Submitted: 03 October, 2022 Accepted: 03 February, 2023 Published: 30 March, 2023 DOI:10.22514/jomh.2023.022

ORIGINAL RESEARCH

JOMH Journal of Men's Health

Online medical crowdfunding in the United States: a cross-sectional analysis of gendered cancer campaign outcomes

Jordan T. Holler[1,2], Michael J. Sadighian[1], Umar Ghaffar[1], Behzad Abbasi[1], Behnam Nabavizadeh[1], Nizar Hakam[1], Kevin D Li[1], William Shibley[1], Michael S Leapman[3], Gregory M. Amend[4], Nathan M. Shaw[1], Benjamin N. Breyer[1,5,*]

[1]Department of Urology, University of California San Francisco, San Francisco, CA 94143, USA
[2]Harvard T.H. Chan School of Public Health, Boston, MA 02138, USA
[3]Department of Urology, Yale University School of Medicine, New Haven, CT 208241, USA
[4]Department of Urology, Icahn School of Medicine at Mount Sinai, New York, NY 10029, USA
[5]Department of Biostatistics and Epidemiology, University of California San Francisco, San Francisco, CA 94143, USA

***Correspondence**
Benjamin.Breyer@ucsf.edu
(Benjamin N. Breyer)

Abstract

This cross-sectional analysis examined online US crowdfunding campaigns from 2010–2018. Campaigns including prostate, breast, bladder, kidney, cervical, uterine, ovarian, testicular, oral, and thyroid cancers were included. Multivariable modeling was utilized to examine predictive factors for successful campaigns. A total of 1830 online cancer campaigns were included in the final analysis. Breast cancer was estimated to be the most frequent online campaign type (n = 3682), followed by cervical (n = 492), kidney (n = 475), ovarian (n = 460), and prostate cancers (n = 382). Breast cancer campaigns generated the most total funding ($15.3 million). In adjusted models, breast cancers generated significantly more donations per campaign than any other cancer. There was no difference in the average amount of funds raised per campaign by most cancer types, except for thyroid (19.4% less than breast, $p < 0.001$). Friend-authored campaigns generated more funding than self- and family-authored. Male cancers are under-represented, and breast cancer campaigns are disproportionately over-represented in online medical crowdfunding and generate more donations than many other cancers. Gendered differences in cancer crowdfunding are likely multifactorial and may be influenced by social networks and public health campaigns.

Keywords

Cancer treatment; Crowdfunding; Gender differences; Breast cancer; Social media; Male cancer

1. Introduction

Health expenditures on cancer treatments in the United States (US) have increased over the last 20 years and were estimated to cost $173 billion in 2020 [1]. This cost continues to grow and contributes to the economic burdens that many cancer patients experience [2]. Patients resort to online medical crowdfunding to alleviate this burden, a type of social media intended to generate financial contributions toward healthcare expenses [3]. For example, the website GoFundMe (http://www.gofundme.com) has grown to be a predominant medical donation crowdfunding service in the US, with one-third of all campaigns on the website being used for medical purposes [4–6].

Evidence shows that breast and prostate cancers receive unequal online support and there are significant differences in research funding between the two [7, 8]. Studies on gender differences in social media attention and support on online platforms such as Twitter have revealed that female cancers significantly outperform male malignancies [9, 10]. Despite this, recent work found significant differences in campaign organizers, recipients, and financial outcomes in favor of male-focused medical crowdfunding campaigns compared to female campaigns [11, 12]. While some studies have examined the characteristics of cancer crowdfunding in the US, literature on this subject is generally limited and medical crowdfunding outcomes are typically not stratified by cancer type [4, 13–16]. One of the only studies to compare crowdfunding outcomes by malignancy type found preliminary evidence to suggest that breast cancer generates more campaigning and total funding than prostate cancer [15]. However, to date, no study has examined the applicability of such female-predominance in other gendered cancers. In addition, there is limited evidence in literature about the degree to which campaign author type and the purpose for funding differ by gender and influence outcomes of medical crowdfunding campaigns.

To address this literature gap, we conducted a comparative analysis of crowdfunding campaigns for several malignancy types in the US. We analyzed campaign narrative features and financial outcomes to better understand the economic needs and how the general public interacts with these campaigns which could mark a potential point of intervention for campaign authors and cancer activists/advocates. We hypothesized that there are a larger number of online crowdfunding

campaigns focused on breast cancer and that these would be better funded relative to campaigns, specifically male-focused campaigns.

2. Materials and methods

2.1 Data source and study design

We performed a cross-sectional analysis of GoFundMe campaigns for patients with cancers that predominately affect a single gender. GoFundMe is an online platform that allows crowd fundraising specifically for life events. Cancer campaigns on GoFundMe are posted either by the patient or a third party (family, friends, or advocates) to cover the medical or life costs that cancer impose or as an effort to facilitate research on the field. Typically, a narrative and funding goal is set for each campaign and the fund is generated by crowd donations. This data collection methodology has been described previously [3]. Briefly, the top 20 most prevalent cancer types in the United States were identified, including rare cancers [3, 17]. These cancers were queried on the GoFundMe platform across all 50 US states for a total of 1000 batches of searches (50 states $\times$ 20 cancer types = 1000 searches). A custom Python programming language code was used to automatically retrieve information from publicly available campaign webpages. This search was conducted in October 2018 and collected data for 37,344 total online cancer campaigns from 2010 to 2018. Data was analyzed in 2021.

The initial study population was filtered by primary cancer type to identify gender-specific and gender predominant cancers. A gender predominant malignancy was defined by an incidence $\geq$60% affecting a single gender [17]. Based on this, out of the top 20 most prevalent malignancy types in the US, ten gender-specific and -predominant cancer types were selected: primary breast, prostate, bladder, kidney, cervical, uterine, ovarian, testicular, oral, and thyroid cancers. A total of 7587 (of 37,344) cancer campaigns were identified. A subset of 2500 campaigns was randomly selected to serve as our study population, with sample sizes for each cancer type proportionally weighted to estimate web-scraped totals. All kidney cancer campaigns were reviewed for the purpose of a concurrent study and included in present study. Campaigns were reviewed and excluded if the subject was non-human, intended for non-cancer illness, unrelated to primary cancer types, or did not contain financial outcomes. As data was available publicly on the internet, formal ethical approval was waived (**Supplementary Fig. 1**). The design and reporting of this study adhered to the Guidelines of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement [18].

2.2 Variables

Basic narrative features, engagement metrics, and financial variables were extracted for each cancer campaign. We examined campaign titles, narratives, creation date, location, and number of social media shares, campaign goal amount, number of donations, and amount of funding raised (**Supplementary Table 1**). Campaign narratives were reviewed to extract additional campaign demographics, including patient gender (male *vs.* female), campaign author type (self, family, friend), and fundraising purpose (medical expenses, non-medical expenses, both medical and non-medical expenses, charity/research fundraising). Medical expenses were defined as any cost related to the medical care of the patient's cancer. Non-medical expenses were those that occurred because of financial difficulty brought upon by the disease, such as rent payments, utility payments or groceries. Campaign narrative pronouns (he/him/his, she/her/hers, they/them/theirs) and relationship labels (mother, son, sister, *etc*.) were utilized to categorize patient gender. Campaigns in which gender was difficult to identify based on pronouns and relationship labels were labelled unknown while performing relevant analysis.

2.3 Univariate analysis

Descriptive statistics were used to characterize the study cohort, with $p < 0.05$ considered statistically significant. Cases were excluded if relevant variables for not available. From the population of identified cancer campaigns (n = 7587), totals for the number of online campaigns and financial outcomes were estimated using proportionally weighted study samples. Kruskal-Wallis tests were used to examine differences in financial outcomes by cancer type, fundraising purpose type, and campaign author type. Further, *post-hoc* Dunn test was used to examine pairwise score differences between breast cancer and other cancer types. Wilcoxon rank-sum tests were used to examine differences in financial outcomes by gender (male *vs.* female) for cancers affecting both biological sexes (kidney, bladder, thyroid, oral). Two sample test of proportions was used to examine the association between gender, campaign author type, and fundraising purpose.

2.4 Multivariable analysis

Two multivariable regression models were created to examine financial engagement outcomes. To assess the amount of funding raised per campaign, we chose the number of donations and average donation amount (amount raised divided by the number of donations) as dependent variables. These outcomes have been previously used to examine medical crowdfunding inequities [11], and were chosen to characterize the social network engagement of cancer campaigns and how individual donors contribute to campaigns. We utilized negative binomial regression to model this outcome to account for substantial overdispersion (variance-to-mean ratio $>$1) in the number of donations. While similar Poisson models have previously been used to assess the number of donations [11], these models assume equal mean and variance of the count data and are therefore inappropriate in instances of overdispersion. Linear regression was used to assess the average donation amount. The average funds raised were log-transformed to account for significantly right-skewed data and non-normal error distributions. Covariates included cancer type, goal amount, social media shares, year of creation, author type, and funding purpose type. Covariates were selected a priori based on previous literature [11, 13, 15] and the intention to include significant predictors and confounders while avoiding collinearity. Effect estimates are reported as the percent

change in outcome associated with a unit increase in the given variable Stata Statistical Software: Release 16 (StataCorp LLC, College Station, TX, USA) was used to perform all data analysis.

3. Results

3.1 Univariate analysis

A total of 1830 campaigns were included in the final analysis. Study demographics and descriptive statistics are shown in Table 1. Total estimates are shown in Tables 1 and 2. Of note, no male breast cancer cases were identified based on narrative pronoun usage. Breast cancer was the most frequent online campaign type, accounting for an estimated 3682 (95% Confidence Interval (CI): 3456 to 3885) online campaigns at the time of web-scraping, followed by cervical cancer (492), kidney cancer (475), ovarian cancer (460), and prostate cancer (382) campaigns. Overall, cancer campaigns in this study generated an estimated $24.8 million (95% CI: $21.7–28 million) in funding. The majority (35.4%) of campaigns requested funding for both medical and non-medical expenses, followed by campaigns which requested funding solely for medical expenses (28.6%). Family members authored most campaigns (39.4%), and self-authored campaigns were the most infrequent (16.8%) author type.

Breast cancer campaigns generated the most total funding, accounting for an estimated $15.3 million (95% CI: $12.2–18.3 million) (Table 2). All other cancer types generated less than $2 million in total funding estimates, with kidney ($1.8 million), ovarian ($1.7 million), prostate ($1.3 million), testicular ($1.3 million), and cervical ($1.3 million) cancers generating the next most total funding. Thyroid ($739,000), bladder ($685,000), oral ($413,000), and uterine ($354,000) cancer campaigns generated the least amount of total funding. Overall, campaigns in this study requested an estimated $8.2 million (95% CI: $7.02–9.3 million) total funding for the purpose of medical care expenses, and $12 million (95% CI: $10.5–13.4 million) when requesting funds for the purpose of both medical and non-medical expenses.

Fundraising goals, the number of donations, and the amount raised per campaign varied significantly ($p < 0.001$) by cancer type (Table 2). Testicular cancer campaigns set the largest fundraising goals based on median and interquartile ranges (median $10,000, IQR: $5000–25,000), while uterine cancers campaigns set the smallest (median $5750 IQR: $3000–10,000). Testicular cancer campaigns also received the greatest number of donations (median 42, IQR: 17–93), while cervical cancer (median 17, IQR: 9–39) and kidney cancer (median 17, IQR: 8–42) campaigns received the fewest donations. Testicular cancer campaigns raised the most funding (median $3371, IQR: $1240–10,127), and uterine cancer campaigns raised the least amount of funding (median $1200, IQR: $550–3125). Fundraising goals, number of donations, and amount raised did not significantly vary by gender (male *vs.* female) among gender predominant cancers (kidney, thyroid, bladder, oral).

As shown in Table 2, all financial outcomes varied significantly ($p < 0.001$) by the purpose of requested funding. The number of donations and amount of funding raised also varied significantly ($p < 0.001$) by campaign author type. Campaigns which requested funding for the purpose of both medical and non-medical expenses set the largest fundraising goals (median $10,000, IQR: $5000–10,000), achieved the largest number of donations (median 24, IQR: 11–53), and raised the most funding (median $1955, IQR: $765–4820). Campaigns authored by unidentifiable persons set the largest goal amounts, generated the largest number of donations, and raised the most funds. However, friend-authored campaigns achieved similar metrics, requesting more funding (median $9750, IQR: $5000–15,000), generating more donations (median 24.5, IQR: 11–53), and raising more funds (median $1918, IQR: $788–4961) than both self-authored and family-authored campaigns.

In an analysis of campaign author type by the campaign recipient's gender (Table 3), females in this study cohort were more likely to self-author campaigns (17.8% *vs.* 13.2%, $p < 0.01$). Males in the study cohort were more likely to have a family member author the campaign (45.7% *vs.* 36%, $p < 0.001$) and less likely to have a friend author their campaign (20.8% *vs.* 25.2%, $p < 0.05$). In an analysis of fundraising purpose type by gender, female identified campaigns were more likely to ask for charity fundraising than male campaigns (4.2% *vs.* 1.2%, $p < 0.001$).

3.2 Multivariable analysis

In the model examining the number of donations that campaigns received, several cancer types generated significantly fewer donations than breast cancer campaigns after adjusting for fundraising goal amounts, social media shares, year of creation, author type, and fundraising purpose type (Table 4). Cervical cancer campaigns generated 22.1% fewer ($p = 0.002$) donations than breast cancer. Additionally, thyroid, uterine, prostate, and kidney cancer campaigns generated 17% to 18% fewer ($p < 0.05$) donations than breast cancer. However, in the adjusted model examining the average amount raised by the campaign, there was no significant difference between all cancer types and breast cancer except for thyroid cancer, which generated 19.4% less ($p < 0.001$) average funding per campaign than breast cancer. Campaigns that requested funding for non-medical expenses generated 17.3% fewer ($p < 0.001$) donations than campaigns that requested funding only for medical expenses. Compared to self-authored campaigns, friend-authored campaigns generated 46.8% more ($p < 0.001$) donations, and family-authored campaigns generated 22.8% more ($p < 0.001$) donations. Additionally, friend-authored campaigns generated 10.7% more ($p < 0.05$) average funding per campaign compared to self-authored campaigns.

4. Discussion

Our study offers novel insight into cancer crowdfunding efforts in the US, and we demonstrate that the public generates and interacts with cancer crowdfunding campaigns differently depending on the malignancy type. Notably, crowdfunding campaigns for certain cancers in our study did not correspond well to their relative frequency of diagnoses or prevalence in the US. Breast cancer campaigns were the most common online

TABLE 1. Campaign features and total online campaign estimates.

Campaign characteristics	Count (%)	Total estimates (95% CI)
Breast Cancer	271	3682 (3456–3885)
Kidney cancer*	475	475
Male	292	292
Female	170	170
Cervical Cancer	209	474 (437, 510)
Ovarian cancer	177	460 (420–496)
Prostate cancer	159	382 (344–417)
Thyroid cancer	135	286 (254–317)
Male	37	78 (57–105)
Female	93	197 (166–229)
Bladder cancer	104	208 (179–236)
Male	78	156 (129–185)
Female	23	46 (30–67)
Testicular cancer	119	175 (156–192)
Uterine cancer	118	149 (135–161)
Oral cancer	63	91 (73–110)
Male	42	61 (45–78)
Female	19	27 (17–42)
Fundraising purpose type		
Medical expenses	523 (28.6)	2173 (2016–2335)
Non-medical expenses	468 (25.6)	1945 (1794–2101)
Both medical & non-medical expenses	647 (35.4)	2688 (2522–2858)
Charity fundraising	55 (3.0)	229 (173–296)
Unknown	133 (7.3)	553 (465–650)
Campaign author type		
Self-authored	307 (16.8)	1274 (1146–1410)
Family	721 (39.4)	2992 (2822–3166)
Friend	423 (23.1)	1756 (1610–1908)
Unidentified	377 (20.6)	1565 (1426–1711)
Year of campaign creation		
2010–2014	178 (9.7)	737 (638–848)
2015	347 (19.0)	1438 (1304–1580)
2016	424 (23.2)	1757 (1612–1909)
2017	432 (23.6)	1791 (1644–1943)
2018	449 (24.5)	1861 (1713–2016)

**entire web-scraped kidney cancer campaign was reviewed for purpose of concurrent study. CI: Confidence Interval.*

TABLE 2. Financial outcomes by campaign feature.

	Outcomes per individual campaign, median (IQR)						Total estimates (95% CI)
Campaign Characteristic	Amount goal, USD*‡	p^1	No. of donations*†‡	p^1	Amount raised, USD*†‡	p^1	Amount raised, USD mil.
Cancer type							
All types	9000 (5000, 15,000)		21 (10, 46)		1610 (646, 3877)		24.80 (21.70, 28.00)
Breast	8000 (5000, 15,000)		21 (10, 53)		1695 (706, 4828)		15.30 (12.20, 18.30)
Cervical	8410 (4000, 15,000)	0.371	17 (9, 39)	0.022	1330 (610, 3000)	0.015	1.30 (1.00, 1.50)
Kidney	10,000 (5000, 20,000)	0.144	17 (8, 42)	0.039	1450 (575, 4050)	0.095	1.80 (1.50, 2.10)
Male	10,000 (5000, 20,000)		18 (8, 47)		1673 (640, 4485)		1.20 (0.96, 1.50)
Female	10,000 (3300, 15,000)		19 (9, 38)		1365 (500, 3290)		0.53 (0.41, 0.65)
Ovarian	10,000 (5000, 15,000)	0.293	27 (14, 49)	0.052	2018 (900, 4560)	0.097	1.70 (1.40, 2.00)
Prostate	6850 (4000, 11,500)	0.101	20 (6, 40)	0.013	1343 (445, 3635)	0.033	1.30 (0.96, 1.70)
Thyroid	7200 (500, 10,000)	0.096	24 (10, 40)	0.344	1525 (550, 2975)	0.033	0.74 (0.49, 1.00)
Male	6000 (3500, 10,000)		18 (8, 47)		1673 (640, 4485)		0.28 (0.07, 0.50)
Female	7500 (5000, 10,000)		19 (9, 38)		1365 (500, 3290)		0.45 (0.32, 0.58)
Bladder	6000 (4750, 13,500)	0.273	19 (8, 38)	0.136	1618 (650, 3833)	0.296	0.69 (0.50, 0.87)
Male	6000 (4500, 15,000)		19 (7, 39)		1650 (640, 4165)		0.55 (0.38, 0.73)
Female	5000 (4000, 10,000)		19 (10, 38)		1610 (810, 3652)		0.12 (0.08, 0.17)
Testicular	10,000 (5000, 25,000)	0.002	42 (17, 93)	<0.0001	3371 (1240, 10,127)	<0.0001	1.30 (0.98, 1.70)
Uterine	5750 (3000, 10,000)	0.012	19 (9, 34)	0.036	1200 (550, 3125)	0.01	0.35 (0.27, 0.44)
Oral	10,000 (5000, 15,000)	0.233	28 (15, 64)	0.055	2530 (965, 4620)	0.047	0.41 (0.28, 0.55)
Male	9000 (5000, 15,000)		29 (15, 47)		2638 (1160, 5125)		0.26 (0.17, 0.22)
Female	10,000 (5000, 15,000)		22 (11, 68)		1800 (820, 3840)		0.12 (0.04, 0.22)
Fundraising purpose type							
Medical expenses	10,000 (5000, 20,000)		23 (10, 52)		1715 (700, 4049)		8.20 (7.00, 9.30)
Non-medical expenses	5000 (3000, 10,000)		16 (8, 35)		1210 (500, 2790)		5.30 (4.30, 6.30)
Both med. & non-med. expenses	10,000 (5000, 20,000)		24 (11, 53)		1955 (765, 4820)		12.00 (10.50, 13.40)
Charity fundraising	5000 (1200, 10,000)		17 (7, 29)		1198 (540, 3450)		0.67 (0.40, 0.95)
Unknown	7500 (4000, 11,000)		26 (10, 46)		1175 (805, 4585)		2.00 (1.50, 2.50)
Campaign author type							
Self-authored	8000 (4000, 15,000)		15 (6, 30)		1175 (445, 2753)		1.30 (0.70, 1.80)
Family	8000 (4000, 15,000)		20 (9, 43)		1510 (622.5, 3628)		5.20 (4.50, 5.90)
Friend	9750 (5000, 15,000)		25 (11, 53)		1918 (788, 4961)		4.50 (3.80, 5.10)
Unidentified	10,000 (5000, 15,000)		26 (13, 54)		2040 (920, 4900)		5.40 (4.50, 6.00)

**†‡Indicates significance ($p < 0.001$) for Kruskal-Wallis test between: *cancer type (including both genders) and variable, †author type and variable, ‡funding type and variable. [1]Indicates p-values for pairwise post-hoc Dunn test between breast cancer and the corresponding cancer type. No. of donations, number of donations; USD, United States Dollars; mil, millions; IQR, interquartile range; CI, confidence interval; Med, medical.*

TABLE 3. Fundraising purpose & author type by gender.

Campaign characteristic	Male (%)	Female (%)	*p*
Fundraising purpose type			
Medical expenses	223 (30.70)	293 (27.20)	0.1
Non-medical expenses	182 (25.07)	282 (26.20)	0.6
Both medical & non-medical expenses	259 (35.70)	379 (35.20)	0.8
Charity fundraising	9 (1.20)	45 (4.20)	<0.001
Unclear	53 (7.30)	78 (7.20)	0.9
Campaign author type			
Self-authored	96 (13.20)	192 (17.80)	0.009
Family	332 (45.70)	388 (36.00)	<0.001
Friend	151 (20.80)	272 (25.20)	0.03
Unidentified	148 (20.40)	226 (21.00)	0.8

Two sample test of proportions.

TABLE 4. Multivariable analysis of campaign donations & average amount raised.

Campaign Characteristic	No. of campaign donations (95% CI)*		Avg. amount raised (95% CI)*	
	Percent difference	*p*	Percent difference	*p*
Cancer type (breast ref)				
Cervical	−22.1 (−33.6 to −8.8)	0.002	−9.20 (−18.6 to +1.2)	0.080
Kidney	−17.5 (−27.4 to −6.0)	0.004	+0.03 (−8.4 to + 9.3)	0.993
Ovarian	+5.4 (−10.5 to +24.0)	0.536	−2.10 (−12.6 to +9.4)	0.696
Prostate	−17.6 (−30.8 to −1.9)	0.029	+0.20 (−11.0 to +12.8)	0.977
Thyroid	−18.9 (−32.3 to −3.0)	0.021	−19.40 (−28.8 to −8.9)	0.001
Bladder	−12.1 (−27.8 to +7.1)	0.200	+6.60 (−6.9 to +22.0)	0.353
Testicular	+5.1 (−13.1 to +26.6)	0.536	+2.30 (−10.0 to +16.4)	0.724
Uterine	−18.8 (−32.7 to −2.0)	0.030	−10.00 (−20.8 to +2.4)	0.109
Oral	−1.6 (−19.7 to +28.6)	0.895	+3.30 (−12.1 to +21.5)	0.694
Fundraising purpose type (med. exp. ref)				
Non-medical expenses	−17.20 (−25.9 to −7.4)	0.001	−3.2 (−10.3 to +4.4)	0.397
Both medical & non-medical expenses	−1.98 (−11.6 to +8.6)	0.702	+5.9 (−13.0 to 13.5)	0.111
Charity fundraising	+0.40 (−21.7 to +28.7)	0.974	+4.8 (−11.5 to +24.2)	0.585
Unclear	−14.10 (−27.4 to +15.9)	0.076	+3.6 (−7.6 to +16.2)	0.546
Campaign author type (self-author ref)				
Family	+22.8 (+9.2 to +38.0)	0.001	+5.23 (−2.9 to +14.0)	0.214
Friend	+46.8 (+29.0 to +67.2)	<0.001	+10.70 (+1.4 to +21.0)	0.024
Unidentified	+37.4 (+20.0 to +56.9)	<0.001	+14.80 (+4.9 to +25.6)	0.003

**Adjusted for cancer type, fundraising purpose type, campaign author type, year of creation, number of social media shares, and goal amount. No, number; Avg, average; Med, medical; ref, reference; CI, confidence interval.*

cancer type, representing more cases than all other campaigns combined. Consequently, breast cancer campaigns generated nearly two-thirds of all funding in our study. While breast cancer is the most common cancer diagnosis in the United States [19], the number of online crowdfunding campaigns for other common cancers was disproportionally underrepresented. Compared to breast cancer, prostate cancer campaigns were nearly ten times less common and generated nearly twelve times less total funding, despite a relatively similar overall incidence, prevalence, and mortality rate in the US [20]. Notably, cervical, kidney, and ovarian cancer campaigns were also more common and generated more total funding than prostate cancer campaigns, despite being less commonly diagnosed malignancies [20]. These findings point to complex social dynamics and cancer-specific socioeconomic differences that may influence how online cancer crowdfunding campaigns are being generated and ultimately funded. Likewise, there is a growing body of evidence that medi-

cal crowdfunding may reflect and perpetuate socioeconomic health disparities through barriers to crowdfunding entry and success [11, 21–24]. These disparities may be reflected in our findings, wherein certain malignancy types were unequally represented and achieved different levels of financial goals in online crowdfunding.

Differences in the number of online cancer campaigns may also indicate that availability biases and public health movements, such as breast cancer advocacy, affect the propensity of individuals to generate cancer crowdfunding campaigns. This study builds on previous work demonstrating that breast cancer campaigns generate more activity on social media platforms than other cancer types. However, we also demonstrate for the first time that several cancer types receive significantly fewer donations per campaign than breast cancer campaigns. Yet, our results also showed that the average amount raised per campaign does not significantly differ for most cancer types. These results indicate that contributors donate similarly across cancer types but are more selective in which cancers they donate to. However, in our study, thyroid cancer campaigns received significantly less average funding than breast cancer campaigns. This may be because of thyroid cancer-specific features, such as relatively simple treatment methods and a high 5-year survival rate [25], or by contextual campaign features that we could not characterize. This study also supports crowdfunding findings from Canada, which similarly showed that crowdfunding campaigns for testicular disease may generate more activity and funding than other urogenital diseases [26]. Given the relatively young age distribution of testicular cancer patients, this finding may be explained by the campaign recipients' age, which is a known predictor of medical crowdfunding success [11].

The degree to which campaign author type and the purpose for funding differed by gender and outcomes is comparable to recent work by Kenworthy and colleagues [11]. Our findings build on evidence that male patients may be less likely to receive social support than female patients on online platforms [27], wherein male campaigns in our study were less likely to be friend-authored than female campaigns. However, male campaigns were more likely to be family-authored than female campaigns. These differences may be important given the context of our multivariable findings, in which having a friend-authored campaign led to significantly more donations and funding than a self-authored one. Notably, campaigns with unidentifiable authors were more likely to be effective. One likely explanation for this result is that unidentifiable authors were friends or family and that these relationships are not always clearly stated in campaign narratives.

In contrast, self-authoring is almost always apparent in narratives. While complex social dynamics likely play a role in who authors cancer crowdfunding campaign narratives, we theorize that having a friend-authored or family-authored campaign is likely related to a recipients' pre-existing social network, therefore influencing the effectiveness of their campaign.

Four major types of crowdfunding include equity-based, lending-based, reward-based, and donations-based crowdfunding. Medical crowdfunding predominantly comprises of donation-based campaigns [28]. Several studies have assessed factors impacting crowdfunding success. An interesting article about medical crowdfunding in pediatric patients found several factors to influence success of campaigns including younger age, lower financial goal and emotional expression of narrative [29]. An interesting study analyzing project titles found the presence of the patient's disease and occupation to have a positive impact while the presence of age, gender, and negative emotions to have a negative impact on success of crowdfunding campaigns [30].

Studies in existing literature have also explored utility of medical crowdfunding in areas besides cancer campaigns. For example, Rajwa *et al.* [31] studied the impact of Coronavirus Disease 2019 (COVID-19) on medical crowdfunding and found a total fundraising amount of USD 1.5 billion in relevant campaigns on GoFundMe.com. Other studies have analyzed disparities unrelated to gender. In an analysis of lung cancer crowdfunding pages, our colleagues found campaigns describing the patient as a non-smoker to be more successful suggesting a "blame the victim" attitude among donors [32]. A study by Mattingly *et al.* [33] about Hepatitis C in crowdfunding found disclosing the source of virus to be associated with a higher donation category. Another interesting study comparing crowdfunding in Canada, UK and US found gender and race of beneficiaries to be associated with funding success with Black beneficiaries raising lesser per campaign [12]. Overall, these results indicate the presence of gender-specific and cancer-specific disparities, amongst others, in the performance of crowdfunding campaigns, which should be noted by medical professionals and investigated in future studies. Highlighting these gender and cancer-specific disparities should positively influence campaign authors, donors and crowdfunding platform owners to take steps for increasing awareness regarding these male-predominant cancers. Suggested steps by crowdfunding platforms could include utilizing changes of search algorithms to promote campaigns uniformly, encouraging shares on social media platforms and scrutinizing campaigns during production phase to identify gaps which are negatively influencing fundraising amounts.

While our study is the first to perform a comparative analysis of several gendered cancer crowdfunding campaigns in the US, this research is limited by the availability of online crowdfunding data. First, GoFundMe does not make its data publicly available. Reliance on platform's search engine and contextual features from public campaign narratives introduces bias. The authenticity of campaigns also cannot easily be ascertained, although GoFundMe removes fraudulent campaigns and reports that they make up $<0.1\%$ of fundraisers [34]. Additionally, users have introduced bias by removing earlier campaigns, which cannot be collected using web-scraping. However, by focusing on a comparative analysis of cancer types, we think our results still provide valid cross-sectional estimates of comparative differences in cancer crowdfunding campaigns. Future medical and public health research would benefit from publicly releasing medical crowdfunding data through online platforms.

5. Conclusions

This cross-sectional analysis provides a novel quantitative comparison of cancer crowdfunding campaigns in the United States. Our findings demonstrate that breast cancer cases represent a disproportionate number of gendered cancer campaigns on crowdfunding platforms and that breast cancer campaigns receive more donations than many other cancer types. While the average amount of funding raised per campaign does not vary greatly across cancer types, it does vary by campaign author type. This study supports the notion that public health campaigns may affect social awareness of cancers and the financial support from online crowdfunding. Additionally, our findings indicate that the performance of a crowdfunding campaign is likely related to the recipient's social network. Future research should continue to examine financial disparities among cancer crowdfunding campaigns, how gender plays a role in online medical crowdfunding, and how crowdfunding may perpetuate socioeconomic health disparities.

AVAILABILITY OF DATA AND MATERIALS

Data was extracted using crowdfunding website GoFundMe and is openly available.

AUTHOR CONTRIBUTIONS

JH, BA and UG—designed the research study. JTH—performed the research and analyzed the data. JTH, MJS, BN, NH, KDL, WJS, UG and BA—reviewed campaign narratives and extracted relevant variables. JH, MJS, BA and UG—wrote the manuscript. MSL, GMA, NMS and BNB—supervised the manuscript and resolved any conflicts that arose in data collection. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

ACKNOWLEDGMENT

Not applicable.

FUNDING

This research received no external funding.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SUPPLEMENTARY MATERIAL

Supplementary material associated with this article can be found, in the online version, at https://oss.jomh.org/files/article/1638101288240463872/attachment/Supplementary%20material.docx.

REFERENCES

[1] Mariotto AB, Robin Yabroff K, Shao Y, Feuer EJ, Brown ML. Projections of the cost of cancer care in the United States: 2010–2020. JNCI: Journal of the National Cancer Institute. 2011; 103: 117–128.

[2] Chan RJ, Gordon LG, Tan CJ, Chan A, Bradford NK, Yates P, *et al*. Relationships between financial toxicity and symptom burden in cancer survivors: a systematic review. Journal of Pain and Symptom Management. 2019; 57: 646–660.e641.

[3] Cohen AJ, Brody H, Patino G, Ndoye M, Liaw A, Butler C, *et al*. Use of an online crowdfunding platform for unmet financial obligations in cancer care. JAMA Internal Medicine. 2019; 179: 1717.

[4] Harris A. GoFundMe keeps gobbling up competitors, says it's "very good for the market". 2018. Available at: https://www.fastcompany.com/40554199/gofundme-keeps-gobbling-up-competitors-says-its-very-good-for-the-market (Accessed: 01 February 2021).

[5] GoFundMe. A universal desire to help: how GoFundMe reached 40 million donors. 2022. Available at: https://medium.com/gofundme-stories/a-universal-desire-to-help-how-gofundme-reached-40-million-donors-fe1c32b04dcc (Accessed: 11 January 2022).

[6] Medical fundraising—start a fundraiser. Available at: https://www.gofundme.com/start/medical-fundraising (Accessed: 11 January 2022).

[7] Blank TO, Schmidt SD, Vangsness SA, Monteiro AK, Santagata PV. Differences among breast and prostate cancer online support groups. Computers in Human Behavior. 2010; 26: 1400–1404.

[8] National Cancer Institute. NCI budget fact book—research funding. 2022. Available at: https://www.cancer.gov/about-nci/budget/fact-book/data/research-funding (Accessed: 11 January 2022)

[9] Vraga EK, Stefanidis A, Lamprianidis G, Croitoru A, Crooks AT, Delamater PL, *et al*. Cancer and social media: a comparison of traffic about breast cancer, prostate cancer, and other reproductive cancers on Twitter and Instagram. Journal of Health Communication. 2018; 23: 181–189.

[10] Loeb S, Stork B, Gold HT, Stout NK, Makarov DV, Weight CJ, *et al*. Tweet this: how advocacy for breast and prostate cancers stacks up on social media. BJU International. 2017; 120: 461–463.

[11] Kenworthy N, Dong Z, Montgomery A, Fuller E, Berliner L. A cross-sectional study of social inequities in medical crowdfunding campaigns in the United States. PLoS One. 2020; 15: e0229760.

[12] Saleh SN, Ajufo E, Lehmann CU, Medford RJ. A comparison of online medical crowdfunding in Canada, the UK, and the US. JAMA Network Open. 2020; 3: e2021684.

[13] Silver ER, Truong HQ, Ostvar S, Hur C, Tatonetti NP. Association of neighborhood deprivation index with success in cancer care crowdfunding. JAMA Network Open. 2020; 3: e2026946.

[14] van Duynhoven A, Lee A, Michel R, Snyder J, Crooks V, Chow-White P, *et al*. Spatially exploring the intersection of socioeconomic status and Canadian cancer-related medical crowdfunding campaigns. BMJ Open. 2019; 9: e026365.

[15] Loeb S, Taneja S, Walter D, Zweifach S, Byrne N. Crowdfunding for prostate cancer and breast cancer. BJU International. 2018; 122: 723–725.

[16] Song S, Cohen AJ, Lui H, Mmonu NA, Brody H, Patino G, *et al*. Use of GoFundMe® to crowdfund complementary and alternative medicine treatments for cancer. Journal of Cancer Research and Clinical Oncology. 2020; 146: 1857–1865.

[17] Street W. Cancer facts & figures. 2019. American Cancer Society. 1930; 76.

[18] von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. Journal of Clinical Epidemiology. 2008; 61: 344–349.

[19] Cancer stat facts: common cancer sites. Available at: https://seer.cancer.gov/statfacts/html/common.html (Accessed: 23 March 2021).

[20] Henley SJ, Ward EM, Scott S, Ma J, Anderson RN, Firth AU, *et al*. Annual report to the nation on the status of cancer, part I: national cancer statistics. Cancer. 2020; 126: 2225–2249.

[21] Berliner LS, Kenworthy NJ. Producing a worthy illness: personal crowdfunding amidst financial crisis. Social Science & Medicine. 2017; 187: 233–242.

[22] Paulus TM, Roberts KR. Crowdfunding a "real-life superhero": the construction of worthy bodies in medical campaign narratives. Discourse, Context & Media. 2018; 21: 64–72.

[23] Snyder J. Crowdfunding for medical care: ethical issues in an emerging health care funding practice. Hastings Center Report. 2016; 46: 36–42.

[24] Young MJ, Scheinberg E. The rise of crowdfunding for medical care. JAMA. 2017; 317: 1623.

[25] Nguyen QT, Lee EJ, Huang MG, Park YI, Khullar A, Plodkowski RA. Diagnosis and treatment of patients with thyroid cancer. American Health & Drug Benefits. 2015; 8: 30–40.

[26] Di Carlo A, Leveridge M, McGregor TB. Crowdfunding in urology: Canadian perspective. Canadian Urological Association Journal. 2021; 15: E139–E143.

[27] Harrison J, Maguire P, Pitceathly C. Confiding in crisis: gender differences in pattern of confiding among cancer patients. Social Science & Medicine. 1995; 41: 1255–1260.

[28] Huang Z, Ouyang J, Huang X, Yang Y, Lin L. Explaining donation behavior in medical crowdfunding in social media. SAGE Open. 2021; 11: 215824402110145.

[29] Kamiński M, Borys A, Nowak J, Walkowiak J. Crowdfunding campaigns for paediatric patients: a cross-sectional analysis of success determinants. Journal of Mother and Child. 2021; 25: 209–227.

[30] Zhang F, Xue B, Li Y, Li H, Liu Q. Effect of textual features on the success of medical crowdfunding: model development and econometric analysis from the tencent charity platform. Journal of Medical Internet Research. 2021; 23: e22395.

[31] Rajwa P, Hopen P, Mu L, Paradysz A, Wojnarowicz J, Gross CP, *et al*. Online crowdfunding response to coronavirus disease 2019. Journal of General Internal Medicine. 2020; 35: 2482–2484.

[32] Nguyen R, Hanna NH, Vater L. Crowdfunding for lung cancer costs. Journal of Clinical Oncology. 2019; 37: e18340–e18340.

[33] Joseph Mattingly T, Li K, Ng A, Ton-Nu T, Owens J. Exploring patient-reported costs related to hepatitis C on the medical crowdfunding page GoFundMe®. PharmacoEconomics—Open. 2021; 5: 245–250.

[34] Reporting fraud. 2022. Available at: https://www.gofundme.com/c/safety/fraudulent-campaigns (Accessed: 22 February 2022).

How to cite this article: Jordan T. Holler, Michael J. Sadighian, Umar Ghaffar, Behzad Abbasi, Behnam Nabavizadeh, Nizar Hakam, *et al*. Online medical crowdfunding in the United States: a cross-sectional analysis of gendered cancer campaign outcomes. Journal of Men's Health. 2023; 19(3): 29-37. doi: 10.22514/jomh.2023.022.