Demographic and Occupational Characteristics of H5N1 Infections in Humans, 2022-2025

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Introduction

Highly pathogenic avian influenza (HPAI) A, also known as H5N1, is a subtype of the influenza virus found primarily in avian animals [1,2]. H5N1 has recently come to the forefront of attention as infection in avian animals has been increasing while spillover to mammalian animals has also been documented [3,4]. Since 1997, HPAI H5N1 has been found to cause infections in humans as well, specifically stemming from zoonotic transmission [1,5]. In a post COVID-19 pandemic landscape where discussions pertaining to future pandemic preparedness are common, it is critical to study the impacts of H5N1 on human populations to proactively prepare and mitigate potentially large-scale impacts that H5N1 can have on human populations globally.

Objectives

- This study aims to further understand the underlying patterns of human exposure and vulnerability to HPAI H5N1
- Exploring age, exposure type, and country of origin, as the three main parameters from which to understand patterns of vulnerability, it aims to highlight the demographic and occupational characteristics consistent among populations most reported to be experiencing cases of HPAI H5N1.



Picture: https://canadianfoodfocus.org/farming/poultry-housing-in-canada-where-and-how-do-chickens-live/

Methodology

- The WHO "Influenza at the human-animal interface summary and assessment" monthly reports were used as the primary source of data collection. All confirmed human H5N1 cases presented in the monthly reports published between January 22nd, 2022 to January 20, 2025 were included.
- Data on each case's location (country), age, type of exposure resulting in H5N1, and final outcome was collected.
- Other sources like the United States Centre for Disease Control (CDC) were used to supplement missing information to the extent that it was available.
- Descriptive statistics were used to evaluate the demographic (e.g., country, age), occupational (e.g., exposure), and mortality-related characteristics of the cases. Graphs and tables were generated using Microsoft Excel.

Results

Table 1. Age Distribution of Total Human Cases of H5N1[8-25]

Age Range	Total	% of Total Cases
<18	17	26.56
18 - 64	41	64.06
65+	2	3.13
Unknown	4	6.25

- Between January 22, 2022 and January 20, 2025, there were a total of 64 human cases of H5N1 reported to the World Health Organization (WHO) [8–25]. Among these cases, 44 were reported to be recovering or having recovered, while 10 cases resulted in mortality [8–11,14–27].
- In terms of age distribution, the majority of reported cases belonged to the 18-64 years and <18 years age categories respectively [8–12,15–25]. This suggests that H5N1 was primarily contracted by working age adults followed by children and/or teenagers, and that seniors were less likely to be exposed and/or contract this infection.

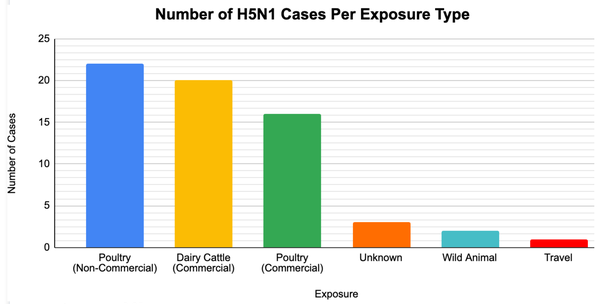


Figure 1. [8-25]

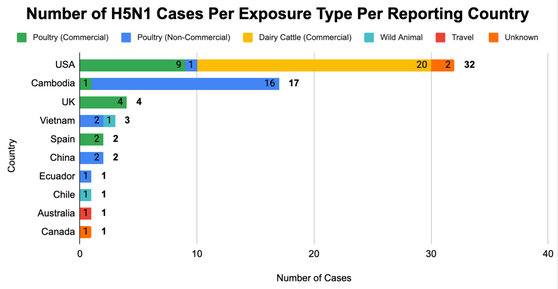


Figure 2. [8-25]

- Poultry exposures contributed to the highest number of infections with 38 associated cases [8–11,13–17,20–23,25], followed by occupational exposures which resulted in 36 infections [8,9,13,14,19–23,25]. This suggests that individuals at greatest risk of contracting HPAI H5N1 are those exposed to poultry or having occupational exposures to poultry/dairy cattle.
- While the United States and Cambodia accounted for most cases, US H5N1 cases primarily came from commercial exposure, whereas Cambodian cases arose almost exclusively from backyard/domestic poultry exposure [8,11,15–17,19–25]. This pattern is consistent across all reporting countries, with cases in the global north largely linked to commercial exposures, as opposed to the global south where cases primarily resulted from domestic/backyard poultry exposure [8–25].
- This indicates that H5N1 is primarily an occupational illness in the global north, contrasting with the global south where non-commercial poultry exposures commonly result from poverty, with families keeping domestic poultry as a means of nutritional enrichment and income [29].

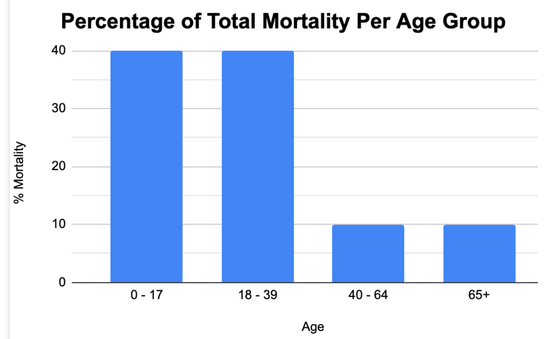


Figure 3. [9, 11, 15-18, 22, 25]

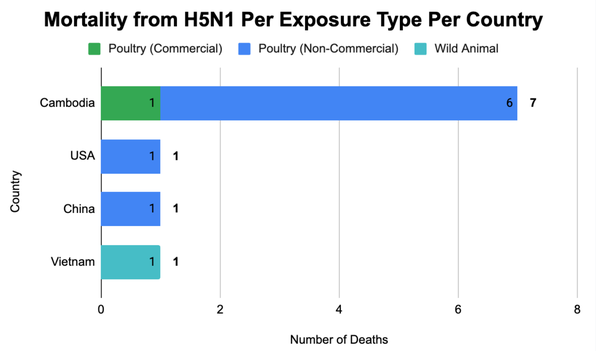


Figure 4. [9, 11, 15-18, 22, 25]

- 80% of deaths from H5N1 were in individuals aged 0-39 years [9,11,15–18,22,25], indicating vulnerability and mortality from H5N1 leans toward a younger demographic (<40 years), which is further supported by the median age of death being 21 years [9,11,15–18,22,25].
- 9/10 cases of mortality resulted from poultry exposure, with 70% being in Cambodia [9,11,15–18,22,25]. Out of these, 8 deaths were due to non-commercial poultry and 1 from commercial exposure [9,11,15–17,22,25].
- Most cases due to commercial exposures were discovered from public health screenings in workers, meaning commercial cases were not only more common in the global north but also more likely to be identified [9,13,14,21,22,31]. This has important treatment implications as timely medical treatment in the form of antiviral drug Oseltamivir prevents severe illness and mortality [28].
- In Cambodia, 4 out of the 7 people who recovered from H5N1 were given prompt antiviral treatment, as were majority US cases [8, 9, 11, 15-22, 25, 26, 31]. This indicates early identification of H5N1 and early treatment thereof, are the primary factors in preventing severe infection and/or mortality.

Conclusions

- Human H5N1 cases disproportionately occurred among socioeconomically vulnerable and working-age populations, with farm workers and poverty-stricken populations at highest risk.
- Mortality leaned toward a younger aged demographic and primarily occurred in disenfranchised populations, largely those in the Global South (e.g. Cambodia), and in people exposed to backyard poultry (an exposure often linked to poverty-stricken households).
- Milder outcomes associated with commercial poultry exposures reflect early detection through routine surveillance and timely antiviral treatment with oseltamivir. In contrast, high mortality rates from backyard poultry exposures are likely driven by delayed/absent diagnosis and lack of antiviral treatment. This contrast is most apparent between cases in the global north and global south, respectively.
- These results indicates that vulnerability to HPAI H5N1 is driven by demographic context rather than the exposure itself and that demographic and occupational factors play a major role in both exposure risk and disease severity.



Picture: https://www.medpagetoday.com/infectiousdisease/uritheflu/104963

Limitations

- Given the nature of secondary epidemiological research, the collected data is unlikely to give a complete picture of the present situation of H5N1 in humans globally.
- Secondary data is normally outdated, with many cases mentioned in the WHO reports being late or many cases not being reported to WHO at all.
- Further, as was the situation with specific ages in the US and UK cases, secondary data collection can often be missing key information

Next Steps

- Study the potential connection of biological sex with vulnerability to H5N1, both from a medical as well as social lens.
- Also necessary to explore interventions that can best prevent zoonotic transmission to human beings as well as mitigate spillover events from animal to human populations, such as large scale vaccination events.
- Such studies can further contribute to the health promotion and policy directives required to protect public health from H5N1.

References

To access the reference list, please scan the QR code