Investigation of Mold Concerns at Fort Hays University, Fort Hays, Kansas

Kansas Department of Health and Environment

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Our Vision – Healthy Kansans living in safe and sustainable environments.

Our Mission – To protect and improve the health and environment of all Kansans.

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Executive Summary

Fort Hays State University (FHSU) is a public higher education institution located at 600 Park Street in Fort Hays, Kansas. It is governed by the Kansas Board of Regents and has a total enrollment of about 15,100 students each year. According to the school's website, the main campus contains 10 residential facilities or dormitories. On February 5, 2024, the Kansas Department of Health and Environment (KDHE) received a complaint from a parent who was concerned about mold in one of the dormitories (dorms). In collaboration with the Ellis County Health Department, KDHE investigated the complaint; FHSU fully cooperated with both county and state public health officials for this investigation. Key personnel from FHSU were interviewed for fact finding purposes and a sample of students residing in three dormitories was surveyed to gather additional information. The information collected covered partially the 2023 fall semester, from August 15, 2023 to March 8, 2024; this time period corresponds to the start of the fall semester through the last day the online survey was available. This report summarizes the findings of the investigation; however, it does not establish any cause-and-effect relationship between potential exposure and health outcomes reported.

Key Findings:

- From August 15, 2023 to March 8, 2024 (the period of interest), the school administration received 85 mold-related complaints (work orders) from students residing in 3 dorms: McMindes Hall, Victor E. Village, and Tiger Village.
- According to FHSU, all 85 work orders were addressed.
- In September 2023, FHSU hired a certified private environmental company to assess the presence of mold in McMindes Hall and Victor E. Village, as well as in the ambient outdoor environment. FHSU reported that a substantial cleaning effort followed this assessment.
- KDHE attempted to survey all students who lived in McMindes Hall, Victor E. Village, and Tiger Village during the period of interest. Twenty one percent of the students responded to the online survey.
- Seventy-eight percent of the respondents reported that they were sick while they were living in one of the three dorms during the period of interest.
- Among those who reported illness, 68% reported that they were sick enough to seek care for their symptoms. The proportion of students who sought care for their illnesses was not significantly different between the three dorms.
- Most of the symptoms reported were non-specific and may be caused by multiple conditions, including exposure to various allergens.
- Many students who reported that they were sick while living in one of the dorms also reported that they had been diagnosed with one or several health conditions prior to moving into the dorms, such as allergies, asthma, immunodeficiency, and autoimmune diseases.

Background

On February 5, 2024, the Kansas Department of Health and Environment (KDHE), through its Northwest District Office, received a complaint from a concerned parent about students being exposed to mold at a dormitory (dorm) located on the campus of Fort Hays State University (FHSU) in Fort Hays, Kansas. After consultation with the Ellis County Health Department, an investigation was opened by KDHE's Bureau of Epidemiology and Public Health Informatics (BEPHI). Several FHSU key personnel were interviewed, and a survey was administered to collect information from FHSU student residents about specific health events they experienced after moving into their dorms in August 2023.

Results from FHSU Key Personnel Interviews

From the interviews of FHSU key personnel, KDHE learned that the school received 85 work orders regarding mold in dorms since the beginning of the fall 2023 semester. Work orders are generated from student residents' complaints or requests to the school's administration regarding their living conditions. FHSU stated to KDHE that they responded to all complaints.

Most of the work orders were related to two dorms, McMindes Hall and Victor E. Village. However, there were two mold-related work orders from one other dorm, Tiger Village.

In September 2023, a certified private environmental company was hired by FHSU to assess the presence of mold in McMindes Hall and Victor E. Village. A copy of the report from this assessment was shared with KDHE. FHSU stated to KDHE that administration had taken steps to address the findings of the report.

Results from Student Survey

The online survey was open from March 4, 2024 to March 8, 2024. It collected information on students' contact information, their residency history in three dorms between August 15, 2023 and March 8, 2024 (the period of interest), the symptoms they experienced, their attempts to seek medical care to address their symptoms and any related diagnosis, and information on select preexisting health conditions. The three dorms of interest were selected based on work orders associated with mold complaints to FHSU management. A personal web link was sent to each student resident on file with FHSU as living within one of the dorms of interest. Links to the survey were sent via official FHSU email addresses.

Survey Results

Residency History

Out of the 995 students contacted, 210 (21%) responded to the survey. The exact number of residents living in each dorm between August 15, 2023 and March 8, 2024 was not available at the time of this report. Therefore, a response rate for each dorm cannot be calculated.

Ninety-eight of the 210 respondents reported that they lived in McMindes Hall. However, 1 respondent failed to report the dates of residence at the hall and their responses were removed from the rest of the analysis. One hundred ten of the 210 respondents reported that they lived in Victor E. Village. However, three respondents failed to report the dates of residence at the hall and were removed from the rest of the analysis. Four respondents reported that they lived in Tiger Village.

Since two respondents reported that they lived in two different dorms during the period of interest, their responses were counted for both dorms when appropriate.

Table 1. Reported place of residence during the period of interest (August 15, 2023 to March 8, 2024)

Reported Residence	Residents[1]
McMindes Hall	95/206 (46%)
Victor E. Village	105/206 (51%)
Tiger Village	4/206 (1.9%)
More than one dorm	2/206 (1.0%)
(Invalid)	4

[1]n/N (%)

The total number of respondents living in each dorm is as follows:
- Number of students who reported living in McMindes Hall: 97.
- Number of students who reported living in Victor E Village: 107.
- Number of students who reported living in Tiger Village: 4.

State of residence

While seventy-eight percent of the respondents (161/206) reported their current state of residence as Kansas, 8% (16/206) failed to report a current state of residence 2% (4/206) provided invalid responses. The remaining 14% (23/160) reported living in Nebraska, Illinois, Colorado, Missouri, Florida, Indiana, California, and New Mexico. It is not clear if the respondents reported their state of residence prior to moving into the dorms, the state where the FHSU campus is located, or the state where they currently reside after they moved off of the FHSU campus.

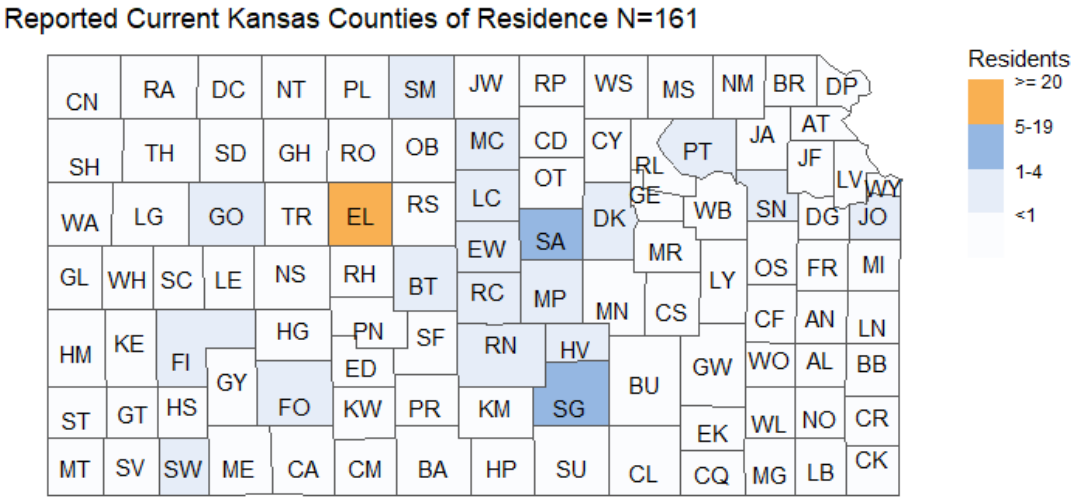
Table 2. Reported current state of residence of respondents

State	**Residents**, 206 (100%)[1]
Kansas	161 (78%)
Unknown	20 (10%)
Nebraska	8 (4%)
Colorado	7 (3%)
Illinois	3 (1%)
California	2 (1%)
Missouri	2 (1%)
Florida	1 (0%)
Indiana	1 (0%)
New Mexico	1 (0%)

[1]n (%)

Kansas County of Residence

Survey respondents were asked to report their county of residence if they lived in Kansas. Most Kansas residents, 39% (62/161) reported that they lived in Ellis County. Ellis County is where the FHSU campus is located. Eleven percent (18/161) had an entry for this question that was invalid. Six percent (9/161) failed to report their county of residence. Shaded counties in the map below indicates where respondents currently live in Kansas.



History of Illness

Seventy-eight percent of the respondents (160/206) reported that they were sick while living in one of the three dorms during the period of interest August 15, 2023 to March 8, 2024. Eighty-three percent (89/107) of respondents who reported that they lived in Victor E. Village reported

that they had an illness, seventy-two percent (70/97) who lived in McMindes Hall reported an illness, and seventy-five percent (3/4) of those who lived in Tiger Village reported an illness. The proportion of respondents who reported any illness over the period of interest was not statistically significantly different between the three dorms. The 95% CI column contains the 95% confidence interval (CI), which is a range of values with a lower limit and a higher limit separated by a comma. This range means that there is 95% confidence that the true value of the proportion reported on the left is within the CI range.

Table 3. Number and percent of respondents who reported having any illness by dormitory

	Reported Illness			
Dormitories, N = 206	**Yes**, 160 (78%)[1]	**95% CI**[2]	**No**, 46 (22%)[1]	**95% CI**[2]
McMindes Hall	70/97 (72%)	62%, 81%	27/97 (28%)	19%, 38%
Victor E. Village	89/107 (83%)	74%, 89%	18/107 (17%)	11%, 26%
Tiger Village	3/4 (75%)	22%, 99%	1/4 (25%)	1.3%, 78%

[1]n/N (%). Two students have been counted twice. Once for each dorm they lived in.

[2]CI = Confidence Interval

The respondents who reported that they were sick were asked if they sought care for their illnesses. Eight respondents did not answer the question. Out of the 152 remaining, 68% (103/152) reported that they sought care for their illnesses. In McMindes Hall, of those who reported that they were sick, 64% (45/70) reported that sought care for their illnesses, 31% (22/70) did not, and 4% (3/70) did not answer the question. In Victor E. Village, of those who reported that they were sick, 65% (58/89) reported that sought care for their illnesses, 29% (26/89) did not, and 6% (5/89) did not answer the question. In Tiger Village, of those who reported that they were sick, 67% (2/3) reported that sought care for their illnesses, 33% (1/3) did not, and all answered the question. The proportion of respondents who reported any illness and who sought care was not statistically different for any of the dorms. The 95% CI column contains the 95% confidence interval (CI), which is a range of values with a lower limit and a higher limit separated by a comma. This range means that there is 95% confidence that the true value of the proportion reported on the left is within the CI range.

Table 4. Number and percent of respondents who reported having any illness during the period of interest and who sought care, by dorm.

Dormitory	Sought Care					
	Yes		No		Unknown	
	N = 103[1]	95% CI[2]	N = 49[1]	95% CI[2]	N = 8[1]	95% CI[2]
McMindes Hall	45/70 (64%)	52%, 75%	22/70 (31%)	21%, 44%	3/70 (4%)	1.1%, 13%
Victor E. Village	58/89 (65%)	54%, 75%	26/89 (29%)	20%, 40%	5/89 (6%)	2.1%, 13%
Tiger Village	2/3 (67%)	13%, 98%	1/3 (33%)	1.8%, 87%	0/3 (0%)	0.0%, 69%

[1]n/N (%)

[2]CI = Confidence Interval

Symptoms Reported

KDHE analyzed the free-text responses describing the types of symptoms experienced while living in the dorms during the period of interest. The top two most frequently reported symptoms were sore throat, 21% (119 times/576 symptoms reported), followed by cough, 20% (117 times/576 symptoms reported). In addition, respondents reported that they experienced difficulty breathing, 12% (70 times/576 symptoms reported), chest tightness, 10% (57 times/576 symptoms reported), burning eyes, 9% (49 times/576 symptoms reported), skin rashes, 8% (48 times/576 symptoms reported), and wheezing 8% (44 times/576 symptoms reported). There were also 72 reports (13%) that contained various symptoms that did not fit into the categories listed above. The 95% CI column contains the 95% confidence interval, which is a range of values with a lower limit and a higher limit separated by a comma. This range means that there is 95% confidence that the true value of the proportion reported on the left is within the CI range.

Table 5. Number and percent of times particular symptoms were reported

Symptom Categories	**Reported**, 576 (100%)[1]	**95% CI**[2]
Sore Throat	119/576 (21%)	17%, 24%
Cough	117/576 (20%)	17%, 24%
Difficulty Breathing	70/576 (12%)	9.7%, 15%
Chest Tightness	57/576 (10%)	7.6%, 13%
Burning Eyes	49/576 (9%)	6.4%, 11%
Skin Rashes	48/576 (8%)	6.3%, 11%
Wheezing	44/576 (8%)	5.7%, 10%
Other Symptoms	72/576 (13%)	10%, 16%

[1]n/N (%)

[2]CI = Confidence Interval

Among those who reported that they became ill during the period of interest, 28% (44/160) reported that they generally suffer from allergies. The respondents reported that they were allergic to several items including: penicillin, cows, cow milk, eggs, grass, watermelon, corn, corn silk, corn dust, pollen, mold, dust in general, trees, cockroach, some animals, trees, fish, shellfish, dogs, cats, sulfonamide, tree nuts, some foods, sorghum, nicotine, wheat, cucurbits, coconut, FASENRA pen, clindamycin, Omnicef, ragweed, peanuts, salicylic acid, Alternaria, Cladosporium, Aspergillus, Penicillium, dust mites, amoxicillin, laundry detergents, and grains. Many (8%, 13/160) reported having seasonal allergies.

Sixty eight percent (103/152) of the respondents who reported that they became ill also reported that they sought care for their illnesses. Eleven percent of those who sought care did not receive a diagnosis from their provider. About 8% (10/132) of the respondents after mentioning that they sought care, failed to report a diagnosis or their entry was confusing. However, the rest of them received a total of 132 diagnoses. Allergy was the most frequently cited, 13% (17/132), followed by respiratory infection, 11% (15/132), sinus infection, 10% (13/132), common cold, 9% (12/132), strep throat, 8% (11/132). The remaining of the diagnoses received, 48% (64/132), included diagnoses that were reported less than 10 times each. Among those were mold allergy, 7% (9/132) and COVID-19, 2% (3/132). As a reminder, all diagnoses were self-reported, and some respondents received more than one diagnosis.

Table 6. Number and percent of diagnoses received by students who sought care for the symptoms they experienced during the period of interest (August 15, 2023 to March 8, 2024)

Diagnoses	Frequency[1]
Allergy	17 (13%)
Respiratory Infection	15 (11%)
Sinus Infection	13 (10%)
Common Cold	12 (9%)
Strep Throat	11 (8%)
Mold Allergy	9 (7%)
None Reported	6 (5%)
Tonsilitis	Suppressed
Viral Infection	Suppressed
Undefined	Suppressed
COVID-19	Suppressed
Influenza	Suppressed
Asthma	Suppressed
Conjunctivitis	Suppressed
Ear Infection	Suppressed
Acid Reflux	Suppressed
Back Injury	Suppressed
Colitis	Suppressed
Food Poisoning	Suppressed
Fungal Infection	Suppressed
Kidney Stone	Suppressed
Mononucleosis	Suppressed
Throat Infection	Suppressed
No Diagnosis	15 (11%)

[1]Data for diagnoses with counts greater than 0 but less than 6 have been suppressed to protect respondents' privacy.

Pre-existing Conditions

The survey participants who reported that they became ill were also asked if they have ever been diagnosed with specific chronic conditions. Twenty-eight percent (44/160) reported that they have been diagnosed with allergies, 6% (9/160) with asthma, 5% (8/160) with auto immune disease, and 2% (3/160) with immunodeficiency.

Table 7. Number and percent of respondents who reported having any illness during the period of interest (August 15, 2023 to March 8, 2024) and having one or more preexisting conditions

	Response N=160		
	Yes	No	Did Not Respond
Diagnosis			
Allergies	44 (28%)	46 (29%)	70 (44%)
Asthma	9 (6%)	36 (23%)	115 (72%)
Autoimmune Disease	8 (5%)	109 (68%)	43 (27%)
Cancer	0 (0%)	113 (71%)	47 (29%)
Immunodeficiency	Suppressed[1]	Suppressed[1]	47 (29%)
Kidney Disease	0 (0%)	0 (0%)	160 (100%)
Liver Disease	0 (0%)	41 (26%)	119 (74%)

[1]To protect respondents' privacy, data for both Yes and No response categories have been suppressed if the count for any one of these responses is greater than 0 but less than 6.

Mold and Human Health

Mold is a significant contributor to indoor air pollution. It is responsible for respiratory illnesses and allergic reactions [1]. Dampness is the main factor for mold growth indoor. Hundreds of species of fungi and bacteria are involved in the production of mold given sufficient moisture.

The World Health Organization has produced guidelines for indoor air quality to reduce the prevalence of health conditions associated with mold [1]. Signs and symptoms of mold exposure vary from person to person; however, some are common and well documented, including coughing, wheezing, and difficulty breathing. In addition, some individuals may experience allergy-type symptoms such as sneezing, runny, or stuffy nose, itchy eyes, nose, or throat and watery eyes. More severe reactions can occur in people with mold allergies or asthma, especially when near high concentration of mold [2].

The American Academy of Pediatrics estimated that approximately 10% of the population has allergic antibodies to fungal antigens, and about half of these individuals are expected to show clinical illness [3]. Moreover, the Environmental Protection Agency (EPA) and Berkeley National Laboratory reported that of the 21.8 million people in the U.S. with asthma, an estimated 4.6 million cases could be attributed to dampness and mold exposure in the home [4].

The US Environmental Protection Agency (EPA) and the National Institute for Occupational Safety and Health (NIOSH) has made available several resources to reduce exposure to mold in schools and non-industrial buildings. Among other recommendations [5, 6] they include the following:

- Reduce indoor humidity.

- Inspect the building for signs of mold, moisture, leaks, or spills.
- Respond promptly when you see signs of moisture and/or mold, or when leaks or spills occur.
- Prevent moisture condensation.
- Clean floors and carpets regularly.

Individuals can also take steps to protect themselves against mold exposure, including keeping their environment dry and clean, and being cautious during clean-up activities by wearing gloves, goggles, and N95 masks. Individuals can also monitor their health if they know they have asthma, mold allergy or sensitivity, or hay fever. Finally, individuals should seek medical attention whenever it is necessary. It is also important to remember that mold is a common part of the environment, both indoors and outdoors. More information is available from the National Institute of Environmental Health Sciences (NIEHS) and the Centers for Disease Control and Prevention (CDC) [2, 7].

Limitations

This analysis provides an overview of the health events experienced by the students living in three FHSU dormitories during the period of interest who were interested in reporting their experiences through the KDHE online survey. However, this analysis has several limitations that should be understood when interpreting results. The first limitation is that the data for this survey came from a convenience sample of the student population who resided in the dorms. As such, the results represent only the experience of those who responded to the survey which may be significantly different from those who chose not to respond. Similarly, all information included in the analysis is self-reported by students and KDHE did not verify information, including medical history and diagnoses after living in FHSU dormitories, with medical records. Also, because of the amount of time that passed between when students moved into the dormitories and when the survey was administered, survey participants may have an inaccurate or incomplete recollection of events reported leading to a recall bias. Finally, some categorical responses produced small numbers making it challenging to detect differences among groups or categories of responses.

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