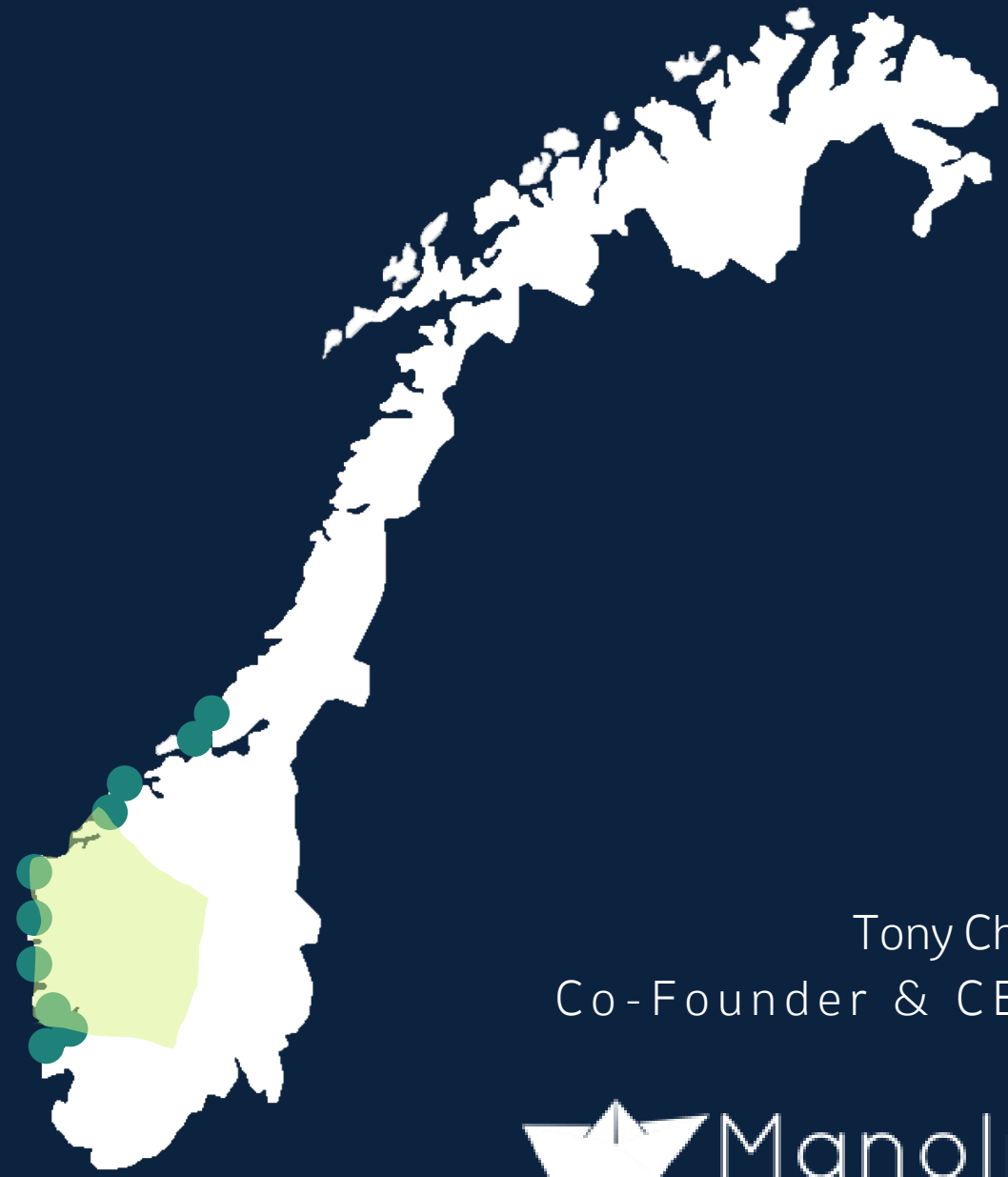
UK-AQP-260400001 / OSTIC 2026-MS-2526 (Oral)

Proximity-Based PD Risk Insights in Norwegian Salmon Production Areas 3 & 4

Leveraging Large-Scale Observational Data for Area-Based Disease Management



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Manolin

Abstract:

This observational, retrospective study examined PD outbreak patterns in Norwegian Production Areas 3 & 4 (2020-2024), analysing spatial relationships between Atlantic salmon farms and neighbouring Rainbow trout sites. Using t-tests and spatial correlation analysis, we found Atlantic salmon farms experiencing PD outbreaks were located significantly closer (mean 2.87 km) to Rainbow trout farms compared to non-outbreak sites. Notably, Atlantic salmon farms located within closer proximity to Rainbow trout sites without documented PD preventative measures showed higher PD occurrence rates. Spatial risk modelling using 10-20km buffer zones revealed consistent patterns across production cycles. These findings underscore the value of shared health intelligence as an important factor in developing comprehensive area-based disease management strategies for Atlantic salmon farmers. The methodology offers a measurable approach for identifying exposure risk to inform future strategies for disease prevention in areas where species are co-farmed.

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OUTLINE

1. PD Trends in Norway
2. Research Questions & Analytical Approach
3. Key Insights
4. Key Considerations
5. Integrated Health Management
6. Next Steps & Conclusions

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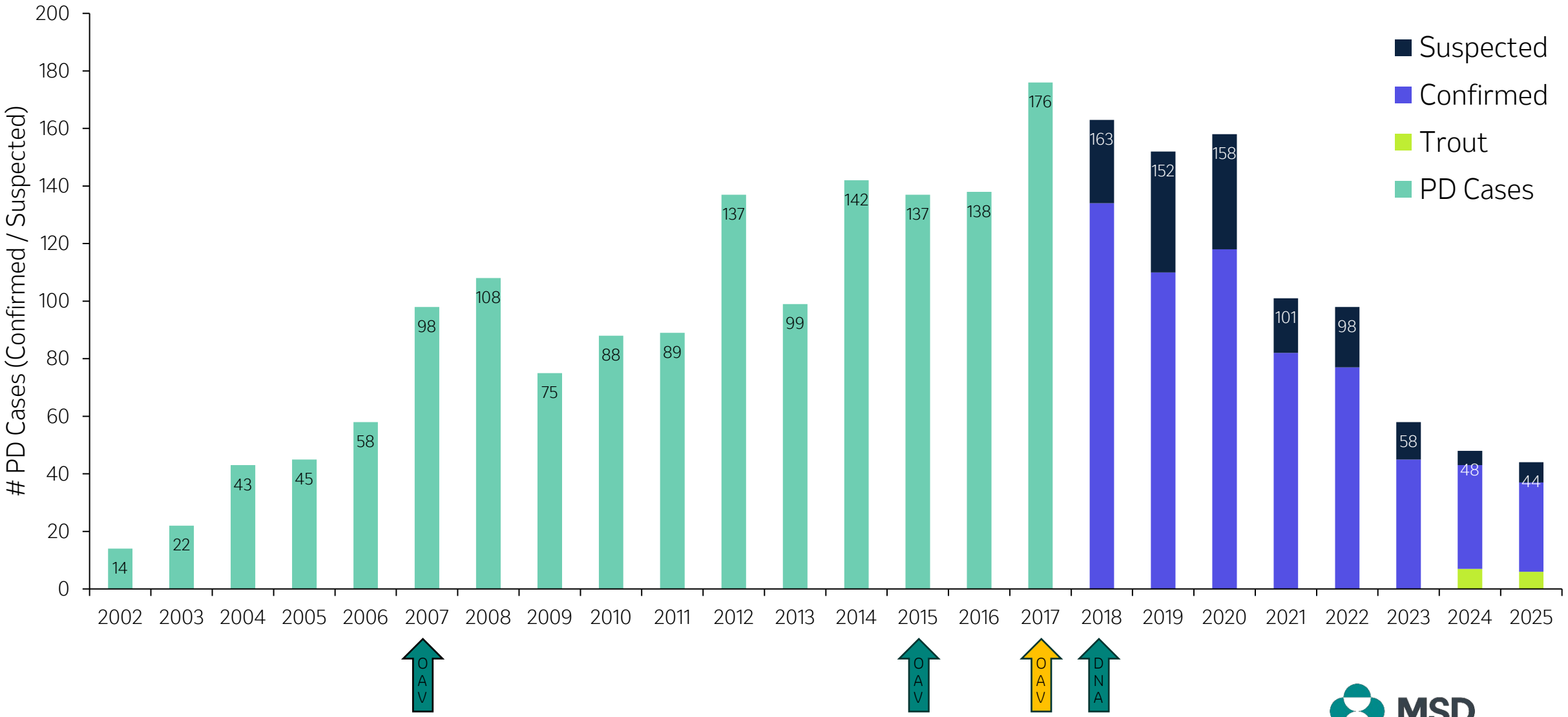
2020-24: PD TRENDS IN NORWAY... A TURNING POINT



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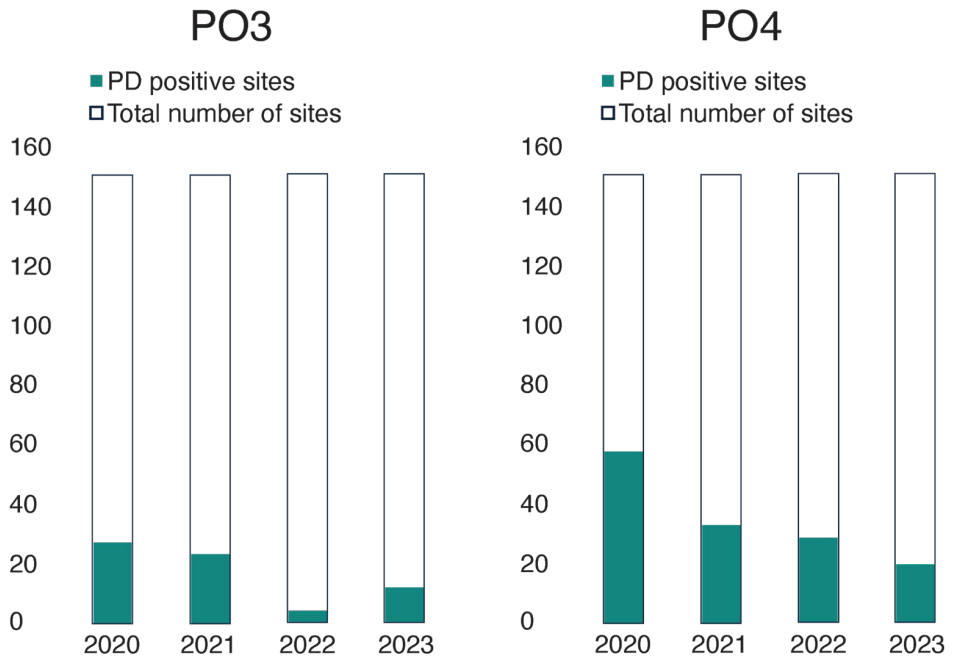
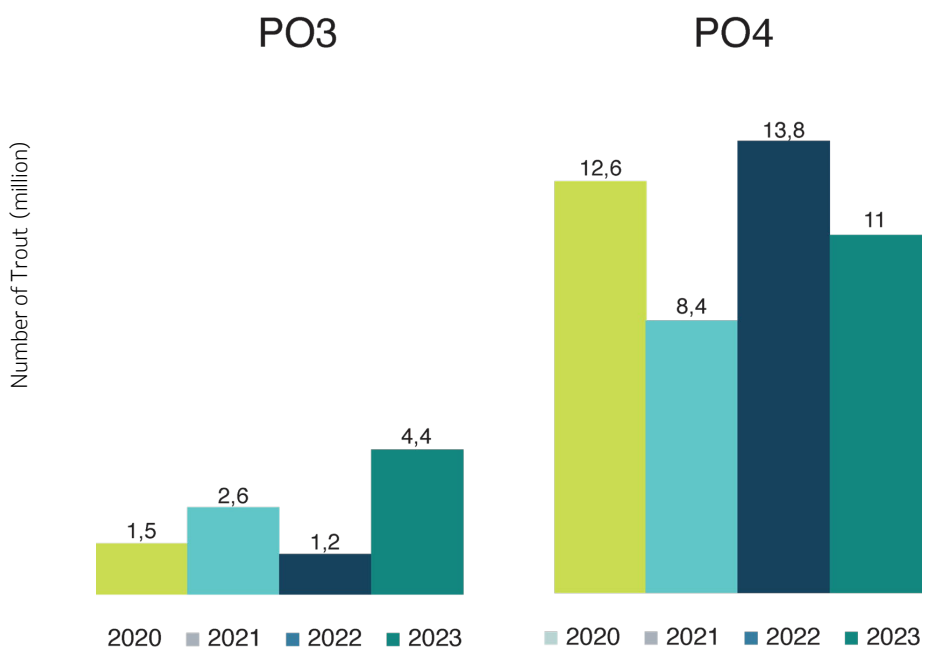
[1]Veterinærinstituttet: Oppdatert status på PD – Veterinærinstituttet
1 The Norwegian Veterinary Institute: Pancreatic disease (PD) - outbreaks and statistics - The Norwegian Veterinary Institute and the Fish Health Reports

WE ASKED MANOLIN TO DIVE A LITTLE DEEPER...

PO3 & PO4 continue to have outbreaks



Trout farming is uniquely high in these regions



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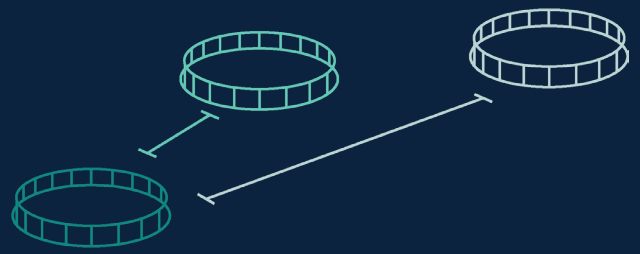
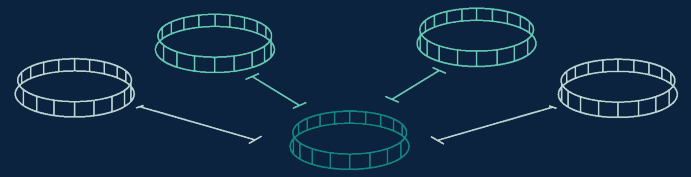
QUESTIONS WE HAD?

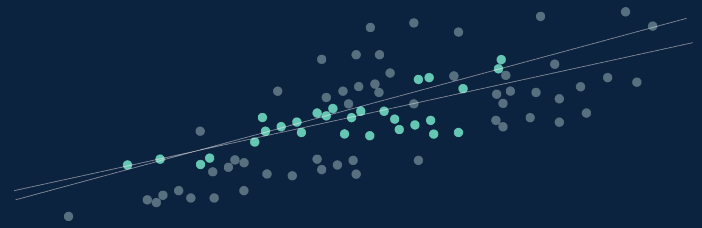


1. Why do P3 & P4 have higher occurrences of PD outbreaks?



2. Are PD outbreaks associated with Trout farms?

3. What relationship is there between health management measures, and outbreak patterns?



4. How can we use industry & real-world data to understand this?

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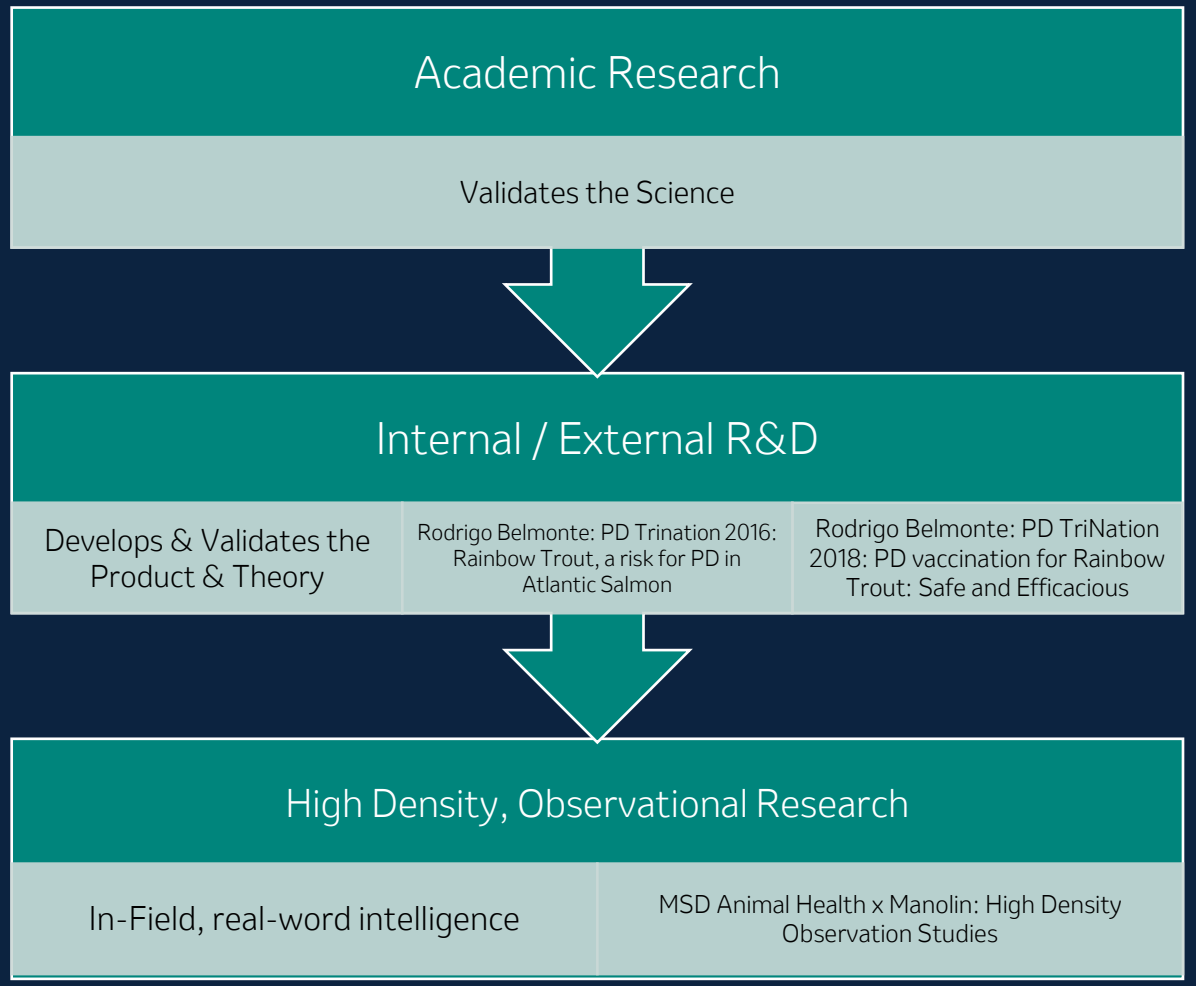
OBSERVATIONAL RESEARCH: A NEW PARADIGM



Analyse data from millions of fish in real-world commercial farming operations … looking for patterns, correlations, and even casual insights.

Real-world complexity captured - Farms routinely record data on feed use, growth rates, health treatments, water quality, and more.

[!] It's important to note that observational research is not about replacing traditional trials or science.

It augments our toolkit for understand aquaculture processes

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REFERENCE = MANOLIN Whitepaper: High-Density Observational Research in Aquaculture – A Faster Path to Product Insights for Suppliers

ANALYTICAL METHODOLGY

DATA QUALITY REVIEW

Collected PD outbreak records (2020–2024)

Mapped all salmon and trout sites in PO3 & PO4

Identified missing values, outliers, and vaccine coverage gaps

Verified production cycle alignment (95%+ accuracy)

Data sources:

- Public: (*Barents Watch*, *ASC Reports*, *Veterinary Register*)
- Proprietary: *MANOLIN Harpoon supplied by Farmers / Producers*

STATISTICAL TESTING

Measured distance to nearest trout site for all farms

Compared PD(+) vs PD(-)farms

Quantified average proximity difference

SPATIAL MODELING

Developed proximity risk layers (10km, 15km, 20km buffers)

Analysed PD risk trajectories across production timelines

Visualized divergence patterns between PD(+) and PD(-)farms

Created interpretable metrics for internal tools

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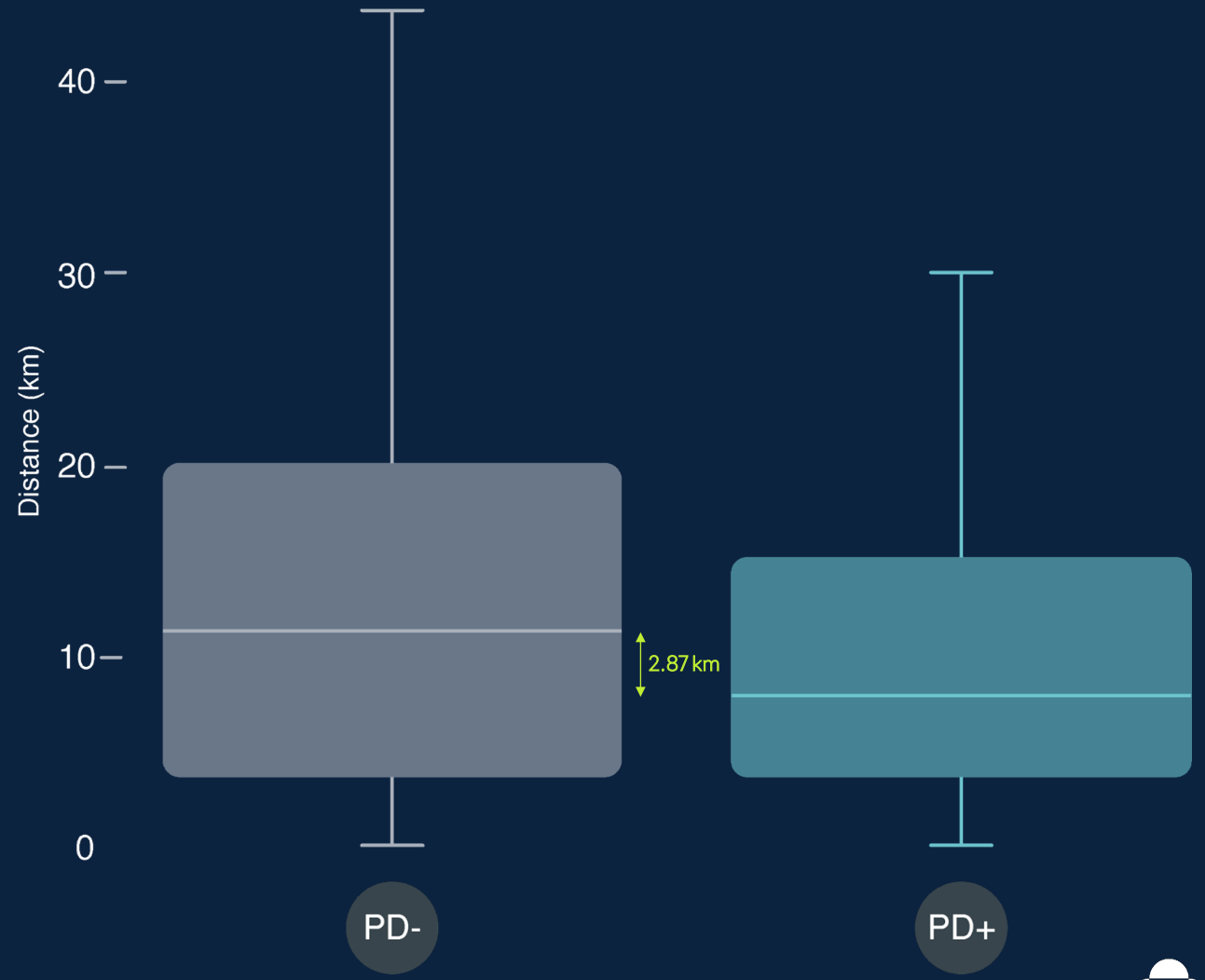
KEY FINDING #1: THE PROXIMITY FACTOR

Proximity Analysis

Spatial modelling & T-Tests

The proximity analysis showed a statistically significant difference between outbreak and non-outbreak sites.

Salmon farms that reported PD outbreaks were located, on average, 2.87 km closer to the nearest trout farm than those without outbreaks



*Data represented in graph is from years 2020-2024

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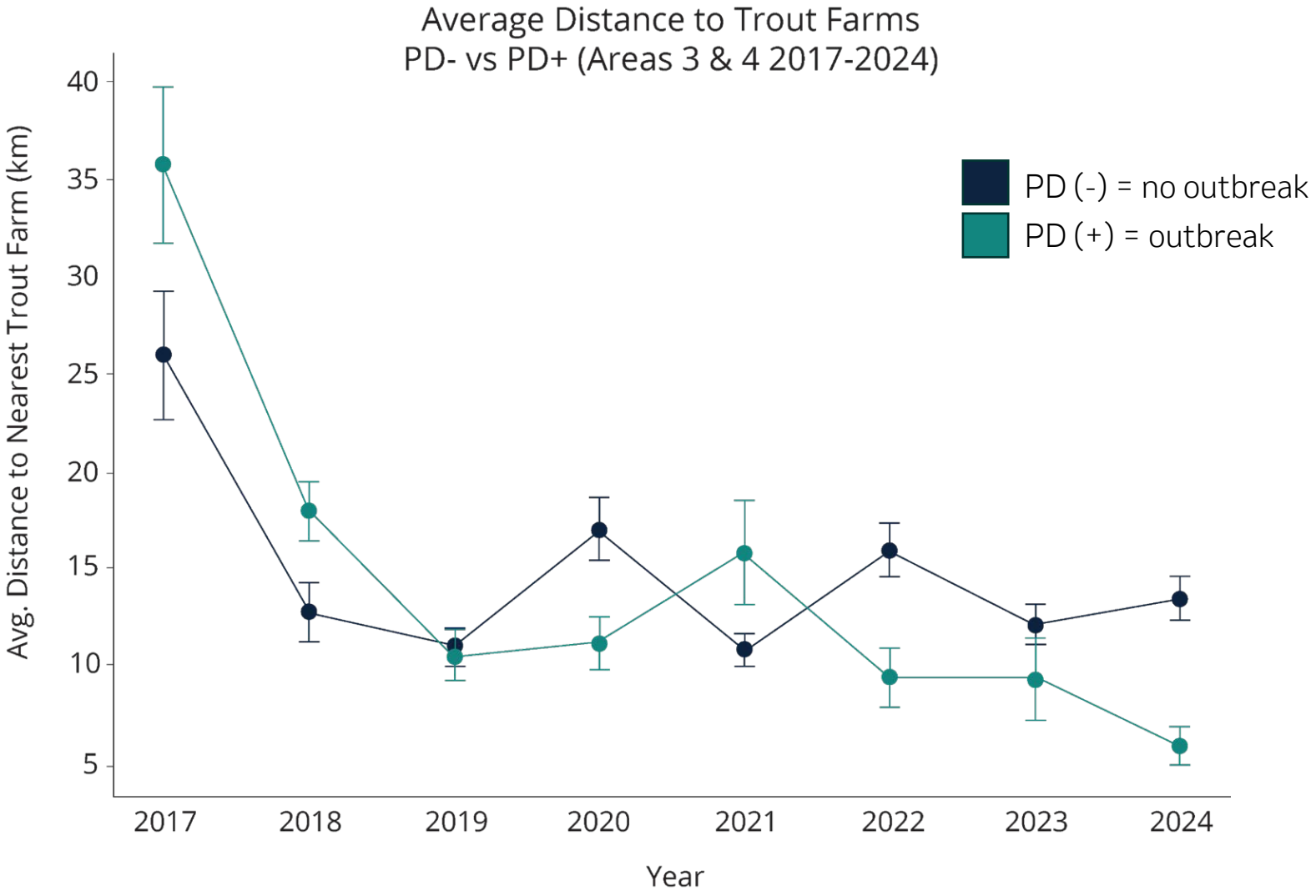
KEY FINDING #2: PATTERN CONSISTENT ACROSS CYCLES



This trend was consistent across multiple years, suggesting that proximity to trout sites may contribute to increased exposure risk.

Salmon farms located further from trout sites, (or located near trout farms with prevention records), were less likely to experience PD outbreaks during the same production cycles.

10-20% increase in documented preventive health measures on Trout farms correlated with 18-33% reduction in PD risk at neighbouring salmon sites

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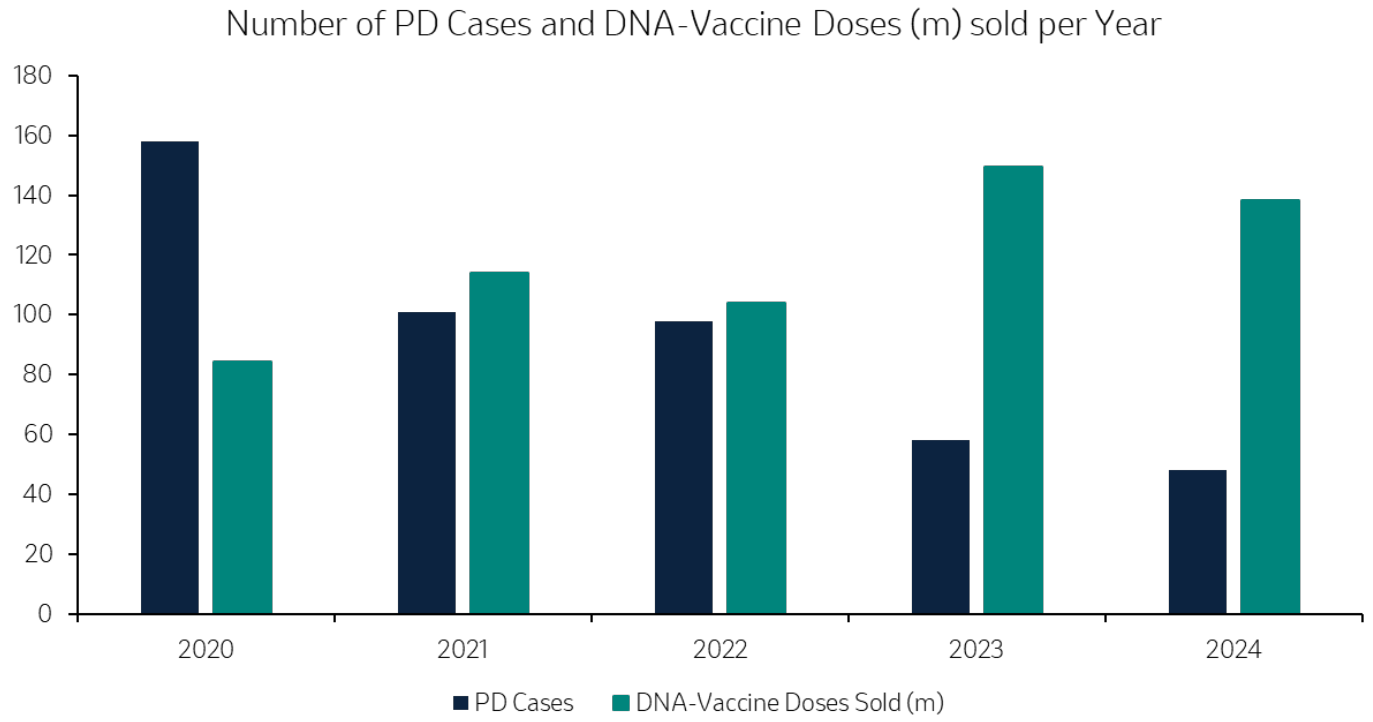
KEY FINDING #3: NATIONAL PD TRENDS & HEALTH MANAGEMENT ADOPTION

PD Cases in Norway

On a broader scale, national PD case counts have declined steadily since 2020, correlating in the same period that DNA-vaccine adoption among farms increased.

This relationship supports further use of spatial and vaccination data as predictive indicators for site-level PD risk



Sources:

- *FarmStat data for 2020-2024 DNA Vaccine Doses Sold*
- [1]Veterinærinstituttet: Oppdatert status på PD – Veterinærinstituttet / The Norwegian Veterinary Institute: Pancreatic disease (PD) - outbreaks and statistics - The Norwegian Veterinary Institute and the Fish Health Reports

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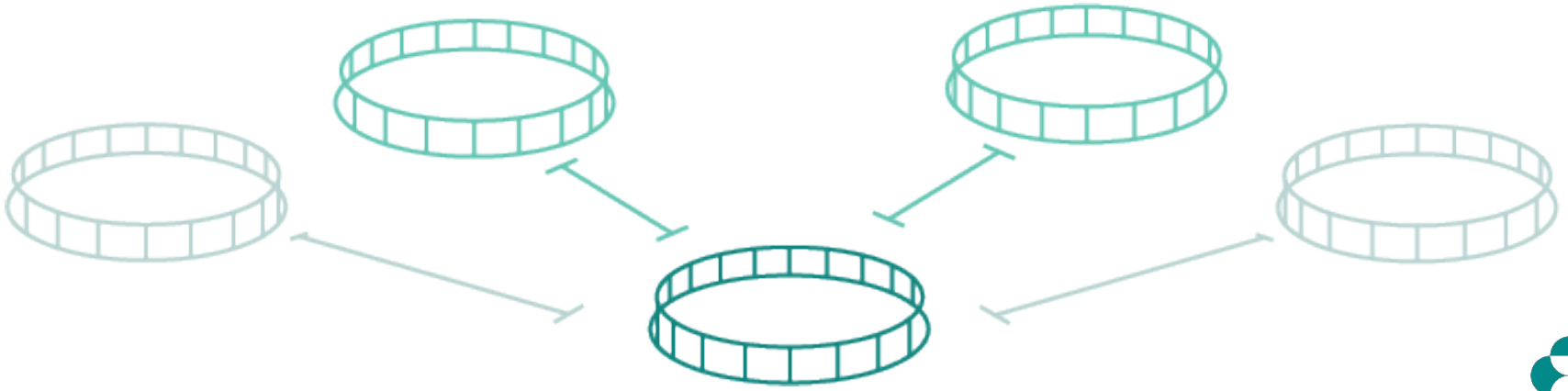
TAKEAWAY #1: PREVENTION IS A KEY FACTOR

1. Spatial modelling confirmed PD(+) Salmon farms were consistently closer to Trout sites, than PD(-) Salmon farms in PO3 and P04.

2. Trout Sites with unknown or absent preventive measures correlated with higher PD occurrence in nearby salmon farms

3. We observed a notable correlation between national vaccination and PD risk reduction

4. High-Density Observational proximity and vaccine data may offer early indicators for risk planning and reporting



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TAKEAWAY #2: REGIONAL CONSIDERATIONS

Norway

Direct applicability to current production areas

Evidence base for spatial planning and site selection

Supports collective action through integrated health strategies in mixed-species farming zones

Demonstration of data-driven disease management strategies

Scotland & Ireland

Transferable insights for managing & mitigating PD risk in areas with multiple salmonid species

Framework for spatial risk assessment

Supports collective action through integrated health strategies in mixed-species farming zones

Demonstration of data-driven disease management + Potential to implement new ideas into Veterinary Health & Welfare Plans (VHWPs) and FMAs.

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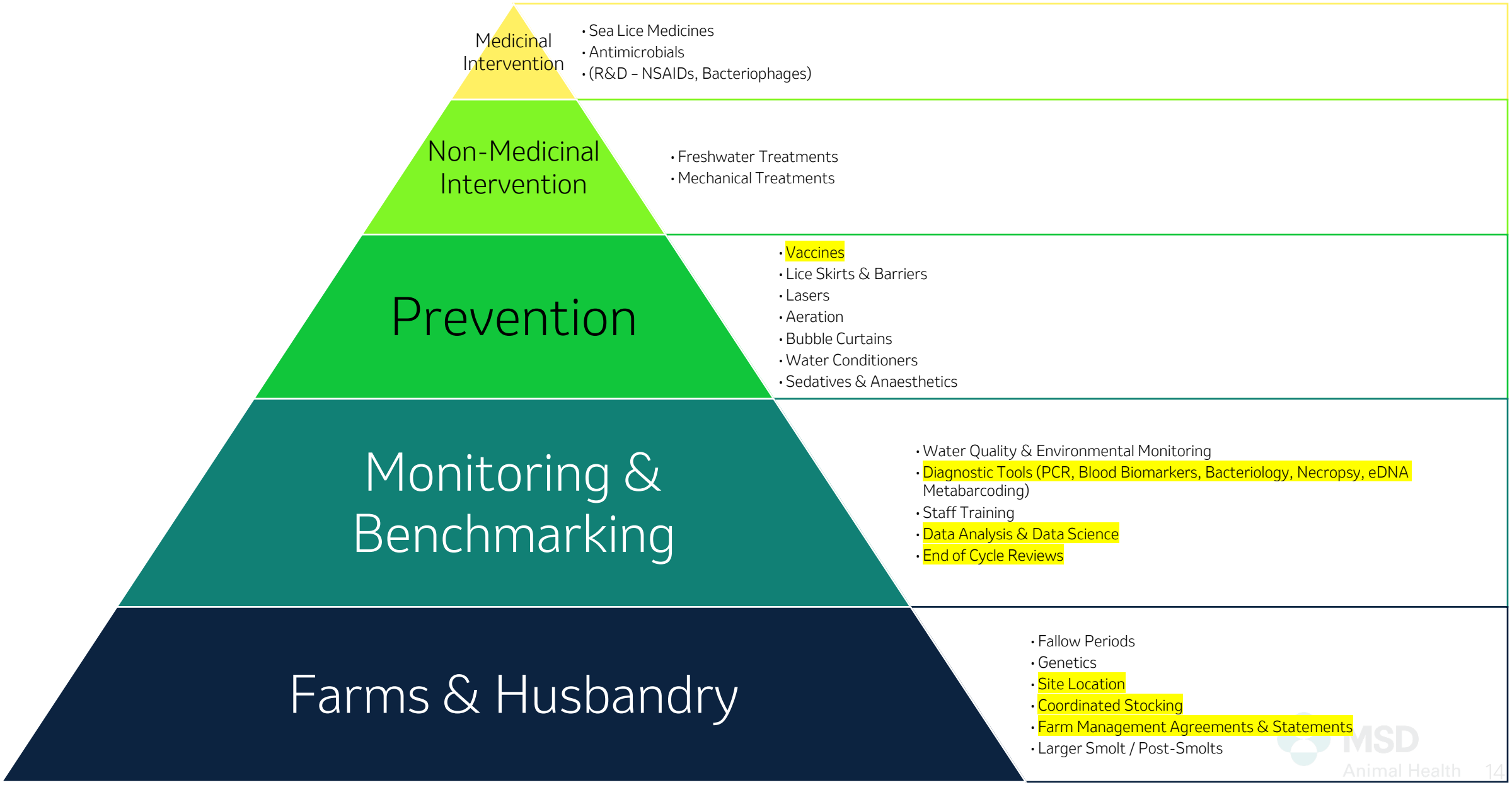
INTEGRATED HEALTH MANAGEMENT:

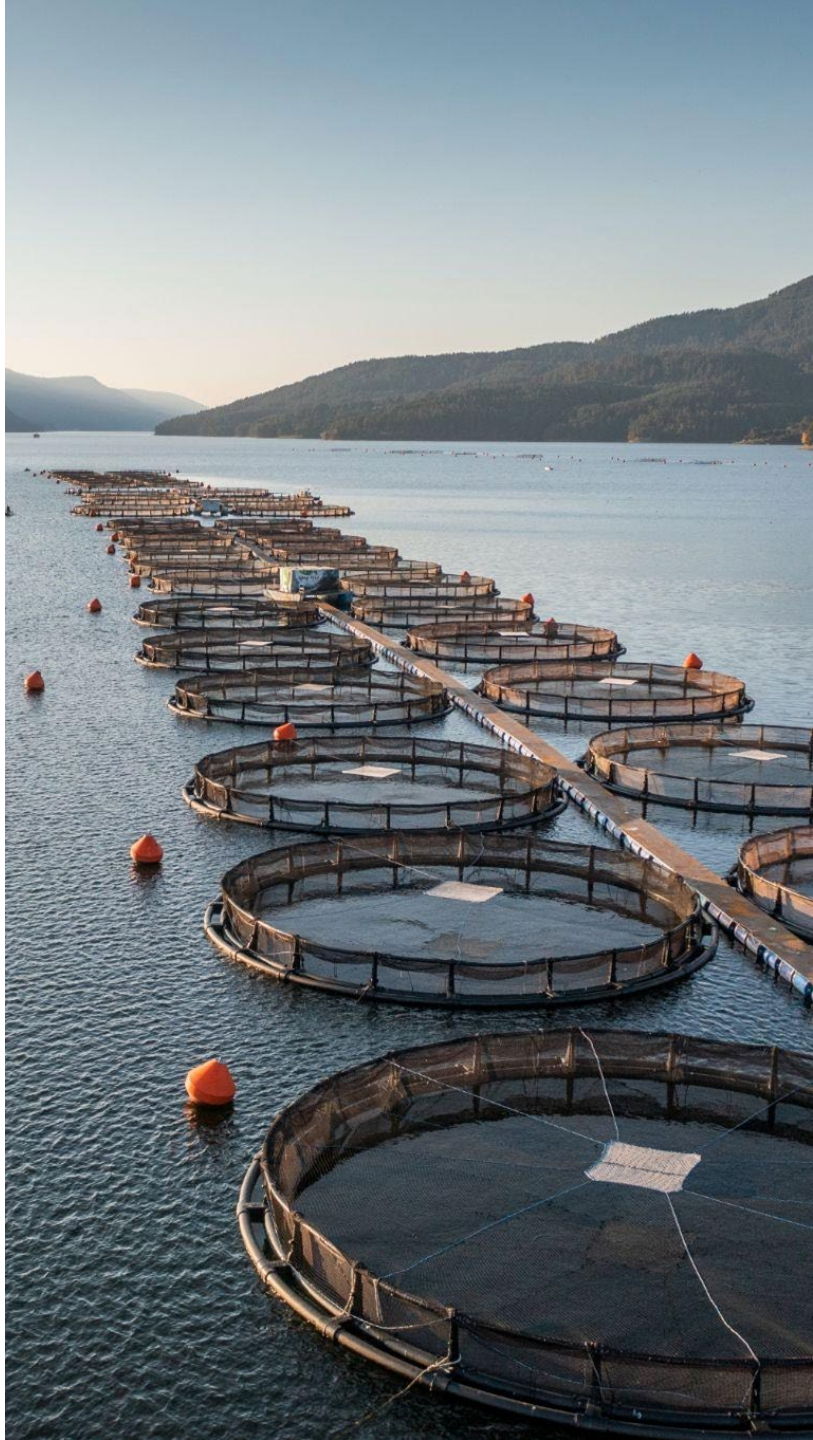


NEXT STEPS

- Improve data coverage across trout and salmon sites
- Expand our study's datasets timeline and variables for deeper analysis
- Encourage increased farm participation in Manolin's platforms to enhance datasets
- Use proximity + vaccine data to refine outbreak assumptions

CONCLUSIONS

- **Observational research** can enable rapid, large-scale insights
- Proximity to trout farms is a **measurable PD risk factor**
- Preventative health measures correlate with reduced PD risk.
- Support industry-wide health data sharing initiatives
- **Integrated & Coordinated strategies** essential for endemic areas



We're making PD history

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ADDITIONAL INFORMATION

UNITED KINGDOM

Clynav contains pUK-SPDV-poly2#1 DNA plasmid coding for salmon pancreas disease virus proteins: 6.0– 9.4 µg. Legal category POM-V. Further information is available from the SPC, datasheet or package leaflet. Advice should be sought from the medicine prescriber. Prescription decisions are for the person issuing the prescription alone. Use medicines responsibly. www.noah.co.uk/responsable.

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ADDITIONAL INFORMATION AVAILABLE AT
Https://www.Ema.Europa.Eu/en/documents/product-information/clynav-epar-product-information_en.Pdf

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ADDITIONAL INFORMATION

IRELAND

Clynav contains pUK-SPDV-poly2#1 DNA plasmid coding for salmon pancreas disease virus proteins: 6.0– 9.4 µg. Legal category POM-V. Further information is available from the SPC, datasheet or package leaflet. Advice should be sought from the medicine prescriber. Prescription decisions are for the person issuing the prescription alone. Use medicines responsibly.

Use Medicines Responsibly. www.apha.ie

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ADDITIONAL INFORMATION AVAILABLE AT
Https://www.Ema.Europa.Eu/en/documents/product-information/clynav-epar-product-information_en.Pdf

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ADDITIONAL INFORMATION

NORWAY

CLYNAV. Vaksine til atlantisk laks. (Salmonid alfavirus subtype 3 (SAV3)-vaksine). Injeksjonsvæske, oppløsning, til intramuskulær injeksjon: 1 dose (0,05 ml) inneholder 6,0-9,4 µg pUK-SPDV-poly2#1 DNA-plasmid som koder for proteiner fra salmonid alfavirus. Indikasjoner: Aktiv immunisering for å redusere hemming av daglig tilvekst, samt redusere dødelighet og lesjoner i hjerte, pankreas og skjelettmuskulatur forårsaket av pankreassykdom etter smitte med SAV3. Beskyttende immunitet utvikles innen 399 døgngrader (gjennomsnittlig vanntemperatur i °C × antall dager) etter vaksinasjon. Varighet av immunitet: 1 år for reduksjon av hemmet daglig tilvekst, og lesjoner i hjerte, bukspyttkjertel og skjelettmuskulatur og 9,5 måneder for reduksjon av dødelighet (vist i en laboratoriestudie ved vanntemperatur 12±2°C på effekt utført i saltvann ved bruk av en kohabitant-modell). Bivirkninger: Avvikende svømmeadferd hos fisk i opptil 2 dager. Endring i fiskens pigmentering i opptil 7 dager. Redusert appetitt i opptil 9 dager. Stikksår: Nåleskader kan vedvare hos opptil 5 % av fisken i minst 90 dager, og kan sees både makroskopisk og mikroskopisk. Forsiktighetsregler: Kun frisk fisk skal vaksineres. En kroppsvekt på minimum 25 g er anbefalt ved vaksinering. Personlig beskyttelsesutstyr, f.eks. beskyttende hansker, bør brukes ved håndtering av preparatet. Ved utilsiktet egeninjeksjon, søk straks legehjelp og vis pakningsvedlegg/etikett. Interaksjoner: Ingen informasjon vedrørende sikkerhet og effekt ved samtidig bruk med andre preparater. Det må derfor avgjøres i det enkelte tilfelle om vaksinen skal brukes før eller etter andre veterinærpreparater. Virkning på reproduksjon er ikke undersøkt. Skal ikke brukes til stamfisk. Dosering: Preparatet ristes lett før bruk. Bedøv fisken til den er håndterbar. 0,05 ml gis i.m. Administrering: Plasser nålen 90° inn i epaxial-muskelen i området umiddelbart foran og lateralt for ryggfinnen, langs en linje like langt til ryggfinnen og midtlinjen og ved punktet for muskelens maksimale tykkelse. For valg av kanyle og bruksanvisning for overføringsslangen, se pakningsvedlegg. Injeksjonsutstyret bør kalibreres og inspiseres regelmessig for å sikre nøyaktig dosering. Se fullstendig produktinformasjon på www.felleskatalogen.no. Vnr 472689. Reseptstatus C.

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