United States mass shootings triggered by serotonin spikes from seasonal pollen level drops

RUNNING HEADER: UNITED STATES MASS SHOOTINGS

KEY WORDS: mass shootings, histamine, serotonin, pollen, pollen.com

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Humans, like all life, are sensitive to their environment. Mentally ill or unstable individuals can be triggered into impulsive and violent activities from spikes in serum serotonin. Serum histamine level is directly proportional to environmental allergen levels, but serum serotonin level is inversely proportional to serum histamine levels with human males having 52% more serotonin than females. Data appears to show an association between the dates of violent acts from mentally ill individuals and the dates of dramatic decreases in pollen levels thus indicating a possible precursor or triggering relationship. This knowledge could be used as a potential predictor for law enforcement and medical agencies for a given city. Mental health professionals would be advised to lower serotonin boosting meds and antihistamines and even supplement sedative medications to male patients in the timeframes of mid-March to the end of June, for spring tree pollen - especially juniper, and from mid-September to the end of November, for fall pollen - primarily ragweed.

United States mass shootings triggered by serotonin spikes from seasonal pollen level drops

Humans, like all life, are sensitive to their environment. Mentally ill or mentally unstable individuals can be triggered into impulsive and violent activities from spikes in serum serotonin (1). Serum histamine level is directly proportional to environmental allergen levels producing the obvious and dreaded seasonal allergic reaction symptoms. But serum serotonin level, or the control of the level, is inversely proportional to serum histamine levels (2) (3) (4). It is critical to note that male humans have 52% more serotonin than females (5). In terms of the specific biochemical mechanisms, mast cells in the human body emit serotonin, a mood-modifying molecule per Science magazine (6). The European Journal of Neuroscience notes that "mast cells are a source of serotonin. We conclude that mast cells contribute to behavioral and physiological functions of the hippocampus. It is known that mast cells can synthesize and store serotonin. The hippocampus is important in the regulation of anxiety and depressive behaviors" (7).

Finally, as noted in the journal Nature:

Because of mast cell involvement in these clinical syndromes… there has been great interest in the pharmacological modulation of histamine release from mast cells. Serotonin is also stored in mast cell granules. Because histamine and serotonin may have divergent functions in delayed hypersensitivity, we hypothesized that these amines could undergo differential release (8).

Materials and Methods

Data from public online webpages, like pollen.com and weather.com, of pollen levels in given cities or zip codes, when compared to the dates of gun "mass shootings" by mentally ill

human males, appears to show a clear association between the date of violent acts and the dates of dramatic decreases in environmental pollen allergen levels (especially when the allergen or pollen level decreases to a level of zero overnight) indicating a possible precursor or triggering relationship. This knowledge could be used as a potential predictor for law enforcement and medical agencies with modern technology that can track near real-time levels per a given city or zip code. Mental health professionals would be advised to lower antihistamines and serotonin boosting meds, and even supplement short-term sedative medications, to male patients in the timeframes of mid-March to early June, for spring tree pollen, and from mid-September to the end of November, for fall ragweed pollen. This treatment can even be tailored closer depending on the latitude versus the time of year using pollen tracking applications.

A scientific motto, often demonstrated to be true, is that *biology drives psychology*. The advent of near real-time tracking of allergen levels in given cities has led to a possible predictive model from known human serum biochemistry of histamine and serotonin interactions versus observed year-over-year acts of violence from mentally unstable individuals. This model can be useful, if not critical, for law enforcement, general public awareness, and public safety. Knowing the heightened level of risk during the annual time of year that major allergen or pollen levels drop to zero in a given city can, theoretically, help save lives. Law enforcement, emergency services (911) staff, medical staff, as well as mentally ill patients themselves, knowing the factors in play, can take actions or be in a heightened state of awareness for the noted small windows of time and literally track it on simple and public websites like https://weather.com/ and www.pollen.com . "Normal" individuals may even be able to observe, track, or understand simple impulsive behaviors from similar, albeit manageable, increases in blood serum serotonin levels leading to excess confidence and risk taking from the biochemistry

of the associated crash in airborne allergens of pollen that, thus, lowers serum histamine levels.

Those behaviors can include individuals getting anxious or angry, gambling, buying stocks, or

even spikes in suicide (9).

There is a remarkable "pattern match" where mentally unstable individuals almost always

(especially relative to those that had already been planning or staging an act of violence or terror

or gun violence) will be triggered, i.e., they "cannot resist the impulse," to act during the surge in

blood (brain) serotonin levels due to a sudden and large drop in environmental allergen levels,

that crashes serum histamine, causing the aforementioned spike in blood (brain) serotonin.

During the peak of histamine or pollen levels, serotonin will be very low in individuals. This

alone can lead to changes in behavior making some individuals very anxious, and others angry,

but this lasts for only a day or two and is not the model being discussed. The key scenarios for

the model of this paper occur during the final "drop-off point to zero" pollen of annual spring

tree pollen (especially juniper) and fall weed (especially ragweed) pollen and from large drops (a

sharp drop in pollen level crossing over at least two or three horizontal levels in the pollen.com

history graph e.g., from Medium to Low-Medium to Low) or drops followed by a spike of pollen

(some even rainstorm induced), where we find the times of highest risk perfectly matching

violent events - especially single shooter male gun violence or mass shootings. The end of

season "drop to zero" pollen reaction makes logical sense, and the violent acts almost always

occur at nearly exactly that same day if not hour. The best analogy for the sudden drop scenario

to the brain reaction is to that of riding a bicycle very fast and hitting a large bump. The rider

does not crash immediately here, and, after a few seconds, most people can stabilize, but not

always. Likewise, if there is a large drop, or even a drop and increase in pollen, then, within two

or at the most three days, most minds can normalize regulation of serotonin, but unstable minds

often cannot and thus two to three days after that massive pollen level drop they react in a violent way. The pollen.com website is a near perfect proxy to match the violent event to histamine level per given zip code of the location of the event.

Results

Events matching this prediction - including the Las Vegas concert shooting on 10/1/17, the Southerland Springs Texas Church shootings on 11/5/17, the Parkland Florida school shooting on 2/14/18, the Pittsburgh Pennsylvania Synagogue shooting on 10/27/18, the 3/17/21 Acworth (Atlanta) Georgia Asian spa shooting, the 3/22/21 Boulder Colorado King Store shooting, and possibly even the 9/11/2001 terrorist attacks known as nine-eleven - all appear to match this model with extreme precision - understanding the obvious limitation of this small sample size versus an actual formal regression analysis using larger data sample sizes.

Large public events during fall ragweed pollen, and especially spring tree pollen dates of final pollen level decline, can be monitored with increased awareness noting that airborne pollen levels will peak and decline following temperature drops and increases (as cold winter temperatures approach in the fall, pollen levels will drop especially from frost (Figure 1.a) and as warm summer temperatures approach in the spring after the tree pollen peak, usually in March (Figure 1.b). The pollen level changes moving from North to South in the fall and from South to North in the spring i.e., moving down and up latitudes of the continental United States (Figure 2).

We can see a unique pattern (blue line) comparing the locations of spring 2021 mass shootings from a CNN and New York Times map to a map of average pollen level activity on March 30. We can see a unique pattern where the locations of the cities of the mass shooting follows the border of northern-headed pollen blooms (border of orange and red colored zones on

the pollen.com pollen map). Note how the pattern of the location of shootings does not match that of US population (NASA nighttime photo - top image in Figure 2.a) which has significant population all along the Mississippi River up to Minnesota (too far north for long pollen season if any) and on the West Coast up to Seattle. We do not see the mass shooting locations following population locations but, rather, the border of the pollen activity with particular attention to the downward "dip" in the center of the country that closely matches the pollen activity (Figure 3.a). We also can see the progression of the mass shootings following the pollen activity in time in spring as the latitude of the locations increases (moves north) using maps of an early March, late March, and mid-April example pollen activity map (Figure 3.b). Thus, we see how the Las Vegas event precedes the Texas shooting in the fall as ragweed weed pollen levels have yet to finish further south in the United States where temperatures are still warm.

On late Sunday night October 1, 2017, in Las Vegas a psychopathic male shooter killed scores of individuals at a concert with sniper type guns from a hotel window. One cannot debate the status of mental illness here, but the observation relates to *why* did he choose or act on the date of 10/1 - versus another day? This model or theory suggests looking at the daily levels of allergens in that season (in this case fall ragweed levels) that, on 10/1/17 in Las Vegas, were plummeting and reached zero on 10/2/17, thus causing dramatic changes in brain serotonin (in any individual in that area) but, likely, setting off a chemical instigator or trigger in the shooter or any psychopathic individual in the city of Las Vegas at that time. It must also be noted that Las Vegas is one of the brightest or sunniest cities in the United States and mentally unstable individuals have even been known to have seizures from the excess blue light from the flood and intensity of light. Thus, we have another possible factor to monitor or consider.

On March 16, 2021, eight people were killed in spas in the Acworth suburb of Atlanta by a single young gunman who apparently had a sexual addiction (Figure 4).

On March 22, 2021, mass shooting at King Soopers supermarket in Boulder Colorado with a lone gunman killing ten people (Figure 5).

On October 1, 2017, 60 people were killed, 411 wounded by a single male shooter in the Las Vegas strip Mandalay Bay Hotel in Nevada targeting audience members of the Route 91 Harvest musical festival (Figure 6).

On November 5, 2017, twenty-six worshippers were murdered in a shooting from a mentally unstable individual in the First Baptist Church of Southerland Springs in Southerland Springs, Texas. Ragweed pollen crashed to zero that day (Figure 7).

On February 14, 2018, seventeen school kids were killed in Parkland Florida by a mass shooting from an expelled student. Tree pollen spiked that day and later in that day crashed. The shooting was at the end of the school day (Figure 8).

On October 27, 2018, eleven innocent worshippers were murdered in Pittsburgh, Pennsylvania in a synagogue shooting from a mentally insane shooter. Fall ragweed pollen crashed to zero that day (Figure 9).

On October 7, 2021, an 18-year old injured four people in a shooting at Timberview High School in Arlington Texas. This is an example of the delayed reaction from sudden drops. At the beginning of the month pollen levels drop from High down to the lower level of Low-Medium or over 2.5 levels (Figure 10).

On October 21, 2021, a fired male employee returned to his office and shot three people killing two of them as pollen levels dropped to zero in Superior Nebraska (Figure 11).

On October 10, 2021, one person was killed and fourteen wounded in a shooting at a bar in St. Paul Minnesota as pollen level dropped to zero (Figure 12).

On October 10, 2021, University of North Carolina in Chapel Hill deals with two suicides over the weekend after pollen levels drop to zero on the 9th (Figure 13).

On October 25, 2021, two people were killed and six people and a police officer were injured in a mall shooting in Boise Idaho (Figure 14).

On October 30, 2021, a 21 year old shot and killed one and wounded nine at a Halloween party in Texarkana Texas (Figure 15).

On the weekend of March 19-20, 2022, eight people were killed and sixty hurt in nine mass shootings where eight events occurred in states with dense spring juniper tree pollen including Texas, North Carolina, Virginia, Louisiana, and Arkansas (Figures 16-19).

A 62-year-old Black nationalist shot and injured twenty-nine subway car riders in a mass shooting in Brooklyn New York on the morning of April 12, 2022 (Figure 20).

Friday night May 13, 2022, three people were shot and then a few hours later another seventeen people were shot in two mass shootings in Milwaukee Wisconsin (Figure 21).

Friday night May 13, 2022, a single male fired multiple shots into an apartment complex in Omaha, Nebraska (Figure 22).

An eighteen-year-old male shot thirteen patrons of a supermarket in Buffalo New York killing ten in a race related mass shooting on May 14, 2022 (Figure 23).

An eighteen-year-old male shot and killed nineteen students and two teachers and wounded seventeen others at Robb Elementary School in a mass shooting in Uvalde Texas (Figure 24).

Discussion

One can speculate that higher levels of pollen in the United States than the rest of the world, especially in the spring, and the increase in the number of frost-free days (possibly from global warming via climate change) is a possible cause of higher gun violence in the United States. Note that the near zero level of mass shootings in Canada, thus, also fits this model as cities in Canada are too far north to have pollen seasons of any significant length and likely it is that fact, and not legislative policies, which is the cause of the difference.

There are limitations to this hypothesis. The hypothesis does not claim to explain all mass shootings. The claim is that there is a large amount of circumstantial evidence that indicates many mass shootings, especially those done by mentally ill male individuals in the United States, appear to correlate with serum serotonin spikes from pollen and thus serum histamine drops each spring and fall. Universities or laboratories with formal testing facilities might undertake human experiments where a control group with no allergies, patients with known allergies, and mentally ill patients with and without specific allergies, are all tested with allergy shots of specific allergens (ragweed or juniper pollen as the best examples) and then observed and tested both subjectively, for impulsivity behaviors, and with blood tests to track the exact timing and degree of serum serotonin increase as the allergic response serum histamine spikes and then drops over the 1-2 days period after the allergy shot. Crime Prevention centers, universities, or government departments with large data sets would be advised when performing formal regression analysis exercises against this hypothesis to consider two key points, 1) to not ignore any survivorship bias or omission bias as a key observation is that so many months of the year have zero mass shootings and that must be take into account in any formal statistical analysis, and 2) that many data sets on mass shootings go beyond the scope of this hypothesis

and include any gun related incident where four or more individuals were injured which can include burglaries and drug or gang related violence. The hypothesis has known limitations of lacking comparative data versus other countries. There does exist the predicted decline in mass shootings in Canada where pollen seasons are very short due to colder climate in higher latitudes. However, I have not found as detailed tracking aids like pollen.com (tracks down to a given city zip code) for European or Asian countries that also have tree and weed season pollen. The prevalence of guns (per capita count) in the United States is also a factor that must be considered when comparing against other countries.

Conclusion

This knowledge could be used as a potential predictor for law enforcement, psychiatric, and medical agencies with modern technology that can track near real-time levels of pollen per a given city or zip code. Mental health professionals would be advised to lower serotonin boosting meds and antihistamines, and even supplement sedative medications, to male patients in the months of March to early June for spring tree pollen (Figure 25) and from mid-September to the end of November for fall ragweed (depending on latitude).

Figures

Figure 1.a.

Fall ragweed pollen levels by city ranked by latitude.

Source: https://link.springer.com/article/10.1007/s10453-019-09601-2

Figure 1.b.

Spring tree pollen levels by city ranked by latitude.

Source: https://link.springer.com/article/10.1007/s10453-019-09601-2
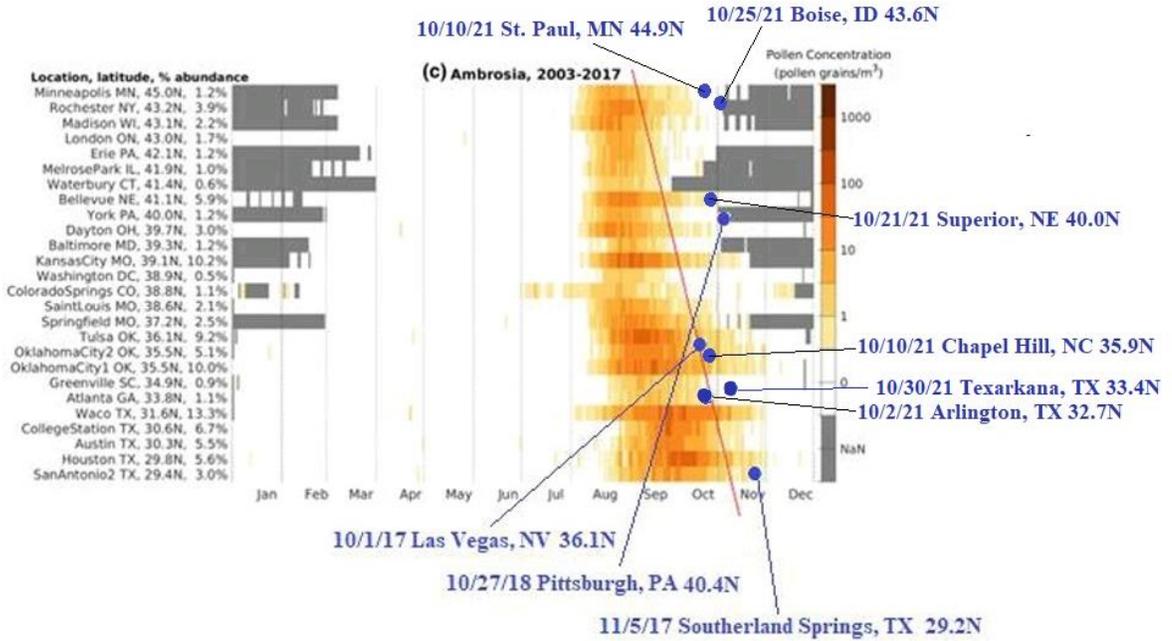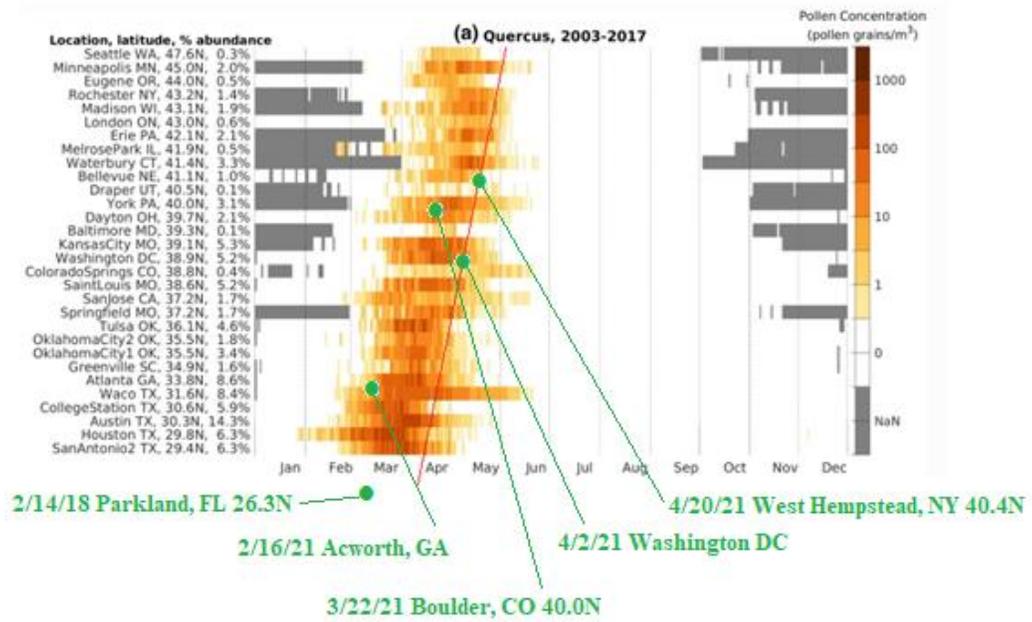
UNITED STATES MASS SHOOTINGS

Figure 2.a.

Maps showing the location of U.S. cities with mass shootings, when compared to a map of

United States population, appear to show a pattern where higher latitude cities (cooler

temperature and thus less pollen-prone in the north) and above the gulf stream "dip" in the

central United States (above the blue line approximation), are less likely to have mass shootings.
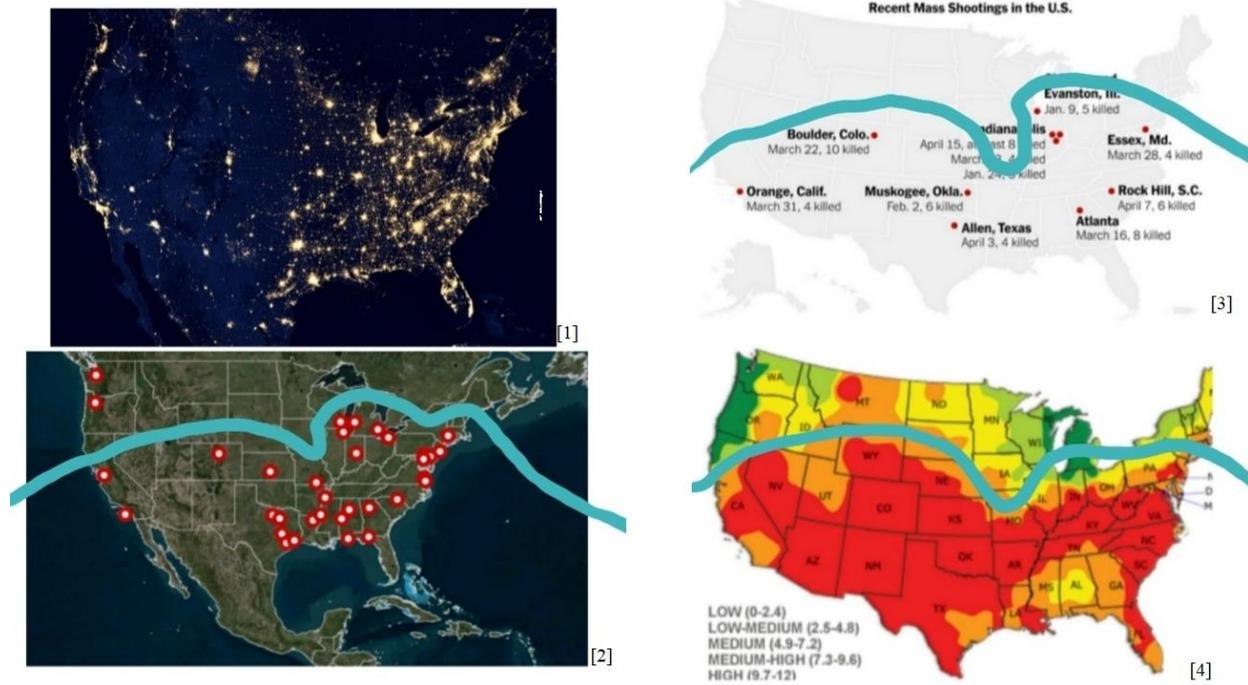
Source:
[1] NASA https://www.nasa.gov/mission_pages/NPP/news/earth-at-night.html
[2] CNN https://www.cnn.com/2021/04/16/us/mass-shootings-45-one-month/index.html?fbclid=IwAR2v1maSQRTYe-d0QyTkAIRY2gudKO3H6p8Bn6J3um1snTi65XjCpXNzBXI
[3] NYTIMES https://www.nytimes.com/article/mass-shootings-2021.html?fbclid=IwAR3qTgF5a7uT_J9K0ivEVTsXqycRqYdUPTkRDFw2yf5jGdbSSvvpluV9yFg
[4] Pollen.com www.pollen.com

Figure 2.b.

U.S. avg March 16, 22, and April 20 pollen vs 2021 mass shooting cities.

Figure 3.

Fall mass shootings (blue) follow (chronologically by date and moving down latitudes) the end of ragweed season from the middle of September to the end of November as temperatures drop toward the first winter frost (north to south and west to east). Spring (green) mass shootings follow (chronologically by date and moving up latitudes) the end of juniper and other tree pollen seasons from the middle of March until the end of June (south to north and west to east).

Fall cooling temp
vs ragweed pollen
vs latitude

Boulder 3/22/21

Pittsburgh 10/27/18

West Hempstead 4/20/2021

Washington DC 4/2/2021

Las Vegas 10/1/17

Acworth (Atlanta) 3/16/21

Southerland Spring 11/5/17

Parkland 2/14/18

Spring warming temp
vs tree pollen
vs latitude

Figure 4.

Acworth (Atlanta) Georgia Asian spa shooting 3/16/21 vs spring tree pollen level decline.

Source: https://www.pollen.com/forecast/historic/pollen/30101
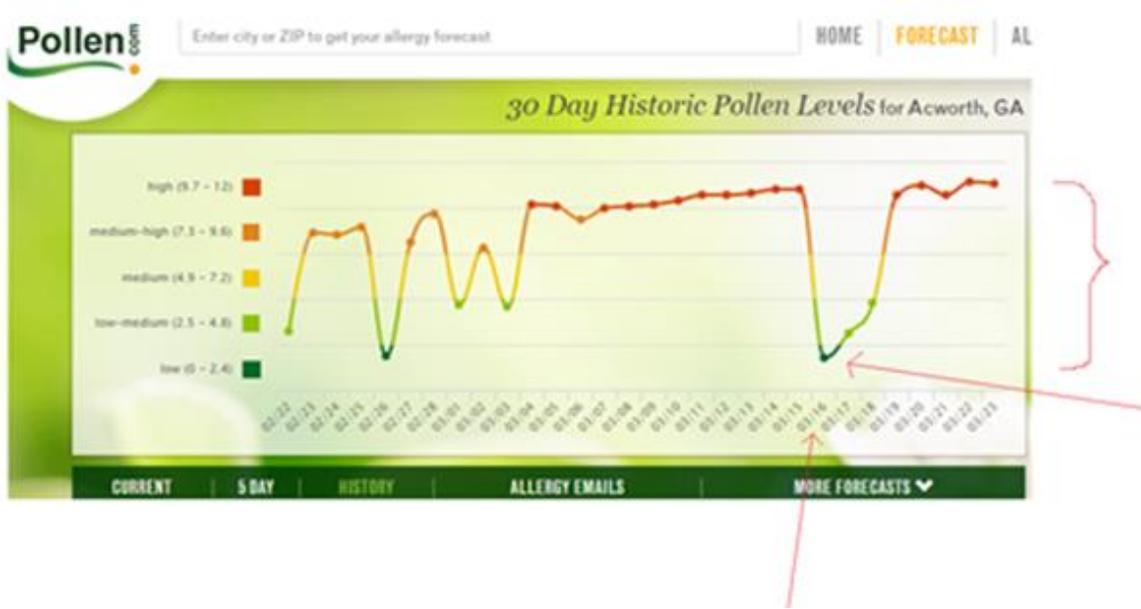
Figure 5.

Boulder, Colorado King Store shooting 3/22/21 vs spring tree pollen level decline.

Source: https://www.pollen.com/forecast/historic/pollen/80301

Figure 6.

Las Vegas, Nevada concert shooting 10/1/17 vs fall ragweed pollen level decline.

Figure 7.

Southerland Springs, Texas Church shooting 11/5/17 vs fall ragweed pollen level decline.
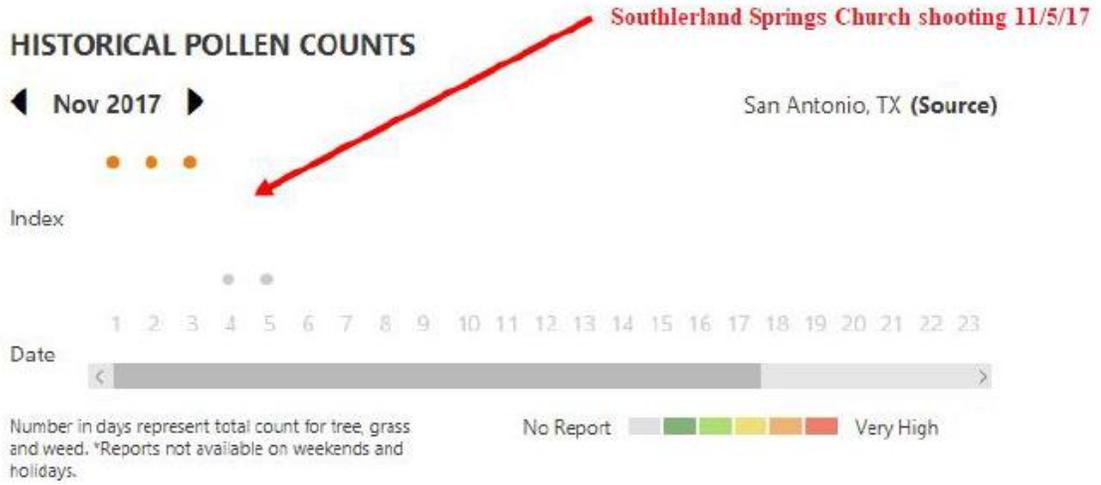
Figure 8.

Parkland, Florida school shooting vs spring tree pollen level decline.

Source: https://m.accuweather.com/en/us/parkland-fl/33067/weather-forecast/337605 and

https://weather.com/
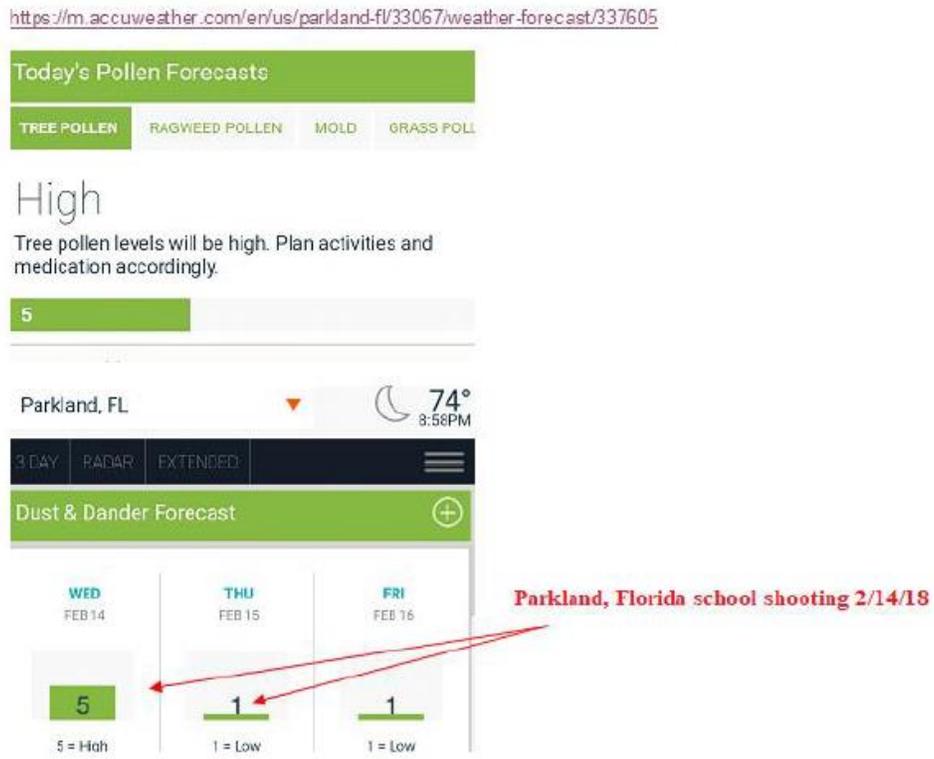
Figure 9.

Pittsburgh, Pennsylvania synagogue shooting 10/27/18 vs fall ragweed pollen level decline.
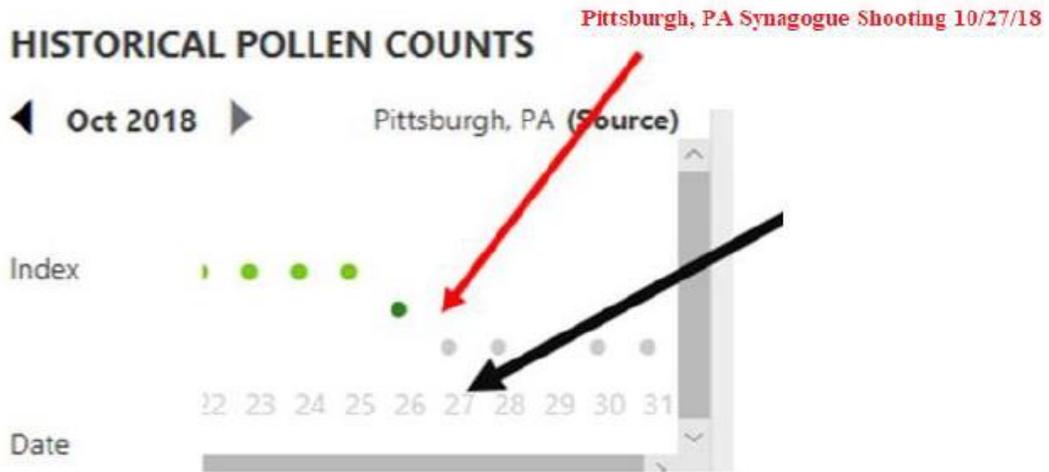
Figure 10.

Arlington, Texas Timberview High School shooting 10/7/21 vs fall ragweed pollen level decline.
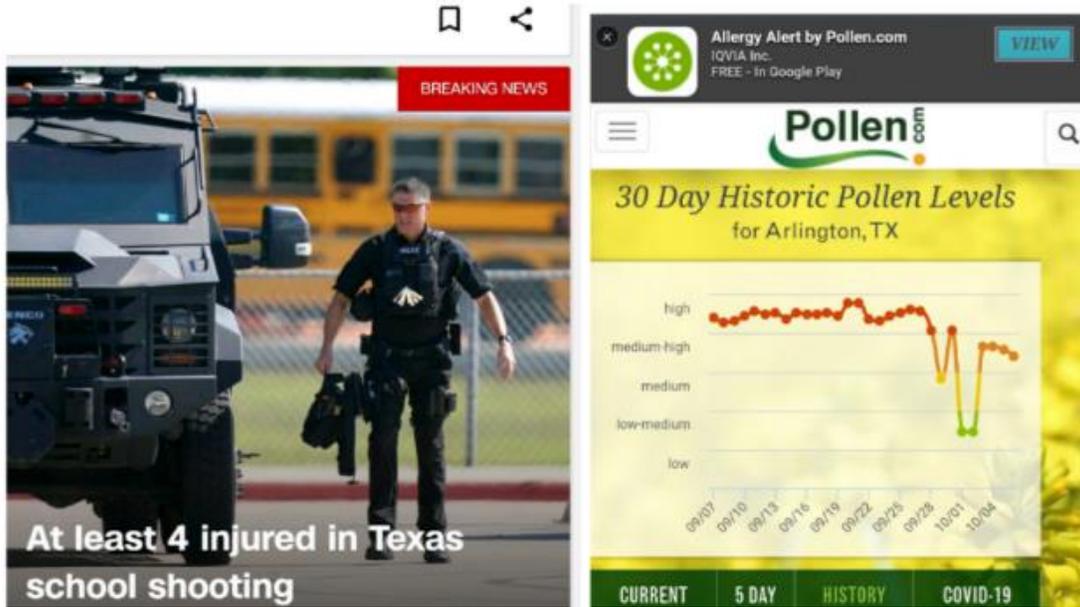
Source: cnn.com and pollen.com retrieved 10/07/2021.

Figure 11.

Superior, Nebraska office shooting 10/21/21 vs fall ragweed pollen level decline.

Source: cnn.com and pollen.com retrieved 10/22/2021.

Figure 12.

St. Paul, Minnesota bar shooting 10/10/21 vs fall ragweed pollen level decline.

Source: cnn.com and pollen.com retrieved 10/10/2021.

Figure 13.

Chapel Hill, North Carolina University of North Carolina suicides 10/10/21 vs fall ragweed

pollen level decline.

Source: cnn.com and pollen.com retrieved 10/13/2021.

Figure 14.

Boise, Idaho mall shooting 10/25/21 vs fall ragweed pollen level decline.
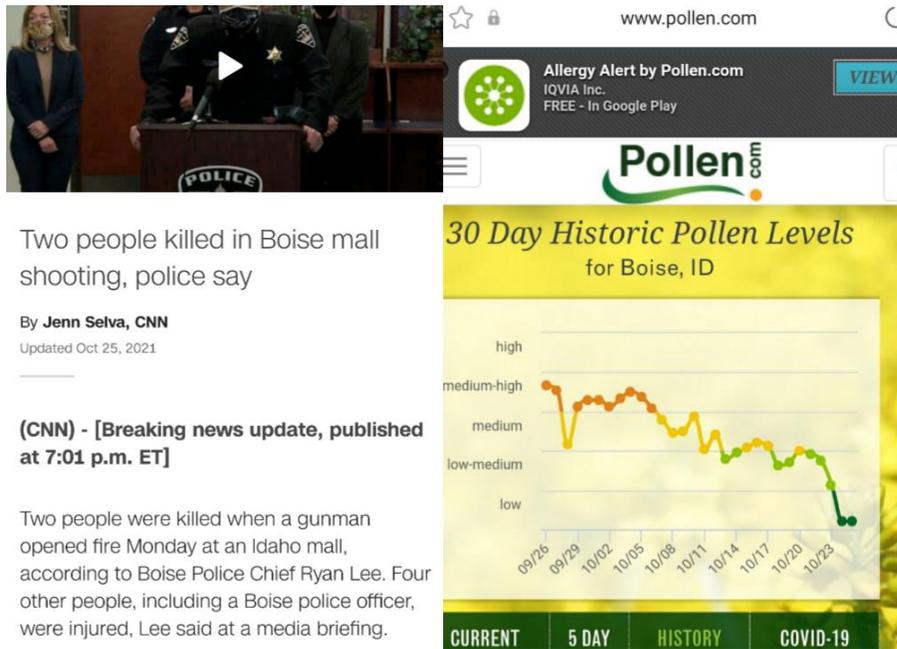
Source: cnn.com and pollen.com retrieved 10/25/2021.

Figure 15.

Texarkana, Texas Halloween party shooting 10/30/21 vs fall ragweed pollen level decline.

Source: https://www.texarkanagazette.com/news/2021/nov/01/victims-identified-in-fatal-halloween-party/ and https://www.pollen.com/forecast/current/pollen/77501
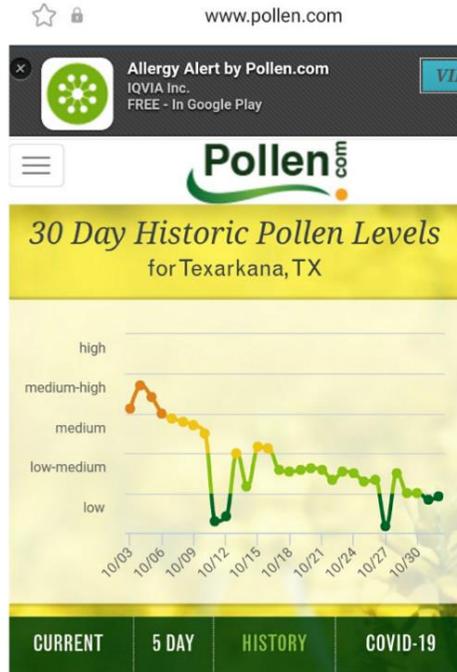
Figure 16.

CNN online article showing eight states with mass shootings weekend of March 19-20, 2022.

At least 8 people were killed and more than 50 hurt in 8 mass shootings acros…

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At least 8 people were killed and more than 60 hurt in 9 mass shootings across the US this weekend

By **Emma Tucker and Dakin Andone, CNN**

Updated 1 hour ago Mar 21, 2022

(CNN) - The largest-scale US mass shooting in more than two years unfolded over the weekend, one of at least nine mass shootings that left eight people dead and more than 60

New Iberia, Louisiana: 5 injured,

Norfolk, Virginia: 2 killed, 3 wounded outside restaurant

Madison Heights, Virginia: 1 killed, 4 wounded

Dumas, Arkansas: 1 killed, 27 injured at car show

Fayetteville, North Carolina: 3 killed, 3 wounded at hotel

Houston: 1 teenager killed, 3 wounded outside birthday party

Dallas: At least 10 wounded

Austin, Texas: 4 shot near

Source: https://www.cnn.com/2022/03/21/us/mass-shootings-weekend/index.html

Figure 17.

Pollen.com website of United States spring tree pollen with locations of eight shootings.
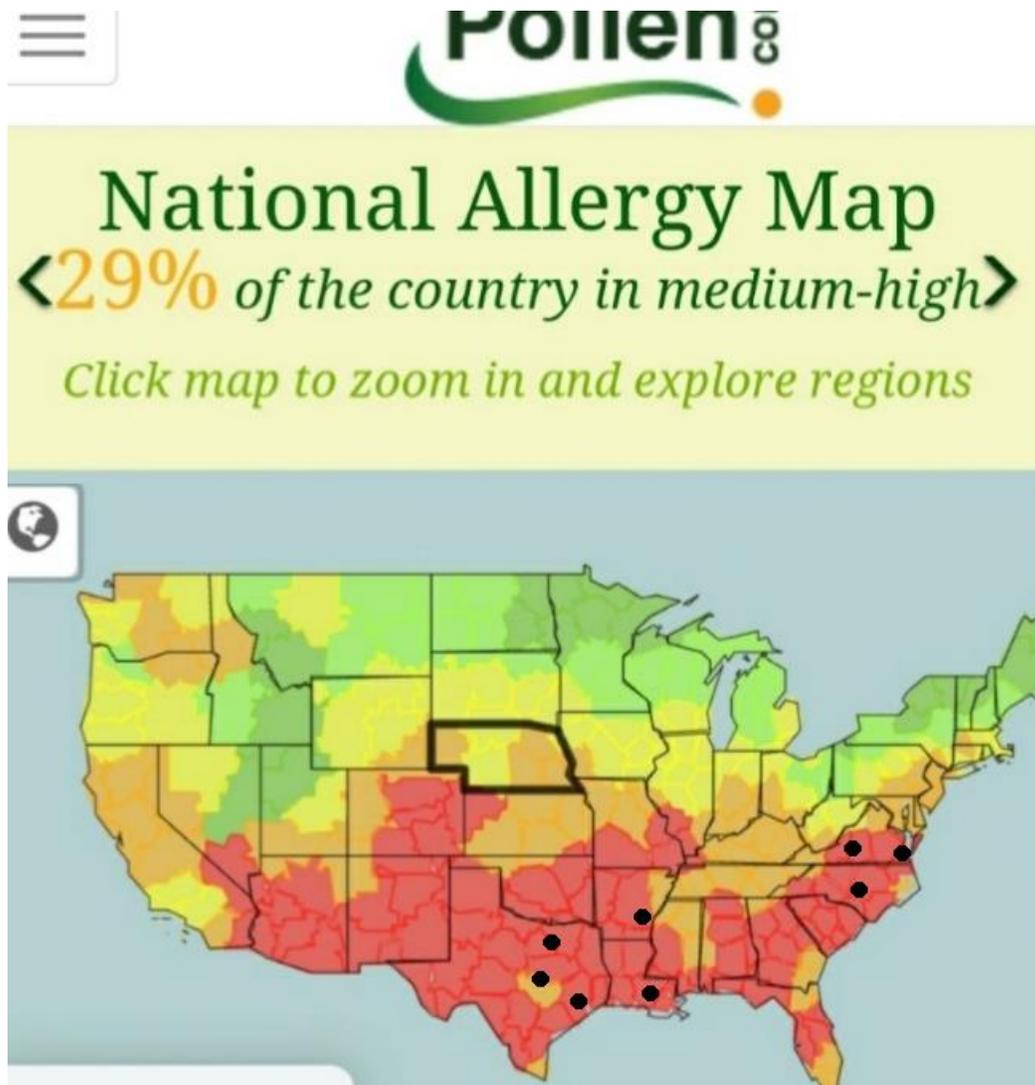
Source: www.pollen.com retrieved 3/20/2022.

Figure 18.

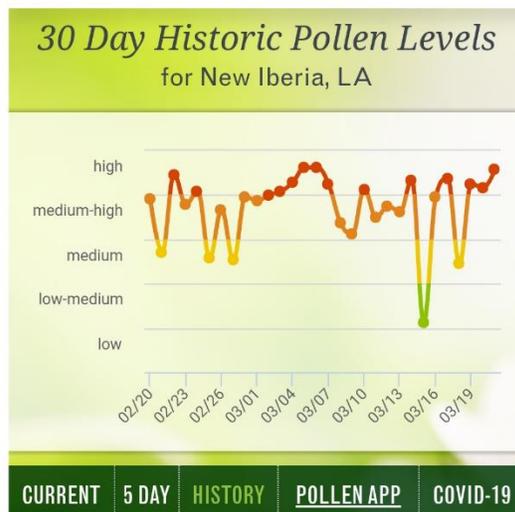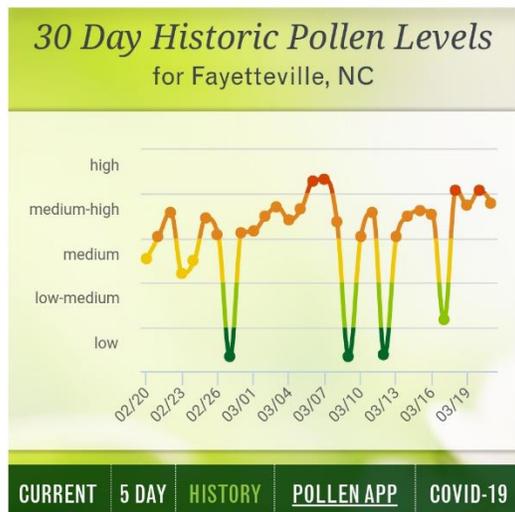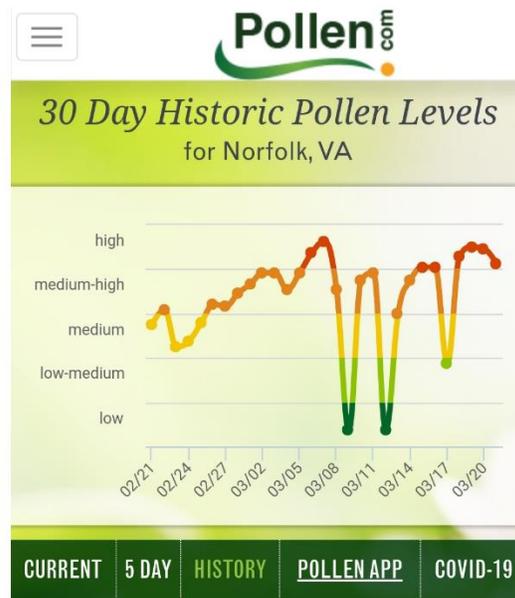*University of Nebraska Wesleyan pollen count site showing "peak" juniper on March 21, 2022.*
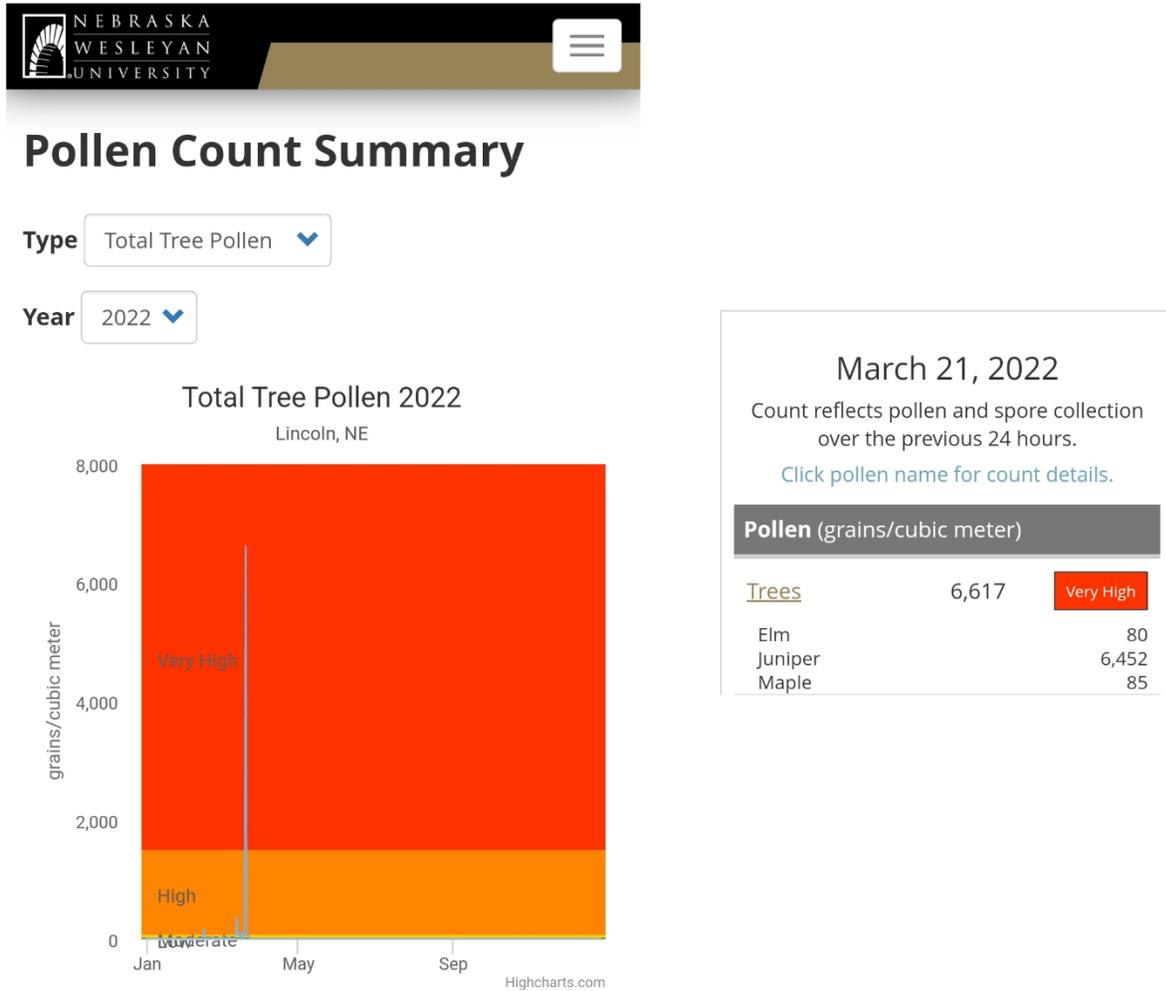
Figure 19.

Examples of four mass shooting sites by zip code on pollen.com site showing dramatic up and down variations in spring tree pollen theorized to impact human serum serotonin levels and thus behaviors via changes in histamine.

Source: www.pollen.com retrieved 3/21/2022.

Figure 20.

A mentally ill adult male injured 23 people in a Brooklyn New York subway car shooting on

April 12, 2022, a day after high pollen levels dropped in the region.

Figure 21.

The pollen.com website shows red colored high level of spring tree pollen fade away from May 11 to May 13 when two mass shootings occur in Milwaukee Wisconsin.
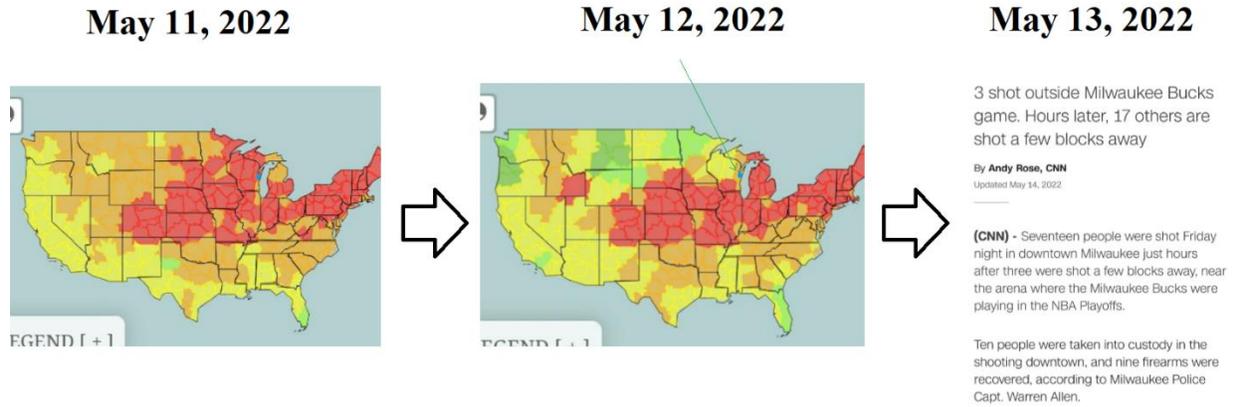
Figure 22.

The University of Nebraska Wesleyan pollen count web site shows a decrease in spring tree

pollen from Very High on May 12 down to High on May 13 the same day as a mass shooting in

Omaha Nebraska.
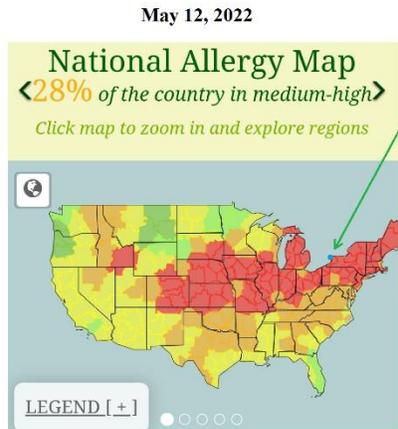

Source: https://www.nebrwesleyan.edu/academics/majors-and-minors/biology/pollen-count
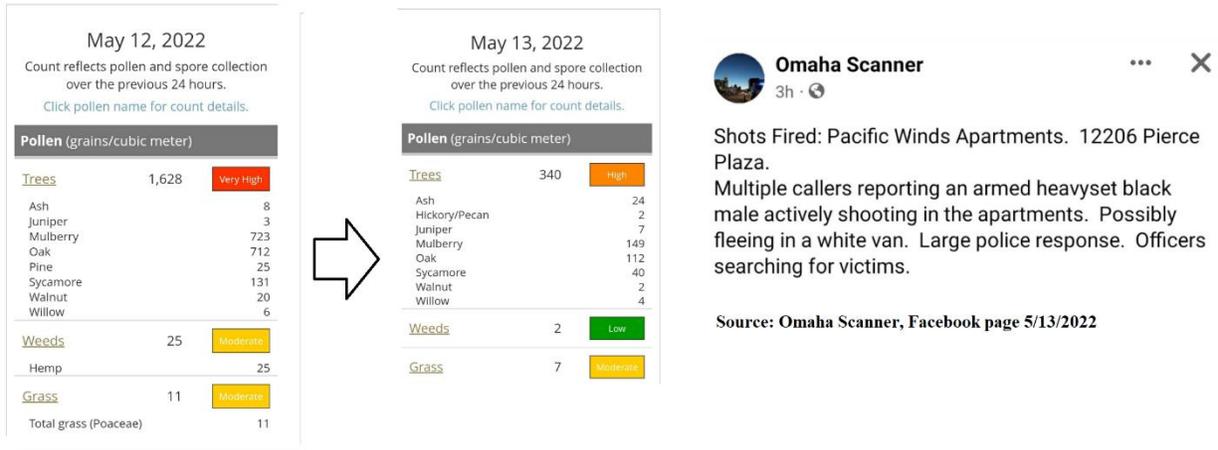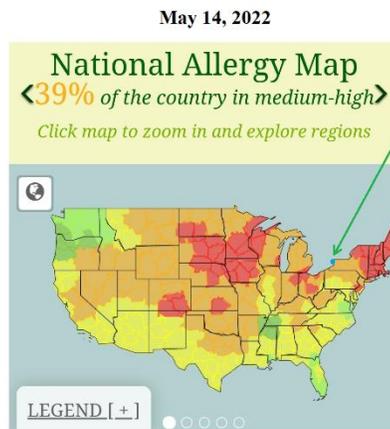
Figure 23.

The pollen.com web site shows a decrease from red colored high pollen from May 12 to May 14

when a young male murdered patrons of a supermarket in a mass shooting in Buffalo New York.

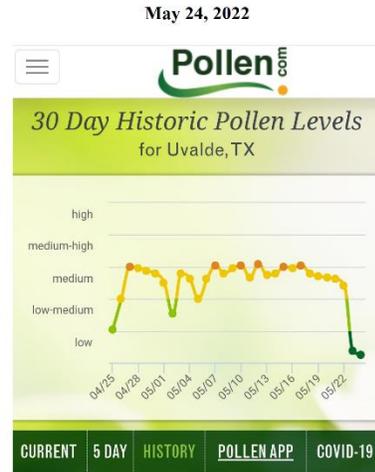Source: www.pollen.com   Source: cnn.com

Figure 24.

The pollen.com web site shows a dramatic multi-layer drop in pollen the very day where a teenage male gunmen killed 21 in Uvalde Texas elementary school mass shooting.

(CNN) — An 18-year-old gunman on Tuesday fatally shot 19 children and two adults at a Texas elementary school before he was killed by law enforcement officers, officials said.

The shooter -- identified by Texas officials as Salvador Ramos, of Uvalde -- also shot his grandmother before crashing a vehicle near the school, Texas Department of Public Safety Sgt. Erick Estrada said. She is in critical condition, he said.

The gunman is believed to have acted alone, Uvalde Consolidated Independent School District Police Chief Pete Arredondo said.

Source: www.cnn.com

May 24, 2022

Source: www.pollen.com

Figure 25.

A spring 2022 count of mass shootings-per-day from the Gun Violence Archive web site shows two large spikes that occur after two large spring tree pollen events using the University of Nebraska Wesleyan pollen count website as an overall estimate for average United States 2022 spring tree pollen. As the pollen and thus brain histamine decreases then do we see brain serotonin levels increase and thus the corresponding increase in violence.
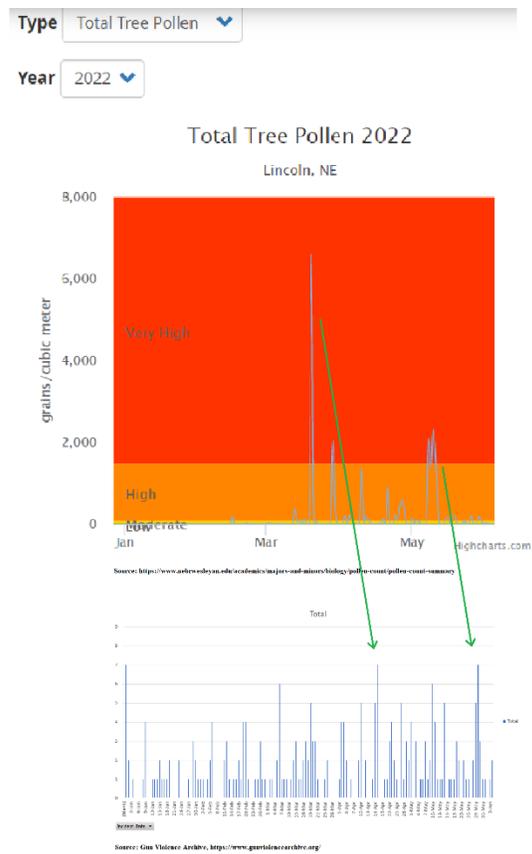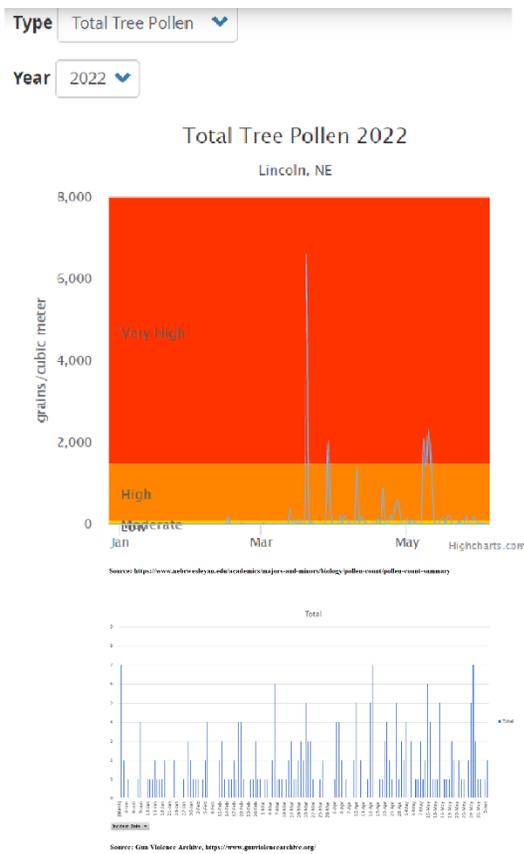
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