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From Wild-Bird Mortality to Poultry Farm Introductions: HPAI Spillover in Ontario, Canada

Highly pathogenic avian influenza (HPAI) has caused widespread mortality in wild birds, outbreaks on poultry farms, and occasional human infections, underscoring its One Health importance. Using Ontario, Canada, as an initial case study, we develop a modelling framework to investigate potential links between HPAI dynamics in wild birds and virus introductions into poultry farms. The framework combines a wild-bird transmission model that characterizes time-varying infection pressure with a within-farm poultry model fitted to outbreak data to infer likely introduction times on affected farms. We then compare these inferred introduction times with modelled wild-bird infection pressure to assess temporal patterns consistent with spillover. Early farm introductions were temporally aligned with elevated wild-bird infection pressure, suggesting a possible contribution of wild-bird-associated exposure. Later introductions may reflect other transmission processes, including delayed exposure through environmental contamination, although temporal patterns alone cannot identify transmission pathways. This framework provides a basis for integrating wildlife and poultry outbreak data to investigate potential spillover and inform surveillance.