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## Abstract

Understanding public media channel preferences can inform preparedness plans, response strategies, and long-term recovery. However, questions remain about how media consumption changes across pre-crisis, crisis, and post-crisis phases. Past theories argue that media use may change for several reasons, including during times of societal conflict and challenge. These theories point to the belief that, during a crisis, we expect media channel use to change because media preferences during a crisis will be fundamentally different compared to everyday routines.

This paper takes advantage of a survey fielded to Texas residents soon after Hurricane Harvey. Here we ask: (1) What media channels are most prominent in each crisis phase? and (2) Do media channel preferences change across crisis phases? We use simple descriptive statistics and chi-squares tests to describe media channel preferences across the three crisis phases by demographics. Additionally, we use alluvial diagrams to visualize media channel preferences over time. In total, 62% (n=174) of respondents reported no changes in channel preferences. However, chi-square tests identified significant differences in media use changes related to a handful of demographic characteristics. These findings are explored alongside theories that would hypothesize likely media use changes across pre-crisis, crisis, and post-crisis phases.

**Keywords:** media channel preferences, Hurricane Harvey, risk communication, crisis communication, emergency preparedness, emergency response

## How Disasters Drive Media Channel Preferences: Tracing News Consumption Before, During, and After Hurricane Harvey

### 1. Introduction

In 2017, Hurricane Harvey posed an imminent threat to residents of Gulf Coast Texas. The historic Category 4 Hurricane dumped 60 inches of rain over the southeastern part of the state and caused catastrophic flooding. Harvey became the second-most costly hurricane in U.S. history behind only Katrina in 2005 (Blake & Zelinsky, 2017). From August 25-30, weather forecast offices (WFOs) located in the primary Harvey impact area issued a total of 372 tornado, flash flood, and severe thunderstorm warnings to motivate public action and save lives (NOAA, 2017).

During a disaster, such as Hurricane Harvey, myriad sources will engage in crisis communication to provide information to at-risk and general audiences. Watches, warnings, or advisories are disseminated to the public via various forms of media channels to provide instructional information about how people can protect themselves. To date, television remains the most common channel audiences use in times of crisis (Heath & O'Hair, 2009; Petrun Sayers et al., 2019; Pollard, 2003) although social media offer new opportunities to connect and collaborate with emergency responders (Kaufhold, Gizikis, Reuter, Habdank, & Grinko, 2019). Ideally, responders (i.e., individual or organizational actors tasked with crisis mitigation) will engage in effective crisis communication to ensure the right messages arrive in a timely fashion to the people that need them. Ultimately, communication needs will only be satisfied when all relevant actors, including members of the business community, institutions, and social and political bodies, work together to reach those at risk (Sorribes & Rovira, 2011; Chehade, Matta, Pothin, & Cogranne, 2020).

## **2. Research Questions**

To date, questions remain about how media consumption and information seeking change throughout the crisis lifecycle (e.g., pre-crisis, crisis, post-crisis). Uses and gratifications theory, media dependency theory, and situational theory of publics shed some light on how individuals engage media during routine vs. non-routine times. During crises, media play a “very relevant role” in sharing risk information (Sorribes & Rovira, 2011, p. 1054). Understanding channel preferences can inform preparedness plans, response strategies, and long-term recovery. Exploring aspects of channel preferences can also provide insight related to vulnerable populations who may have limited access to certain channels (Clark-Ginsburg & Petrun Sayers, 2020). However, selecting the most effective types of channels can remain challenging. Social media has recently changed how people seek and use information, increased dependence on social media channels during a crisis (and thus simultaneously decreased dependence in other channels), and introduced new issues such as misinformation (Park, Boatwright, & Avery, 2019). Considering, “contemporary work on channel use is critical” (Park et al., 2019, p. 4).

### **2.1 Uses and Gratifications**

Audience-centered approaches to understanding media use, such as the uses and gratifications theory, seek to explain the appeal of media to attract and hold audience attention (Ruggiero, 2000). The theory assumes that consumers are active and use media to fulfil unmet needs (e.g., for information, interpersonal communication, or entertainment). The overarching goal of uses and gratifications research is to understand the needs of an audience and the context related to those needs (Palmgreen, Wenner, & Rosengren, 1985). For example, why might someone choose to watch a nightly national news show instead of scrolling through their social media feeds? Television is often linked to entertainment or relaxation (Ruggiero, 2000; Steiner &

Xu, 2020). Papacharissi and Rubin (2000) found that people use the Internet for various reasons, but the most salient use was information seeking. More recent research into social media use finds that many log into social networking sites to have fun and learn about news about personal acquaintances (Quan-Haase & Young, 2010) and not primarily for information seeking (Liu, Fraustino, & Jin, 2015). Across multiple social networking sites, a different study also finds that many users turn to such platforms for entertainment and because they are convenient (Alhabash & Ma, 2017). During a disaster, social media use may vary as people fulfill needs like “information sharing, support exchange, emotional coping, and opinion expression” (Zhao, Zhan, & Liu, 2019, p. 389-390).

The theory can be used in other contexts, such as crises, to explain how media use changes. For example, different channels are thought to contain characteristic contents, attributes, and typical exposure situations that could render one form better or worse in terms of serving different needs (Katz, Blumler, & Gurevitch, 1973). Relatedly, the idea of “media richness,” or the channel’s “capacity to facilitate meaning,” might encourage individuals to turn to channels that are highly rich in times of crisis (Trevino, Daft, & Lengel, 1990, p. 75). Further, individuals may also seek out multiple channels to achieve message convergence. Message convergence is achieved when audiences evaluate messages from multiple sources to validate information (Anthony, Sellnow, & Millner, 2013). However, DeSanto (2005) finds that change may only occur when the social disruption is severe enough to create a new preference. Ultimately, uses and gratifications theory would suggest that people use different types of media at different times, and media choices during a crisis compared to a routine setting will be considerably different.

## 2.2 Media Dependency Theory

Media dependency theory suggests that media influence is the product of the interrelations between the media, audiences, and society (Ball-Rokeach & DeFleur, 1976). Media system dependency is a “relationship in which the capacity of individuals to attain their goals is contingent upon the information resources of the media system” (Ball-Rokeach, 1985, p. 340). Further, these resources create capacity to create and gather, process, and disseminate information (Ball-Rokeach, 1985). As societies become more complex, individuals and groups may rely more on mass communication instead of interpersonal channels (Becker, 2004; Lowrey, 2004). This supports dependency between individuals and established media institutions. However, dependency may change during times of uncertainty and conflict, particularly when those established institutions, beliefs, or practices are challenged (Ball-Rokeach & DeFleur, 1976).

In addition to the macro-approach to media dependency, individual media dependency theory explores individual-level attachment to specific media (Grant, Guthrie, & Ball-Rokeach, 1991). Like uses and gratifications, the individual-level approach to media dependency assumes that if a particular medium is meeting someone’s needs they will continue to engage with that medium. According to the theory, six levels of dependency relations between an individual and media system emerge. These include three goals: understanding, orientation, and play; across two different goal targets: personal and social (Ball-Rokeach, 1985; Grant et al., 1991; Carillo, Scornavacca, & Za, 2017). Individuals will remain dependent on media so long as their goals (whatever they may be) are accomplished (Zhang & Zhong, 2020). Conceptualizing a crisis scenario, again it is reasonable to assume that goals will change from a routine to non-routine (i.e., crisis). For example, Lowrey (2004) finds that heightened threat perception leads to greater

dependency on mass media. More recently, Jang and Baek (2019) applied this framework to explore the effects of a MERS outbreak in South Korea. The authors found that perceptions of public health officials as being untrustworthy are associated with a greater likelihood to turn to online news, interpersonal networks, and/or social media to access MERS information (Jang & Beck, 2019). Crises are uncertain by their very nature, and this uncertainty can serve as a catalyst for shifting dependency in new ways.

### **2.3 Situational Theory of Publics**

The situational theory of publics assumes that different members of the public will have something in common and/or behave similarly towards a problem (Aldoory & Shan, 2007). The theory explains that “people are most likely to seek information that is relevant to decision-making situations in their lives” (Grunig & Grunig, 2008, p. 332). Three independent variables – involvement, problem recognition, and constraint recognition - may explain how publics communicate, what attitudes they have, and their behaviors (Aldoory & Shan, 2007). This includes involvement, problem recognition, and constraint recognition. Involvement includes how personally relevant a problem is for an individual, problem recognition is determined by whether an individual knows that they face a problem, and finally constraint recognition is the extent to which individuals perceive factors that may inhibit their ability to act (Grunig & Hunt, 1984). Considered together, these variables show whether and how much an individual engages in information processing and information seeking (Aldoory & Shan, 2007). Practitioners use this theory to “segment stakeholders into publics, to isolate the strategic publics with whom it is most important for organizations to develop relationships in order to be effective” (Grunig & Grunig, 2008, p. 332). Further, communicators also rely on this theory to create different strategies for reaching publics who fall into either active or passive categories (Grunig & Grunig,

2008). For example, one study applied the theory to understand online political activism (Dozier, Shen, Sweetser, & Barker, 2016). Dozier et al. (2016) used situational theory to understand what types of persons engage in political action using digital and social media platforms and explored if user characteristics, attitudes, and/or behaviors predict digital political action. Another study used the theory to examine politicized consumer activism and identify distinct publics (Chen, 2020). Chen (2020) described several publics (i.e., an inactive unprivileged group, moderate elites, and an active middle class) and observed differences in activism between the segments.

Another rationale for media channel preference shifting could be that during a crisis, individuals are more likely to engage in active information seeking behaviors (e.g., internet) rather than passive (e.g. television) (Grunig, 1983). Understandably, a crisis could impact one or more of the three independent variables. As Fraustino and Liu (2018) point out, limited research has tested the theory in crisis contexts to date. People will seek information as they become motivated to solve a problem (e.g., how do I evacuate? What should I do to prepare to shelter in place?) (Grunig, 1997). Other work is continuing to build an understanding of audience segmentation approaches, such as situational theory of publics, and suggests new frameworks for understanding aware and active publics (Kim, Miller, & Chon, 2016). However, more work is needed to comprehensively understand the applications of this theory during crisis scenarios.

These theories point to the belief that, during a crisis, we expect media channel use to change because the motivations underlying media choices during a crisis will be fundamentally different compared to everyday preferences. This assumption has fueled various studies focused on understanding the shift in channel use due to a variety of factors. For example, one study that examined the effects of crisis information source and channel found that participants are most likely to use the same type of media in which they heard about a crisis to seek information



(Austin, Liu, & Jin, 2012). Dunwoody and Griffin (2014) theorize that channel perceptions are guided by many beliefs, particularly whether the channel will provide quality information (ideally, which would be used to inform decision making). Further, individuals select channels based on an intuitive cost-benefit analysis, often settling for an adequate balance between these two factors (Dunwoody & Griffin, 2014). People weigh the “cost” of using a given channel (e.g., in terms of money, time, effort, availability) against the anticipated value to them of the information contained in that channel (e.g., could it help their decision-making?).

Given the decades-long research record on media use during crises, our understanding about media channels should be robust. There are many public opinion efforts that ask the public about news consumption (Gallup, 2019; Pew, 2019), in addition to empirical studies that report information source use during disasters (Becker, 2004; Liu, Austin, & Jin, 2011; Cortiñas-Rovira, Pont-Sorribes, & Alonso-Marcos, 2015; Steelman, McCaffrey, Velez, & Briefel, 2015; DeYoung, Wachtendorf, Farmer, & Penta, 2016; Park & Avery, 2018). However, there are sparse examples of how specific audience needs change throughout the crisis lifecycle. The main reason for the scarcity of papers about how information needs map to the different crisis phases is that longitudinal data from studies repeatedly querying the same individuals over time is rare (Parker, Edelman, Carman, & Finucane, 2019). To fill this knowledge deficit, we examine media channel preferences of residents living in Texas during Hurricane Harvey and ask respondents afterward to recall their main sources of news before, during, and after the storm’s landfall.

Specific research questions are:

RQ1: What media channels are most prominent in each crisis phase?

RQ2: Do media channel preferences change across crisis phases?

### **3. Methods**

#### **3.1 Data collection**

Data come from Texas respondents in the second wave of the Survey on Trauma, Resilience, and Opportunity among Neighborhoods in the Gulf (STRONG II), designed specifically to capture experiences related to Hurricane Harvey. STRONG II builds on a prior survey focused on the human effects of the Deepwater Horizon oil spill (STRONG I). STRONG I is a probability based, English-language landline and cell telephone survey of 2,520 adult residents in 56 counties/ parishes along or near the Gulf of Mexico coastline conducted in 2016 (Ramchand et al., 2019). In the STRONG I sample, 623 respondents resided in Texas, including 463 with physical addresses recorded. Beginning in March 2018, we mailed STRONG II surveys to residents along with a five-dollar cash incentive and a self-addressed stamped envelope to return the STRONG II survey. Non-responders received a postcard reminder in April 2018. Remaining non-responders and residents without an address on file were contacted by phone to complete the survey in May 2018. In total, we collected 295 responses (47.4% response rate) from Texas residents (184 mail and 111 telephone). All respondents willing to provide an address to receive an incentive were mailed a \$30 gift card. All research activities received Institutional Review Board approval (IRB) and included a confidentiality statement assuring participants that their responses would not be associated with personally identifying information.

#### **3.2 Measures**

Three questions, adapted from Gallup, asked about information channel preferences across three crisis phases: “What would you say was your main source of news once you learned Hurricane Harvey was approaching?,” “What would you say was your main source of news during Hurricane Harvey?,” and “What would you say was your main source of news about

Hurricane Harvey when the rain and flooding ended?” (Saad, 2013). Possible responses included television, internet, social media, print (newspapers, magazines), radio, word-of-mouth, and other. We retroactively asked respondents about all their pre-crisis, crisis, and post-crisis news preferences when STRONG II was fielded in March 2018. We selected the Gallup item as a previously fielded survey question which only required minor modifications (i.e., adding a social media option, adding a word-of-mouth option, and adding examples of print sources for respondents like newspapers and magazines). The additional response options were proposed and agreed upon by the research team prior to fielding STRONG I.

We collected demographic information modeled after questions in the American Community Survey, including gender (male/ female/other), age, race (White, Black/African American, American Indian or Alaska Native, Asian, or Native Hawaiian or Other Pacific Islander), and ethnicity (Hispanic/not) (U.S. Census Bureau, n.d.). Additional variables included educational attainment (less than a high school diploma, some college, associate’s degree, vocational/technical diploma, bachelor’s degree, master’s degree, or more) and income (categories ranging from less than \$10,000 to \$100,000 or more). Race/ethnicity and education were collected during STRONG I; gender, age, and income during STRONG II. Finally, we also measured change in respondents’ news source by creating a “any change in news source” variable. This is the measure that captures whether the news sources reported pre-, during, and post-disaster ever differed.

### **3.3 Sample Demographics and Weighting**

The sample was 47.4% female, 45.8% male, and 6.8% don’t know/refused to answer. Age distribution was 10.8% age 18-25, 35.5% age 26-50, 42.7% age 51-75, 6.7% age over 75, and 4.3% don’t know/refused to answer. Respondents reported being 35.3% Hispanic; 40.3%

White, Non-Hispanic; 12.4% Black/African American, Non-Hispanic; 5.7% Other race, Non-Hispanic, and 6.3% don't know/refused to answer. Educational attainment spanned seven categories: 14.3% less than a high school diploma, 26.2% high school diploma, 21% some college, 6% associate degree, 2.1% vocational, 14.8% bachelor's degree, 9.4% master's degree or more, and 6.3% don't know/refused to answer. Income spanned five categories: 15.9% under \$10,000-\$19,000, 22.3% \$20,000-\$39,999, 19.9% \$40,000-\$74,999, 31% \$75,000-\$100,000 or more, 11% don't know/refused to answer.

STRONG II data is weighted. We used a weighting adjustment (Little & Rubin, 2002; Heeringa, West, & Berglund, 2010) to allocate more weight to underrepresented groups and less weight to overrepresented groups. The final weights help adjust the data to match that of Texas residents in Gulf Coast counties. The procedure matches various demographic factors, such as ethnicity, race, education, household income, gender, and age. Combined with random sampling, weighting the data helps to eliminate nonresponse bias and increase the generalizability of the results.

### **3.4 Analysis**

We used simple descriptive statistics to describe media channel preferences across the three crisis phases (Tables 1-3). We use alluvial diagrams to visualize media channel preferences over time. Alluvial diagrams are a type of Sankey diagram showing flow from one state to another (Rosvall & Bergstrom, 2010; Schmidt, 2008) and are used here to show changes in media preferences across crisis phases. We first tabulated individual combinations of media preferences across all three crisis phases, and then graphed these patterns using the alluvial package in R. Thicker arrows designate greater flow (in this case, more respondents). For clarity, only alluvia (i.e., bands) representing two or more individuals are displayed (i.e., singletons are

suppressed). Missing data are excluded from the alluvial diagrams, and the “other media” category is removed to improve visualization. Tables 1-3 document the total number of responses for each item and note the amount of missing data (which varies for each crisis phase item).

We also tested whether within-phase media channel preferences and *any* change in media channel preferences across the three crisis phases varied by demographics, using chi-square tests in SAS. In order to complete chi-square tests examining differences in media channel preferences in each phase by demographics, we needed to combine several of the original media channel preference and demographic categories to achieve sufficient cell sizes for the tests. First, media categories are reduced to: (1) television, (2) internet, and (3) other (including social media, print, word-of-mouth, and other responses). Age is collapsed to (1) 18-50 and (2) 51-75+. Income is (1) under \$10,000-\$39,999 and (2) \$40,000-\$100,000+. Race and ethnicity is (1) non-white (Hispanic/ Latino; Black, non-Hispanic; other, non-Hispanic) and (2) white, non-Hispanic. Education is collapsed into three categories: (1) less than high school diploma to high school diploma, (2) some college, associate’s degree, and vocational/ technical diploma’s, and (3) bachelor’s degree through advanced (graduate) degrees. Missing data are excluded from the chi-square analyses.

## **4. Results**

### **4.1 Media channel preferences in the pre-crisis phase**

Prior to Hurricane Harvey, most respondents reported using television (see Table 1) as their main news source (n=209; 63.4%), followed by the internet (n=23; 12.4%), social media (n=22; 12.3%) word-of-mouth (n=18; 8.9%), radio (n=9; 2.0%), other (n=3; 0.9%), and print (newspapers, magazines) (n=2; 0.2%). See Table 1 for additional descriptive information,

including media channel preferences by demographic groups. Chi-square tests revealed that media channel preferences in the pre-crisis phase varied significantly only by age, ( $X^2 [2, N = 281] = 13, p = .0015$ ). The younger segment (18-50) reported television as their preferred media channel in the pre-crisis phase ( $n=33$ ; 50.2%), then other (including social media, print, word-of-mouth, and other responses) ( $n=17$ ; 29.5%), and finally internet ( $n=12$ ; 20.4%). The older segment (51-75+) also reported television as their preferred media channel in the pre-crisis phase ( $n=176$ ; 79.1%), followed by other (including social media, print, word-of-mouth, and other responses) ( $n=33$ ; 17.6%), while remaining responses selected internet ( $n=10$ ; 3.2%). While both younger and older segments rank the media channels in the same order, respondent endorsement varies between the two age categories for each channel.

#### **4.2 Media channel preferences in the crisis phase**

During Hurricane Harvey, most respondents again reported using television (see Table 2) as their main news source ( $n=191$ ; 67.1%), followed by the internet ( $n=26$ ; 9.3%), radio ( $n=22$ ; 3.6%), social media ( $n=20$ ; 11.6%), word-of-mouth ( $n=13$ ; 2.5%), other ( $n=7$ ; 5.7%), and print (newspapers, magazines) ( $n=1$ ; 0.1%) See Table 2 for additional descriptive information, including media channel preferences by demographic groups. Chi-square tests revealed that media channel preference in the crisis phase varied significantly only by age, ( $X^2 [2, N = 275] = 8.5, p = .015$ ). The younger segment (18-50) again reported television as their preferred media channel in the crisis phase ( $n=33$ ; 56.1%), followed by other (including social media, print, word-of-mouth, and other responses) ( $n=18$ ; 31.6%), and lastly internet ( $n=8$ ; 12.4%). The older segment (51-75+) continued to list television as their preferred media channel in the crisis phase ( $n=157$ ; 80.3%), followed by other (including social media, print, word-of-mouth, and other responses) ( $n=42$ ; 15.0%), with remaining responses noting internet ( $n=17$ ; 4.7%). Considering,

the older segment prefers television more than their younger counterparts. The younger segment endorses more channels in the other category along with the internet.

### **4.3 Media channel preferences throughout the post-crisis**

After Hurricane Harvey, most respondents continued to report using television (see Table 3) as their main news source ( $n=190$ ; 64.9%), followed by the internet ( $n=25$ ; 12.6%), word-of-mouth ( $n=24$ ; 7.1%), social media ( $n=20$ ; 10.5%), radio ( $n=12$ ; 2.3%), print (newspapers, magazines) ( $n=8$ ; 1.1%), and other ( $n=4$ ; 1.6%) See Table 3 for additional descriptive information, including media channel preferences by demographics. Chi-square tests revealed significant differences in media channel preferences in the post-crisis phase by sex ( $X^2 [2, N = 278] = 26.1, p < .0001$ ) and by age ( $X^2 [2, N = 279] = 15.6, p = .0004$ ). In the post-crisis phase, males preferred television ( $n=77$ ; 74.9%), other (including social media, print, word-of-mouth, and other responses) ( $n=16$ ; 8.8%), and internet ( $n=13$ ; 16.3%), compared to females who preferred television ( $n=112$ ; 61.3%), other (including social media, print, word-of-mouth, and other responses) ( $n=51$ ; 36.2%), and internet ( $n=9$ ; 2.5%). Simply put, females endorsed television less than males, other sources more than males, and internet less than males. As for age, the younger segment (18-50) preferred television ( $n=33$ ; 51.5%), other (including social media, print, word-of-mouth, and other responses) ( $n=17$ ; 28.2%), and internet ( $n=10$ ; 20.4%) in the post-crisis phase. Comparatively, the older segment (51-75+) preferred television ( $n=157$ ; 80.5%), other (including social media, print, word-of-mouth, and other responses) ( $n=49$ ; 16.4%), and internet ( $n=13$ ; 3.1%). The older segment remains consistent in their preference television more than their younger counterparts. Additionally, the younger segment endorses more channels in the other category along with the internet again.

#### **4.4 Tracing news consumption across phases with alluvial diagrams**

Examining media preferences during each discrete phase demonstrates minimal aggregate changes during the crisis lifecycle. However, alluvial diagrams allow the visualization of individuals' preference pathways across the time periods. Figure 1 follows respondents across pre-crisis, crisis, and post-crisis phases for all six media categories. Width of alluvia (i.e., bands) represents the number of individuals with that pattern. As expected, based on Tables 1-3, most individuals report using television as their main source of news, and never waiver (the bottom alluvium). Some of those pre-event television watchers move to the internet, radio, and word-of-mouth during the crisis phase (see Figure 2). Following Hurricane Harvey, a portion return to television while others stick to their new channels (i.e. internet, radio, and word-of-mouth).

#### **4.5 Comparing individuals who change preferences to those who remain constant**

Using the weighted data, we performed multiple chi-square tests to identify significant differences related to the “any change in news source” variable. This is the measure which captures whether the news sources reported by individuals pre-, during, and post-disaster ever differed. Cell sizes were sufficiently large enough between groups, thus the original (i.e., not collapsed) demographic categories remained functional. In addition to demographic factors, we ran chi-square tests to examine the relationship between hurricane exposure impacts including finances, health, or home (an indicator of more severe damages from the hurricane). However, we found no significant differences. In other words, individuals who reported hurricane exposure impacts did not opt to change their media channel preferences any differently from individuals who did not experience hurricane exposure impacts. When we examined the change variable across demographic segments, we found only three significant results ( $p < .05$ ).



First, those in the 26-50-year-old category changed their news sources across the crisis phases more than other ages groups ( $X^2 [3, N = 275] = 12.3, p = 0.0065$ ). Specifically, 55% of participants aged 26-50 reported media changes ( $n=24$ ) compared to 23.1% of 18-25-year-olds ( $n=4$ ), 23.7% of 51-75-year-olds ( $n=53$ ), and 27.6% of adults ages 75+ ( $n=21$ ). Next, significant differences in change in channel preferences were detected by income group ( $X^2 [4, N = 272] = 17.3, p = 0.0017$ ). Those in the highest income bracket (\$75,000 or more) changed their channel preferences across the crisis phases at higher rates ( $n=37$ ; 58.3%) relative to those in the lower income brackets (e.g., under 10,000-\$19,999 [ $n=25$ ; 34.5%], \$20,000-\$39,999 [ $n=14$ ; 13.5%], and \$40,000-\$74,999 [ $n=24$ ; 31.2%]). Finally, the rates of change in news source varied significantly by race/ethnicity ( $X^2 [3, N = 261] = 9.3, p = 0.0256$ ). White, non-Hispanic respondents changed their news sources across crisis phases more than other racial/ ethnic groups ( $n=58, 43.7\%$ ). In contrast, Hispanic/ Latino respondents reported changing their preferences less often ( $n=28$ ; 35.5%), followed by Black, non-Hispanic individuals ( $n=10$ ; 19.8%), and Other, non-Hispanic individuals ( $n=1$ ; 1.1%).

## 5. Discussion

The results from this sample suggest that many respondents report static news channel preferences across crisis phases. In total, 62% ( $n=174$ ) respondents reported no changes in channel preferences across all phases. The alluvial diagrams further visualize that most stayed in their original media lanes prior to, during, and after Hurricane Harvey. Examining individuals who “changed” news source preferences across the three crisis phases revealed few significant findings: and none that related to assessed impact on finances, health, or home (an indicator of more severe damages from the hurricane). Overall, these findings are somewhat contradictory to what existing theory would suggest (Ball-Rokeach & DeFleur, 1976; DeSanto, 2005; Grunig,

1983). However, the results do support Austin et al.'s (2012) work that notes individuals are most likely to use the same type of media in which they heard about a crisis for more information. Perhaps in line with Dunwoody and Griffin (2014), individuals generally tune in to channels believed to provide quality information and adding in the element of a crisis does not disrupt an individual's original cost-benefit analysis of tuning into a particular channel. Another nuance is that while someone's news channel may not change, their behaviors on the preferred platform do. For instance, Zhao et al. (2019) find that social media users adopt distinct communicative functions on social media during a disaster.

Uses and gratifications theory (Ruggiero, 2000) would posit that a crisis introduces a new need for individuals. Instead of routine times, where other needs such as interpersonal communication and entertainment will be core drivers of media engagement, an acute crisis should spur information seeking. This should also hold true for individuals particularly impacted (e.g. finances, health, or home) by the hurricane, but we were not able to find any significant relationships between impact and media source changes. These results might appear as individuals move from television, social media, or word-of-mouth sources to alternatives like the internet or radio (which can be especially important during extreme weather). However, to Trevino et al.'s (1990) point related to media richness, it is possible that most persons still opt for television sources due to the medium's "richness" (p. 75). Internet and/or radio may not be capable of communicating enough meaning during a crisis.

Media dependency theory (Ball-Rokeach & DeFleur, 1976) suggests, similar to uses and gratifications theory, that an imminent threat serves as a catalyst for new goals (e.g., orientation compared to understanding or play) (Carillo et al., 2017). Further, as challenges emerge, which are inevitable during crises, individuals engage with new types of media as they grapple with

uncertainty (Jang & Beck, 2019). The notion that most of the sample did not report any changes from the pre-, during, or post-Harvey phases either suggests that generally respondents believe their preferred channels for news are meeting their needs; or perhaps that hurricane Harvey did not substantially create uncertainty or conflict (i.e., the hurricane did not disrupt established institutions, beliefs, or practices) (Ball-Rokeach & DeFleur, 1976).

The third theory, situational theory of publics, assumes certain variables including involvement, problem recognition, and constraint recognition will inform how publics communicate, what attitudes they have, and their behaviors (Aldoory & Shan, 2007). A crisis such as Hurricane Harvey would likely impact all three of the theory's variables. Residents likely find the hurricane personally relevant (especially those rating high on the impact factors) and would have problem recognition as responders delivered hundreds of warnings to motivate public action and save lives (NOAA, 2017). Less is known related to constraint recognition, yet many factors suggest the sample might veer towards information processing and/or information seeking. As mentioned previously, more respondents should move towards different media sources between the pre- and acute crisis phases as they engage in information seeking to prepare for the storm.

Media channel preferences reveal several significant findings for demographic segments across phases, perhaps with the most interesting finding being that age does impact media channel partiality. Results do show individuals aged 26-50, those in the highest income bracket (\$75,000 or more), and white, non-Hispanic respondents changed their news sources more than other segments. Without additional information, it is impossible to know what factor(s) caused new source preference changes. In some cases, vulnerable or marginalized audiences may seek information from distinct credible sources (e.g. specific people or organizations) or channels that

differ from other segments (Petrun Sayers et al., 2019). Distrust, systemic racism, a lack of representation in local or national media outlets, or conflict (i.e., from a hurricane) can create specific media needs for certain audiences. However, in this sample, those reporting changes again were not systematically more impacted by the hurricane, the youngest or oldest segments of the sample, those with lower incomes, and did not belong to a minority racial/ethnic group.

There are several takeaways, while not significant, which may point to additional trends to consider. For example, there are noticeable jumps (see Figure 1) from the pre-crisis media preferences to alternate media preferences moving into the crisis and post-crisis phases. Television users moved to radio and word-of-mouth users moved to television and the internet. DeYoung et al. (2016) found that radio was the second most listed channel during a hurricane threat in North Carolina (i.e., during the crisis phase). Additionally, Park et al. (2019) observed a jump to radio news when comparing routine and crisis situations. While we do not have more data to understand why the Texas respondents shifted to radio and other news sources, one suggestion could be that other channels became inaccessible and individuals might have utilized a radio that was powered by batteries, solar power, hand-cranked, or other alternative power sources. Additionally, word-of-mouth updates can be too slow to keep up with news updates and these users may have turned to accessible mass media for more up-to-date information.

During an emergency, responders might be tempted to primarily target television as the most popular news source to disseminate information related to forecasting, watches, warnings, and or advisories to the public. However, another point to consider is all the individuals who do not change 62% (n=174) from their original news source (even during a crisis). Only relying on television, which would capture most of our sample in this case, would still leave out others who simply prefer other mediums. For example, those who prefer other media channels such as the

internet, social media, radio, or word-of-mouth at risk would be at risk for missing instructional information.

In some cases, emergency responders should also keep in mind, depending on the crisis and location type, vulnerable populations might utilize some media channels more frequently when compared to the general public (Park & Avery, 2018; Petrun Sayers et al., 2019). For example, social media users pre-, during, and post- Hurricane Harvey were comprised of primarily Hispanic users. Additionally, television users across phases have higher concentrations of respondents in the wealthier income brackets. As touched on previously, vulnerable populations are often left out of disaster planning (Turner et al., 2010) and can face heightened barriers related to infrastructure and access to technology (Clark-Ginsberg & Petrun Sayers, 2020) leading to worse outcomes following a crisis. Emergency responders should continue to monitor disparities in media systems and emergency response planning to support their communities.

Ultimately, emergency responders tasked with crisis communication responsibilities, such as the professionals who managed the response to Hurricane Harvey, must contend with variability in message strategies, nuances of crisis type (i.e. hurricane vs. oil spill), differences in spokespeople (i.e. government vs. community leader), and other contextual factors (e.g., historical experience with crises). However, perhaps other factors such as media channel preferences are not as dynamic as originally conceptualized. While this assumption remains a widely held belief, few studies investigate shifting media channel preferences.

## **6. Conclusion**

This study examined media channel preferences of Texas respondents to understand their experiences related to Hurricane Harvey. Frequency data suggest that television remained the

most important media channel across all phases, which reinforces that television remains king even in the world of increasing smart phone penetration and social media adoption. In line with existing theories, we expected to find variation in media channel preferences across the pre-crisis, crisis, and post-crisis phases. Instead, we discovered that most respondents reported largely stable media channel preferences throughout Hurricane Harvey. Only a handful of audience segments changed their news sources more than other segments.

This research is not without limitations. First, we only collected data during one hurricane, and more information is needed to see if media channel preferences remain stable during a different hurricane and/or a different crisis type (e.g. flooding, drought, terrorism, etc.). In light of the current coronavirus (COVID-19) pandemic, it would be particularly relevant to capture news source preference over an extended (i.e., multiple year) event. Secondly, in order to run chi-square tests to compare segment differences for media channel preferences across crisis phases, we needed to collapse some demographic categories to achieve sufficient cell sizes. This reduced the granularity of the results, yet still provided some insight into significant differences between groups for media channels preferences. Next, we collected information from respondents in one session post-Hurricane Harvey. As with any retrospective data collection effort, recall bias could influence respondent's ability to identify their true media channels preferences over time. Given the conflicting understanding of media channel preferences during crises, additional research should continue to examine media channel preferences over time. Future studies might consider allowing respondents to offer multiple channel preferences for each crisis phase. Forthcoming studies might also benefit from adding qualitative elements to future data collection efforts to not only explain the what (e.g., who is changing news sources

during a crisis and what news sources are changing) but also the why (i.e., what is the reason behind the changes?).

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**Table 1: Media Channel Preferences Before Hurricane Harvey**

	Pre-event: What would you say was your main source of news once you learned Hurricane Harvey was approaching? <sup>†</sup>							
	Television (73.1%, 209)	Internet (8.0%, 23)	Social Media (7.7%, 22)	Print (0.7%, 2)	Radio (3.1%, 9)	Word-of- mouth (6.3%, 18)	Other (1.0%, 3)	Total (100%, 286)
	W. Col % (N)	W. Col % (N)	W. Col % (N)	W. Col % (N)	W. Col % (N)	W. Col % (N)	W. Col % (N)	W. Row % (N)
<b>Gender<sup>‡</sup></b>								
Male	50.4 (79)	55.7 (10)	13.1 (1)	.	15.9 (3)	59.9 (9)	91.9 (2)	45.8 (104)
Female	49.2 (129)	19.4 (11)	80.5 (17)	23.1 (1)	42.4 (5)	40.1 (9)	8.2 (1)	47.4 (173)
Missing	0.4 (1)	9.2 (1)	6.4 (2)	76.9 (1)	41.8 (1)	.	.	4.9 (6)
<b>Age</b>								
18 – 25	11.8 (6)	22.1 (2)	6.6 (4)	.	.	0.9 (1)	.	10.8 (13)
26 – 50	25.9 (27)	55.7 (10)	53 (6)	.	.	74.8 (6)	.	35.5 (49)
51 – 75	53.1 (132)	11.2 (7)	36.2 (8)	23.1 (1)	43.3 (5)	21.1 (7)	100 (3)	42.7 (163)
Over 75	9.3 (44)	1.8 (3)	1.5 (3)	76.9 (1)	6.5 (2)	2.6 (3)	.	6.7 (56)
Missing	.	9.2 (1)	2.7 (1)	.	50.2 (2)	0.6 (1)	.	4.3 (5)
<b>Income</b>								
Under \$10,000 – \$19,999	16.8 (44)	21.2 (7)	11.3 (5)	.	7.5 (1)	13.7 (6)	8.22(1)	15.9 (64)
\$20,000 – \$39,999	21.5 (47)	24 (2)	48.7 (7)	76.9 (1)	.	1 (1)	.	22.3 (58)
\$40,000 – \$74,999	22.3 (48)	18 (5)	16.1 (5)	23.1 (1)	20.5 (4)	13.5 (3)	45.7 (1)	19.9 (67)
\$75,000 – \$100,000 or more	30.7 (62)	19.3 (6)	18.4 (4)	.	30.3 (3)	69.7 (6)	46.2 (1)	31 (82)
Don't Know, Refused, or Missing	8.8 (8)	17.5 (3)	5.5 (1)	.	41.8 (1)	2.2 (2)	.	11 (15)
<b>Race/ethnicity</b>								
Hispanic/Latino	31.4 (47)	27.9 (7)	62.8 (11)	.	7.8 (2)	49.6 (6)	53.8 (2)	35.3 (75)
White, non-Hispanic	39.5 (114)	64.5 (14)	30.2 (8)	23.1 (1)	80.5 (5)	21.7 (7)	46.2 (1)	40.3 (150)
Black, non-Hispanic	16.4 (29)	4.1 (1)	6.1 (2)	.	8.4 (1)	9.4 (1)	.	12.4 (34)
Other, non-Hispanic	9.1 (6)	.	0.9 (1)	.	.	.	.	5.7 (7)
Missing	3.6 (13)	3.5 (1)	.	76.9 (1)	3.3 (1)	19.4 (4)	.	6.3 (20)



<b>Education</b>								
Less than high school diploma	9.6 (12)	15.8 (1)	45.9 (4)	.	41.8 (1)	0.7 (1)	8.2 (1)	14.3 (20)
High school diploma or GED	26.2 (49)	20.6 (5)	21.7 (5)	.	4.6 (1)	52.1 (5)	.	26.2 (65)
Some college	23.2 (37)	25.1 (6)	15.9 (4)	.	9.2 (2)	11.8 (3)	46.2 (1)	21 (53)
Associate's degree	6.6 (20)	2.9 (2)	7.9 (2)	23.1 (1)	.	2.3 (1)	45.7 (1)	6 (27)
Vocational/technical diploma	3.1 (9)	.	.	.	8.4 (1)	0.6 (1)	.	2.1 (11)
Bachelor's degree	17.7 (39)	15.6 (4)	7.5 (5)	.	23.4 (2)	7.6 (2)	.	14.8 (52)
Advanced degree	10 (30)	16.5 (4)	1.1 (2)	.	9.4 (1)	5.4 (1)	.	9.4 (38)
Missing	3.6 (13)	3.5 (1)	.	76.9 (1)	3.3 (1)	19.4 (4)	.	6.3 (20)

<sup>†</sup>N = 286, nine (9) participants did not respond to this question; <sup>‡</sup>One individual self-classified other gender and specified internet as their main news source.

**Table 2: Media Channel Preferences During Hurricane Harvey**

	<b>During event: What would you say was your main source of news during Hurricane Harvey? <sup>†</sup></b>							
	<b>Television</b> (68.2%, 191)	<b>Internet</b> (9.3%, 26)	<b>Social Media</b> (7.1% ,20)	<b>Print</b> (0.4%,1)	<b>Radio</b> (7.9%, ,22)	<b>Word-of-mouth</b> (4.6%, 13)	<b>Other</b> (2.5%, 7)	<b>Total</b> (100%, 280)
	W. Col % (N)	W. Col % (N)	W. Col % (N)	W. Col % (N)	W. Col % (N)	W. Col % (N)	W. Col % (N)	W. Row % (N)
<b>Gender<sup>‡</sup></b>								
Male	48.7 (71)	58.7 (13)	21.3 (4)	.	50.9 (10)	27.3 (4)	71.4 (2)	45.8 (104)
Female	47.9 (118)	28.6 (12)	71.7 (14)	100 (1)	49.1(12)	72.7 (9)	13.5(4)	47.4 (170)
Missing	0.4 (1)	12.7 (1)	7 (2)	.	.	.	15.1 (1)	4.9 (5)
<b>Age</b>								
18 – 25	9.9 (5)	31.5 (3)	7.2 (4)	.	.	.	.	10.8 (12)
26 – 50	28.8 (28)	30.3 (5)	70.8 (9)	.	23 (2)	43.8 (2)	64.3 (1)	35.5 (47)
51 – 75	52.7 (119)	21.5 (12)	22 (7)	.	54.1(12)	42.4 (7)	19.7 (4)	42.7 (161)
Over 75	8.3 (38)	4.1 (5)	.	100 (1)	13.7 (7)	13.8 (4)	.	6.7 (55)
Missing	0.3 (1)	12.7 (1)	.	.	9.3 (1)	.	16 (2)	4.3 (5)
<b>Income</b>								
Under \$10,000 – \$19,999	17.5 (39)	2.4 (3)	7.7 (4)	.	32.02 (7)	57.3 (6)	11 (3)	15.9 (62)

\$20,000 – \$39,999	18.3 (40)	35.9 (5)	52.5 (6)	.	4.9 (1)	14.5 (3)	2.5 (1)	22.3 (56)
\$40,000 – \$74,999	24 (46)	9 (5)	10.6 (3)	.	21 (9)	.	7.2 (1)	19.9 (64)
\$75,000 – \$100,000 or more	31.9 (59)	28.5 (10)	23.3 (6)	.	38.9 (4)	24.9 (3)	64.3 (1)	31 (83)
Don't Know, Refused, or Missing	8.4 (7)	24.3 (3)	6 (1)	100 (1)	3.1 (1)	3.3 (1)	15.1(1)	11 (15)
<b>Race/ethnicity</b>								
Hispanic/Latino	30.3 (43)	27.1 (7)	58.5 (10)	.	13.7 (3)	12.5 (3)	83.8 (5)	35.3 (71)
White, non-Hispanic	41.7 (105)	58.1 (15)	34 (7)	100 (1)	64.9 (13)	44.8 (8)	15.1 (1)	40.3 (150)
Black, non-Hispanic	14.1 (25)	6.4 (2)	6.5 (2)	.	9 (2)	42.7 (2)	.	12.4 (33)
Other, non-Hispanic	8.8 (5)	.	1 (1)	.	.	.	1.2 (1)	5.7 (7)
Missing	5.1 (13)	8.4 (2)	.	.	12.5 (4)	.	.	6.3 (19)
<b>Education</b>								
Less than high school diploma	12.1 (11)	.	50.6 (5)	.	.	9.1 (3)	15.1 (1)	14.3 (20)
High school diploma or GED	24.5 (42)	28.6 (5)	4.4 (2)	100 (1)	21.1 (4)	61.7 (6)	74.3 (3)	26.2 (63)
Some college	22.7 (36)	28.2 (6)	17.1 (3)	.	10.3 (3)	24.7 (3)	2.5 (1)	21 (52)
Associate's degree	6.4 (20)	0.7 (1)	13.1 (4)	.	1.6 (1)	.	7.2 (1)	6 (27)
Vocational/technical diploma	2 (8)	.	.	.	23 (2)	.	1 (1)	2.1 (11)
Bachelor's degree	16.6 (35)	21 (6)	8.2 (5)	.	18.1 (3)	4.5 (1)	.	14.8 (50)
Advanced degree	10.5 (26)	13.2 (6)	6.6 (1)	.	13.5 (5)	.	.	9.4 (38)
Missing	5.1 (13)	8.4 (2)	.	.	12.5 (4)	.	.	6.3 (19)

<sup>†</sup>N = 280, fifteen (15) participants did not respond to this question; <sup>‡</sup>One individual self-classified other gender and specified television as their main news source.

**Table 3: Media Channel Preferences After Hurricane Harvey**

	<b>Post-event: What would you say was your main source of news about Hurricane Harvey when the rain and flooding ended? <sup>†</sup></b>							
	<b>Television</b> (67%, 190)	<b>Internet</b> (8.8%, 25)	<b>Social Media</b> (7.1%, 20)	<b>Print</b> (2.8%, 8)	<b>Radio</b> (4.2%, 12)	<b>Word-of-mouth</b> (8.5%, 24)	<b>Other</b> (1.4%, 4)	<b>Total</b> (100%, 283)
	W. Col % (N)	W. Col % (N)	W. Col % (N)	W. Col % (N)	W. Col % (N)	W. Col % (N)	W. Col % (N)	W. Row % (N)
<b>Gender<sup>‡</sup></b>								
Male	53.9 (77)	60.2 (13)	16.6 (5)	29.1 (1)	56.9 (5)	11.2 (5)	.	45.8 (106)
Female	45.7 (112)	9.6 (9)	83.4 (15)	70.9 (7)	43.1 (7)	88.8 (19)	47.5 (3)	47.4 (172)
Missing	0.4 (1)	14.5 (2)	.	.	.	.	52.5 (1)	4.9 (4)
<b>Age</b>								
18 – 25	9 (4)	22.2 (3)	16.5 (4)	.	.	10.7 (1)	.	10.8 (12)
26 – 50	28.4 (29)	53.7 (7)	50.9 (4)	29.1 (1)	35.9 (2)	61.6 (5)	.	35.5 (48)
51 – 75	54.5 (118)	10.5 (10)	32.7 (12)	14 (1)	57.5 (8)	21 (13)	47.51 (3)	42.7 (165)
Over 75	8.1 (39)	1.8 (3)	.	56.9 (6)	6.6 (2)	5.9 (4)	.	6.7 (54)
Missing	.	11.7 (2)	.	.	.	0.8 (1)	52.5 (1)	4.3 (4)
<b>Income</b>								
Under \$10,000 – \$19,999	15.5 (39)	19.4 (4)	7.2 (3)	13.8 (2)	27.8 (5)	25 (10)	34.9 (2)	15.9 (65)
\$20,000 – \$39,999	16.9 (36)	31.4 (6)	65.6 (6)	23.7 (2)	11.5 (2)	4.1 (3)	12.7 (1)	22.3 (56)
\$40,000 – \$74,999	27.5 (51)	4.9 (4)	5.9 (4)	9.7 (1)	13.8 (3)	3.3 (2)	.	19.9 (65)
\$75,000 – \$100,000 or more	31.3 (55)	27.6 (8)	21.3 (7)	44.6 (2)	46.9 (2)	56.8 (8)	.	31 (82)
Don't Know, Refused, or Missing	8.8 (9)	16.8 (3)	.	8.1 (1)	.	10.7 (1)	52.5 (1)	11 (15)
<b>Race/ethnicity</b>								
Hispanic/Latino	36.5 (46)	29.7 (8)	63.6 (9)	29.1 (1)	16.2 (4)	6.1 (5)	30.9 (1)	35.3 (74)
White, non-Hispanic	34.4 (99)	58.5 (13)	34.5 (10)	50.1 (5)	75.3 (7)	67.9 (15)	52.5 (1)	40.3 (150)
Black, non-Hispanic	16.2 (27)	5.4 (1)	1.9 (1)	14 (1)	.	12.7 (2)	16.6 (2)	12.4 (34)
Other, non-Hispanic	8.9 (5)	.	.	.	.	0.9 (1)	.	5.7 (6)

Missing	4 (13)	6.5 (3)	.	6.8 (1)	8.6 (1)	12.3 (1)	.	6.3 (19)
<b>Education</b>								
Less than high school diploma	9.3 (11)	15.7 (1)	54.3 (4)	.	3.8 (1)	2.3 (2)	52.5 (1)	14.3 (20)
High school diploma or GED	30.5 (44)	23.2 (6)	16 (4)	8.1 (1)	4.7 (1)	21.9 (7)	43.6 (2)	26.2 (65)
Some college	23.2 (36)	17.5 (4)	1.9 (2)	26.5 (3)	2.8 (1)	45.2 (7)	.	21 (53)
Associate's degree	7.4 (22)	5.9 (2)	2.9 (1)	29.1 (1)	.	.	3.9 (1)	6 (27)
Vocational/technical diploma	1.8 (7)	.	.	.	35.9 (2)	0.8 (1)	.	2.1 (10)
Bachelor's degree	13.3 (30)	18.2 (4)	21.5 (7)	29.5 (2)	35.9 (5)	14.6 (3)	.	14.8 (51)
Advanced degree	10.7 (27)	13 (5)	3.5 (2)	.	8.3 (1)	3 (3)	.	9.4 (38)
Missing	4 (13)	6.5 (3)	.	6.8 (1)	8.6 (1)	12.3 (1)	.	6.3 (19)

<sup>†</sup>N = 283, twelve (12) participants did not respond to this question; <sup>‡</sup>One individual self-classified other gender and specified internet as their main news source.

Figure 1.

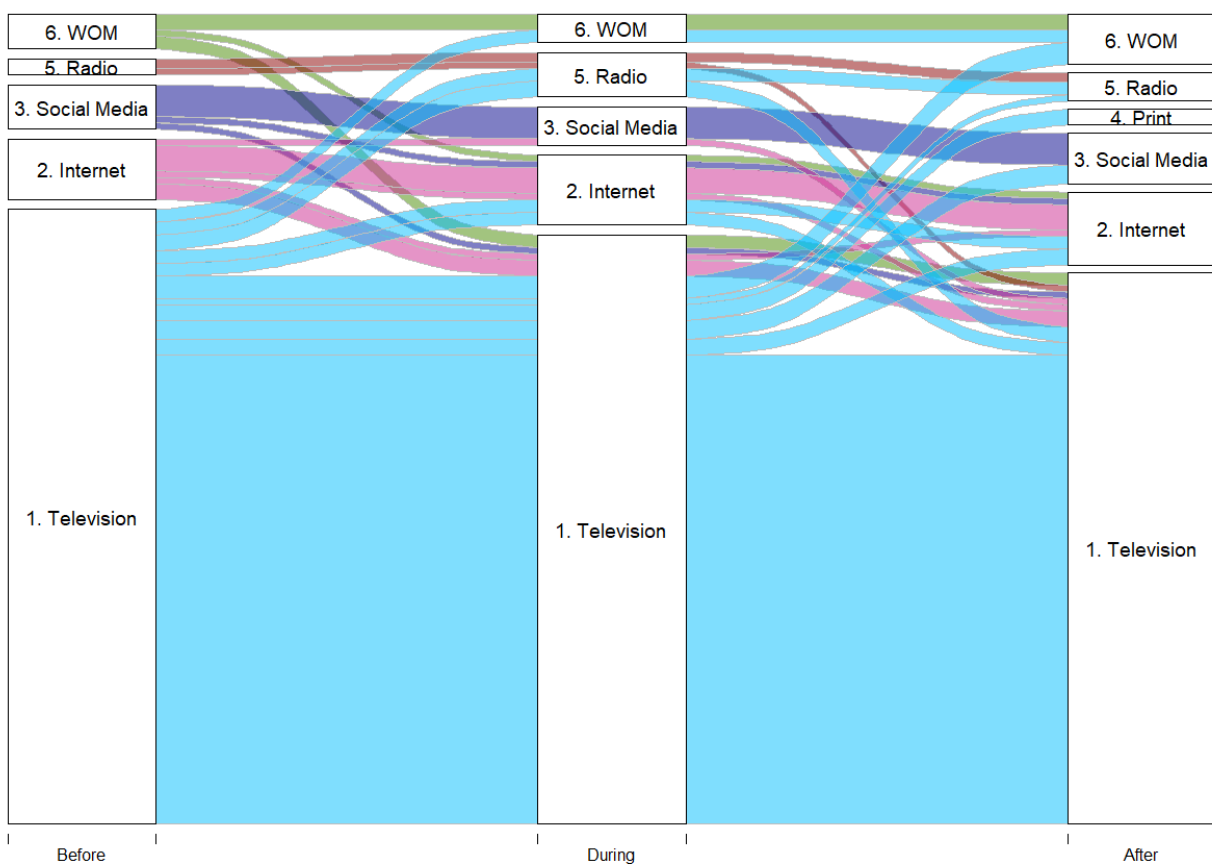


Figure 2

