

# 'Is' to 'Was': Coordination and Commemoration on Posthumous Wikipedia Biographies

**Brian C. Keegan**

College of Social Sciences and Humanities  
Northeastern University  
Boston, Massachusetts, USA  
bkeegan@acm.org

**Jed R. Brubaker**

School of Information and Computer Sciences  
University of California, Irvine  
Irvine, California, USA  
jed.brubaker@uci.edu

## ABSTRACT

Following the deaths of notable people, Wikipedians incorporate this new knowledge by updating or creating biographical articles. Drawing on literature from death studies and peer production, we demonstrate how the creation of these "wiki-bituaries" requires complex coordination work and highlight processes of commemoration and memorialization within socio-technical systems. Using the corpus of 6,132 articles about people who died in 2012, we examine the network relationships and contribution dynamics of users who perform this work and identify behavioral and content dynamics on the biographical articles about the deceased. The collaborations that emerge from posthumous editing of these biographies are sites of significant activity that coalesce into complex but temporary collaborations. Based on these findings, we argue that Wikipedia has re-imagined the obituary into a genre for creating memory spaces in which the death of a subject prompts a form of "death work" involving the collective re-evaluation of article content and a transition into a new mode of data stewardship.

## Author Keywords

Wikipedia; death; obituary; cybermemorial; collective memory; network analysis; peer production; death work

## ACM Classification Keywords

H.5.3 Information Interfaces and Presentation: Group and Organization Interfaces (collaborative computing, computer supported cooperative work); K.4.2 Computers and Society: Social Issues

## INTRODUCTION

Even in death, the famous and powerful do not want for attention. Their passing—like anyone's—is an occasion for family and friends to commemorate and reflect. But what do we remember about the deceased? Wikipedia biographies are a

unique kind of artifact that users collectively create to document the lives of notable people. These encyclopedia articles are intended to be historical accounts, but their mutability reveals that what is remembered about important people changes after death. Just as importantly, Wikipedia data can provide a window into *how* this memorialization is done and *who* makes these changes.

Wikipedia's open collaboration model has proven remarkably adept at covering current and breaking news events [24, 25]. The death of political leaders, artists, and other notable people are examples of news events that lead strangers to create and modify their biographical articles. Wikipedia users' responses to the death of living people exhibit surprising similarities as well as differences to posthumous activity on other socio-technical systems such as Facebook and other social network sites [4, 5]. Articles become gathering places for large numbers of people, but the types of content and activity that are permitted are governed by strong social and stylistic norms emphasizing notability, a neutral point of voice, and reliable sourcing that would seem to pre-empt practices of memorialization.

However, the Wikipedia community has demonstrated substantial capacity to re-interpret non-encyclopedic norms and practices such as journalistic writing [25]. We find evidence that Wikipedia has re-imagined the obituary into a genre for creating memory spaces in which the death of a subject prompts collective re-evaluation as well as a transition into a new mode of stewardship [3]. Rather than simple revisions of verb tenses ("*is* an actor" to "*was* an actor") and vital statistics, the death of notable people prompts bursts of focused activity among contributors with diverse backgrounds.

Who authors these "wiki-bituaries"? Do previous contributors participate in the posthumous collaboration or are there users who specialize in this genre of writing? What content changes after the death of a subject? Are there systematic biases in the posthumous attention some biographies receive over others? How is the structure of collaborations different before death versus the days and weeks following the death? These questions highlight how socio-technical scholarship overlooks the importance of death for creating communicative spaces for participants to encode collective memories into more durable knowledge artifacts.

Drawing upon a mixture of quantitative and qualitative methods, we examine the changes in the features of posthumous biographical articles as well as changes in the composition of

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from [permissions@acm.org](mailto:permissions@acm.org).

CSCW'15, March 14–18 2015, Vancouver, BC, Canada.

Copyright is held by the authors. Publication rights licensed to ACM.

ACM 978-1-4503-2922-4/15/03...\$15.00.

<http://dx.doi.org/10.1145/2675133.2675238>

their contributors. Shifting between these levels of analysis reveals significant differences in attention, the development of specialized skills, and the emergence of complex structures that distinguish posthumous collaborations from other types of peer production on Wikipedia. We identify editors who cluster their edits on particular days and use this strategy to qualitatively examine their history of revisions as well as their practices on these articles. We find the articulation of a posthumous biography draws on practices in journalistic obituary writing, but embeds the deceased in a web of connections to their contributions [32].

## BACKGROUND

Wikipedia is a peer-produced online encyclopedia that has become one of the largest reference works and most-trafficked websites in the world. While Wikipedia has adopted rules that emulate centuries-old norms of encyclopedic production [28], the technological affordances of a wiki platform has also expanded the possibilities of the genre. In particular, the potential to rapidly update encyclopedic content in reaction to new information has led the Wikipedia community to develop structures to support “newswork” that journalists traditionally engage in around evaluating source credibility, synthesizing information, and sharing timely content [25].

Prior research has examined Wikipedia’s coverage of current and breaking news events. Large-scale collaborations emerge following major natural disasters such as the 2011 Japanese earthquake and tsunami and generate real-time accounts of events as they unfold. The coordination of this work involves user communities specializing in newswork, users with relevant domain and process expertise, as well as technological tools to prevent vandalism and standardize content [22]. Compared to other Wikipedia collaborations, the structures of these breaking news collaborations are marked by the rapid emergence of a connected core of users [24] and dense patterns of user interactions and content modifications [23]. The encyclopedia has also adopted policies that expand its mission into quasi-journalistic coverage of news events [25].

In this study, we focus on a more subtle form of newswork—the journalistic practice of writing obituaries—as a genre of high-tempo knowledge collaboration involving large-scale self-organization, time-sensitive coordination, and conflicting norms. Obituaries of notable people allow us to look at another journalistic practice that has been re-interpreted by Wikipedians for encyclopedic functions of documenting social memory and history. Obituaries report the news, but they also serve as an authoritative account of an individual’s life. Given the variety of stakeholders, Wikipedia’s articles for “notable people” may potentially be sites of tension. If obituaries are a cultural practice in which a life narrative is concretized and the deceased is symbolically put to rest, there are open questions about who stewards this narrative and what types of engagement that requires over time.

To provide some background for the “death work” performed on Wikipedia, we start with a brief history of the obituary as a genre of journalistic writing. Next, we talk about the cultural functions that obituaries serve—namely, they reflect and encapsulate a culture’s shared, but evolving, values and

ideals. While obituaries outside of Wikipedia are static, we turn to related literature around online memorialization over the last twenty years as a way of understanding how individuals’ practices and online user-generated content are shifting memorials from static content to communal sites of interaction around evolving content. We then bridge research on obituaries and Wikipedia by considering the role both play in the material construction of memory. Finally, we outline the relevant policies and guidelines on Wikipedia that inform the practices we describe.

## Obituaries as Journalistic Practice

Obituaries are news articles that report the death of an individual and provide a summary of their life. They are conventionally authored by a journalist and published in newspapers and other news media [38].<sup>1</sup> While newspapers are dedicating increasing amounts of space for the publication of obituaries [37], historically they have been reserved for celebrities and the famous whose deaths qualified as “news” [1].

Obituary writing presents significant ethical challenges. Editorial staff must make decisions about who to cover, what content to include, and the overall style [38, 39]. Scholarship has noted journalistic bias that privileges men [31], cultures that are proximate to the newspaper [17], as well as stylistic differences across different countries [37].

Posthumously reviewing a subject’s life is “a formidable exercise of authority” [38]. More comprehensive than a death notice, contemporary obituaries must balance elements of opinion with historical fact. It is through this balance that obituaries serve as a record of our cultural history as well. Examined across time, obituaries reflect a culture’s shared, but evolving values and ideals. As Hume writes: “An obituary distills the essence of a citizen’s life, and because it is a commemoration as well as a life chronicle, it reflects what society values and wants to remember about that person’s history” [19]. Post-war obituaries, for example, are notable for references to valor and patriotism [19], while the contemporary obituaries in the United States increasingly celebrate ordinary, “every American” qualities [20].

Today the obituary genre has been popularized in use and is more populous in its content. Many follow its format when posting a notice of a loved one’s death in classified advertisements or when creating a written memorial. This democratization of the obituary genre, however, raises questions about a genre that is based on “distinction” [11]. It is this distillation that we examine in the context of Wikipedia. We consider how existing encyclopedia articles are reframed to not only include a person’s death as part of their overall history, but how content is commemorated as well.

In the context of Wikipedia, questions rise about who is engaging in obituary-styled journalistic practices. Are there editors who specialize in obituary-styled writing? How many

<sup>1</sup>Even though the announcement family or loved ones place in a newspaper is commonly called an “obituary”, the technical term for this is a “death notice”

and what kinds of users become involved in posthumous editing? Do “wiki-bituaries” reproduce the biases found in journalistic obituaries that privilege some types of individuals over others? In what ways does a dynamic wiki-platform challenge the authority of the static journalistic obituary?

### User-Generated Content and Online Memorials

In order to understand how individual practices and online user-generated content (UGC) might impact obituary work, we turn to research on online memorials to understand how individuals’ practices and UGC online are shifting memorials from static spaces or content to communal sites of interaction around evolving content. “Virtual memorial” sites can be traced back to the early days of the Internet [35]. Most memorials were written in the style of an obituary or eulogy, and a few of the larger memorial sites included rudimentary “guest books” that allowed visitors to author a message that would be displayed with the memorial [36]. Likewise, as newspapers have migrated online, some have included spaces for visitors to leave comments.

Greater scholarly attention, however, has focused on the use of social media sites for memorialization. User profiles on social network sites over the last fifteen years have provided natural spaces for interactive memorials. As Brubaker and Hayes note, the continued presence of profiles on these sites post-mortem have enabled the development of post-mortem social networking practices [4].

Three features of practices on social networking sites (SNS) are relevant when considering practices on Wikipedia. First, memorials on social media allow large groups of individuals to visit and participate in content creation. Many academics have noted the potential benefits of support these communal spaces provide [7]. Studying celebrity death, Radford & Bloch have argued that by sharing information fans validate their view of the deceased and incorporate the reality of their death [33]. However, the public visibility of these spaces creates potential privacy concerns about who is allowed to participate [30]. Second, like Wikipedia articles, social media profiles exist prior to the owner’s death. Unlike a traditional obituary that reviews an individual’s life, posthumous activity on social network sites and Wikipedia may be better conceptualized as a “reappraisal” of existing content. Finally, open and evolving memorial spaces can create tensions between existing and new content [3, 4], as well as the disparate depictions of the deceased [5].

Recent work has begun to consider what claims survivors might appropriately have over deceased’s accounts or data, and the roles that stewarding each entails [3]. Similar tensions might exist with Wikipedia between providing a factual historical account of an individual’s life and the types of ongoing engagements that might occur as people connect to, edit, augment, and shape the content. In the context of Wikipedia, the quality of the user-generated content relies on implicit and explicit coordination among contributors [26].

UGC shifts obituaries from a codified accounting of the deceased’s life to a site of ongoing engagement and contestation. A similar tension manifests in Wikipedia between providing

a factual historical account of an individual’s life and the types of ongoing engagements that might occur as people connect to, edit, augment, and shape the content. Our contention here is that systems that support UGC are shifting their memorial, obituary, and encyclopedic content from static entries to communal spaces in which content can be reappraised and revised. This raises the question of who are the users generating this content? How do their temporal and structural patterns of contributions change in the aftermath of the subject’s death? Do these revisions co-occur simultaneously with other attempts at re-appraisal and for how long does this behavior persist?

### Collective Memory

Finally, we bridge death studies and Wikipedia by considering the role both memorials and Wikipedia play in the material construction of memory. Based on the sociological work of Halbwach [15], memory is understood as a collective function that is constructed in the individual through interactions with others. Sites of collective memory, then, are places where what is considered worthy of remembering is negotiated. Arguments have been made for both obituaries and Wikipedia as sites of collective memory. An obituary provides “a rare instance when an average person can become part of collective thought, part of what Americans might believe in common about the worth of a life” [20]. Examined as a whole, obituaries serve as a repository for our collective memory [11, 19]. Pentzold applies the same theoretical lens when studying Wikipedia as a site of collective memory. He argues that the web presents both a vast archive and endless potential for communicative interactions. As such, when considering the role of online content in relationship to collective memory, is not simply the transition from communicative to cultural modes, but “also interactions between the canon and the archive” [32].

Given the role that Wikipedia plays in collective memory of events and individuals, we expect to see significant changes in biographical articles’ content, contributors, and contexts. What types of content are introduced or removed from the deceased’s Wikipedia article? Is the death of a subject an occasion for adding new content and links to contextual information about legacies? Is there anything that marks the “hand-off” between editor communities dedicated to policing biographies of living people to those coordinating biographies of the recently deceased and finally those stewarding historical biographies?

### Wikipedia Guidelines

Not everyone who dies has an article on Wikipedia. Wikipedia is governed by an extensive body of explicit rules as well as implicit norms [2, 10], and specific rules have evolved to determine who is worthy of a biographical article. Wikipedia includes a “Notability” policy that explains that only individuals who are “worthy of notice” by virtue of being “significant, interesting, or unusual enough to deserve attention” are eligible for a “written account of that person’s life.” While these criteria are subjective, Wikipedia

operationalizes “attention” as “significant coverage in multiple published secondary sources.”<sup>2</sup> Wikipedia explicitly acknowledges that biographical articles are intended to be historical records, but despite its participatory ethos, it enforces distinctions about who and what is included in this cultural memory through formal rules and institutional routines.

The notability policy is further reinforced by Wikipedia’s policy enumerating all the things “Wikipedia is not.”<sup>3</sup> Part of this policy states that “Wikipedia is not the place to memorialize deceased friends, relatives, acquaintances, or others who do not meet [the notability requirements].” This rule stems from early debates about the boundaries of Wikipedia’s identity during the aftermath of the September 11, 2001 terrorist attacks when some users attempted to create articles for every single victim [25]. Although the rule is intended to provide a bulwark against appropriating Wikipedia as a site for “virtual memorials,” commemoration nevertheless plays a significant role in editing behaviors [9]. Thus we expect that the recently deceased who had no Wikipedia articles in life may yet still “earn” an article in death. This may be a function of new information coming to light that passes the notability criterion, enumeration practices in which users create articles in response to lists of the recently deceased, as well as memorialization and commemoration practices among users.

Articles about living people also have to abide by an additional set of guidelines called the “Biographies of Living Persons” (BLP).<sup>4</sup> This policy emphasizes that biographical articles about living people must be held to a higher standard of verifiability and neutrality to ensure they do not run afoul of libel, defamation laws, respect for privacy of non-public figures, and maintained norms around the presumption of innocence. This, in turn, motivates a very active policing and maintenance of biographical articles through dedicated taskforces and communities. These communities have also developed tools for monitoring changes and automating reversion, as well as specialized administrative processes for alerting administrators and removing content. However, this policy states that it generally does not apply to “material concerning people who are confirmed dead by reliable sources” unless the individual recently died or the death is particularly notable. Thus, biographical articles for deceased people are not held to the same set of governing policy and do not receive the same level of monitoring and oversight. This heightens questions about how articles change posthumously and what stewardship practices are involved.

## METHODS

We conducted a mixed-methods empirical study of revisions to English Wikipedia articles about people who died in 2012. We used 2012 data to ensure that data for analyses that look at the year following the death were not censored, but analysis of data for deaths in 2013 show similar patterns. Like many

open collaboration platforms, the MediaWiki software running Wikipedia includes a complete revision history of every change to an article. These revisions document the changes in content as well as metadata such as the contributor and timestamp. We collected the complete revision histories for 6,132 biographical articles in the “2012 deaths” category<sup>5</sup> using a Python script to retrieve data from the English Wikipedia’s MediaWiki API.<sup>6</sup> This generated an original corpus of revisions containing 528,980 revisions from 117,829 unique users from between July 2001 and May 2014. The data returned by the API may omit revisions deleted by administrators that are blatant copyright violations or contain offensive/disruptive material.<sup>7</sup>

We then extracted attributes about the subjects of the biographies from WikiData, which provides an extensive corpus of labels for articles covering attributes such as gender,<sup>8</sup> birth and death places,<sup>9</sup> and birth and death dates,<sup>10</sup> among others. However, these data are not extensive across all articles in the parent “2012 deaths” corpus. WikiData contains information on death dates for 3,734 articles, gender for 3,918 articles, and birthplaces for 2,016 articles.

Despite the importance of bots in the ecology of work on Wikipedia, especially in anti-vandalism and stylistic standardization [14], we removed contributions associated with bot users from our dataset so as to focus on people who directly engage in posthumous journalistic and memorializing practices. Automated editing is so deeply embedded within Wikipedia’s editing practices that it requires several iterative steps to identify and filter out most of these revisions with any confidence. We began with the set of automated users formally flagged as bots in the “All Wikipedia bots” category.<sup>11</sup> Removing contributions associated with bot users, there were 491,826 revisions from 117,412 unique users remaining.

In addition to the bots, we also found that the users who contributed to the most articles in each of the pre- and post-mortem coauthorship networks were ranked among the top 10 users with the most edits.<sup>12</sup> Many of these users employ semi-automated tools such as “AutoWikiBrowser”<sup>13</sup> and “Twinkle”<sup>14</sup> to generate hundred of revisions for repetitive or minor tasks. Because these semi-automated generalists would appear as prominent users in nearly any corpus of articles or revisions, we also exclude them to focus on contributions more specific to biography or “wiki-bituary” writing.

<sup>5</sup>[https://en.wikipedia.org/wiki/Category:2012\\_deaths](https://en.wikipedia.org/wiki/Category:2012_deaths)

<sup>6</sup><http://en.wikipedia.org/w/api.php>

<sup>7</sup>[http://en.wikipedia.org/wiki/Wikipedia:Revision\\_deletion](http://en.wikipedia.org/wiki/Wikipedia:Revision_deletion)

<sup>8</sup><https://www.wikidata.org/wiki/Property:P21>

<sup>9</sup><https://www.wikidata.org/wiki/Property:P19>

<sup>10</sup><https://www.wikidata.org/wiki/Property:P569>

<sup>11</sup>[http://en.wikipedia.org/wiki/Category:All\\_Wikipedia\\_bots](http://en.wikipedia.org/wiki/Category:All_Wikipedia_bots)

<sup>12</sup>[http://en.wikipedia.org/wiki/Wikipedia:List\\_of\\_Wikipedians\\_by\\_number\\_of\\_edits](http://en.wikipedia.org/wiki/Wikipedia:List_of_Wikipedians_by_number_of_edits)

<sup>13</sup><http://en.wikipedia.org/wiki/Wikipedia:AWB>

<sup>14</sup><http://en.wikipedia.org/wiki/Wikipedia:Twinkle>

<sup>2</sup>[https://en.wikipedia.org/wiki/Wikipedia:Notability\\_\(people\)](https://en.wikipedia.org/wiki/Wikipedia:Notability_(people))

<sup>3</sup>[https://en.wikipedia.org/wiki/Wikipedia:What\\_Wikipedia\\_is\\_not](https://en.wikipedia.org/wiki/Wikipedia:What_Wikipedia_is_not)

<sup>4</sup>[https://en.wikipedia.org/wiki/Wikipedia:Biographies\\_of\\_living\\_persons](https://en.wikipedia.org/wiki/Wikipedia:Biographies_of_living_persons)



**Figure 1.** Examples of template messages used as disclaimers or warnings about biographical articles for the recently deceased.

Previous work has employed a number of methods to identify and filter out these “cyborg” users based on their implausible productivity of making continuous contributions without taking a break for six hours [13, 16]. Because we sampled on articles rather than on users, their contributions to articles outside the corpus are censored, which limits our ability to filter users based on the continuity of their activity. Instead, we use the flags many of these semi-automated tools include within revision comments to filter “cyborg revisions” rather than “cyborg users.” We adopted a method to filter revisions containing these tags by adapting queries suggested by the Wikimedia Foundation [12].<sup>15</sup> Removing these semi-automated revision, there were 458,818 revisions from 116,010 unique users remaining in the final revision corpus.

In the set of 3,738 articles about deaths in 2012 for which a specific death date was coded on WikiData, 2,865 of these articles existed before the day of the death (“pre-mortem”) and 873 (23%) have their first revision occurring on or after the day of the death (“post-mortem”). There are a total of 235,875 pre-mortem revisions from 68,994 unique users and 226,248 post-mortem revisions from 48,941 unique users. Note that we will employ the term “users” throughout the paper to refer to individuals who author changes to an article, rather than consumers of article content.

To evaluate whether there are significant differences in post-mortem attention, we specify a multiple regression model to evaluate the simultaneous effects of gender, age, birthplace, and revisions in the preceding year on the number of revisions in the subsequent year as an outcome. We also compare the state of the content in the article the day before the death as well as a week after the death. We specifically measure the number of categories, external links to other websites, and internal links to other Wikipedia articles. Because the distributions of these variables are not normal, we use a non-parametric version of an ANOVA called the Wilcoxon signed-rank test is used to test the null hypothesis that the medians of these two related groups are the same [8].

We explore the results in two separate sections. The first focuses on articles as the unit of analysis. We examine the practices and changes that occur on biographical articles after the subject’s death, how changes to the article differ in the year following the death compared to the years preceding death, and finally whether there are biases in the response of Wikipedians to subjects based on gender, age, or birthplace. The second set of results focuses on users as the unit of analysis. We examine how the network of users contributing to ar-

<sup>15</sup>[https://wiki.toolserver.org/view/MySQL\\_queries#Automated\\_tool\\_and\\_bot\\_edits](https://wiki.toolserver.org/view/MySQL_queries#Automated_tool_and_bot_edits)

Pre-mortem		Post-mortem	
Title	Users	Title	Users
Whitney Houston	3239	Whitney Houston	488
Neil Armstrong	2800	Donna Summer	441
Rodney King	2243	Jenni Rivera	436
Ray Bradbury	1822	Ray Bradbury	420
Arlen Specter	1122	Rodney King	376
Joe Paterno	1116	Davy Jones	356
Donna Summer	1016	Joe Paterno	338
Gore Vidal	975	Rajesh Khanna	327
Sun Myung Moon	917	Andy Griffith	325
Sally Ride	907	Robin Gibb	322

**Table 1.** List of articles with the most unique users in the pre- and post-mortem coauthorship networks, after filtering out bots and “cyborg” users.

ticles evolves over time to incorporate different types of users and changes in the structural patterns. We also examine the most active contributing users on different days reveals distinct social roles and orientation to maintaining these articles.

**ARTICLE-LEVEL RESULTS**

As a way of exploring practices of re-evaluation, this section explores changes in the properties of biographical articles following the death of the subject. To provide some context for the results in this section, Table 1 enumerates the top ten articles with the most unique users in the pre- and post-mortem eras. Both lists are predominantly composed of major figures from the spheres of politics and entertainment, however there are substantial differences in the rank of individuals between lists. The subjects of the most widely-edited post-mortem articles are generally marked as “unexpected” deaths and many involve actors or musicians rather than political figures, business people, or scientists.

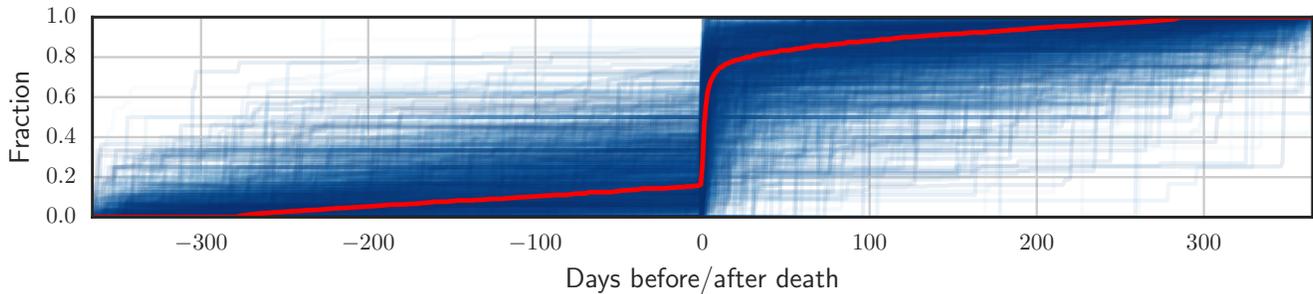
**Death Work on Wikipedia**

The work of administering content about the recently deceased occurs in several places and involves three notable practices. First, biographical articles are labeled with categories that include the year of the subject’s birth, and after they die, the year of their death. In addition to adding the death year category, contributing users also remove the “Living People” category that marks the article as warranting Biographies of Living Persons (BLP) protections.

Second, the article is added to a list such as “Deaths in 2014” that enumerates all of the individuals who died by day alongside a short biographical summary.<sup>16</sup> Some of these articles are “red linked” which reflects the fact there is no corresponding article for the person, and thus invites other users to create a new article.

In a rare third step, when individuals of particular importance and notability die, their biographical article can be added to a section on the homepage of Wikipedia. Inclusion criteria for this section emphasize the need for an individual to have occupied a “high-ranking office,” have made a “significant

<sup>16</sup>[https://en.wikipedia.org/wiki/Deaths\\_in\\_2014](https://en.wikipedia.org/wiki/Deaths_in_2014)



**Figure 2.** Cumulative number of normalized revisions made to biographical articles in year before and after subject's death ( $x = 0$ ). Each line corresponds to a single article's cumulative revision history. Median trajectory in red.

contribution or impact,” or made a “major impact” on current events.<sup>17</sup> Users can nominate biographical articles for inclusion, after which other users can discuss and come to a consensus about whether this “recent death” warrants inclusion on this homepage for a few days. In addition to being a more prominent acknowledgment of an individual's notability, links from the homepage generate substantially more traffic and editorial attention from the community.

A variety of social communities as well as technological and administrative tools have also been implemented to support the process of updating biographical articles to reflect the subject's death. These include templates about current events,<sup>18</sup> which include a template explicitly for recent deaths.<sup>19</sup> As seen in Figure 1, these templates are intended to be disclaimers applied to biographies to warn readers about the fast-changing state of the article. But these templates can also be used by editors to label articles so they might attract the attention of other users, who in this case are interested in contributing to posthumous articles. Still other templates exist to warn readers that the biographical article is in violation of style guidelines and reads like a memorial or obituary.<sup>20</sup> These warnings invite users to rewrite the article to establish a neutral point of view or sufficiently demonstrate the notability of the subject. These findings all point to how “death work” on Wikipedia has highly been structured into highly specialized and routinized processes.

### Temporal Dynamics

How does editing an article after the subject's death differ from pre-mortem edits? An initial way to examine this question is to compare how much editing occurs on the days leading up to a subject's death to the editing that occurs in the days following their death. Figure 2 plots the normalized cumulative time series of revision activity for each Wikipedia articles in the year before and the year after the date of the sub-

ject's death ( $x = 0$ ). The data is normalized in two ways to make it comparable across articles with very different scales of response. First, all articles start the period with 0 revisions 365 days before the subject's death to provide a baseline to measure changes over the subsequent two years. Second, the number of revisions 365 days after the death of the subject are normalized again to 1 to create a fractional index of number of revisions as a total of the final revisions.

There is an obvious “jump” in editing activity on the day of the subject's death. Little editing activity precedes the subject's death relative to the final amount of edits, reflecting death as a newsworthy event that Wikipedians document, as well as a moment in which Wikipedians begin to integrate and re-evaluate biographical content as a whole. The days immediately following the subject's death see very large changes in the number of normalized revisions relative to the editing activity over the year beforehand. This reflects the need to incorporate new information, but the scale of activity in such a short time period suggests complex coordination work involving multiple users working in parallel.

The data in Figure 2 examined only the year before the death, which eliminates possible changes occurring in earlier years. Looking at the four years before the death of the subject, we also find that editing patterns in general are consistent during pre-mortem years. Figure 3 plots the changes in the revisions, users, and bytes changed in the articles in the four years preceding the death and the year following the death. In addition to significantly more revisions ( $\widetilde{r}_{pre} = 1, \widetilde{r}_{post} = 15, p < 0.001$ ), there are significantly more unique users ( $\widetilde{u}_{pre} = 1, \widetilde{u}_{post} = 8, p < 0.001$ ) as well as significantly larger changes in the article content (bytes added) in the year following the death ( $\widetilde{b}_{pre} = 0, \widetilde{b}_{post} = 2073, p < 0.001$ ) than in any of the preceding four years.

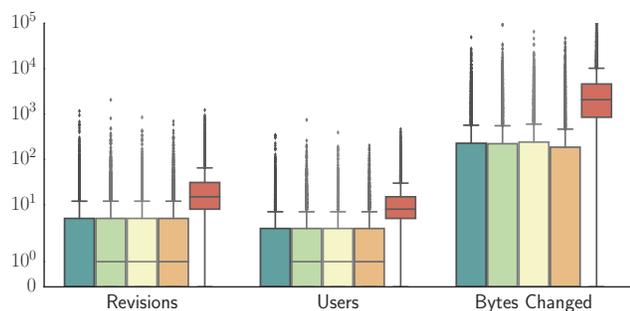
These findings suggests that the death of the subject is potentially an occasion for “finishing” a biography. They provide evidence that death on Wikipedia, rather than prompting existing users to make minor changes such as changing verb tenses or adding information about the death, actually prompts substantial collaborative activity involving many users making large changes over many revisions, relative to articles' previous four years of history.

<sup>17</sup>[https://en.wikipedia.org/wiki/Wikipedia:In\\_the\\_news#Deaths](https://en.wikipedia.org/wiki/Wikipedia:In_the_news#Deaths)

<sup>18</sup>[https://en.wikipedia.org/wiki/Wikipedia:Current\\_event\\_templates](https://en.wikipedia.org/wiki/Wikipedia:Current_event_templates)

<sup>19</sup>[https://en.wikipedia.org/wiki/Template:Recent\\_death](https://en.wikipedia.org/wiki/Template:Recent_death)

<sup>20</sup><https://en.wikipedia.org/wiki/Template:Obituary>, <https://en.wikipedia.org/wiki/Template:Memorial>



**Figure 3.** The number of revisions, users, and bytes changed in the year following the death (red) are significantly higher than in any of the four years (other four bars) preceding the death.

### Biases in Attention

In the previous section we observed large changes in the behavior of a biographical article following the death of the subject. However, prior research has suggested that English Wikipedia articles have systematic biases against women, historic figures, and people from the Global South [6, 18, 34], a tendency that emulates biases observed in the selection of subjects for obituaries [17, 31, 37]. If this is true, we expect that posthumous editing activity will show significant differences based on the gender, and birthplace of individuals. Likewise, prior research indicates that online memorials skew towards younger deaths [4, 7]. If this is a byproduct of online memorializing practices generally and not just the social networks on social media, we would expect to see a difference on Wikipedia based on age as well. Using WikiData to code articles by their subject's gender, birth year, and birth location, we compare editing behavior in the year preceding and following their death.

To assess the direction, strength, and statistical significance of these demographic features on editing behavior, we specified a multiple regression model. Using the age of the article (days since first edit) and the number of revisions in the year preceding the death as control variables, we estimated the effects that the age at death, gender (female as base category), and birthplace (Africa as base category) had on the number of revisions in the year following the subject's death. This model is estimated on the 2,139 articles for which we had complete information, but Figures 4 through 6 plot the univariate relationships between pre-mortem (light green) and post-mortem (dark green) revision activity across these variables. We extended the analyses of revisions to the number of unique users and cumulative bytes changed in article content and found similar patterns to those we report below. Because we employed standardized coefficients to compare effect sizes, the estimates should be changes in standard deviations rather than count of revisions.

The model estimates several significant effects. The strongest effect ( $\beta_{Before} = 0.586, p < 0.01$ ) on the number of post-mortem revisions is the number of pre-mortem revisions: individuals who are popular in life are also popular in death. Similarly, the age of the article also has a significant and moderate ( $\beta_{ArticleAge} = 0.175, p < 0.01$ ) effect on post-mortem

	$\beta$	S.E.	$p$
Male	-0.107	0.043	*
Death age	-0.192	0.016	**
Asia	0.208	0.100	*
Caribbean	0.067	0.236	
Eurasia	-0.090	0.123	
Europe	0.057	0.092	
North America	0.217	0.093	*
Oceania	0.087	0.142	
South America	-0.019	0.123	
Article age	0.175	0.017	**
Revisions before	0.586	0.016	**
Constant	-0.036	0.097	

**Table 2.** Multiple regression model. Standardized coefficients ( $\beta$ ) are reported.  $N = 2,139, R^2 = 0.478$ ; \* $p < 0.05$ ; \*\* $p < 0.01$

activity: the longer a biographical article has existed the more revisions it attracts after the subject has died. These variables on popularity and history are important controls to test subsequent effects of biases owing to demographic differences.

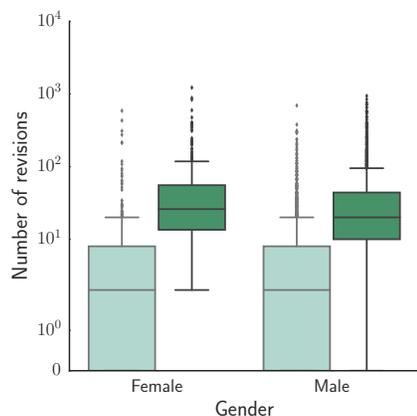
We find mixed evidence of biases in post-mortem attention based on demographic features. First, articles about men attract significantly less post-mortem revisions than articles about women, but this effect is moderate ( $\beta_{Male} = -0.107, p < 0.05$ ). This inverts our expectation that Wikipedia should award greater post-mortem attention to men, but it may also be an artifact of gender-biased censoring. Wikipedians write more articles about men (4,285) than women (693) and thus the women present in the sample may be more important than the semi-notable men.

Second, the biographies of older people attract less post-mortem activity than articles about younger people. The direction of this moderate effect ( $\beta_{DeathAge} = -0.192, p < 0.01$ ) replicates other findings around online memorialization in which attention skews towards younger people. This reflects the confounding of several potential processes: younger people having articles are rarer and as notability requires the accumulation of many accomplishments, they are also demographically less likely to die, and their deaths are more prominently covered in the news media and popular culture as unexpected and tragic.

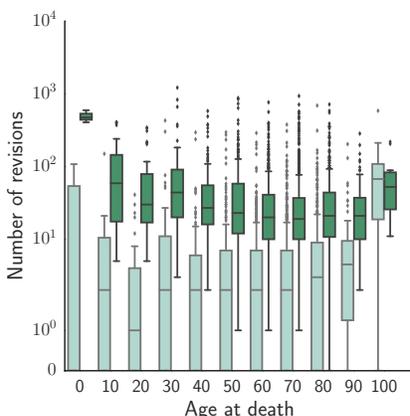
Third, we find mixed evidence of biases in post-mortem activity across birthplaces. Biographies of people born in Asia ( $\beta_{Asia} = 0.208, p < 0.05$ ) and North America ( $\beta_{N.America} = 0.217, p < 0.05$ ) both have significantly and substantially larger post-mortem attention than biographies of African-born people. While North America shows a strong and significant effect, we observe no similar effect for Europe or Oceania which also are typically classified into the Global North. Thus, we have mixed evidence that biographies of people from the Global South are significantly under-represented in post-mortem activity.

### Changes in Hyperlinked Content

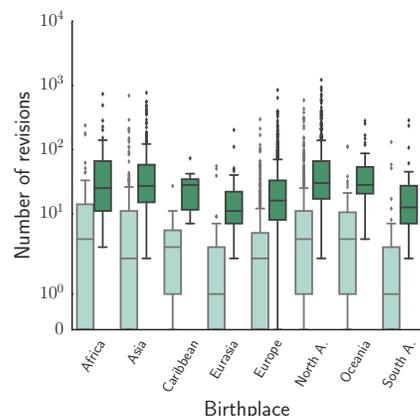
In this section, we examine how the content of biographical articles changes over time. We expect that postmortem revisions should lead to an integration with a larger cultural



**Figure 4.** Revisions in the year before (light green) and the year after (dark green) death by gender of the biographical subject.



**Figure 5.** Revisions in the year before (light green) and year after (dark green) death by age of the biographical subject.



**Figure 6.** Revisions in the year before (light green) and year after (dark green) death by birthplace of the biographical subject.

account of the subject’s contributions. Practices of commemoration emphasize that people will try to make claims on the subject’s legacy and one part of grieving is placing the subject’s contributions into a larger context, which we capture through the addition of links to other content and inclusion of new categories for classifying the subject. Furthermore, we also expect the external links used in the articles’ citations and references will become more diverse as more information comes to light through published obituaries about the individual’s contributions.

Figure 7 plots the differences in the number categories, number of links to external website, and the number of links to other Wikipedia articles for 1 day before death (left bar) and 7 days after (right bar) the death of the subject. We used the Wilcoxon signed-rank test to test the differences between the medians of these distributions. There were the same number of media categories pre-mortem ( $\widehat{c}_{pre} = 9, \widehat{c}_{post} = 9, p = 0.108$ ), more post-mortem external links ( $\widehat{e}_{pre} = 3, \widehat{e}_{post} = 4, p < 0.001$ ), and fewer post-mortem internal links ( $\widehat{i}_{pre} = 25, \widehat{i}_{post} = 23, p < 0.001$ ). This implies the significant uptick in post-mortem revisions we observed in Figure 3 did not translate into the creation of new categories, but did result in the removal of internal links and the addition of external links. These differences are very slight and suggests that much of the changes could reflect stylistic (copy editing) or procedural (anti-vandalism) changes than adding new relationships.

While Figure 7 suggests the median change in links between the day before the death and 7 days after the death is close to zero, it also hides within-article changes. Plotting the distribution of within-article changes in Figure 8 reveals there is substantial variance in behavior across articles. First, we observe articles see both positive and negative changes in new internal links, external links, and category memberships. This means that there are hundreds of articles that have a net *loss* of links, rather than gain, following the death of the subject. Second, we observe this distribution is peaked around 0 but there are “long tails” of both positive and negative changes

in linked content. Thus while the median biographical article has small changes in content in the week following the death of the subject when most editing activity occurs, there are hundreds of articles that see the addition of dozens of new links, references, and categories.

For example, when closely examining deaths from 2013, we see the article for activist Aaron Swartz grew in size and connectivity following his death, going from 14 categories, 17 external links, and 34 internal links the day before his death to 30 categories, 82 external links, and 151 internal links just 7 days after his death. Conversely, the article for the Taliban commander Hakimullah Mehsud lost 10 external links as citations for speculation about his whereabouts was replaced with information about the circumstances of his death. Other articles that saw major losses of external links such as politician Frank Lautenberg are attributable to the removal of tangentially-related navigation templates that often contain dozens of links. Articles like those of author Doris Lessing saw the removal of 10 categories in response to redundant or over-zealous categorizing; for example, simultaneously including “English women writers,” “21st-century women writers,” and “Women novelists.”

This distribution and these linking examples point to at least two interwoven post-mortem practices. First, linking is a form of contextualization that creates semantic adjacencies. The death of a subject is an occasion for other media outlets to publish obituaries and information. This new information may reflect topics that previous contributors overlooked or were unable to reliably reference, but now become inputs to the article. The addition of these new links move the article from the periphery and make it more embedded within the project as a whole.

Second, the death of a subject also provides an occasion that prompts other members of the community to police the content and style of articles and make them conform to norms and standards when information is most available about the subject. The death of a subject also causes the knowledge artifact to undergo a transition as it is prepared and made ready to

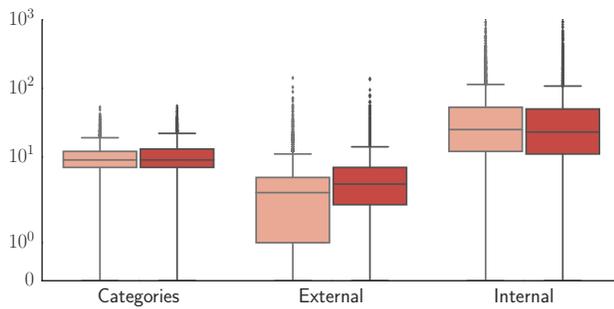


Figure 7. The number of categories, external links, and internal links on the day before (left, in light red) and 7 days following the death (right, in dark red).

join the set of articles about other historical figures. Articles about other historical figures can be used as templates and can lead to reframing as an entity of historical importance, rather than contemporary interest. Furthermore, because the subject is no longer living, Wikipedia’s BLP policies are no longer in force. As a result, the article will receive less close scrutiny from users who specialize in anti-vandalism or regular cleanup of BLP articles. There may be “handing off” practices from users who specialize in editing living people to users who edit the recent dead or historical figures.

### USER-LEVEL RESULTS

In this section, we shift the unit of analysis from the article to the users who are making contributions to these articles. Who edits biographical articles after the death of the subject? We differentiate between the population of users who edited the article before death as “pre-mortem” users and the set of users who made their first edit after the death of the article’s subject as “post-mortem” users. In the first subsection, we examine how the composition of users shifts from pre-mortem to post-mortem users. We also analyze how the networks of users contributing to articles change over time. Finally, we identify and compare the contributions made by some of the most active users on two different days.

### Coauthorship Network Evolution

The users most involved in shaping a biographical article while the person was alive may potentially have their contributions drowned out by new contributors arriving to edit the recently-deceased’s article. This disparity is not necessarily bad as it may be the case that users who specialize in obituary writing or editing current news events have more relevant expertise during these most acute phases of article editing. To get at whether pre-mortem users are being crowded out by new users in the post-mortem era, Figure 9 plots how many pre-mortem editors return to edit the article on each post-mortem day. This distribution is the fraction of revisions from pre-mortem users divided by revisions from all users on each post-mortem day, averaged across all articles. Plotting time on a log-scale on the  $x$ -axis highlights the differences in the earlier post-mortem days while compressing the differences in later days.

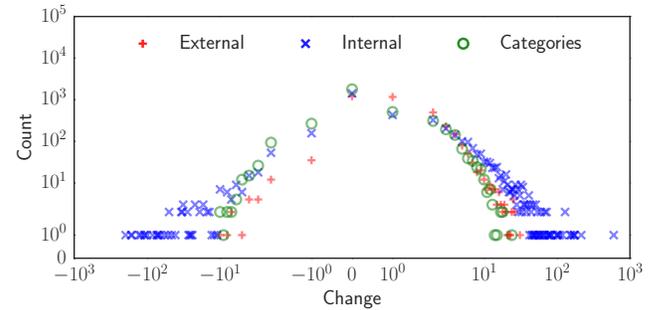


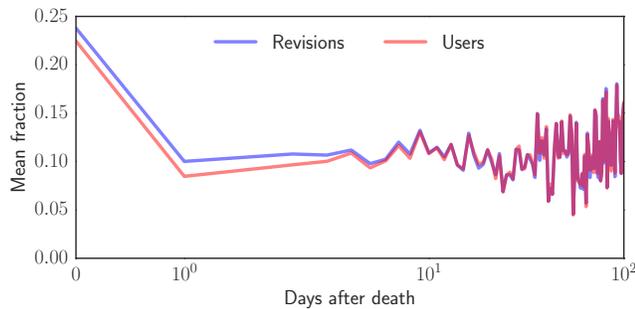
Figure 8. The distribution of changes to categories (green), external links (red), and internal links (blue) between the day before and 7 days following the death

We observe that pre-mortem users make up approximately 20% of the revisions and contributors on the day of the death. This falls to approximately 10% of the revisions and contributors on average for the remainder of the week, and then never rises above 20 until several months later. While pre-mortem users’ activity never makes up a majority of the post-mortem activity, these users are most active on the day of the subject’s death and then their contributions are subsequently outweighed by new users.

The analyses of structure in the previous section demonstrates substantial similarities in the structure of pre- and post-mortem collaborations. However, we know that the post-mortem activity on articles is intensely concentrated in the days immediately following the death and then recedes to more typical levels. In this section, we examine the properties of the networks that emerge on the day of a subject’s death and how these daily networks change over time relative to the subjects’ deaths.

We borrow from the methods we used above to place all articles on a relative timescale. Like Figure 2, we center the activity for each article to 0, which represents the day of the subject’s death and then look at the activity over the preceding and following 365 days. We then construct daily networks based on this relative time scale. For example, user  $U_1$  may edit article  $A_1$  on the day of that subject’s death in March and  $U_1$  may also edit article  $A_2$  on the day of that subject’s death in October. Using this relative timescale approach with daily collaboration networks, user  $U_1$  is connected to both article  $A_1$  and article  $A_2$  in the network for relative time 0, even though these contributions actually occurred at very different absolute times. This approach thus focuses on the collaborations that emerge in response to the death. Substantively, a dynamic network analysis like this also captures macroscopic patterns that emerge from users’ microscopic decisions to autonomously self-select into contributing to specific articles at particular points in their history relative to the lives of their subjects. Changes in the structure of the network reflect changes in editors’ behavior as they choose to adopt practices to contribute broadly or narrowly.

How does the structure of these collaborations change? Figure 10 plots three other network statistics over the daily relative time collaboration networks. These network statistics

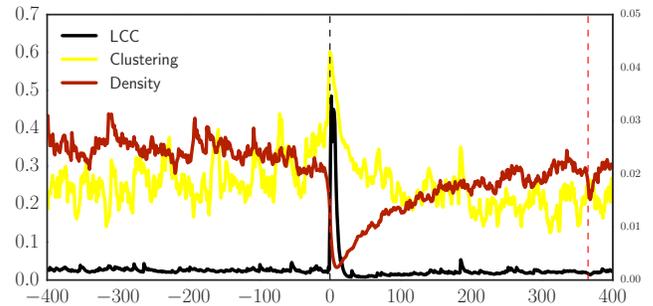


**Figure 9.** Average fraction of pre-mortem users (red) and their revisions (blue) each post-mortem day (log-scaled) peaks on day of death and then does not recover for weeks.

are defined specifically for bipartite coauthorship networks in the *NetworkX* analysis package and defined in prior scholarship [27].<sup>21</sup> The *density* is the ratio between the number of edges in the observed network and the number of edges in a completely-connected network of the same size. The *average clustering* captures whether users tend to share articles in common and whether articles tend to share users in common. The *LCC fraction* captures how many user and article nodes are in the largest connected component (LCC). Each of these measures captures distinct structural signatures of how users and articles are interrelating and then tracks how they change over time.

Again, we observe significant changes in the daily structure of the collaboration networks on the relative date of death. First, the density (red, right *y*-axis) falls and does not recover to pre-mortem levels until approximately 200 post-mortem days later. This loss of density implies sparser collaborations where users edit only a few articles among the many possible articles on each relative day. In the pre-mortem era, users contribute to several articles that are being edited on any given relative day but in the post-mortem aftermath, it becomes unfeasible for all users to contribute to all articles that are being edited by all other users on the same day. Thus, collaborations on the day of subjects' deaths appear to be generally characterized by users' focused editing on a few articles rather than users' contributing across many articles.

Second, the average clustering (yellow) exhibits substantial day-to-day variation but nevertheless spikes on the day of death. This effect decays rapidly and returns to pre-mortem ranges within approximately a month. High levels of clustering imply that editors who work together on one article also work together on other articles. This finding presents a potential paradox as it suggests the post-mortem collaboration is both less dense and yet more clustered than the pre-mortem collaborative. However, density is a metric for the entire network while the average clustering is a local metric for each article and user: the network is clustered by virtue of editors working together on some articles but the network is



**Figure 10.** Changes in the daily co-authorship network structure relative to the day of death. The fraction of nodes in the largest connected component (LCC), the average bipartite clustering coefficient, and the bipartite network density. The 1-year anniversary is marked by a red dotted line.

also sparse by virtue of most editors working on only a few articles rather than all articles on each day.

Third, the fraction of nodes in the LCC (black) also spikes on the day of death before falling rapidly back to baseline levels within several days. The LCC finding in Figure 10 suggests pre-mortem collaborations involve users typically operate in relative autonomy from other users' contributions. This manifests as few users being in the largest component. However on the day of the death, this "autonomy" evaporates and a giant component emerges in which up to 60% of users and articles are indirectly connected to one another rather than operating in isolation. The emergence of a "giant component" on the day of a subject's death reflects contributions from users who specialize in "death work" by making revisions across multiple articles in the hours and days following the death.

### Active Contributing Users

The pre- and post-mortem levels of aggregation presented in Tables 1 obscure the dynamics and distributions of users' contributions. Previous findings suggest there were "hand offs" between old pre-mortem and new post-mortem user groups. To explore *who* these users are, we examined how users' contributions clustered by daily relative time. Figures 11 and 12 show the users who cluster their contributions a year, a month, a week, a day before and after the day of death. Each cell in a row is the percentage of revisions (within in the 2012 revision corpus, not across all contributions) from that user on that relative day. For example, user "Makecat" made no revisions on any day in the pre-mortem period, made 42% of his revisions within the corpus on the day of the subject's death, 26% of revisions the day after, and then 0% thereafter. To prevent users who made a single contribution or edited a single article from saturating these results, we have subsetting the data to those users who contributed to 10 or more articles in the corpus. This biases our inferences, but it tries to capture users engaged in biographical work broadly and examines whether editing activity is differentiated across (relative) days.

Figure 11 plots the top 10 user contributions, sorted for highest percentage for day 0. Although sickness or injury may foreshadow the death, it is obviously difficult to consistently predict the date of death. As such, we see little evidence of the active users contributing to biographies in advance of the

<sup>21</sup><http://networkx.lanl.gov/reference/algorithms.bipartite.html>

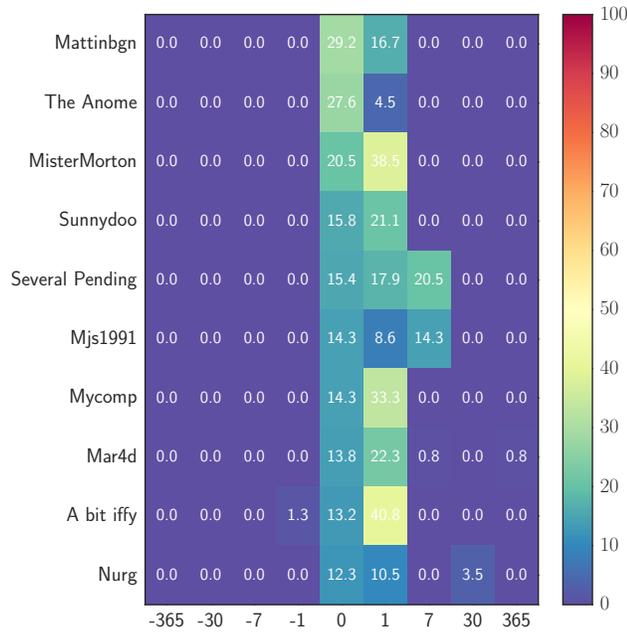


Figure 11. Among users making post-mortem contributions to 10 or more articles, the top 10 users’ percentage of contributions by post-mortem day, sorted on highest percentage for day 0. Colors are percentage of edits.

subject’s death. Instead, these users who cluster their contributions across articles on day 0 are the “first responders”. This cohort of top day 0 users nevertheless makes less than 50% of their contributions on the day of the death, suggesting their revisions are spread out over longer periods of time in our data. This suggests a group of users who are motivated to make the earliest updates to the article but also remain active in editing biographical articles the day following the death. These first responders make no contributions a week later, suggesting they move on to other topics after a few days.

Some of the users who appear in Figure 11, such as “Makecat” and “Callanec,” are actively engaged in anti-vandalism efforts that are not specific to obituary work. Rather, their contributions are reverting vandalism made by other users who were presumably attracted by the timeliness of the article. Other users such as “MisterMorton” are focused more on topics such as actors or “Droodkin” on Middle Eastern politicians and athletes, that leads them to contribute based on the intersection of these topics and their mortality.

Figure 12 plots the top 10 user contributions, sorted for the highest percentage for day 1. A very different cohort of users and contribution behavior emerges from this sorting and none of the top users from Figure 11 are found here. These users are wholly distinct behaviorally as well as few of them edit on day 0 and more than 60% of their contributions in the corpus are focused on this single day. Like the other users above, this engagement is very short-lived and these users no longer make contributions after a week or more. Users such as “Martyn Smith” and “Andres arg” specialize in “death work” by contributing extensively to arti-

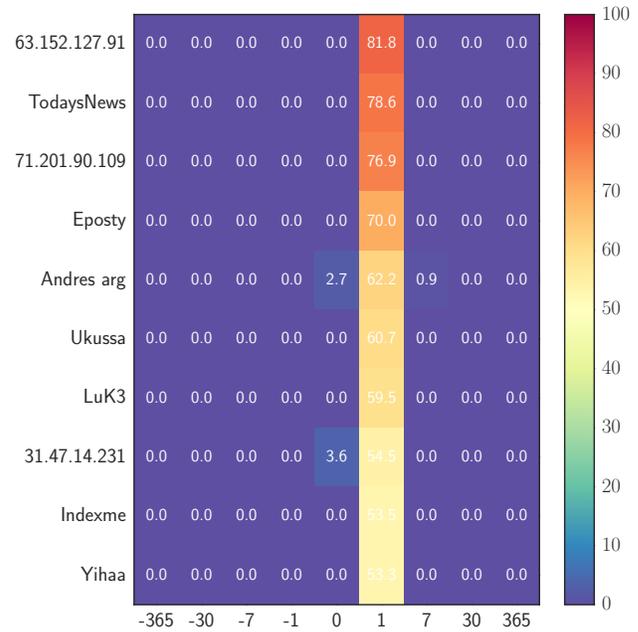


Figure 12. Among users making post-mortem contributions to 10 or more articles, the top 10 users’ percentage of contributions by post-mortem day, sorted on highest percentage for day 1. Colors are percentage of edits.

cles such as the “2012 deaths” over long periods of time. The unregistered user 63.152.127.91 edited several posthumous biographies almost exclusively over a week in May, but did not contribute again. User “Eposty” edits “date” articles (i.e., “December 31”) which list major historical events as well as deaths, which was the focus of his contributions.

The sampling strategy we adopted overlooks users who may engage heavily in editing a single article as a form of commemoration and focuses instead on users who engage more broadly. This includes users whose contributions are in response to the attention and activity of vandals who are motivated by the temporary attention afforded recent deaths, users who specialize in death work of updating and enumerating information to articles such as “2012 deaths” as a part of an ongoing routine, users whose contributions abut obituary work by virtue of their topical interests in actors or athletes, and users who contribute in a short burst and then leave the community. Like other forms of breaking news coverage [23], posthumous biography writing thus involve users with varied motivations, backgrounds, and social roles temporarily coming together to manage the transition of living biographies to posthumous biographies.

**DISCUSSION**

Wikipedia’s biographies are intensively updated following the death of their subject. We used quantitative methods to demonstrate the significant differences in posthumous behavior across a large sample of articles. We used qualitative methods to explore the death work on Wikipedia and the practices of prominent users in the corpus. Our results highlight how death work on Wikipedia is not only a reappraisal of

what is worth remembering about the deceased, but a reappraisal of the kinds of collaborative work practices enacted and adapted within socio-technical systems.

Our analyses were conducted at the level of articles and users as both are irreducibly entangled in these posthumous and self-organized collaborations. At the level of the article, Wikipedia employs a number of highly specialized tools and practices that served to routinize and even privilege the death work that migrates biographies away from the policies and content only appropriate for a “living person.” The need for these resources is apparent when examining the extreme concentration of editing activity in the immediate aftermath of the death as well as the significant increases in the number of revisions, users, and content changes in the year following the death. Wikipedia reproduces some but not all of the systematic biases and inequalities found in its biographical coverage and in journalistic obituary practices more generally, but differences in posthumous activity as a result of gender, age, or birth place were moderate and mixed. Finally, while the differences in the overall connectivity of post-mortem articles compared to pre-mortem articles were minor, we did find extremely skewed distributions in these content-level changes. Post-mortem re-appraisals involve not only the addition of new content about the circumstances of the death of the subject and their legacy, but also the removal of hyperlinked and referenced content suggesting death is an occasion to re-evaluate the article as a whole.

At the level of the user, Wikipedia’s posthumous collaborations exhibit remarkable dynamism in their composition. Over the course of the post-mortem collaboration, pre-mortem users did more work on the day of the subject’s death than at any subsequent post-mortem point in time. The reduction in these users’ contributions suggests they accede to the contributions made by the new post-mortem users that appear in subsequent days. This dynamic suggests pre-mortem users are highly motivated to be among the first to make the initial changes to the article, but users specializing in obituary writing appear over subsequent days to revise the article to more general standards. This is emblematic of the “hand-off” between communities: users who edited articles about living subjects make a concerted effort on the day of the death to update the article, but users who specialize in death work take over stewarding articles about the recently deceased.

The networks of users contributing to articles after death show major, but temporary, disruptions in scale and structure when compared to the pre-mortem collaborations. Post-mortem collaborations involve users working closely with a few other users (high clustering) on select articles (low density) connected indirectly to many other users and articles (high LCC fraction). Rather than relying on a few highly central specialist users, post-mortem contributions are coordinated through a distributed network of tight clusters connected by weak ties. The post-mortem collaborations are evolving networks of users who edit a single article as well as brokers who stitch this collaboration together and may be able to ensure consistency of death work across articles. Finally, there is variation in top users’ contribution patterns

across post-mortem days, which reinforces the need for different social roles throughout the stages of death work.

### Limitations and Future Work

While we report on a large-scale dataset using a variety of descriptive, temporal, and network methods to identify prominent users and articles, our methods do not provide a rich account of the purpose or meaning of the rapid succession of edits that happen post-mortem. Specifically, literature from memory studies and death studies about the “contested distribution” of collective remembrances [29, 40] suggest that a deeper qualitative analysis of edits might reveal the tensions between consensus and contestation on Wikipedia generally that play out in obituary news work [32].

Many questions also open remain for quantitative researchers. The deaths of subjects can serve as a valuable instrument for conducting naturalistic experiments to evaluate complex phenomena like peer or spillover effects. Death may prompt increased pageview and editing attention not only on the biographical article but also for the articles linked from it as forms of re-evaluation. Death may also change the psychological states of editors, which could manifest in changes in the types of articles edited or differences in language used in subsequent revisions. Memorialization on biographies may also provide opportunities to evaluate how to recruit and socialize new users into the community.

Given that changes can continue indefinitely, how are post-mortem articles edited over the span of decades? Are obituaries “revised” to stay in sync with the shifting cultural norms? Are “wiki-bituaries” involving different users, norms, and times even comparable? If so, what might this say for our sense of cultural memory, the cultural memories of past generations, and our ability to surface these disparities from long-term archives? This problem, of course, is inherent to larger encyclopedic practices where the demand for an authoritative account asks temporal questions around how authority is maintained in a network.

Our examination of posthumous collaborations likewise focused solely on the English language Wikipedia. Death practices vary immensely across cultures [21]. We do not expect that Anglophone practices of memorialization generalize to these contexts, but rather that there will be significant variation across other language editions that may reflect local cultural practices. This underscores the need for more multilingual work to illuminate the social construction of cultural practices by their selective implementation and appropriation by socio-technical systems.

### CONCLUSION

“Death work” on Wikipedia highlights the tensions between encyclopedic documentation of social memory and cultural history versus journalistic practices of commemoration and democratization. While its policies warn against memorialization of biographies, Wikipedia’s flexibility enables a form of participation that emulates post-mortem social networking practices of participation, stewardship, and shares similar tensions around content and contributions. Wikipedia, like

journalism, relies upon specialists who can be best characterized as “obituarists” to update biographies of the recently deceased rather than relying upon either previous contributors or newcomers to make these changes. This work does not merely encompass minor grammatical changes (“is” to “was”) but a larger re-appraisal of both the article and its subject. The constitution of posthumous biographical collaborations reflects a series of “hand offs” between communities of users who edit the biography of the living person, manage the transition to death, and then steward biographies about deceased subjects.

Our study of the death work on Wikipedia opens up our understanding of the ways existing social and technical structures in a community like Wikipedia come to be differently enacted due to contexts that extend beyond the boundaries of the community—in this case, mortality. The mutability of articles afforded by Wikipedia, not only in content but also in contributors, raises important questions for both practices of stewarding collective memories and how collaborative networks shift that can be overlooked in human-computer interaction and computer-supported cooperative work: whose stories do we end up telling? How does what we say in them change over time?

Socio-technical systems that rely upon user-generated content are fundamentally shifting who gets to participate and what types of content are privileged in memorials, obituaries, and other forms of cultural memory [32]. These systems have the potential to be communal spaces that can support on-going re-appraisal of what is worth remembering through interaction, but institutionalized routines and norms can also undermine this potential. However this problem is not unique to Wikipedia, but rather reflects how Wikipedia’s posthumous collaborations emulate journalistic obituaries that portray the deceased relative to contemporary values [19], which can naturally shift over time. What remains an open question is when and how Wikipedia and other socio-technical systems that serve as cultural repository archive will evolve in relationship to these values.

#### ACKNOWLEDGMENTS

We would like to thank Navid Dianati, Darren Gergle, Ryan Patrick Kennedy for input on statistical analyses; Scott Hale, Stuart Geiger, Aaron Halfaker, and other members of `wiki-research-1` for feedback on data cleanup; and Deborah Keegan for copy-editing.

#### REFERENCES

1. Barry, E. From epitaph to obituary: Death and celebrity in eighteenth-century British culture. *International Journal of Cultural Studies* 11, 3 (2008), 259–275.
2. Beschastnikh, I., Kriplean, T., and McDonald, D. W. Wikipedian self-governance in action: Motivating the policy lens. In *Proc. ICWSM 2008*, AAAI (2008), 27–35.
3. Brubaker, J. R., Dombrowski, L. S., Gilbert, A. M., Kusumakaulika, N., and Hayes, G. R. Stewarding a legacy: Responsibilities and relationships in the management of post-mortem data. In *Proc. CHI 2014*, ACM (2014), 4157–4166.
4. Brubaker, J. R., and Hayes, G. R. “We will never forget you [online]”: An empirical investigation of post-mortem myspace comments. In *Proc. CSCW 2011*, ACM (2011), 123–132.
5. Brubaker, J. R., Hayes, G. R., and Dourish, P. Beyond the grave: Facebook as a site for the expansion of death and mourning. *The Information Society* 29, 3 (2013), 152–163.
6. Callahan, E. S., and Herring, S. C. Cultural bias in Wikipedia content on famous persons. *Journal of the American Society for Information Science and Technology* 62, 10 (2011), 1899–1915.
7. Carroll, B., and Landry, K. Logging on and letting out: Using online social networks to grieve and to mourn. *Bulletin of Science, Technology & Society* 30, 5 (2010), 341–349.
8. Corder, G. W., and Foreman, D. I. Comparing two related samples: The Wilcoxon signed ranks test. In *Nonparametric Statistics for Non-Statisticians*. John Wiley & Sons, Inc, 2009, 38–56.
9. Ferron, M., and Massa, P. Psychological processes underlying Wikipedia representations of natural and manmade disasters. In *Proc. WikiSym 2012*, ACM (2012), 1–10.
10. Forte, A., Larco, V., and Bruckman, A. Decentralization in Wikipedia governance. *Journal of Management Information Systems* 26, 1 (2009), 49–72.
11. Fowler, B. Mapping the obituary: Notes towards a Bourdieusian interpretation. *The Sociological Review* 52 (2004), 148–171.
12. Geiger, R., and Ribes, D. Trace ethnography: Following coordination through documentary practices. In *Proc. HICSS 2011*, IEEE (2011), 1–10.
13. Geiger, R. S., and Halfaker, A. Using edit sessions to measure participation in Wikipedia. In *Proc. CSCW 2013*, ACM (2013), 861–870.
14. Geiger, R. S., and Ribes, D. The work of sustaining order in Wikipedia: The banning of a vandal. In *Proc. CSCW 2010*, ACM (2010), 117–126.
15. Halbwachs, M. *On collective memory*. University of Chicago Press, 1992.
16. Hale, S. A. Multilinguals and Wikipedia editing. In *Proc. WebSci 2014*, ACM (2014), 99–108.
17. Hanusch, F. Valuing those close to us. *Journalism Studies* 9, 3 (2008), 341–356.
18. Hecht, B., and Gergle, D. Measuring self-focus bias in community-maintained knowledge repositories. In *Proc. C&T 2009*, ACM (2009), 11–20.
19. Hume, J. *Obituaries in American Culture*. University Press of Mississippi, 2000.

20. Hume, J. "Portraits of Grief," reflectors of values: The New York Times remembers victims of September 11. *Journalism & Mass Communication Quarterly* 80, 1 (2003), 166–182.
21. Kastenbaum, R. *The psychology of death*. Springer Publishing Company, 2000.
22. Keegan, B., Gergle, D., and Contractor, N. Hot off the wiki: Dynamics, practices, and structures in Wikipedia's coverage of the Tōhoku catastrophes. In *Proc. WikiSym 2011*, ACM (2011), 105–113.
23. Keegan, B., Gergle, D., and Contractor, N. Staying in the loop: Structure and dynamics of Wikipedia's breaking news collaborations. In *Proc. WikiSym 2012*, ACM (2012), 1–10.
24. Keegan, B., Gergle, D., and Contractor, N. Hot off the wiki structures and dynamics of Wikipedia's coverage of breaking news events. *American Behavioral Scientist* 57, 5 (2013), 595–622.
25. Keegan, B. C. A history of newswork on Wikipedia. In *Proc. WikiSym 2013*, ACM (2013), 1–10.
26. Kittur, A., Lee, B., and Kraut, R. E. Coordination in collective intelligence: The role of team structure and task interdependence. In *Proc. CHI 2009*, ACM (2009), 1495–1504.
27. Latapy, M., Magnien, C., and Vecchio, N. D. Basic notions for the analysis of large two-mode networks. *Social Networks* 30, 1 (2008), 31–48.
28. Loveland, J., and Reagle, J. Wikipedia and encyclopedic production. *New Media & Society* 15, 8 (2013), 1294–1311.
29. Martin, D. D. Identity management of the dead: Contests in the construction of murdered children. *Symbolic Interaction* 33, 1 (2010), 18–40.
30. Marwick, A., and Ellison, N. B. "There isn't wifi in heaven!" negotiating visibility on Facebook memorial pages. *Journal of Broadcasting & Electronic Media* 56, 3 (2012), 378–400.
31. Moremen, R. D., and Cradduck, C. 'How will you be remembered after you die?' gender discrimination after death twenty years later. *Omega: Journal of Death & Dying* (1998), 241–254.
32. Pentzold, C. Fixing the floating gap: The online encyclopaedia Wikipedia as a global memory place. *Memory Studies* 2, 2 (2009), 255–272.
33. Radford, S. K., and Bloch, P. H. Grief, commiseration, and consumption following the death of a celebrity. *Journal of Consumer Culture* 12, 2 (2012), 137–155.
34. Reagle, J., and Rhue, L. Gender bias in Wikipedia and Britannica. *International Journal of Communication* 5, 0 (2011), 1138–1158.
35. Roberts, and Lourdes A. Vidal, P. Perpetual care in cyberspace: A portrait of memorials on the web. *OMEGA: The Journal of Death and Dying* 40, 4 (2000), 521–545.
36. Roberts, P. The living and the dead: Community in the virtual cemetery. *OMEGA: The Journal of Death and Dying* 49, 1 (2004), 57–76.
37. Starck, N. Posthumous parallel and parallax: the obituary revival on three continents. *Journalism Studies* 6, 3 (2005), 267–283.
38. Starck, N. Revelation, intrusion, and questions of taste: The ethical challenge for obituary editors. *Journalism Practice* 1, 3 (2007), 372–382.
39. Starck, N. Death can make a difference: A comparative study of "quality quartet" obituary practice. *Journalism Studies* 9, 6 (2008), 911–924.
40. Unruh, D. R. Death and personal history: Strategies of identity preservation. *Social Problems* 30, 3 (1983), 340–351.