

**How Broadcast Meteorologists Can Be More Effective At Communicating Severe Weather
To The Public**

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Abstract

Broadcast meteorologists communicate on a daily basis with the public and when it comes to severe weather, how the message is communicated is vital to the public's well-being. During severe weather, broadcast meteorologists give out specific information to the public; however, what the public wants and what broadcast meteorologists are communicating to them does not always match up. For severe weather events, communication between broadcast meteorologists and the public needs to be better understood so the public can receive the most valuable information possible to keep them safe. By interviewing broadcast meteorologists in Oklahoma City, Oklahoma and Birmingham, Alabama and distributing a survey for the public to take, we were able to find out about what the public wants from broadcast meteorologists leading up to and during a severe weather event. This research will aim to improve how severe weather is communicated by broadcast meteorologists in a way that will be most beneficial to the public. Through our research, we found that people prefer broadcast meteorologists to stay calm when delivering information during a severe weather event and to not hype the message they are trying to communicate. This will help the public remain calm and make logical decisions for their protection prior to and during a severe weather event. In order for meteorologists to communicate a unified message regarding a potential severe weather threat, it is vital they work together. This research will aim to close the gap in communication between broadcast meteorologists and the public.

Introduction

Communication of severe weather to the public is an issue all meteorologists struggle with today. A forecast can be correct in every aspect, but if people do not understand the message, an event could lead to major fatalities. Fixing these communication issues also includes finding ways to get the public to act immediately and without hesitation. In order to figure out better ways of communicating, it is necessary to look at the evolution of weather communication.

Back in the 1900s, meteorologists wrote monthly weather reports for weather that happened worldwide. Even by telegraph alone, word about storms spread rather quickly. At this time, people were mainly concerned with studying the atmosphere (Transatlantic weather 1900). As weather tools advanced, communication began to play a more important role in meteorology.

A communication training program took place in Honolulu in 1972. This training program came about at the request of the National Weather Service Pacific Region in order to train meteorologists on how they can effectively communicate with the public. In six weeks these meteorologists were able to improve their communication skills regarding pronunciation, the way they were relaying information to the public, and their tone of voice. This helped the participants to communicate in a way the average person could understand (Sanderson 1972). These are necessary skills to have so that the public can trust meteorologists when the time comes for a severe weather event.

Meteorologists had improved their communication skills and the warning system for tornadoes and hurricanes by the late 1980s. This allowed for the total number of deaths to decrease, yet the amount of damage post-disaster to increase due to not enough warning time (Riebsame et al. 1986). As time has progressed, the lead-time for inclement weather can now be up to a week out prior to the event.

Today most people receive their warnings from TV. This comes with a price since the media tends to favor events that would get them more coverage. In a way, the media has the potential to depict how the public sees disasters (Redmond 1995). This study will include an inquiry into how ratings impact severe weather coverage.

In order for forecasts to be effective the public needs to know how to react. After the 1925 Tri-State tornado, spreading information about tornadoes was deemed necessary for public safety. In the early 1940s, volunteer storm spotters were placed in essential locations. TV stations started to deliver “cut-ins” to deliver warnings to the public. Weather crawls on the

bottom of the screen were also used if a station did not want to interrupt programming. These means of communication are still used by the TV industry (Doswell III et al. 1999).

In order to address the issues of miscommunicating to the public, meteorologists need to come together and figure out how to communicate appropriately and effectively. For instance, during the 1997 to 1998 El Niño in Australia, the media contributed to public panic because they failed to describe the phenomenon correctly and even implied the event would cause devastation, which was not the case. Meteorologists also need to be able to communicate to the media in order for the correct information to go out to the public. Another key factor to making sure the public listens to meteorologists is for there to be an agreement on weather definitions. If meteorologists are all describing El Niño differently, the public is less likely to trust them since they cannot agree on one solid definition (Nicholls 2001). This is still an issue today.

In general there are three steps in a forecast process: generating the forecast, communicating the information, and making a decision. Since digital forecasts do not always accurately depict the forecast, they cannot be relied on to make a major decision. There are many types of models that give different views of upcoming weather that meteorologists can look at in order to make the best forecast possible. Communicating the uncertainty of a forecast helps the public to understand why something does or does not occur (Ryan 2003). Models are still used today; however, some models have been found to be more reliable than others. This helps reduce uncertainty; however, the models often do not handle certain inclement weather setups as well as others. This is why it is still important to communicate forecast uncertainty to viewers.

Although broadcast meteorologists tend to put meteorological terms in a way the public can understand, they should continue to include scientific terms to help educate the public on the science behind the forecast. News producers often want their meteorologists to be the first to get a long range forecast out for a major storm so they can boost ratings. This is not always the best way to put information out to the public since the forecast will change with time (Grenci 2005). This study will look into the public's opinion on including scientific details in forecasts and their opinion on the timing of forecast information for future events.

The media relies on technology and data provided by agencies, such as the National Weather Service (NWS), to provide better information to the public through many of the available resources that exist today. However, having data and technology is not all that is needed to provide information to the public. As mentioned, the information must be accurate, but

it must also be given in a timely manner to best serve the public and avoid any serious losses (Drost et al. 2016). As new communication issues arise, most broadcast meteorologists try to stay on the same page as the NWS and the Storm Prediction Center (SPC) when it comes to severe weather in order to avoid further confusing the public.

In the past few years, social media has played an important role in communicating weather information to the public. Broadcast meteorologists are constantly updating the public on the weather via Facebook and Twitter, not just on TV. The way meteorologists present the weather may be perceived differently via tweet than it would be on-air. It is important to understand just how differently the public would react to these different forms of communication. Not only how they react, but how quickly they see a tweet or Facebook post could mean the difference between life and death for some (Ripberger et al. 2014). There may not be a “simple formula for effective forecast communication,” but learning what words and phrases best engage the audience is important as meteorologists go forward (Pennesi 2007). Our study evaluates some of the certain phrases/statements used by broadcast meteorologists to get the public's attention as well as the role social media plays in reaching the public.

With all of this in mind, knowing how to communicate properly with the public is a necessary process that still needs improvement. Meteorologists need to work on both their phrasing of words and their presentation of weather information to the public to improve overall communication. Finding new ways to improve communication is vital to keeping the public safe during severe weather events. Proper communication is the key to getting the public to trust what a broadcast meteorologist is conveying with the first warning, not the few minutes before destruction takes place.

The purpose of this study is to begin to bridge the gap in communication between broadcast meteorologists and the public. This was done by comparing what information broadcast meteorologists are communicating to the public to what information the public actually wants to know. This will help decrease the miscommunication between broadcast meteorologists and the public. Two areas that have frequent severe weather, Oklahoma City (OKC), Oklahoma and Birmingham, Alabama were the target locations for this study. By comparing two regions that see similar severe weather patterns, we were able to compare how broadcast meteorologists handle severe weather in the different markets. However, anyone who did not reside in these areas was still able to participate in the survey. This allowed for us to see if the public is on the

same page in regards to what they want from broadcast meteorologists regardless of their location.

Data & Methods

We invited eight broadcast meteorologists to participate in our research. To get them all on board, we sent emails to each chief meteorologist in OKC and Birmingham with an overview of what our research would entail. We received responses from five meteorologists agreeing to participate. We wrote up the same set of interview questions for each meteorologist. Before the interviews began, the interview questions were sent to the University of Oklahoma (OU) Institutional Review Board (IRB) for approval. Once they were approved, they were sent out to each meteorologist. We scheduled Skype phone interviews with the meteorologists in Birmingham and interviewed the OKC meteorologists in person. Before the actual interviews began, an oral consent form, required by the IRB, was read to the meteorologists. At any point they wanted to stop the interview, they could. However, each meteorologist finished the interview questions. The interview questions covered how broadcast meteorologists communicate information about severe weather, as well as, questions about what they think viewers want from them. There were eleven questions total. We recorded their responses so we could go back and write down key points from each meteorologist. Each meteorologist will remain anonymous for this research. They will be referred to as Met #1-5 in the results section.

The survey for the general public was created on Qualtrics, an online survey service available to students and faculty at OU. Once the survey was approved by the IRB, it was sent out to the public via social media. The survey asked the public specific questions regarding broadcast meteorologists and severe weather. We asked the broadcast meteorologists to post the survey on their Facebook and Twitter pages. The researchers also posted the survey on social media. This means there could be some bias in the data towards a more weather interested audience. People who do not live in either OKC or Birmingham were allowed to participate. Before the survey began, there was a written consent form that provided general information about the purpose of this research and then required each person to indicate if they agreed to participate or did not agree to participate. If they agreed, they were directed to the survey. If they did not agree, they were sent to the end of the survey. For the first question in the survey, if the participant did not pick “TV” as one of the ways they get their weather information, they were also sent to the end of the survey. There are two reasons for this: One is so we can see how many

people do not get their weather information from TV, and two is we are targeting people who watch broadcast meteorologists. The survey, in total, was 19 questions. There were four questions where people could write down free response answers. We expected to get at least 200 total responses for the survey. Being that Qualtrics has built in software that automatically organizes all the data into percentages and bar graphs, this was the method we used to analyze the data.

After collecting data from the public and broadcast meteorologists, comparisons were made within each data set. Questions from the survey were compared to each other, questions from the broadcast meteorologist interviews were compared to each other, and finally, the survey and interview questions were compared to each other. This allowed for us to see if the public and broadcast meteorologists were on the same page when it comes to communicating severe weather information.

Results

There were a total of 809 people who agreed to take the survey. Of this only 21 people indicated that they do not watch TV at all to get their weather information. This left us with 788 people who indicated TV as one of the ways in which they get their weather information. This number also reflects the amount of people who completed the survey in its entirety. This is what we would expect since we targeted people who watch weather broadcasts on TV. All of the results for this section came from the public survey and the broadcast meteorologist interviews.

The two platforms people said they get most of their weather information from were TV and social media (Figure 1). Of these, 51.26% of people said they watch the weather every day on TV followed by 18.64% of people said they watch the weather on TV every other day. This shows that people might have some understanding of how quickly the weather forecast can change. When asked their first reaction after finding out there may be a severe weather threat in their area within the next couple of hours, the top two answers from people were 45.83% of people saying they turn on the TV and 34.17% of people go online. This further supports the idea that broadcast meteorologists need to be active on social media as well as TV.

Based on some of the free responses we received from the survey, the public trusts their favorite broadcast meteorologist based on their personality, reputation, and past experience. When it comes to trusting local broadcast meteorologists, 86.39% of people have at least some trust in them, and only 5.25% of people have some amount of distrust in them. In regards to local

broadcast meteorologists' forecasts, 83.17% of people think their forecast is trustworthy, and only 5.88% of people see some amount of distrust in their forecast. This data, for the most part, shows the public trusts their local broadcast meteorologists; however, the public sees the broadcast meteorologists' personalities as slightly more trustworthy than their forecasts. From the meteorologists' point of view, Met #1, #3, and #5 think adding some technical details in their forecasts will gain more trust from the viewers. Met #3 said "people need to know you are a scientist, not a blow-dried boob". Met #5 thinks these technical details add some credibility to their forecast. Met #2 and Met #4 think adding technical detail will not make the viewer trust them more. Met #2 said they sprinkle it in sometimes, but they do not want to lose the message they are communicating. Met #4 said to leave the technical details off TV because meteorology is complicated and they can lose the viewer quickly, but if they want to get technical do so online.

Hype in meteorology has become an issue the past few years, mainly because of social media; however, it also happens on TV. Although hype is very subjective and does not yet have a fixed definition in meteorology, the Oxford Dictionary defines hype as to "promote or publicize (a product or idea) intensively, often exaggerating its benefits". From the survey, 29.61% of people think their local broadcast meteorologist in the Birmingham and OKC areas largely overhype severe weather threats, 39.49% of people think they slightly overhype, and only 9.01% of people think they do not hype at all. Every meteorologist we interviewed (Mets #1-5) all said they do not hype severe weather events, yet the public thinks they are overhyping to some extent. A possible answer for this is broadcast meteorologists putting out severe weather chances a week prior to the event. The public could see this as a form of overhyping because they know the forecast will continue to change up until the time of the event. This shows that broadcast meteorologists see hype differently than the public. Each broadcast meteorologist also said ratings do not play a role in severe weather coverage. According to some the free response answers, people said stations in OKC tend to hype the threat of severe weather. The stations people felt hyped events the most in OKC were the stations that did not agree to participate in this research project. Therefore, we are unable to compare the public's opinion to these broadcast meteorologists' viewpoint on hype. The majority of the people, 73.01%, said they would like to know only a few days in advance when severe weather is going to happen and only 17.67% of people said they wanted to know a week in advance (Figure 2). The only two meteorologists who

already communicate potential severe weather threats a few days out were Met #1 and Met #2. Met #1 said they would mention a potential severe weather threat two or three days out while Met #2 said no more than five days out. Met #3-5 said they would go up to a week prior to the event. Met #3 and Met #4 are the most watched stations in the Birmingham and OKC areas. Neither of these meteorologists matched up with what the viewers want when it comes to how far in advance they want to know about potential severe weather.

When people were asked if they would trust their local broadcast meteorologist more if they gave them more time to prepare for severe weather, the results were split down the middle. Of these, 55.95% of people said they would trust their local broadcast meteorologist more if they gave them more time to prepare and 44.05% said they would not trust them more. A reason for this could be that if knowing a week out in advance that a potential severe weather threat would be reliable, meaning the forecast does not vary much, then people would like more time to prepare. However, since most people seem to understand weather forecasts can change, they would not trust them more if they gave them more time to prepare. While the data was mostly split on this aspect of trust, when it comes to receiving notice a week in advance for possible severe weather, 63.4% of people feel like they could prepare more, 19.03% of people said it stresses them out, and 17.67% said other. This is where people could write in a response if they did not feel like they fit into the two options. Most people said it did not matter since a week in advance is not accurate and the local broadcast meteorologists tend to hype the weather this far in advance. The reasoning for the contradiction between people wanting to know about a potential threat a few days in and for feeling more prepared if they know a week in advance is similar to the reasoning above in that people feel more prepared if the information they are given is not subject to change.

We asked the public what they would do if broadcast meteorologists gave them notification for potential severe weather more days in advance. Of these, 81.17% said they would check to see if information about the storm had changed by watching the weather every day, 15.35% said they would get the information a day before the event is supposed to happen, and only 3.5% of people said they would follow along for the first few days then lose interest over time (Figure 3). This shows warning fatigue is not much of an issue. The majority of people will follow up with a severe weather threat until it happens. Once again, people would only want more advance notice about a potential severe weather threat if the information is actually

accurate and not subject to change. 87.72% of people have a severe weather plan already in place. This goes to show that the majority of people are prepared long before an event happens.

When it comes to severe weather warnings, 96.31% of people know the NWS issues the watches and warnings and the broadcast meteorologists simply relay this information to the public. When asked if viewers would trust their local broadcast meteorologists more if they issued their own tornado warnings independent of the NWS, 66.93% said no, and 33.07% said yes. (Figure 4) Comparing this to the broadcast meteorologists' answers, Mets #1-3 and Met #5 said they would not issue their own tornado warnings independent of the NWS. Met #1 might say the storm most likely has a tornado in it, however, if the tornado does not happen and they were to issue their own tornado warning, they would be seen as scaring the public, and it could hurt their credibility. Met #2 said it is the responsibility of the NWS and it is not the broadcasters place to issue their own warnings as this can insult the NWS. If there was a tornado on the ground without a tornado warning, they would simply say there is a tornado on the ground. Met #3 said if every TV station were to issue their own tornado warnings, it would be a disaster. They use the NWS warnings to stay consistent. They go on to say it is "stupid... if every television station issues their own warnings, then that's going to open the door for mass chaos and that confusion will lead to people losing their life". Met #5 said he would only issue his own warnings if the NWS was having technical issues. Met #4 said if there is a tornado on the ground and a chaser has a video of it then they would say it is a tornado warned storm because they are the face of the event. Met #4 went on to say if they do not say it is a tornado warned storm, and there's a tornado on the ground, it can ruin the station's credibility. Met #4 is the most watched station in the OKC area, and the majority of viewers have said they would not trust a local broadcaster to issue their own warnings. This shows there is disagreement within both the meteorology community and the general public when it comes to the communication of tornado warnings.

When it comes to how much information the broadcast meteorologists give out about severe weather, Mets #1-3 and Met #5 said they would touch on the "why" before the event happens, but not during the event due to safety hazards. This matches up with the fact that 63.69% of people would like to know some of the science behind why severe weather could happen and only 16.31% did not want to know some of the science behind why severe weather could happen. However, Met #4 said the viewers do not care about the "why" and they only want

to know the “what” and the “where”. Although this station is the most watched in OKC, this shows their perception of what the viewers want does not match what the viewers told us in the survey. When asked if the public wants to know why there was a severe weather “bust” 85.44% of people said they wanted to know some of the science behind why severe weather did not happen and only 14.56% of people said they did not want to know some of the science behind why severe weather did not happen. More people would like to know why severe weather did not happen rather than why severe weather could happen. By explaining a “bust” in a forecast, this could help eliminate some of the perception of how meteorologists never get the forecast right. Mets #1-3 and Met #5 would explain to the viewers why there was a forecast “bust”. Mets #1-3 said they would make a quick statement on air and Met #5 said he would put it on social media. Met #4 says it depends but if they did, they would make a quick statement on air and go into more detail on social media. Met #4 said the reason for this is because time is money for the news and they do not want to focus on the past.

Broadcast meteorologists communicate a potential severe weather threat differently when it is further out than when it is closer to happening. Each broadcast meteorologist has their own style of presenting severe weather information when the threat is further out. Met #1 will present the severe weather information at the end of the 7-day forecast and usually talks about the threats verbally. Met #2 is careful with the wording of the message. Met #3 starts with the SPC outlook, and if there is no outlook, they will draw a zone of where the risk could be located. Met #4 mentions hazards verbally, presents the chance of it on a certain day graphically, highlights the severe weather day in red on the 7-day forecast, uses the SPC outlook, and uses 2-3 graphics and a minimum of 40 seconds talking about the graphics. Met #5 uses bar graphs, issues an alert for high impact weather, and talks about the potential threats. When a severe weather event is closer to happening, the broadcast meteorologists have more similarities when it comes to presenting the information. Met #1, #3, and #4 use the SPC outlooks. Mets #1-5 all talk about the impacts the severe weather could bring and track or give timelines for when the storm will impact their viewers. Met #4 uses a tornado index or a TOR:CON to reiterate the tornado probability issued by the SPC because they feel the public has a hard time understanding this statistic. According to The Weather Channel, TOR:CON is defined as an index that, “ranges from 0 to 10. Multiply the value by 10 to get your percentage chance of a tornado within 50 miles of a location. For example, a TOR:CON index of 6 means there's a 60% chance of a tornado within 50 miles of

any location in the indicated area”. However, there is disagreement between the broadcast meteorologists when it comes to the use of the TOR:CON index. Met #2 and Met #3 both agree TOR:CONS are misleading to the public in that they can misinterpret their threat level.

Two of the broadcast meteorologists, Met #1 and Met #3, said there needs to be more communication and collaboration between broadcast meteorologists, even if they are in the same market. According the Met #3, all the chief meteorologists in Birmingham collaborate in NWSChat during severe weather to make sure they are all communicating the same information. This helps decrease the confusion if viewers are watching more than one TV station for severe weather coverage. If all meteorologists attempted this during severe weather, it would help everyone communicate a more unified message and cut down on confusion.

In regards to the separate markets, specifically OKC and Birmingham, people were able to add some of their opinions in the last three questions of the survey. Most people said there is not enough coverage in rural areas of Oklahoma and Alabama. Several people mentioned that tornadoes are not covered in less populated areas until the damage has already been done. For example, there have been cases when the broadcast meteorologists have focused on a thunderstorm in OKC rather than a tornado in Payne County, a more rural area outside of OKC. In general, the respondents indicated that broadcast meteorologists need to do a better job of covering their entire viewing area. The public mentioned they do not need to see live shots of regular rain and snow. They also prefer broadcast meteorologists to not cut into programming until storms have gone severe. People would like to see the broadcast meteorologists work together more in OKC and for it to be less about the competition and more about informing the public about severe weather. People also mentioned they would like to receive more alerts to their phones just in case they do not have the time to watch severe weather coverage. This would be especially helpful at night when people are asleep. Fortunately, most people understand the weather is constantly changing and do not blame the meteorologists if the forecast does not occur exactly like they said it would.

We also asked the participants to let us know what they would like to start seeing during severe weather coverage that does not already occur. The most popular response to this question was the viewers want to see less hype and more of the science behind severe weather. They pressed the fact that they want broadcast meteorologists to stay calm during severe weather and to not hype events. This would help the viewers to stay calm and to take appropriate action. The

participants also want broadcast meteorologists to focus more on rural areas that are receiving severe weather as opposed to more populated areas that are only experiencing rain or non-severe storms. The public wants to see meteorologists work together more so they can come to an agreement on terminology as well as graphics to create a more unified message. Overall, the participants understand broadcast meteorologists are working hard to provide the most accurate forecast and many of them are appreciative of the work they do to keep the public safe.

Summary

The results for this research were very dependent on the broadcast meteorologists who were willing to participate in the interviews and assist in publicizing the survey on social media. Unfortunately, since two stations in OKC did not agree to participate, and one station in Birmingham never responded, we were unable to get more responses from their viewers. However, one of the broadcast meteorologists who works at one of the stations in OKC that declined to participate in the interviews, did advertise the survey on social media so this helped this particular station receive more input from their viewers; however, we were unable to interview the chief meteorologist so we were unable to compare their answers to their viewers' answers. Something else to take into account with this data is this survey did target two areas known for severe weather. These areas tend to educate the public more heavily about severe weather compared to markets with less severe weather. Since socio-demographics were not collected in this research, we cannot make generalizations about these findings in these areas or the U.S. as a whole. From the survey results, 19.14% of people did not reside in the OKC or Birmingham areas. This shows that even outside of the Birmingham and OKC areas, people seem to agree, for the most part, on how broadcast meteorologists should communicate to the public. The public mostly agrees that they only want a few days notice before a potential weather threat occurs, less hype from broadcast meteorologists, more science behind severe weather, a more unified message to decrease confusion, and more storm coverage in rural areas. This study has the potential to lead to further research on how the public perceives hype. Although we were able to make assumptions based on the survey answers regarding hype being associated with mentioning a potential storm threat a week or further out, future research needs to be done to see if this is actually the case.

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Figures

Q1 - During ordinary weather conditions, how do you primarily get your weather information? (Check all that apply)

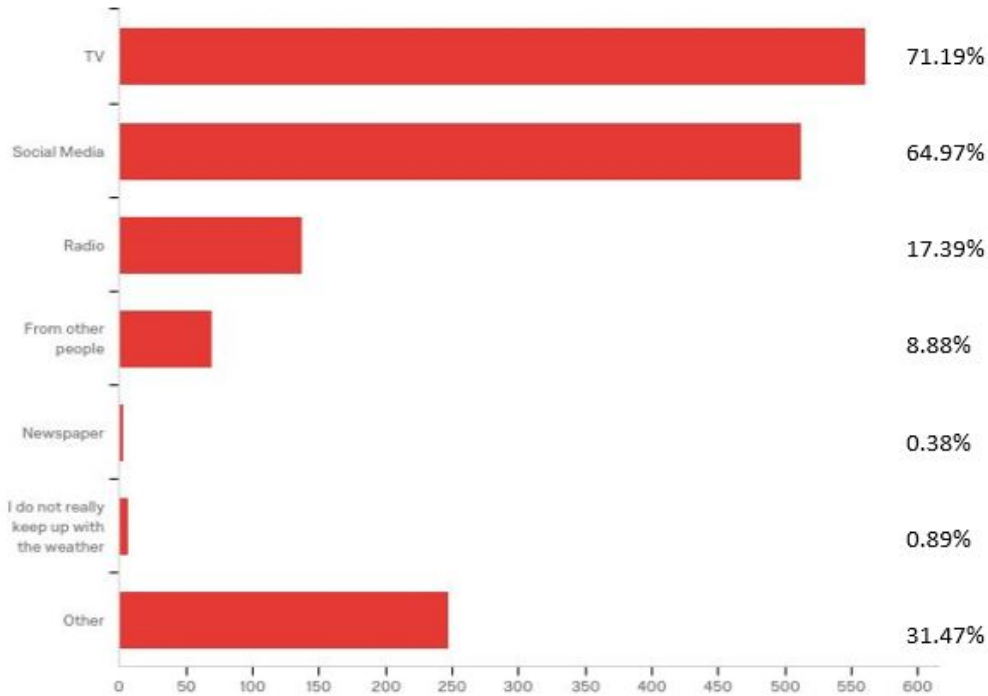


Figure 1: The figure shows the results for question one from the participants when asked how they primarily get their weather information. TV and social media are the most common places that people go for that information. If the participant did not select “TV” they were sent to the end of the survey.

Q7 - How soon would you like to know about a potential severe weather threat?

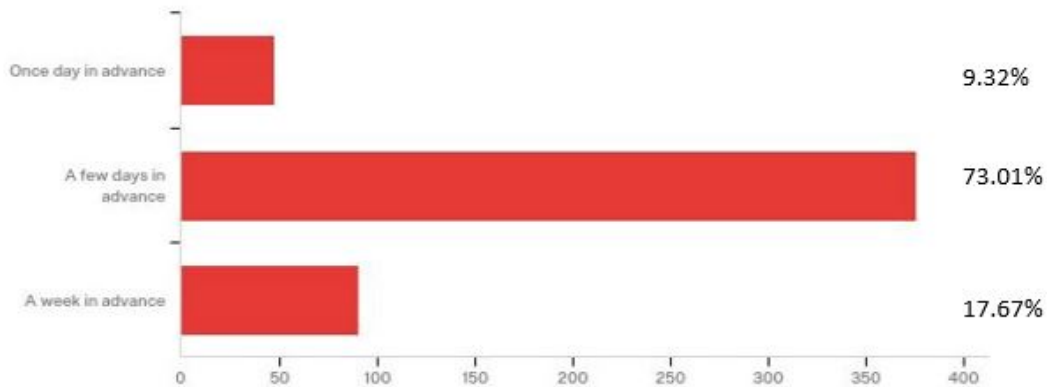


Figure 2: The figure shows the results for question seven from the participants when asked how soon they would like to know about a potential severe weather threat. From the results, we can see that most people prefer to know a few days in advance.

Q10 - If broadcast meteorologists give you more days of advanced notification about potential severe weather you are most likely to ____?

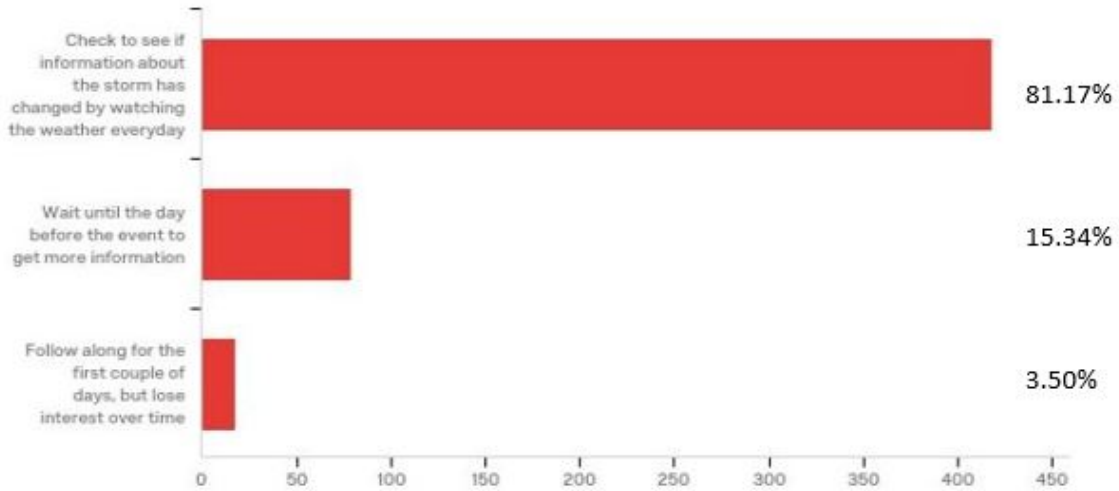


Figure 3: The figure shows the results for question ten from the participants when asked how people would react if given more days to prepare for potential severe weather. The most common response was that the participants would check the weather every day to see if the information has changed.

Q14 - Would you trust your local broadcast meteorologists more if they issued their own tornado warnings independent of the National Weather Service?

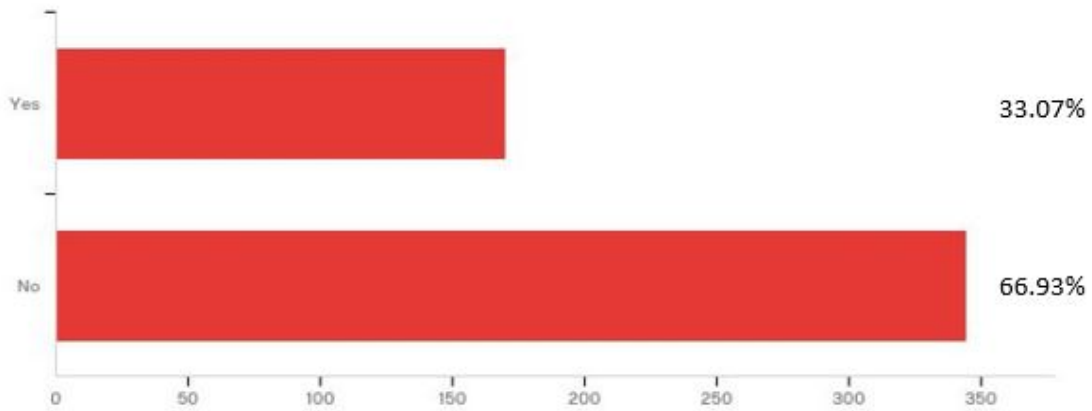


Figure 4: The figure shows the results for question fourteen from the participants when asked whether or not they would trust their broadcast meteorologist more if they issued their own tornado warnings. A majority of the participants said that they would not trust the broadcast meteorologist more.