

1 RUNNING HEAD: Incivility on Twitter

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5 **Socioeconomic Status, Social Capital, and Partisan Polarity as Predictors of Political**

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**Incivility on Twitter: A Congressional District-Level Analysis**

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20 **Abstract:** Using 414,322 Tweets drawn from 143,404 individual Twitter users located in  
21 all 435 U.S. congressional districts, this study employed big data and automated content  
22 analysis techniques to explore the degree to which socioeconomic status, social capital  
23 potential (i.e., the degree to which a congressional district has the potential for  
24 interconnected citizen networks), and in-district partisan polarization were associated  
25 with incivility on Twitter during the 2012 presidential election. Broadly speaking, and  
26 with some exceptions, the results indicated that election oriented incivility on Twitter was  
27 highest in districts that had low socio-economic status indicators, low levels of social  
28 capital potential, and low levels of partisan polarity. In its sum, this study shows how  
29 large social datasets (i.e., the Census) can be combined with big data to explain social  
30 phenomena.

31

32 **Keyword list:** incivility, big data, Twitter, social capital, 2012 general election,  
33 congressional districts, partisan polarity

34

35 \* Authors contributed equally to this project.

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Over the past two decades, the rapid proliferation of web-based, socially  
interactive digital platforms (i.e., “social media”) has provoked intense exploration of its  
democratic potential (e.g., Freelon, 2013; Gil de Zúñiga, Jung, & Valenzuela, 2012;  
Papacharissi, 2004; Sunstein, 2001; Valenzuela, Kim, & Gil de Zúñiga, 2012). Perhaps  
unsurprisingly, this exploration has yielded fairly sharp debate (e.g., Dahlberg, 2001;  
Davis, 2009; Stromer-Galley & Muhlberger, 2009). Perspectives framing the debate can  
be segmented into two camps. The first perspective holds that the accessible nature of the  
Internet will encourage a relative widening of the public sphere and in so doing, “pave  
the road for a democratic utopia” (Papacharissi, 2004, p. 260). Conversely, the alternate  
perspective suggests that despite its potential, digital technologies simply reinforce  
existing participatory gaps and thereby, “frequently induce fragmented, nonsensical, and  
enraged discussion” (p. 260) that possesses inherently limited democratic value.

As social media has grown, so has the scale of online discourse. For instance, in  
2012, 622 million pieces of original content were generated on Twitter alone (Goel et al.,  
2012). Recent developments in the computer and social sciences have enabled wider  
scholarly access to very large and potentially very rich datasets containing information  
about millions - if not billions - of individual user interactions. Access to these so-called  
big datasets, coupled with increasingly sophisticated analytic tools and approaches, has  
enabled social scientists new avenues for the appraisal of social media’s democratic  
potential. As a means of continuing development in this area, the present study sought to  
explore the degree to which offline factors previously associated with productive offline  
political discussion and debate can be used to predict online behavior. It does so using

1 automated content analysis, which allows the results to be scaled to the proportions  
2 necessary for evaluation of big data.

3 Examination of the literature suggests that offline civic involvement has been  
4 previously associated with a host of contextual factors, including socio-economic  
5 conditions, community heterogeneity, community in/stability, and ideologically-driven  
6 partisan polarization (e.g., Costa & Kahn, 2003; Fiorina & Abrams, 2008; Kang & Kwak,  
7 2003). Building upon this research, the current study set out to explore the relationship  
8 between contextual-level features associated with individual U.S. voting districts and  
9 aggregated (at the district level) political incivility on Twitter. Using a big data sample  
10 consisting of 414,322 tweets (drawn from 143,404 individual Twitter users located in all  
11 435 U.S. congressional districts) relevant to the 2012 presidential election, this study was  
12 specifically interested in the degree to which socioeconomic factors, social capital  
13 potential (i.e., the degree to which a congressional district has the potential for  
14 interconnected citizen networks), and in-district political polarization were related to  
15 civility on Twitter. Notably, and despite the obvious potential for the Internet to both  
16 widen and deepen the public sphere, relatively few studies have attempted to explore the  
17 degree to which web-based platforms such as social media sites *actually* facilitate  
18 meaningful participation throughout the citizenry. As such, this study analyzed citizen  
19 behavior using big data techniques, which offer novel means of addressing questions  
20 relevant to the relationship between social media, society, and democracy as they relate  
21 to political discussion.

## 22 Literature Review

23  
24 *Incivility*  
25

1            Drawn from the Latin word *incivilis* (which can be roughly translated as  
2 *unmannerly, unjust, and, ultimately, unbecoming of a citizen*), incivility refers to a wide  
3 array of behaviors that range from rudeness and name-calling to forcible theft and  
4 hooliganism. In its myriad of forms, civility, as the converse of incivility, is thought to be  
5 central to a well-functioning democracy. For instance, Boyd (2006) argued that  
6 adherence to the principles of civil engagement helps facilitate social interactions.  
7 Civility helps citizens “communicate respect for others and generate habits of moral  
8 equality in the everyday of life of a democracy” (p. 863). Specifically on the topic of civil  
9 communication, Coe, Kenski, & Rains (2014) noted that “commitment to civil discourse  
10 —the free and respectful exchange of ideas—has been viewed as a democratic ideal from  
11 the ancient Athenian forums to the mediated political debates of modern times” (p. 658).  
12 Grand (2014) summarized the importance of civility by simply noting, “democracy  
13 requires democrats” (p. 8).

14            Incivilities manifest in a number of behavioral forms. According to Boyd (2006),  
15 there are two, inter-related connotations of civility. The first of these connotations,  
16 referred to by Boyd as *formal civility*, speaks to the manner and tone in which  
17 interactions are carried out in everyday life. The second connotation, understood as  
18 *substantive civility*, denotes a sense of membership in the surrounding social and political  
19 community. These dimensions are inherently related to one another, as the former (*formal*  
20 *civility*) can be understood as exerting a direct influence on the latter (*substantive*  
21 *incivility*). Specifically, Boyd notes: “civility is a kind of ‘adverbial’ restraint on the civic  
22 language we speak with one another. In the same way that one is enjoined to speak

1 politely, modestly or temperately, the adverbial condition of civility modifies and  
2 qualifies conduct without specifying its content” (p. 864).

3 Modern society is perforated by concerns that the age of civility (if indeed such a  
4 thing ever existed) is in its twilight. Forni (2011), for instance, remarked:

5 *In today's America, incivility is on prominent display: in*  
6 *the schools, where bullying is pervasive; in the*  
7 *workplace, where an increasing number are more*  
8 *stressed out by co-workers than their jobs; on the roads,*  
9 *where road rage maims and kills; in politics, where*  
10 *strident intolerance takes the place of earnest dialogue;*  
11 *and on the Web, where many check their inhibitions at*  
12 *the digital door (par. 1).*

13  
14 Partially in response to such concerns, communication scholars have increasingly begun  
15 to investigate the issue of incivility, particularly as it relates to online political discussion  
16 (e.g., Coe, Kenski, & Rains, 2014; Hmielowski, Hutchens, & Cicchirillo, 2014;  
17 Papacharissi, 2004; Rowe, 2015; Santana, 2014). Operating under the assumption that  
18 computer-mediated civil political discourse is a meaningful component of 21<sup>st</sup> century  
19 political involvement, these studies have focused on the individual user and addressed  
20 topics such as the role of usage patterns relative to behavior (e.g., Hmielowski, Hutchens,  
21 & Cicchirillo, 2014; Papacharissi, 2004), the relationship between media  
22 content/structure and discussion tone (e.g., Borah, 2014; Coe, Kenski, & Rains, 2014),  
23 and the effects of uncivil discussion on issue perceptions (Anderson, Brossard, Scheufele,  
24 Xenos, & Ladwig, 2014). Focus on individual-level attributes through experiments and  
25 surveys helps build a comprehensive understanding on the social effects of incivility. It  
26 generally does not, however, address incivility as a phenomenon that is rooted in larger  
27 surrounding social structure (e.g., such as the socioeconomic factors in which an

1 individual lives). Moreover, these studies tend to address citizen behavior prospectively  
2 rather than when it actually occurs.

3         Accordingly, the goal of this work was to explore the degree to which contextual  
4 factors associated with social life are associated with aggregated patterns of computer-  
5 mediated political incivility. In so doing, this study attempted to empirically investigate  
6 the degree to which factors commonly associated with *substantive* incivility (i.e.,  
7 membership in the surrounding social and political community) can also be used to  
8 describe patterns of *formal* incivility (i.e., the manner and tone in which social  
9 interactions are carried out on Twitter).

### 10 ***Social Media and Civic Participation***

11         Previous research has explored civic participation in the context of social media  
12 use (e.g., de Zúñiga, & Valenzuela, 2012; Johannessen, 2012; Lutz, Hoffman, & Meckel,  
13 2014; Valenzuela, Park, & Kee, 2009). Research in this area has found that social media  
14 can promote civic involvement. In so doing, it can increase public awareness and  
15 optimism about social projects (Marinov & Schimmelfennig, 2015). In a broad sense,  
16 digital media use has bolstered the amount of political talk for those with lower levels of  
17 political interest (Bimber et al., 2015). Those who are generally unmotivated to talk about  
18 politics do seem to talk more when they use digital media to consume news. However,  
19 some debate exists as to where that “talk” takes place, and the degree to which it is  
20 beneficial to society. In a study of newspaper comments during the 2012 general election,  
21 Coffey Kohler, and Granger (2015) found that the majority of online discussion was  
22 uncivil. The commentators described the language as “shocking” and “disappointing,”  
23 and went on to say that the discussion “contained not just insults about the candidates but

1 designations of anyone who supported a candidate” (pg. 262). The authors did find  
2 thoughtful arguments amongst the comments, but were “somewhat pessimistic” as the  
3 degree to which social media can facilitate meaningful political discussion.

4       Indeed, examination of the literature indicates that social media’s potential for  
5 social capital formation and subsequent civic engagement is neither uniform nor  
6 unconditional (Vissers & Stolle, 2014). For instance, some have noted that online  
7 participation varies greatly from person-to-person and from topic to topic (Lutz,  
8 Hoffmann & Meckel, 2014). Yet others have observed that online political participation  
9 is also influenced by number of contextual variables relating to one’s social surroundings  
10 (Coffey, Kohler, & Granger, 2015). By specifically investigating how social, economic,  
11 and political conditions influence aggregate levels of political civility, this study  
12 addresses the latter concern. In so doing, our hope is to add additional clarity to the  
13 rapidly growing (Lutz, Hoffman, & Meckel, 2014) body of literature on political  
14 participation and social media.

#### 15 *Socioeconomic Status*

16  
17       Socioeconomic status (SES) has long been understood as a key predictor of social  
18 cohesion and civic behavior (Boardman & Robert, 2000). As summarized by Oliver  
19 (1999), prior research has consistently indicated that SES factors and civic participation  
20 are linked to one another. Specifically, the “underlying theme throughout these works is  
21 that people who are surrounded by more participators (i.e., the educated and affluent) feel  
22 more social pressure and are given more opportunities to participate themselves” (p. 190).  
23 A number of theoretical perspectives support the notion that the surrounding  
24 socioeconomic climate influences social and political behavior. *Social disorganization*

1 *theory* (Shaw & McKay, 1942), for instance, holds that socio-economic conditions play  
2 an instrumental role in a given community's ability to come together around common  
3 goals and, in so doing, cooperatively address chronic problems afflicting the community  
4 (Aiyer, Zimmerman, Morrel-Samuels, & Reischl, 2014). Specifically, community factors  
5 such as high poverty and unemployment rates limit a community's ability to control and  
6 organize behavior, subsequently resulting in diminished levels of social trust. Relatedly,  
7 classic theoretical approaches centered on *political socialization* (e.g., Hyman, 1959;  
8 Settle, Bond, & Levitt, 2011) hold that more affluent communities allow parents to  
9 devote more resources to child-rearing, particularly as it relates to shaping worldview  
10 constructions, political knowledge sets, and productive political/civic behaviors  
11 (Jennings & Niemi, 1974; McIntosh, Hart, & Youniss, 2007). Comparatively affluent  
12 areas also are more likely to possess primary and secondary school systems that have  
13 more experienced teachers, offer increased opportunities for extracurricular participation,  
14 and feature curricular approaches that include civics education (e.g., Wegner, 1991;  
15 McFarland & Thomas, 2006; Settle, Bond, & Levitt, 2011). Still other models, such as  
16 those describing chronic stress imposed by poverty (e.g., Baum, Garofalo, & Yali, 1999;  
17 Steptoe & Feldman, 2001) hold that low SES status negatively affects physical and social  
18 wellbeing, which in in turn is associated with feelings of powerlessness and poorer  
19 coping skills. Finally, as pointed out Brady, Verba, and Schlozman (1995), a lack of  
20 available resources may inhibit the socioeconomically disadvantaged from perceiving  
21 themselves as stakeholders in the surrounding democratic society and thus such citizens  
22 may be comparatively more inclined to engage in uncivil behavior.

1           Relative to communication behaviors, previous research has found a direct link  
2 between contextual socioeconomic status and uncivil communication practices. In a study  
3 of 400 undergraduate students, Glascock (2014) found that a composite variable  
4 describing (perceived) neighborhood quality was significantly and negatively linked to  
5 the propensity to use verbally aggressive/abusive language. In Brady, Verba, and  
6 Scholzman's (1995) explication of their *political resource model*, the authors found that  
7 resource paucity was associated with a relative lack of the communication and  
8 organizational skills necessary to facilitate productive political discussion. Relatedly,  
9 Dahlgren's notion of *civic culture* (2000; 2003; 2005) suggests that the facets of the  
10 socio-cultural world that constitute pre-conditions for democratic participation influence  
11 all forms of civic and political practice, including those practices related to citizen  
12 engagement in the online public sphere. Together, these studies suggest that online  
13 behavior is inextricably linked to citizens' lived experiences and personal resources  
14 (Dahlgren, 2005). Finally, previous research on structural influences affecting online  
15 political discourse has found sizeable associations between SES indicators and political  
16 knowledge (e.g., McLeod & Perse, 1994; Kwak, Williams, Wang, & Lee, 2005). Political  
17 knowledge, in turn, has been found to influence political discussion in terms of both  
18 frequency and quality (e.g., Cappella, Price, & Nir, 2002; Evelend & Hively, 2009).

19           To establish this link between the two lines of scholarship, SES factors were  
20 included in the current investigation. This is vital because the resources necessary for  
21 civil political discourse tend to be biased toward those in higher SES categories, who  
22 are more likely to have skills such as "a good vocabulary, the ability to communicate in  
23 English, a sense of personal efficacy, the ability to write or speak well, and the cognitive

1 wherewithal to draw on previously existing political knowledge” (Brundige & Rice,  
2 2009, p. 147). Furthermore, if it is indeed the case that citizens who exist in low SES  
3 contexts feel comparatively excluded from the social and political mainstream (Brady,  
4 Verba, & Schlozman, 1995), it logically follows that they would be more likely to  
5 express sentiment that deviates from what is broadly considered civil. Interpreted relative  
6 to the objectives of the current study, then, the above literature suggests that citizens in  
7 low SES districts may be less likely to engage in less-than-civil discussion online.

8         Notably, SES is generally measured using a diverse array of indicators  
9 representing various facets of social life. While there is not universal agreement on the  
10 most precise indicators of socio-economic status, researchers have typically used  
11 measures such as annual household income, education level, and occupational status  
12 (Conger & Donnellan, 2007; Glascock, 2014). Following this research, we employed four  
13 measures of socioeconomic status. First, we suggested that mean household income  
14 would be negatively related to political incivility on Twitter (e.g. Baum, Garofalo, &  
15 Yali, 1999; Shaw & McKay, 1942; McIntosh, Hart, & Youniss, 2007). Second, we  
16 predicted that the education level of the district would be negatively associated with  
17 incivility (e.g. Wegner, 1991; Hyman, 1959). This assumption was rooted in the  
18 perception that college-educated adults are more likely to possess knowledge and skills  
19 relevant to social and political process (and their importance), and thus be more likely to  
20 meaningfully and productively engage in civic activities. Third, we suggested that  
21 districts with high unemployment rates would be associated with increased levels of  
22 political incivility as residents may feel increasingly distressed by their surrounding  
23 economic conditions (e.g. Boardman & Robert, 2000). Fourth, building on emerging

1 body of literature that suggests that access to healthcare is a reliable indicator of  
2 socioeconomic status (e.g., Baum, Garofalo, & Yali, 1999; Heck & Parker, 2002), we  
3 predicted that the percentage of respondents with health insurance would be negatively  
4 related to political incivility on Twitter. These hypotheses are presented below:

5 **Hypothesis 1<sub>a</sub>: Political incivility on Twitter will be negatively related to**  
6 **district income level.**

7  
8 **Hypothesis 1<sub>b</sub>: Political incivility on Twitter will be negatively related to**  
9 **district education level.**

10  
11 **Hypothesis 1<sub>c</sub>: Political incivility on Twitter will be positively related to**  
12 **district unemployment rate.**

13  
14 **Hypothesis 1<sub>d</sub>: Political incivility on Twitter will be negatively related to**  
15 **percentage of citizens in each district with health insurance.**

16

### 17 *Social Capital*

18 The theory of social capital has a long, profound, and varied intellectual history  
19 that includes, but is not limited to, thinkers such as de Tocqueville, Durkheim, and  
20 Bourdieu. At its core, the theory holds that associations in networks of citizens help “to  
21 sustain civil society and community relations in a way that generates trust and  
22 cooperation between citizens and a high level of civic engagement and participation”  
23 (Newton, 2001, p. 201). The theory of social capital presupposes that a civil and engaged  
24 society is based, to no small degree, on individual citizens’ access to “network ties of  
25 goodwill, mutual support, shared language, shared norms, social trust, and a sense of  
26 mutual obligation that people can derive value from” (Huysman & Wulf, 2004, p.1; cf  
27 Ellison, Steinfeld, & Lampe, 2006, p. 7). Broadly speaking, social capital is an elastic  
28 concept that is commonly thought of as both a *cause* and an *effect* (Ellison, Steinfeld, &  
29 Lampe, 2007).

1 Social capital can be compartmentalized into two distinct types: *bridging* capital  
2 and *bonding* capital. As defined by Gittel and Vidal (1998), bridging social capital  
3 refers to ties, primarily weak in nature, that bring together groups of people previously  
4 unfamiliar with one another. Conversely, bonded social capital refers to the type of social  
5 capital, generally predicated upon the existence of strong ties, “that brings closer together  
6 people who already know each other” (p. 15; cf Yuan & Gay, 2006, p.1067). Despite the  
7 semantic association with “weak” and “strong” ties, both types of social capital play an  
8 instrumental role in the maintenance of behaviors (i.e., open exchange of ideas, task-  
9 related research exchange, new knowledge generation, distribution of social support)  
10 necessary for a civil and productive society (Granovetter, 1973; Yuan & Gay, 2006).  
11 Specifically, bonding social capital facilitates in-group cohesion, which facilitates  
12 interpersonal trust and knowledge sharing (Krackhardt, 1992). Alternately, bridging  
13 capital encourages connections between otherwise disconnected networks of people and  
14 helps both “facilitate the exchange of information between distinct groups” and expedites  
15 “the flow of ideas among groups” (Kavanaugh, Reese, Carroll, & Rosson, 2005).

16 Prior research has measured social capital on both individual and aggregate levels.  
17 On the individual level, prior research has operationalized social capital in terms of the  
18 quantity and frequency respondents engage in pro-social civic behaviors (e.g., Blanchard  
19 & Horan, 1998; Onyx & Bullen, 2000), political and organizational participation (e.g.,  
20 Wellman, Haase, Witte, & Hampton, 2001), degree of interpersonal trust (e.g., Lee &  
21 Lee, 2010; Shah, 1998), and life contentment (e.g., Shah, Kwak, & Holbert, 2001). On  
22 the aggregate level, researchers have conceptualized high levels of community-based  
23 social capital as manifest in aggregated composites of individual-level indicators of social

1 capital (e.g., Hendryx, Ahern, Lovrich, & McCurdy, 2002), fraction of the eligible  
2 participation who voted in recent elections (e.g., Chamlin & Cochran, 1995; Rosenfeld,  
3 Messner, & Baumer, 2001), and structural opportunities for community action (Israel,  
4 Beaulieu, & Hartless, 2001).

### 5 *Social Capital Potential*

6

7

8 As the current methodological approach limited our ability to directly measure  
9 social capital, this study was instead primarily concerned with the *potential* for social  
10 capital formation. Social capital is, centrally speaking, concerned with individual  
11 citizens' access to networks built around social trust and norms of reciprocity. It can thus  
12 be reasoned that the presence (or absence) of certain social factors can serve as a conduit  
13 for the formation and maintenance of social capital (in both *bridged* and *bonded* forms).  
14 At least two factors, existing on the contextual level, should encourage the formation of  
15 social capital. First, prior research has shown that racial heterogeneity hampers  
16 relationship building and, thus, is negatively associated with social capital formation  
17 (e.g., Costa & Kahn, 2003; Yuan & Gay, 2006). Second, research has shown that  
18 neighborhood stability allows citizens to form and maintain the networks necessary for  
19 the production of social capital, which therefore acts as a vanguard against uncivil  
20 behavior. Moreover, we reasoned that familiarity with the broader cultural and social  
21 norms that govern local social behavior should encourage social capital formation and  
22 lessen the prevalence of uncivil online communication behavior. Both of these factors are  
23 reviewed in the paragraphs below. <sup>1</sup>

24 Racial diversity simultaneously offers benefits and imposes costs on communities.  
Gurin, Nagda, and Lopez (2004), for instance, found that campus-wide racial

1 heterogeneity was associated with a number of positive outcomes related to on-campus  
2 democratic engagement while Costa and Kahn (2003) argued that racial diversity helps  
3 communities retain “epicurean variety” and resist so-called “urban sprawl” (p. 103).  
4 Perhaps unfortunately, however, racial heterogeneity has been consistently associated  
5 with low levels of community-wide social capital (e.g., Alesina & Ferra, 2002; Costa &  
6 Kahn, 2003; Rupasingha, Goetz, & Freshwater, 2006). According to Yuan and Gay  
7 (2006), the tendency for racial diversity to be associated with low levels of social capital  
8 formation can be explained through a number of inter-related socio-psychological  
9 theories, including *self-categorization theory* (e.g., Turner, 1987), the *similarity-*  
10 *attraction hypothesis* (e.g., Byrne, 1971), and the *theory of homophily* (McPherson &  
11 Smith-Lovin, 1987). Put most simply, these theories hold that “similarity breeds  
12 connections” (McPherson, Smith-Lovin, & Cook, 2001, p. 415) and that society has  
13 embedded within it a “natural aversion to heterogeneity” (Alesina & Ferrara, 2002, p.  
14 225). Building upon this logic, the current study suggested that communities with high  
15 levels of racial fragmentation have lower potential for social capital production as  
16 citizens are likely to exercise natural preferences for homogenization by restricting their  
17 social interactions to densely similar subgroups. We further suggested that such  
18 diminished social capital production potential would be associated with increased levels  
19 of incivility, resulting in the following hypothesis:

20           **Hypothesis 2<sub>a</sub>: High levels of racial heterogeneity will be positively associated**  
21           **with high levels of political incivility on Twitter.**

22  
23           Scholars of community integration and attachment have long noted the negative  
24 relationship between residential mobility and social capital production (Kang & Kwak,  
25 2003). Referred to as the *systems model of community attachment* (Kasarda & Janowitz,

1 1974; cf from Kang & Kwak, 2003), there exists fairly robust empirical support for the  
2 notion that length of residence is positively correlated with interest in local/community  
3 affairs (e.g., Oropesa, 1992), participation in local government/affairs (e.g., Kasarda &  
4 Janowitz, 1974), and the maintenance of local friendships (e.g., Liu, Ryan, Aurbach, &  
5 Besser, 1998). As noted by Kan (2007), “rapid inflows and outflows of residents in a  
6 neighborhood lead to neighborhood instability” (p. 437), which, in turn, results in social  
7 capital deficits. Broadly speaking, the relationship between social capital and residential  
8 stability is multidirectional. Residential outflow results in social capital reduction while  
9 social capital dearths are, themselves, an impetus for neighborhood abandonment. This  
10 study predicted that districts featuring higher levels of residential stability would be more  
11 likely to feature high levels of social capital and, therefore be likely to have diminished  
12 levels of incivility.

13 **Hypothesis 2<sub>b</sub>: High levels of neighborhood stability will be negatively related**  
14 **to political incivility on Twitter.**

15  
16 ***Partisan Polarity***

17  
18 The last two decades have seen increased public and scholarly concern over  
19 partisan polarization in the United States (e.g., Brady & Han, 2006; Campbell, Rockman,  
20 & Rudalevige, 2008; DiMaggio, Evans, & Bryson, 1996; Fiorina & Abrams, 2008).  
21 Much of this research has focused on partisan polarization of elites, relative to the  
22 relationship between elite polarization and the presumed polarization of the electorate  
23 (e.g., Hetherington, 2001). A smaller, but substantive body of research has explored *mass*  
24 *polarization*. Often this research has targeted outcomes such as public opinion and voting  
25 behaviors (e.g., Klinkner, 2004; Klinkner & Hapanowicz, 2005; Nunn & Evans, 2006;  
26 Glaeser & Ward, 2006). Perhaps echoing the larger debate on partisan polarization, there

1 does not seem to be an identifiable consensus on if and how contextual polarization  
2 influences civic and political behaviors (Fiorina & Abrams, 2008).

3 Careful consideration of the available literature does, however, provide some  
4 useful clues for parsing this contradictory evidence, especially in relation to the present  
5 research objectives. For the purposes of the present work, we center our discussion on the  
6 notion that that hotly contested districts (i.e., *swing* or *battleground* districts) are subject  
7 to increased attention from *both* presidential candidates (Goldstein & Freedman, 2010)  
8 and, as such “represent more heterogeneous environments, where people are more likely  
9 to encounter counter-attitudinal messages” (Wolak, 2006, p. 354) both in the form of  
10 interpersonal interactions and political advertisements. Citizens in districts featuring  
11 diminished levels of partisan polarity (as evidenced by their designation as swing  
12 districts) encounter a greater number of election-relevant messages and, therein, a greater  
13 number of messages that may be counter-attitudinal in nature. Indeed, Coffey, Kohler,  
14 and Granger’s (2015) analysis of newspaper comments in battleground states found  
15 evidence that campaign environments tend to intensify levels of online incivility. Other  
16 research has suggested the existence of a *stimulation effect* whereby conflict-inducing  
17 political advertisements (i.e., negative and attack ads) mobilize voter involvement (e.g.,  
18 Goldstein & Freedman, 2002; Lau, Sigelman, Heldman, & Babbit, 1999), particularly as  
19 it relates to attentional resources (Cheng & Riffe, 2008). Specific to social media, Settle  
20 and colleagues (2015) found that citizens in battleground states are more likely to post  
21 election-relevant Facebook content than those in so-called blackout states. Given that  
22 prior scholarship has suggested a relationship between the tone used in political  
23 advertising and the tone used by citizens (e.g., Cho, 2013) and that political advertising

1 has become increasingly negative in nature (Farnam, 2012; Rubenstein, 2014), it stands  
2 to reason that citizens in battleground districts might be prone to engage in comparatively  
3 higher levels of uncivil discourse.

4 Taken as whole, the above research suggests that hotly contested political districts  
5 feature an increased emphasis on the on-hand election. In turn, this stimulates citizen  
6 attention on the election (Cheng & Riffe, 2008; Settle et al, 2015). Given the notions that  
7 the tone of major political campaigns has turned increasingly negative in nature  
8 (Rubenstein, 2014) and that citizen discourse is thought to be sensitive to the tone of the  
9 political messages that dominate the information environment (Cho, 2013), we reason  
10 that district partisan polarity (i.e., highly *uncompetitive* districts) will be negatively  
11 related to uncivil discourse on Twitter:

12 **Hypothesis 3: District partisan polarity will be negatively associated with**  
13 **political incivility on Twitter.**

14

#### 15 **Method**

16

##### 17 ***Retrieving the Data from Twitter***

18

19 Version 1.0 of Twitter's API was called to download relevant Tweets during the  
20 2012 presidential election period. Specifically, the streaming API call was used to  
21 download public messages from Twitter that mentioned the terms "Obama" or  
22 "Romney." The data was collected at a large scale, with a total of 70 million tweets being  
23 collected in all. The collection started on August 1st, 2012 and ended on the Election  
24 Day, November 6th. In all, 465,582 Tweets were collected with GPS coordinates. Here  
25 users disclosed their location at the time the tweet was sent.

26 Version 3 of the Sunlight Foundation's Congress API was used to resolve GPS  
27 coordinates (latitude and longitude) to correct congressional district in which the message

1 came from (Sunlight Congress API, 2014). In total, 414,322 messages from 143,404  
2 Twitter users were successfully resolved to the congressional district in which that  
3 message was sent.

4         Several concerns guided our decision to conduct the current analyses at the  
5 district level. First, given our interest in partisan polarity, the district level was the most  
6 granular level at which we could obtain accurate estimates of voting behavior. Second,  
7 we encountered difficulties resolving user-provided GPS coordinates to more  
8 precise/smaller units of analysis. Third, we had concerns that resolving to the county or  
9 neighborhood level could result in starkly unequal cluster sizes, especially given that  
10 Twitter is more heavily used in urban areas and among younger users (Duggan, Ellison,  
11 Lampe, & Madden, 2015).

#### 12 *The Use of Geotagged Messages from Twitter*

13         For a Tweet to be included in our dataset, a Twitter user must have allowed  
14 message geotagging. Twitter prompts users to make a decision on this, typically once.  
15 Other studies have survived this same limitation and predicted larger general phenomena  
16 successfully, such as infectious disease transmission and breaking news stories (e.g.,  
17 Sadilek, Kautz & Silenzio, 2012; Meyer et al., 2011). In fact, researchers have noted key  
18 advantages of using geotagged data as it pertains to assessing public sentiment on an  
19 issue or event. First, the vast majority of “spam bots” that plague Twitter do not “opt-in”  
20 to geotagging of their Tweets (Guo & Chen, 2014; Thomas, Grier & Paxson, 2012).  
21 Instead they only provide a minimum amount of metadata alongside their tweet.

#### 22 *Pivoting to User*

1           The data was then pivoted by user ID. For each user in the dataset an average  
2 location was derived. If a user sent messages from more than one district, the district in  
3 which the majority of messages originated from was treated as that user’s home district.  
4 For each user, an average incivility score was calculated. This was done to limit any one  
5 user in a district from inflating district level results. Finally, all users for each district  
6 were then averaged, and average incivility scores were created for each district.

### 7 *Census Data*

8           Data from the 2013 American Community Survey (1-Year estimates) was used to  
9 obtain and derive SES and social capital data points for each congressional district  
10 (United States Census Bureau, 2014). This data was collected in 2012, during the time of  
11 the election period.

### 12 *Measures*

13  
14           *Incivility.* Incivility was the criterion measure in the current study. Given the size  
15 of the data, the corpus could not be manually annotated. The researchers employed  
16 computer-assisted content analysis to derive incivility scores using Python. A script was  
17 written to process the wordlists and to develop incivility scores for the unit of analysis  
18 (a.k.a. a Tweet). It processed the list and detected the presence of words in the lists in the  
19 Tweets.

20           Not unlike inter-coder agreement with manual content analysis, “algorithms and  
21 dictionaries must often be repeatedly revised and tweaked to improve their performance”  
22 (Zamith & Lewis, 2015, pg. 4). This iterative process only concludes when the analysis  
23 yields a satisfactory level of construct validity. This is assessed when the researcher  
24 evaluates the algorithmic coder against the same coding decisions humans. In this case,

1 two coders both must agree with each other to establish “gold standard” data. Then, the  
2 computer and the humans must agree at an acceptable level. Here, given the blatant  
3 nature of incivility in Twitter messages, human-to-human agreement of the two coders  
4 produced no errors.

5 Finally, the researchers draw attention to the point that once a computer has been  
6 verified to be valid, it will be also be reliable, as computers are persistent and consistent  
7 and not prone to human error. Thus, calculating reliability is not necessary (Riffe, Fico &  
8 Lacy, 2014; Zamith & Lewis, 2015).

9 The authors proposed that incivility manifests in one or more of the following  
10 forms: name-calling, aspersion, lying, vulgarity, and pejorative speech. Similarly,  
11 Santana (2014), defined incivility as having nine key components: (1) name calling; (2)  
12 threats; (3) vulgarities; (4) abusive or foul language; (5) xenophobia; (6) hateful  
13 language, epithets or slurs; (7) racist or bigoted sentiments; (8) disparaging comments on  
14 the basis of race/ethnicity; and (9) use of stereotypes.

15 In the current study, we adopted Santana’s definition (with some modifications)  
16 of incivility as it broadly encompassed the conceptual approaches used by Papacharissi  
17 (2004) and Coe, Kenski, and Rains (2014) while also including constructs potentially  
18 relevant to the 2012 presidential election. An initial, manual scan of 800 Tweets revealed  
19 that 8 of the 9 concepts were present in Tweets. Xenophobia was not present in this scan  
20 and did not appear to be relevant to the election. The researchers then leveraged two  
21 wordlists that are regularly used to detect concepts (2), (3), (4), (6), (7) and (8) on short  
22 informal text on the web. Google’s “bad word list” and ClueBot’s “insult list” have been  
23 used by dozens of machine learning data scientists seeking to automatically detect insults

1 in social commentary (Mueller, 2012). “Strong words” have been shown by others to be  
2 the most effective search terms. For instance, prior research has found that terms such as  
3 “idiot” and “moron” were strong predictors of incivility (Coffey Kohler and Granger,  
4 2015). No clear wordlists existed for concepts (1) and (5). As such they were derived  
5 during the manual content analysis.

6 Starting with over 600 words that been linked to concepts encompassed by  
7 incivility, the researchers proceeded with four rounds of manual content analysis. 800  
8 random tweets were pulled from the dataset. Each tweet was scored for incivility using  
9 the initial wordlists. A Python script took stemmed words and looked for a combination  
10 of windowed and unwindowed matches. The score was calculated by adding the number  
11 of words that appeared in that Tweet. In addition, when the matching word was in  
12 uppercase, or when the message contained an exclamation point, Tweets were boosted by  
13 an additional point, as most affective boosting tools similarly do (Thelwall, 2010). The  
14 researchers read each message and (1) verified that the words flagged were indeed incivil  
15 (2) scanned the message to see if any additional words in the Tweet were incivil, but  
16 undetected and (3) verified that the overall score was correct. In cases where (1) was  
17 incorrect, the researchers altered the keywords (i.e., adding a word window around “hell”  
18 so “hello” was not detected). When (2) was incorrect, the researchers added the  
19 appropriate keyword. In all cases (3) was satisfied and verified that the Python code was  
20 programmed correctly. This process was performed four times; each time the keyword  
21 list was adjusted. After each iteration the incivility measure improved across (1) and (2).  
22 The final percent agreement with the manual annotations was 98.5% for (1) and 98% for  
23 (2). In all, the researchers were left with a list of 650 keywords that addressed all 8

1 concepts that are encompassed by incivility. While this wordlist is powerful on the corpus  
2 at hand, its validity is likely limited to the context of the 2012 election, specifically short  
3 informal text that mentioned either Obama or Romney. In all, we found that “bad words”  
4 were not the only type of incivility that was found in text. In fact, out of the box, the  
5 wordlists were not sufficient.

6 As a result of these procedures, a single index was created. Each user was  
7 assigned an average incivility score based upon their “normal” pattern of interaction.  
8 These scores ranged from 0 (completely civil) to 23.00 (highly incivil). To establish  
9 criterion validity, we next explored the degree to which the presently derived construct  
10 correlated with user-averaged arousal and sentiment. Arousal and sentiment are  
11 commonly identified constructs; thus we were able to use existing, previously validated  
12 classification schemes. As such, sentiment and arousal were coded with the same  
13 parameters recommend by Vargo (2014). Our expectation was that incivility should be  
14 negatively associated with sentiment and positively correlated with arousal. In both cases,  
15 bivariate correlations were in the direction expected (sentiment,  $r = -.22, p < .01$ ; and  
16 arousal,  $r = .08, p < .01$ ).<sup>2</sup>

17 Finally, using the mean individual scores assigned to each user, we then  
18 calculated a mean incivility score for each congressional district. Figure 1 provides a  
19 visual representation of the average incivility scores associated with each U.S.  
20 congressional district.<sup>3</sup>

21 INSERT FIGURE 1 ABOUT HERE

22  
23 *Socioeconomic status indicators.* SES factors of interest in the current study  
24 included mean annual household income in each congressional district, the percent of

1 individuals in each district with a bachelor's degree or higher, district unemployment rate  
2 (represented as a percentage of the total workforce), and percent with of the district with  
3 health insurance.

4 *Social capital potential indicators.* Based upon the literature, two factors relevant  
5 to each district's potential for social capital were employed: racial heterogeneity and  
6 residential tenure. Residential tenure was conceptualized as the percent of the population  
7 with more than 12 years of tenure in their current residence. Racial heterogeneity was  
8 calculated at the district level using the index previously employed by Costa and Kahn  
9 (2003). The measure was calculated as

$$10 \quad \text{Heterogeneity} = 1 - \sum_k s_{ki}^2$$

11 where  $k$  represents the number of racial categories recorded in the Census dataset (white,  
12 black, American Indian, Asian, more than one race, and other) and  $s_{ki}$  represents the share  
13 of each racial category in voting district  $i$ . The measure returned values between 0 and 1  
14 with larger values representing greater heterogeneity.

15 Notably, the structure of the Census data framed the operationalization of some of  
16 these variables. For instance, the response categories associated with residence tenure  
17 were "Moved in 2010 or later," "Moved in 2000 to 2009," "Moved in 1990 to 1999" and  
18 so on. Judging that the formation of meaningful social capital with one's neighbors would  
19 be an involved process that could, conceivably speaking, take more than four years, we  
20 used a somewhat conservative approach to formation of the residence tenure variable.

21 *District polarity.* District polarity was assessed using a modified version of  
22 Cook's Partisan Voting Index (PVI; Wasserman, 2013). The PVI is based upon the  
23 district's voting behavior in the previous two presidential elections (2008 and 2012).

24 Although the Twitter data was harvested before the 2012 election, we nonetheless used

1 the results of the 2012 election as part of this measure because, we reasoned, it provided  
2 an accurate depiction of the polarization climate within the district at the time of data  
3 collection. Without modification, the PVI describes the direction (i.e., R or D) and  
4 magnitude of partisan polarity in each district relative to the nation as a whole. The PVI  
5 was calculated as

$$6 \quad PVI = \left( \frac{pA + pB}{2} \right) - \left( \frac{PA + PB}{2} \right)$$

7  
8 where  $pA$  represents the percentage of the two-way presidential vote that Obama  
9 received in the district in 2008,  $pB$  represents the percentage of the two-way vote that  
10 Obama received in the district in 2012,  $PA$  represents the percentage of the two-way  
11 national vote that Obama received in 2008, and  $PB$  represents the percentage of the two-  
12 way national vote that Obama received in 2012. A large positive value suggested that the  
13 district was polarized in favor of the Democratic Party while a large negative value  
14 suggested polarization in favor of the Republican Party. Values near 0 were indicative of  
15 a relative lack of partisan polarity. As the current study was interested in assessing  
16 partisanship magnitude *irrespective* of party affiliation, we took the absolute value of  
17 each district's PVI value. The measure thus returned a value that described district-level  
18 polarity irrespective of the party towards which such polarity trended toward.

19 *Control variables.* All hypotheses tests controlled for a number of potentially  
20 confounding factors. First, as there are substantial differences in district population sizes  
21 across the US, we controlled for number of inhabitants in each district. The median age  
22 of each district was controlled for, as Twitter use is heavier among younger users.  
23 Similarly, the percent of urban inhabitants was similarly controlled for, as Twitter users  
24 tend to reside in urban areas (Duggan, Ellison, Lampe, Lenhart, & Maden, 2015). Finally,

1 the effects of number of users and average Tweets per user in each district were  
2 accounted for as a means of ensuring that the incivility measure was not upwardly biased  
3 by districts that housed a comparatively small number of infrequent but highly incivil  
4 Twitter users.

5 Descriptive statistics for each measure are provided in Table 1. Zero-order  
6 correlations for all of the variables included in the hypotheses tests are shown in Table 3.

7 INSERT TABLE 3 ABOUT HERE

8 INSERT TABLE 4 ABOUT HERE

### 9 *Results*

10 Hypotheses H1 – H3 were tested using hierarchical OLS regression. Classes of  
11 independent variables (i.e., social economic status indicators, social capital potential  
12 indicators, and district-wide partisan polarity) were examined both individually and in  
13 conjunction with one another.

14 Hypotheses 1<sub>a-d</sub> were broadly concerned with the relationship between district SES  
15 status and Twitter incivility. The data indicated that the mean household income was a  
16 positive predictor of incivility on Twitter ( $\beta = .25, p < .01$ ) in the model including only  
17 the SES indicators; however, this relationship disappeared in the all-entry model. Given  
18 that we predicted a negative relationship between annual household income and incivility  
19 on Twitter, no support for Hypothesis 1<sub>a</sub> was observed.

20 Percent of users in each district with a bachelor's degree or higher was a negative  
21 and significant predictor of incivility on Twitter in both the SES-only and all-variable  
22 models ( $\beta = -.62, p < .001$  and  $\beta = -.50, p < .001$ , respectively), thus Hypothesis 1<sub>b</sub> was  
23 supported.

1           Unemployment rate was positively and significantly related to incivility in the  
2 SES-only model ( $\beta = .20, p < .001$ ). However, this relationship disappeared in the all-  
3 variable model. Thus, no support was found for Hypothesis 1<sub>c</sub>.

4           Finally, the percent of the district with healthcare insurance was not related to  
5 Twitter incivility in either the SES indicator model or in the all-entry models.  
6 Accordingly, Hypothesis 1<sub>d</sub> was not supported.

7           Hypothesis 2<sub>a</sub> suggested that ethnic heterogeneity would be positively associated  
8 with uncivil communication on Twitter. As seen in Table 3, ethnic heterogeneity was  
9 positively and significantly related to incivility on Twitter when examined both  
10 individually ( $\beta = .32, p < .001$ ) and after controlling for the effects of all other  
11 independent variables ( $\beta = .28, p < .001$ ); therefore, Hypothesis 2<sub>a</sub> was supported.

12           Hypothesis 2<sub>b</sub> suggested that residential tenure would be negatively related to  
13 incivility on Twitter. In the model consisting only of the control variables and social  
14 capital indicators, the residential tenure measure was related to incivility but in the  
15 opposite direction expected,  $\beta = .16, p < .01$ . This relationship remained significant after  
16 controlling for the effects of all other independent variables,  $\beta = .13, p < .05$ . Thus,  
17 Hypothesis 2<sub>b</sub> was not supported.

18           Finally, Hypothesis 3 suggested that districts with lower levels of partisan polarity  
19 would yield higher levels of uncivil Twitter activity. As seen in the polarity-only model,  
20 the relationship between partisanship and incivility was not significant. However, after  
21 controlling for the influence of the SES and social capital indicators, there was a negative  
22 and significant relationship between district partisanship and political incivility on

1 Twitter,  $\beta = -.18$ ,  $p < .001$ . This result was generally supportive of Hypothesis 3. Table 3  
2 provides full description of the above-delineated results. <sup>4</sup>

3 INSERT TABLE 3 ABOUT HERE

4  
5 **Discussion**

6  
7 Using a big data approach, the present study drew upon a corpus of nearly 70  
8 million tweets posted around the time of the 2012 presidential election. Given the scale of  
9 the data under consideration, this study developed and applied a computer-automated  
10 technique for the identification of online incivility. The present work also combined  
11 thousands of data points from the U.S. Census and voting outcomes from each U.S.  
12 district to explore the relationship between physical context and online behavior. In a  
13 broad sense, this study shows how social media data can be used in concert with  
14 traditional data to explain behaviors on a large scale.

15 Specifically, we investigated the relationship between district-level SES, social  
16 capital, and partisanship characteristics and the average amount of Twitter incivility that  
17 emanated from each U.S. congressional district. The currently observed results suggest  
18 that online incivility is positively associated with racial heterogeneity and negatively  
19 associated with district-wide education level and partisan polarity. When considered  
20 jointly, education level ( $\beta = -.50$ ) emerged as the strongest predictor of district-wide  
21 incivility, followed by racial heterogeneity ( $\beta = .28$ ) and partisan polarity ( $\beta = -.18$ ).

22 There are a number of implications that stem from the current results. First, the  
23 strong relationship between district-wide education level and political incivility on  
24 Twitter is congruent with previous research, which has repeatedly identified education as  
25 an antecedent to political participation (e.g., Muhlberger, 2004; Verba, Scholzman, &

1 Brady, 1995). Indeed, our results would seem to concur with the notion that “educational  
2 attainment is the primary mechanism behind many citizenship characteristics” (Hillygus,  
3 2005, p. 25). Notably, prior research on political discussion has generally sought to  
4 associate education with mere involvement. Our results indicate that educational  
5 attainment may influence both the quantity/frequency of political discussion and the  
6 *quality* of such discussion.

7         Second, our results suggest that the social resources obtained offline (such as  
8 social capital) may be tied to the individual and social value gained from online  
9 engagement. While it may be the case that the Internet has the potential to fulfill social  
10 needs and enrich individual lives, it may also be the case that factors resultant in  
11 individual citizens’ lived experiences may actively inhibit such potential. While previous  
12 research has explored this from a knowledge acquisition standpoint (*the rich get richer*  
13 *hypothesis*; see Brundidge & Rice, 2010, for review), our results suggest that the Internet  
14 may also play host to a *civility divide*. In other words, those equipped with economic and  
15 social privilege in the offline realm may disproportionately gain value from online  
16 deliberation while those with diminished economic and social resources may be relegated  
17 to a hostile, uncivil, and ultimately, less rewarding strata of the Internet.

18         Taken as a whole, the initial evidence presented here suggests that the tenor of  
19 online political discussion is generally reflective of the broader social, cultural, and  
20 partisan contexts within which users physically reside (e.g., Dahlgren, 2005).  
21 Specifically, our analyses suggested factors that have been previously associated with  
22 offline incivility (i.e., racial heterogeneity and low levels of college education among the  
23 population), can similarly be correlated with online incivility. Understood in its broadest

1 sense, our findings seem to offer support for theoretical perspectives that connect online  
2 behavior with lived experience. Moreover, in regards to the online potential of social/new  
3 media, these findings mirror others (e.g., Albrecht, 2006; Baek, Wojcieszak, & Delli  
4 Capini, 2011) in their suggestion that online deliberation cannot, alone, overcome the  
5 systematic inequalities that have traditionally structured political involvement.

6 Our results suggested that incivil discourse was highest in districts that were  
7 characterized, in part, by factors traditionally thought to be indicative of a healthy and  
8 diverse democracy (i.e., low levels of partisan polarity and high levels of racial diversity).  
9 Clearly, these findings do not suggest that society is forced to choose between *either* a  
10 civil democracy *or* a well functioning one. High levels of unconstrained and unfocused  
11 incivility are unlikely to yield the type of social cohesion and ideological compromise  
12 necessary for the continued and virile existence of the democratic state. That said, the  
13 present results suggest that there may be something of a misalignment between the  
14 idealized notion of democracy and its functional enactment.

15 Notably, we failed to either fully or partially support a number of our hypotheses.  
16 In some cases, such as those hypotheses related to SES status, it could be that a single  
17 indicator (i.e., education level) served as the optimal representative of the on-hand  
18 phenomenon and, therefore, explained a bulk of the variance. In other cases, it could be  
19 that variable inter-relationships are highly conditional in nature. For instance, we found  
20 that residential tenure was positively - rather than negatively - related to incivility,  
21 suggesting that, in some cases, floating populations and inflows of new residents might  
22 actually serve as a dynamic force *for* civil discourse.<sup>5</sup> Future research should seek to  
23 explicitly and rigorously explore the degree to which social and economic factors exert

1 moderating influences on the relationship between factors such as social capital, partisan  
2 polarity, and uncivil communication practices on Twitter.

3         A number of limitations temper the present findings. First, the nature of the data  
4 severely limits the generalizability of our findings. The source of data here, Twitter, is, at  
5 best, an instantaneous measure of behavior, not a durable measure of emotion or feelings  
6 (Vieweg, 2010). Moreover, Twitter cannot be reasonably understood to be a directly  
7 reliable proxy for public opinion in general. Moreover, the corpus here was limited to a  
8 specific event, the 2012 general election. The messages gathered in this analysis were  
9 also directed at a specific political candidate (e.g., Obama and/or Romney). While the  
10 findings still yield important conclusions toward discourse, democracy and general  
11 elections, we cannot use the current results to make generalizations about the state of  
12 political discussion as a whole (either *on* or *off* of Twitter).

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### Endnotes

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2  
3 1. *Potential* could be interpreted in a number of ways. For instance, high levels of racial  
4 heterogeneity could present the *potential* for citizens to build ties with members of a  
5 number of different racial groups. However, in the present study, we interpreted potential  
6 in terms of factors previously shown to *empirically* affect the production and  
7 maintenance of social capital on the community/contextual level.

8  
9 2. Reported correlations are from the disaggregated data set ( $n = 143,404$ ) before GPS  
10 resolving.

11  
12 3. Although researchers have previously outlined some advantages to use of geotagged  
13 Twitter data (e.g., Guo & Chen, 2014; Thomas, Grier & Paxson, 2012) questions relative  
14 to the degree that the geotagged subsample replicated the larger sample were addressed  
15 before proceeding to hypothesis testing. As the current sample was a subsample of a  
16 larger body of tweets on the 2012 election (over 70 million tweets from more than 11  
17 million users), we were able to compare the characteristics of the geotagged subsample to  
18 the larger sample comprised of those users who opted out of geotagging. Comparative  
19 examination of the raw individual-level data contained in each dataset suggested that the  
20 distributional characteristics of the incivility variable were quite similar across samples  
21 (geotagged sample:  $M = 0.25$ ,  $SD = 0.52$ , skewness = 6.01, kurtosis = 88.73; non-  
22 geotagged sample:  $M = 0.24$ ,  $SD = 0.66$ , skewness = 7.46, kurtosis = 110.98). Next,  
23 given the potentiality that better educated people may be more likely to opt-out of  
24 geotagging (e.g., Hargitti, 2002; Min, 2002; Peter & Valkenburg, 2006), we performed a  
25 series of basic analyses to ensure that socioeconomic factors did not confound our results.  
26 Using the aggregated (i.e., district-level) dataset, we calculated a variable that represented  
27 the percentage of geotag-enabled user accounts (i.e., total number of users per district in  
28 the current subsample) relative to the overall population. Percentages ranged from 0.01%  
29 to 0.20% ( $M = 0.05\%$ ,  $SD = 0.02\%$ ; skewness = 2.14, kurtosis = 8.44). We next  
30 correlated this variable with socioeconomic (percent of district with bachelors degree or  
31 higher, unemployment rate, mean household income, and percent with health insurance)  
32 and control factors (median district age and urbanicity). Here we identified a positive  
33 correlation with education ( $r = .27$ ,  $p < .01$ ), a negative correlation with median district  
34 age ( $r = -.14$ ,  $p < .01$ ), and a positive correlation with urbanicity ( $r = .23$ ,  $p < .01$ ). All  
35 other relationships were non-significant at  $p < .05$ . Finally, we estimated a series of  
36 nested OLS regression that employed incivility as the criterion. In the first model, we  
37 assessed the effects of control and socioeconomic factors. In the second model, we added  
38 the variable representing the percentage of geotag-enabled user accounts relative to the  
39 overall population. The results of these analyses suggested that addition of the latter  
40 variable had a negligible overall effect on the relationship between socioeconomic status  
41 and civility, thus leading us to conclude while the decision not to opt out of geotagging  
42 may be connected to socioeconomic status, this relationship should have a generally  
43 negligible effect on the hypotheses of interest in the current study.

44  
45 4. Due to the strong correlation between the income and education measures ( $r = .88$ ; see  
46 Table 2), the SES-only and all variables models (Table 3) possessed relatively high levels

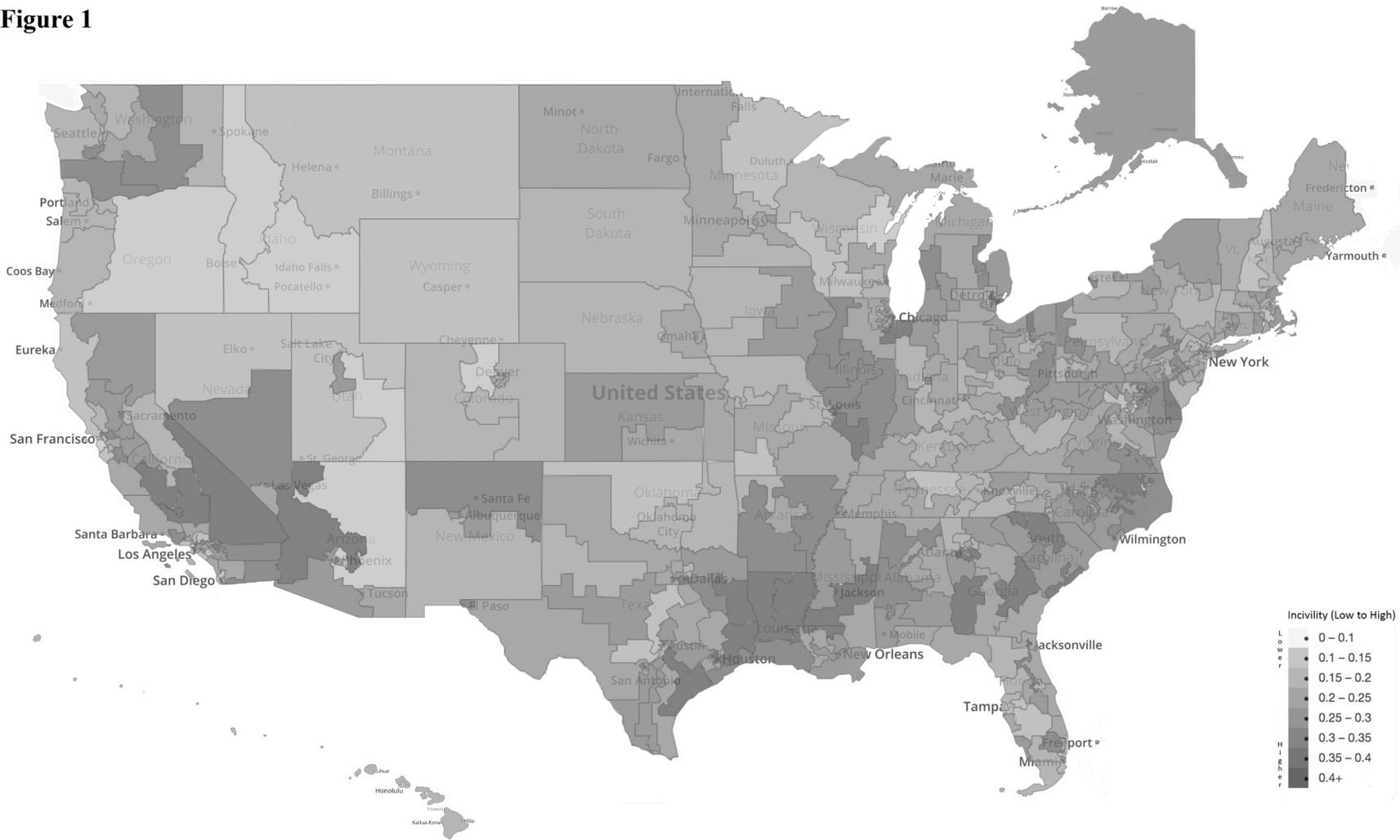
1 of multicollinearity. Removal of the household income measure from these models did  
2 not meaningfully impact either the patterns of significance (including direct and  
3 relationship strength) or the amount of variance explained in the criterion variable.  
4 Moreover, the highest observed VIF coefficient was well below the commonly employed  
5 heuristic of 10.00 (e.g., O'Brien, 2007). As such, the models were presented in the  
6 initially hypothesized form.

7  
8 5. Supplementary OLS moderation analyses failed to indicate that SES factors exerted a  
9 moderating influence on the relationship between neighborhood tenure and uncivil  
10 discourse on Twitter. However, this finding may due to the relative lack of granularity in  
11 our unit of analysis. Future research should explore this relationship using neighborhood  
12 level data.

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**Figure 1**



Visual representation of Twitter incivility in each U.S. congressional district  
An interactive version of this map can be viewed on [chrisjargo.com/incivility](http://chrisjargo.com/incivility)

1

**Table 1**

*Descriptive statistics for items included in analyses*

Indicator	Range	M	SD	Skewness	Kurtosis
District Population	523,170 – 1,015,165	725,246.87	36,620.59	0.48	15.09
Median Age	27.70 – 52.30	37.82	3.65	0.20	0.76
% Urban	23.51 – 100.00	80.72	19.01	-0.75	- 0.53
Number of Users	82 -1,436	329.66	158.13	2.11	8.16
Avg. Tweets Per User	1.53 – 7.08	2.84	0.76	1.96	5.65
Ethnic Heterogeneity	0.06 - 0.75	0.38	0.16	0.11	- 1.00
Residence Tenure (%)	13.84 – 50.70	31.94	6.30	0.00	- 0.31
Household Income (\$)	36,896.00 - 155,093.00	73,564.20	19,989.20	1.36	2.17
Unemployment Rate (%)	2.60 – 19.10	8.54	2.48	0.83	0.12
% with Bachelor Degree/Higher	8.30 – 69.16	29.26	10.18	0.87	0.79
% with Healthcare Coverage	61.53 – 97.39	85.48	5.71	0.12	1.52
Partisan Polarity	0.02 – 44.00	12.50	8.96	0.91	0.42
Average Incivility	0.09 – 0.53	0.28	0.08	0.37	0.16

2

3

1  
Table 2

*Zero-order correlations between items*

	1	2	3	4	5	6	7	8	9	10	11	12	13
District Population (1)		-.17***	.14**	.12*	.00	.13**	.15**	-.10*	-0.06	.15**	-.26***	.04	-.11*
Median Age (2)			-.34***	-.16**	.11*	.16**	.14**	-.21***	.50***	-.50***	.48***	-.37***	-.20***
% Urban (3)				.25***	.01	.42***	.45***	.17***	-.18***	.59***	-.39***	.16**	-.05
Number of Users (4)					-.05	.09	.29***	.12*	.04	.29***	-.15**	.28***	.00
Avg. Tweets Per User (5)						.08	.07	-.11*	.04	-.06	-.16**	.03	-.12*
Household Income (6)							.88***	-.44***	.43***	.14**	.03	-.16**	-.34***
% Bachelor Degree/Higher (7)								-.46***	.47***	.13**	-.09	-.07	-.42***
Unemployment Rate (8)									-.44***	.47***	-.10*	.31***	.39***
% with Healthcare Coverage (9)										-.37***	.50***	-.31***	-.24***
Ethnic Heterogeneity (10)											-.34***	.44***	.21***
Residence Tenure (11)												-.19***	.08
Partisan Polarity (12)													.03
Incivility (13)													

Note: \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

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**Table 3**

*Standardized coefficients describing relationship between social capital potential indicators, SES status indicators, partisan polarity, and Twitter incivility*

<b>Variable Name</b>	<b>Controls Only</b>	<b>SES Indicators</b>	<b>Social Capital</b>	<b>Partisan Polarity</b>	<b>All Variables</b>	<b>VIF (All Variables Model)</b>
District Population	-.14**	-.07	-.12*	-.14**	-.07	1.13
Median Age	-.25***	-.13*	-.20***	-.26***	-.13*	1.99
% Urban	-.11*	.05	-.21***	-.11*	-.01	2.34
Number of Users	.00	.10*	-.04	.01	.10*	1.45
Avg. Tweets Per User	-.09	-.06	-.05	-.09	-.02	1.12
Household Income		.25**			.08	5.89
% Bachelor Degree/Higher		-.62***			-.50***	7.76
Unemployment Rate		.20***			.11	2.43
% with Healthcare Coverage		.10			.05	2.57
Ethnic Heterogeneity			.32***		.28***	2.82
Residence Tenure			.16**		.13*	2.14
Partisan Polarity				-.04	-.18***	1.48
<i>R</i> <sup>2</sup>	.08	.27	.15	.08	.32	
<i>ΔR</i> <sup>2</sup> (Rel. to Controls Only)		.19***	.07***	.001	.24***	
<i>F</i>	(5, 429)= 7.41 <i>p</i> < .001	(9, 425)= 17.45 <i>p</i> < .001	(7, 427)= 10.72 <i>p</i> < .001	(6, 428)= 6.28 <i>p</i> < .001	(12, 422)= 16.26 <i>p</i> < .001	

*Note: \* p < .05; \*\* p < .01, \*\*\* p < .001*

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**Author Biographies**

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