

# Study of Northeastern Illinois Hum Report Locations

A deep dive into Hum reports reveals a positive correlation with proximity to natural gas transmission pipelines

DALE TUTAJ  
JANUARY 2022  
[djtutaj@gmail.com](mailto:djtutaj@gmail.com)

## Background

The goal of this analysis is to assess if Hum reports are closer to high pressure inter/ intra state natural gas transmission pipelines than the population. Hum reports appear to align with natural gas transmission pipelines which suggests that pipelines are the source of the low frequency noise (LFN) and related conditions people are complaining about. However, a challenge to this idea is that reports may simply be distributed evenly among the population and that natural gas transmission pipelines just happen to occupy the same areas that people live. It is expected that there are higher concentrations of Hum reports in the proximity nearer the source.

A primary focus of this study is to assess if the location of Hum Reports reveals any insight into the validity of Gas Pipeline Syndrome (GPS) associated with most Hum reports. GPS is the phenomena and conditions of the studied theory that gas transmission pipelines are responsible for generating LFN that can travel miles from these pipelines and cause health and wellbeing problems living around them. Additionally, this LFN is detrimental to wildlife and pets. By defining GPS in this way, it is intended to differentiate from other unsupported theories of sources of the Hum and related environmental pollution.

The goals of this analysis are to:

1. Assess the population-weighted average distance to natural gas transmission pipelines for Northeastern Illinois.
2. Compare average Hum report concentrations (people per report ratio) and distance to the population-weighted distances to transmission pipelines
3. Provide a methodology that could be applied to other regions or improved with advanced mapping analysis techniques
4. Bring a step of validation of Gas Pipeline Syndrome

The key finding is that there is a clear positive correlation between Hum reports and proximity to natural gas transmission pipelines. This means that natural gas transmission pipelines are a plausible source of LFN that most Hum reports are about within the study area and GPS should be studied.

This study was inspired by and builds upon research conducted by Steve Kohlase. He has investigated the Hum he first began experiencing at his home in Western Connecticut in 2009<sup>1</sup>. Over time, his problem has been revealed to be the same problem many people are experiencing around the world. He has developed maps that have been submitted to the Federal Energy Regulatory Commission (FERC) and other organizations. Figure 1 shows one of Steve Kohlase's maps of Hum reports overlaid with natural gas transmission pipelines. Reports align with natural gas transmission pipelines across the United States.

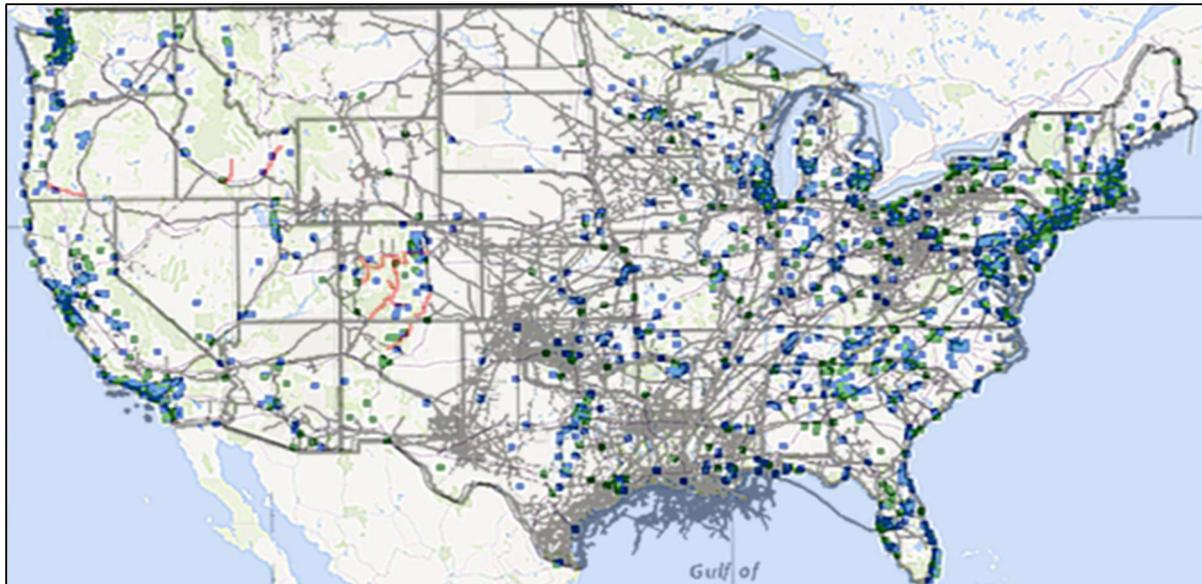


Figure 1: Overlay of Hum Reports and Natural Gas Pipelines Map

Personal accounts, measurements, videos capturing the phenomena, and research on LFN provide more than enough justification that more needs to be done. This problem is widespread and extremely damaging. This study only bolsters what people have been saying for years: a large and holistic investigation must be conducted by unbiased experts. The findings serve as a strong indication that GPS is real and needs to be the area of focus. The impacts on people and nature need to be studied and mitigation solutions found!

The sections below discuss the methodology, location being studied, and the results of this study. For the supporting data and calculation see the excel file: *Illinois Hum Mapping.xlsx*.

## Method

The approach is to measure distances of Hum reports and the population to natural gas transmission pipelines. The distances of each report and the population form the basis of this analysis.

**Mapping distance from report location to natural gas transmission pipelines:** This is done by mapping the Hum report location (latitude and longitude) and measuring the distance to the closest transmission

---

<sup>1</sup> For more information see: *The Hum: the Unexplained Noise 2 Percent of People can Hear*, Garret Harkawik, July 18, 2019, <https://www.theatlantic.com/video/index/593992/doom-vibrations/>

pipeline. In some instances, the closest pipeline may be in a neighboring county. Only natural gas transmission pipelines are considered. Hazardous liquid pipelines and natural gas distribution systems are not included.

**Mapping distance from population to natural gas transmission pipelines:** This is done by mapping the city center and measuring the distance to the closest transmission pipeline. It is noted that some cities may have a population center that doesn't correspond to the map's city center. However, by consistently applying the city center as the population center, this is representative, on average. An exception to this is the city of Chicago. The population of Chicago makes up a high percentage of the total population in the area under review and has a large geographical area. Therefore, special consideration is needed. This is discussed in the section below. A future review could consider population with higher resolution such as zip codes.

Table 1 provides a summary of the data sources and description.

*Table 1: Data Sources*

Data	Source	Description	Website
Hum reports-current	The World Hum Map and Database	<ul style="list-style-type: none"> <li>30 Hum reports made in 2018 &amp; 2019</li> <li>Includes latitude and longitude</li> </ul>	<a href="https://thehum.info/">https://thehum.info/</a>
Hum reports-archived	The World Hum Map and Database	<ul style="list-style-type: none"> <li>11 Hum reports made from 2002 to 2012</li> <li>Town location</li> </ul>	collected from previous versions of the World Hum Map and Database, no longer available
Natural gas transmission pipeline locations	National Pipeline Mapping System (NPMS)	<ul style="list-style-type: none"> <li>Web tool with map of transmission pipelines by county</li> <li>Map distances to locations on the map.</li> </ul>	<a href="https://www.npms.phmsa.dot.gov/">https://www.npms.phmsa.dot.gov/</a>
Population	US Demographics by Cubit	<ul style="list-style-type: none"> <li>Population by city</li> <li>2020 US Census Redistricting dataset</li> </ul>	<a href="https://www.illinois-demographics.com/cities_by_population">https://www.illinois-demographics.com/cities_by_population</a>

The more recent Hum reports are used for measuring report distances as this data includes precise coordinates. The archived Hum reports were omitted from this part of the analysis since they only include town location information. However, both sources were used to analyze the people per report ratios.

The NPMS is used for mapping. This is the best single-source tool available for transmission pipeline locations in the United States. However, it doesn't include wellhead collection system locations and may be missing new installations of transmission pipelines since the map was last updated.

The population data is from the 2020 US Census. The 2010 US Census data was also considered as it might be more representative of the older reports. However, applying the 2020 versus the 2010 populations had a negligible impact on results.

## Location

A total of 9 counties from Northwestern Illinois are included in the analysis. This region has a mix of rural, suburban, and densely populated areas. Natural gas transmission pipelines run through much of

the area. Additionally, there are an adequate number of reports to identify trends. The following figures show the counties that were included in this analysis and the location of each Hum report.

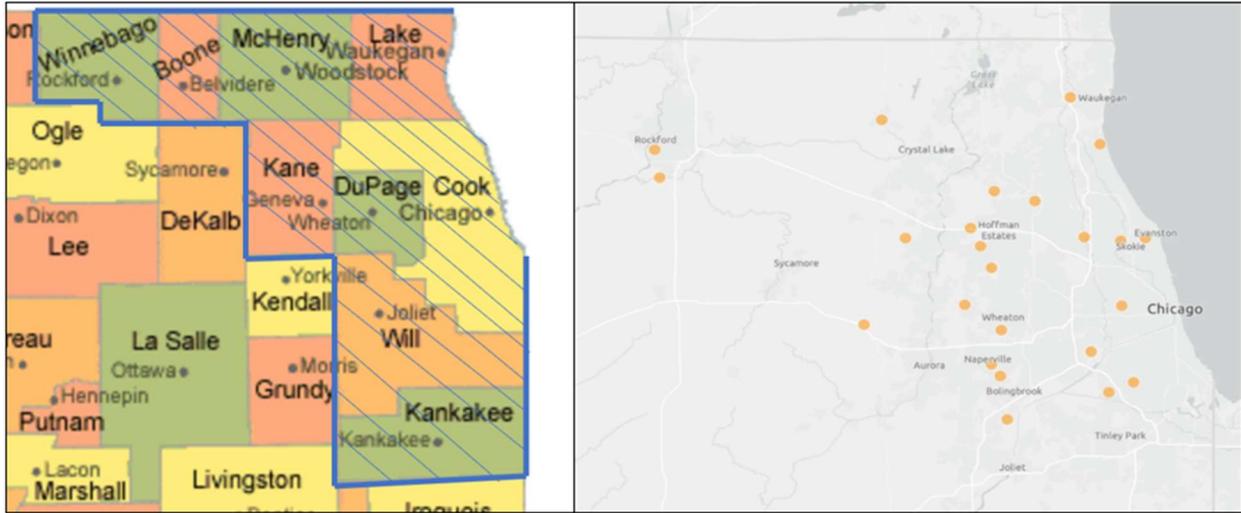


Figure 2: Counties Included in Mapping Exercise & Figure 3: Hum Report Locations

Chicago makes up 33% of the entire population across the entire population in of the study area. Therefore, the weighted average distance applied to Chicago has a large impact on the results. Given the population and the geographical area, the population was separated into five groups, with an average distance across the groups of 3 miles (1, 2, 3, 4, 5 miles applied as equal distribution). The city center distance to the closest transmission pipeline is 6.08 miles. Applying the average distance of 3.0 miles to this population is likely conservative (erroring on the side of being closer to natural gas transmission pipelines). Figure 4 shows that Chicago has only a few areas with gas transmission pipelines near the edges of the city.

It should be noted that Chicago does not have any Hum reports in the current data set and only two reports from the archived reports (although, the specific coordinates are not available). This gives it by far the largest population per Hum report compared to all cities with Hum reports. The results are provided both include and excluding Chicago and Cook county to see the impact including this population has.

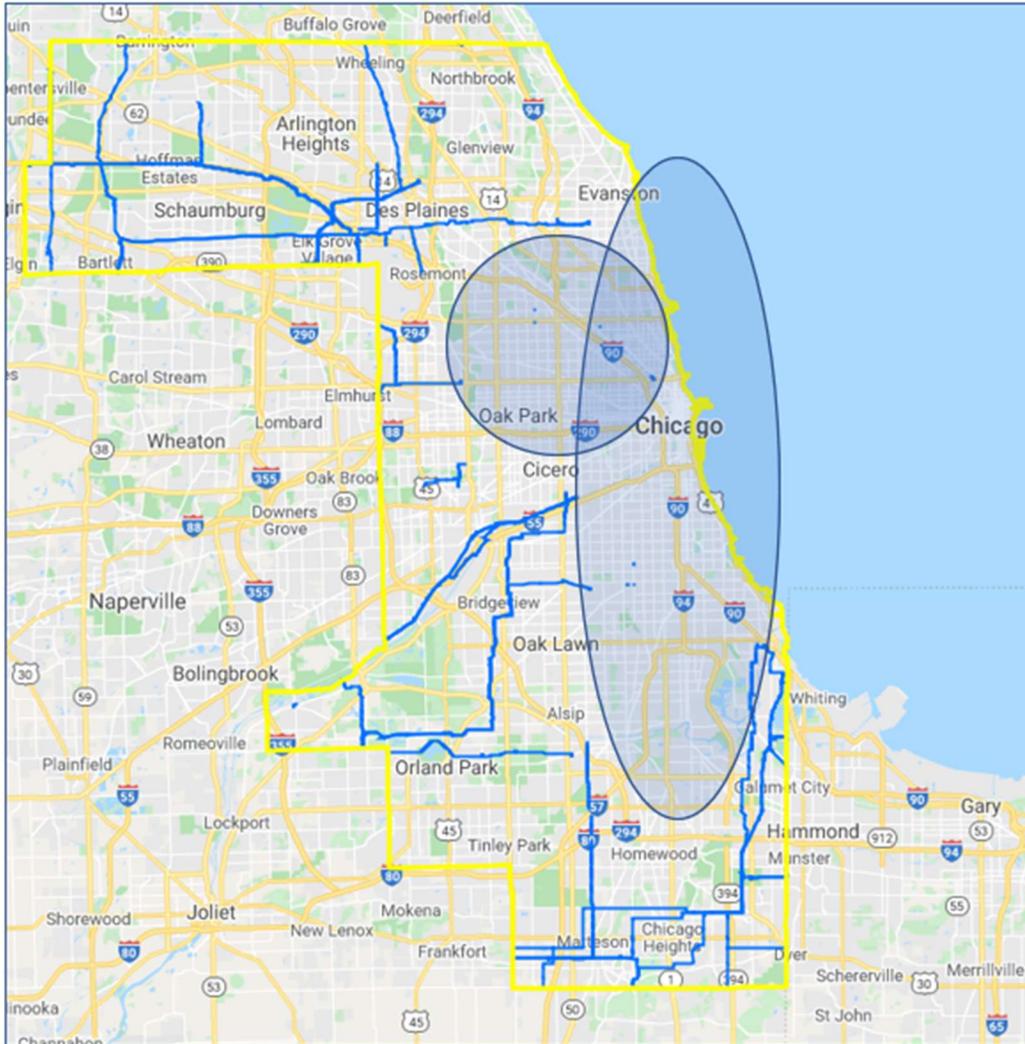


Figure 4: Cook County and Chicago Natural Gas Transmission Pipelines

## Results

**The Hum reports are correlated with proximity to natural gas transmission pipelines.** The population weighted average distance across all counties is 2.23 miles, while the average Hum report distance is 1.55 miles.

Of the eight counties with Hum reports, only one (DuPage) has a closer population distance to gas transmission pipelines than the Hum report average distance. The average Hum report distance for that county is 2.3 miles, which includes two of the five reports being over 3 miles. For comparison, across all 30 Hum reports only 4 reports are over 3 miles from natural gas transmission pipelines. It may be that these reports are associated with other LFN sources not accounted for in this analysis, or simply that they are outliers. Table 2 shows a summary at the county level<sup>2</sup>.

<sup>2</sup> Towns are assigned to a single county. Most towns are only in one county, but where they span multiple counties, the city center is used to assign the county. A few towns have city centers on a county line, these were assigned arbitrarily to one of the counties.

Table 2: County Summary of Hum Report and Weighted Population Distances

County	Population	Report Count	Median Report Distance, Miles	Population Weighted Average Distance, Mile	Average Report Distance, Mile <sup>3</sup>	Percent Difference Distant
Boone	32,872	0	-	3.57	-	-
<i>Cook (w/o Chicago)</i>	<i>2,439,033</i>	<i>14</i>	<i>1.36</i>	<i>1.62</i>	<i>1.44</i>	<i>11.0%</i>
Cook	5,185,421	14	1.36	2.35	1.44	38.7%
DuPage	805,055	5	2.30	2.10	2.30	-9.1%
Kane	547,915	3	1.58	2.34	1.78	23.9%
Kankakee	79,184	1	0.99	1.92	0.99	48.4%
Lake	637,820	3	0.58	1.76	0.74	57.8%
McHenry	262,698	1	1.86	2.18	1.86	14.6%
Will	542,026	1	0.96	1.30	0.96	26.3%
Winnebago	231,956	2	1.79	3.11	1.79	42.7%
<b>Total</b>	<b>8,324,947</b>	<b>30</b>	<b>1.39</b>	<b>2.23</b>	<b>1.55 ± 0.32 (1.23 to 1.88)</b>	<b>30.3% (44.8% to 15.9%)</b>
<i>Total (w/o Cook County)</i>	<i>3,139,526</i>	<i>16</i>	<i>1.39</i>	<i>2.03</i>	<i>1.65 ± 0.43 (1.22 to 2.08)</i>	<i>18.6% (39.8% to -2.6%)</i>
<i>Total (w/o Chicago)</i>	<i>5,578,559</i>	<i>30</i>	<i>1.48</i>	<i>1.85</i>	<i>1.55 ± 0.32 (1.23 to 1.88)</i>	<i>16.0% (33.4% to -1.4%)</i>

Excluding DuPage county, the percent difference between the population and the average Hum report distances to transmission pipelines range from 11% (Cook w/o Chicago) to 57.8% (Lake). The total percent difference including all counties is 30.3% (44.8% to 15.9% with 90% confidence interval). The total including Cook county but excluding Chicago has a lower population distance to transmissionism (1.85 miles) compared to the total including all cities and counties (2.03 miles). This is largely due to Cook county, outside of Chicago, having lots of natural gas transmission pipelines. The population’s average distance for Cook county excluding Chicago is 1.62 miles, which is the lowest except for Will county.

Figure 5 below shows the cumulative percent of population and Hum reports by the distance from natural gas transmission pipelines. The percent of Hum reports outpaces the population at every distance.

<sup>3</sup> Totals shown at 90% confidence interval for a normal distribution, actual distribution is positively skewed.

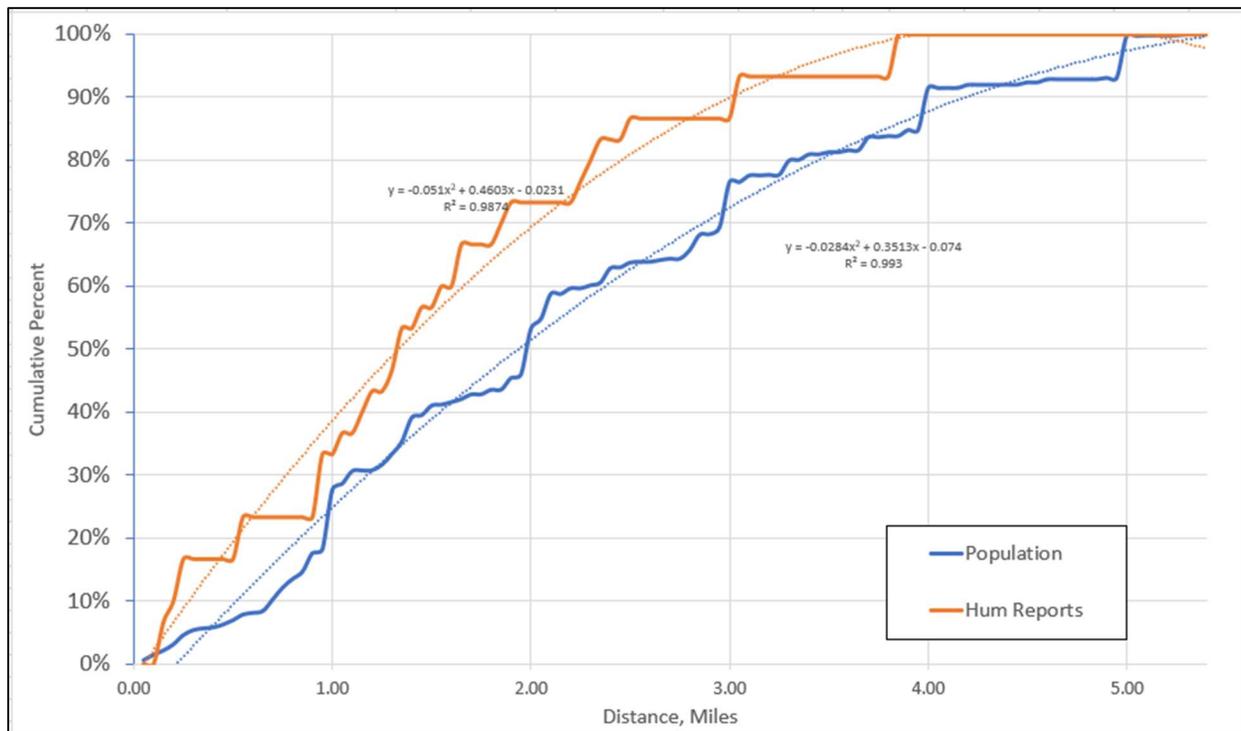


Figure 5: Cumulative Percent of Population and Reports by Distance from Natural Gas Transmission Pipelines

37% of the Hum reports are less than 1.0 mile from a natural gas transmission pipelines while only 29% of the population is less than 1.0 mile. 73% hum reports and only 54.8% are less than 2.0 miles. This figure clearly demonstrates that the Hum reports are in closer proximity to natural gas transmission pipelines than the population. The trend continues until 100% of Hum reports and the population are accounted for. The trend lines have a high  $R^2$  indicating that they the data fits well.

Another way to view the correlation is a plot of the Hum report distance versus the population weighted distance, as shown in Figure 6 . The orange line shows the population weighted distance equal to the reported distance. This is what would be expected if there was no correlation. However, all but one county (DuPage) is below this line. This indicates that the report distance is closer than the population for almost all the counties.

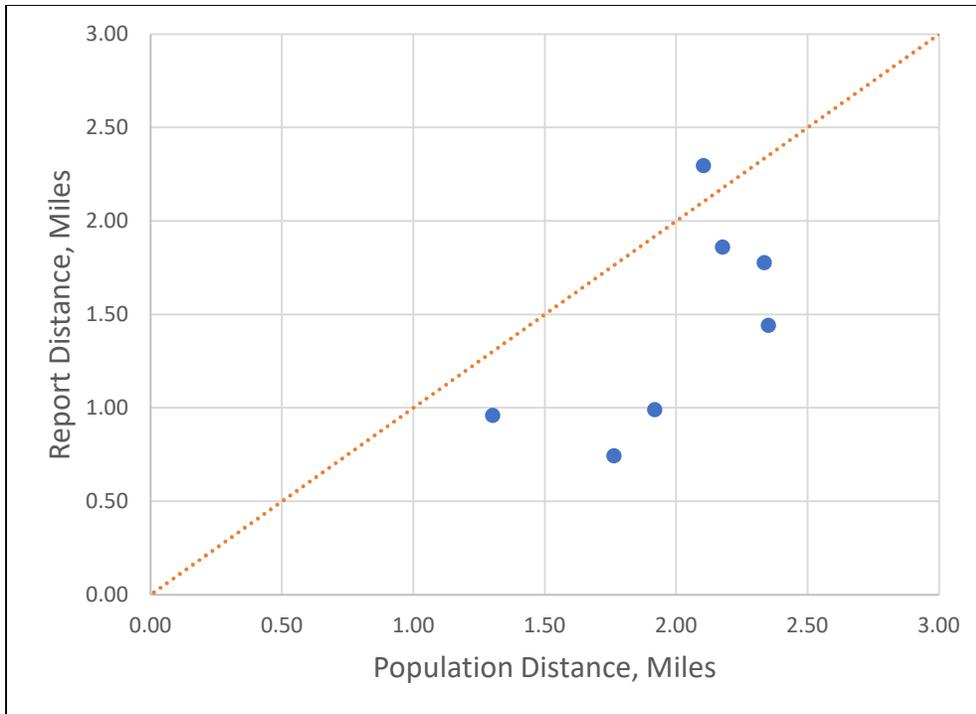


Figure 6: County Population Weighted versus Reported, Average Distance to Natural Gas Transmission pipelines

The following table shows the Hum reports and the people per Hum report ratios. The reports include the archived Hum reports since only the town and county level location is needed for calculation the people per report ratio.

Table 3: County People per Hum Report Ratios

County	Towns	Total Population	Hum Report Count	People per Report Ratio	Population Weighted Average Distance, Mile
Boone	5	32,872	-		3.57
<i>Cook (w/o Chicago)</i>	<i>120</i>	<i>2,439,033</i>	<i>16</i>	<i>152,440</i>	<i>1.62</i>
Cook	121	5,185,421	18	288,079	2.35
DuPage	29	805,055	7	115,008	2.10
Kane	24	547,915	3	182,638	2.34
Kankakee	19	79,184	1	79,184	1.92
Lake	46	637,820	5	127,564	1.76
McHenry	27	262,698	2	131,349	2.18
Will	25	542,026	3	180,675	1.30
Winnebago	11	231,956	2	115,978	3.11
<b>Total</b>	<b>307</b>	<b>8,324,947</b>	<b>41</b>	<b>277,498</b>	<b>2.23</b>
<i>Total (w/o Cook County)</i>	<i>186</i>	<i>3,139,526</i>	<i>23</i>	<i>196,220</i>	<i>2.03</i>
<i>Total (w/o Chicago)</i>	<i>306</i>	<i>5,578,559</i>	<i>39</i>	<i>185,952</i>	<i>1.85</i>

Boone county has no reports. While this county has the furthest distance to natural gas transmission pipelines, it also has a relatively small population. For the other counties, the people per reports ratios range from 79,184 people/report (Kankakee) to 288,079 reports/people (Cook). Across all counties, there are 277,498 reports/people. Though this is largely driven up by Cook county having the highest population and the highest people per report ratio. By excluding Cook county, the ratio is 196,220 people/report.

A closer examination of towns with Hum reports shows that the closer the population is to natural gas transmission pipelines, the lower the people per Hum report ratio. This means that when people live closer to natural gas transmission pipelines there is a higher report concentration. This demonstrates that natural gas pipelines are a plausible and supportable source of the LFN people are reporting. Figure 7 shows this correlation.

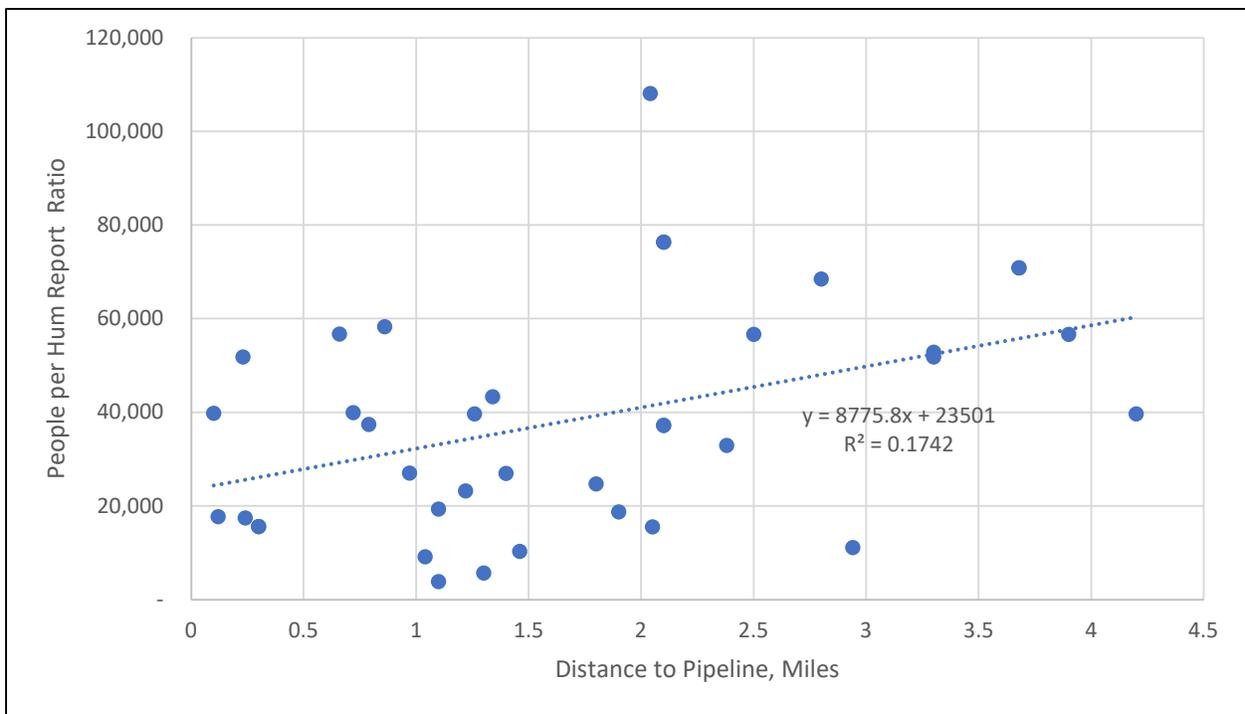


Figure 7: Population per Hum Report Ratio vs Distance to Pipeline for Towns with Reports

The  $R^2$  is low, showing a moderate correlation. This is still significant given the variation in population size across towns and that only 39 reports are considered across the population. Note that this figure excludes 2 Chicago reports as there is a wide variation in distance to pipelines and the high population count. There are 1,347,788 people per report for Chicago. This is much higher than any other city with reports by several factors. This might be attributed to the low exposure of natural gas transmission.

pipelines as there are very few if any places that the pipelines enter the city. The city center distance is 6.08 miles from the closest natural gas transmission pipeline.

## Limitations

This analysis shows a positive correlation with proximity to natural gas transmission pipelines and Hum reports. The analysis is possible because of there is a significant number of Hum reports for the study area. However, in places where the Hum report density is much lower, the correlation may be diminished as there will be more noise in the data. The Hum reports that are used likely severely underrepresent the true number of people that are aware of the Hum. The World Hum Map and Database is the only consolidated mapping project available. Therefore, it must suffice as the primary source of Hum reports. However, the reports in the current data set only include reports from 2018 and 2019. It appears that reports are periodically removed as it does not include submitted points by many in personal correspondences or reports that were available prior to 2018. If more reports were made available, this analysis could be expanded. Furthermore, Hum reports only capture people that are aware of the LFN pollution. The damage doesn't only affect those that are aware.

A limitation of this analysis is that it does not consider any specific characteristics of natural gas transmission pipelines, such as pipe diameter, depth, or any operating parameters (changes in operation to bring onset of the conditions, schedule, pressure, etc.). However, the fact that there is such a pronounced correlation without a more complex regression analysis suggests that natural gas transmission pipelines are the source of the LFN for most Hum reports.

## Next Steps

This analysis could be repeated for other regions of the world. One thing that made this possible was having a mapping tool that showed natural gas transmission pipeline location and allowed for mapping the distances to various locations. This same tool can be used for all US locations. It is possible that similar tools are available for other countries.

If this analysis were repeated for other areas, the same metrics could be combined with this analysis, building a clearer picture. Additional areas in the United States that would make good study candidates are areas with clusters of reports and includes both rural and urban areas. Some of these areas are in Florida, Colorado, and Washington, as well as many others.

There are additions or modifications that could be included to improve this analysis, such as:

- Adding more Hum reports from additional sources
- Consider other sources for transmission pipeline locations to capture pipelines that may be missing from the NPMS
- Apply more robust statistical analysis, the distribution of Hum reports is a positively skewed distribution and not a normal distribution as treated in this analysis.
- Using higher resolution population groupings for population weighted average distance. The town level was sufficient for this analysis but using zip code or some other basis might improve the analysis. Some towns have large geographical areas, or the population may be distributed away from the city center. Using higher resolution population groupings may be impractical

using manually measurements as done for this study. However, if done in some sort of automated mapping technique this may be relatively straight forward.

- Adding pipe diameter information
- Adding second pipeline distance, anecdotally, some of the reports that seemed further away, had multiple pipelines similar distances away in opposite directions
- Indicating if closest distance from Hum report to natural gas transmission pipeline is a 90-degree bend or other distinct feature. This was the case for some Hum reports, and the thinking is that these features may be associated with increased turbulence and LFN.
- Considering other potentially related infrastructure, such as compressor stations, storage and production equipment, and hazardous liquid lines

Perhaps the best opportunity for improvement is to use advanced mapping techniques. This would mean automating all distance measurements and layering in additional information. Using this approach, the analysis could be done for entire countries where natural gas transmission pipelines location data is available.

## About the Author

I live with my family in Milwaukee, WI. I am a mechanical engineer primarily focused on energy efficiency and consulting. I first realized that something wasn't right in 2016, after moving into a new apartment in San Francisco. My walls rattled every night and promptly started again in the early morning. Like many others, I went through a slow process of ruling out potential sources. After years, I realized that the source of my apartment's walls rattling is the same as the Hum. This problem is causing immeasurable harm and needs to be addressed.

Please contact me with feedback, questions, or suggestions: Dale Tutaj, [djtutaj@gmail.com](mailto:djtutaj@gmail.com)