Ventures into viral cartography: Waffle House, educational attainment, and the social life of maps

Jerry Shannon, University of Georgia

Kyle Walker, Texas Christian University

This is the Accepted Manuscript of an article published by Taylor & Francis in *The Professional Geographer*, available online: https://www.tandfonline.com/doi/abs/10.1080/00330124.2019.1653774

Abstract

Viral maps—ones that are shared widely on social media and media outlets—have become an increasingly common part of online conversations about a range of issues. Despite their increasing prevalence, only a few academic researchers have examined the factors leading to their popularity or their social use and effect. In this article, we analyze two case studies of viral maps, a viral tweet about the August 2017 total eclipse and an interactive tool for exploring educational attainment by neighborhood in the United States. By reflecting on our experience as authors of these maps and analyzing the reactions they elicited, we identify several key elements of these maps and their circulation. First, viral maps act as a form of phatic communication, allowing users to restate and react to shared social identities. Second, maps are read from specific times and places, and this spatiotemporal context significantly shapes the reactions of map readers. Lastly, viral maps illustrates gaps or improvements in trust between map makers and map readers, including questions about map accuracy or the intentions behind the map. We close by considering implications for future research and viral cartography.

Key words: Viral cartography, social networks, online maps

The growing number of user-friendly tools for working with geospatial data, combined with a significant use of social media outlets for coverage of important issues, has produced a number of maps that have "gone viral" in online news and social media. Borrowing from epidemiological models of infectious disease, the term generally refers to content that demonstrates exponential growth in sharing both on social media and/or media outlets (Robinson 2018). Some researchers have used described the rapid spread of this content through these networks as a cascade, measuring the speed at which the original source is shared as a way of describing its social impact and diffusion (Visoughi, Roy, & Aral, 2018; Goel et al., 2015). Researchers have yet to agree on the point at which a given posting achieves viral status, however. In this paper, we use the term generally to describe maps that elicit widespread attention from online users and media organizations.

The topics of viral maps range widely, from the most popular foods in each state to local level election results. The cultural authority given to viral maps allows them to significantly shape perceptions of the world, even if they are subject to bias and inaccuracy (Goodchild 2009; Harley 1989; Wood & Fels 1992). Viral maps demonstrate the ways that spatial knowledge and the ways we collectively understand social phenomena are shared and negotiated in online communities. For these reasons, viral maps play a growing role in online discussions on topics ranging from politics to climate change.

Despite their increasing prevalence, few academic geographers have written explicitly on the nature and effects of viral maps (Muehlenhaus 2014; Robinson 2018). Both of the authors of this article have created maps that have gone viral. This article outlines and reflects on two case studies from our experience. Drawing from broader research on viral content, we identify factors that explain the viral spread of these maps and note how they illustrate often fraught

relationships between mapmakers and map readers. Viral maps, we argue, have deep ties to individuals' sense of social identity and to specific spatiotemporal contexts. We close by outlining implications and future research opportunities for those studying viral maps.

Memes, phatic communication, and viral cartography

Multiple studies outside geography have examined the factors shaping viral content. Berger and Milkman (2012) tracked which articles were most likely to make the paper's "Most Emailed" list, coding them by emotional content using sentiment analysis. They found that positive articles were more likely to be shared than negative ones, and articles evoking high-arousal emotions (e.g., awe or anger) were most likely to be shared. An analysis of retweeting behavior on Twitter similarly found that emotionally charged content was most likely to be shared widely, and the speed at which this occurs is related to the centrality of a user within a given social network (Stieglitz & Dang-Xuan 2013).

Within communication studies, researchers have examined the ways that memes—images and/or text that expresses a particular sentiment or viewpoint—are shared (and sometimes altered) on social media. This process of mimetic repetition is often an example of phatic communication, a way to reaffirm social ties and shared group identities (Robinson 2018; Varis & Blommaert 2015). The spread of memes through social networks can foster a sense of community membership "in contexts where sharedness of characteristics, backgrounds and resources is not to be taken for granted" (Blommaert & Varis 2015, p. 8). The circulation of images and text in online forums draws upon and rearticulates social structures and the identities they foster, such as political affiliation, gender or racial categories, or regional character. The boundaries of these virtual communities may be ephemeral and the social ties they foster may be weak, but Varis & Blommaert (2015) warn against dismissing them as trivial.

Viral content also exists within a specific temporal context. Vie (2014) notes how viral content appears at just the right moment, drawing upon the rhetorical concept of kairos: "a moment in time that is just right for communication to happen. In the kairotic moment, the time is right, the audience receptive, and the communicator ready." For example, Vie notes how the viral spread of a red equality logo—symbolizing marriage equality—in Facebook profile photos was fueled by the Supreme Court's consideration of the Defense of Marriage Act. While this issue has a long legal history, the issue was receiving acute attention in media outlets at this moment due to the impending court decision.

Miller's (2018) research on the use of memes for social action investigates the political potential of viral content. Online campaigns are sometimes dismissed as "slacktivism" (Kien 2013), replacing more substantive forms of social action. Miller argues that memes and other digital content can have notable social impact when timed appropriately, connected to broader social campaigns, and designed to have affective impact. Viral content situated in this way, she argues, "creates social impact because it assembles individuals into a grassroots force[….]Indeed, successful internet memes for digital activism generate an affective desire to participate" (p. 37). Situated within broader social movements, viral media may potentially help sustain group commitments or increase participation by otherwise disengaged individuals.

Research on viral content provides insight on how and why it spreads, but maps are also not simply memes. More than two decades of work on critical cartography has demonstrated how maps function as technologies that name and produce space (Harley 1989; Wood & Fels 1992; Elwood 2006). Maps carry cultural and political authority, even if the version of the world they present is inherently distorted (Monmonier 1991). As symbolic objects, memes reflect already existing social identities and ideological commitments, but they often lack the perceived

objectivity and authority of maps. Viral maps can provide an element of scientific certainty to the phenomena they portray, providing authority to those who wield them.

Only a few authors have specifically examined viral cartography. A 2014 article by Ian Muehlenhaus examined the specific cartographic characteristics of online maps, including the rhetorical design and use of interactive features. He contrasted maps shared online as static images, which were often visually complex and rhetorically forceful, and web based interactive maps, which were often more understated (Muehlenhaus 2014). More recently, Robinson's review of viral maps focuses both on the eclipse maps examined in this paper and a series of maps related to the 2016 presidential election (Robinson 2018). Using algorithmic image analysis, Robinson identifies common themes in these maps and examines how they were repurposed by different organizations. The article identifies multiple challenges related to studying viral maps: the need to develop better tools for identifying and capturing viral map content, the importance of identifying those who create and/or modify these maps, and analysis of the ways viral maps shape political discourse.

More broadly, work in neogeography—non-expert use of maps and mapmaking tools—is relevant to framing the social life of viral maps (Haklay, Singleton, & Parker 2008; Leszczynski 2014). As new technologies make it easier for individuals to create and share maps, traditional forms of cartographic expertise—both for map design and data analysis—may be more likely to be questioned as biased or inaccurate. Online maps thus reconfigure the positions of mapmakers and map readers.

Moreover, if we accept the idea that maps are fundamentally propositions about the world—assertions that "this is there" (Wood, Fels, & Krygier, 2010)—the circulation of viral maps outlines the social life of these propositions. That is, through retweeting, upvoting, or modifying

maps, users accept or challenge the propositions made by maps about the physical and social world. In this sense, viral maps are not simply "small talk," a phrase sometimes used to describe phatic communication (Miller 2018, p. 33). Rather, they may reveal converging or diverging epistemological stances in the ways we collectively name and understand the world and build consensus for social and political action.

Indeed, by affirming or challenging collective understandings of place, maps can have affective power. Others have written on the potential of affective cartography (Iturrioz & Wachowicz 2010; Cartwright et al., 2008; Kwan 2007). Aitken & Craine (2009, 2006) draw from non-representational theory to discuss the affective power of geovisualization. They point to maps that are more than simply informational, but also provoke a sense of wonder, amazement, or what Massey (as they quote her) calls "spatial delight" (qtd. in Aitken & Craine, 2006). However, as cartographers have long noted, cartographers can use color and design to provoke a range of emotional reactions from readers, including fear or anger as well as delight or appealing to nativist sentiments as well as inclusionary ones (Momonier 1991; Tyner 1982). The Floating Sheep collective argued that new mapping tools recenter the map around each individual, and this resonates with viral maps' phatic role as expressions of social identity (Zook et al. 2015). Similar to other forms of phatic communication discussed above, such as memes, maps can be affective as well as informational by affirming and rearticulating these shared identities and associated understandings of the world.

Our paper adds to the small but growing body of research on viral maps. Both Robinson and Muehlenhaus focus primarily on cartographic elements of viral maps. In this paper, we reflect on our experiences as creators of viral maps, identifying factors both internal and external to the maps themselves that contributed to their popularity. We specifically analyze reactions to our

maps in the press, online comments, and repostings in social media networks. Through this analysis, we suggest ways that viral cartographers might design maps that engage with public audiences and promote conversations about geographic research.

Background

Education map

In March of 2017, Kyle published the interactive map *Educational Attainment in America* as part of a research project on the design of interactive dot-density maps. The map uses data from the American Community Survey, detailing the highest level of educational attainment for respondents age 25 and older at census tract level. Similar to other popular dot-density web maps like the *Racial Dot Map* (Cable 2013) and *Where are the Jobs?* (Manduca 2015), the map allows users to zoom and pan around the United States, showing national, regional, and local trends depending upon the map view. The project incorporates a number of cartographic and user interface design decisions to improve the legibility of the map. This includes *dasymetric dot placement*, which avoids placing dots in areas of no population; zoom-dependent styling and data ratios that remove dots as users zoom out; and a linked summary chart that computes the percentage breakdown of categories visible on the screen at a given time. A full description of the map's methodology is available in a published article (Walker, 2018).

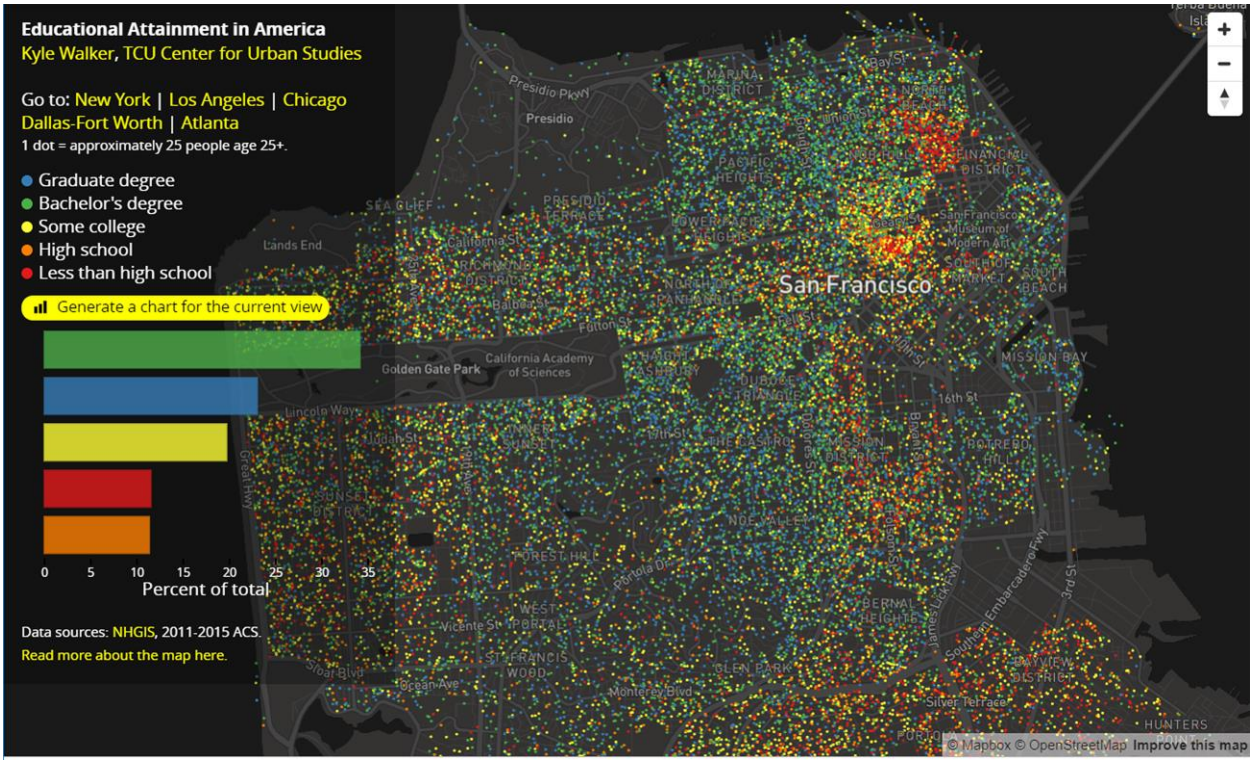


Figure 1: Educational Attainment map

Shortly after the publication of the map in March 2017, Kyle was interviewed by *CityLab* (Misra 2017) and *D Magazine* (Goodman 2017), articles that were shared across social media outlets like Facebook and Twitter, attracting thousands of visitors to the map. The map peaked in popularity on March 29 2017 when Business Insider published an overview of the map's content (Weller 2017), prompting over 16,000 visits to the map on that day alone. As of October 2018, the map has been visited over 164,000 times by over 142,000 unique users.

Waffle House and the total eclipse

On August 2, 2017, Joshua Stevens posted a map on Twitter showing the path of the upcoming total solar eclipse and reports of Bigfoot sightings (Stevens 2017). The eclipse, which occurred on August 21, had generated significant news coverage, including several maps showing places where people could experience the totality. Stevens, a lead in digital visualization and

cartography at NASA's Earth Observatory, had made several eclipse related maps himself. This map was a lighthearted response to these more serious efforts, using volunteered geographic information on Bigfoot sightings as a counterpoint to a significant celestial event.

Several authors created their own maps in direct response to Stevens' post, including one showing UFO sightings (Nelson 2017) and one inspired by the song "Total Eclipse of the Heart," showing places including heart themed language in their names (Debus 2017). Jerry joined this thread by posting a map of all Waffle Houses in the eclipse's path (Shannon, 2017). NASA had posted shapefiles of the eclipse totality on its website (NASA SVS 2017). Data on Waffle House locations was obtained through Dun and Bradstreet's Million Dollar Database, using all restaurants with "Waffle House" in the title.

After being retweeted by Waffle House, this post quickly went viral. As of October 2018, the post has been retweeted 474 times and viewed by over 182,000 people, 22,722 of whom "engaged" with the image by clicking on it. Based on anecdotal evidence, this image was also widely shared on other social media platforms such as Facebook, but we cannot easily track the exact numbers for these outlets.

The popularity of this tweet also was evident in widespread media coverage. At least twenty national and regional media outlets discussed this tweet including the Atlanta Journal-Constitution (Pirani 2017), National Geographic (Mason 2017), Fortune Magazine (Price 2017), the Chronicle of Higher Education (Zamudio-Suaréz 2017), and even Golf Digest (Weinman 2017). CNN's online news journal Beme sent a film crew to Athens to interview Jerry about the map and visit Waffle Houses in the path of totality, although this story was pulled in the wake of protests in Charlottesville, VA. Jerry was also interviewed by multiple local radio and TV

stations. While this map took less than an hour to make, it clearly resonated with a large audience.

Figure 2: Waffle House eclipse map

Themes from viral cartography

Viral maps and group identity

One of the most consistent questions Jerry received in press interviews about his eclipse map was why he chose Waffle House as a subject. Jerry has conducted multiple previous studies on access to retail food outlets (Shannon, 2018; Shannon, 2016), and Waffle House has a particularly distinctive tie to the Southeast, where he lives and works. As Moser (2018) writes, "It's never easy to explain to a non-Southerner what Waffle House means to practically

everybody who grew up in Dixie." In *Parts Unknown*, food critic Anthony Bourdain spends one episode visiting a Waffle House in South Carolina, concluding that it is "indeed marvelous-- an irony-free zone where everything is beautiful and nothing hurts; where everybody regardless of race, creed, color or degree of inebriation is welcomed" (Ormont Blumberg 2018). This is not to romanticize Waffle House, which can also be a site of racial conflict (Moser 2018; Murphy Jr. 2018) and labor disputes (Capps 2018). Rather, Waffle House resists "romanticizing antebellum grandiosity" while still being a "petri dish of the American south, showcasing peace, conflict, mundanity" (Anderson 2016).

The strong connection between Waffle House and southern identity was clear in mentions of the chain on Twitter in the run up to the eclipse. Hosts of a Minnesota radio show tweeted a photo of a Waffle House on their trip south to see the eclipse, writing, "Pulled into our 'campground' in St. Joseph, MO & we are walking distance from one of these..." (Halvorson 2017). Another user commented on reports of families stationed at a Waffle House by saying that it "sounds like a Jeff Foxworthy joke...Well if you camp out at a Walmart or Waffle House for a Solar Eclipse you might be a redneck" (Joyner 2017). A television station in Atlanta had a more positive take. After describing the map, one anchor stated, "The one thing you learn in the South is that you can tie Waffle House to anything. Football, politics, and now eclipses" (Wolfe 2017). In these cases, Waffle House acted as a way for individuals to position themselves relative to southern culture and "redneck" stereotypes.

Other tweets often expressed a desire to use it as a way to celebrate or plan a visit to Waffle House during the eclipse. Responding to a news story about the map (Pirani 2017), one user responded, "Yeah baby!! That's what I'm talking about!!" (Guyton 2017). Another tweeted that "@jerry_shannon has performed the great public service of ID'ing all the Waffle Houses in the

Path of Totality!" (Jolly 2017). A third user wrote on the day of the eclipse, "Hi! We made it! Thank you for your help! #nashville #pathoftotality #wafflehouse #itallworkedout" (Life 2017). A series of photos highlighted by the online publication Eater highlighted the social nature of Waffle House excitement (Filloon 2017). In these photos, individuals pose with restaurant employees, stand on the restaurant's roof for a better view, and wear eclipse glasses while drinking from Waffle House mugs. While not explicitly tied to the eclipse map, these photos participate in the same viral thread it started.

Viewers of the educational attainment dot map also drew upon notions of place identity in their responses to the map. Some map viewers interpreted places as "favorable" or "unfavorable" depending upon their demographic composition. Said one map viewer in an email correspondence with Kyle:

> I just wanted to thanks for putting together the dot map for educational attainment. My wife and I were contemplating a move from Salt Lake to Denver, and your map has been extremely useful in identifying quickly which neighborhoods we would want to live in. (Personal communication with R.T. 2017)

The viewer interprets highly educated areas as more desirable – and thus worthy places for relocation – whereas less-educated areas are less desirable.

Another email commenter took issue with the map's potential misrepresentation of these less-educated areas. After outlining the educational attainment of members of her family, which included bachelor's and associate's degrees as well as students currently in school in a Houston neighborhood, she wrote, "It's sad that my parents have done and are continuing to do everything in their power to allow us to continue our education. It's sad that it's a huge red dot in

your map" (Personal communication with R.C. 2017). While the map viewer from Houston misinterpreted the map's content, her reaction also may reflect limitations of the map, such as the reliance on five-year estimates from the U.S. Census that may have already been outdated.

Just like memes, viral maps can operate as phatic communication, virtual small talk that reaffirms group identity. In both our case studies, users used these maps to understand and navigate through their environment. In addition, responses to each map showed that the maps were not just informational. Users placed themselves and their communities through these maps, resisting or commenting on perceived stigma and welcoming the affirmation of their social identities.

The time and place of viral maps

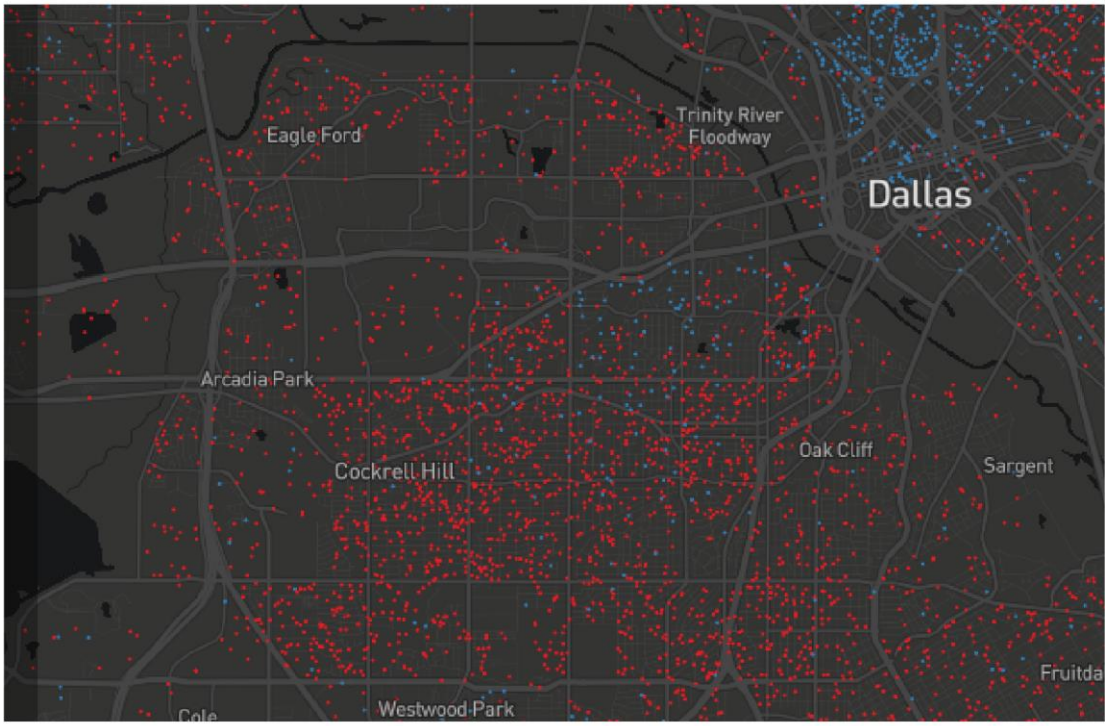
Previous work in feminist and critical GIS has emphasized the need for cartographers to be reflective about the social context of their maps, considering the time, place and purposes for their production (Haraway 1988, p. 589; Elwood & Leszczynski 2018; Kitchin, Perkins, & Dodge 2009). Viral maps exist in virtual spaces as well as physical ones. Still, in addition to considering our own role as mapmakers (discussed more in our next section), we saw evidence of ways that our maps were always read from somewhere, placed in specific spatial and temporal contexts by news media and general users.

While designed at a national scale, the *Educational Attainment in America* dot map allows visitors to localize the viewing experience by panning and zooming. Significantly, maps that cover the entire United States enable US-based visitors to locate their own residences and interpret the content of the map in accordance with their own experience of those places. This is notable in media coverage of the map's content. ABC affiliates in both the Houston and

Philadelphia markets ran short segments where the anchor interactively explored the map on-air. The Philadelphia news segment focused highly educated areas near downtown and in the Pennsylvania suburbs. Less-educated areas were shown in the segment but not addressed by the anchor. The Houston ABC affiliate billed the segment as "where the smartest people in Houston lived" with a focus on highly educated areas.

Some local media outlets used the map to focus on specific thematic issues confronting their cities and regions. *D Magazine*'s article on the map covers the city of Dallas, Texas and notes educational gaps between the affluent north side of the city and poorer east and south sides (Goodman 2017). The topic of the article quickly turns to gentrification, and focuses on maps showing specific gentrifying areas of the city.

But look at North Oak Cliff:



The red dots represent clusters of 25 people or more who lack high school diplomas. The blue dots are clusters of 25 people or more that have graduate degrees.

Figure 3: Educational Attainment map as used in Goodman 2017

Significantly, the article also uses an interactive feature of the map's user interface that allows categories of data to be turned on and off. For example, Figure 3 shows the west Dallas neighborhood of Oak Cliff with dots visible for only the two categories of Less than High School (red) and Graduate Degree (blue), with each dot representing approximately 25 residents age 25 and up. Areas of mixing between red and blue dots are presented as visual evidence of gentrification and illustrate how the map's interactivity can be adapted for a particular purpose of the viewer.

The Waffle House map, as noted in the previous section, drew responses from multiple readers for whom the restaurant represented a particular regional identity. Individuals thus often reacted based on their own perceived relationship to the South. In addition, the map also appeared at a specific kairotic moment, in the weeks leading up to the total solar eclipse. This eclipse map and the others posted as part of that conversation tapped into a broader current of interest and excitement around the event. A map posted even a month earlier would have likely had a much smaller reach, and a similar map posted on Twitter showing Waffle Houses in the path of the 2024 total eclipse received relatively modest interest.

While both of these maps circulated widely on social media, users often read them based on their local context, noting neighborhood level demographic trends or identifying restaurant locations for the eclipse event. In the case of the Waffle House map, the timing was also crucial. As we will discuss later in this paper, these experiences demonstrate how viral cartography necessitates attention to the spatial and temporal contexts in which readers and online media sources encounter and interpret maps.

Viral maps and academic expertise

In both of our case studies, media stories and comments showed how our readers often used maps as navigational guides. A story on the Waffle House map in Atlanta, for example, ran under the title, "These are the best Waffle House locations to watch the Total Solar Eclipse" (WSB-TV 2017). A CNN crew working on a story for this map requested specific footage of the reporter browsing data on specific retail locations for future interview opportunities. However, readers often questioned the authority of each map. In creating the Waffle House map, Jerry did minimal data cleaning. As a result, the map showed restaurants with the name Waffle House but no tie to the chain. The most visible examples, such as a location in California, drew comments from Twitter users, such as "Since when is there a WaHo in Sacramento?" (Eargle 2017). For the education map, the most common of these questions showed a misinterpretation of the dot density format, viewing the randomly placed dots as literal locations. One viewer of the map wrote with "I found the map fascinating, but ultimately either incomplete or inaccurate. I know of many college graduates, and some with advanced degrees (including my own), that live in my neighborhood, but are not shown on the map" (Personal communication with J.P. 2017). Another similarly wrote, "Better pull your map and rework it. I have lived in my house for over 10 years with a post graduate degree across the street from a lawyer who has lived there since the 60s and my parents for over 20 and I know my neighbors really well. Your info dots are wrong" (Personal communication with T.S. 2017).

These responses are in some ways unique to the dot density format of these maps. Both Jerry and Kyle focused on the broader geographic patterns revealed by the map, clusters of restaurants or neighborhood residents. In contrast, lay readers focused on specific points, locating themselves on the map or identifying locations they hoped to visit. These differences highlighted how

differing educational backgrounds and positionalities shaped interactions with the map. For the academic mapmakers, the focus was on general patterns of clustering, while other readers used maps to locate themselves spatially and socially.

Our position as academic researchers also influenced reactions from map readers. Media stories and online comments on the Waffle House map often referenced Jerry's academic position. One Atlanta station's headline read "UGA Professor Creates Waffle House Eclipse Map" (Wolfe 2017). Twitter comments ranged from "@jerry_shannon is a true public servant" (Bob 106.9 2017) to "I want to back [sic] to grad school _again_ just I can [sic] study with you" (George 2017). At the end of one live radio interview about the map, hosts began playing the University of Georgia fight song. In these cases, emotional responses to the map highlighted not just attachment to Waffle House as a regional chain but also to one of the state's top public universities.

While this recognition was mostly positive, bringing attention to University of Georgia, Jerry was also aware of the ways the Waffle House map might be used to question whether tax dollars used to support the university were wisely spent or whether faculty were focusing on issues with actual economic and social relevance. In interviews and on Twitter, Jerry addressed this issue by consistently linking the Waffle House map to his ongoing research on food retailer locations in the metro Atlanta region. This led to multiple online interactions around patterns of racial segregation in neighborhood food environments.

As these examples show, reactions to these viral maps revealed distinct and often differing reactions to academic authority and educational institutions. Users often focused on specific map features, such as dot locations, using them as a guide or questioning their veracity. Both maps also prompted responses from individuals who either viewed educational institutions with

skepticism or identified with them as past students or local residents. In this sense, these maps served as boundary objects, artifacts through which individuals placed themselves in relation to educational institutions and the knowledge produced within them (see also Polman & Hope 2014). As mapmakers, we attempted to use press stories and social media interactions to win trust and promote public conversations, recognizing that the maps provided opportunities to renegotiate these boundaries and speak to issues of pressing concern.

Implications/Conclusion

In this article, we have reflected on two case studies where we created viral maps. We thus base our conclusions on these specific examples, and other case studies may add to or qualify our findings. Robinson's (2018) analysis of viral maps, for example, examines the organizations that modify viral maps for partisan purposes, providing disinformation or shoring up particular ideological viewpoints. Still, our case studies highlight several key elements for viral cartography.

First, viral maps often function as phatic communication, meaning that they reaffirm collective identity. Individuals used these maps to place themselves and their communities—as Southerners (or non-Southerners) in the case of the Waffle House map or in urban areas with heterogeneous social characteristics in the case of the educational attainment map. This contrasts with the ways maps are conventionally used within much geographic research, where researchers describe general trends across an entire study area from an outsiders' perspective. This omniscient view may itself be problematic (Haraway 1988), but for mapmakers seeking to engage publics through social media, this shift in perspectives is crucial. Viral maps provide ways for readers to see themselves and their communities at ground level, creating avenues for self-recognition. This is not to say that these maps simply restate already stable identities. Rather, it suggests that future

research into viral maps might examine how they contribute the formation of new publics organized around social activism and key issues of interest. Furthermore, Robinson's (2018) use of computer assisted image analysis to track both the sharing and repurposing of viral maps is an innovative method to trace the outlines of these emerging networks and identify key actors within them.

Second, both maps discussed in this article elicited affective reactions from readers, expressions of enthusiasm or skepticism. Both Muehlenhaus (2014) and Robinson (2018) discuss design elements that can elicit these reactions from readers. In our case studies,Kyle's use of scalable dot density maps certainly drew interest from readers who attempted to match each dot to specific households. However, affective reactions were also linked to users' regional and social identities, such as their perception of Southern culture or their view of education and highly educated individuals. Choosing a subject that stirs strong emotions, whether it be Waffle House of residential segregation, is a key aspect of viral cartography that is not reducible to map design. As the members of Floating Sheep wrote, "Maps are powerful and there's nothing that says a map has to be pretty to communicate clearly or expose a previously unknown understanding of a given social phenomena, especially if an issue is time-sensitive and you don't have time to fine tune the nuances of a map or learn advanced design skills" (Zook et al. 2015). Our case studies demonstrate that viral maps can (and should) provoke a range of affective reactions, regardless of their technical excellence.

Third, viral maps have a spatial and temporal context, a time and a place. For many academic research projects, maps may take months or even years to develop. For long-term problems such as residential segregation or climate change, the exact timing of a map may not significantly influence its reach. However, for specific events—an eclipse, an election, or a natural disaster—

this academic timeline is a poor fit. While mapmakers at news outlets are accustomed to short turnarounds, academics seeking to engage public audiences through viral maps might develop workflows with a quicker pace—developing an active social media presence over time and keeping relevant data at hand. Similarly, the responses to the educational map in our case study show the importance of considering how readers from a range of personalities may read and react to a given map.

Lastly, our case studies highlight the ways that viral maps can highlight the trust (and distrust) the public places in maps and cartographers. In both our case studies, users debated the veracity of the data shown on our maps. In the case of the educational attainment map, this also included debate of the purpose of the map itself, how educational attainment might act as a proxy for particular political or ideological views more than access to resources. Readers often used maps to position themselves in relation to the educational institutions we represent, expressing affection or skepticism. We argue that this is another aspect of the phatic nature of viral maps, that they have the potential to build or erode trust between mapmakers and map readers by affirming common values and shared views of the world or by providing data that contradicts what map users believe. To give another example, Monica Stephens published a Geographies of Hate map in 2012, showing a heat map of tweets with homophobic, racist, and ableist language (Stephens 2012). A post about this map on the Floating Sheep blog (Zook 2012) elicited well over 100 comments, including both methodological critiques and accusations that race-based attacks for former presidential candidate Mitt Romney were ignored in the analysis. Many of the commenters were clearly committed to simply trolling the author and other commenters, posting negative and controversial opinions with a goal of generating emotional reactions in others. This example shows that online engagement is sometimes, maybe even most of the time, a difficult

task. Still, we see viral maps—even silly ones—as one way academic cartographers can build trust with a sometimes skeptical public.

While academic research in this area is still developing, the social life of viral maps speaks to long standing issues within the discipline around public engagement and cartographic expertise. As geographers develop ways to connect with broader publics over pressing issues such as racial segregation and climate change, developing tools and approaches for viral cartography may provide an effective (and affective) pathway to build trust, forge new partnerships, and foster productive conversations.

Acknowledgements

We presented earlier versions of this paper at the Southeastern Division of the AAG annual conference and at the North American Cartographic Information Society (NACIS) annual conference. The authors are grateful for feedback from session attendees, as well as feedback from the journal editor and anonymous reviews.

Biographies

Dr. Jerry Shannon is an Assistant Professor in the Department of Geography and the Department of Financial Planning, Housing, and Consumer Economics at the University of Georgia. He studies accessibility to food and affordable housing, with a specific interest in community-engaged research that fosters healthier and more equitable communities.

Kyle Walker is Associate Professor of Geography at Texas Christian University. His research interests include urban demographic change, demographic data visualization, and software tools for open data science.

References

Aitken, S., & Craine, J. 2009. Into the image and beyond: Affective visual geographies and GIScience. In M. Cope & S. Elwood (Eds.), *Qualitative GIS: a mixed methods approach*. Los Angeles: SAGE.

Anderson, C. 2016. The Very Hungry Swattie: Southern (Dis)Comfort in Waffle House. Retrieved October 8, 2018, from https://swarthmorephoenix.com/2016/08/31/the-very-hungry-swattie-southern-discomfort-in-waffle-house/

Berger, J., & Milkman, K. L. 2012. What Makes Online Content Viral? *Journal of Marketing Research*, *49*(2), 192–205. https://doi.org/10.1509/jmr.10.0353

Blommaert, J., & Varis, P. 2015. The importance of unimportant language. *Multilingual Margins*, *2*(1), 4–9.

Bob 106.9. [Bob1069]. 2017, August 15. @jerry_shannon is a true public servant! Nothing says #solareclipse like a little covered and smothered! @WaffleHouse -Tim Leary. [Tweet]. Retrieved from https://twitter.com/Bob1069/status/897419022622498816.

Cable, D. 2013. The Racial Dot Map. *Weldon Cooper Center for Public Service, University of Virginia*. Retrieved October 15, 3028, from https://demographics.virginia.edu/DotMap/.

Capps, K. 2018. Class Action Lawsuits Could Be a Thing of the Past. Retrieved October 9, 2018,

from https://www.citylab.com/equity/2018/05/the-supreme-court-may-make-it-even-harder-to-sue-your-employer/559280/

Debus, B. [BryanDebus]. 2017, August 3. Love this thread. Here's my contribution: Forever's gonna start tonight. [Tweet]. Retrieved from https://twitter.com/BryanDebus/status/893220789243318276

Eargle, M. [airbornesurfer]. 2017, August 9. One question: since when is there a WaHo in Sacramento? [Tweet]. Retrieved from https://twitter.com/airbornesurfer/status/895351310249115648

Elwood, S. 2006. Beyond Cooptation or Resistance: Urban Spatial Politics, Community Organizations, and GIS-Based Spatial Narratives. *Annals of the Association of American Geographers*, *96*(2), 323–341. https://doi.org/10.1111/j.1467-8306.2006.00480.x

Filloon, W. 2017. 13 Photos of People Watching the Solar Eclipse at Waffle House. Retrieved October 9, 2018, from https://www.eater.com/2017/8/22/16183564/solar-eclipse-waffle-house

George, Corey. [LutzFLDawg]. 2017, August 9. I want to back to grad school _again_ just I can study with you. [Tweet]. Retrieved from https://twitter.com/LutzFLDawg/status/895489396601872384.

Goel, S., Anderson, A., Hofman, J., & Watts, D. J. (2015). The Structural Virality of Online Diffusion. *Management Science*, *1909*, 150722112809007. https://doi.org/10.1287/mnsc.2015.2158

Goodchild, M. 2009. NeoGeography and the nature of geographic expertise. *Journal of Location Based Services*, *3*(2), 82–96. https://doi.org/10.1080/17489720902950374

Goodman, M. 2017. Use This Interactive Map To Dissect Dallas By Educational Achievement. *D Magazine*. Retrieved October 1, 2018 fropm https://www.dmagazine.com/frontburner/2017/03/use-this-interactive-map-to-dissect-dallas-by-educational-achievement/.

Guyton, V. B. [ValerieBGuytonTV]. 2017, August 10. Yeah baby!! That's what I'm talking about!!. [Tweet]. Retrieved from https://twitter.com/ValerieBGuyton/status/895771498958422016.

Halvorson, Zach. [ZachHalvorson]. 2017, August 20. Pulled into our "campground" in St. Joseph, MO & we are walking distance from one of these.... [Tweet]. Retrieved from https://twitter.com/ZachHalverson/status/899424027948732416.

Haklay, M., Singleton, A., & Parker, C. 2008. Web mapping 2.0: the Neogeography of the Geoweb. *Geography Compass*, *2*(6), 2011–2039.

Haraway, D. 1988. Situated knowledges: The science question in feminism and the privilege of partial perspective. *Feminist Studies*, *14*(3), 575–599.

Harley, J. B. 1989. Deconstructing the Map. *Cartographica*, *26*(2), 1–20. Retrieved from http://hdl.handle.net/2027/spo.4761530.0003.008

Iturrioz, T., & Wachowicz, M. 2010. An Artistic Perspective for Affective Cartography. In K. Kri, W. Cartwright, & L. Hurni (Eds.), *Mapping Different Geographies* (pp. 74–92). Berlin: Springer.

Jolly, R. [@ProudExDemocrat]. 2017, August 15. @jerry_shannon has performed the great public service of ID'ing all the Waffle Houses in the Path of Totality! [Tweet] Retrieved from https://twitter.com/i/web/status/897671894857601025

Joyner, M. [joyner_10141981]. 2017, August 21. Sounds like a Jeff Foxworthy joke... Well if you camp out at a Walmart or Waffle House for a Solar Eclipse you might be a redneck lol. [Tweet]. Retrieved from https://twitter.com/i/web/status/899709823406788609

Kien, G. 2013. Media memes and prosumerist ethics: Notes toward a theoretical examination of memetic audience behavior. *Cultural Studies - Critical Methodologies*, *13*(6), 554–561. https://doi.org/10.1177/1532708613503785

Kitchin, R., Perkins, C., & Dodge, M. 2009. Thinking about maps. In M. Dodge, R. Kitchin, & C. Perkins (Eds.), *Rethinking Maps: New Frontiers in Cartographic Theory* (pp. 1–25). Routledge.

KTRK-TV Houston 2017. Interactive map shows neighborhoods with smartest residents. Retrieved January 9, 2019 from https://abc13.com/news/map-shows-neighborhoods-with-smartest-people/1917716/.

Kwan, M.-P. 2007. Affecting geospatial technologies: toward a feminist politics of emotion. *Professional Geographer*, *59*(1), 22.

Leszczynski, A. 2014. On the Neo in Neogeography. *Annals of the Association of American Geographers*, *104*(1), 60–79. https://doi.org/10.1080/00045608.2013.846159

Life. [@Iluvmyblackness]. 2017, August 21. Hi! We made it! Thank you for your help! #nashville #pathoftotality #wafflehouse #itallworkedout. [Tweet]. Retrieved from https://twitter.com/Iluvmyblackness/status/899698805834215425/photo/1.

Manduca, R. 2015. Where Are The Jobs? Retrieved October 1, 2018, from http://www.robertmanduca.com/projects/jobs.html.

Mason, B. 2017. The Best—and Quirkiest—Maps of the 2017 Solar Eclipse. *National Geographic*. Retrieved from https://news.nationalgeographic.com/2017/08/total-solar-eclipse-maps-cartography-august-science/

Miller, J. 2018. Digital Citizenship Tools for Cause-Based Campaigns: A Broadened Spectrum of Social Media Engagement and Participation-Scale Methodology. Unversity of Central Florida.

Misra, T. 2017. Mapping the Achievement Gap. *CityLab*. Retrieved October 1, 2018 from https://www.citylab.com/equity/2017/03/a-us-dot-map-of-educational-achievement-segregation/519063/.

Monmonier, M. 1991. How to lie with maps. Chicago: University of Chicago Press.

Moser, B. 2018. Waffle House Shooting: What the Chain Restaurant Means to Southerners. Retrieved October 8, 2018, from https://www.rollingstone.com/politics/politics-features/what-waffle-house-means-to-southerners-630618/

Muehlenhaus, I. 2014. Going Viral: The Look of Online Persuasive Maps. *Cartographica: The International Journal for Geographic Information and Geovisualization*, *49*(1), 18–34. https://doi.org/10.3138/carto.49.1.1830

Murphy Jr., B. 2018. People Are Boycotting Waffle House After Its 4th Alleged Racial Incident in 12 Days. Here's Who's Leading It. Retrieved October 9, 2018, from https://www.inc.com/bill-murphy-jr/people-are-boycotting-waffle-house-after-its-4th-alleged-racial-incident-in-12-days-heres-whos-leading-it.html

NASA Scientific Visualization Studio. 2017. 2017 Total Solar Eclipse Map and Shapefiles. Retrieved August 2, 2017, from https://svs.gsfc.nasa.gov/4518

Nelson, J. [John_M_Nelson]. 2017, August 2. JS: "This is the last possible eclipse map possible" Challenge accepted. [Tweet]. Retrieved from https://twitter.com/John_M_Nelson/status/893092853555097600

Ormont Blumberg, P. 2018. Watch Anthony Bourdain's First Meal at Waffle House: "It Is Indeed Marvelous." Retrieved October 8, 2018, from https://www.southernliving.com/news/anthony-bourdain-waffle-house-clip

Pirani, F. (2017). UGA professor creates map of Waffle House restaurants to watch the solar eclipse from (seriously). Retrieved September 29, 2018, from https://www.ajc.com/news/national/uga-professor-creates-map-waffle-house-restaurants-watch-the-solar-eclipse-from-seriously/YFoTfByZTxZRd9jL9HYgOK/

Polman, J. L., & Hope, J. M. G. 2014. Science news stories as boundary objects affecting engagement with science. *Journal of Research in Science Teaching*, *51*(3), 315–341. https://doi.org/10.1002/tea.21144

Price, E. 2017. Map: All the Waffle Houses Where You Can Watch the Solar Eclipse. Retrieved September 2, 2017, from http://fortune.com/2017/08/15/waffle-house-eclipse/

Robinson, A. C. 2018. Elements of viral cartography. *Cartography and Geographic Information Science*, *00*(00), 1–18. https://doi.org/10.1080/15230406.2018.1484304

Shannon, J. (2016). Beyond the Supermarket Solution: Linking Food Deserts, Neighborhood Context, and Everyday Mobility. *Annals of the American Association of Geographers*, *106*(1), 186–202. https://doi.org/10.1080/00045608.2015.1095059

Shannon, J. [jerry_shannon]. 2017, August 3. “Eclipse watching always makes me hungry.” [Tweet]. Retrieved from https://twitter.com/jerry_shannon/status/893117028671913984.

Shannon, J., Bagwell-Adams, G., Shannon, S., Lee, J. S., & Wei, Y. (2018). The mobility of food retailers: How proximity to SNAP authorized food retailers changed in Atlanta during the Great Recession. *Social Science & Medicine*, *209*, 125–135. https://doi.org/https://doi.org/10.1016/j.socscimed.2018.05.046

Stephens, M. (2012). Geographies of Hate. Retrieved May 21, 2019, from https://users.humboldt.edu/mstephens/hate/hate_map.html

Stevens, J. [Jscarto]. 2017, August 2. "’There are no more eclipse maps to make’ Challenge accepted.” [Tweet]. Retrieved from https://twitter.com/jscarto/status/892933635761995780.

Stieglitz, S., & Dang-Xuan, L. 2013. Emotions and Information Diffusion in Social Media—Sentiment of Microblogs and Sharing Behavior. *Journal of Management Information Systems*, *29*(4), 217–248. https://doi.org/10.2753/MIS0742-1222290408

Tyner, J. A. 1982. Persuasive cartography. *Journal of Geography*, *81*(4), 140–144. https://doi.org/10.1080/00221348208980868

Varis, P., & Blommaert, J. 2015. Conviviality and collectives on social media: Virality, memes, and new social structures. *Multilingual Margins*, *2*(1), 31–45. https://doi.org/10.1145/2492517.2492530

Vie, S. 2014. In defense of "slacktivism": The Human Rights Campaign Facebook logo as digital activism. *First Monday*.

Vosoughi, S., Roy, D., & Aral, S. (2018). The spread of true and false news online. *Science, 359*, 1146–1151.

Walker, K. E. (2018). Scaling the Interactive Dot Map. *Cartographica: The International Journal for Geographic Information and Geovisualization*, *53*(3), 171–184. https://doi.org/10.3138/cart.53.3.2017-0021

Weinman, S. 2017. There's a map that shows where you can watch the solar eclipse AND eat Waffle House. Retrieved September 2, 2017, from https://www.golfdigest.com/story/theres-a-map-that-shows-where-you-can-watch-the-solar-eclipse-and-eat-waffle-house

Weller, C. 2017. Mesmerizing Maps Show Where the Most Educated Americans Live. *Business Insider*. Retrieved October 8, 2018 from http://www.businessinsider.com/where-most-educated-americans-live-2017-8.

Wolfe, J. 2017. UGA Professor creates Waffle House eclipse map. Retrieved October 10, 2018, from https://www.11alive.com/article/news/eclipse/uga-professor-creates-waffle-house-eclipse-map/463417274

Wood, D., & Fels, J. 1992. *The power of maps*. New York: Guilford Press.

Wood, D., Fels, J., & Krygier, J. 2010. *Rethinking the power of maps*. New York: Guilford Press.

WSB-TV. 2017. These are the best Waffle House locations to watch the Total Solar Eclipse. Retrieved November 2, 2018, from https://www.wsbtv.com/news/national/hot-topics/these-are-the-best-waffle-house-locations-to-watch-the-total-solar-eclipse/587675825

Zamudio-Suaréz, F. 2017. Want Your Eclipse With a Side of Greasy Hash Browns? This Professor's Got You Covered - The Chronicle of Higher Education. Retrieved August 12, 2017, from http://www.chronicle.com/article/Want-Your-Eclipse-With-a-Side/240911

Zook, M., Shelton, T., Poorthuis, A., Donohue, R., Wilson, M. W., Graham, M., & Stephens, M. 2015. *What would a floating sheep map?* Lexington, KY: Oves Natantes Pres. Retrieved from http://manifesto.floatingsheep.org/

Zook, M. (2012). Mapping Racist Tweets in Response to President Obama's Re-election. Retrieved April 1, 2019, from http://www.floatingsheep.org/2012/11/mapping-racist-tweets-in-response-to.html