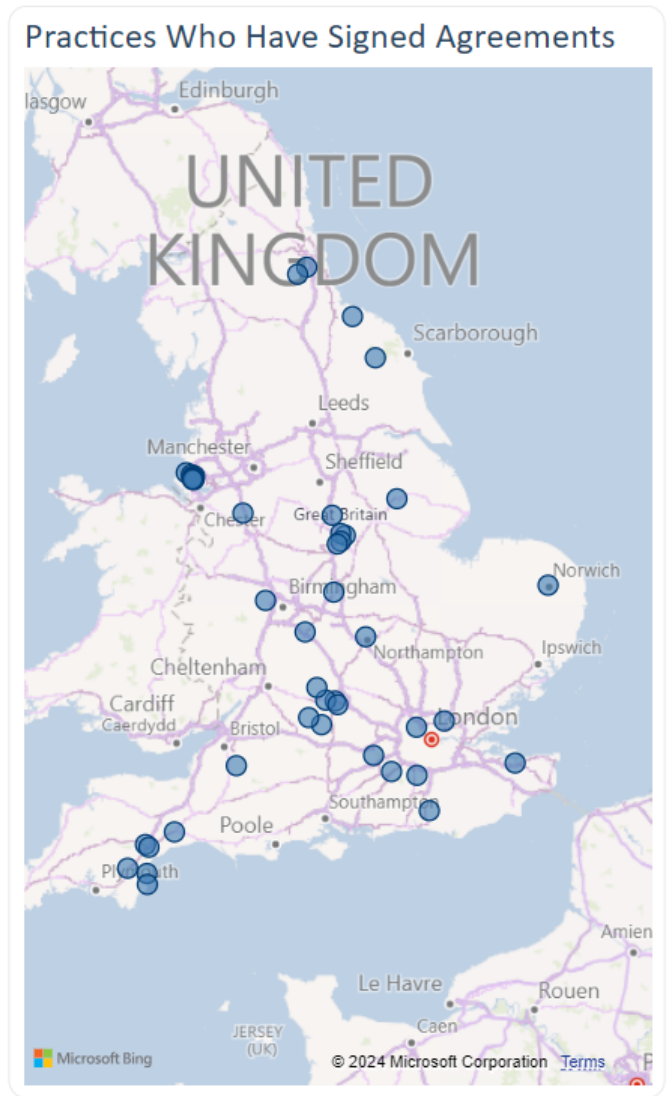
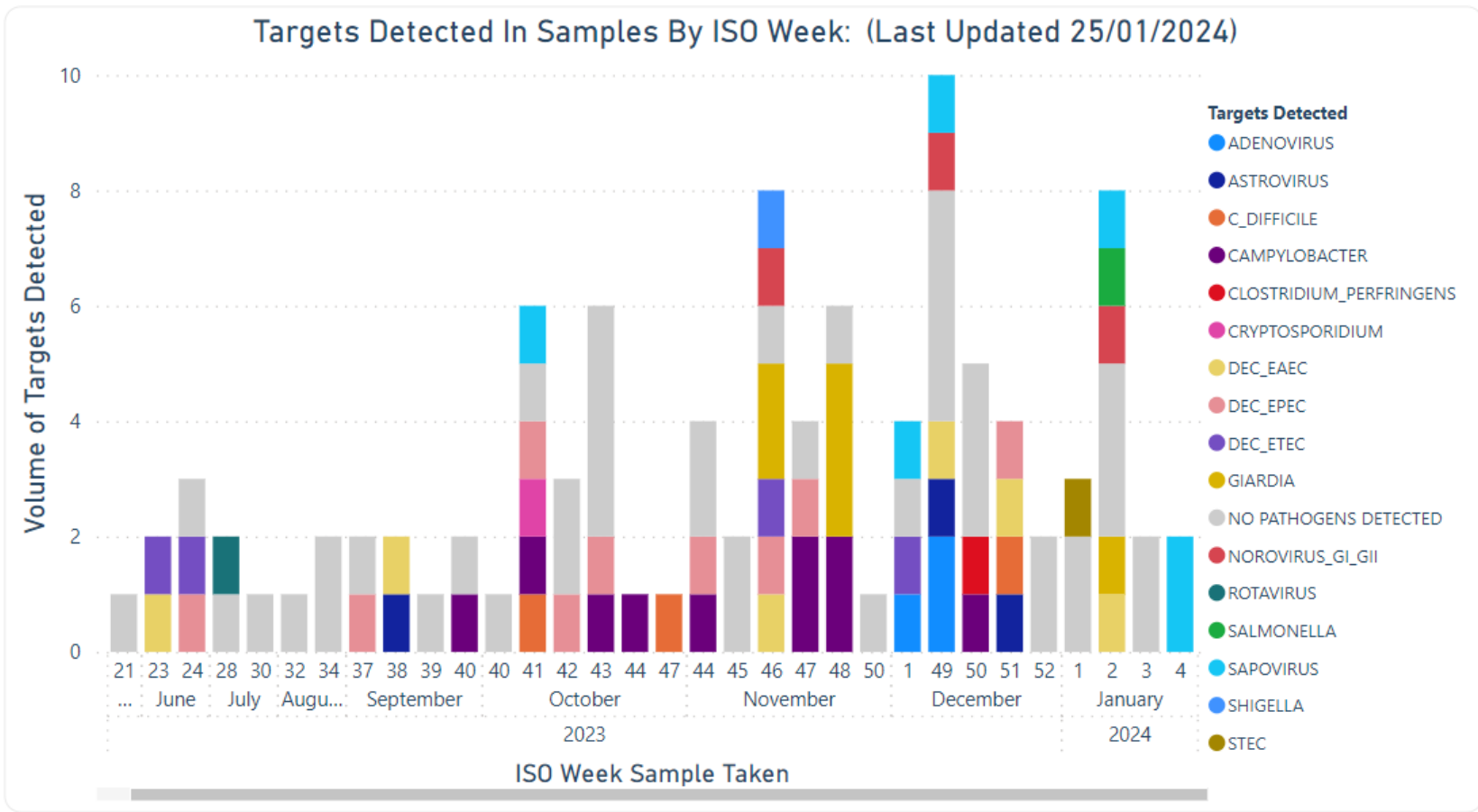
Current Progress

- Stool samples tested: 107
- No pathogen identified: 43

Bacterial	# positive	Viral	# positive	Parasites	# positive
<i>Salmonella</i>	1	Norovirus GI/GII	3	<i>Entamoeba histolytica</i>	-
STEC	1	Sapovirus	6	Giardia	6
<i>Campylobacter</i>	10	Astrovirus	3	<i>Cyclospora cayetanensis</i>	-
<i>Shigella</i>	1	Adenovirus	3	Cryptosporidium	1
<i>Aeromonas</i> spp	-	Rotavirus	1		
<i>E. coli</i> - ETEC	4				
<i>E. coli</i> - EPEC	9				
<i>E. coli</i> - EAEC	6				
<i>Yersinia</i>	-				
<i>Clostridium difficile</i>	3				
<i>Clostridium perfringens</i>	1				
<i>Vibrio</i>	-				

IID3 Dashboard

Samples Received 107	New EOI Practices 1	Completed EOI Practices 37	Actioned EOI Practices 49	No. Signed Agreements 46
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Outcomes

Data will then be used to update FSA models

- Foodborne disease estimates
- Cost of Illness model

Compare results to IID1 & IID2

- Trends for IID in UK
- Any new areas of concern?

Outputs

- Final report and anonymised dataset available late 2026 or early 2027
 - Salmonella sequences being added to NCBI for inclusion on PATH-SAFE platform
- IID3 samples will be stored for research use
 - Faecal sample and extracted cDNA/DNA
 - Ethical approval required to access

To Note: IID2 samples still being stored
(erica.kintz@food.gov.uk)



**The diversity of shiga-toxigenic *E. coli*,
optimising routinely generated
Salmonella sequences in Scotland
and other relevant RESAS activities.**

Dr Sue C. Tongue

SRUC (Scotland's Rural College)

sue.tongue@sruc.ac.uk

This work was supported by the Rural and Environment Science and Analytical Services Division

SRUC-B6-1 Diversity of STEC

Understanding the diversity of STEC and its relationship with human pathogenic potential

Why?

- STEC = Shiga-toxin producing *E. coli*
- Highest rate clinical cases (per 100,000 head per annum) – human population in UK
 - *E. coli* O157 STEC
 - non-O157 STEC



Food
Standards
Scotland
For safe food and
healthy eating



Survey of beef mince at retail level in Scotland



British *E. coli* O157 in cattle study, also known as BECS*



[FS101055](#)



• [10.1017/S0950268817002151](https://doi.org/10.1017/S0950268817002151)

<https://doi.org/10.1128/AEM.03142-20>

O26 phylogenetic relationships and virulence composition

Retail mince survey – 2019

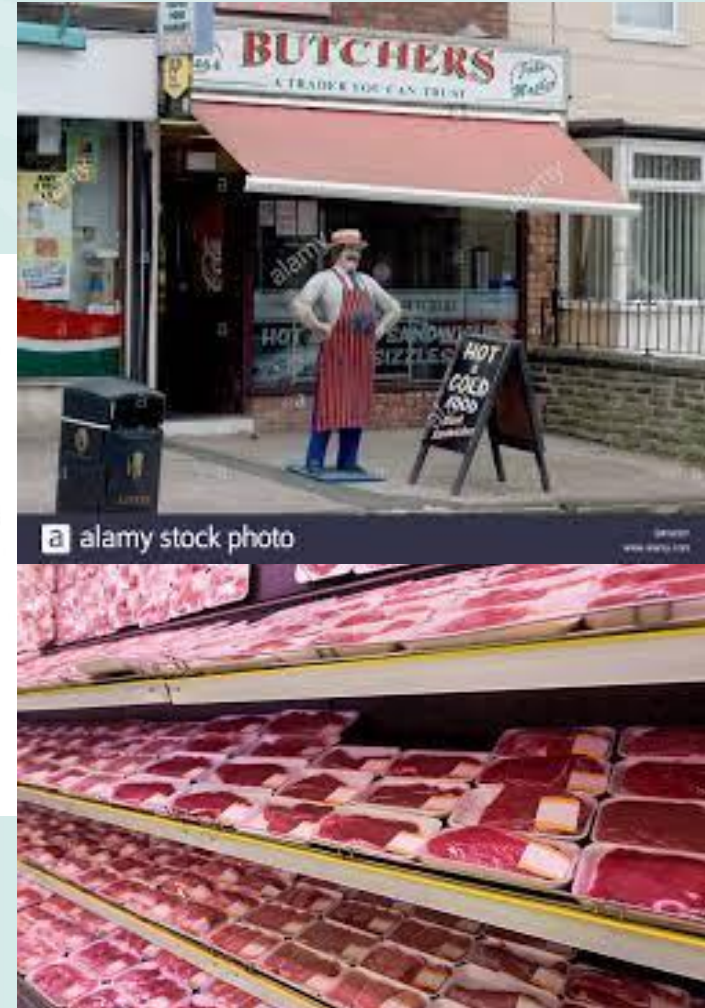
FSS/2018/013



SURVEY

Survey of beef mince at retail level in Scotland

<https://doi.org/10.4315/JFP-22-051>



The risk of STEC contamination in wild venison



What are we doing in SRUC-B6-1?

-  = Completed
-  = Ongoing
-  = initiated





O157 


SRUC

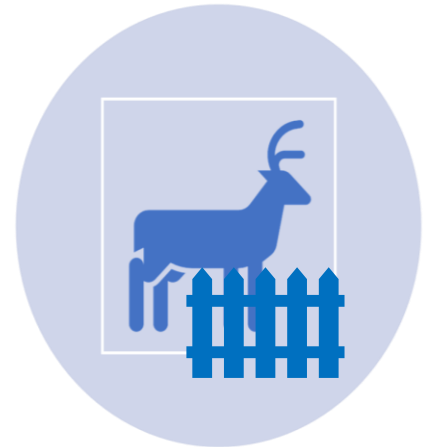
non-O157 STEC 



O157 


SRUC

non-O157 STEC



O157 

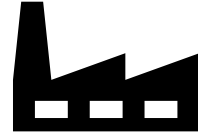
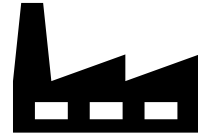
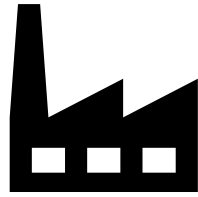

Moredun
Research Institute

non-O157 STEC 

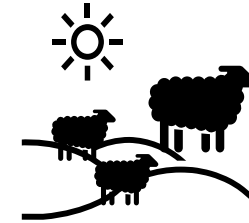
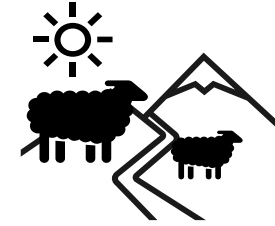




**Scottish healthy
animal AMR
survey samples**



**Samples
from
additional
premises**



Field flocks



10 farms sampled

Samples (321 deer, 16 cattle, 16 sheep)



What else are we doing in SRUC-B6-1??



SRUC

Home Profiles **Research output** Projects Activities Datasets Press/Media Prizes ...

Harnessing diverse prophages of STEC O157:H7 phage-type 8 for rapid identification of fresh produce-associated STEC strains


JYN Nale, SC Tongue, NH Holden

Centre for Epidemiology and Planetary Health (CEPH), New North Agri Cost Centre, Food Security Challenge Centre

Research output: Contribution to conference • Paper




 = Completed

 = Concept

 = still to come



MoreDun



Improving methods for isolation and characterisation of for non-O157 STEC




Eco-system case studies

SRUC-B6-1 Diversity of STEC



- Diversity
- Sampling strategies & design
- Interpretation
- So what?

Salmonella sequences

Objective 3.1 SRUC-A2-2

SEFARI 


SRUC



Veterinary Services





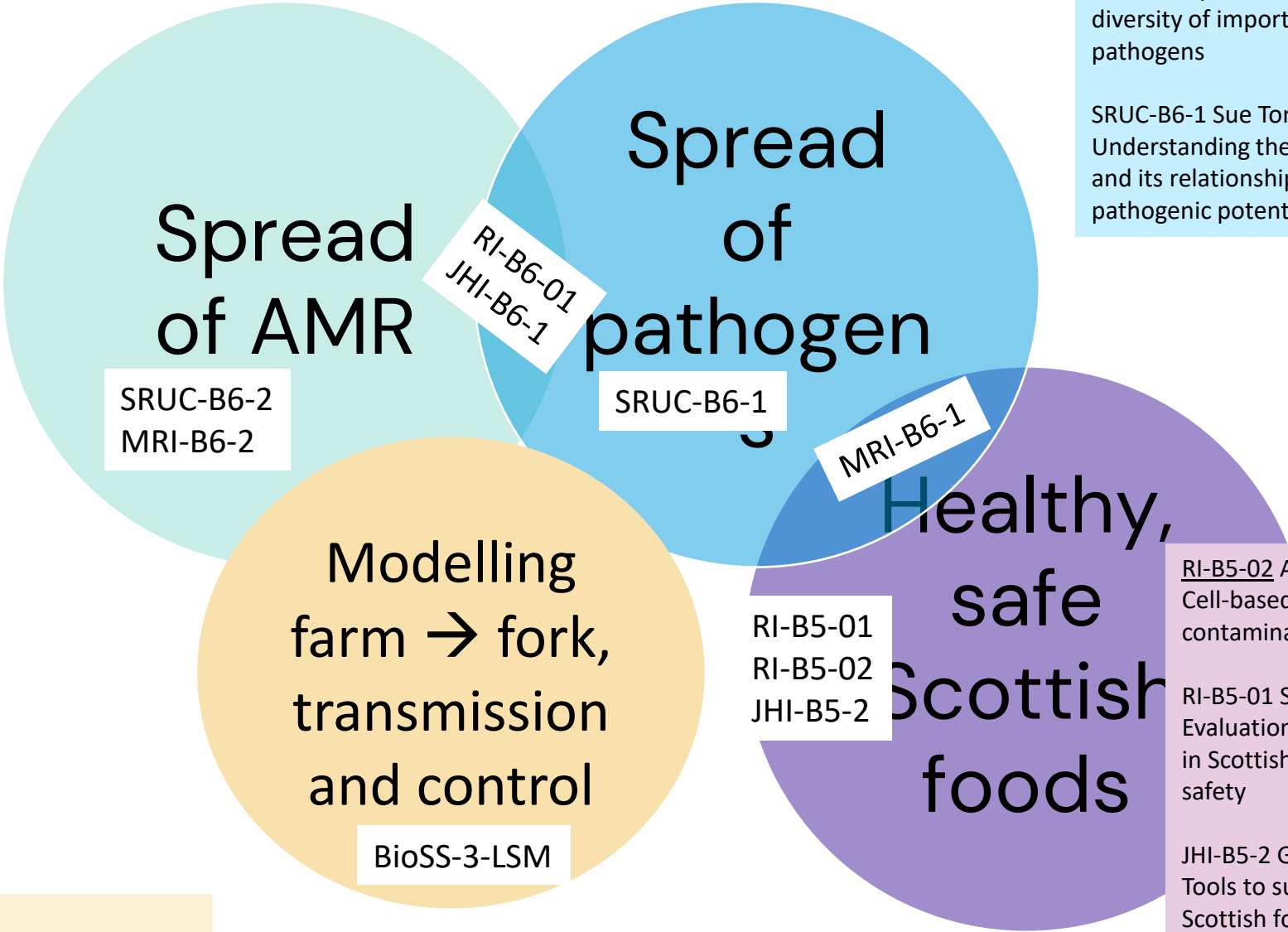
RESAS SRP 2022-2027

Topic B6

Diet and Food Safety

This work was supported by the [Rural](#) and Environment Science and Analytical Services Division

Projects and research areas



MRI-B6-1 Clare Hamilton
Addressing knowledge gaps in the sources, epidemiology and genetic diversity of important foodborne pathogens

SRUC-B6-1 Sue Tongue
Understanding the diversity of STEC and its relationship with human pathogenic potential

SRUC-B6-2 Mike Hutchings
A systems understanding of the flow of AMR from livestock production to the environment and humans: informing risk analyses

MRI-B6-2 Nuno Silva
Understanding the dynamics of antimicrobial resistance genes (ARGs) flux in the soil, animals and humans in different fertilisation practices for grasslands

RI-B6-01 Karen Scott
Incorporation of whole ecosystem approaches to reduce transmission of foodborne pathogens and antimicrobial resistance

JHI-B6-1 Lisa Avery
Flows of Antimicrobial resistance (AMR) and pathogens through environment to food chain

RI-B5-02 Andreas Kolb
Cell-based bioassay solutions for food contaminant testing

RI-B5-01 Silvia Gratz
Evaluation and mitigation of mycotoxins in Scottish oats to ensure consumer safety

JHI-B5-2 Gordon McDougal
Tools to support healthier, safer, Scottish food produce

BioSS-3-LSM
Framework for modelling farm to fork transmission and control of foodborne hazards

B6 Diet and Food Safety

SRUC-B6-2 Mike Hutchings

A systems understanding of the flow of AMR from livestock production to the environment and humans: informing risk analyses

MRI-B6-2 Nuno Silva

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Understanding the diversity of STEC and its relationship with human pathogenic potential

BioSS-3-LSM Glenn Marion

Framework for modelling farm to fork transmission and control of foodborne hazards

SEFARI 



Dr Sue C. Tongue

SRUC (Scotland's Rural College)

sue.tongue@sruc.ac.uk





SRUC



UK Research
and Innovation

UKRI Strategic Themes

Tackling Infections

28th February 2024

Andrew Hellewell



UKRI strategic themes:

- address large-scale, complex national and global challenges
- harness the full power of the UK's research and innovation system
- underpin key sectors of the UK economy.

Over the first year of our strategy, we will co-create research agendas, coordinate actions and leverage private investment.



Five strategic themes, 2022-27:

- Building a Green Future
- Securing better health, ageing and wellbeing
- **Tackling infections**
- Building a secure and resilient world
- Creating opportunities, improving outcomes



Tackling Infections

The Challenge

Infectious disease threats are becoming more acute, driven by biodiversity loss, changing climate, human demographics and behaviours

Compounded by endemic infectious disease threats to both human health and the health of systems we depend on (food, water, waste, natural and managed environments)

UK has led G7 commitments to deliver effective future pandemic preparedness action; tackling infectious diseases will be essential to meeting UN Sustainable Development Goals and Net Zero targets



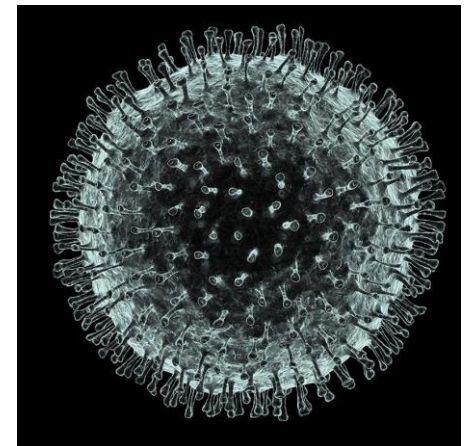
Tackling Infections

Current Situation

The landscape across human, animal and plant health could be more integrated and coordinated.

There is an opportunity to:

- Build on the foundations of disciplinary strength to foster innovative thinking across the full breadth of UKRI's remit
- Capitalise on approaches and partnerships established during the COVID19 pandemic

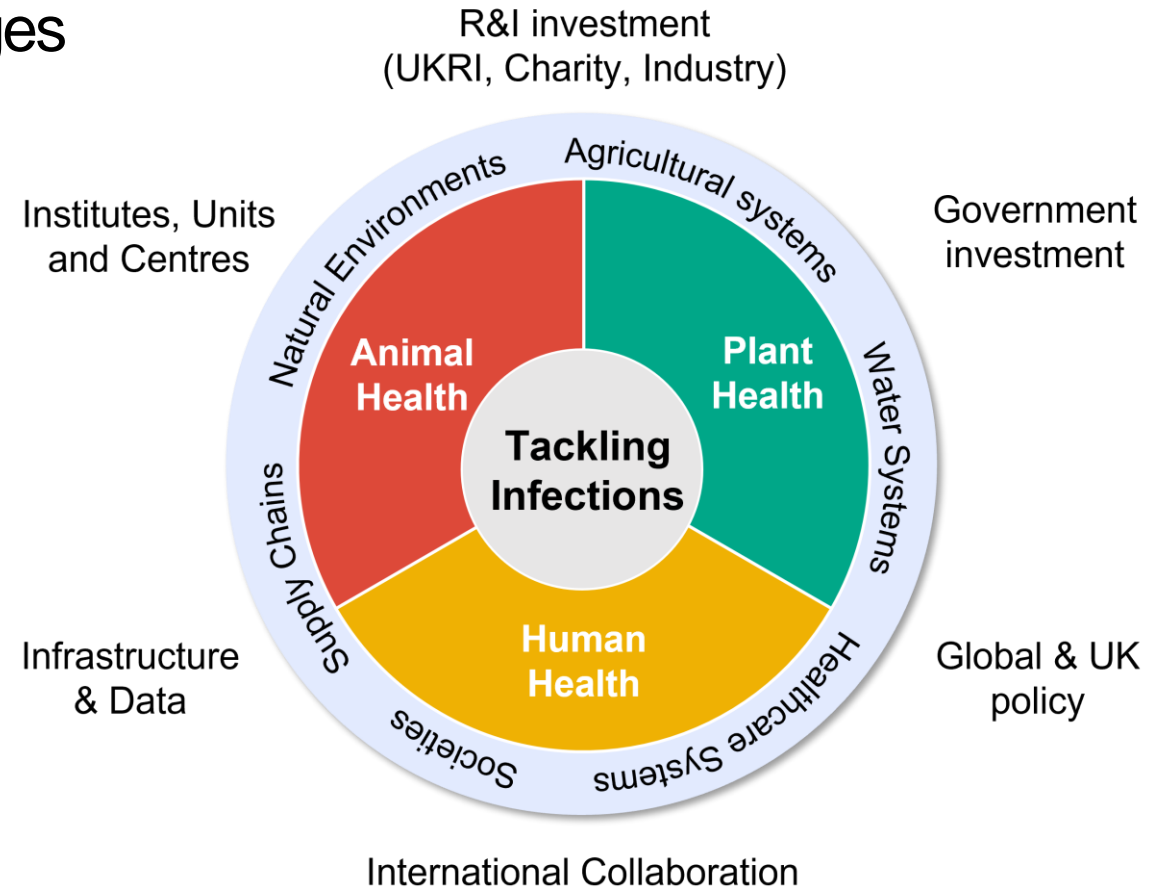


Tackling Infections – UKRI Strategic theme

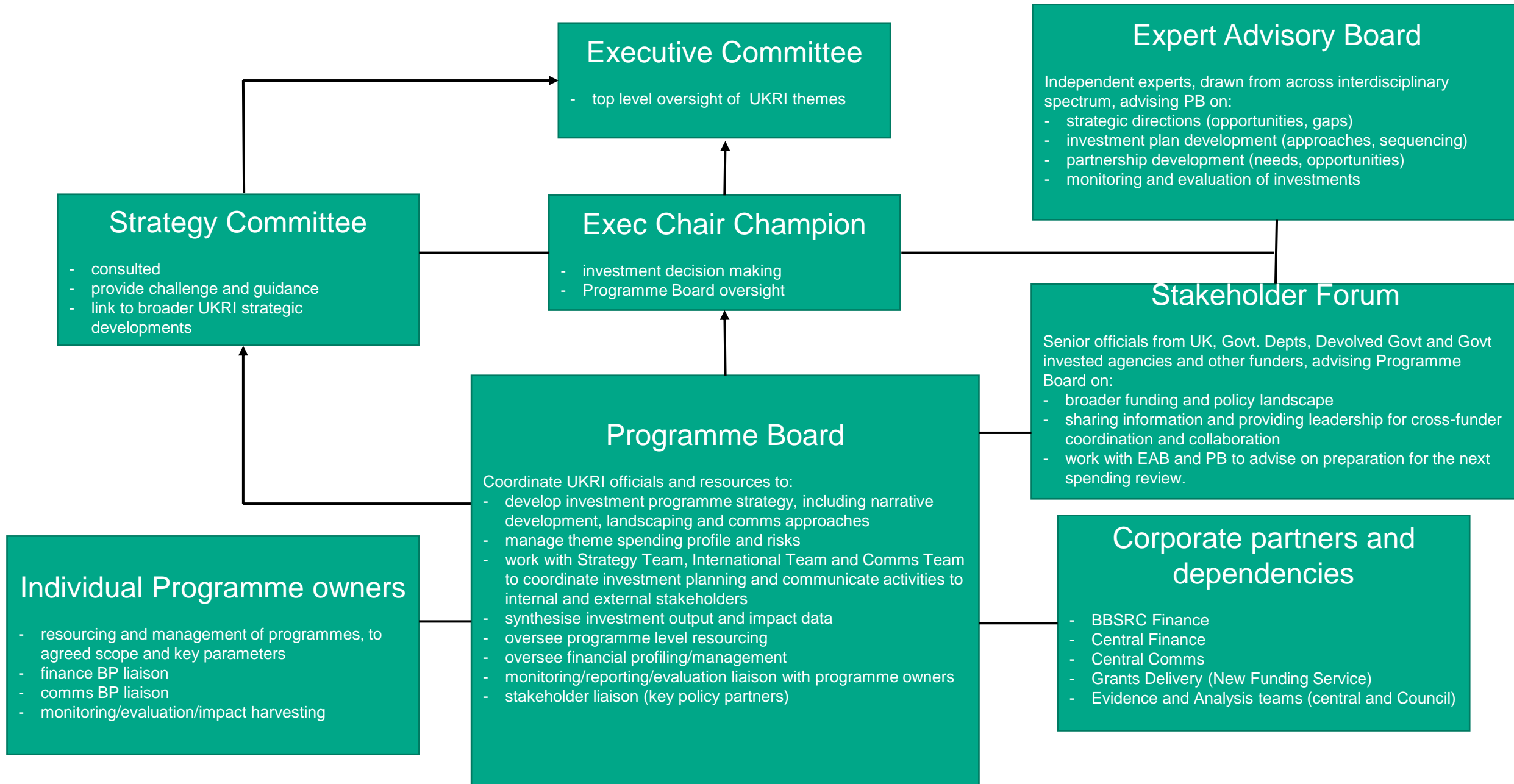
An ambitious and holistic research and innovation agenda to tackle major infectious disease challenges that threaten our national and global health, wellbeing, security, prosperity and environments

Aims to:

- Foster the development of systems-level understanding of how infectious diseases emerge and spread through natural environments, agricultural and water systems, supply chains and societies
- Ally this new understanding with the development of innovative diagnostics, antimicrobial toolkits and effective tools to prevent and disrupt emergence and transmission



UKRI Governance



Investment Plan Outline

£75m, over 5 years – supporting new interdisciplinary activity and working to amplify and connect existing UKRI investments. **2 Phases (2nd provisional)**

Phase 1: Flagships

Epidemic Preparedness

An interdisciplinary initiative to better understand, predict and prevent (re-)emergence of diseases of epidemic potential.

- Initial investments will seed interdisciplinary teams and research ideas – Call closed 27th February
- Larger scale programmatic awards will address research questions and establish a networked, interdisciplinary research community better prepared to address future threats.

AMR

Community capacity building and a deep integration of a wider range of disciplines and approaches to deliver the transformative approaches needed to effectively tackle the slow-moving pandemic of antimicrobial resistance.

- Network call closed 13th December.

Investment Plan Outline

Phase 1: Amplification

Leveraging core commitments in targeted priority areas, injecting collective value to programmes in various stages of development

Recent Investments:

- UKRI-Defra One Health approach to vector borne diseases
- CDT: Environmental Solutions to Zoonoses ~60 students/3 cohorts
- UK-US research: ecology and evolution of infectious diseases
- Research consortia to underpin proactive vaccinology
- Tackling Infections: Novel Technologies Mini-Sandpit
- Genomics for Animal and Plant Disease Centre (GAP-DC2) – UKRI Contribution to Defra-led programme
- Avian Influenza Rapid Response Investment



Investment Plan Outline

Phase 2: Augmentation and Gap-Filling

Taking stock of, and building on, the key capabilities established in Phase I

Phase 2: Focus Areas

Details to be confirmed

- To be determined in consultation with the External Advisory Board, Stakeholder Forum and the wider community





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Thank you

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