

# Pre-movement Active Surveillance Options for the Movement of Pullets During an HPAI Outbreak

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# Live Bird Movement from Pullet to Egg-layer Operations During an HPAI Outbreak

- High consequence movement
  - Risk of HPAI spread to large egg-layer operations
  - Moving even a single infected and undetected bird may result in substantial consequences
- Critical movement from a business continuity perspective
- Evaluation of active surveillance options requested by industry stakeholders during the 2015 HPAI outbreak

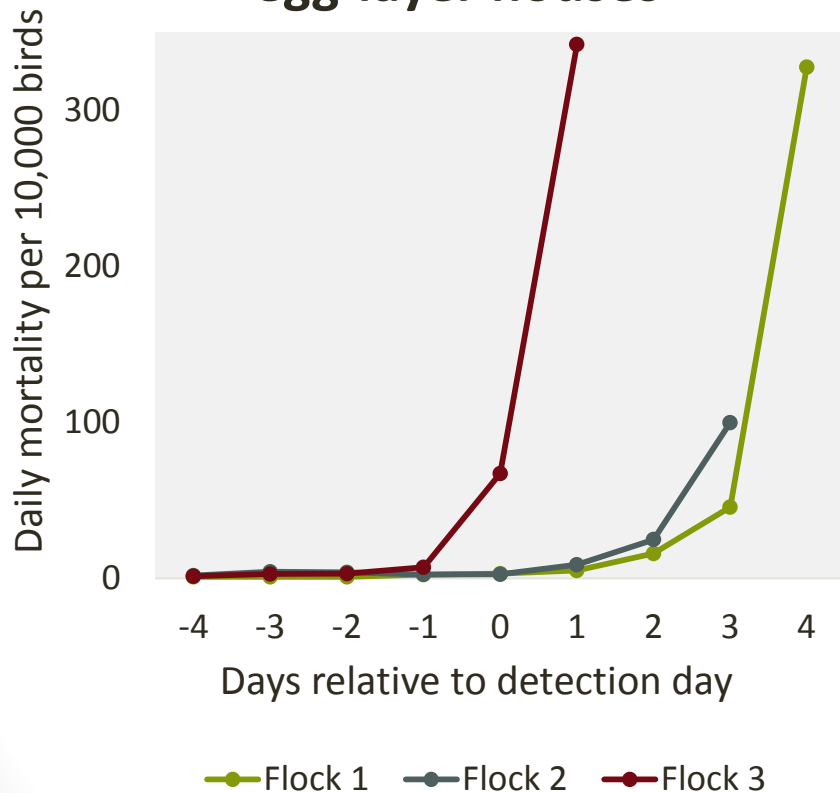


# HPAI Transmission in Caged Egg-layer and Pullet Houses

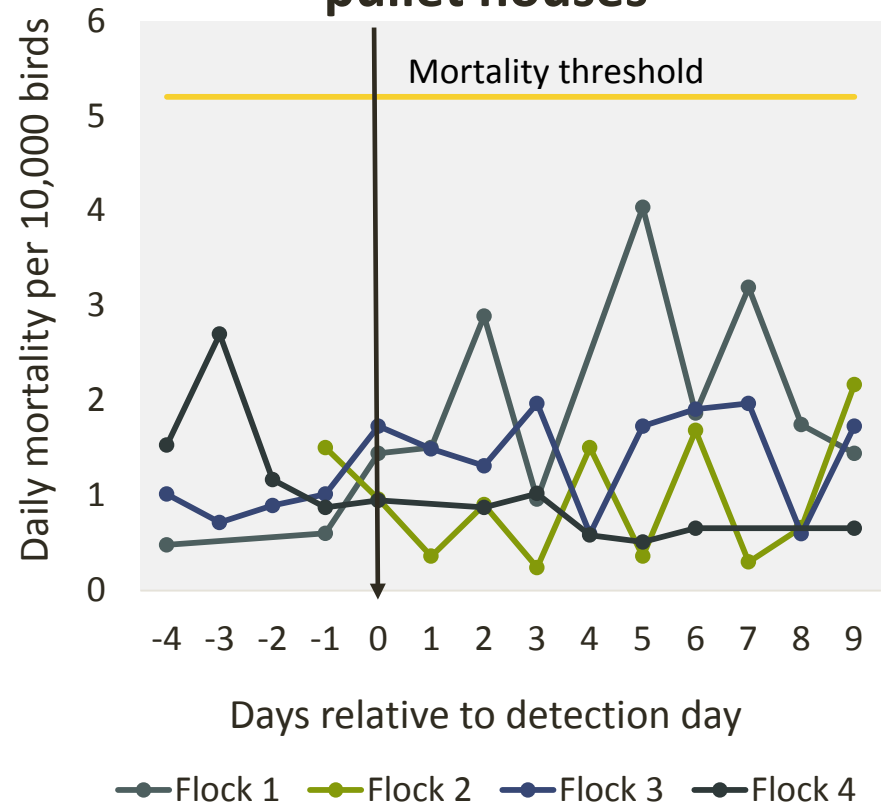
- The rate of HPAI spread in a poultry house impacts detection
- Rapid increase in mortality was observed in most layer houses during the 2015 EA/AM HPAI H5N2 outbreak
- There was a **delayed increase** in mortality or **no increase** in mortality in several infected pullet flocks
  - a pattern of intermittent positive tests on progressive days indicative of slow or inefficient within-house spread

# Example Daily Mortality in HPAI Positive Egg-layer and Pullet Houses During the 2015 Outbreak

## Daily mortality in infected egg-layer houses



## Daily mortality in infected pullet houses



HPAI simulation model parameter	Parameter description	Value and sources
Adequate contact rate	Impacts the rate of HPAI virus spread within a house	<b>Baseline scenario:</b> 1 to 2 birds per-day Spekrijse et al., (2011), Tiensin et al., (2007)
	Number of contacts with other birds per unit time of the type that can transmit infection	<b>Slow spread scenario:</b> 0.54 to 0.81 birds per-day Bouma et al., (2009)
Infectious period (1983 PA HPAI H5N2 strain)	Time interval when an infected bird is actively shedding virus	Mean 3.75 days, std. dev. 2 days  Van der goot et al., (2003), Swayne and Eggert (2003)
Latent period (1983 PA HPAI H5N2 strain)	Time interval when a bird is infected but not yet shedding virus	Mean 0.71 days, std.dev. 0.48 days  Poetri et al., (2011), Das et al., (2008)



# HPAI Simulation Model Output: Slow-spread Scenario is Consistent with Field Observations

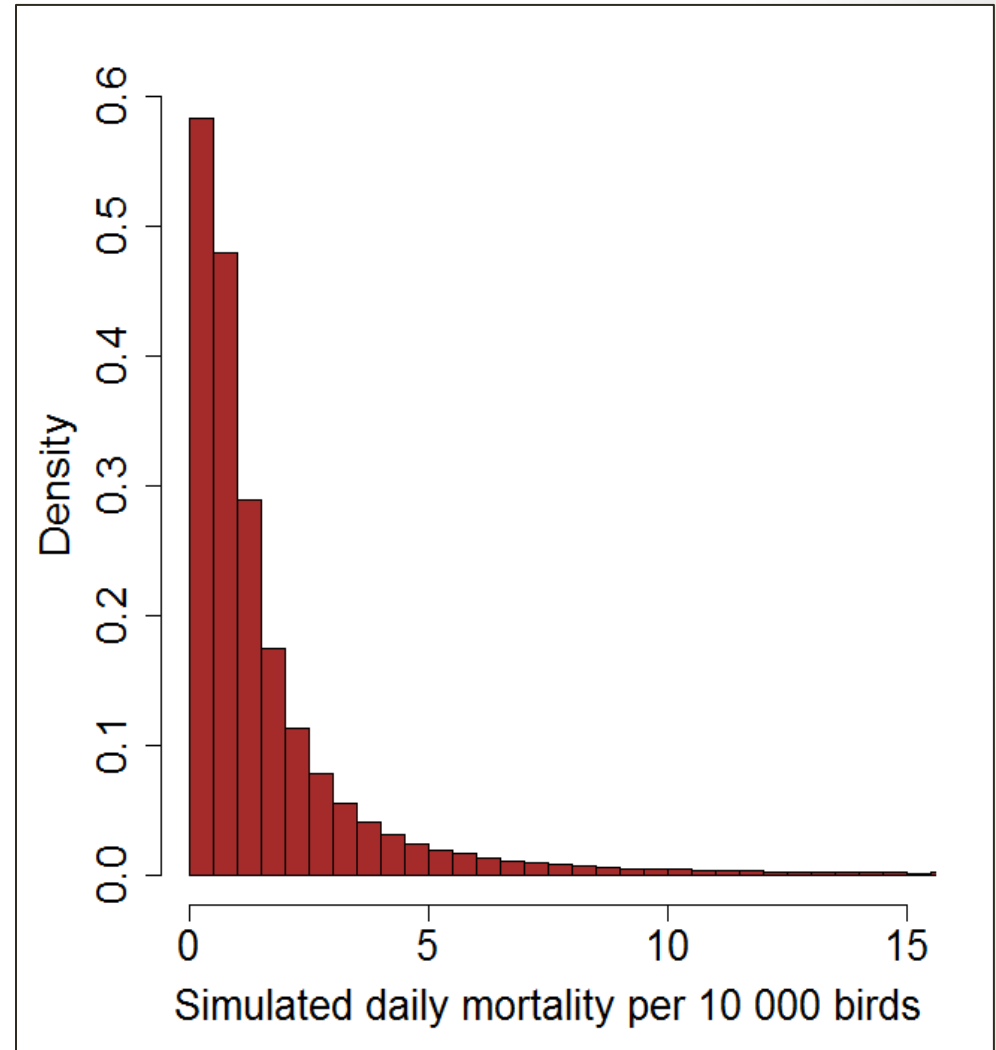
- Delayed onset or no increased HPAI mortality several days after detection
- Intermittent positive RRT-PCR tests on progressive days

Predicted HPAI disease mortality  
on various days post exposure of a pullet flock:  
Four simulation iterations in a slow-spread scenario

Simulation number	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	0	0	1	0	1	0	2	2	3	4	6	7	8	14
2	0	0	0	0	0	0	0	0	2	0	0	2	2	1
3	0	0	0	0	2	0	0	0	0	0	4	1	0	1
4	0	0	1	0	1	0	1	0	0	0	0	0	0	0

# Simulating Normal Daily Mortality in Pullet Houses

- 101 flocks of weekly mortality and 31 flocks of daily mortality data for last 4 weeks before movement were provided by industry
- Pullet flock (house) sizes ranged from 37,000 to 307,000 birds
- Simulated daily mortality mean 1.7 (90% P.I., 1.2 to 5.2) dead birds per 10,000 birds



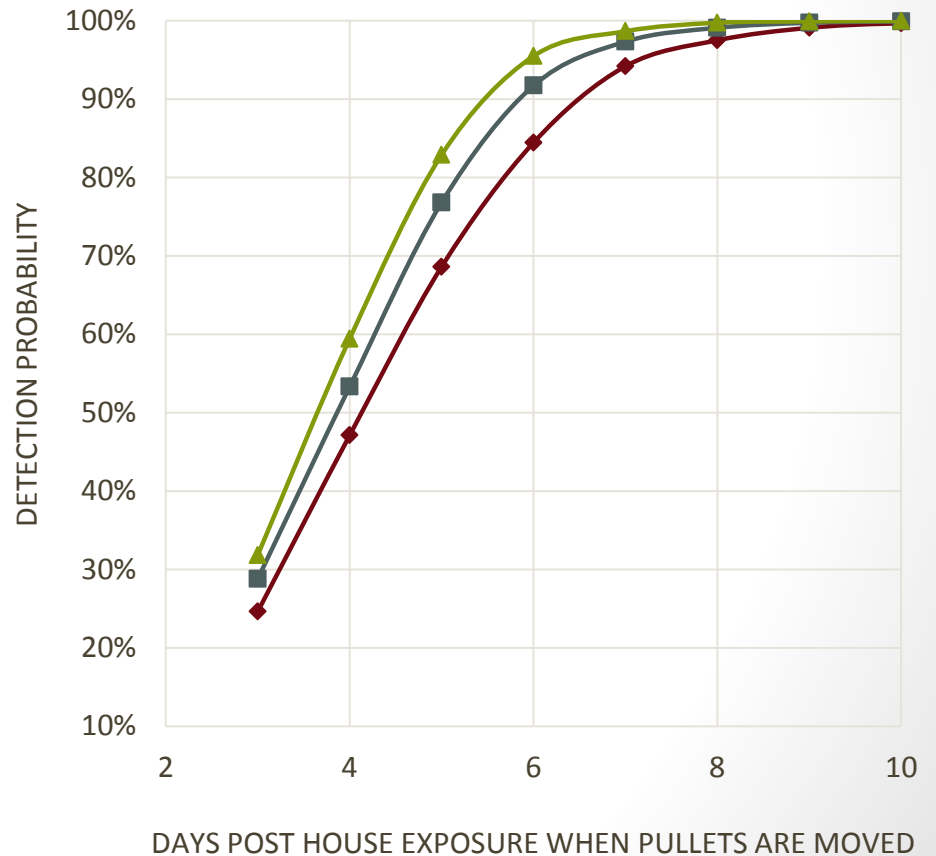
# Results: Baseline Transmission Rate Scenario

## Daily RRT-PCR testing for 10 days prior to movement day

Number of 11-swab pooled samples per 50 dead birds on each test day

Tracheal swabs	Cloacal swabs
<b>1</b>	---
<b>2</b>	---
<b>2</b>	<b>2</b>

## Predicted HPAI detection probability from simulation models



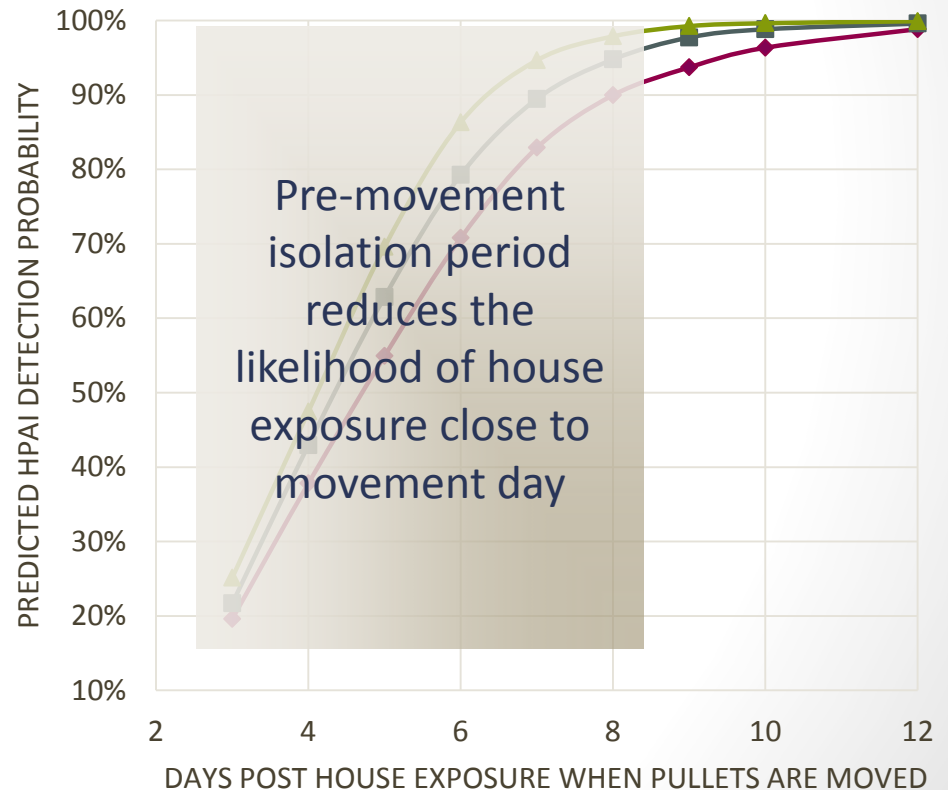


# Results: Slow-spread Scenario

Daily RRT-PCR testing for 10 days prior to movement day + extreme biosecurity for a few days before movement

Number of 11-swab pooled samples per 50 dead birds on each test day	
Tracheal swabs	Cloacal swabs
1	---
2	---
2	2

A Pre-movement Isolation Period (PMIP) substantially reduces the risk of moving an infected, undetected flock



Active surveillance protocol with RRT-PCR testing (per 50 dead birds in house each day)	Days of daily testing before movement	Likelihood of detection by movement for different days post exposure when a flock is moved		
		7 Days post exposure	8 Days post exposure	9 days post exposure
1 pooled sample of 11 tracheal swabs	10	0.83	0.90	0.94
	5	0.83	0.89	0.93
2 pooled samples of 11 tracheal swabs	10	0.90	0.95	0.98
	5	0.90	0.94	0.97
2 pooled samples of 11 tracheal swabs + 2 pooled samples of 11 cloacal swabs	10	0.95	0.98	0.99
	5	0.94	0.98	0.99

# Results Summary

- Daily testing of 2 pooled samples of 11 tracheal swabs + 2 pooled samples of 11 cloacal swabs had the highest detection probability among the protocols evaluated
- Daily testing of 2 pooled samples of 11 tracheal swabs was predicted to result in a moderate gain in detection probability relative to testing 1 pooled sample of 11 tracheal swabs
- Daily testing for 10 days prior to movement only resulted in a minor gain in detection probability over testing for 5 days prior to movement

# Conclusion

- The movement of pullets to egg-layer operations is a high consequence movement
  - Increased sampling may be justified given the costs and benefits
- Daily testing of 2 pooled samples of 11 tracheal swabs + 2 pooled samples of 11 cloacal swabs had the highest detection probability
- Secure Poultry Supply (SPS) cross-commodity workgroup planned
  - Results will be shared to address transfer movements of live poultry



# Questions?

