RESEARCH ARTICLE

Cervical Cancer Prevention on Instagram: Content and Social Interaction Analysis of Brazilian Accounts

Elen P Vicente[1], Sergio Eduardo Emydgio de Faria[1], Ana Beatriz L Almeida[2], Patricia Ayumi Yamada[2], Tiago FR Lucena[3], Tania MG Silva[1,4], Marcelo Picinin Bernuci[1,4]*

Abstract

Abstract: Objective: The aim of the present study was to analyse the content of posts on Instagram about cervical cancer. **Methods:** It was conducted a qualitative analysis using the 50 most popular publicly available Portuguese-language Instagram posts, containing the hashtags #cervicalcancer, #papsmear, #hpv, #papillomavirus, and #hpvvaccine, during the Brazilian national cervical cancer prevention campaign in March 2018. **Results:** Posts recruited using #cervicalcancer provided 60% of posts with contents related to secondary prevention; the #papsmear provided 46% of posts with irrelevant contents; the #hpv and #papillomavirus provided 50% and 64% of posts with informative content, respectively; and the #hpvvaccine provided 58% of posts with content related to primary prevention. The posts that received the highest number of likes were those from the hashtags #hpv and #papillomavirus with 151.33 and 78.00 likes/post, respectively. The majority of posts presented less than 05 comments/post, except for the #hpv, which had 64.76 comments/post. According to the users' profiles, the majority of the posts, regardless of the hashtag used, were made by health professionals. **Conclusion:** The focus of Instagram posts about cervical cancer is on secondary prevention, which can contribute to the promotion of health behaviours not directed to aspects of primary prevention of the disease.

Keywords: Health promotion; mHealth; chronic non-communicable diseases

Introduction

Cervical cancer is a serious public health problem worldwide, especially in Latin America and the Caribbean. It represents the third most prevalent type of malignancy in women and the fourth leading cause of cancer mortality in this population (Bray et al., 2018). Over the past decade, the incidence, mortality, and morbidity of cervical cancer have been reduced in some high-income countries (Canfell et al., 2020). The results in low- and middle-income countries, have shown to be inconsistent in response to limited strategies for disease control (Pilleron et al., 2020; Vale et al., 2020).

The main causative agent of cervical cancer is the human papillomavirus (HPV) types 16 and 18 (Walboomers et al., 1999). Many countries have implemented screening strategies for pre-malignant lesions, as well as the HPV test and its vaccine, in an organized way as the main control strategies for cervical cancer (Wright et al., 2015; Pimple and Mishra, 2019). In March 2014, Brazil implemented free vaccination of the quadrivalent HPV vaccine for women aged 9–13

years which was expanded in 2017 to women aged 9–14 years, men aged 11–14 years, and women and men aged 9–26 years living with HIV/AIDS or immunodeficiency (Gomes et al., 2020). Consequently, throughout March, a national campaign to control cervical cancer, known as March Lilac, was launched in Brazil.

Even after the implementation of this campaign, the incidence of cervical cancer among the female population remains high in the country, especially among young women (Balmant et al., 2017; da Silva et al., 2018; Vargas et al., 2020). The limitations of access to prevention programs, especially HPV vaccination, have been suggested as a preponderant factor for the configuration of this epidemiological scenario (Noguchi et al., 2020; Comerlato et al., 2020). Difficulties in accessing health services, fear of adverse reactions to the vaccine, and lack of knowledge of the relationship between HPV and cervical cancer are the main reasons for low adherence to the vaccine campaign (Lobão et al., 2018; Guzman-Holst et al., 2020; Faisal-Cury et al., 2020).

As it is gynecological cancer, many taboos and cultural aspects emerge from discussions about the management

[1]Postgraduate Program in Health Promotion, Universidade Cesumar, Brazil. [2]Faculty of Medicine, Cesumar University, Brazil. [3]Faculty of Communication and Multimedia, State University of Maringá, Brazil. [4]Cesumar Institute of Science, Technology and Innovation, Brazil. *For Correspondence: marcelo.bernuci@unicesumar.edu.br

of cervical cancer. The spread of fake news and misinformation, especially through social media platforms, harms health decision-making (Swire-Thompson and Lazer, 2020; Pulido et al., 2020) as in the case of the HPV vaccine (Ortiz et al., 2020). Misinformation shared on these platforms has led many parents to believe that the HPV vaccine would stimulate their child's early sexual activity or even be subjecting them to risks of severe side effects (Walker et al., 2020). Thus, the successful implementation of health education strategies based on the use of social media depends on the quality of the information disseminated (Niu et al., 2020; Dawson et al., 2020). Some studies have reported the presence of posts contrary to the HPV vaccine (Basch et al., 2019; Kearney et al., 2020) on Instagram, one of the most popular social media platforms among youngsters (Statista, 2020). This highlights the need for studies focusing on the analysis of posts related to cervical cancer prevention on online social networks.

To the best of our knowledge, few studies have evaluated health-related posts on Instagram focusing on cervical cancer. Of those, more attention was paid to the HPV vaccine rather than other cervical cancer prevention issues. Thus, we present data showing how the main hashtags on the topic of cervical cancer direct and streamline health-related content on Instagram during the Brazilian campaign for cervical cancer prevention.

Materials and Methods

This is a descriptive study that used a qualitative method to analyse the content of posts retrieved by hashtags (#) related to the topic of cervical cancer prevention on Instagram (www.instagram.com; Facebook, Menlo Park, CA) in Brazilian Portuguese-language accounts. This study adhered to Instagram's terms and conditions of use and privacy policy. The research protocol was exempt from ethical review since all data were publicly available and the researchers did not interact with the users. All data collected had no identifying information to guarantee the anonymity of the participants and prevent the misuse of information.

The posts were collected manually from screenshots directly from Instagram (website version) by a researcher using an anonymous account. As posts on the Instagram Platform are indexed by #, the search for posts was directed through keywords that are linked to the topic of cervical cancer. In addition, as the Instagram platform has a specific filter to search for the most popular posts, the filter of the 50 most popular posts was used to analyze only the content of the most popular posts among instagramers. So, the 50 most relevant posts were retrieved using the following hashtags in the search area: #cervicalcancer, #papsmear, #HPV, #papillomavirus, and #hpvvaccine. These hashtags were selected because they represent terms commonly described in protocols for early detection and prevention of cervical cancer (Dillner, 2019; Fontham et al., 2020). Data were collected on the last day of March in 2018, a period representing the awareness campaign on cervical cancer prevention in Brazil, known as March Lilac. In this way, the 50 most popular posts on the topic

were posted throughout the campaign period. Each post was encoded and stored in folders named after the hashtags used in the screening.

The posts content analysis was performed using inductive and deductive classification methods (Elo and Kyngäs, 2008). Posts were characterized according to 1) media's resources (image with or without text, photo, video); 2) post content (primary prevention, secondary prevention, informational, and irrelevant); 3) interaction tags (likes, comments, and views); and 4) self-declared description of the users' accounts (health professionals, not health professionals).

The content analysis of the posts was carried out following the recent recommendations of scientific literature regarding the prevention and management of cervical cancer (Liverani et al., 2020). Therefore, it was considered that the contents related to primary prevention dealt with actions taken to remove causes and risk factors for cervical cancer (e.g., HPV immunization, physical activity guidance, healthy eating, smoking, use of condoms, etc.). Secondary prevention measures, on the other hand, dealt with actions taken for the early detection of cervical cancer (e.g., screening for precursor lesions with a Pap smear, HPV test). Contents classified as informative indicated or notified about specific dates regarding cervical cancer control campaigns. Those classified as "irrelevant" dealt with aspects other than cervical cancer prevention, usually with spurious associations.

The data were analyzed by two independent researchers who classified all posts. The analyses were compared between the researchers and those that showed discrepancies were analyzed by a third researcher. The discrepancies between the two analyzes were minimal, thus, the analysis of only one of the researchers was considered.

Results

Content analysis

Table 1 shows data regarding the media resource type. Images with text were the most frequent types of media resources in posts, corresponding to 76% of the total on the #cervicalcancer, 72% on the #papsmear, 68% on the #hpvvaccine, and 56% on the #papillomavirus. For #hpv, videos represented the most frequent type of resource (58%).

Data related to the post content are presented in Table 2. For the #cervicalcancer, the majority of posts (60%) addressed content related to secondary prevention; 46% of #papsmear addressed irrelevant content; 50% of #hpv and 64% of #papillomavirus addressed informative

Table 1. Media's Resource Profile

	Image without text	Image with text	Photograph	Video
#cervicalcancer	-	38	10	2
#papsmear	4	36	6	4
#hpv	-	20	1	29
#papillomavirus	1	28	16	5
#hpvvaccine	-	34	10	6

Figure 1. Cervical Cancer Prevention-Related Content on Instagram. Examples of post content including (a) Informative; (b) Primary prevention; (c) Secondary prevention; (d) Irrelevant content.

Table 2. Post's Content Profile

	Primary prevention	Secondary prevention	Informative	Irrelevant
#cervicalcancer	-	30	10	10
#papsmear	-	14	13	23
#hpv	10	6	25	9
#papillomavirus	4	3	32	11
#hpvvaccine	29	6	15	-

Table 4. User's Profile

	Health professionals	Non-Health Professionals
#cervicalcancer	29	21
#papsmear	37	13
#hpv	35	15
#papillomavirus	42	8
#hpvvaccine	47	3

content; while 58% of #hpvvaccine addressed content related to primary prevention. Representation of posts with different content approaches is shown in Figure 1.

Social interaction analysis

Table 3 shows data regarding the posts' interaction. The posts that received the highest number of likes were those from #hpv and #papillomavirus with 151.33 and 78.00 likes/post, respectively. For the comments, most of

Table 3. Post's Interaction Profile

	Likes/post	Comments/post	views/video
#cervicalcancer	41.79	1.16	20
#papsmear	53.26	3.85	1.171
#hpv	151.33	64.76	8.829
#papillomavirus	78.00	5.35	575
#hpvvaccine	52.97	1.52	213

the posts presented less than 6 comments/post, except for #hpv, which had 64.76 comments/post. For the videos, the most viewed were those from #hpv (8.829 views/video) and #papsmear (1.171 views/video).

Data regarding the self-declared description of the users' accounts are shown in Table 4. Most of the posts were made by users who declared themselves to be health professionals. They accounted for 58% of the posts for #cervicalcancer, 74% for #papsmear, 70% for #hpv, 84% for #papillomavirus, and 94% for #hpvvaccine.

Discussion

The present study seeks to contribute into the scientific literature presenting how the main cervical cancer-related hashtags leads to relevant informational post on Instagram, in order to analyze the effectiveness and safety of social media as a health education's ally. In summary, the main

findings, showed that informational content regarding cervical cancer has spread among Brazilian Instagram accounts by profiles linked to the health area. However, at least in the way it was conducted, it has not reached high popularity and the content shared poorly addressed primary prevention informational content.

To broaden the search for posts with more general information about the disease, we used hashtags with terms targeting both the prevention and early detection of cervical cancer. The data from this screening showed that the use of each specific hashtag shifted the focus of posts to pragmatic actions within the theme. The hashtags #hpv and #papilomavirus direct to informative content about dates and locations of vaccination campaigns, #hpvvaccine to primary prevention, and #cervicalcancer to secondary prevention. These data seem to be positive as the hashtags are targeting content related to them. Some studies focusing on other types of cancer pointed out that Instagram posts tend to focus on awareness and patient support rather than on concrete actions and behaviors (Vraga et al., 2018; Basch and MacLean, 2019). This tendency of the content of the posts to focus on issues of low relevance to promote more effective self-care behaviors, with attention to risk and protection factors, brings relevant limitations for the use of Instagram as an effective tool for health empowerment, suggesting the need for reassessment of its use for this purpose.

Health-related content usually does not receive attention from digital influencers because it is not attractive to young followers. To mitigate this effect, studies have suggested some alternatives. One of them is labeling commercially sponsored content on social media, as recently demonstrated for posts by e-cigarette influencers on Instagram (Klein et al., 2020), another is to take advantage of topics with greater media repercussions, such as the COVID-19 (Rovetta and Bhagavathula, 2020). For diseases such as cervical cancer, what has really drawn the most attention is the HPV vaccine (Kearney et al., 2019). In this case, although posts with pro-vaccine content are more prevalent on Instagram, posts with anti-vaccine content have more engagement regardless of whether they are more or less reliable (Basch et al., 2019; Niu et al., 2020). Thus, the controversy regarding the HPV vaccine seems to hide or make it impossible to address other issues related to the disease, such as information on risk or protective factors as well as early detection matters. As the tendency of the publications analyzed in the present study was on the HPV vaccine, this corroborates the hypothesis that the choice of a controversial topic was the anchor of popularity.

Furthermore, the tendency of some hashtags, especially #hpv and #papilomavirus, to target content on alerts and reminders of vaccination campaigns draws attention to the quality of the posted content, with little effective value to promote useful learning for self-care in health. This finding was not surprising since the data were collected exactly at the end of March, a month dedicated to the national campaign for cervical cancer prevention in Brazil, showing that Instagram helped to publicize this campaign. Posts related to primary prevention issues

other than the HPV vaccine, such as physical activity guidance, healthy eating, smoking, use of condoms, and others, were posted incipiently, gaining little attention from Instagram accounts for these issues. In view of the growing increase in HPV vaccine hesitancy (Khodadadi et al., 2020; Szilagyi et al., 2020), pro-vaccine actions are appropriate in this context; however, they should not be exclusive, and other issues also need to be highlighted.

The addressing of both cervical cancer risk factors and protective factors, as well as content about myths and stigmas of the disease, are mandatory for better engagement of women in health-educational strategies focusing on self-care practices related to cervical cancer prevention (Cooper et al., 2020; Taghizadeh et al., 2020; Sitaresmi et al., 2020). It seems that guaranteeing only informative content on Instagram underestimates the potential of this social network as a driver of behavioral changes based on improving knowledge about self-care in health. This signals the debate on improvements in the usability of this popular communication tool among Brazilian Instagram users.

Another issue analyzed in our study was the social interaction, for this, it was speculated how the choice of media type (image, photo, video) or the information content itself could influence the popularity of the posts. Results showed that the most used resource was images with text, except for posts sorted using #hpv where the preference was for videos. This finding may justify the little interaction of users with the posted content, suggesting once again limitations in the theme articulation by Brazilian Instagram accounts. This hypothesis has also been raised by others, showing that the use of more elaborate media resources is more attractive among young people, and for this reason, they have gained more attention (Nayyar et al., 2019; Gabarron et al., 2020; Martin and MacDonald, 2020).

In the case of Instagram, social influencers often let their viewers be part of their personal lives by sharing personal and intimate stories and images that reinforce the identification process and engagement, which may also lead to improvements in the popularity (Lou and Kim, 2019; Folkvord et al., 2020; Lăzăroiu et al., 2020). Results indicated that posts in the format of videos received a good number of views; however, as most of these videos were derived from the #hpv, their popularity cannot be attributed only to the resource format but also to the topic addressed or the information quality. Although we have not carried out an analysis of the quality of the information posted, we can infer based on the direction of the topics linked by the hashtags used that the controversy over the HPV vaccine has indeed favored the viewing of these videos.

Regardless of the relevance of the debate about the HPV vaccine, it cannot be ruled out that for chronic non-communicable diseases with a high potential of prevention, such as cervical cancer, health education strategies directed toward risky or protective behaviors are more suitable as recently reviewed (Shah et al., 2020). It is also known that for effective learning in health, it is important that educational strategies support

content favoring deliberation of ideas and the sharing of experiences (Alanzi et al., 2018; da Silva Junior et al., 2020). The relevance of informational content dissemination, especially that aimed at alerting prevention campaigns as well as content on secondary prevention of the disease, cannot be underestimated.

However, it is expected that the focus of the content is in line with that proposed by health institutions. Thus, even though many health professionals used Instagram to disseminate information about cervical cancer during the March Lilac campaign, as presented herein, it may not have been so significant in driving behavioral changes aimed at more efficient cervical cancer prevention mechanisms. However, they served as alerts of attention to the topic. As previously demonstrated by others, Instagram has been used by health professionals to deliver information on health for different diseases, and as reported here, the approaches were superficial (Arasli et al., 2020; Alanzi and Al-Habi, 2020; Kerr et al., 2020). Regardless of the course of discussions, the participation of health professionals in health education strategies might be necessary for guaranteeing information content quality and the focus of the debate.

Studies suggest that the presence of health professionals supervising the flow of information through social networks may contribute to reducing the risk of spreading false news and improving the efficiency of the educational strategy (Lavorgna et al., 2018; Jenkins et al., 2020). In a recent study by our research group, findings indicated that online discussion groups (WhatsApp groups) are most effective in improving learning about disease prevention (breast cancer) when informational content is articulated by an experienced moderator (Pereira et al., 2020). Regardless of the type of social media platform used, the presence of a health professional to mediate discussions in a precise and harmonious way can be decisive for the success of online health education actions.

Although an analysis of the content of the comments was not carried out in the present study to validate whether the topic addressed had low repercussions among users, the low number of likes and comments on the posts suggests poor articulation. This fact, combined with the tendency to publish informative posts with little depth in important topics in cervical cancer prevention, suggests the need for better theme articulation by health professionals on Instagram. Other studies focusing on periods other than the March Lilac campaign need to be carried out to determine whether the content of the publications assume topics other than just campaign matters.

Thus, as youth and young adults are the largest consumers of Instagram content and that health professionals have used this type of social media to disseminate content related to cervical cancer, it is possible to speculate that Instagram has the potential to be part of health communication strategies. However, there is a need to incorporate media tools more closely linked to the reality of young people in order to ensure that the topic of cervical cancer gains notoriety among this population. Thus, we believe that the data presented herein may be relevant for future discussions about Instagram's potential to offer the cervical cancer control campaign new opportunities to reach the target audience.

Author Contribution Statement

The authors confirm contribution to the paper as follows: study conception and design: Marcelo Picinin Bernuci and Tiago FR Lucena; data collection: Elen P Vicente, Ana Beatriz L Almeida and Patricia Ayumi Yamada; analysis and interpretation of results: Sergio Eduardo Emydgio de Faria and Tania MG Silva; draft manuscript preparation: Elen P Vicente and Marcelo Picinin Bernuci. All authors reviewed the results and approved the final version of the manuscript.

Acknowledgments

References

Alanzi T, Bah S, Alzahrani S, Alshammari S, et al (2018). Evaluation of a mobile social networking application for improving diabetes Type 2 knowledge: An intervention study using WhatsApp. *J Comp Eff Res*, **7**, 891–9.

Alanzi T, Al-Habib DK (2020). The use of social media by healthcare quality personnel in Saudi Arabia. *J Environ Public Health*, **2020**, 1417478.

Arasli H, Furunes T, Jafari K, et al (2020). Hearing the voices of wingless angels: A critical content analysis of nurses' COVID-19 experiences. *Int J Environ Res Public Health*, **17**, E8484.

Balmant NV, de Souza Reis R, de Oliveira Santos M, et al (2017). Trends in cancer mortality among adolescents and young adults in Brazil. J Adolesc Young Adult Oncol, 6, 341–7.

Basch CH, Ed.D MPH, MacLean SA (2019). A content analysis of HPV related posts on Instagram. *Hum Vaccin Immunother*, **15**, 1476–8.

Basch CH, MacLean SA (2019). Breast cancer on Instagram: A descriptive study. *Int J Prev Med*, **10**, 166.

Bray F, Ferlay J, Soerjomataram I, et al. (2018). Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin*, **68**, 394–424.

Canfell K, Kim JJ, Brisson M, et al (2020). Mortality impact of achieving WHO cervical cancer elimination targets: A comparative modelling analysis in 78 low-income and lower-middle-income countries. *Lancet*, **395**, 591–603.

Comerlato J, Kops NL, Bessel M, et al (2020). Sex differences in the prevalence and determinants of HPV-related external genital lesions in young adults: a national cross-sectional survey in Brazil. *BMC Infect Dis*, **20**, 683.

Cooper EC, Maher JA, Naaseh A, et al (2020). Implementation of human papillomavirus video education for women participating in mass cervical cancer screening in Tanzania. *Am J Obstet Gynecol*, **9378**, 30730-9.

da Silva Junior GB, Askari M, et al (2020). The renal health Instagram: An analysis of comments. *Stud Health Technol Inform*, **270**, 781–5.

da Silva Viana L, Balmant NV, de Paula Silva N, et al (2018). Incidence trends of cervical cancer in adolescents and young adults: Brazilian population-based data. *J Adolesc Young Adult Oncol*, **7**, 54–60.

Dawson JQ, Davies JM, Ingledew PA (2020). Quality of online information regarding cervical cancer. *Cureus*, **12**, e9511.

Dillner J (2019). Early detection and prevention. *Mol Oncol*,

13, 591–8.

Elo S, Kyngäs H (2008). The qualitative content analysis process. *J Adv Nurs*, **62**, 107–15.

Faisal-Cury A, Levy RB, Tourinho MF, et al (2020). Vaccination coverage rates and predictors of HPV vaccination among eligible and non-eligible female adolescents at the Brazilian HPV vaccination public program. *BMC Public Health*, **20**, 458.

Folkvord F, Roes E, Bevelander K (2020). Promoting healthy foods in the new digital era on Instagram: An experimental study on the effect of a popular real versus fictitious fit influencer on brand attitude and purchase intentions. *BMC Public Health*, **20**, 1677.

Fontham E, Wolf A, Church TR, et al (2020). Cervical cancer screening for individuals at average risk: 2020 Guideline update from the American Cancer Society. *CA Cancer J Clin*, **70**, 321–46.

Gabarron E, Larbi D, Dorronzoro E, et al (2020). Factors engaging users of diabetes social media channels on Facebook, twitter, and Instagram: Observational study. *J Med Int Res*, **22**, e21204.

Gomes JM, Silva BM, Santos E, et al (2020). Human Papillomavirus (HPV) and the quadrivalent HPV Vaccine among Brazilian adolescents and parents: Factors associated with and divergences in knowledge and acceptance. *PLoS One*, **15**, e0241674.

Guzman-Holst A, DeAntonio R, Prado-Cohrs D, et al (2020). Barriers to vaccination in Latin America: A systematic literature review. *Vaccine*, **38**, 470–81.

Jenkins EL, Ilicic J, Molenaar A, et al (2020). Strategies to improve health communication: Can health professionals be heroes?. *Nutrients*, **12**, 1861.

Kearney MD, Selvan P, Hauer MK, et al (2019). Characterizing HPV vaccine sentiments and content on Instagram. *Health Educ Behav*, **46**, 37–48.

Kerr H, Booth R, Jackson K (2020). Exploring the characteristics and behaviors of nurses who have attained microcelebrity status on Instagram: Content analysis. *J Med Int Res*, **22**, e16540.

Khodadadi AB, Redden DT, Scarinci IC (2020). HPV vaccination hesitancy among Latina immigrant mothers despite physician recommendation. *Ethnic Dis*, **30**, 661–70.

Klein EG, Czaplicki L, Berman M, et al (2020). Visual attention to the use of adversus sponsored on e-Cigarette Influencer Posts on Social Media: A Randomized Experiment. *J Health Commun*, **2020**, 1–6.

Lavorgna L, De Stefano M, Sparaco M, et al (2018). Fake news, influencers and health-related professional participation on the Web: A pilot study on a social-network of people with Multiple Sclerosis. *Mult Scler Relat Disor*, **25**, 175–8.

Lăzăroiu G, Neguriţă O, Grecu I, et al (2020). Consumers' decision-making process on social commerce platforms: Online trust, perceived risk, and purchase intentions. *Front Psychol*, **11**, 890.

Liverani CA, Di Giuseppe J, Giannella L, et al (2020). Cervical cancer screening guidelines in the postvaccination era: Review of the literature. *J Oncol*, **2020**, 8887672.

Lobão WM, Duarte FG, Burns JD, et al (2018). Low coverage of HPV vaccination in the national immunization programme in Brazil: Parental vaccine refusal or barriers in health-service based vaccine delivery?. *PLoS One*, **13**, e0206726.

Lou C, Kim HK (2019). Fancying the new rich and famous? Explicating the roles of influencer content, credibility, and parental mediation in adolescents' parasocial relationship, materialism, and purchase intentions. *Front Psychol*, **10**, 2567.

Martin C, MacDonald BH (2020). Using interpersonal communication strategies to encourage science conversations on social media. *PLoS One*, **15**, e0241972.

Nayyar A, Jadi J, Garimella R, et al (2019). Are you on the right platform? A conjoint analysis of social media preferences in aesthetic surgery patients. *Aesthet Surg J*, **39**, 1019–32.

Niu Z, Bhurosy T, Jeong DC, et al (2020). Associations of social media use, patient-centered communication, and knowledge with perceived human papillomavirus vaccine effectiveness. *Am J Health Behav*, **44**, 642–51.

Noguchi T, Zaitsu M, Oki I, et al (2020). Recent increasing incidence of early-stage cervical cancers of the squamous cell carcinoma subtype among young women. *Int J Environ Res Public Health*, **17**, E7401.

Ortiz RR, Smith A, Coyne-Beasley T (2019). A systematic literature review to examine the potential for social media to impact HPV vaccine uptake and awareness, knowledge, and attitudes about HPV and HPV vaccination. *Hum Vaccin Immunother*, **15**, 1465–75.

Pereira A, Destro JR, Picinin Bernuci M, et al (2020). Effects of a WhatsApp-delivered education intervention to enhance breast cancer knowledge in women: Mixed-methods study. *JMIR Mhealth Uhealth*, **8**, e17430.

Pilleron S, Cabasag CJ, Ferlay J, et al. (2020). Cervical cancer burden in Latin America and the Caribbean: Where are we?. *Int J Cancer*, **147**, 1638–48.

Pimple SA, Mishra GA (2019). Global strategies for cervical cancer prevention and screening. *Minerva Ginecol*, **71**, 313–20.

Pulido CM, Ruiz-Eugenio L, Redondo-Sama G, et al (2020). A new application of social impact in social media for overcoming fake news in health. *Int J Environ Res Public Health*, **17**, 2430.

Rovetta A, Bhagavathula AS (2020). Global infodemiology of COVID-19: Analysis of google web searches and Instagram hashtags. *J Med Int Res*, **22**, e20673.

Shah SK, Nakagawa M, Lieblong BJ (2020). Examining aspects of successful community-based programs promoting cancer screening uptake to reduce cancer health disparity: A systematic review. *Prev Med*, **141**, 106242.

Simms KT, Steinberg J, Caruana M, et al (2019). Impact of scaled up human papillomavirus vaccination and cervical screening and the potential for global elimination of cervical cancer in 181 countries, 2020–99: A modelling study. *Lancet Oncol*, **20**, 394–407.

Sitaresmi MN, Rozanti NM, Simangunsong LB, et al (2020). Improvement of Parent's awareness, knowledge, perception, and acceptability of human papillomavirus vaccination after a structured-educational intervention. *BMC Public Health*, **20**, 1836.

Statista. Instagram accounts with the most followers worldwide as of October 2020 (in millions). https://www.statista.com/statistics/421169/most-followers-instagram/.

Swire-Thompson B, Lazer D (2020). Public health and online misinformation: Challenges and recommendations. *Ann Rev Public Health*, **41**, 433–51.

Szilagyi PG, Albertin CS, Gurfinkel D, et al (2020). Prevalence and characteristics of HPV vaccine hesitancy among parents of adolescents across the US. *Vaccine*, **38**, 6027–37.

Taghizadeh Asl R, Van Osch L, De Vries N, et al (2020). The role of knowledge, risk perceptions, and cues to action among Iranian women concerning cervical cancer and screening: A qualitative exploration. *BMC Public Health*, **20**, 1688.

Vale DB, Teixeira JC, Bragança JF, et al (2020). Elimination of cervical cancer in low- and middle-income countries: Inequality of access and fragile healthcare systems. *Int J Gynaecol Obstet*, 10.1002/ijgo.13458. https://doi.org/10.1002/ijgo.13458

Vargas AC, Dell Agnolo C, Melo WA, et al (2020). Trends in cervical cancer mortality in Brazilian women who are screened and not screened. *Asian Pac J Cancer Prev*, **21**, 55–62.

Vraga EK, Stefanidis A, Lamprianidis G, et al (2018). Cancer and social media: A comparison of traffic about breast cancer, prostate cancer, and other reproductive cancers on twitter and Instagram. *J Health Commun*, **23**, 181–9.

Walboomers JM, Jacobs MV, Manos MM, et al (1999). Human papillomavirus is a necessary cause of invasive cervical cancer worldwide. *J Pathol*, **189**, 12–9.

Walker KK, Owens H, Zimet G (2020). The role of the media on maternal confidence in provider HPV recommendation. *BMC Public Health*, **20**, 1765.

Wright TC, Stoler MH, Behrens CM, et al (2015). Primary cervical cancer screening with human papillomavirus: End of study results from the ATHENA study using HPV as the first-line screening test. *Gynecol Oncol*, **136**, 189–7.