# Prevalence and risk factors for avian influenza and Newcastle disease viruses in domestic poultry in seven African countries with outbreaks of H5N1 HPAI

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The distribution of H5N1 highly pathogenic avian influenza (HPAI) outbreaks in domestic poultry has been previously studied in Asia, and within Egypt and Nigeria in Africa. However, no studies have yet explored across multiple African countries how local conditions may relate to HPAI H5N1 outbreaks distribution, and to the general prevalence of avian influenza (AI) and Newcastle disease (ND) viruses.

A cross-sectional survey was conducted between February and May 2008 in 43 sites located in seven countries (Burkina Faso, Cameroon, Egypt, Ivory Coast, Niger, Nigeria and Sudan) which had previously experienced outbreaks of H5N1 HPAI. Twenty-two sites corresponded to locations where H5N1 outbreaks had occurred, and 21 sites corresponded to non-infected sites in the same surveillance zone as the outbreak sites. Information on poultry management, trade practices, environment, and presence of wild birds was collected in each site and analysed by univariate and multivariate methods including logistic regression, principal component analysis, distance matrices, Mantel test, and linear model. Biological samples (tracheal and cloacal swabs, sera) were also collected in each site from a number of birds sufficient to detect a 5% or more prevalence with a 95% confidence. Samples were collected from a total number of 3 672 birds and tested by RRT-PCR for the detection of AI and APMV1 viruses, ELISA and/or hemagglutination inhibition (HI) tests for the detection of antibodies against type A influenza, H5 and H7 AI strains, and APMV1 virus.

The comparison of HPAI H5N1 infected and non-infected sites found that sites where routine ND vaccination was practiced, wild bird mortality had been observed, or a permanent pond was present, were more likely to have been infected. However, these results should be treated cautiously because of the non-random selection of non-infected sites and the lack of statistical power preventing testing multiple factors simultaneously.

None of the swabs tested (3641 tracheal, 3627 cloacal) was positive for AI RRT-PCR, but 26.4% of the 3539 sera tested were positive for ELISA AI (19.9% when only considering birds non-vaccinated against HPAI), with 3.1% also positive for HI H5 and 0% positive for HI H7. 0.7% of the 3641 tracheal swabs and 0.4% of the 3627 cloacal were positive for APMV1 RRT-PCR, and 34.0% of the 3519 sera tested were positive for HI APMV1 (25.5% when only considering birds non-vaccinated against ND). AI seroprevalence was much more spatially structured than ND seroprevalence and was correlated to the poultry composition of the site. A statistical association was found between individual AI serological results and age and species, and between individual ND serological status and species.

These results represent the first large-scale survey of AI and ND in African domestic poultry and enabled to identify putative risk factors both qualitatively and quantitatively.