DATA NOTE



Real-time epidemiological surveillance data: tracking the occurrences of avian influenza outbreaks around the world



Francesco Branda^{1*}, Ranjan K. Mohapatra², Lawrence Sena Tuglo^{3*}, Massimo Ciccozzi¹ and Fabio Scarpa⁴

Abstract

Objectives This study aims to provide real-time surveillance of epidemiological outbreaks of avian influenza in humans and mammals. The primary objective is to understand and track the dynamics of outbreaks as they develop, facilitating timely interventions and informed public health decisions. The data collection is part of a broader initiative focused on improving preparedness and response capabilities to emerging health threats.

Data description The dataset includes comprehensive and up-to-date information on epidemiological patterns, including geographic spread, incidence rates, and demographic factors. Collected through systematic monitoring and reporting systems, this dataset is invaluable to researchers seeking to understand the evolving nature of avian influenza outbreaks in the global context. By sharing these data, we aim to contribute to the collective knowledge base by supporting evidence-based strategies for effective public health management and intervention.

Keywords Avian influenza, Epidemiological surveillance, Outbreak dynamics, Global monitoring, Disease tracking, Public health response

Objective

In the context of health challenges, the timely and accurate availability of data plays a critical role. With a wide range of infectious diseases and an ever-changing population, responding to health emergencies requires a solid information base. Up-to-date data make it possible to

*Correspondence: Francesco Branda f.branda@unicampus.it Lawrence Sena Tuglo Istuglo2012@uhas.edu.gh ¹Unit of Medical Statistics and Molecular Epidemiology, University Campus Bio-Medico of Rome, Rome, Italy

²Department of Chemistry, Government College of Engineering, Keonjhar 758 002, Odisha, India

³Department of Nutrition and Dietetics, School of Allied Health Sciences, University of Health and Allied Sciences, Ho Ho-00233, Ghana

⁴Department of Biomedical Sciences, University of Sassari, Sassari, Italy

monitor the spread of diseases, identify at-risk populations, and implement targeted preventive interventions. Avian influenza viruses (AIVs) pose a serious threat to humans and other mammalian species because of their ability to change and adapt across species boundaries. These viruses, often transmitted by birds, have the ability to genetically mutate so that they can infect humans and other mammals. Understanding these dynamics is critical, as evidenced by research on the role of penguins in the spread of avian influenza and the factors that influence their susceptibility and potential as vectors. Recent avian influenza outbreaks have involved not only birds but also various mammals, demonstrating the adaptability of the virus to new hosts [1]. In particular, there have been relevant cases of infection among mammals such as mink in Spain in 2022 [2], which were a warning sign for the zoonotic potential of the virus. In 2023, outbreaks



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Table 1 Overview of data files/data sets

Label	Name of data file/data set	File types (file extension)	Data repository and identifier (DOI or acces- sion number)
Dataset 1	africa-outbreaks	CSV	[15]
Dataset 1	americas-outbreaks	CSV	[15]
Dataset 1	asia-outbreaks	CSV	[15]
Dataset 1	europe-outbreaks	CSV	[15]
Dataset 1	Line-lists (2022-10-21-avian-flu-linelist, 2023-01-09-avian-flu-linelist,)	CSV	[15]
Dataset 1	data_dictionary	yml	[15]
Dataset 2	latest-outbreaks-mammals	CSV	[16]
Dataset 2	avian-mamm-visualization	Rmd	[16]
Dataset 2	Contributing	md	[16]
Dataset 2	WOAH-WAHIS reports	PDF	[16]

were reported among mink and foxes in Finland, highlighting transmissibility among different species of carnivores [3]. In addition, outbreaks among sea lions in South America in 2023 further confirmed the risk that marine wildlife may act as a reservoir for the spread of virus [4]. In the United States, a case of infection among cattle was documented in 2024, indicating the ability of the virus to infect even economically important domestic [5]. The objective of this dataset is to provide public health officials, researchers, and policymakers with a valuable resource for evidence-based decision-making and intervention strategies to contribute to the ongoing efforts in real-time surveillance of epidemiological outbreaks of avian influenza. It is part of a global initiative [6] to provide reliable, concise, machine-readable data to aid in epidemiological understanding, standardize case characteristics, and estimate key parameters related for emerging health threats [7-9]. By openly sharing these data, we aim to stimulate collaboration and contribute to the ability of the global scientific community to proactively respond to the emerging threat of avian influenza worldwide.

Data description

The Open Avian Flu Dataset, referred to as Dataset 1 in Table 1, is a comprehensive collection of unstructured information related to highly pathogenic avian influenza (HPAI) cases in humans, wild birds, and domestic poultry. To update and curate our dataset, we use several sources such as press releases of Public Health Commissions [10], as well as updates on the official websites of governmental or public health institutions [11, 12]. Second, we enrich these data with online reports, mainly captured through news websites (e.g., https://www.wh o.int/emergencies/disease-outbreak-news) or via news aggregators (e.g., https://www.cidrap.umn.edu/) to find additional details for each case or patient. We collected data on the following: (a) Geographic information, which

provides details on the location of avian influenza outbreaks. (b) Key dates, which include the dates of outbreak initiation and detection, allowing researchers to track the timeline of events. (c) Demographic and clinical data, which report the age and sex of patients/case, details on clinical symptoms, morbidity, and mortality rates associated with different outbreaks, providing valuable insights into the impact of avian influenza on affected populations. (d) Any additional information, such as affected host species, which is critical for understanding transmission dynamics and potential reservoirs, and viral strain information to provide insights into the specific strains of avian influenza virus involved in the different outbreaks, aiding genetic analysis, and understanding of strain diversity. An early experimental use of it was used in this work [13].

In addition to the Open Avian Flu Dataset, the AVIAN-MAMM Dataset, namely Dataset 2 in Table 1, is a curated global dataset of HPAI events in mammals. We used the World Animal Health Information System (WAHIS) dashboard of animal disease events (https://w ahis.woah.org/ - /event-management) to extract cases of avian influenza infection in mammals notified by World Organisation for Animal Health (WOAH) Member and non-Members States. WAHIS publishes immediate notifications (INs) and follow-up reports (FURs), identifiable through the prefix "IN" and "FUR" in their respective names. Immediate notifications dispense information on newly notified events while FURs generally provide updates on previously notified, ongoing events (e.g. number of newly infected animals and new deaths, newly implemented control measures). We applied filters to the field "DISEASE" ("Influenza A viruses of high pathogenicity (Inf. with) (non-poultry including wild birds) (2017-)") to select reports related to avian flu mammals' events from 2021 until today. Dataset 2 we have made available represents a comprehensive collection of geocoded and enriched data, including essential information

such as: (i) details of avian influenza cases in mammals, including start and end of events, geographic locations, and detailed characterization of events, enabling users to track the spread of infection and identify epidemiological patterns; (ii) results of diagnostic tests, which include the specific name of the test used and the laboratory of origin, providing a clear view of the diagnostic methods used and their reliability; (iii) the species name for each mammalian case, allowing users to identify the specific mammalian species affected by the HPAI outbreak. For example, the dataset records details such as the "species" and "typology_of_animal" columns, which provide information on the animal species (e.g., Red Fox) and whether it is wild or domestic. (iv) Control measures specific to each reported event, allowing users to assess the effectiveness of the management strategies implemented and identify any gaps or areas for improvement in the response to avian influenza events in mammals. An explanation of how to use this dataset is explained here [14]. Further details on the methodology for data collection, cleaning, analysis, and reporting, as well as the open-shared code and procedures for data entry and revision, are provided in the supplementary file.

Limitations

- 1. Data Sources: The datasets rely on multiple sources, including press releases, official websites of governmental or public health institutions, news websites, and news aggregators. While these sources provide valuable information, there may be discrepancies or inaccuracies in reporting, leading to potential inconsistencies or incomplete data entries.
- 2. Data Completeness: Despite efforts to compile comprehensive datasets, there might be instances of underreporting or missing data, particularly in regions with limited surveillance infrastructure or where reporting standards vary. This could affect the overall representativeness and reliability of the datasets, potentially skewing the understanding of avian influenza dynamics.
- 3. Data Quality: The quality of the data may vary across different sources and over time. Information obtained from news reports or unofficial sources might lack verification or validation, leading to potential errors or misinformation. Additionally, the accuracy of demographic and clinical data, such as age, sex, and clinical symptoms, may be subject to reporting biases or misclassification.
- 4. Limitations in Data Linkage: Integrating datasets from multiple sources or across different domains (e.g., human health, animal health) may be hindered by limitations in data linkage or interoperability. Challenges such as incompatible data formats,

disparate data standards, or legal constraints on data sharing can impede efforts to achieve comprehensive surveillance and analysis.

- 5. External Factors Impacting Data Quality: External factors such as political instability, conflict, or natural disasters can impact data quality by disrupting healthcare systems, impeding data collection efforts, or causing population displacement. These external factors may introduce biases or inconsistencies in the datasets, affecting their reliability and validity.
- 6. Dynamic Nature of Disease Dynamics: avian influenza outbreaks are influenced by a myriad of factors, including environmental, ecological, and socioeconomic variables. The datasets may not fully capture the dynamic interplay of these factors, leading to limitations in understanding the underlying drivers of disease transmission and spread.

Abbreviations

 WOAH
 World Organisation for Animal Health

 WAHIS
 World Animal Health Information System

 FUR
 Follow-up report

 IN
 Immediate notification

 AlVs
 Avian influenza viruses

Supplementary Information

The online version contains supplementary material available at https://doi.or g/10.1186/s13104-024-07042-w.

Supplementary Material 1

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None.

Author contributions

FB and RKM conceived and designed the study. FB analyzed the data. FB and RKM wrote the manuscript. FB prepared the figures and tables. FB and LST corrected and proofread the manuscript. FS supported in the review of the paper. MC validated and supervisioned the review of the paper. All authors read and approved the final manuscript.

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Data availability

The data described in this Data note can be freely and openly accessed on Open Avian Flu Dataset [12] and AVIAN-MAMM: A Global Open Access Dataset of Reported Avian Flu Events in Mammals [13]. Please see Table 1 for details and links to the data.

Declarations

Ethics approval and consent to participate Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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