Where experts and amateurs meet: the ideological hobby of medical volunteering on Wikipedia

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Abstract

The following paper advances our understanding of online volunteering in the medical context, through the study of Wikipedia volunteers who edit medical topics. It employs the Volunteer Functions Inventory (VFI) model to study volunteers' motivations through a survey carried out in 2021 (N=74). It highlights the importance of the non-traditional VFI dimensions of "fun" and "ideology" which have not been adequately discussed in the context of medical volunteering. The findings also show that Wikipedia volunteers who edit medical topics are older, more gender-balanced, and better educated than typical Wikipedia volunteers from a decade ago. Many are medical professionals, and their significant involvement helps to explain the above-average quality of Wikipedia medical topics. Conversely, the study reveals the need for more experts to engage with Wikipedia. Lack of volunteers, in particular, experts, and inadequate support from professional institutions, are identified as main reasons for problems in Wikipedia's quality.

Introduction

Despite reservations and disclaimers, Wikipedia, which recently celebrated its 20th birthday, is widely used as a source of medical information, not just by the general public but by many medical practitioners themselves.[1][2][3][4][5][6] Since in medical context, internet interventions can be defined as the delivery of health care-related treatments via Internet,[7] Wikipedia can be arguably said to be one of the most popular tools for internet interventions in existence (at least in the context of patient education; for a discussion on whether patient education can be seen as a form medical internet intervention).[8]

On the one hand, Wikipedia remains a work in progress, with errors and inaccuracies, and it has much scope for improvement. On the other, already a decade ago the quality of medical information on Wikipedia was described as comparable to traditional encyclopedias,[9] and more recently, judged to be above-average when compared to most other areas of the project[10] and even praised by the World Health Organization.[11] This mirrors the shifting attitudes towards Wikipedia in media and academia, which went from scepticism and even hostility, common in the project's early years, to acceptance, and arguably, even trust.[12] Regardless of its imperfections, it is reasonable to assume that in the nearby future, Wikipedia will, according to Shafee et al., "retain its position as a key public health information resource",[2] and remain (quoting Heilman and West, 2015), "one of if not the most viewed medical resource(s) globally".[1]

In the following article, I discuss how this grassroots project, operating with next to no institutional support, was able to create such a reference work. This is achieved through an in-depth look at the group of volunteers, mostly associated with the WikiProject Medicine, who are significantly responsible for introducing and enforcing high standards in medical articles on English Wikipedia.[13][14][15][2]

I compare how the motivations of Wikipedia's contributors to medical topics match up against these of Wikipedia volunteers in general, as well as these of

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medical volunteers outside Wikipedia. I also discuss why some individuals chose to volunteer on Wikipedia instead of elsewhere, and how the Wikipedia medical volunteers locate their volunteering in the context of accepted and best practices in the field of medicine. The study also presents findings on the volunteers' opinions on issues such as Wikipedia's reliability, as well as their thoughts on the sustainability and future of the Wikipedia project. Finally, I discuss the cooperation – or lack of it – between Wikipedia volunteers and the medical establishment, and the consequences of this situation.

Through the discussions outlined above, the paper contributes to advance our understanding of medical volunteering and online volunteering (particularly in the context of Wikipedia). I also show the applicability of the Volunteer Functions Inventory (VFI) model, and how the version of VFI model previously used to study online, but not medical, volunteering can be used to enhance our understanding of the latter.

Theoretical framing

Volunteering in medicine

Volunteering in medicine, also known as medical volunteerism, has a lengthy history. In general, it is seen as a praiseworthy activity, often recommended to young aspiring physicians or nurses, and has been described as a traditional "ethical imperative to serve the disadvantaged".[16] More recently, however, some related activities have been disparagingly called medical voluntourism, as concerns have been raised regarding the short-term medical volunteerism abroad, often in developing countries. Such activities have been criticized when compared to the alternative notion of sustainable capacities, i.e., work done in the context of long-term, locally-run, and foreign-supported infrastructures.[17]

In general, the body of works on the motivations of volunteers is substantial, and a number of studies have focused on the motivations of medical volunteers. One of the most influential has been the research by Fletcher and Major,[18] based on the general functionalist model of volunteering proposed by Clary et al.,[19] known as the Volunteer Functions Inventory, or VFI. It looked into six motivational dimensions:

1) values – expressing values to do with altruism and helping;

2) social – engaging with friends, taking part in activities viewed favorably by others;

3) understanding – expanding knowledge through activities;

4) career – gaining work experience and skills;

5) protective – e.g., reducing guilt over personal privilege, and

6) enhancement – demonstrating knowledge to others.

The VFI model has been used in numerous studies and is considered relatively robust and established, although some scholars suggested a number of improvements or refinements of it since, including adding new motivational dimensions.[20][21]

Findings of Fletcher and Major[18] showed that the relative importance of motivations was values first, followed by understanding, enhancement, social, career, and protective; out of these, the first two categories were generally seen as important, whereas the other four, much less so. This is roughly comparable but not identical to the average portrait of a typical volunteer across all fields, as compiled from the analysis of two decades of VFI use by Chacón et al.,[21] who found that values are indeed the most common dimension, but generally ranked enhancement lower than what Fletcher and Major found; further, medical volunteers seem to find the protective dimension less significant than average volunteers.

WikiProject Medicine

WikiProject Medicine (WPMED) is an organization of Wikipedia volunteers dedicated to improving coverage of medicine-related topics, established in 2004 on English Wikipedia. Since then, over a dozen similar affiliate projects have been established in other languages (unless otherwise stated, this study refers to English Wikipedia's project and content). WPMED has no legal standing, as "WikiProjects" are semi-formal volunteer adhocratic groupings that self-organize within the Wikipedia community.[22] However, in 2012, a dedicated United States-based NGO, Wiki Project Med Foundation (WPMEDF), was formed to support it, with the stated mission of "persuading individual experts and professional and scholarly organizations to review or contribute to Wikimedia medical content, and provide them with necessary support and training".[14][2]

WikiProject Medicine has over a hundred active volunteers, some anonymous, others, including several medical professionals and researchers, who openly disclosed their identity. About half of the volunteers are health care professionals or students.[13][15] According to the WikiProject Medicine's own statistics, since the project's creation until December 2021, 803 volunteers

have declared themselves to be a part of the WikiProject Medicine, but most were active only for a limited period (month or years). It is worth noting that the exact number of medical volunteers active on Wikipedia is hard to assess accurately, as many volunteers edit medical topics without declaring themselves to be a member of the WikiProject Medicine. To put it in context, estimating the exact number of Wikipedia volunteers is hard;[22] and even Wikipedia itself just gives a wide range estimate, stating that for December 2022, "the English Wikipedia currently has 44,734,012 users who have registered a username. Only a minority of users contribute regularly (118,675 have edited in the last 30 days), and only a minority of those contributors participate in community discussions. An unknown but relatively large number of unregistered Wikipedians also contribute to the site."). As such, attempting to answer what fraction of Wikipedia active volunteers is composed of WPMED members is unfortunately hard, particularly in quantitative way. It is undeniably one of the more significant WikiProjects of the site, as evidenced by its inclusion in the series of interviews conducted by Wikipedia's newspaper, The Signpost, with representatives of the most prominent WikiProjects, where it was described as "a very active project".[23]

As noted by Murray[14] and Harangozó,[24] the project has since established contacts with organizations such as the World Health Organization, National Institutes of Health, National Library of Medicine, and Cancer Research UK, and succeeded in creating several Wikipedian in Residence liaison programs at medical institutions (for more on WiR initiative, see Diamond and Doyle).[25] Members of that WikiProject have participated in the creation of the open access WikiJournal of Medicine, launched in 2014 and indexed in SCOPUS from 2020. Tools developed by the WikiProject Medicine members have been found useful in a number of settings, such as "Editathons", events where students and activists are taught how to edit Wikipedia.[10] Content-wise, as of December 2022, WPMED according to the project metrics has overseen over 44,000 articles, out of about six and a half million that existed on English Wikipedia at that time (so approximately a bit over 0.5% of Wikipedia's content). The importance of medical topics is made more clear by the pageview statistics the top most popular 1000 medical-content pages in November 2022 had a combined 132,589,171 views, compared to the project-wide 695,786,927 views for the most popular 1000 Wikipedia pages in general. This suggests that indeed, medical content on Wikipedia is of much interest to the public.

The project has been subject to some cursory attention from scholars. Trevena[13] in his review of the project efforts praised it for assessing the vast majority of medical articles on Wikipedia (at that time numbering about 25,000), at the same time remarking that only around 70 have been assessed as high quality. Trevena also suggested improvements to the Wikipedia system, such as making article assessment more prominent to the readers, and requesting that reviewers leave notes on how to improve low-quality articles. Murray[14] reported that the WikiProject Medicine is "making progress", and a year later, James[15] noted that the number of high-quality articles has improved to approximately 80 and that one of them (on Dengue fever) was even republished in a peer-reviewed journal.[26] James praised the efforts of the volunteers but noted that participation levels are too low to promise any significant improvements to the thousands of lower-quality articles, calling for more medical practitioners to volunteer their time on Wikipedia. With regards to the quality of articles, the review also pointed out that the readability (complexity) of Wikipedia articles may be too high for its intended audience, and encouraged the Wikipedia volunteers to address this issue. More recently, during the recent coronavirus pandemic and the fight against fake news, the activities of the WikiProject Medicine even attracted the attention of mainstream media, which generally praised the Wikipedia volunteers for producing good, if still imperfect content.[3][11] Wikipedia's coverage of that pandemic has also received praise in scholarly studies[27][28] with Segault writing that "a strict observance of the encyclopaedia's rules regarding information quality allowed a precise and robust description of the events" and noting the timely creation of a dedicated WikiProject Medicine's offshoot, WikiProject COVID-19.[29] (Several other offshoots and related projects exist on Wikipedia, such as WikiProject Viruses and WikiProject AIDS, among others).

While the WikiProject Medicine has not been subject to an in-depth theoretical framing, it fits the framing for an epistemic community of practice, as discussed by Akrich[30] in the context of online health activism. According to Akrich, an epistemic community of practice goes beyond a regular community of practice ("a form of collective learning that made it possible to develop experiential knowledge and to articulate this knowledge with other knowledge sources"), as it has "activist approach" with "activities... oriented towards the outside world", positioned between the worlds of science and politics.

Volunteering on Wikipedia

The motivations and activities of WikiProject Medicine volunteers have not, up till now, been studied outside of a brief descriptive treatments mentioned in the preceding section; likewise, the history and activity of WikiProjects in general has not been subject to any significant academic scrutiny, which makes comparative study impossible at present. However, the topic of motivations of Wikipedia volunteers, in general, is relatively well understood, at least with regards to psychological factors, an area that most of the relevant studies have focused on. Findings suggest the importance of intrinsic and extrinsic motivations such as altruism, reputation, and enjoyment[31][32][33] with some more recent work attempting cross-national comparisons trying to address macro-level factors such as culture and level of development.[34]

As observed by Chacón et al.,[21] it is not uncommon for researchers to attempt to refine the classic VFI model, and even Clary et al.[19] acknowledged that their list of functional areas is nonexhaustive. Following the VFI model, Nov[31] suggested the following eight motivational categories (Table 1) – six based on VFI as well as two more that emerged as significant in related research on free and open-source software movement (FOSSM): ideology – expressing support for what is perceived to be the underlying ideology of the activity (e.g., the belief that knowledge should be free) and fun – enjoying the activity. Out of those, the most common motivations are "fun", "ideology", and "values", whereas the least frequently indicated ones are "career", "social", and "protective" ones, Thus Nov's findings align themself with the more general ones of Fletcher and Major,[18] although it's noticeable that the two extra dimensions Nov proposed, absent from Fletcher and Major research, were very significant. Although Nov did not provide a theoretical justification for such extra dimensions, the "ideology" one fits with the "social justice" dimension as discussed by Jiranek et al.,[20] or similarly understood "political and social responsibility"[35] while the "fun" dimension resembles the "event- or excitement-related function" proposed by Güntert et al.[36]

Farič and Potts[37] have explicitly looked at motivations of volunteers in the medical topics, finding them similar to studies done on general volunteer pool, with one significant exception – more volunteers in medical topics declared to have professional experience in this topic area than is common for average volunteers in Wikipedia. Based on their sample of 31 volunteers who responded to their survey and interviews, Farič and Potts developed a model for motivations for editing health-related content on Wikipedia resembling a simplified VFI system, stressing five strongly interrelated categories: education (learning about subjects by editing articles), help (wanting to improve and maintain Wikipedia), responsibility (responsibility, often a professional responsibility, to provide good quality health information to readers), fulfillment (editing Wikipedia as a fun, relaxing, engaging, and rewarding activity), and positive attitude to Wikipedia (belief in the value of Wikipedia).

The classic model proposed by Nov[31] with eight motivational categories has been shown to be quite robust and confirmed by a number of subsequent studies.[32][33] The minor variations between Nov's and subsequent studies appear mostly cosmetic, as different scholars attempted to refine Nov's categories. For example, comparing the classic models of Nov[31] and Farič and Potts,[37] the latter dispensed with the "social" category and arguably combined career, protective, and enhancement groups into one called "professional responsibility", while renaming "understanding" into "education" and "values" into "help". Unfortunately, this means that due to such redefined, overlapping categories, the results of many studies are not fully compatible with others. This is why for my study I have chosen to use Nov's version of the VFI classic framework, which allows easy comparison of my findings to both Nov's original findings and the robust general VFI model.

Data and methods

The following research questions were considered in designing the survey (for the list of survey questions, including an informed consent statement, see here). The research questions have been inspired by the literature survey, my own experience with Wikipedia, as well as online discussions with Wikipedia's medical volunteers conducted prior to and during the survey design (on the public talk pages of the WikiProject Medicine). The survey was sent on December 14, 2021, to 115 users identified by WPMED's own statistics as currently active, as well as to 132 other users I identified as recently active in the relevant topic area on English Wikipedia. Data collection ended a month later, on January 15, 2022:

RQ1: Are (motivations of) medical volunteers different from those of regular Wikipedians – or those of medical volunteers in other contexts? What is the importance of the "fun" and "ideology" dimensions introduced by Nov?

RQ2: Why do some people choose to volunteer on Wikipedia instead of more traditional forms of medical volunteering?

RQ3: According to the volunteers themselves, what is the perception of volunteering on Wikipedia in the medical establishment? Is it something that can raise – or lower – one's reputation in the eyes of their peers?

RQ4: Did Wikipedia medical volunteers have a history of volunteering before Wikipedia and did volunteering on Wikipedia encourage them to volunteer somewhere else?

RQ5: How are the core volunteers dealing with issues such as fake news, COI, advertising, and drive-by edits (a wiki equivalent of medical voluntourism)?

RQ6 How do the core volunteers themselves assess the quality of the article on Wikipedia, and what do they think about the future of the project?

Findings

The response ratio was 30% (74 respondents). Values are reported for the 5-point Likert scale except for VFI values which traditionally use a 7-point scale. Responses of volunteers declaring themselves as medical professionals were compared to others and controlled for; aggregate values are reported as the occasional variations were not statistically significant (according to a t-test).

Limitations

Although the functional approach represented by VFI has been criticized on the grounds of loose theoretical foundation of the functions, their unspecified number, and a varying level of generality,[38] it is judged to be an appropriate theoretical perspective for the present study because it allows motives to be analyzed on a multidimensional and multifunctional level. Further, VFI has been used to study the motivations of Wikipedia volunteers, allowing for generalization and comparisons, much more than other models such as the theory of planned behavior, which has been used less frequently in this context.

With regards to whether the editors on medical topics differ from the "averaged Wikipedia editor", we are unfortunately faced with the reality that the last wide-scale survey of Wikipedia volunteers is over 10 years old (Wikimedia 2011); the last few years saw a series of smaller surveys by the Wikimedia Foundation, but they reported only fragmentary data when it comes to factors such as respondent's education, age or expertise.

Demographics

The respondents of both surveys were mostly male. Majority (90%) of the respondents of the 2011 survey identified themselves as male, compared to my survey which shows an improvement in gender balance, with 75% of respondents identifying themselves as male, 20.5% as female, and 3% as non-binary (Figure 1).
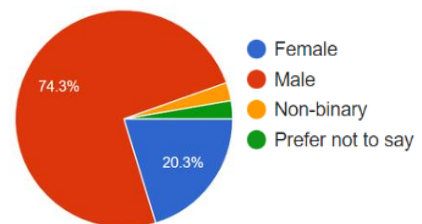

Figure 1 | Respondents' gender

With regards to age, the 2011 survey had over half of the respondents in the age bracket 17-40 and only 20% over that age. In my survey, the distribution was much more even, with over a quarter of respondents reporting being 61 years and older, and a similar number, falling into the 41-60, 26-40. and under 25 brackets. Only 10% of respondents declared themselves to be under 20 years old, while in 2011, over a quarter of editors reported being 21 years or younger (Figure 2).
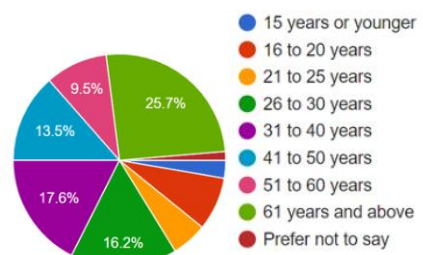

Figure 2 | Respondents' age

A third of respondents of my survey reported completing a doctorate degree, and a quarter, masters (those terms were not defined further in the survey, given its international audience and the general best practices in keeping surveys for general audiences free of unnecessary jargon and details, and should be understood in the broadest meaning). Less than a quarter reported finishing only the high school level. For

the 2011 survey, the numbers were, respectively, 8%, 18% and 40% (Figure 3).
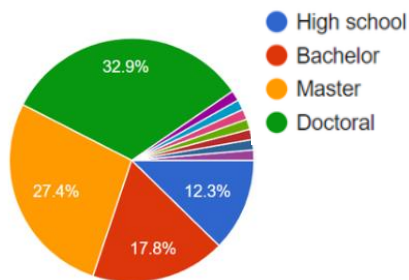

Figure 3 | Respondents' education

About half of the respondents declared they are not medical professionals; 20% declared themselves to be medical practitioners and 12%, medical researchers (Figure 4). Those terms were again kept simple, given the international audience of the survey, and as such, can be interpreted to include concepts such as allied health professions.
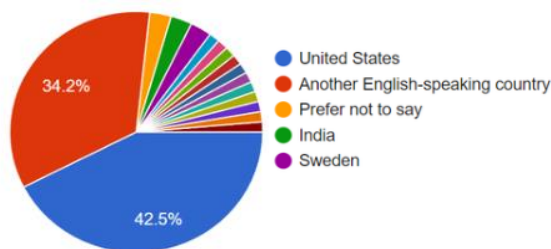

Figure 4 | Respondents' citizenship

Most (80%) respondents came from the US or another English-speaking country (Figure 5).
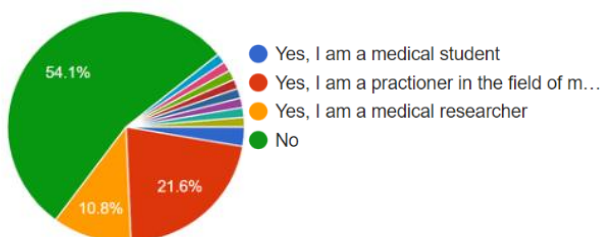

Figure 5 | Respondents' expertise

Volunteering

With regards to the VFI dimensions, the most significant one (measured on a 7-point scale) is ideology at 6.3, followed by values and understanding, respectively at 6.1 and 6, fun at 5.85, enhancement at 5.5, protective at 4.2, and rounded up by the social and career dimensions respectively at about 3.4 and 3.2 Table 1).

Over half of the surveyed volunteers have been active on Wikipedia for 10 or more years. A quarter has been active for less than three years, with less than 5% of the respondents active for less than one year (Figure 6). The time volunteers spend in Wikipedia shows 25% of the respondents spending 11 hours or more per week, 20% less than one hour, and the rest falling in between (Figure 7).
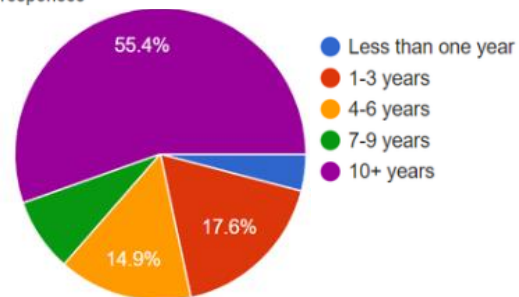
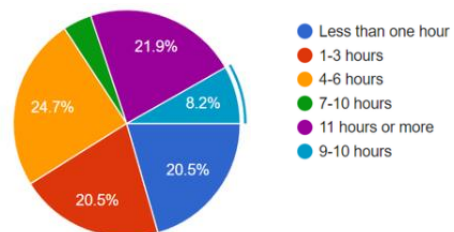**Figure 6** | Length of respondent's Wikipedia

Figure 7 | Respondent's Wikipedia activity

Table 1 | VFI comparative results (7-point scale)

	Fletcher and Major (2004)[18]	Nov (2007)[31]	Chacón et al. 2017[21] (Health)	Clary et al., (1998)[19]	This study
Values	5.98	3.96	5.61	5.82	6.03
Understanding	5.23	3.92	3.72	4.91	6.09
Enhancement	4.38	2.97	4.33	2.59	5.52
Social	4.15	1.97	3.09	4.27	3.36
Career	3.9	1.67	1.68	2.74	3.19
Protective	2.68	1.51	2.9	2.61	4.15
Fun	N/A	6.1	N/A	N/A	5.85
Ideology	N/A	5.59	N/A	N/A	6.3

With regard to their focus on editing Wikipedia, the respondents are evenly distributed. For nearly 40% of respondents, editing medical topics takes up half or more of their volunteering. For approximately a third or less, it accounts for 10% or less of their edits on Wikipedia (Figure 8).

Q19. What percantage of your total volunteering on Wikipedia is made of edits to or discussions about medical topics?
71 responses

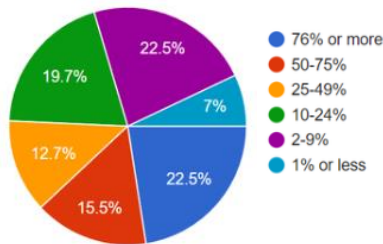- 76% or more
- 50-75%
- 25-49%
- 10-24%
- 2-9%
- 1% or less

Figure 8 | Respondent's Wikipedia focus

Three-quarters of respondents volunteered in other ways before doing so on Wikipedia, about a third significantly. About 40% of the respondents said that volunteering on Wikipedia inspired them to do so elsewhere, although only 13% see Wikipedia as a significant influence. When asked to elaborate on their off-Wikipedia volunteering, only a few respondents mentioned other wikis or online contexts; the majority of responses discussed more traditional forms of volunteering (Figures 9 & 10).

When asked about why volunteer on Wikipedia instead of elsewhere, the most common response was that it is convenient (14). Other responses included that this is because Wikipedia has a high impact (10), that it is a fun hobby (10) and that they believe in Wikipedia's mission (9).

Only a quarter of respondents disclose their identity on Wikipedia. Reasons for not disclosing their identity include concerns about privacy as well as fear or actual experiences of harassment and stalking. A minority of respondents indicated that they live in a place where editing Wikipedia could be frowned upon by their government. Editors who edit non-anonymously noted

Q9. Did you volunteer before becoming an active Wikipedian? (As in, did you ever donate time and labour for community service)
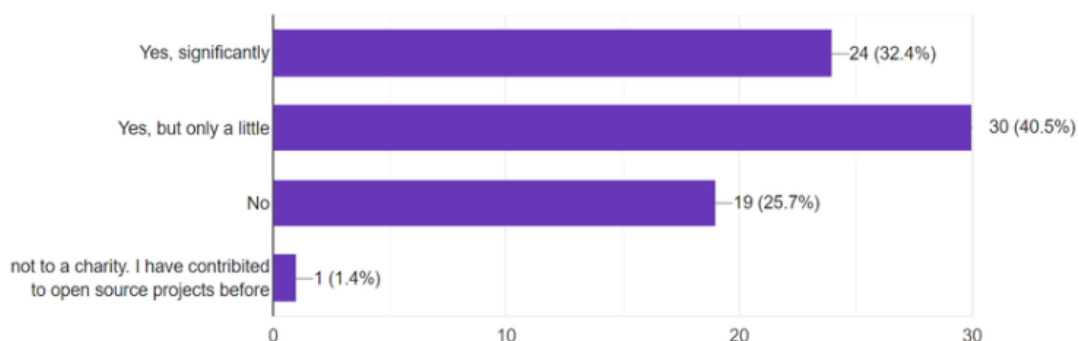74 responses

- Yes, significantly — 24 (32.4%)
- Yes, but only a little — 30 (40.5%)
- No — 19 (25.7%)
- not to a charity. I have contributed to open source projects before — 1 (1.4%)

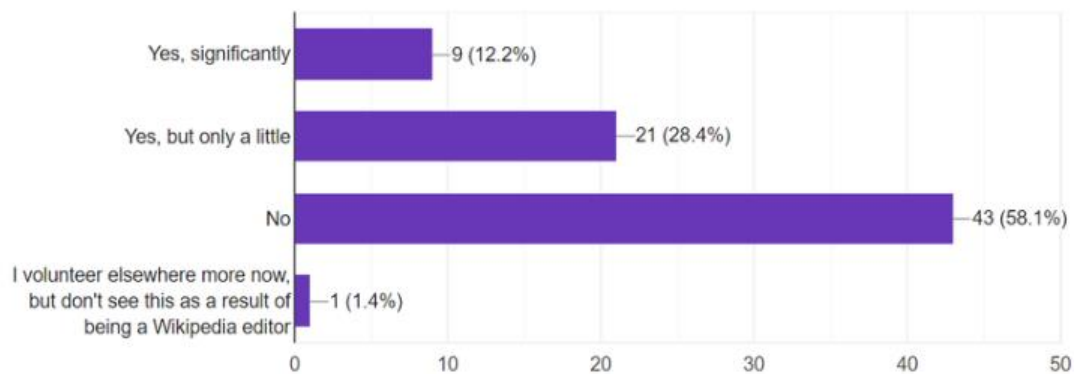**Figure 9 |** Respondent's volunteering trajectories

Figure 10 | Respondent's volunteering trajectories, continued

that they do so because they are proud to declare their involvement with the project, as well as to disclose their credentials and address potential conflicts of interest.

Most editors strongly agree with the statement that editing Wikipedia is satisfying (4.6). Some, however, also find it stressful (3.3).

The majority would recommend editing Wikipedia to their colleagues (4.2), although they only moderately agree that if said colleagues' knew about them editing Wikipedia their opinion about them would improve (3.3), in turn very few are concerned that their colleagues knowing about their Wikipedia volunteering would reflect badly on them (2). The respondents strongly agree that more medical professionals should edit Wikipedia (4.4).

Regarding why medical professionals don't edit Wikipedia, the respondents moderately agree that "they don't know how easy it is to edit Wikipedia" (3.6) although they also express the sentiment that "editing Wikipedia is still too challenging/difficult" (3.5). Despite this being one of the project's slogans, many respondents believe that many of their colleagues still may not know that Wikipedia can be edited by anyone (3.7). Most respondents think that medical professions are too busy with their professional life (4.4) as well as families and hobbies (4.2). They are also concerned that editing Wikipedia may not be seen as is a reputable professional activity (3.7), that the Wikipedia environment is too hostile to new editors (3.4), and that incentives to edit Wikipedia are too few (3.4).

WikiProject Medicine

A bit over half of the respondents declared that they are members of WikiProject Medicine, with about 7% declaring themselves as former members. For about

40% of the members, their membership is important for their identity in the project. When asked to describe the purpose of the WikiProject Medicine in their own words, nearly all respondents articulated their views about how its goal is to improve the coverage of medical topics.

The respondents agreed with the statements that:

- WikiProject Medicine, compared to other WikiProjects, is more professional (3.6)
- WikiProject Medicine, compared to other WikiProjects, is more successful (3.5)
- WikiProject Medicine has a growing reputation outside Wikipedia (3.3)
- WikiProject Medicine should receive more support from within Wikipedia (e.g. from WMF) (3.5)
- WikiProject Medicine should receive more support from outside Wikipedia (e.g. from WHO, professional bodies, etc.) (3.7)
- WikiProject Medicine needs new members (3.9)
- More people outside Wikipedia should know about WikiProject Medicine (3.8)

And were mostly ambivalent whether:

- WikiProject Medicine, compared to other WikiProjects, is more friendly (2.9)
- WikiProject Medicine steadily attracts new members (2.9)
- There are very few active members, and I fear for the future of the project (3)

With regards to the project's biggest success, the respondents listed, predominantly, high-quality content (22), with less frequent answers pointing out to enforcing above-average standards for referencing of medical content (5), institutional partnerships (3), and creating a friendly community (3).

With regards to the project's biggest failures, the opinions were more diversified and included concerns about quality of important topics (15), about conflicts with other editors and infighting (13), lack of focus (5), overuse of jargon (5), and failure to attract and retain more members, particularly experts (4).

Wikipedia coverage of medical topics

Respondents strongly agree that many people use Wikipedia as a source for medical information (4.5), and agree that "many medical professionals use Wikipedia as a source for medical information" (3.9). The respondents think that medical content on Wikipedia is relatively reliable (3.7; Figure 11) but they also agree that "there are better, more reliable websites than Wikipedia for medical information that the average person should be using instead" (3.6).

With regards to what better, more reliable sources should be used, eight respondents listed WebMD, four mentioned Mayo Clinic, US NIH and UK NHS, three Medline. two UK NICE, WHO, CDC and PubMed, and there were a number of other websites mentioned only once.

When asked about the biggest challenges for ensuring Wikipedia's coverage of medical topics is high quality, the respondents strongly agreed about the lack of volunteers (4.2) and agreed that paywalls that make it difficult to access reliable sources (3.8), that one biased active editor can significantly skew the coverage of topics they are interested in (3.7), and that problems arise due to undeclared advocacy, paid editing, spam and similar ethical problems (3.7), usage of low-quality sources (3.4), and too many amateurs making low-quality edits (3.3) while disagreeing that editing Wikipedia is too difficult (2.7) and that not enough weight is given to sources that may not be peer-reviewed but could nonetheless be valuable as presenting an alternative point of view (2.5).

When asked how many years before most of the medical topics on Wikipedia are considered "high quality" the respondents were divided, with roughly similar numbers pessimistic (never, 17.5%) and optimistic (less than 5 years, 16%). The majority of about 40% settled on the range of 6-20 years, with 8% choosing the 21-60 yeas timeframe.

When asked if they have any suggestions on what needs to happen for Wikipedia's medical content to significantly improve, the most common answers included encouraging expert participation (16) and recruiting more volunteers in general, as well as improving experiences of new editors (10), followed by addressing the readers needs, particularly by making articles more accessible and less reliant on jargon (4).

When asked about how they feel about the educational initiatives, where professors assign their students to edit Wikipedia articles, the respondents were quite positive, agreed that "such initiatives are usually net positive" (3.7) and disagreed that "medical topics are too sensitive to be edited by students" (2.3). Approximately 10% of the respondents noted that at some point they were instructors organizing such activities, and a similar number that they have participated in such activities as a student.

When asked about outside support from organizations like WHO or NIH for Wikipedia, the respondents strongly agreed that "there is no such support or it is negligible" (4.4) likely because "Wikipedia is not seen as important by such institutions" (4.5), and somewhat agreed that support from such institutions could be problematic "due to conflict of interest" (3.4).

Discussion

Demographics

My survey suggests that the demographic image of the volunteers on Wikipedia has undergone a shift compared to the 2011 baseline. The female participation has doubled, although whether the improved female participation is a result of the efforts of the Wikimedia community to address the issue of gender gap within the project, or a result of other factors, remains to be determined by future studies. A recent Wikimedia Foundation survey suggested that female participation in the Wikimedia projects, ten years ago only at 10%, has recently increased to 20%, although considering the fact that most of respondents to my survey have been active for a long period of time, it seems likely that medical volunteers on Wikipedia have had a more balanced gender ratio before the recent changes to the wider Wikipedia editor community.
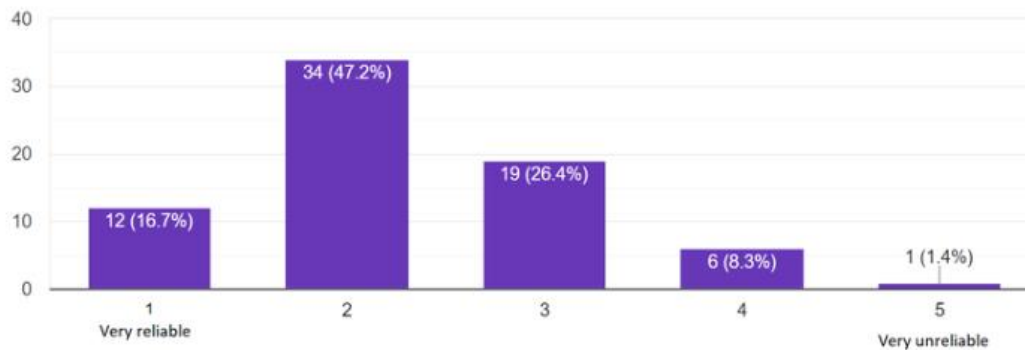
Figure 11 | Respondent's views on Wikipedia reliability

Another observed difference concerns the fact that the 40+ age group for Wikipedia volunteers is twice the size of the average Wikipedia volunteer group from ten years ago, and in turn, the number of young respondents has significantly decreased. The educational level of surveyed volunteers is also shown to be much higher than that of average Wikipedians from the past, although more consistent with findings by Farič and Potts[37] and Heilman and West.[1] 50% of those surveyed by Farič and Potts[37] had a medical background, 70% were older than 30 years, most were male, and 75% had a college degree; likewise, Heilman and West[1] found that 85% of Wikipedia's core medical editors have attained one (with more than 50% going beyond that level). This reinforces prior findings suggesting that medical editors are not typical of the wider community as understood by past studies.

In summary, my respondents are more gender-balanced, older, and better educated than typical volunteers from ten years ago. However, the studied group of Wikipedia volunteers may not be representative of the Wikipedia volunteers in general, given the sample's focus on volunteers editing medical content. Therefore, whether this suggests a wider generational shift in the demographics of all Wikipedia editors or is a difference between editors interested in medical topics and the rest of Wikipedia volunteers again remains to be determined by follow-up comparative research.

Volunteering

To understand the potential differences between my respondents and other groups, I have compared them, on the 7-point scale commonly used in the VFI methodology, to other groups: the medical volunteers as studied by Fletcher and Major,[18] the Wikipedia volunteers as studied by Nov,[31] the health volunteers from comparative meta-study by Chacón et al.[21] and

the original volunteer group from Clary et al.[19] Unfortunately, while Chacón et al.[21] provided data on how the score of volunteers in the health settings differs from others, they did not provide any discussion or analysis of the relevant findings. Further, Nov[31] did not discuss why the score for traditional VFI motivations in his study has been visibly lower compared to the Clary et al.[19] at all baseline (a finding not repeated in my survey).

Key takeaways include the following:

- the additional dimensions proposed by Nov[31] have been shown to continue to be viewed as significant motivations by respondents of my survey, although their relative importance has been flipped (volunteers studied by Nov ranked fun as more important than ideology, at 6.1 to 5.6, whereas volunteers from my sample ranked ideology as superior to fun, 6.3 to 5.8). In both mine and Nov's studies, those two dimensions have been highly significant (representing the two most important dimensions in Nov's sample, and respectively the first and fourth in mine).

- For Fletcher and Major,[18] Chacón et al.,[21] and Clary et al.,[19] values have been the most important dimension. However, for mine and Nov's samples, they are, while still significant, third to other values. In Nov's data, fun and ideology are more significant, and in mine, ideology and understanding take precedence, although the mean scores in my set are much more similar than in Nov's.

- In all studies, protective, career, and social motivations are among the least important, although their respective ranks tend to differ

- Likewise, enhancement and understanding are generally considered middle-ranking motivations.

If the volunteers in my study could be seen as typical Wikipedia volunteers of the project's second decade – something that I am not prepared, however, to endorse without a much more wide-ranging survey – then we could conclude that the importance of "ideology" has increased, and "fun", slightly decreased, which could be consistent with the assumption that the Wikipedia volunteers are aging or, in other words, growing up. The other values are similar to those reported by Nov, except for the increased significance of career motivation, which roughly doubled from 1.67 to 3.19, although still remains the least important dimension. Those findings, in the context of most of the respondents being long-term Wikipedia volunteers, also do not confirm these by Cox et al.,[39] who suggested that long-term online volunteers will see decrease in the significance of values and understanding, and increase in protective and social motivations. In either case, however, the importance of "fun" and ideology in the content of Wikipedia, and by extrapolation with existing literature, the free and open software community is significant. Note that ideology, in this context, represents the free culture attitude that "information wants to be free" (for more on this, see Lessig).[40] In either case, this suggests that more studies using the VFI model might benefit from the inclusion of these two dimensions to get a more nuanced understanding of the volunteer motivations, particularly as my literature review failed to find a sound theoretical reason to limit the use of those dimensions to the studies of the free and open-source movement. Many other aspects of social movement activity have their own ideologies, comparable to FOSSM, and the concept of fun is even more universal.

If we were to see my respondents as primarily medical volunteers, then the findings are relatively consistent with prior research,[18][21] although the "understanding" dimension scores much more highly in mine and Fletcher and Major's dataset than in Chacón et al.'s. This could be explained, for my sample, due to the fact that writing for Wikipedia is closely related to reading it, and reading an encyclopedia is a classic self-educational activity. Compared to all previous studies, my respondents also assigned above-average importance to the protective dimension, something that could merit further investigation.

Several responses also suggested that in addition to the division into medical experts and laymen, further research may benefit from a category for dedicated amateurs, such as well-informed patients, described by

one of the respondents as "editors who suffer from a disease or disability and who edit that ailment's article". Follow-up discussions on whether such editors represent any significant percentage of Wikipedia's volunteers editing medical topics may be fruitful.

With regards to other findings, the group of 10% respondents for whom engagement with Wikipedia became an inspiration to volunteer elsewhere, as well as the group of 40% for whom editing Wikipedia seems to be the first major experience in community service suggest the potential for further research relevant to the social movement and psychology scholarship on paths of volunteering (for more on this, see e.g., Matsuba et al.[41] and Maher and Earl).[42] There are indications that prior history of volunteering is conducive to engaging with Wikipedia, as well as of the reverse casual relationship, which also might warrant further investigation as to which side of this relationship, if any, is dominant. Further, the comments from a number of editors about convenience as a significant reason for them choosing to edit Wikipedia (instead of or in addition to other activities) are insightful. Prior research on online volunteering did note that convenience is a relevant factor (e.g., Haski-Leventhal et al.),[43] one found relevant to explaining Wikipedia's popularity,[5] and it also appears to be one that VFI does not fully account for, suggesting another dimension that may be missing from the current framework.

As fewer than 5% of respondents have been active on Wikipedia for less than a year, and half report ten or more years of engagement with the project, coupled with a relatively low level of concerns about drive-by amateur contributions, it seems that the Wikipedia volunteering setting is not significantly affected by the problems of "voluntourism".

My study also confirms that Wikipedia volunteers, while generally seeing their activities as fun and satisfying, can also be affected by various stressors, thus confirming the findings of Konieczny (2018)[44] on the importance of stress in online volunteering.

WikiProject Medicine

With regards to the WikiProject Medicine, the respondents, both members, and non-members alike are generally positive about it (while several respondents described themselves as former members, none discussed the reasons for their change of membership status, something that is pretty informal on Wikipedia anyway). Respondents generally agree that the project is rather successful and professional, although opinions are divided on whether it is

sufficiently collegial and able to produce a particularly friendly environment. A small number of respondents voiced criticism of the project's leadership, perhaps reflecting the inevitability of issues such as the iron law of oligarchy in all communities, including Wikipedia.[45]

The emerging picture suggests that WPMED is able to successfully curate content but is not more successful than other parts of Wikipedia when it comes to retention of new and old editors, and conflict resolution, and issue which remains a serious concern for the Wikimedia community.[44] While many feel that the project has been successful, there is a general feeling that much more remains to be done, and that progress is slow due to relatively small numbers of volunteers (when compared to the number of tasks that need carrying out).

Wikipedia coverage of medical topics

The respondents generally agree that Wikipedia is relatively reliable in medical topics, but overall recommended caution, pointing to the project's medical disclaimer and to the fact that encyclopedias are not health advice sites, something that many people are nonetheless confused about. Many noted that much work remains to be done and that existing statistics on Wikipedia's reliability, often based on the project's internal assessment may be overly optimistic. Right now, approximately 1% or 600 medical articles are rated on Wikipedia as high-quality ("Featured" and "Good" articles that at some passed internal Wikipedia peer review process), but such statistics are misleading, as some of these assessments are years, even a decade old, and need reassessment.

The respondents generally agree, to quote one respondent, that "Wikipedia is the most requested, published, accessed, and consulted source of medical information on almost every topic for which people search." although they are not convinced this is the ideal situation, as they acknowledge the existence of more reliable resources. Many respondents recommend government-run information portals. At the same time, many respondents also observed that said other websites are either harder to find or simply not accessible to the general public. As another respondent remarked: "There are better more reliable sites, but relatively inaccessible. Wikipedia is useful as a gateway to many of these sites via references, and helps to filter out unreliable sites which Google and social media spectacularly fail to do." Another concluded that "It depends on the context, but I believe Wikipedia is the main initial source for most people, most of the time—we should accept that and make the

signposting onwards (to better sources) from Wikipedia more robust.".

With regards to the biggest challenges, the number one concern is the perennial problem of not enough volunteers. This is not a novel finding, as already in their conclusion, Farič and Potts[37] noted that "there is a need for more people to be involved in Wikipedia's health-related content.", a sentiment echoed by a number of other writers in the reviewed literature. To put this in perspective, the number of highly active Wikipedia volunteers in medical topics rarely surpasses a few dozens at any active time, and as this study shows, even in that small number, many are well-meaning amateurs and not experts. Hence it should not come as a surprise that the volunteers feel that their efforts are underappreciated by the professional community, which they feel should engage more with Wikipedia.

There are inevitable tensions due to experts and amateurs mixing on Wikipedia, some of which were visible in the comments by respondents, who noted the occasional conflict lines between these two groups (for a view from an expert who failed to integrate into Wikipedia community, see for example Friedman 2021);[46] nonetheless, most respondents expressed a desire to see more experts contributing to Wikipedia. With regards to the topic of the relationship between the Wikipedia community and experts[47][48] the respondents confirm that the days of experts fearing or actively disliking Wikipedia are gone, although there is no agreement that editing Wikipedia is seen as particularly reputable; it is more of an acceptable rather than a commendable hobby. Many volunteers feel that this is a missed opportunity: "There are big opportunities for impact. For instance, the COVID-19 pandemic article gets hundreds of thousands of views per month, yet even things like the description in the lead of spread via fomites, length of symptoms, and the ordering/weighting of the list of preventative measures could benefit from attention from a medical expert."

Nonetheless, while the overall attitude of Wikipedia volunteers towards experts is positive, it is more cautious towards institutions. Many expressed varying levels of concerns about conflicts of interest or institutional agendas. There were also repeated concerns regarding the problems related to undeclared advocacy, paid editing, spam and similar ethical problems. This presents a counterpoint to recent research on the ethics of using monetary incentives in eliciting knowledge contribution from health experts.[49]

The respondents were not biased towards non-medical professionals, likely given the overall amateur-friendly culture of Wikipedia. Several did express some caution, exemplified by one respondent who observed that "There is a constant threat from pseudoscience propagated by a small number of highly motivated editors. A fair proportion of it gets through and can hang around for years on seldom-edited pages. I don't think there is any solution to this problem at the moment: there is a limited number of well-informed good-faith editors." Nonetheless, most respondents saw ample opportunity for collaboration between experts and amateurs. As one respondent remarked, "I'd like non-medical people to know that they can have a role in medical articles, even if they aren't medical professionals." Some respondents suggested that non-experts can help through activities such as copyediting or working on less sensitive topics such as the history of medicine. The respondents were also quite favorably disposed towards educational initiatives where teachers are encouraging students to edit Wikipedia (an activity recommended by, among others, Mendes et al.;[48] for further a discussion of such initiatives, see Konieczny,[50] Suwannakhan and Limpanuparb[51] and Weiner et al.).[10]

The respondents observed that one of the main reasons for experts not contributing to Wikipedia is a lack of time combined with a lack of incentives, followed by a lack of realization that Wikipedia has such a big impact yet contributing to it is relatively easy. Considering how many respondents fear that their colleagues do not even realize that they can edit Wikipedia, this suggests that despite many medical professionals using Wikipedia as a source, their understanding of how it works – and that it is a place they could easily contribute to – remains limited. Among proposed practical solutions were suggestions on how to engage with the professional community, such as utilization of grants and related incentives, collaboration with professional and educational institutions through outreach programs such as the "Wikipedians in residence" scheme, and recognizing editing Wikipedia as an activity that should be credited as institutionally recognized professional development or community service.

The issue of restricted access to reliable materials, in particular, due to paywalls, emerged as the next big concern. As one respondent remarked "we have problems finding sources that cover some relevant and encyclopedic aspects of sources, such as academic sources that compare and contrast practices in different countries or that summarize large regions" Ironically, some of that information exists in professional medical

encyclopedias – works that remain very hard to access, and which therefore have very little impact, yet contribution to which rewards the authors with professional recognition – unlike contributing to Wikipedia. Several editors connected this to worldwide digital divide, noting that many readers but also contributors to Wikipedia come from developing countries ("do mention how WP is useful to Third World countries, where practitioners have $$$ to pay for literature."). Other area of concern involved biased editing, which can occur not only from non-experts trying to promote topics such as alternative medicine, but also from experts, either due to conflict of interest, or misunderstanding Wikipedia's audience and writing content with too much jargon, focusing on fellow practitioners rather than the general readership; this confirms the findings of James (2016).[15] The comments on issues with jargon and readability also echo general findings on Wikipedia quality, which confirm that readability is one of the weakest areas of the project, although there have also been signs of progress over the years.[52][53][54]

Conclusions

There are indications that medical volunteers on Wikipedia have a much higher proportion of experts, and are older, more gender-balanced, and better educated than Wikipedia volunteers from ten years ago. This finding comes with the caveat that this could be true for all Wikipedia editors, as we do not have any recent comparative survey of the general Wikipedia editor population to cross-reference my findings with.

The popular image of Wikipedia as a project written mostly by amateurs does not hold true for the medical topic area, where we see a roughly equal mixture of medical professionals and amateurs. All respondents, including medical professionals, share a qualified view of Wikipedia as a reliable, if imperfect, source. Given the above-average quality of medical content, compared to many other topic areas on Wikipedia, the findings suggest that the reason for this is the significant involvement of medical professionals. There are no indications of any significant culture clashes between amateurs and experts, and WikiProject Medicine has been able to successfully integrate both groups. Most respondents see the need to increase the number of volunteers, preferably experts, active on Wikipedia, particularly if Wikipedia's coverage and quality are to improve on a realistic timeframe. There is also a general feeling that Wikipedia's significance as a source of medical information is underrated in the world of medical practitioners, who are seen as mostly unaware

of or unconcerned with Wikipedia's reach, popularity, and the very fact that they can easily engage with the project.

With regards to volunteering, the analysis of the VFI dimensions in the present study suggests that ideology and fun are important factors, despite not being commonly used in VFI models. This suggests that these dimensions need not be limited to the studies of the free and open-source movement (where there are most commonly found). There are also indications of longitudinal changes with fun becoming slightly less important, and ideology, more so, for Wikipedia volunteers. In addition to the fun and ideology, another dimension that emerged as significant but not covered in the general VFI model is the concept of convenience as a factor why people chose to volunteer on Wikipedia instead of elsewhere, although this factor is likely related to the digital aspect of volunteering in general.

The relative ranking of other dimensions is consistent with those found in prior studies (with values generally seen as a major reason to contribute, while career and social aspects are much less significant). Therefore, the emerging profile of a medical Wikipedia volunteer is not much different from a typical medical volunteer in other contexts – outside the aforementioned influence of "free culture" ideology and fun (finding editing Wikipedia to be an enjoyable hobby), topics that may be worthwhile to investigate in other, non-digital settings, to check whether they have wider implications on our understanding of medical volunteering in particular and volunteering in general.

While Wikipedia is a non-profit endeavor, recent research shows that big media companies, which Wikipedia rivals in its impact, play an important role in publishing and sharing health information, showing the positive impact they can have on public health communication.[55] This research should be of interest for digital platform managers who want to maximize health experts' knowledge contribution, which is vital for improving health literacy, while engaging with volunteers motivated less by profit than ideals.

Additional information

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Ethics statement

Best practices were followed to ensure respect for ethics during the design and implementation of the survey. See here for IRB page related to the author's institution, including a list of institutional best practices.

References

1. Heilman, James M.; West, Andrew G. (2015-03-04). "Wikipedia and Medicine: Quantifying Readership, Editors, and the Significance of Natural Language". *Journal of Medical Internet Research* **17** (3): e4069. doi:10.2196/jmir.4069. ISSN 1438-8871.

2. Shafee, Thomas; Masukume, Gwinyai; Kipersztok, Lisa; Das, Diptanshu; Häggström, Mikael; Heilman, James (2017-11-01). "Evolution of Wikipedia's medical content: past, present and future". *Journal of Epidemiology & Community Health* **71** (11): 1122–1129. doi:10.1136/jech-2016-208601. ISSN 0143-005X. PMID 28847845.

3. Laudato, Anthony (May 24, 2020). *"The rise of Wikipedia as a source of medical information". Sunday Morning.* CBS News. Retrieved 2022-11-14.

4. Smith, Denise A. (2020-02-18). "Situating Wikipedia as a health information resource in various contexts: A scoping review". *PLoS ONE* **15** (2): e0228786. doi:10.1371/journal.pone.0228786. ISSN 1932-6203. PMID 32069322. PMC 7028268.

5. Huisman, Martijn; Joye, Stijn; Biltereyst, Daniël (2021-09-10). "Health on Wikipedia: a qualitative study of the attitudes, perceptions, and use of Wikipedia as a source of health information by middle-aged and older adults". *Information, Communication & Society* **24** (12): 1797–1813. doi:10.1080/1369118X.2020.1736125. ISSN 1369-118X.

6. Epstein, Helen-Ann Brown (2022-04-03). "Health Information on Wikipedia: Can You Trust It?". *Journal of Consumer Health on the Internet* **26** (2): 218–224. doi:10.1080/15398285.2022.2069391. ISSN 1539-8285.

7. Rozental, Alexander; Boettcher, Johanna; Andersson, Gerhard; Schmidt, Brad; Carlbring, Per (2015-05-04). "Negative Effects of Internet Interventions: A Qualitative Content Analysis of Patients' Experiences with Treatments Delivered Online". *Cognitive Behaviour Therapy* **44** (3): 223–236. doi:10.1080/16506073.2015.1008033. ISSN 1650-6073. PMID 25705924.

8. Ritterband, Lee M.; Thorndike, Frances (2006-09-29). "Internet Interventions or Patient Education Web sites?". *Journal of Medical Internet Research* **8** (3): e580. doi:10.2196/jmir.8.3.e18. ISSN 1438-8871.

9. Reavley, N. J.; Mackinnon, A. J.; Morgan, A. J.; Alvarez-Jimenez, M.; Hetrick, S. E.; Killackey, E.; Nelson, B.; Purcell, R. *et al.* (2012-08). "Quality of information sources about mental disorders: a comparison of Wikipedia with centrally controlled web and printed sources". *Psychological Medicine* **42** (8): 1753–1762. doi:10.1017/S003329171100287X. ISSN 1469-8978.

10. Weiner, Shira Schecter; Horbacewicz, Jill; Rasberry, Lane; Bensinger-Brody, Yocheved (2019-03-18). "Improving the Quality of Consumer Health Information on Wikipedia: Case Series". *Journal of Medical Internet Research* **21** (3): e12450. doi:10.2196/12450. ISSN 1438-8871.

11. *"Wikipedia is 20, and its reputation has never been higher". The Economist.* 2021-01-09. ISSN 0013-0613. Retrieved 2022-11-15.

12. Benjakob, Omer; Harrison, Stephen (2020). "From Anarchy to Wikiality, Glaring Bias to Good Cop: Press Coverage of Wikipedia's First Two Decades". In Reagle, Joseph; Koerner, Jackie. *Wikipedia @ 20: Stories of an*

Incomplete Revolution. The MIT Press. doi:10.7551/mitpress/12366.003.0005. ISBN 9780262538176.

13. Trevena, Lyndal (2011-06-08). "WikiProject Medicine". *BMJ* **342**: d3387. doi:10.1136/bmj.d3387. ISSN 0959-8138. PMID 21653617.

14. Murray, Terry (2015-03-03). "WikiProject Medicine making progress". *CMAJ* **187** (4): 245–245. doi:10.1503/cmaj.109-4982. ISSN 0820-3946. PMID 25646285.

15. James, Richard (2016-10-01). "WikiProject Medicine: Creating Credibility in Consumer Health". *Journal of Hospital Librarianship* **16** (4): 344–351. doi:10.1080/15323269.2016.1221284. ISSN 1532-3269.

16. Scott, H. Denman; Bell, Johanna; Geller, Stephanie; Thomas, Melinda (2000-01-05). "Physicians Helping the UnderservedThe Reach Out Program". *JAMA* **283** (1): 99–104. doi:10.1001/jama.283.1.99. ISSN 0098-7484.

17. McCall, Daniel; Iltis, Ana S. (2014-12-01). "Health Care Voluntourism: Addressing Ethical Concerns of Undergraduate Student Participation in Global Health Volunteer Work". *HEC Forum* **26** (4): 285–297. doi:10.1007/s10730-014-9243-7. ISSN 1572-8498.

18. Fletcher, Thomas D.; Major, Debra A. (2004-07-01). "Medical Students' Motivations to Volunteer: An Examination of the Nature of Gender Differences". *Sex Roles* **51** (1): 109–114. doi:10.1023/B:SERS.0000032319.78926.54. ISSN 1573-2762.

19. Clary, E. Gil; Snyder, Mark; Ridge, Robert D.; Copeland, John; Stukas, Arthur A.; Haugen, Julie; Miene, Peter (1998). "Understanding and assessing the motivations of volunteers: A functional approach". *Journal of Personality and Social Psychology* **74** (6): 1516–1530. doi:10.1037/0022-3514.74.6.1516. ISSN 1939-1315.

20. Jiranek, Patrick; Kals, Elisabeth; Humm, Julia Sophia; Strubel, Isabel Theresia; Wehner, Theo (2013-09-01). "Volunteering as a Means to an Equal End? The Impact of a Social Justice Function on Intention to Volunteer". *The Journal of Social Psychology* **153** (5): 520–541. doi:10.1080/00224545.2013.768594. ISSN 0022-4545. PMID 24003581.

21. Chacón, Fernando; Gutiérrez, Gema; Sauto, Verónica; Vecina, María L.; Pérez, Alfonso (2017-08). "Volunteer Functions Inventory: A systematic review". *Psicothema* **29** (3): 306–316. doi:10.7334/psicothema2016.371. ISSN 1886-144X. PMID 28693699.

22. Jemielniak, Dariusz (2014). *Common Knowledge?: An Ethnography of Wikipedia.* Redwood City, CA: Stanford University Press. doi:10.11126/stanford/9780804789448.001.0001. ISBN 978-0-8047-9120-5.

23. Thomas888b (2011-03-21). "Medicpedia — WikiProject Medicine". *The Signpost.* Wikipedia. Retrieved 2022-12-30.

24. Harangozó, Adam (21 March 2022). "Where should we share health information if not where people are looking?". National Institute for Health and Care Research. Retrieved 2022-12-30.

25. Diamond, Kelly; Doyle, Kelly (2018-09-28). "What a Wikipedian in Residence Can Do For You: Information Literacy and Learning Transfer". *Georgia International Conference on Information Literacy.*

26. Heilman, James M.; De Wolff, Jacob; Beards, Graham M.; Basden, Brian J. (2014-10-02). "Dengue fever: a Wikipedia clinical review". *Open Medicine* **8** (4): e105–e115. ISSN 1911-2092. PMID 25426178. PMC 4242787.

27. Colavizza, Giovanni (2020-12). "COVID-19 research in Wikipedia". *Quantitative Science Studies* **1** (4): 1349–1380. doi:10.1162/qss_a_00080. ISSN 2641-3337.

28. Avieson, Bunty (2022-11-07). "Editors, sources and the 'go back' button: Wikipedia's framework for beating misinformation". *First Monday* **27** (11). doi:10.5210/fm.v27i11.12754. ISSN 1396-0466.

29. Segault, Antonin (2022). "Wikipedia as a trusted method of information assessment during the COVID-19 crisis". In Rossette-Crake, Fiona; Buckwalter, Elvis. *COVID-19, Communication and Culture: Beyond the Global Workplace.* Routledge. pp. 47. doi:10.4324/9781003276517-5. ISBN 9781003276517.

30. Akrich, Madeleine (2010-05). "From Communities of Practice to Epistemic Communities: Health Mobilizations on the Internet". *Sociological Research Online* **15** (2): 116–132. doi:10.5153/sro.2152. ISSN 1360-7804.

31. Nov, Oded (2007-11-01). "What motivates Wikipedians?". *Communications of the ACM* **50** (11): 60–64. doi:10.1145/1297797.1297798. ISSN 0001-0782.

32. Oreg, Shaul; Nov, Oded (2008-09-01). "Exploring motivations for contributing to open source initiatives: The roles of contribution context and personal values". *Computers in Human Behavior.* Including the Special Issue: Internet Empowerment **24** (5): 2055–2073. doi:10.1016/j.chb.2007.09.007. ISSN 0747-5632.

33. Shaw, Aaron; Hargittai, Eszter (2018-02-01). "The Pipeline of Online Participation Inequalities: The Case of Wikipedia Editing". *Journal of Communication* **68** (1): 143–168. doi:10.1093/joc/jqx003. ISSN 0021-9916.

34. Konieczny, Piotr (2020-05-08). "Macro-level Differences in Participation in Sharing Economy: Factors Affecting Contributions to the Collective Intelligence Wikipedia Platform across Different Asian Countries". *Asian Journal of Social Science* **48** (1–2): 115–149. doi:10.1163/15685314-04801007. ISSN 1568-5314.

35. Bierhoff, Hans-Werner; Schülken, Theo; Hoof, Matthias (2007-01-01). "Skalen der Einstellungsstruktur ehrenamtlicher Helfer (SEEH)". *Zeitschrift für Personalpsychologie* **6** (1): 12–27. doi:10.1026/1617-6391.6.1.12. ISSN 1617-6391.

36. Güntert, Stefan T.; Neufeind, Max; Wehner, Theo (2015-08). "Motives for Event Volunteering: Extending the Functional Approach". *Nonprofit and Voluntary Sector Quarterly* **44** (4): 686–707. doi:10.1177/0899764014527797. ISSN 0899-7640.

37. Farič, Nuša; Potts, Henry W. W. (2014-12-03). "Motivations for Contributing to Health-Related Articles on Wikipedia: An Interview Study". *Journal of Medical Internet Research* **16** (12): e3569. doi:10.2196/jmir.3569. ISSN 1438-8871.

38. Wilson, John (2012-04). "Volunteerism Research: A Review Essay". *Nonprofit and Voluntary Sector Quarterly* **41** (2): 176–212. doi:10.1177/0899764011434558. ISSN 0899-7640.

39. Cox, Joe; Oh, Eun Young; Simmons, Brooke; Graham, Gary; Greenhill, Anita; Lintott, Chris; Masters, Karen; Woodcock, Jamie (2018-10). "Doing Good Online: The Changing Relationships Between Motivations, Activity, and Retention Among Online Volunteers". *Nonprofit and Voluntary Sector Quarterly* **47** (5): 1031–1056. doi:10.1177/0899764018783066. ISSN 0899-7640.

40. Lessig, Lawrence (2004). *Free Culture: How Big Media Uses Technology and the Law to Lock Down Culture and Control Creativity.* New York: Penguin Press. ISBN 1-59420-006-8.

41. Matsuba, M. Kyle; Hart, Daniel; Atkins, Robert (2007-08-01). "Psychological and social-structural influences on commitment to volunteering". *Journal of Research in Personality* **41** (4): 889–907. doi:10.1016/j.jrp.2006.11.001. ISSN 0092-6566.

42. Maher, Thomas V.; Earl, Jennifer (2017-01-01). "Pathways to Contemporary Youth Protest: The Continuing Relevance of Family, Friends, and School for Youth Micromobilization". In Earl, Jennifer; A. Rohlinger, Deana. *Studies in Media and Communications.* **14**. Emerald Publishing Limited. pp. 55–87. doi:10.1108/s2050-206020170000014001. ISBN 978-1-78743-098-3.

43. Haski-Leventhal, Debbie; Oppenheimer, Melanie; Holmes, Kirsten; Lockstone-Binney, Leonie; Alony, Irit; Ong, Faith (2019-04). "The Conceptualization of Volunteering Among Nonvolunteers: Using the Net-Cost Approach to Expand Definitions and Dimensions of Volunteering". *Nonprofit and Voluntary Sector Quarterly* **48** (Suppl 2): 30S–51S. doi:10.1177/0899764018768078. ISSN 0899-7640.

44. Konieczny, Piotr (2018-01-01). "Volunteer Retention, Burnout and Dropout in Online Voluntary Organizations: Stress, Conflict and Retirement of Wikipedians". In Coy, Patrick G.. *Research in Social Movements, Conflicts and Change.* **42**. Emerald Publishing Limited. pp. 199–219. doi:10.1108/s0163-786x2018000042008. ISBN 978-1-78756-895-2.

45. Konieczny, Piotr (2009-03). "Governance, Organization, and Democracy on the Internet: The Iron Law and the Evolution of Wikipedia". *Sociological Forum* **24** (1): 162–192. doi:10.1111/j.1573-7861.2008.01090.x.

46. Friedman, Ken (2021-06-01). "Wikipedia Is a Magnificent, Flawed Gem. Can It Be Polished?". *She Ji: The Journal of Design, Economics, and Innovation* **7** (2): 177–187. doi:10.1016/j.sheji.2021.05.005. ISSN 2405-8726.

47. Konieczny, Piotr (2021-06-01). "From Adversaries to Allies? The Uneasy Relationship between Experts and the Wikipedia Community". *She Ji: The Journal of Design, Economics, and Innovation* **7** (2): 151–170. doi:10.1016/j.sheji.2020.12.003. ISSN 2405-8726.

48. Mendes, Thiago Bosco; Dawson, Jennifer; Evenstein Sigalov, Shani; Kleiman, Nancy; Hird, Kathryn; Terenius, Olle; Das, Diptanshu; Geres, Nour *et al*. (2021-12-01). "Wikipedia in Health Professional Schools: from an Opponent to an Ally". *Medical Science Educator* **31** (6): 2209–2216. doi:10.1007/s40670-021-01408-6. ISSN 2156-8650. PMID 34608425. PMC PMC8480752.

49. Qi, Tuotuo; Wang, Tianmei; Yan, Jiarui (2021-01-01). "The spillover effects of different monetary incentive levels on health experts' free knowledge contribution behavior". *Internet Research* **31** (6): 2143–2166. doi:10.1108/INTR-08-2020-0445. ISSN 1066-2243.

50. Konieczny, Piotr (2016-07). "Teaching with Wikipedia in a 21 st -century classroom: Perceptions of Wikipedia and its educational benefits". *Journal of the Association for Information Science and Technology* **67** (7): 1523–1534. doi:10.1002/asi.23616. ISSN 2330-1643.

51. Suwannakhan, Athikhun; Limpanuparb, Taweetham (2017). "Wikipedia writing assignments: A one-year pilot program in chemistry classes at Mahidol University". *Catalyst* **16** (2): 65–79. ISSN 2408-137X.

52. Hutchinson, Nora; Baird, Grayson L.; Garg, Megha (2016-06-01). "Examining the Reading Level of Internet Medical Information for Common Internal Medicine Diagnoses". *The American Journal of Medicine* **129** (6): 637–639. doi:10.1016/j.amjmed.2016.01.008. ISSN 0002-9343.

53. Brezar, Aleksandar; Heilman, James (2019). "Readability of English Wikipedia's health information over time". *WikiJournal of Medicine* **6** (1): 7. doi:10.15347/wjm/2019.007. ISSN 2002-4436.

54. Naveed, Muhammad Shumail (2022-09-12). "Readability of Wikipedia pages on andrology and gynecology: comparative study". *Universal Access in the Information Society*. doi:10.1007/s10209-022-00916-5. ISSN 1615-5297.

55. Yang, Shufang; Huang, Lin; Zhang, Yanli; Zhang, Pengzhu; Zhao, Yuxiang Chris (2021-01-01). "Unraveling the links between active and passive social media usage and seniors' loneliness: a field study in aging care communities". *Internet Research* **31** (6): 2167–2189. doi:10.1108/INTR-08-2020-0435. ISSN 1066-2243.