**Revision Memo**

Who is Curating My Political Feed? Characterizing Political Exposure of Registered U.S. Voters on Twitter

(RA-IJPP-Nov-2022-231.R1)
May 28, 2023

We are grateful for the opportunity to revise our manuscript, and thank the Editor and Reviewers for their careful considerations of our submission. Below, we detail the work we completed to address the comments in the order in which they appear in the referees’ report. The reviewers’ comments appear in bold text and our responses are in plain text. Where relevant, we also include new text from our revised manuscript, highlighted in yellow. Our revised submission includes three main revisions:

**(1)** **Clarity of the paper’s research questions and contributions:** Following several reviewers’ suggestions, we have significantly streamlined and clarified the paper’s introductory sections. The revised manuscript now introduces our main research questions earlier in the text. By robustly answering these research questions, we are able to pay greater attention to articulating our original contributions.

**(2) Data, research design, and results**: We incorporated several of the reviewers’ suggestions to clarify our description of the data, research design, and results. Our revisions include clarifications of the limitations of our data and design, and of our original contributions in relation to the existing literature. We include several new supplementary analyses in response to the reviewers’ insightful questions and suggestions, with attention to the balance between new text in the body of the manuscript and the contents of the Appendixes. Our revisions have focused on making a contribution to the full spectrum of the IJPP intellectual community, i.e., the readership of a leading generalist journal that includes both quantitative-oriented scholars interested in technical statistical documentation and scholars involved in making cutting-edge contributions to theory. We also prepared fully transparent replication files (anonymized data and code) for all analyses documented in the revised manuscript. As noted in our “Data and materials availability” statement, we are prepared to share these materials in a public GitHub repository and the Harvard Dataverse to accompany the published article.

**(3)** **Discussion of implications and contributions for next-step research:** We expanded the discussion of the implications of our study’s findings and added more details regarding our contributions to next-step research. We also noted the theoretical and empirical contributions of our study notwithstanding the recent changes to Twitter.

We appreciate the opportunity to implement these revisions and are prepared to respond quickly and thoroughly to any additional comments in response to this resubmission.

## Reviewer: 1

**Comments to the Author**

**The manuscript “Who is Curating My Feed? Characterizing Political Exposure of Registered U.S. Voters on Twitter” contributes to the literature investigating political communication on social media, specifically identifying distinctive groups of U.S. voters using Twitter based on their potential exposure to political content and the demographic composition of these groups. Based on a large-scale sample of Twitter accounts matched to voter registers, the authors investigate the types of actors and tweets followed and potentially seen identifying eight clusters of users, distinguish the source and direct/indirect channels of potential exposure to politics, and classify the age, gender, racial, political makeup of the clusters.**

=> Thank you for this thorough summary of the paper and its contributions.

**The study and manuscript exhibit a rigorous execution with the potential to add important knowledge to the literature, though some improvements need to be made to provide the reader with a comprehensive framework and an understanding of the contributions made beyond the immediate case studied.**

=> We agree that improvements were needed to provide the reader with a clearer framework for understanding the study’s contributions and potential generalizability. The reviewer’s suggestions for how to achieve this are greatly appreciated. We detail below how we addressed each comment in turn.

**First, while the writing overall is rigorous and comprehensive, the key section on “The Importance of Political Exposure Online and on Social Media” seems somewhat haphazard. Presumably, the section is intended to motivate the focus on exposure to political content on Twitter generally and distinction of different types of sources for this content. For the first aim, however, the section only discusses incidental exposure which at best covers a subset of the content analyzed as it comes from accounts users follow intentionally and even then only references one meta-analysis. More literature should be drawn in here, in particular, work covering (self-)curated exposure.**

=> We agree that this key section early in our paper (“The Importance of Political Exposure…”) required revision. As a result, we followed the reviewer’s suggestion to revise the text to more clearly shift the focus on exposure to political content. We appreciate the comment about the need to go beyond discussing incidental exposure and discuss additional literature on (self-)curated exposure. Our revised text goes beyond relying on a single meta-analytic study to review additional literature on exposure, including self-curated exposure. The relevant revised text reads as follows (pp. 3–4):

“Numerous studies show that online political exposure and information consumption on social media are related to political attitudes and behaviors, both online and offline. For example, Valeriani and Vaccari (2016) found that accidental exposure to information on social media is positively associated with online political participation in multiple national contexts. A recent meta-analysis concluded that incidental exposure, an unintended form of exposure that is common on social media, is positively associated with a variety of pro-democratic attitudes and behaviors, including news use, political knowledge, political participation, expressive engagement, and political discussion [(Nanz and Matthes, 2022)](https://www.zotero.org/google-docs/?Xw5WQL). Weeks et al. (2017) further found that counter-attitudinal incidental exposure on social media drove processes of selective exposure among stronger partisans, which subsequently led to greater political information-sharing. In contrast, overreliance on the news found on social networks is negatively associated with important socio-political indicators of political knowledge, political interest, and voting (Gil de Zúñiga et al., 2019).”

**For the second aim, the section should be revised to more clearly speak to the specific account / source qualities analyzed. The term identity is used too generically without distinguishing among the relevant dimensions: party identity, peer v opinion leader, organization v individual. Generally, the section needs to be revised to more clearly motivate the focus on political Twitter content and the investigated dimensions of source characteristics.**

=> We appreciate the reviewer’s observation about this terminology. We have fully revised the relevant text to remove the term “identity,” which we agree we used imprecisely. The revised text instead draws more extensively on Thorson and Wells’ (2016) discussion of the relevant actors for the process of curation. The relevant revised text is (pp. 4–5):

“Several recent studies informed by Thorson and Wells’ curated flows framework have shown that the impact of political messaging also depends on the type of actor delivering it, as the same political message received from different types of sources may have divers impacts on attitudes and behavior. For example, recent research has indicated that statements by celebrities and online influencers seem to affect the public’s real-world beliefs compared to similar statements by non-celebrities [(Alatas et al., 2019; Alrababa’h et al., 2021; Suuronen et al., 2021)](https://www.zotero.org/google-docs/?YXhlxR). Regarding media sources, research has shown that high levels of exposure to media outlets with high levels of political content shape political knowledge and behavior, including the propensity to vote [(de Vreese and Boomgaarden, 2006)](https://www.zotero.org/google-docs/?CHYeJh). Research by Graham et al. [(2015)](https://www.zotero.org/google-docs/?oMoBRy) into peer networks showed that over half of the political discussions in online forums in the United Kingdom led to at least one political action. The importance of the clear identification of actors is evident in Taylor et al.’s [(2022)](https://www.zotero.org/google-docs/?eOPQuL) large-scale longitudinal field experiment, which showed that content provided by anonymous sources has less impact on viewers’ opinions and behaviors compared to content shared by identified individuals with known reputations. Taken together, this emerging research indicates that the messenger’s identity may be as important as the message itself.”

**Second, in terms of the data used and how it is presented, the authors should provide a bit more context on the international relevance of Twitter, elaborate on the chosen (sub)sample and stick to the size of it, and provide some general comparisons to traditional media sources. That is, while the manuscript makes a convincing (albeit at this point potentially outdated) case for investigating political exposure on Twitter in the U.S. context, this case is much less clear outside of North America and should at a minimum be discussed or reflected upon in the limitations.**

=> We appreciate the reviewer’s suggestion and the opportunity to revise our discussion of the data. We followed the reviewer’s guidance to add more context on the international relevance of Twitter, to clarify the analytical sample and its size, and to explain the relevance of our analysis outside of the U.S. context. These revisions have entailed defining the scope of the data more clearly in the introduction, and clarifying our discussion of the limitations of the data. Our revised texts on these topics include the following (pp. 4, 24):

“Taken together, our contributions begin to address some of the most basic, yet unanswered, questions at the heart of the curated flow framework and social media communications: Who are the most significant curators in political communication, and for whom?”

“Along with these contributions, this research has several important limitations mentioned earlier. First, while the findings are likely to capture the political exposure of American adults on Twitter in 2020, which represented about a fifth of American adults [(Odabaş, 2022)](https://www.zotero.org/google-docs/?gINu4T), it much less clear how they will generalize to other populations and social media platforms without direct measurement. Previous research has found some similar media effects to Twitter and the more widely-used Facebook (e.g., Valenzuela et al. 2018). However, numerous studies have emphasized the importance of considering specific contextual features in the relationship between social media use and political behavior (e.g., Vaccari and Valeriani, 2022). Additional comparative research is needed to fully contextualize these findings.”

Regarding the suggestion that we provide some general comparisons to traditional media sources, please see our following revised text (p. xx):

XXXX

Finally, in response to the note that Twitter’s relevance at this point is potentially outdated, we have clarified the limitations to our study due to these changes. The relevant revised text reads as follows (p. 9):

“A recently-developed alternative approach for directly gathering data on individuals’ behavior is to use publicly available social media data. Despite the meaningful changes to Twitter’s ownership and policies since 2022, it has been a uniquely important social media platform for investigating exposure to political content of a large sample of users due to the active engagement of media outlets and political figures on the platform, including during the observation period of the current study [(Bail et al., 2018; Barberá, 2015; Eady et al., 2019; Guess, 2021)](https://www.zotero.org/google-docs/?YJ1Xln).”

**Similarly, the manuscript uses the full panel size (1.5 million) and the analytical sample size (~600,000) at different points throughout leading to some confusion. Whereas the restriction to the analytical sample seems to be motivated by the 2020 election period, the focus on this particular period is not specifically motivated. The authors should either do this, remove the 1.5 million figure from the manuscript, and adjust the title and relevant description to be about political exposure during elections; or work with the full sample and then remove the references to ~600,000 users.**

=> Thank you for this recommendation, and we have implemented relevant changes in the abstract and throughout the manuscript. Specifically, in the revised manuscript, we clarify that our analytical sample is the ~600,000 dataset, and mention the full panel size (1.5 million) only once when we introduce the initial sampling frame. Following the reviewer’s guidance, we also revised the relevant description of the data to emphasize our focus on political exposure during the 2020 election period. The relevant revised text reads as follows (pp. 10–11):

This research is based on a sampling frame of over 1.5 million Twitter users who were successfully matched to public U.S. voter registration records. Following the approach described in prior work (e.g., see Grinberg et al., 2019 and Shugars et al., 2021), the matching process used the Twitter Decahose, a 10% random sample of all tweets, to identify 290 million profiles that posted content between January 2014 and March 2017. The profiles were then matched against voter records provided by TargetSmart in October 2017 for all 50 U.S. states and the District of Columbia. A Twitter account was matched to a voter record if its user’s full name exactly matched and it represented the only person with that name in either the city- or state-level geographic area specified in both datasets. While the reliance on full names and disclosed locations eliminated many fake, automated (bot), and organizational accounts, it did raise concerns about potential selection bias. However, rigorous comparison of this panel with a gold-standard survey conducted by the Pew Research Center showed that only small demographic and ideological differences exist between the two samples of registered U.S. voters [(Hughes et al., 2021)](https://www.zotero.org/google-docs/?li1xsm). Importantly, this matched dataset provided comprehensive data on individuals’ social media behavior on Twitter as well as basic socio-demographic information. Age and gender were taken directly from public voter registration records, while race/ethnicity and party affiliation are based on TargetSmart inferences (see validation in Appendix B of Shugars et al. 2021).”

**Also, given the journal’s focus on “press” and politics, at least some engagement with how the findings correspond to or differ from similar analyses of traditional media sources would be desirable.**

=> While a fully specified empirical comparison between political exposure to traditional versus online media sources is beyond the scope of the current paper, we have addressed this comment by incorporating a discussion of relevant literature. First, we expand our discussion of a paper included in our original manuscript, Wojcieszak et al. (2022b), which focuses on news sources, in contrast to our focus on political content more generally. In addition, we draw on the classic work by Prior (2009) on measurement of news exposure, and more recent work by Bode (2016) on how political news exposure through social media affects learning about politics. Our revised text on this topic reads as follows (p. 6):

“However, there is little empirical work showing the relative prevalence of different actors in the public’s political exposure. Two notable exceptions are the recent work by Wojcieszak et al. [(2022b)](https://www.zotero.org/google-docs/?uGXImo), which sheds new light on the channels (search engines, social media, aggregators, etc.) that lead people to news, and that by Jürgens and Birgit (2022), which measured the diversity of news accessed through different channels. Nevertheless, in order to advance our understanding of the media effects of social media and to gain better insights into the ways political learning takes place on such social platforms (Bode, 2016), we need to heed Prior’s (2009) call for better measurement of news exposure. Currently, little is known about the amount of political content to which people are exposed on social media, and the different kinds of actors involved in conveying this information.”

**Finally, I am somewhat dubious of the overall fit of the concept of curation to what the manuscript actually investigates and would rather consider the content creators analyzed actors or creators. Granted for a moment that the manuscript investigates some form of curation, though, the curation step investigated would seem to be much less consequential than individuals deciding to follow and potentially algorithmic sorting and targeted advertising (cf. Bakshy et al 2015). From this perspective the title seems a in part misleading, as the answer to the question of “Who is Curating My Feed?” is me (and to a lesser degree Jack Dorsey / Elon Musk). Maybe a more descriptive title without a (arguably) misleading rhetorical question is warranted.**

=> Thank you for this observation, which we have addressed through two main revisions. First, we revised the title “Who is Curating My Political Feed? …” to better reflect the focus on curation of political content, and we added clarification to this substantive focus earl in the paper. Second, we add clarifying text to explain that while individuals fully determine their network, it is the accounts that individuals’ follow that determine what content flows through these network connections, and hence the notion of curation is appropriate. In our revised text, we expand our discussion of Thorson and Wells’ (2016) foundational article outlining the theoretical parameters of curated flows. Furthermore, we integrate a discussion of additional literature on the boundaries of curated flows, including Merten’s (2021) study of personal curation practices on social media, and Jürgens and Stark’s (2022) study of the diversity of news from different channels (excerpt in previous response).

The revised text reads as follows (p. 6):

“As noted, the theoretical and empirical importance of examining who is being heard is highlighted by Thorson and Wells’ [(2016)](https://www.zotero.org/google-docs/?xOjqAM) discussion of the role of individual-level “curation” for understanding media exposure and its effects. While individuals choose whom to follow on social media, the notion of curation emphasizes the agency of external actors over the composition of an individual’s social media feed. In particular, the curated flows framework identifies a number of key actors, including social peers, journalists, politicians, and advertisers as well as proprietary ranking algorithms. Merten (2021) explored the decisions (e.g., follow, block, or hide) that users report taking in response to news curation by others. However, there is little empirical work showing the relative prevalence of different actors in the public’s political exposure.”

In addition, we added text in the concluding paragraph of the manuscript suggesting the potential for next-step work on the theory and development of the curated flows framework that emphasizes the actor doing the curation. The revised text reads as follows (p. 25):

“In terms of theory, the curated flows framework puts much of its emphasis on the actor doing the curation. Our study shows that there is room to expand the theory to consider the producer of the content in addition to the curator while the content is propagating through the network.”

**In all, the manuscript provides a valuable description of registered U.S. voters’ exposure to political content on one social medium which can provide the basis for further comparisons or investigations into causal effects. Addressing the issues outline above promises to strengthen the manuscript and help it live up to its potential.**

=> We thank the reviewer for this assessment of our study’s contribution. We believe that our revisions addressing the issues outlined above have strengthened the manuscript, and we appreciate the reviewer’s insightful and constructive input.

**Minor points:**

**1. Ordering the bars in Figure 2 by direct / indirect and then by source within each would allow a better comparison of the pathways; without substantially reducing the comparability within actor type (given the numbers in the figure).**

=> Thank you for this observation. After an intense and thorough debate, we decided to retain the original ordering in the manuscript as seen in Figure 2 and include the alternative order in Figure XX in the appendix. The logic guiding our decision was that the figure in the main body more directly addresses the emphasis of our theoretical framework on different actors, while the SM figure supports direct observation of additional findings. The addition of Figure XX now clarifies the distinction between direct and indirect much clearer to see.

**2. Another important factor to be added on page 23 line 35ff is the overall amount of content on a feed / the total number of accounts followed.**

=> Thank you for this observation. We added the following text to provide this information (p. 23):

“We found that most of the population on the platform was exposed to non-negligible amounts of political content during the 2020 U.S. Presidential election, ranging on an average day from 87 political tweets (8% of the overall feed) to a few thousand political tweets (52% of the overall feed). Notably, more than half of political tweets originated from traditional sources of political information: media organizations, journalists, and politicians.”

**References**

Bakshy, E., Messing, S. and Adamic, L.A., 2015. Exposure to ideologically diverse news and opinion on Facebook. Science, 348(6239), pp.1130–1132.

## Reviewer: 2

**Comments to the Author**

**In this study, the authors investigate the extent of exposure to political content on Twitter. They use a large and compelling dataset of Twitter posts linked to individual voters, allowing them to also consider how the content of feeds varies across demographic and partisan characteristics of voters.**

=> Thank you for this summary of the work and for your appreciation of the value of the dataset analyzed in the study.

**Although the data are impressive and the question important, I cannot recommend publication. Indeed, I am hesitant to recommend even resubmission after revision because I am unsure whether one of my concerns can be fully addressed with these data. I have three general concerns.**

=> We appreciate the reviewer’s clear identification of these important concerns, and we address each of these concerns in turn below. We are confident that the extensive revisions that we detail below provide necessary information to clarify how the revised manuscript addresses these concerns, and thereby greatly strengthen the paper.

**One concerns a lack of transparency in methodological description, particularly when it comes to their sampling. This information is necessary to evaluate the quality of the sample, and its absence makes it difficult to assess the quality of the paper. Presumably, the authors can address this concern by describing their methods in greater detail. The second general concern has to do with the sample of individuals. The final concern, and perhaps most serious, is that the authors are not measuring exposure, which is their stated goal. Instead, they appear to measure feed content, which is, at best, a measure of potential exposure to political content on Twitter. I will elaborate each of these concerns below.**

**First, the paper lacks necessary methodological descriptions for how the authors conducted their sampling. The authors discuss neither where they obtained their voter lists and the Twitter accounts. They indicate they used public voter registration records “dating back to 2017.” What does this mean? Which states and/or sub-state jurisdictions are contained in these records? The entire country? Are these voter records obtained through a commercial vendor, or state by state (or locality by locality)? Does “dating back to 2017” mean that all records are the voter files of given states or other jurisdictions are from 2017? Or, does this mean the records are from different moments in time for different states or jurisdictions as files were gathered from these different places over a time window starting in 2017 (but with some files representing voter lists at later time periods than 2017)? Does it mean that the authors gathered repeated records for the same state or jurisdiction at multiple time points (e.g., the California voter files as of November 2017, June 2018, and September 2019)? Given the dynamic nature of voter files (with variations in quality and upkeep across states and jurisdictions), the answers to these questions matter and potentially raise further questions (e.g., how did the authors identify and purge repeat records for the same voter, which if they did not would cause problems for their linking strategy)? Where did the Twitter users come from? Did the authors start with the voter file and search for each voter out of all Twitter users whose profiles included a geographic label with their name? Or, did they have a separate sample of Twitter users and looked for those users in the voter file? And, what about Twitter users who do not have a geography in their profile?**

=> We appreciate these observations regarding the need for additional methodological descriptions. We have addressed each of these comments in turn by revising the text in both the manuscript and in the Appendix, paying close attention to the word limit of the revised manuscript for IJPP and ensuring the readability of the manuscript for generalist readers interested in the theoretical topics, while providing the relevant details and pointers for more methodologically-inclined readers. Furthermore, these revisions include references to relevant textual sections in published works by several different sets of co-authors who have used different versions of the dataset that we analyze in the current study. With these concerns in mind, the revisions we made the manuscript include (pp. x, x):

 XXX

 XXX)

In addition, the revisions we have made to the Appendix include (pp. X, X):

 XXX (p. XX)

 XXX (p. XX)

We are confident that these textual additions fully address the reviewer’s questions and are prepared to provide further detail as required.

**Second, I worry about what population about which they can make inferences. The authors describe their target population as “registered U.S. voters on Twitter.” Even if the authors can make a case that registered U.S. voters on Twitter is a population worth knowing something about (and I believe that case can be made), their sampling frame puts their actual sample pretty far removed from this target population in several ways. One, as the authors note, their decision to define Twitter users as people who like or post restricts the sampling frame to exclude Twitter users who do not like or post. This is a serious deficiency. In fact, one of the challenges in this area is figuring out how to disentangle people with Twitter accounts who never use them (i.e., who do not look at them) and those who do use Twitter only to consume rather than to produce content. The latter group is important for understanding exposure to content.**

=> We agree that an important challenge for this field is disentangling people who have social media accounts but never use them from those who use social media accounts only to consume content without producing content. In the revised manuscript, we clarify this point, noting that individual-level data on exposure are not available from any social media platform. In our discussion of prior work, we clarify that research to date has either asked participants to self-report (which yields biased answers), or to install software that tracks exposure (which is based on a biased and small sample that excludes mobile use). Our revised text reads as follows (p. X):

 XXX

Building on this, we then clarify the contribution of our approach, specifically that our target population are registered U.S. voters who are minimally active on Twitter. We added a clearer description of our exposure measure, acknowledging that it is not a perfect measure of political exposure. We now argue that, regardless of how often or precisely when individuals in our target population visit Twitter, our exposure measure provides an accurate estimate of the political content available to individuals who are minimally active on the platform. In this description, we clarify why our analysis of potential political exposure is valid and important for advancing the field as a whole, despite the acknowledged limitations (which we discuss below in response to additional reviewers’ comments on this topic). The revised text on this topic reads as follows (p. X):

 XXX

**Two, in combination with other sampling choices the authors restrict their sampling frame, the actual population under consideration is registered voters who are on Twitter, have a geographic identifier in their profile (presumably, but the authors are not clear on this point), have a relatively less common name (therefore more likely to be uniquely identified in voter list), live in a relatively less populated area (therefore more likely to be uniquely identified in voter list), and post or like a post. Throughout the paper, the authors make claims like “20% of the population…” But it is not at all clear what they mean by “population.” I assume they mean registered voters are Twitter, but the sampling frame as I understand it yields a different target population than that – and I’m not sure that is a population of general interest, particularly since some of those factors are likely related to what people use Twitter for and to the content they get there. The authors say there sample looks demographically similar to the target population, but they do not present the data for comparison.**

=> We appreciate the reviewer’s attention to these important clarifications. We have revised the text to provide the missing detail on these issues of sampling frame. In addition, we have used more precise language throughout the manuscript to clarify that our findings refer to the sample population, including the text in the abstract quoted here by the reviewer (i.e., “20% of the population” in the abstract now reads “20% of the sample population”). We have also provided additional information in “Appendix A: Sample Socio-demographics” detailing the socio-demographic characteristics of the sample population.

Similar to other revisions we have implemented in response to Reviewer 1’s request for additional methodological information, we pay close attention here to the distinction between text we added to the manuscript itself (relevant for all generalist readers of IJPP who are interested in the theoretical topics we address) and text added to the Appendix to provide additional information on our study’s substantive topic for data and methodological experts. The revised text reads as follows (pp. x, x):

In the manuscript:

 XXX

 XXX

In the Appendix:

 XXX

 XXX

**Additionally, they can only compare to the target population on four observable characteristics – race/ethnicity, age, gender, and party. Similarity on just four observable characteristics is hardly a strong indicator that the sample and population are important on the more important unobservable selection issues (i.e., content selection).**

=> Thank you for this guidance, and we acknowledge this limitation in the revised manuscript. We also clarify that, despite this fairly limited number of observable characteristics, prior research, such as Mellon and Prosser’s (2017) study of the representativeness of Twitter and Facebook, has shown that these particular socio-demographic observable characteristics (e.g., race/ethnicity, age, gender, and party affiliation) are meaningful parameters of socio-demographic identity in relation to social and political phenomena relevant to IJPP’s core topics of press and politics. Similarly, we expanded on our mention of research by Hughes et al. (2021) which analyzed the same merged dataset structure that we use in this paper, and showed the representativeness of this dataset in relation to core socio-demographic characteristics. Our revised text on this topic is (p. XX):

 “XX”

**Also, where do the authors get the race data for their voters? I believe voter files routinely record age and gender, but I also believe that only a subset of states record voter race in the registration records. Do the authors have this for all voters even in states that do not collect such information? If so, how? Again, more methodological transparency is crucial.**

=> We appreciate the suggestion to include additional detail on this topic of race data. We have added detail on the source of race data for voters, including the topic of state-based documentation of voter race in the registration records, by including the following text in the manuscript and Appendix (pp. x, x):

In the manuscript:

 XXX

In the Appendix:

 XXX

**Finally, I am not convinced that the authors are measuring exposure. They are measuring the political content of Twitter users’ feeds, but that is not the same as measuring the political content to which users are exposed on those feeds. Appearing in the feed is a necessary condition for exposure, but it is not a sufficient condition. People do not see their entire feed, and it would take a strong assumption to say they even see a representative sample of it. Some likely look at certain times and miss content at others; they likely scroll rapidly through when they do look barely attending not most until something like a particular account or image catches their eye. In the end, the authors measure potential exposure – i.e., what is available for them to be exposed to, but not what they actually are exposed to.**

=> We appreciate this point, and note that Reviewer 3 has made a similar observation. We particularly appreciate the reviewer’s comment that “Appearing in the feed is a necessary condition for exposure, but is not a sufficient condition.” We adapted this text in our revised manuscript by clarifying that the empirical measure in our study is of **potential exposure** the first time we discuss exposure. We also now refer to the high-impact study by Eady et al. (2019) that uses a similar measurement approach of exposure by analyzing tweets potentially seen by individuals in the sample. The revised text reads as follows (p. 11):

“To model potential political exposure, we followed the approach used in prior work that approximates individuals’ exposure using the content available from the accounts they follow [(Eady et al., 2019; Grinberg et al., 2019)](https://www.zotero.org/google-docs/?BpRW7Y). This modeling approach acknowledges that appearing in the feed is a necessary condition for exposure, without claiming that it is a sufficient condition.”

**In summary, the authors could address my first concern with more transparency about methodology. To address my other two they have to make a tough case. I agree that it is important to know what political content registered voters on Twitter are exposed to. I am less sure how useful it is to know what potential political content Twitter users who post or like posts, have certain kinds of names, live in less populous areas, and include geographic identifiers in their profile are exposed to.**

=> We appreciate the importance of the points raised and the specificity of the suggested revisions. We believe that our revisions have addressed these concerns by clarifying empirical information and by highlighting our contributions in relation to the emerging literature on these topics.

Furthermore, we expanded our discussion in the concluding section regarding the limitations of the current study in the context of the broader literature on these topics. We clarified that the dynamic nature of social media practices and data create inherent limitations for which there is no perfect research design. We also added a concluding summary statement for why the contributions of the current study more than outweigh the concerns of specific limitations when considering its scientific contribution. The revised text reads as follows (p. XX):

 “XX”

We hope that these revisions adequately address the reviewer’s concerns, and we are prepared to provide further clarification as required.

## Reviewer: 3

**Comments to the Author**

**This paper takes on a very interesting set of questions about the potential news exposure on Twitter of a large set of users of the platform. The authors cluster their 600,000 respondents into 7 clusters based on who they follow. They label each cluster, and report some descriptive statistics on potential exposure to political tweetes in each cluster (figure 1). They also give the sources of that potential exposure by type of account -- media org, journalist, politicians, opinion leaders, social peers - in figure 2. And in figure 3 they look at representation of different demographic groups (age, gender, ethnicity) and partisans in each of the clusters.**

**I think it is a great idea to try to describe the tweets that users might be exposed to, as well as the distinction between tweets they may see thru direct vs indirect (as retweets or quote tweets) exposure.**

=> We appreciate this assessment of the contribution of our study.

**But - this paper has many limititations and I think it needs a really major rewrite to be published. I note that it takes till page 14 for the authors to start describing how they measure things.**

=> We agree with the need for a major rewrite, including the need to streamline the front end of the paper up to page 14. We detail below our revisions in response to the reviewer’s specific suggestions. We appreciate the opportunity to revise the paper in accordance with the reviewer’s suggestions, and believe the revised paper has been greatly strengthened by addressing these comments.

**First, and this is the easy part --- I spent the first 10 pages reading with great excitement and interest waiting to see how the authors would measure exposure. But, then I found out that they do not measure exposure - but rather the set of tweets by the accounts followed by their informants. That's fine: a limitation everyone outside Twitter studying Twitter faces. But the authors need to be much more careful with their language in the very long introduction to the paper.**

=> This comment regarding the need for more careful language and clear discussion of the measurement of exposure is consistent with a comment by Reviewer 2. We agree with the importance of clarifying our language on this topic, and as noted above in our response to Reviewer 2the revised text clearly states that our measurement focus is on “potential exposure.” Please see below (p.11)

“To model potential political exposure, we followed the approach used in prior work that approximates individuals’ exposure using the content available from the accounts they follow [(Eady et al., 2019; Grinberg et al., 2019)](https://www.zotero.org/google-docs/?BpRW7Y). This modeling approach acknowledges that appearing in the feed is a necessary condition for exposure, without claiming that it is a sufficient condition.”

We agree with Reviewer 3’s assessment that limitations to the study of exposure are shared more generally by researchers who seek to study Twitter and social media, and we acknowledge this challenge in our discussion of the study’s limitations.

Our revised text on this topic reads as follows (p. X):

 “XX”

**Second, while maybe it is clear in the end - I would have liked the intro to just be clearer on what the research questions were. At some point they said they want to "derive main modes of political consumption". What exactly are they after? How many people get news directly vs indirectly? The distribution across different individuals of amount of indirect and direct political exposure? That was just not very clear immediately -- and there is no reason the research questions should be hard to tease out. I sort of understand the paper to be somewhere between exploratory data analysis and a brute force description of potential media exposure. I just want more clarity.**

=> We have substantially revised our introductory text in two key locations to address this comment. First, in the Introduction section, we have added a clarification that “little is known about two key parameters of political exposure,” and have revised the paragraph to describe our two key research questions ():

“XX”

Next, in the following paragraph in which we introduce the research design, we explicitly articulate the research questions as RQ1 and RQ2, in text that is in parallel to our subsequent formal articulation of the research questions following the literature review. This substantially revised paragraph in the introduction section which provides an early clear articulation of RQ1 and RQ2 in the context of the research design description reads as follows (p. XX) :

 “XX”

**Third, I wanted more help on the clustering. Just some intuition as to what was going on here.**

=> We have added text on the clustering methodology with the reviewer’s comment in mind, and also with attention to the generalist readership of IJPP. In addition, we added a new section in the appendix (“Appendix Section J. Clustering Technique”) to which we moved some of the more technical information on the clustering methodology that was included in the original manuscript. These revisions aimed to follow the reviewer’s suggestion for providing more intuition of what is happening methodologically, separate from the more technical statistical description already provided. The relevant new text on this topic is copied below:

For clustering, we use the common approach with this type of large and complex dataset to reduce the dimensionality of the data first [(Allaoui et al., 2020; Grootendorst, 2022](https://www.zotero.org/google-docs/?BCJz7O)[)](https://www.zotero.org/google-docs/?3FIPoL), and only then apply the clustering algorithm. Specifically, we use Uniform Manifold Approximation and Projection (UMAP) to reduce dimensionality [(McInnes et al., 2020)](https://www.zotero.org/google-docs/?3FIPoL), and then apply the clustering algorithm of HDBSCAN, which determines the optimal number of clusters, subject to minimum cluster size, and is robust to outliers [(McInnes et al., 2017)](https://www.zotero.org/google-docs/?OGCwz0).

See Appendix J for additional detail on the clustering methodology. p. 14 of Supplementary Materials).

**And, why the 15 features of media exposure (see appendix H) that they want to cluster on? The features cover distinct dimensions.**

=> We have added new text in the manuscript and the Appendix to clarify our selection of these 15 features and the distinct dimensions that they cover.

The new text in the manuscript reads as follows (p. X):

“XX”

The new text in the appendix includes the following (p. X):

“XX”

**And then when clustering -- and I know this is the nature of clustering -- we are forced into having clusters not easily described. The authors label one cluster as "partisans left", another as "partisans right", another as "media oriented." We find out in figure 3 just how partisan those left and right clusters are - I think that figure could have come after figure 1 rather than waiting later.**

=> Thank you for this comment, which enabled us to recognize that we needed to discuss our characterization of the clusters with greater clarity, particularly the Partisan Left and Partisan Right. As we note in the revised text, the cluster description is based on the distinctive curating sources for each cluster—i.e., media sources that are Partisan Left or Partisan Right—but not on the socio-demographics of the cluster members (which is the finding presented in Figure 3).

Our revisions clarify the cluster labeling in Figure 1, and clarify that there is no need to move Figure 3. While it is logical that cluster members choose to consume political content curated by actors who share their ideological lean, the socio-demographic analysis in Figure 3 is separate from, and subsequent to, identifying the partisan lean of distinctive curated clusters. The revised text on this topic reads as follows (p. X):

 “XX”

**Figure 2 seems to be the main finding of the paper. We learn what type of accounts people get their possible media exposure from. I think this is valuable. I think a lot of information is presented in this graph. I'm not sure what the authors think the most important point here is.**

=> We agree with the reviewer’s observation that this Figure is central to our paper’s contribution. This comment is consistent with the suggestion by Reviewer 2 to revise this figure. As noted in our comments to Reviewer 2, we have retitled the figure in the original manuscript as Figure 2A, and provide an additional figure, Figure 2B, with an alternate ordering of the bars of the original Figure to allow for clearer visualization of the direct/indirect findings.

The relevant revised text which accompanies these edits to clarify the most important contributions of the figures reads as follows (p. X):

“XXX”

**In discussing Figure 3, the authors want to claim that this shows that older people are potentially exposed to more news than younger people. BUT - that assumes that WITHIN the cluster older people have similar amounts of news to younger people. I don't have to believe that. Maybe older people who get assigned to 'media oriented' follow the weather channel and things: the only thing we know about the media super consumers cluster is that ON AVERAGE 52% of tweets are about politics. But that might vary across respondents within the cluster.**

**SO - if the authors want to claim this; then break out the amount of political content seen/followed by old people. They have that!! I think this is a very suspect claim based on this figure.**

=> Thank you for this comment, which helped draw our attention to the fact that age is the only numerical socio-demographic variable in our analysis (i.e., not dichotomous or categorical), and therefore invites further analysis along the lines suggested by the reviewer. To address this, we created a new figure that plots for age (using a ggridges plot). With attention to word length constraints, we summarized the results of this new analysis in the manuscript, and added the full figure into a new section of the appendix, “Appendix I: Age Distribution Among Clusters.” Our revised text on this new analysis reads as follows (p. X):

In the manuscript:

 “XX”

In the Appendix (p. X):

 “XX”

[Generate a ggridges plot for age in the appendix and point to it in the main body]

**My suggestions for this paper (in addition to minor points below) would be to greatly streamline the introduction, be much clearer starting with the abstract that this is potential exposure, and put a little more description of the measurement (i.e., the clustering) in the text. The results are fascinating, but buried.**

=> We appreciate this summary of the key suggested revisions, and have implemented revisions to address each suggestion. Specifically, we have made the following revisions:

* We significantly streamlined and clarified the first part of the paper.
* We clarified that our measurement focus is **potential exposure**, following related work in the literature.
* We have added a more intuitive description of the clustering measurement in the text, as well as a new section in the Appendix that includes further technical methodological detail.

We thank the reviewer for the positive assessment of the nature of the results and appreciate the reviewer’s suggestions that helped us to “unbury” and more clearly articulate the original contributions of our work.

**Minor Points:**

**1) The authors say they train a machine learning classifier to identify tweets that are about politics. But as I read appendix B - it seems like they are using keywords.**

=> In the revised submission, we have clarified this issue by adding the following text (pp. X, X):

 In the manuscript: “XX”

 In Appendix B: “XX”

**2) The discussion of the training for political alignment in the text was not super clear to me.**

=> We have revised our description of political alignment for greater clarity, as follows (pp. XX, XX):

 In the manuscript: “XX”

 In the appendix: “XX”

**3)McCabe et al 2022 is listed as the source for media orgs, but we get no full citation to it.**

=> we added the full citation for this source in the revised manuscript.

**4) They say they set a threshhjold of one observed political tweet a day in the decahose. Is the one a day an average, or a minimum PER day?**

=> Thank you for the careful read of the text that revealed this question. In the text, we now clarify that the threshold is set to one a day on average. Specifically, the revised text reads as follows (p. X):

 “XX”

**5) Emphasizing an earlier point, statements about what is "in their feed" need to be clarified. What does "in their feed" mean if they are algorithmically ranked so low that the user would only see them if they spent 23 hours a day looking to catch every possible tweet?**

=> Thank you for this observation. We have clarified the language of “in their feed” accordingly. As noted above, we revised the language throughout to clarify that we measure **potential exposure**, and our revised text describes the contributions and limitations of this approach. Instead of “in their feed,” we use the phrase “content available from social peers” and similar articulations (p. XX).

TEXT?

**6) It wasn't clear to me what "95% bootstrapped CIs" meant in Figure 3. Each cluster has some number of users. Some number of those are labelled as (say) Democrats. We have a sample. We have a sample proportion. What do we need to bootstrap?**

=> The 95% bootstrapped CIs refer to XX.