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My Sharky Secrets for Telling Fabulous Data Stories

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ABSTRACT

One of the hardest things about presenting data is capturing people's attention! Numbers might prove your point, but how do you get others to care about them? Simple—use data storytelling! Data storytelling enables you to mix narratives with data so that you can maximize your impact. Data storytelling is a popular way to present data. However, many data professionals don't understand the value of using these methods when presenting data.

By keeping the message focused, considering the audience, and using a convincing narrative, data storytellers engage and move listeners to act. This powerful technique will help you clearly communicate the business insights found in your data. And, in doing so, you can enable decision-making and create a lasting, positive impact on your organization. Let's make you a data storyteller today!

INTRODUCTION

If you are still using ineffective presentations to convince senior management that the data is suggesting a course of action - maybe you should borrow some tricks from the marketing department.

Data storytelling is becoming a popular way to present data; however, many data professionals are not yet versed on the importance of using storytelling methods. If you are in this common population, here are compelling ways to think like a data storyteller and make your data stories more memorable and actionable.

ELEMENTS OF A DATA STORY

There are only three secrets to a great data story. It's a clear message that resonates with an audience in a way that persuades them to action. Now you know the secret − guess you can stop reading here! Maybe you would like a few more details about how to apply those secrets to your work.

DATA STORYTELLERS FOCUS ON A SIMPLE MESSAGE THAT RESONATES

An effective data story sends a succinct data message. Often when an inexperienced data analyst presents data without a message, he sends the audience multiple messages. When there are lots of information bits without a clear trajectory, the audience becomes confused. They don't know if you are informing them about a situation or you want them to act.

> *"For a message to resonate,*
> *it must be clear, concise,*
> *credible and even …*
> *offer an element of surprise."*

By crafting your message into a succinct, actionable statement, an effective data story emerges. This can be difficult, particularly if you have a plethora of data and possibly even more ideas! But it pays to take the time to reduce.

If you want your audience to act on the data, it's your job to give them a convincing message. In 1854, one of the earliest data storytellers, Dr. John Snow used a data story with a simple message, "We can stop the cholera epidemic by turning off the polluted Broad Street water pump."

Not only was it simple, it is an actionable message. Keep your message simple and focused. Think to yourself, "What is the one thing I want the audience to do differently after viewing my data story?" Craft your message around that element.

DATA STORYTELLERS THINK ABOUT THEIR AUDIENCE

Not all audiences are the same - your message should be based on the audience and what works for them. You wouldn't present data to an interested observer the same way you would to a savvy insider.

The observer lacks background information and may not understand why a fact is so significant. This data story would require more context to help the audience reach your same conclusion.

Likewise, savvy insiders don't have much patience for a data story containing what they perceive as well-known facts. You would present that data story with more depth to convince these individuals of your suggested actions. Your goal is to help your audience see what you see in the data, so the needed action is obvious.

> *"Your goal is to help your audience see what you see in the data, so the needed action is obvious."*

Not all audiences are equal, so a successful message is based on the audience's knowledge level. By meeting the audience at their respective starting points, your recommendations will be more powerful and the needed action more obvious.

Many data professionals create a single set of slides that are targeted too broadly. In these stories, the audience may not understand what needs to happen next or perhaps fail to understand the issue. Make sure that you think through what questions your audience is likely to have and answer those questions.

DATA STORYTELLERS WANT TO MOVE THE AUDIENCE TO ACTION

Narratives are the single best way to engage an audience. People love stories! Stories stimulate our curious nature and allow us to follow where the narrative leads, while statistics presented alone ask us to question and evaluate what we are presented.

There's science behind this idea! Think of a time when you have been in PowerPoint Hell - where you sat through tedious, bullet-point ridden slides. When a dull storyteller uses these methods, your brain's language processing engages but that's it. Your brain is only working to decode the language, not engage with the data.

In the book, *Made to Stick*, the authors, Chip and Dan Heath, noted a study in which students were asked to present a one-minute persuasive presentation to their classmates. Each presentation included 2.5 statistics on average. One student used a story. Ten minutes later, the audience was asked to write down every idea they recalled. What do you think happened?

> *"5% remembered the statistics;*
> *while an astounding*
> *63% remembered the story."*

Let that sink in – the story was what the listeners retained. It's because stories engage our senses allowing us to recall narratives successfully. Once a storyteller has engaged the senses, the audience is more easily persuaded toward the recommended actions.

WHAT MAKES DATA STORYTELLERS DIFFERENT?

By keeping the message focused, considering the audience, and using a convincing narrative, data storytellers engage and move audiences toward their conclusions. This powerful technique shows the real value of data and has a lasting impact on the organization.

What Makes a Good Story?

People have been telling stories since ancient times. Before there was writing, people used oral stories to communicate and preserve the tribal history. Stories help us understand how life changes and why it changes. These stories serve as lessons to teach the listener how to deal with opposition, ways to face difficult decisions, and the best actions to take.

When you think of great stories perhaps you recall a strong conflict where you didn't know how the main character would overcome the enemy. How could Luke Skywalker with so little training overcome Darth Vader? Maybe your favorite part of the story was the stunning victory or when the characters found true love. Perhaps you were touched when a beloved character died. These are the elements of a great story and what causes us to connect with the characters.

Defining a Data Story

There are various definitions for data storytelling floating around the web. Most of those definitions indicate it is a method for combining data with analysis to help others understand. Few understand the narrative is an essential ingredient.

Brent Dykes defines a data story as a structured approach to communicating data insights using narrative elements and data visualizations. Using his three elements of a data story: narration, visuals, and data, you can move an audience toward action. If one of the elements are missing, your data story is likely to miss the target.

Data

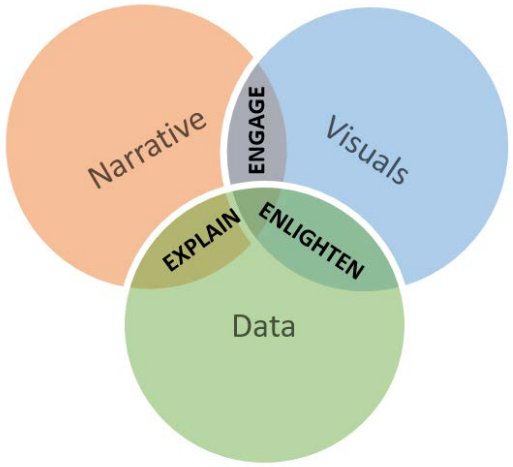
All data stories contain facts and statistics to qualify as a data story. These facts and statistics must be accurate and support the narrative.

Visuals

The pictures or graphs that allow the viewer to see the trends or categorization of the data.

Narrative

The story that explains the data and helps the viewer understand what it means.



When you combine data with the narrative, you are explaining the data. When you combine visuals with data, you are enlightening the audience. When you add a narrative with visuals, then you are engaging the audience. But effective data stories must explain, engage, and enlighten. This is the real value of a data story.

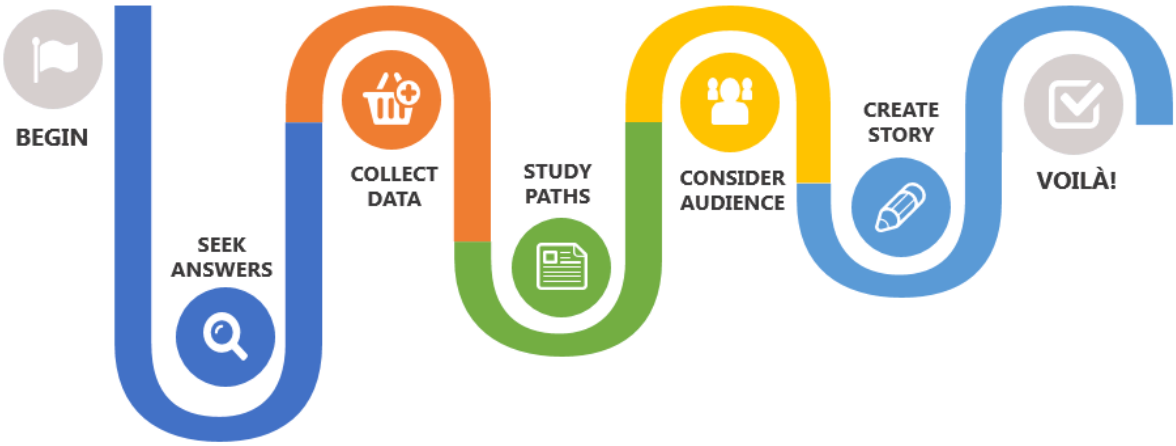
Creating Impact with Data Stories

Professor Ben Wellington considers creating impact to be the most important part of data storytelling. In his *Making Data Mean More through Storytelling* lecture, he provided many examples of data stories he had submitted to the city government. (The talk is available on You Tube.)

While not all data stories had the exact impact he was seeking, he was pleased with knowing that he had someone thinking about his point. He considered that a victory and rightly so! His mantra is about having impact with your data and story above all else

USING THE DATA STORYTELLING PROCESS

Many data professionals don't understand the value of using storytelling methods with their data. There are five steps to crafting a data story. If you can master these five steps, you can create a powerful data story that impacts your audience and moves your ideas forward.



What you may quickly notice is that creating the story is the last step in this process. In this next story, let's walk through how Dr. John Snow used this process when he was facing the Cholera epidemic in London.

As an example of the storytelling process, let's use one of the first data stories ever told. It occurred during 1854 when a cholera outbreak claimed the lives of over 600 southern London residents. This data story was told by Dr. John Snow, who is often credited with ending the outbreak

STEP 1: SEEKING AN ANSWER

In the mid-1800s there was a cholera outbreak in London. Many people died and a local physician, John Snow, was trying to prevent more deaths. His professional concern for his patients prompted him to seek an answer.

STEP 2: COLLECT AND KNOW YOUR DATA

Of course, a data story starts with data – that seems like a ridiculous thing to even say. Most data professionals find the challenge is the abundance of data. The goal is to determine the key insights and then filter and group that data to get there.

Dr. John Snow didn't have a handy Oracle database to study the data, so he had to walk door-to-door and survey residents. Through this data discovery process, he was able to make some observations about certain locations where the deaths occurred. The most notable area was in London's south region known as Soho, specifically on Broad Street.

Deaths from Cholera in London, registered from September 23d, 1848, to August 25th, 1849.

Districts of London.	Population in 1841.	Deaths from Cholera.	Deaths to each 1,000 inhabitants.
West . .	300,711	533	1·77
North . .	375,971	415	1·10
Central . .	373,605	920	2·48
East . . .	392,444	1,597	4·06
South . .	502,548	4,001	7·95
Total . .	1,948,369	7,466	3·83

The following figure, from Dr. Snow's essay, uses data to show which districts were the most impacted. This data shows the deaths prior to the specific event Dr. Snow investigated. It reveals that the southern London district was impacted by cholera before. So, the doctor knew he had to act quickly.

He needed more data and he was able to take evidence from another physician who had gone door-to-door to collect the impact of the disease on the community.

STEP 3: FIND THE UNLIKELY NARRATIVE IN THE DATA

In modern times, it's common knowledge that you can catch diseases, like cholera, from unclean water. This fact was not common knowledge in 1849. People understood that germs could be transmitted through the air, but water was a different story.

Think about it – it was a common practice for people to dump raw sewage into the Thames. They must have realized the sewage was nasty, but they may not have thought through how germs might survive in water. The water company responsible for getting water to the pump didn't consider its impact or need for filtering. Luckily Dr. Snow did!

What convinced Dr. Snow he was correct was the nearby brewery which had no deaths. He found out the brewery had their own well and did not use the Broad Street pump. Thus, cholera had spared the site.

For someone to suggest this water-based illness theory was insanity – like someone suggesting that a minimum wage job at McDonald's was more profitable than dealing drugs. (It is … but that's a different data story.)

Dr. Snow's theory was an unlikely narrative, which made it compelling!

In the Wikipedia article about Dr. Snow, the author notes that the idea

of germs spreading from fecal matter to someone's mouth was more than people could tolerate.

However, it's these interesting storylines that get attention. When the data reveals something unexpected, it creates a captivating storyline that engages the viewer.

Dr. Snow Had a Sticky Message

As you begin to write your data story, you must create a central message or your theme. This message allows you to build the narratives for your story.

Your message should be clear and simple. State the issue and the resolution in as few words as possible. Keep in mind the audience when writing this message – will they understand the message, and will they care. Ensure you have creditability to state the message or use the creditable facts to assist.

When possible, make the message contagious. This causes others to repeat your message because they find it powerful.

STEP 4: WRITE FOR YOUR AUDIENCE

When you write a data story, you must consider what questions your audience will have and then how your data answers those questions. For Dr. Snow, the main audience he had to influence was the local government. He wanted the Broad Street water pump closed and they had the power to do it. In this letter to the editor of the Medical Times and Gazette, he said:

> "With regard to the deaths occurring in the locality belonging to the pump, there were 61 instances in which I was informed that the deceased persons used to drink the pump water from Broad Street, either constantly or occasionally...
>
> The result of the inquiry, then, is, that there has been no particular outbreak or prevalence of cholera in this part of London except among the persons who were in the habit of drinking the water of the above-mentioned pump well.
>
> I had an interview with the Board of Guardians of St James's parish, on the evening of the [7 September], and represented the above circumstances to them. In consequence of what I said, the handle of the pump was removed on the following day."

From this passage we understand that he spoke to his audience directly. Notice that he limited the statistics to convincing ones. Since the Broad Street pump was shut down the following day, he must have answered their questions succinctly.

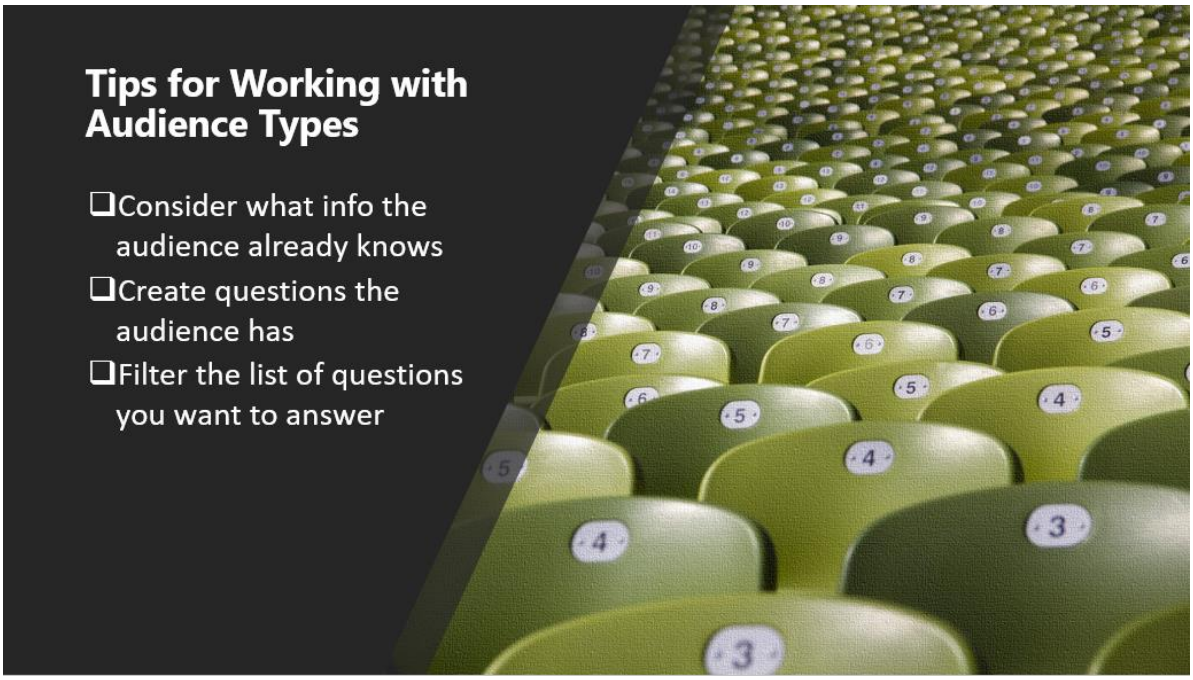
Working with the Audience

Sometimes audience is the single most important element of your data story. If you talk over their heads or don't provide enough information, all effort is lost. "Think what your audience already knows," says Jim Stikeleather in the *How to Tell a Story with Data* article.

He defines these main audiences. When you craft your story, think about how differently these audiences would view your data. What questions would each audience type have?

Tips for Working with Audience Types

When working with an audience, put yourself in their place. For each audience listed in the proceeding figure, generate the questions you think they would have about your data and about your suggested approach.



Persuading People

Persuasion has a bad reputation. Many people think of the word in a negative way. Often it is associated with manipulation or even evil desires. When you think of people who have had a lasting impact on the world, you undoubtedly do not think of them as using manipulative or evil devices to achieve their goals. You instead realize they had to convince others that they had a good idea. This is how we want you to think of persuasion.

Here's the four elements required to persuade an audience.

STEP 5: CRAFT YOUR STORY

Dr. Snow published his findings in a 30-page essay called *On the Mode of Communication of Cholera* that described how he had collected the data, how the disease had progressed through the Soho district, and why he thought it was tied to the water supply.

> *"It's a moving narrative because as he narrates what happened to each person.*
>
> *You feel the impact the disease has on the community."*

It's written in very simple terms and is easy to follow. He was able to lay out he case for how the water supply was the most likely cause of the cholera outbreak.

He goes through each case describing who was affected. In one case it was a gentleman who was hoping to see his brother before he died of cholera. Sadly, the brother dies before he arrives. The man has a meal, which includes drinking the tainted water and returns home. Two days later he also died from cholera. Each story is heartbreaking. We know the victims could have been saved so easily.

Dr. Snow told a story and used the storytelling arc.

Building the Perfect Storyline

What is a story? A story is a report of connected events, *real or imaginary,* presented in a sequence. All stories have the basic elements – someone or thing working through conflict to get his or her desired results. The plot is what moves the character through the conflict. The theme is the message the reader has at the end.

Using the Storytelling Arc

Use the storytelling arc to tell your story. It has three stages: Beginning, Development, and Resolution.

In the first stage, you introduce the situation and reveal the question you are trying to answer. This is where you must hook your reader. It may be with a story or some astonishing facts. The listener is moved between the first and second stage by the conflict.

During the Development stage, you can use the data charts and additional narratives to illustrate the issue. Your narrative should help the audience understand the conflict and why you are making your recommendations.

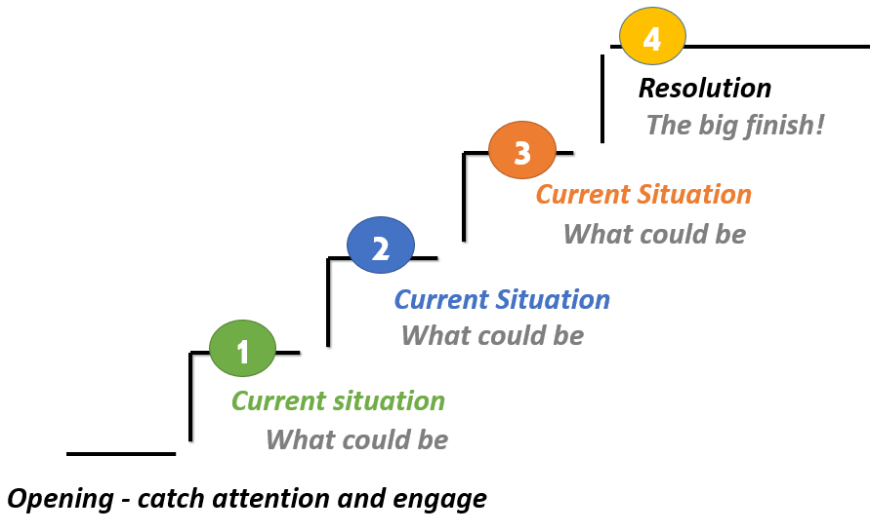
The Resolution stage is where you present the resolution or your recommended action. You are offering them the new bliss or a better tomorrow.

Walk the Conflict Staircase

You can use techniques like the conflict staircase to work through your storyline. Each stairstep is a point to move your story forward. This technique is used by many great storytellers, such as Garr Reynolds, Steve Jobs and Nancy Duarte. They had different names for it, but the methodology is the same.

Each step should help the audience understand the current reality and then define what it could be. By moving up the staircase, the audience sees their initial objections dissipate. They understand the new world in the way you envision it.

They understand what the data suggests and why the course of action is necessary. Essentially, you allow the audience to persuade themselves.



"It's about impact" as Professor Wellington suggests in his Ted Talk shown earlier. Even if they do not agree with you, they will have a different way to think about the data.

CONCLUSION

In today's world, Dr. Snow would have needed Facebook or a You Tube video to get his point across. At that time, he had a limited means of communicating but he told a rousing story supported with data.

Dr. Snow's famous data visualization was created years later in a separate essay. See excerpt of map on previous page, it shows the Broad Street pump responsible for the outbreak. The stacked bars indicate the deaths attributed to cholera. When we view the geo-based data visualization, it's obvious what happened.

I suspect after collecting the data he must have visualized it in his head to make the correlation with the Broad Street water pump. But it took Dr. Snow's master storytelling to persuade an audience to action.

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Harvard Business Review. Strikeleather, "*How to Tell a Story with Data*." Accessed Feb 2020. https://hbr.org/2013/04/how-to-tell-a-story-with-data

ACKNOWLEDGMENTS

Thanks to our many colleagues who read multiple versions of this paper. Big thanks to Ocearch for their work toward helping people understand sharks better.

RECOMMENDED READING

- *Ocearch Site (http://www.ocearch.org)*

- *On the Mode of Communication of Cholera,* Dr. John Snow Available: https://collections.nlm.nih.gov/ext/cholera/PDF/0050707.pdf
- *Effective Data Storytelling: How to Drive Change with Data, Narrative, and Visuals,* Brent Dykes.
- *Presentation Zen: Simple Ideas on Presentation,* Garr Reynolds.
- *Resonate: Present Visual Stories that Transform Audiences,* Nancy Duarte.

CONTACT INFORMATION

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APPENDIX A. EXAMPLE DATA STORY ONE

SHARK TALES: DOES DATA DISPROVE JAWS?

When it comes to persuading an audience, are statistics or data stories most impactful?

Building empathy to move people to action and humanizing data to make an emotional impact creates the best data stories. Analyzing shark data led me to fascinating findings, so I decided to combine my results with Tricia's insights to create this persuasive **data story**.

In my data story, Mary Lee, a great white shark with over 100,000 twitter followers, is the lead character. I used her to bring the human aspect to the data. Let's see if I can persuade you with my conclusions in this example data story.

In this virtual event, you can watch as I walk through my SAS Visual Analytics data story: Data Storytelling: You Can Stop Being Afraid of Sharks

Data Story: Are Sharks Really the Villains?

Let's face it, Hollywood has given sharks a bad rap, portraying them as monsters and creating a culture that fears the fin through the 1977 movie Jaws. One organization that does not see sharks as the villain is OCEARCH. They are a non-profit organization that studies great white sharks. They have generated outstanding amounts of data regarding movement, biology, and shark health that not only allows researchers to generate information that was previously unattainable but enhances public safety practices.

One of OCEARCH's tagged sharks, @MaryLeeShark, a 50-year-old great white shark, was seen foraging much of the Atlantic over the years. She's never been tracked too close to the coast or where people would usually be about swimming. The following figure shows her path around the Atlantic. Each dot represents when she was close enough to the surface to ping the satellite. There are two paths – orange and gold. The gold path represents Mary Lee and the other represents shark Katherine, another one of OCEARCH's tagged sharks.

Mary Lee's only known human interaction was with the OCEARCH team when she was tagged (see below). Like humans, sharks like to socialize – not with humans but with other sharks. Back in 2015, Mary Lee and Katherine were pinged swimming off North Carolina at various times. (see above) Mary Lee was later seen up north near Cape Cod with other sharks of similar species. It's presumed that they were hunting seals.

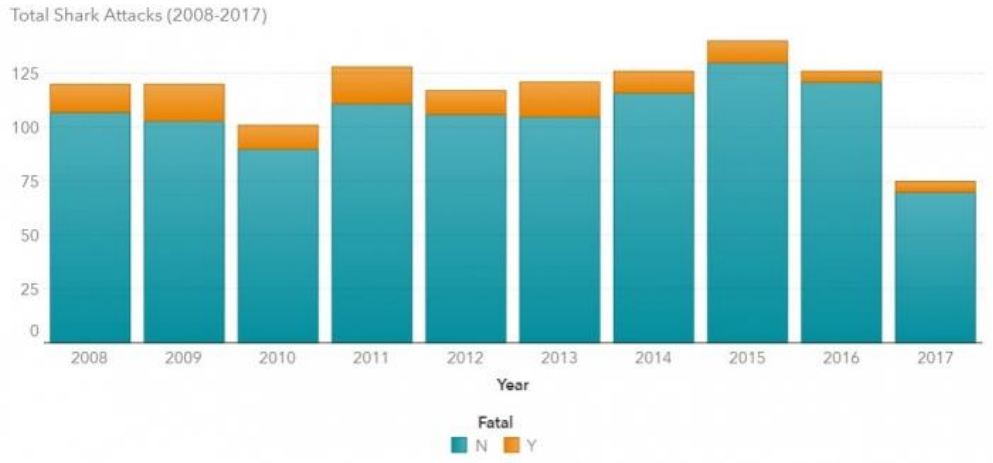
You may be surprised to know that our interest in them outweighs their interest in us.

The odds of getting attacked and killed by a shark are so slim that you are more likely to die from heart disease, the flu, biking or even lightning. So, if you get anxious while swimming in the ocean or have a fear of being attacked by a shark, I have good news for you – your chances of a shark encounter are very slim. There are approximately 110 shark attacks worldwide each year and only a few are fatal.

Reviewing Shark Incidents: Sharks Prefer Fish to Humans

Over the past 10 years, there have been 1,174 shark attacks worldwide. Roughly 90% were not fatal

While shark attacks have slightly increased over the years, fatality rates have declined. Researchers (like OCEARCH) believe this could be due to better responses to beach safety practices or increased public awareness – such as avoiding areas where there have been shark sighting.



Total shark incidents worldwide Source: Line Chart from SAS Visual Analytics

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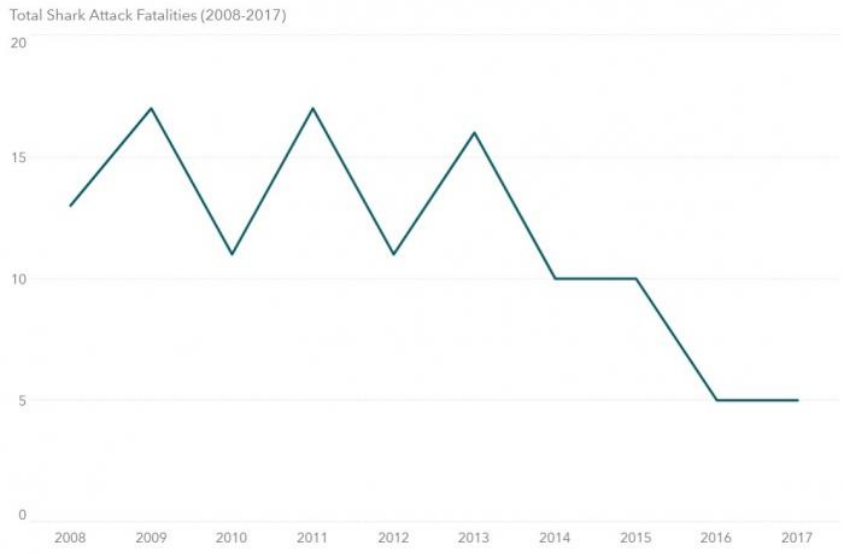
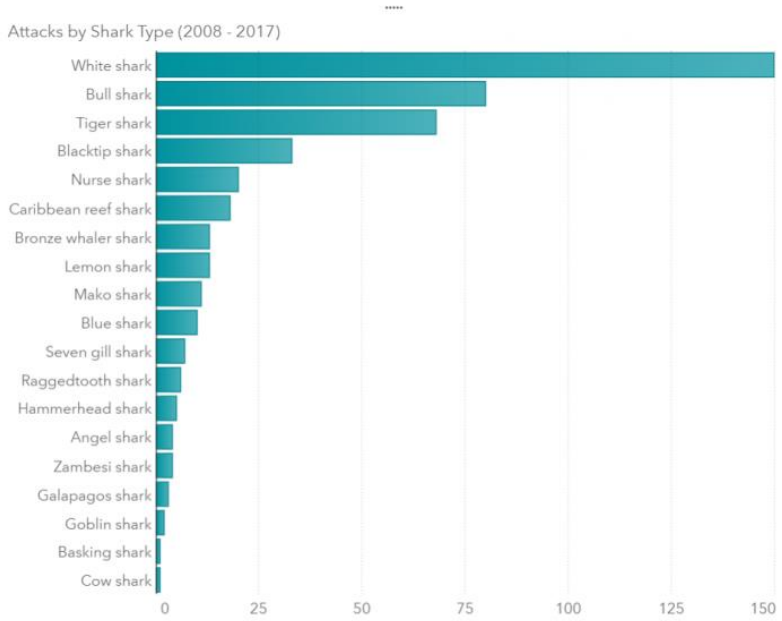


The outcome of an attack largely depends on the size of the shark. A large shark is more prone to fatally hurting a victim as their bite imposes a significant amount of pressure.

WHICH SHARKS ARE MORE CURIOUS?

Seven hundred and thirteen of the reported shark attack cases were conveyed without a species and were filtered out of the graph below. These cases are perhaps the result of a person's inability to identify species in the heat of the moment. In some cases, people aren't familiar with shark species, so they can only provide a description of what was seen.



The white shark also commonly referred to as the great white shark, bull and tiger sharks rank highest for attacks on humans. Generally, sharks do not eat humans. Great whites typically feed on marine animals. Attacks and fatalities are highly unusual and typically occur when sharks are confused or curious.

HOW TO AVOID SHARK ENCOUNTERS

While the risks are extremely low for potential shark attacks, spending any amount of time in the ocean makes your risk slightly higher as you happen to be playing where they live, plain and simple. There are things you can do to avoid a potential shark attack:

- Avoid wearing shiny jewelry
- Avoid waters being fished or chummed
- Don't go in the water if you are bleeding
- Don't swim alone

WHAT WE KNOW

Jaws was a fictional great white shark, but @MaryLeeShark is real. She became internet famous after being tagged by OCEARCH in September 2012. She has since gone missing. Her last ping was in June 2017. Scientists and researchers believe the battery on her tracking device has run its course. They believe she is now she is at least 20 feet and likely weighs over 4000 pounds.

There are few animals as terrifying to humans as sharks. Some people believe just getting near the ocean can result in a shark-related death – however, luckily for us, the data doesn't support that fear.

If OCEARCH can't find her, you probably won't either – so #dontfearthefin!

APPENDIX B. EXAMPLE DATA STORY TWO

DO YOU FEAR THE FIN — YOU SHOULDN'T

Using cold hard data to challenge your irrational shark fears

You are walking toward the waves, and your mind starts playing iconic music that indicates danger is approaching from the deeper waters — what do you do? Run back to the shore? Hide under your beach blankie? Boldly move forward to catch some waves?

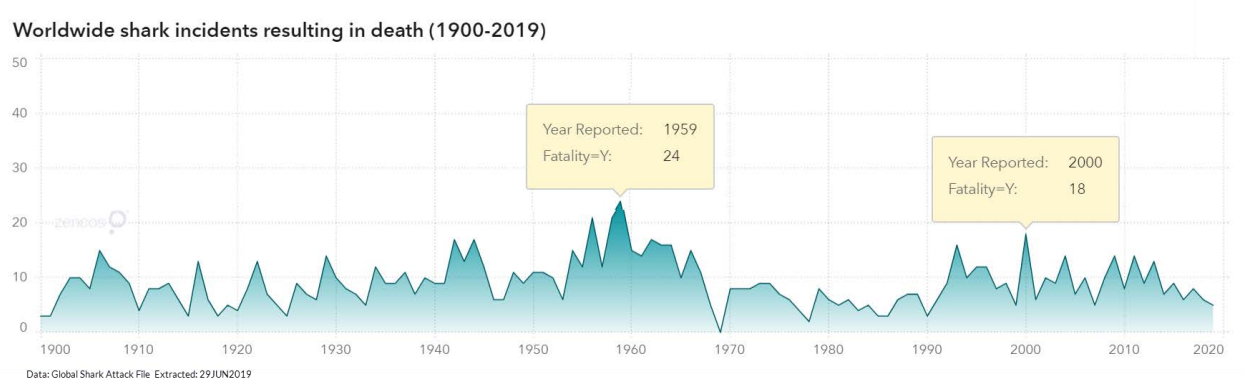
Many people fear that even getting near the ocean will result in a sudden shark attack. Hollywood has traumatized us! We easily believe sharks are lurking near the shore just waiting for a victim to wander into their mouths.

But it is not true.

LET'S REVIEW THE SHARK DATA

Someone is keeping track of global shark-related incidents. That someone is the Shark Research Institute. They collect and publish shark encounters in the Global Shark Attack File. One of the first reports is sourced from an excavated Italian vase that details a sea disaster in 725 BC.

What's clear about this data is how unlikely a shark incident is and even more unlikely a shark-related incident is fatal. But look at the information if you are doubtful, you don't have to believe me. On average, there are six reported fatalities a year worldwide with a few years standing out due to sea disasters.



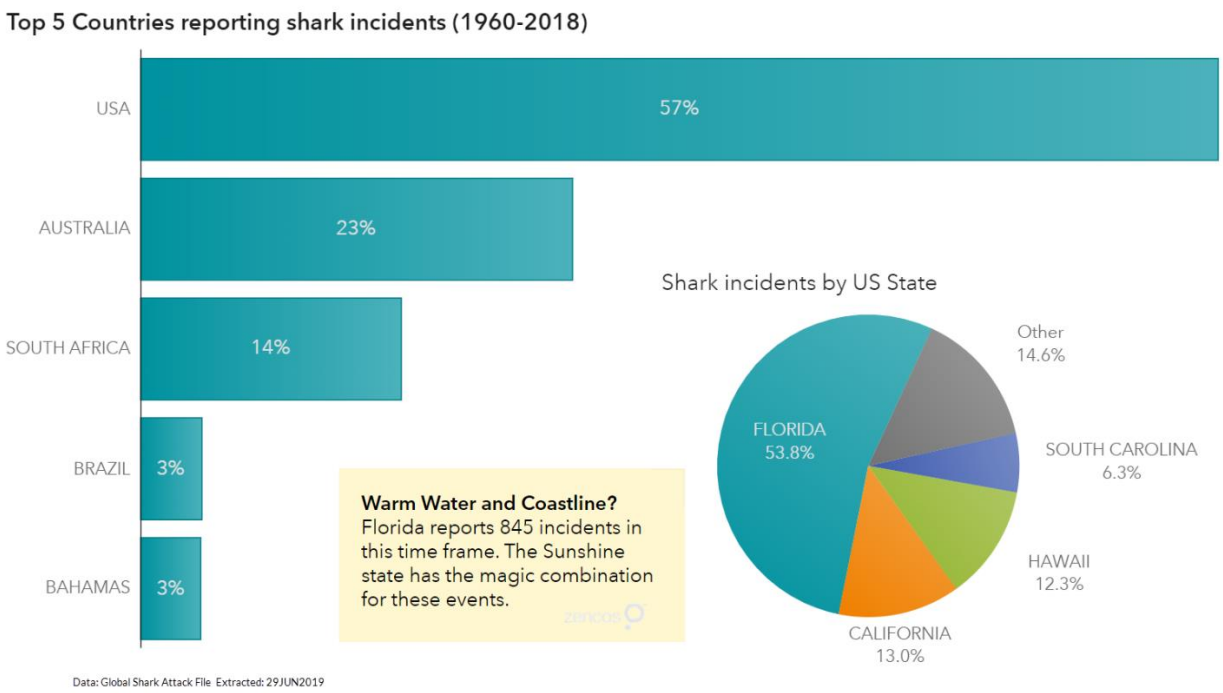
If you think of the global population (and even reduce that number to those in the ocean), you realize a fatal shark attack is less than 0.01% risk. But which animal *is* likely to kill you — how about the mosquito? These insects spread malaria, which claims the lives of over 1.32% of the population each year. Bet you rarely run or hide from them.

How about staircases? These beasts are responsible for over 1,000,00 injuries each year in the US. That's one injury every 30 seconds — eek.

My point is that there are plenty of risks that you take daily with your phone, your car, and even your loved ones, which are much more dangerous and likely to lead to death than a shark attack.

WHERE DO THESE EVENTS OCCUR MOST FREQUENTLY?

The US reports over 1,800 shark-related incidents, which accounts for nearly 60% of data. The US has multiple large coastal areas where people like to enjoy water activities such as surfing, swimming, and fishing. [I will concede that it might be easier to collect US data from within the US.]

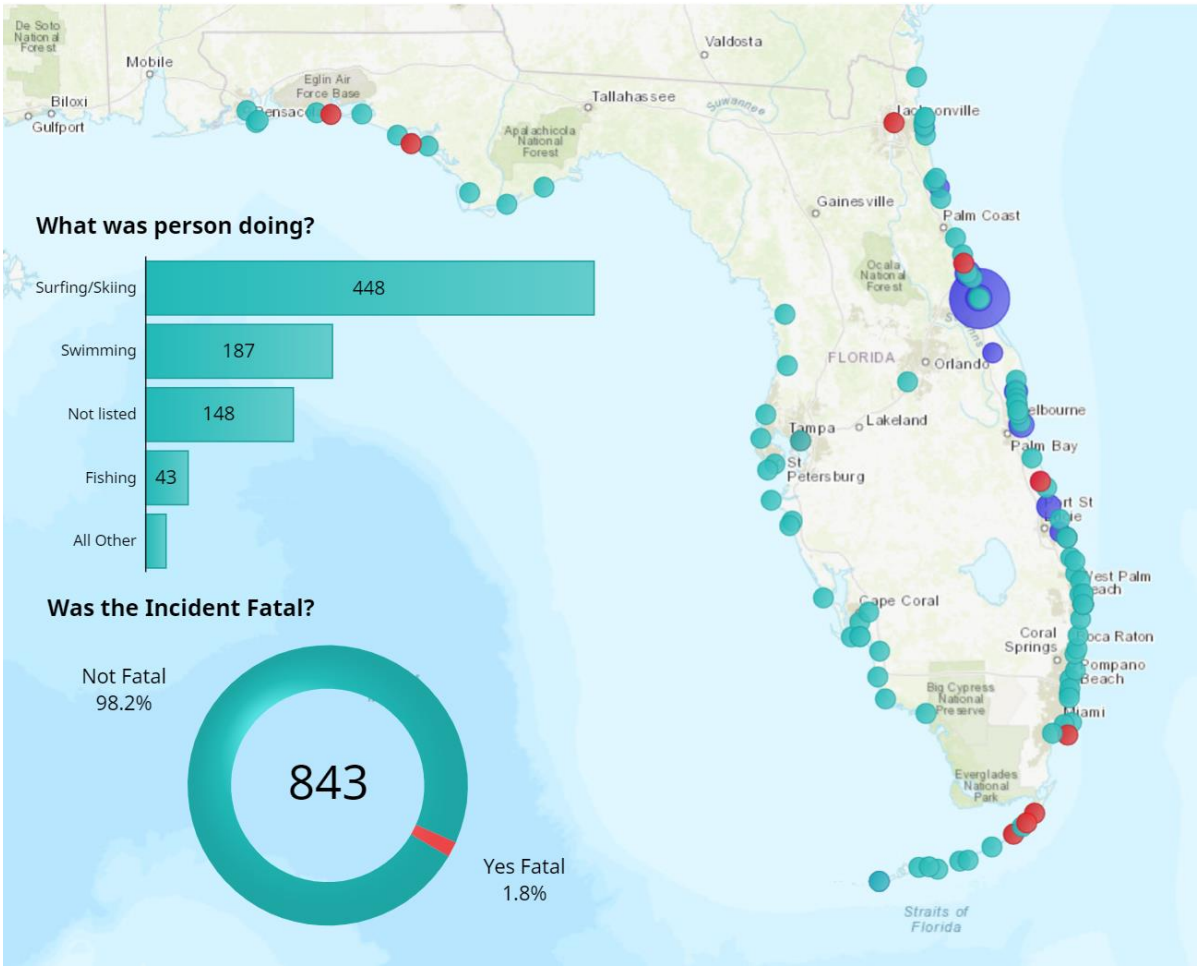


With its 1,350 miles of coastline and tropical climate, Florida is the leading area for shark incidents. It is a vacation destination for many in the US and Canada. This location creates lots of opportunities for people and increases their chances of a shark encounter.

LET'S EXPLORE FLORIDA

Some data stories are so tied to a location that you cannot tell the story without the maps. People get focused on where shark incidents are more likely to occur. Even just mentioning the incident seems to fill people with a morbid curiosity about the data story.

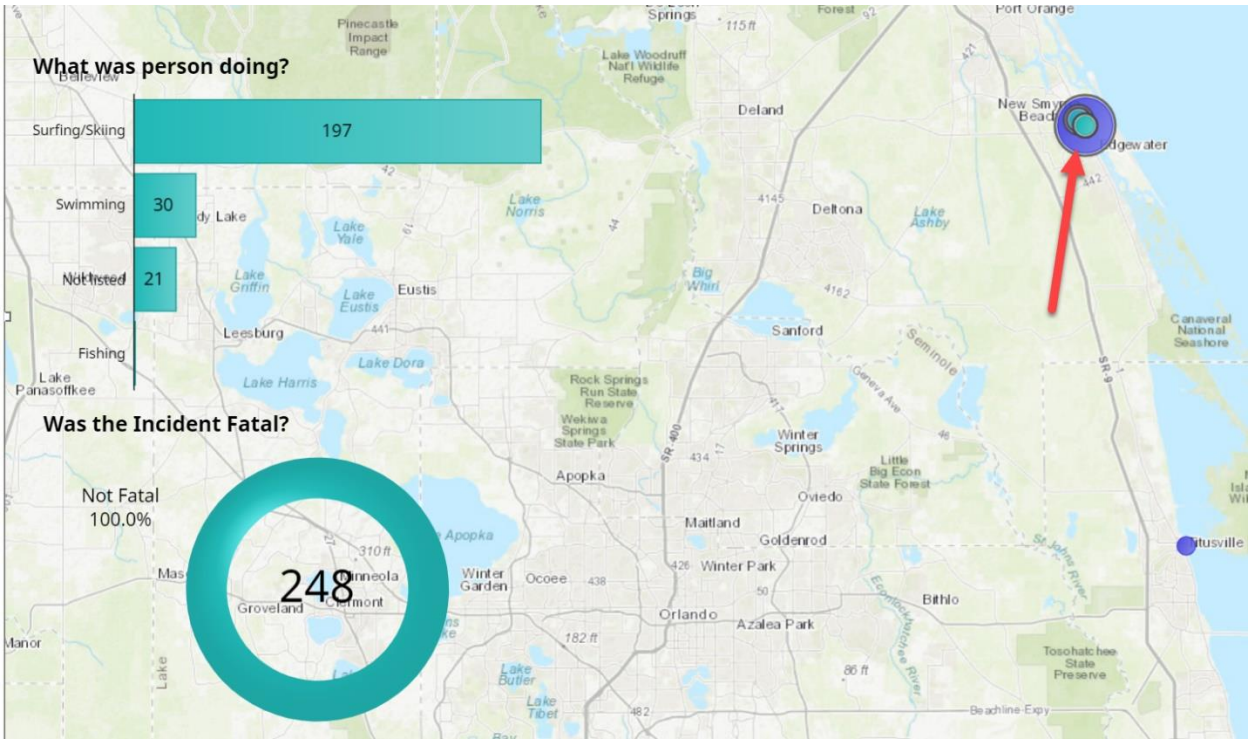
Location analysis adds an exciting element to a data story — when used effectively. In this figure, you can see where shark incidents occurred in Florida since 1960. The larger the bubble, the higher the number of shark incidents. The purple bubbles indicate locations with more than ten events. While red ones indicate areas with at least one fatality.



The geospatial analysis isn't complete without some supporting information such as fatalities and activities. The map contains the location of 843 incidents. Less than 2% of those incidents were fatal. Considering the number of people who were in the ocean during the same period — that is an insignificant number. [Sadly, humans kill *100 million* sharks each year — compared to the six humans sharks claim each year.]

Do Surfers Make Good Shark Snackies?

The gigantic bubble is New Smyrna Beach. I suspect you are getting curious now. Don't you wonder if people like to surf on this beach? After all, the most likely activity leading to a shark incident is surfing. When I click on the bubble for New Smyrna Beach, I learn that 197 of the 248 incidents were related to surfing or skiing. None of these incidents were fatal. Most resulted in lacerations or other minor injuries usually to the leg.

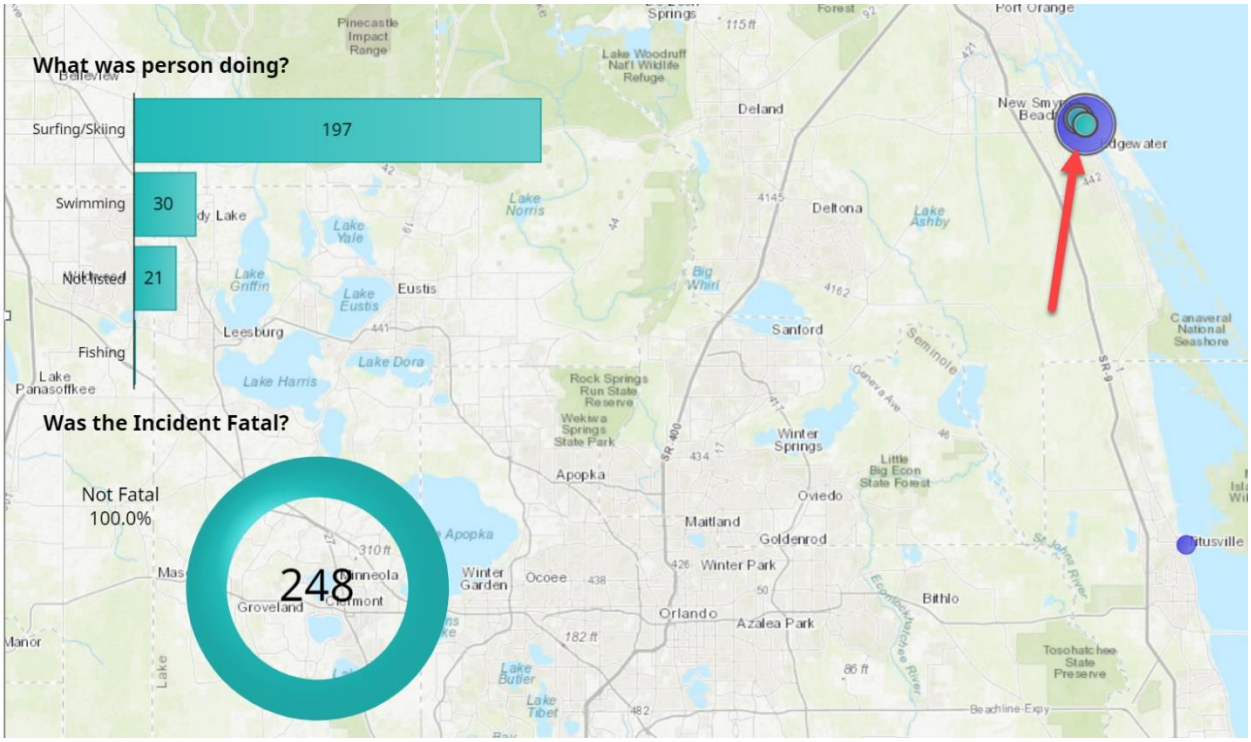


Using SAS Visual Analytics to zoom in on the map.

ZOOMING IN ON THE DEADLY LOCATIONS

Looking at data on a map tells us two things: where events do and do not occur. Both pieces of information are useful. For instance, there are few incidents in the Florida Keys — only a handful in the past 20 years. However, the events tend to be more deadly!

Let's look closer at the fatalities. If we cluster the incidents and apply a filter from the donut chart, we see the Keys and Port St Lucie are the more dangerous areas. If the victims were swimming, keep in mind they were most likely further away from shore. If you visit the Ocearch site, you'll see that the sharks are generally not lurking that close to shore.



With many of the most modern tools, such as SAS Visual Analytics, it is effortless to use geospatial data objects for everything. When used effectively, geospatial data can reveal previously unknown patterns or assist with confirming suspicions.

Author's Note: Some of the locations in the Global Shark Attack File (GSAF) were not reported thoroughly and thus were omitted from the examples. This was less than 1% of the data.