

# HPAI A(H5) Scenario-Based Human Health Risk Assessment



HPAI A(H5) Scenario-Based Human Health Risk Assessment for the United States  
 Center for Outbreak Response Innovation (CORI)  
 Updated as of November 26, 2024

*In this update, the Center for Outbreak Response Innovation (CORI) reports the latest developments in the H5N1 outbreak; the risk levels remain unchanged.*

	Risk to farm workers	Risk to other people in contact with affected workers and animal populations	Risk to healthcare workers	Risk to the US general public
<b>Scenario for Increased Potential for Human Adaption and Increased Human Reports:</b> Increased potential for reassortment and human adaptation, increased reports of human infections, potential early laboratory/epidemiological/sequencing evidence for human-to-human transmission but still no human-to-human transmission confirmed	High	Moderate	Low*	Low*

Since the last report, the first case in a child in the US has been reported. The case was mild and the child has recovered. [The child did attend daycare while symptomatic prior to testing positive for H5](#); individuals have been notified and offered preventative testing and treatment. No other cases have been identified at this time. California also reported H5N1 virus detected in raw milk being sold in Fresno County. [CDPH has issued a press release](#) and [the company has elected to recall the batch](#). No individuals have been found ill at this time. People who consume raw milk may be exposed to H5N1 and have the potential to become ill. The prevalence of H5N1 in the US raw milk supply is currently unknown. [Pasteurizing milk](#) is the only known safe way to eliminate the risk of H5N1 in dairy products. Therefore we strongly recommend that individuals only consume pasteurized milk and other dairy products. Since the last report, [a mutation was identified from the Canadian teen that has the potential to confer better adaptation of the virus for humans](#). Canadian health experts believe that it is likely the virus acquired this new trait during the course of infection for the Canadian teen and the mutation will die out since no other contacts tested positive for H5N1, however, since the source of the infection remains unknown this is not certain. **These recent developments do not change the current risk scenario.** For the risk scenario to increase, limited human-to-human transmission would need to be confirmed. For the risk level to decrease, there would need to be a decline in human cases and a reduction in opportunities for reassortment (eg widespread utilization of PPE by farm workers and others in contact with animals and/or a decline in animal cases). **\*While the immediate risk to the general public and healthcare workers is still currently low, the long-term consequences of continued, uncontrolled transmission presents a high risk to all populations.** For this reason, along with the uncertainty and complexity of these events, CORI will continue to monitor the situation and update this risk assessment. For a detailed analysis, including limitations and recommendations see the next page.

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## Critical Epidemiological Updates

- CDC has confirmed the [first H5N1 case in a child](#) living in Alameda County, CA. The case was mild, and follow-up testing was negative for H5 but positive for other common respiratory viruses. All household members of the child were symptomatic but negative for H5 at the time of testing, with some positive for the same common respiratory viruses as the child. [The child did attend daycare while symptomatic prior to testing positive for H5](#); individuals have been notified and offered preventative testing and treatment "out of an abundance of caution." No other information about daycare contacts is available at this time. Genetic information for the H5 strain is not yet available.
- California identified that raw milk from Fresno County contained active H5N1 virus. [CDPH has issued a press release](#) and [the company has elected to recall the batch](#). No individuals have been found ill yet as a result of the raw milk from this batch. An estimated 4% of the US population drinks raw milk once a month. People who consume raw milk may be exposed to H5N1 and have the potential to become ill. Previous animal studies have demonstrated this type of transmission among other mammals. Pasteurizing milk is the only known safe way to eliminate the risk of H5N1 in dairy products.
- [A mutation was observed from the Canadian teen that has the potential to confer better adaptation of the virus for humans](#). This mutation is a residue 226, and [has the potential to dramatically increase receptor binding preference for human lungs](#), which can make it more transmissible to humans through the air. Canadian health experts believe that it is likely the virus acquired this new trait during the course of infection for the Canadian teen and the mutation will die out since no other contacts tested positive for H5N1, however, since the source of the infection remains unknown this is not certain.

## Routine Surveillance Updates

- The Centers for Disease Control and Prevention (CDC) is reporting [55 confirmed human cases](#) of H5 in the United States as of November 25, 2024. Two of these cases have not had a known source of infection, and reported no contact with animals or raw milk.
- The United States Department of Agriculture Animal and Plant Health Inspection Service ([USDA APHIS](#)) has reported 261 new infected cattle herds across two states (UT, CA) in the last 30 days, bringing the total for the outbreak to 650 cattle herds in 15 state. This represents a slight increase compared to the previous 30 days.
- CDC reports that for the duration of the outbreak, [250 tests for poultry workers and 131 tests for dairy workers have been sent to CDC for H5N1 testing](#), resulting in a positivity rate since March 2024 of 8.4% (21/250) and 20.6% (32/140), respectively.

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**Cattle Worker Positivity Rate: 22.8%**  
**Poultry Worker Positivity Rate: 8.4%**

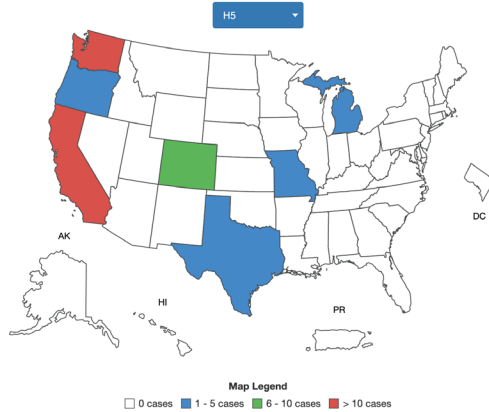


Figure 1: 2024 Map of Human H5 Infections (available from CDC)

**Total Cattle Herds Affected: 549 in 15 states**  
**Total Swine Affected: 1 in 1 state**

In the Total Outbreak, in Livestock (all), there were:  
**652 Confirmed Cases in 16 States**

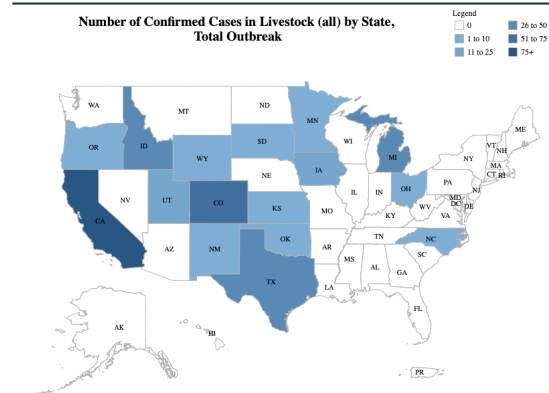


Figure 2: HPAI Confirmed Cases in All Livestock (available from USDA APHIS)

## Critical Limitations

- Information about the true prevalence of live H5N1 in the raw US milk supply is greatly needed, along with clear communication efforts to individuals still consuming raw milk about the potential risks.
- Information on the true prevalence and incidence of affected animals remains limited because [testing is only required by USDA when moving cattle across state lines](#). This gap in information may be ameliorated in part by new efforts for bulk milk testing.
- Testing for humans remains limited due to many factors: 1) commercial testing is unavailable, 2) testing must first be completed for seasonal flu, and then tests that are positive for influenza A but cannot be subtyped must be sent to CDC for H5N1 confirmation, 3) targeted surveillance efforts are limited to commercial farms that are aware of the infection in their animals, and are open to health department involvement, 4) symptom reporting by affected farm workers is likely vastly underreported due to the complex relationship between farm workers and owners, and may be impacted by stigma, fear of government involvement, and concerns about missing work.
- CDC [human case numbers](#) are updated on Mondays, Wednesdays, and Fridays, while [number of tests conducted](#) by each exposure category (poultry, dairy cows) are based on weekly counts, this can lead to some fluctuations in positivity rates.

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## Recommendations

In the current scenario, it is vital to:

### 1. Prevent reassortment opportunities, especially during the current flu season

- Members of the general public are vaccinated against seasonal flu
- Individuals consume only pasteurized dairy products (milk, chesses, etc.)
- Farm workers diligently use personal protective equipment (PPE; including masks goggles, gloves, gowns, head covers, and boot covers) when working directly with or closely to cattle and poultry, other infected or potentially animals, and potentially infected environments.
- Farm workers receive the seasonal flu vaccine as early as possible in the current flu season.
- Individuals working with agricultural animals who are sick do not report to work, especially if they exhibit respiratory or flu-like symptoms, and seek medical care for diagnosis.
- Individuals working with agricultural animals who are sick and unable to stay home wear a KN95 mask when in contact with animals.
- [Individuals planning agricultural or other events that bring together birds, cattle, and swine, should consider](#) testing animals before exhibits or events, promoting good hygiene at events, and taking extra steps to ensure that sick animals remain at home and animals who become sick at or recently following an event are seen by a veterinarian.

### 2. Ensure timely, accurate surveillance and prevention of H5N1 in agricultural animals

- Increase diagnostic testing and genomic surveillance in cattle and poultry.
- Separation of infected cattle during convalescence.
- Enforce cattle import restrictions to limit the movement of infected cattle across state borders.
- Stringent control of potentially infected food products (removal of milk or other infected products).

### 3. Continue enhanced public health activities to prevent H5N1 transmission to and among humans

- Increase focus on sentinel surveillance, wastewater surveillance, and education of clinicians to consider H5N1 as a possible diagnosis for people who present with new respiratory illness.
- Implementation of and support for recommended isolation of human cases and quarantine of close contacts of cases through escalated case finding and contact tracing, antiviral (eg, Tamiflu) prophylaxis for those exposed, compensation for individuals who are isolated/quarantined and cannot report to work, and social support to provide for essential needs of those in isolation/quarantine.

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- Continue development and widespread implementation of antigen and molecular testing in both hospital and outpatient healthcare settings.
  - Increase public health surveillance for H5N1 cases in local communities.
- 4. Continue enhanced, open communication about the current situation and potential risks**
- Information sharing between the agricultural and public health sectors to increase transparency and monitor for increases in animal-to-human or human-to-human transmission.
  - Enhanced communication with the public about the situation and the measures being taken to address it, as well as efforts to mitigate the spread of rumors and disinformation.
- 5. Continue and consider strengthening political support for public health response**
- Policy preparation for the possibility of a pandemic, including congressional deliberations about emergency funding and emergency planning by healthcare institutions, workplaces, and federal, state, territorial, local, and tribal public health agencies.
  - Increase investment and urgent development, testing, and production of vaccines and treatment options.

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## Appendix

### Scenarios

**\*Please note:** We are evaluating the risks to human health should each scenario occur, **not** the relative risk of any one scenario occurring.

Features that would characterize each scenario include:

**Scenario for Minimal Spread in Cattle:** *The virus is predominantly infecting cattle but there is minimal spread within herds and to other animals.* Likelihood of widespread human infections is low. Population health consequences are low. Overall risk to human health in this scenario is low.

**Scenario for Widespread Transmission in Cattle:** *Widespread transmission in cattle, few human infections, no human-to-human transmission.* The virus is predominantly infecting cattle but spreads widely within herds. There is also occasional cow-to-human transmission. There are few human infections no human-to-human transmission. Likelihood of widespread human infections is low. Population health consequences are low. Overall risk is low, but population-specific risk is increased for farm workers.

**Scenario for Potential Human Adaptation:** *There is increased potential for reassortment and human adaptation, but still no human-to-human transmission.* The virus begins to infect swine or other animal species that could facilitate the mixing and spreading of influenza viruses. This increases the likelihood that the virus reassorts with other influenza viruses and adapts to humans. Although the opportunities for reassortment are present, there are no specific mutations, laboratory or epidemiological evidence indicate that the virus has adapted for human-to-human transmission. Likelihood of widespread human infections is low. Population health consequences are low. Overall risk of widespread transmission in humans is low, but risk is increased for farm workers. The relative risk of a future pandemic has increased, but the absolute risk remains low.

**Scenario for Increased Potential for Human Adaption and Increased Human Reports:** *There is increased potential for reassortment and human adaptation, increased reports of human infections, potential early laboratory/epidemiological/sequencing evidence for human-to-human transmission but still no human-to-human transmission confirmed.* The virus has been observed in animal mixing vessels, including pigs, and additional reassortment opportunities are present, such as mixing of the H5N1 virus with the seasonal flu virus, due the ongoing seasonal respiratory virus season (October to April), that increase the risk of human adaptation. There are more reports of human infections due to contact with infected animals like cattle, swine, and/or poultry. Viral mutations, laboratory or epidemiological evidence may be reported that indicate the potential for human-to-human transmission, but there are no confirmed

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reports of human-to-human transmission. Population health consequences are low. Overall risk of widespread transmission in humans is low, but risk is increased for farm workers and individuals who work with animals, and close contacts of those workers. The relative risk of a future pandemic has increased, but the absolute risk remains low.

**Scenario for Limited Human Transmission:** *There is continued potential for reassortment, increasing reports of human infections, limited human-to-human transmission between close contacts.* There are more reports of human infections due to contact with infected animals like cattle, swine, and/or poultry. Limited human-to-human transmission is reported among close contacts of infected individuals, including healthcare workers, but there is no efficient human-to-human transmission. Likelihood of widespread human infections is moderate. Population health consequences are low. Overall risk of widespread transmission is low, but population-specific risk is increased for farm workers, close contacts of farm workers, and healthcare workers. The likelihood of a future pandemic is increased.

**Scenario 5 – Efficient human-to-human transmission:** *There are reports of efficient human-to-human transmission.* Likelihood of human infections is high because the virus now transmits efficiently and will be very difficult to contain. Population health consequences are high. Overall risk is high for all populations. The likelihood of a pandemic is very high.

**H5N1 Human Health Risk Assessment Scenario Table**

	<b>Risk to farm workers</b>	<b>Risk to other people in contact with affected workers and animal populations</b>	<b>Risk to healthcare workers</b>	<b>Risk to the US general public</b>
<b>Scenario for Minimal Spread in Cattle:</b> The virus is predominantly infecting cattle but there is minimal spread within herds and to other animals	Low	Low	Low	Low
<b>Scenario for Widespread Transmission in Cattle:</b> Widespread transmission in cattle, few human infections, no human-to-human transmission	Moderate	Low	Low	Low
<b>Scenario Potential Human Adaptation:</b> Increased potential for reassortment and human adaptation, still no human-to-human transmission	Moderate-High	Low	Low	Low

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<p><b>NEW Scenario for Increased Potential for Human Adaption and Increased Human Reports:</b> Increased potential for reassortment and human adaptation, increased reports of human infections, potential early laboratory/epidemiological/sequencing evidence for human-to-human transmission but still no human-to-human transmission confirmed</p>	High	Moderate	Low	Low
<p><b>Scenario for Limited Human Transmission:</b> Continued potential for reassortment, increasing reports of human infections, limited human-to-human transmission between close contacts</p>	High	Moderate-High	Moderate	Low-Moderate
<p><b>Scenario Sustained Human transmission:</b> Efficient human-to-human transmission</p>	High	High	High	High

## References

- Branswell, Helen. H5N1 bird flu virus in Canadian teenager displays mutations demonstrating virus' risk. Published November 18, 2024. Accessed November, 26. 2024. <https://www.statnews.com/2024/11/18/bird-flu-pandemic-h5n1-virus-mutations-canada-genomic-analysis/>
- California Department of Public Health. State Reports Single, Possible Case of Bird Flu Virus in Child with Mild Symptoms. Published November 19, 2024. Accessed November 26, 2024. <https://www.cdph.ca.gov/Programs/OPA/Pages/NR24-037.aspx>
- California Department of Public Health. California Acts to Protect Public Health: CDPH Warns Against Drinking Single Lot of Raw Milk Following Bird Flu Detection; Secures Voluntary Recall. Published November 24, 2024. <https://www.cdph.ca.gov/Programs/OPA/Pages/NR24-039.aspx>
- Government of Canada. Statement from the Public Health Agency of Canada: Update on Avian Influenza and Risk to Canadians. November 13, 2024. <https://www.canada.ca/en/public-health/news/2024/11/update-on-avian-influenza-and-risk-to-canadians.html>
- US Centers for Disease Control and Prevention. CDC confirms H5N1 Bird Flu Infection in a Child in California. Published November 22, 2024. Accessed November 26, 2024. <https://www.cdc.gov/media/releases/2024/p1122-h5n1-bird-flu.html>



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- US Centers for Disease Control and Prevention. How CDC is monitoring influenza data among people to better understand the current avian influenza A (H5N1) situation. Updated November 16, 2024. Accessed November 26, 2024. <https://www.cdc.gov/bird-flu/h5-monitoring/index.html>
- US Centers for Disease Control and Prevention. H5 Bird Flu: Current Situation. Updated November 18, 2024. Accessed November 26, 2024. <https://www.cdc.gov/bird-flu/situation-summary/index.html>
- US Department of Agriculture Animal and Plant Health Inspection Service. Highly Pathogenic Avian Influenza (HPAI) Detections in Livestock. Updated November 18, 2024. Accessed November 26, 2024. <https://www.aphis.usda.gov/livestock-poultry-disease/avian/avian-influenza/hpai-detections/hpai-confirmed-cases-livestock>
- US Centers for Disease Control and Prevention. Raw Milk: Know the Raw Facts. <https://www.cdc.gov/food-safety/media/pdfs/raw-milk-infographic2-508c.pdf>