Representation of cancer incidence and mortality in Spanish press

Representación de la incidencia y mortalidad por cáncer en la prensa española

Representação da incidência e mortalidade por câncer na imprensa española

Noelia Zurro Antón, Universidad Rey Juan Carlos, Fuenlabrada, Spain
(n.zurro.2018@alumnos.urjc.es)

Luis Cárcamo Ulloa, Universidad Austral de Chile, Valdivia, Chile (lcarcamo@uach.cl)

Ángeles Moreno, Universidad Rey Juan Carlos, Fuenlabrada, Spain
(mariaangeles.moreno@urjc.es)

ABSTRACT | Cancer is the leading cause of death worldwide and the second leading cause of morbidity and mortality in Spain. In emergencies and health crises, the media provide information that can condition public perception and help specialized broadcasters to communicate strategically, to ensure disease prevention and containment. The main objective of this article is to observe whether the Spanish written press, in its selection of news about cancer, reflects a preponderance of those types of cancer with higher incidence and mortality rates. We used content analysis and latent topic assignment (LDA) to study 1,371 cancer news items published between April 2022 and March 2023 in the three conventional newspapers with the highest weekly online reach, *El País, El Mundo* and *La Vanguardia*. Some cancers are over-represented in the media, such as leukemia and brain cancer, while other cancers with higher incidence and mortality rates, such as colorectal and prostate cancer, are under-represented. Skin cancer is mentioned in only 4% of the publications and is under-represented, considering that it is also a cancer with epidemiological status. The results are in line with previous Ibero-American studies and confirm the only study on media coverage of skin cancer in Spain. With the exception of breast and lung cancer, there is no general correspondence between the incidence and mortality of the main cancers and their media coverage, which may have implications for the prevention and control of these diseases.

KEYWORDS: health communication; public health; incidence; mortality; media; cancer; Spain.

RESUMEN | *El cáncer es la principal causa de muerte global y la segunda de morbi-mortalidad en España. En emergencias y crisis sanitarias, los medios proporcionan información que puede condicionar la percepción pública y ayudar a los emisores especializados a comunicar estratégicamente para garantizar la prevención y la contención de enfermedades. El principal objetivo de este artículo es observar si la prensa escrita española refleja en su selección de noticias sobre el cáncer una preponderancia de aquellos tipos de cáncer con mayores tasas de incidencia y mortalidad. Mediante análisis de contenido y asignación de tópicos latentes (LDA), se estudiaron 1371 noticias sobre el cáncer publicadas entre abril de 2022 y marzo de 2023 en los tres diarios convencionales con mayor alcance semanal en línea: El País, El Mundo y La Vanguardia. Existen cánceres sobrerrepresentados mediáticamente, como la leucemia y los cerebrales, mientras que otros con mayores tasas de incidencia y mortalidad, como los de colon y próstata, tienen menos presencia. El cáncer de piel solo es mencionado en 4% de las publicaciones y presenta una subrepresentación, considerando que además es un cáncer en estado epidemiológico. Los resultados son coherentes con los estudios iberoamericanos previos y corroboran la única investigación sobre la cobertura mediática del cáncer de piel en España. A excepción de los casos de mama y pulmón, no existe correspondencia global entre la incidencia y mortalidad de los principales tipos de cáncer y su cobertura mediática, lo que puede incidir en la prevención y contención de estas enfermedades.*

PALABRAS CLAVE: *comunicación en salud; salud pública; incidencia; mortalidad; medios de comunicación; cáncer; España.*

RESUMO | O câncer é a principal causa de morte em todo o mundo e a segunda principal causa de morbidade e mortalidade na Espanha. Em emergências e crises de saúde, a mídia fornece informações que podem condicionar a percepção do público e ajudar as emissoras especializadas a se comunicarem estrategicamente, a fim de garantir a prevenção e a contenção de doenças. O principal objetivo deste artigo é observar se a imprensa escrita espanhola reflete em sua seleção de notícias sobre câncer uma preponderância dos tipos de câncer com as maiores taxas de incidência e mortalidade. Por meio de uma análise de conteúdo e atribuição de tópicos latentes (LDA) foram estudadas 1.371 notícias sobre câncer publicadas entre abril de 2022 e março de 2023 nos três jornais convencionais com o maior alcance semanal on-line, El País, El Mundo e La Vanguardia. Alguns tipos de câncer estão sobre-representados na mídia, como a leucemia e os cânceres cerebrais, enquanto outros tipos de câncer com taxas de incidência e mortalidade mais altas, como os cânceres de cólon e de próstata, estão menos representados. O câncer de pele é mencionado apenas em 4% das publicações e está sub-representado, considerando que também é um câncer em situação epidemiológica. Os resultados são consistentes com estudos iberoamericanos anteriores e corroboram a única pesquisa sobre cobertura da mídia sobre câncer de pele na Espanha. Com exceção do câncer de mama e de pulmão, não há correspondência geral entre a incidência e a mortalidade dos principais tipos de câncer e a cobertura da mídia, o que pode ter um impacto na prevenção e na contenção dessas doenças.

PALAVRAS-CHAVE: comunicação em saúde; saúde pública; incidência; mortalidade; mídia; câncer; Espanha.

INTRODUCTION

Cancer is the leading cause of death in the world (Organización Mundial de la Salud, 2022), with mortality rates continuing to rise (Carrasco et al., 2021). According to the World Health Organization [WHO] (Organización Mundial de la Salud, 2022), one in six people died from cancer in 2020. In the same year, 2.7 million people in the European Union were diagnosed with cancer, while 1.3 million people died from the disease ("Un plan contra...", n.d.).

The Spanish Society of Medical Oncology, SEOM (Sociedad Española de Oncología Médica, 2023), considers cancer to be one of the main causes of morbidity and mortality in Spain. In June 2022 alone, 56,454 people died of cancer in Spain (Instituto Nacional de Estadística, n.d.). Non-melanoma skin cancer —for example basal cell carcinoma and squamous cell carcinoma— has a high incidence of 22,518 new cases, but a relatively low mortality rate, with 791 people dying from it in 2022 (Observatorio de la Asociación Española Contra el Cáncer, n.d.).

Skin cancer could be the next epidemic (Guillén Subirán, 2013; Moreno Fernández & Soria, 2022). According to estimates by the International Agency for Research on Cancer (n.d.), more than 1.5 million new cases of skin cancer will occur in 2020. By 2040, melanoma, the most aggressive form of skin cancer, is expected to be the second most common worldwide and the most common in men ("El melanoma será...," 2023). The WHO estimates that there will be around 57,000 deaths from melanoma in 2020, and despite numerous prevention measures, melanoma mortality continues to rise (Alonso-Belmonte et al., 2022). In 2022, there were 7,474 new cases of skin cancer in Spain (Sociedad Española de Oncología Médica, 2022), a figure that rose to 8,049 in 2023 (Sociedad Española de Oncología Médica, 2023). In 2021, the number of deaths due to malignant melanomas in the country was 1,056 and 1,675 for non-melanomas.

Incidence	NO.	Mortality	Total
Oral cavity and pharynx	7,779	Tumors	112,741
Esophagus	2,249	Malignant tumor of the trachea, bronchus and lung	21,918
Stomach	6,913	Malignant colon tumor	11,131
Colon	28,706	Malignant tumor of the pancreas	7,427
Rectum	14,664	Malignant breast tumor	6,651

Liver	6,604	Malignant prostate tumor	5,922
Gallbladder	2,834	Malignant tumor of liver and intrahepatic biliary tract	5,021
Pancreas	9,252	Malignant tumors of lymphatic tissue, hematopoietic organs and related tissues, except leukemia	5,011
Larynx	3,335	Malignant stomach tumor	4,917
Lung	30,948	Malignant tumor of ill-defined sites, secondary and unspecified sites	4,734
Skin melanoma	7,474	Malignant tumor of the bladder	4,423
Breast	34,750	Malignant tumor of the rectum, rectosigmoid portion, and anus	3,994
Uterine cervix	2,480	Leukemia	3,363
Uterine corpus	6,773	Malignant tumor of the brain	3,901
Ovary	3,600	Other malignant digestive tumors	2,508
Prostate	30,884	Other tumors of uncertain or unknown behavior	2,429
Testicle	1,428	Malignant tumor of the lip, oral cavity, and pharynx	2,399
Kidney (without pelvis)	8,078	Malignant tumor of the kidney, except pelvis renal	2,116
Urinary bladder	22,295	Malignant ovarian tumor	2,036
Brain and nervous system	4,169	Malignant esophageal tumor	1,823
Thyroid	6,040	Other malignant tumors of the skin and soft tissue	1,669
Hodgkin's lymphoma	1,590	Malignant tumor of other parts of the uterus	1,600
Non-Hodgkin's lymphomas	9,514	Other malignant tumors of the urinary tract	1,588
Myeloma	2,963	Malignant tumor of the larynx	1,181
Leukemias	6,079	Malignant melanoma of the skin	1,079
Others	18,700	Malignant tumor of the uterine cervix	673
All except non melanoma skin	280,101	Other malignant respiratory and intrathoracic tumors	502
		Malignant tumors of bone and articular cartilage	328

Table 1. Cancer incidence and mortality by tumor type in Spain

Source: Sociedad Española de Oncología Médica (2023).

The social stigmatization of oncological diseases

Social stigmatization is traditionally associated with diseases that are transmitted or leave visible traces, such as leprosy, tuberculosis, HIV and epilepsy. Even today, people diagnosed with cancer are still vulnerable to stigmatization and discrimination (Fujisawa & Hagiwara, 2015). Explanations for such attitudes often begin by associating the disease with death and fear, with saying goodbye to loved ones, and ultimately with grief and dependence, which are the two biggest concerns associated with cancer in all populations (Castaño Rodríguez & Palacios-Espinosa, 2013; Grupo Español de Pacientes con Cáncer, 2019).

The perception of guilt is a psychological barrier that stigmatizes and obscures certain types of cancer. In Spain, a proportion of the population associates the development of cancer with unhealthy lifestyle habits (Morales, 2023), including tobacco use (29.38%), exposure to harmful radiation (24.23%), regular alcohol consumption (17.01%), excessive and careless photo exposure (14.43%) and obesity and poor diet (15.46%), according to the results of the Spanish Group of Patients with Cancer (2019). However, lung cancer, which ranks first in the mortality rate in Spain (Sociedad Española de Oncología Médica, 2023), is a pathology that is often associated with habitual tobacco consumption. According to experts, the stigma of lung cancer has long limited economic resources and social support for patients with this disease, which is why prevention and awareness campaigns have emerged as alternatives (Freire, 2021).

Beliefs, shame, negative attitudes, lack of knowledge and lack of interest not only promote discrimination against people who have or may have cancer, but also discourage self-examination and screening tests for the disease (Penagos-Corzo & Pintado Cucarella, 2020). However, Antonio Prieto, president of the Prostate Cancer Association, has acknowledged that the stigmatization of cancer is "more social than clinical" and has an "impact on male self-esteem" (Pilar, 2022, par. 2). María José Méndez Vidal, a member of the SEOM board, has stated that stigma also causes fear and shame in some patients, which prevents them from visiting their GP for a check-up.

Media's role in shaping cancer's image in society

In recent decades, research on media effects has taken a new direction, consistent with the shift of audiences from a homogeneous receptive mass to diverse but relatively active prosumers (Benassini Felix, 2014). Allard and Orom (2023) found that 44% of young adults in their study had sought information at least once about oncological diseases, which, given their prevalence and characteristics, are among the most important social and health issues of our time (Brea Carrasco, 2007). In addition, this age group preferred to seek information online, ideally

through information produced or verified by doctors. Such consumer research seems fundamental in the 21st century, at a time when the audience is considered a key element to establish the hierarchy and framing of issues for public discussion using what is shared on social media (Aruguete, 2021).

In this way, the media are indispensable when it comes to ensuring citizens' compliance with measures to promote health and curb disease (Stanojlovic, 2015; Sotelo Rodríguez, 2020) and play a fundamental role in disseminating and raising awareness about cancer prevention and treatment (Brea Carrasco, 2007). For example, Dixon and colleagues (2014) found that the media agenda on skin cancer influences the adult population's attitudes towards the disease and their beliefs about prevention. More specifically, news stories promoting sun protection were associated with beliefs that tanning is unhealthy and a low preference for intense tanning, even among young adults accustomed to the practice. Other research on how message images influence audience behavior has shown that a losing image is relatively persuasive when it comes to activating preventive screenings, while a winning image is relatively persuasive when it comes to preventing oncological diseases (Wang et al., 2022).

In the only study looking at journalistic coverage of skin cancer in Spain, Sánchez Ballestero (2018) found that the media agenda on the disease can be divided into three thematic categories: prevention (e.g. advice and warnings), research and treatment and others (e.g. curiosities, new commercial products). However, a limitation regarding the continuous role of the media is that these publications were not evenly distributed over time and mostly coincided with the periods of the photo prevention campaigns, namely in July and August. At the same time, recent evidence suggests that another limitation in exploring the role of the media is that adequate space is not devoted to the cancers with the highest incidence and mortality rates. In Japan, for example, stomach and colorectal cancers are the least talked about, even though they are associated with higher mortality (Miyawaki et al., 2017). In Chile, stomach cancer — the cancer with the highest mortality rate in men— - ranks eighth in terms of mentions, while breast cancer — the cancer with the highest mortality rate in women— - ranks fifth (Carrasco et al., 2021). A review of the literature also shows a general decline in the reporting of cancer.

Against this background, the aim of this study was to analyze the content published in major Spanish newspapers about skin cancer as a growing subtype of malignancy.

Three research questions (RQ) were formulated:

RQ1. Does the press coverage of cancer in Spain accurately reflect the incidence and mortality rates of each type of cancer in the country?

RQ2. Is skin cancer given space as a possible next big epidemic?

RQ3. Which terms appear most appear in press coverage in Spain?

METHOD

For this study, the three conventional newspapers with an online presence that perform best in terms of weekly reach and subscriptions in Spain were first selected: *El País, El Mundo* and *La Vanguardia* (Vara-Miguel et al., 2022).

Second, the flow or pipeline pipeline es_core_news_lg of the Natural Language Processing (NLP) software library SpaCy was used. This flow or pipeline of connected computer processes enables the processing of written news texts in Spanish in terms of vocabulary, syntax, entities and vectors. According to Fosado (2019), SpaCy relies on neural network models to perform labeling, analysis and recognition of named entities. SpaCy was used to search the three newspapers for the terms –with and without diacritics: *cáncer cancer, oncológico, oncologico, oncología, oncologia, leucemia, linfoma, neoplasia, tumor,* which were taken from a previous study (Carrasco et al., 2021). The validity of the NLP used was between .88 and .99.

The original corpus consisted of 1,774 full-text messages. However, after an initial analysis, a relevant ambiguity was found in the term cancer, especially in *La Vanguardia*. Therefore, a refinement process was carried out, extracting the ambiguous data irrelevant to this study. The result was a final dataset of 1,371 news articles for the entire year from April 1, 2022 to March 30, 2023.

Third, this study was based on content analysis and latent Dirichlet allocation (LDA), a modeling approach proposed by Blei and colleagues (2003) and applied in a recent study on cancer topics (Carrasco et al., 2021). To answer RQ1 and RQ3, a content analysis was conducted on 1,371 news items from the three newspapers that contained the mentioned terms in their headlines, introductions or paragraphs. The types of cancer mentioned in these news items were recorded in a non-exclusive way, i.e. the same news item could cover more than one type of malignant neoplasm or do so in a general way without specifying a particular type. In the context of an LDA model, each document is seen as an amalgamation of several thematic aspects. The basic premise for this is the concept of the word bag, where each term is considered part of a topic and conveys the same information regardless of its position in the document. This automatic modeling

process results in a list of terms classified according to their relevance to each topic. A human analyst can then interpret and name each thematic topic based on the terms it contains.

Fourth, RQ2 was approached by performing a latent topic analysis. This is a probabilistic statistical model used to observe patterns in the occurrence of terms and connections between documents that exhibit related trends (Luque et al., 2021) to identify dominant latent ideas from keyword categorization.

This process sought to identify the most appropriate number of themes by using the validation metrics of thematic modeling –coherence and perplexity. Based on the results, we grouped the terms into the number of themes recommended by the validation metrics, ranked the resulting terms according to their value for each group, and identified the 25 most frequent terms. Inductive techniques were then used to suggest the most appropriate titles for each topic with respect to the texts studied. Finally, to check the suitability of the titles, news items for each group were randomly selected to compare their content with the titles of the selected topics.

RESULTS
Media's representation of cancer's incidence and mortality by type of cancer

The malignant neoplasm most frequently mentioned in the most widely read conventional newspapers in Spain was breast cancer (n=257, 18.75%), followed by cancers of the lung and respiratory tract - trachea and bronchus - (n=162, 11.82%), leukemia (n=140, 10.21%), brain tumors and cancers of the nervous system (n=133, 9.7%), cancers of the digestive system - esophagus, stomach and intestine - (n=112, 8.17%) and non-leukemic lymphatic and hematologic cancers (n=110, 8.02%). In contrast, the least mentioned cancers were testicular cancer (n=15, 1.09%), kidney cancer (n=14, 1.02%) and eye cancer (n=7, 0.51%) - mainly retinoblastoma (figure 1).

In addition, we created a general category for news items that referred to cancer as a disease in general, without emphasizing a specific type of cancer (n=344, 25.09%). These articles typically reported on cancer research, general treatments for the disease, and donations to cancer-related organizations.

By and large, the cancers with the highest incidence in Spain according to the report *Las cifras del cáncer en España* 2022 (Cancer figures in Spain 2022) (Sociedad Española de Oncología Médica, 2022) were the most frequently mentioned, although with some variations. In particular, the cancers with the highest incidence (i.e., 30,000 new cases) were breast, lung and prostate cancer, which ranked first, second and eighth respectively in terms of frequency.
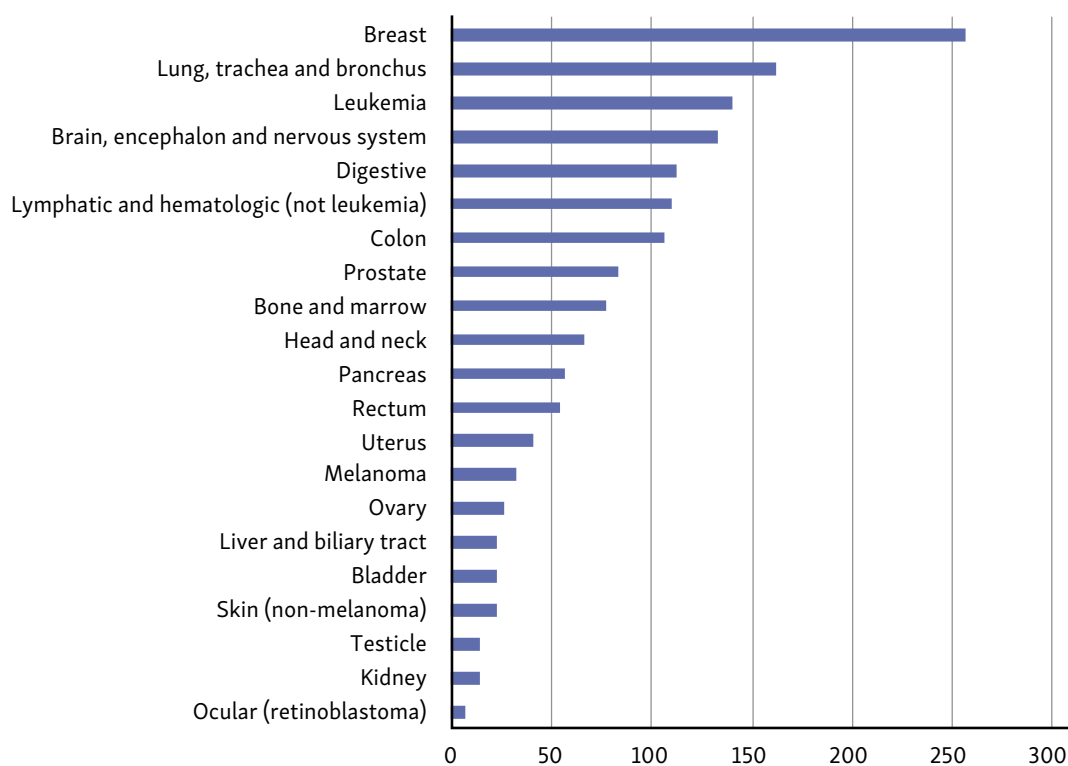
Figure 1. Frequency of mentions by type of cancer

Source: Own elaboration.

In comparison, cancers with an incidence rate between 20,000 and 30,000 new cases —namely bowel and bladder cancer—ranked 7th and 17th respectively. The biggest difference was in bladder cancer, which had an annual incidence of 22,295 new cases in 2022, but was only mentioned in 23 news stories in the one-year period studied.

When we compared the frequency of mentions with the highest mortality rates, the five deadliest cancers (i.e. lung, colorectal, pancreatic, breast, and prostate cancer) ranked 2nd, 7th, 11th, 1st and 8th in terms of frequency of mentions. The two rankings therefore differed significantly. The malignant neoplasms that caused fewer than a thousand deaths were cervical cancer, cancer of the respiratory tract and bone and joint cancer. Although cervical cancer ranked 13th and bone cancer 9th, the greatest variation was seen in cancers of the respiratory tract, which are grouped in the second tier in figure 1.

Leukemia, cancers of the brain, encephalon and nervous system, and cancers of the digestive system stood out with the lowest incidence rates and only moderate mortality rates, although they were mentioned very frequently in the media analyzed.

Skin cancer in newspapers in Spain

Skin cancer, both melanoma and non-melanoma, accounted for 4% of all cancers mentioned in the papers examined (i.e., 2% melanoma and 2% non-melanoma) and had a mortality rate of more than 700 cases –melanoma (n=1,079), basal and squamous cell carcinoma (n=791). Together (n=1,870), these figures exceed the mortality of uterine cancers-cervical cancer (n=67), other body parts (n=1,600) and exceed the mortality of abnormal masses of malignant tissue in bone (n=328) by a factor of eight. In the news of *El País, El Mundo* and *La Vanguardia*, uterine cancer (2.99%) and bone cancer (5.69%) were mentioned more frequently than melanoma (2.41%) and other skin cancers (1.68%).

In terms of incidence, melanoma alone accounted for 7,474 new cases, while melanoma and carcinoma combined accounted for 22,518 new cases. This makes skin cancer a more common disease than other malignant neoplasms, including cancers of the brain and nervous system (n=4,169) and leukemia (n=6,079). Nevertheless, these diseases were mentioned more frequently in the news (4th and 3rd place respectively) than skin cancers.

The news items in which skin cancer was mentioned were few in number but varied in topic. Most news stories covered the skin cancers of public figures such as Jimmy Carter, Joe Biden and Khloé Kardashian, as well as Hispanic citizens with emotional media profiles. Other topics included studies and treatments for skin cancer, particularly the initial results of drug trials by Moderna and Merck, prevention of skin cancer by limiting sun exposure, proposed predictors for early detection of skin cancer, the increased incidence of skin cancer and the development of a computer application to detect ultraviolet rays.

Co-text and categorization

A word frequency analysis and an LDA topic analysis were carried out. The former to identify the most frequent words accompanying the terms (i.e., co-text) in the messages, and the latter to identify the dominant latent ideas in the categorization of the terms.

The results on co-text include 52 terms repeated more than 20 times. The results in terms of frequency indicate that the dimensions of research, diagnosis and treatment were generally predominant in media coverage of any type of cancer in the Spanish mainstream press, often in terms such as scientific, clinical, medical, sanitary and later therapeutic and pharmaceutical. Reference was also made to the structure or health system of the Spanish welfare state, using terms such as public, social and, to a lesser extent, general. Another recurring idea was fear, expressed in the terms aggressive, oncological, tumorous and malignant. In figure 2, the terms that are larger are more common in the new articles analyzed.

Next, the LDA topic analysis revealed the latent ideas in the news articles. For the NLP metrics used to validate the topic modeling, the graphs for perplexity (0.50) and coherence (–8.55) showed a trade-off or overlap in the number of topics that approached 3. Therefore, three groups of texts were created based on three themes.

The closer the terms in the diagrams are to 1, the more dominant or representative they are of the model. Overall, the 25 terms with the highest consistency values were included in the analysis.

Based on the observation of the selected keywords, the most representative topic of each group was determined, as well as the interpretation of the tags (Table 2). Following the model of Tresnasari et al. (2020), the first group (35.9%) captured the resilience, survival, and life expectancy of patients diagnosed with cancer, indicated by the words years, life, tumor, hospital, disease, day, year, months, moment, and time. In view of this, the terms family, mother, distribution, father, social media and people were interpreted as referring to the dimension of personal support for the patient as well as information, treatment, doctors, health and specialist support.

Figure 2. Word cloud of cancer coverage in Spain

Source: Own elaboration.

Group	Dominant keywords	Unique keywords	Label/ topic name	Group size
1	0,013* years + 0,010* cancer + 0,009* life + 0,006* tumor + 0,005* hospital + 0,005* sickness + 0,005* family + 0,005* day + 0,004* year + 0,004* information + 0,004* treatment + 0,004* networks + 0,004* days + 0,004* month + 0,003* mother + 0,003* moment + 0,003* doctors + 0,003* time + 0,003* distribution + 0,003* father + 0,003* health + 0,003* world + 0,003* social media + 0,003* part + 0,003* persons	Hospital, family, day, information, networks, days, months, mother, moment, doctors, time, distribution, father, social media, part	Resilience, survival and life	35.9%
2	0,022* cancer + 0,015* patients + 0,013* cells + 0,012* tumor + 0,011* treatment + 0,010* tumors + 0,007* years + 0,007* treatments + 0,006* research + 0,006* system + 0,006* disease + 0,006* patient + 0,005* breast + 0,005* type + 0,004* cases + 0,004* drugs + 0,004* surgery + 0,004* results + 0,003* drug + 0,003* form + 0,003* breast cancer + 0,003* survival + 0,003* euros + 0,003* life + 0,003* metastasis	System, drugs, surgery, results, breast cancer, survival, euros, metastasis	Advances in research and treatment (AvInt)	35.6%
3	0,024* cancer + 0,010* years + 0,008* risk + 0,006* women + 0,006* disease + 0,006* persons + 0,005* cases + 0,005* tumors + 0,004* study + 0,004* disease + 0,004* life + 0,004* breast + 0,004* lung + 0,004* health + 0,004* virus + 0,004* cells + 0,003* tumor + 0,003* population + 0,003* patients + 0,003* world + 0,003* research + 0,003* data + 0,003* form + 0,003* factors + 0,003* type	Risk, women, study, disease, lung, virus, population, data, factors	Susceptibility or prevalence (SuPre)	28.4%

Table 2. Representation of the three topics

Source: Own elaboration.

The second group (35.6%) captured advances in cancer research and treatment, which were indicated by the terms patients, cells, treatment, research, drugs, surgery, outcomes and survival. The funding and costs of this research were represented by the terms system, form and euro. In this group, as in the next, breast cancer appears to have had a significant weight due to the recurrence of breast and breast cancer.

Finally, the third group (28.4%) captured the susceptibility or prevalence of each type of cancer in a given group of people, that is, the group's relative likelihood

of developing the disease based on the characteristics or distinguishing factors of the group. The terms in this group were risk, disease, people, cases, study, population, patients, factors and type. The third group also listed some cancers with the highest incidence in certain groups (e.g., breast cancer in women) and their relationship to carcinogens (e.g., lung cancer and viruses).

From the automated analyzes, a map of the distances between the topics was created using the multidimensional scaling technique to visualize the three groups in a two-dimensional space. Figure 2 shows that the three groups were completely separated from each other, with no overlap, and that there was a significant distance between them. However, as mentioned above, several terms appeared in two or three groups, suggesting heterogeneity in their co-text and meaning. For example, treatment did not have the same function in the first two groups. In the second group, it was the topic of news about advances in cancer research, but in the first group it was only one of many vehicles for the topic of resilience, survival and life expectancy.

The map illustrates the size of each group, which represents the number of news items included in the group (figure 3). The larger the size, the greater the number of news articles. Although the differences in size are not remarkable, the first two groups are slightly larger than the third. Their size can also be seen from the percentages at the end of table 2.

Finally, looking at the map of thematic distances as a strategic diagram, it can be seen that the collective theme of resilience, survival and life expectancy represented by the third group is a fundamental, overarching theme in the coverage of cancer in the conventional press in Spain, and at times even a driving theme. In comparison, the topic of advances in cancer research and treatment appears to be an emerging, growing theme. Finally, the issue of susceptibility and prevalence has made an important development, albeit in a relatively isolated way.
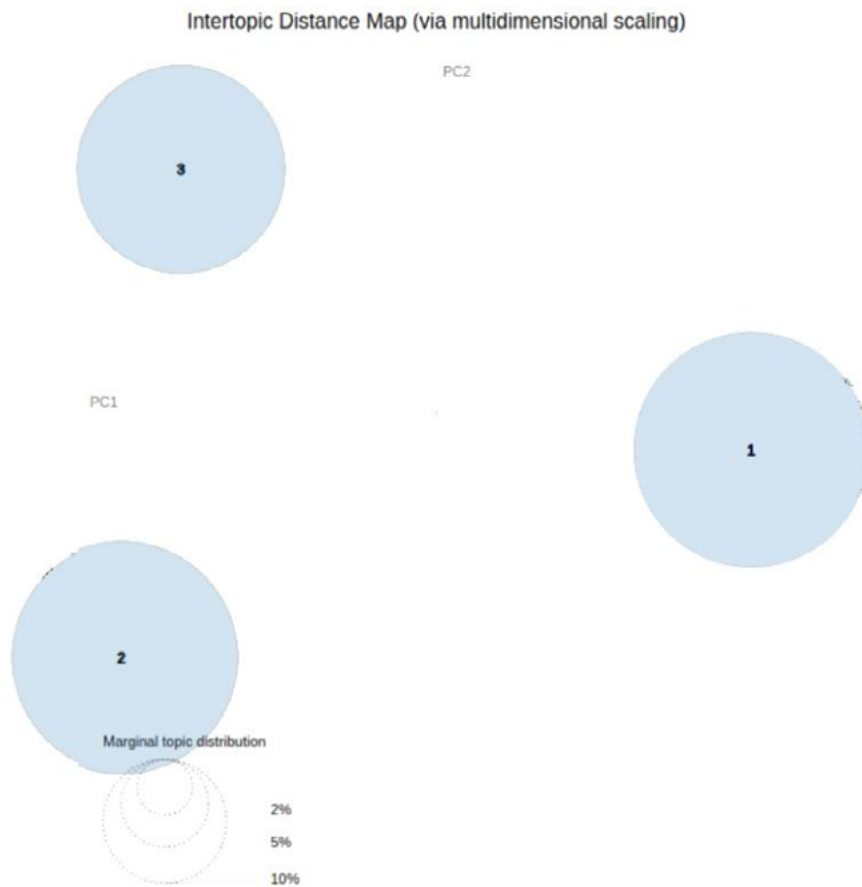
Figure 3. Display of the selected model

Source: Own elaboration.

DISCUSSION

The results of this study support the approach of reflecting cognitive processes (e.g., stereotypes) and emotional processes (e.g., prejudice) in media coverage of cancer incidence and mortality within the social stigma model. The analysis of latent topics revealed that the topics of survival and susceptibility as well as the prevalence of cancer dominate in more than half of the publications analyzed. Thus, the terms hospital, family, days, months, doctors, father, mother, distribution and time recur in the popular media, usually in the context of linking the disease with death and fear, recalling concerns such as saying goodbye to loved ones, pain and dependence (Castaño Rodríguez & Palacios-Espinosa, 2013; Grupo Español de Pacientes con Cáncer, 2019). In contrast, feelings of guilt are caused by the insistence on ignoring risk factors associated with a particular type of cancer.

As Conde Melguizo (2014) has suggested, health should not be defined as a state, but as a continuum on which a person finds themselves differently at

each stage of their life. However, the immediacy and rapidity of today's media could further alter any continuum-based perspective on the concept of health as opposed to that of disease.

Sometimes the news media uses literary and political expressions that help to capture the reader's attention in a hyper-competitive media environment with an overabundance of news. According to the book *Palabras que cuidan: Comunicación social ética y empática del cáncer* (Words that matter: social, ethical and empathic cancer communication) (Rojas et al., 2023), the language typically used to describe warfare is one of the most controversial types of language associated with media coverage of oncological diseases. Such polarizing discourse confronts cancer as the enemy of humans as individuals and as a species with phrases such as fight against and war against, which according to Rojas et al. puts pressure on people affected by cancer to be stoic. Among the news items analyzed, the one about María Luisa Marín, an 83-year-old woman, stood out. Her experience was repeatedly described with the expressions of struggle, overcoming, strength and good physiological condition, while cancer was associated with risk, doom and mortality. Similarly, patients with breast cancer over the age of 70 were described with terms such as fragility (López Tovar, 2022). Taken together, these findings suggest that the media is able to influence the image of cancer in society and society's stigmatizing attitudes towards the disease.

Research on theories of media boundary, including that of social representation, has shown that "the determination of social objects is alien to the media; social communicators take up only the social meanings of events that occur almost independently of them" (Calonge, 2006, p. 81). From this perspective, the question arises as to what phenomena in society currently indicate a decline in the usual coverage of the most underrepresented cancers, including colorectal and prostate cancer. Men, as the population group most at risk of these cancers, are less likely to go for screening than women, often due to fear, lack of knowledge, shame and a "false image of masculinity" where "going to the doctor seems to make you weaker" (Villena, 2022, para. 11).

Currently, patient and health associations have become important socio-political actors whose activity can significantly influence reporting. According to Jiménez Sánchez and colleagues (2023), major broadcasters dedicated to the fight against skin cancer routinely present photoprotective content and cause-centered framing in their media. Five years earlier, Sánchez Ballestero (2018) pointed out that one of the main news topics in *El País, ABC* and *El Mundo* was "health promotion and education" in "publications with advice and warnings on sun protection and skin cancer prevention" (p. 27).

In the absence of such actors, however, the result is different. One of the most concealed and highly stigmatized cancers is liver cancer, and although almost 7,000 new cases of liver cancer are diagnosed in Spain every year, there is no patient association for it in the country (Morales, 2023). The coverage of liver cancer examined in this study barely reached 1.30% of publications in the period analyzed.

At the same time, in line with the findings of Carrasco et al. (2021), the cancers that receive the most attention — breast cancer, lung cancer, leukemia and brain tumor — continue to be very strongly associated with emotional topics, including the story of little Oliver (Ortiz and Lamet, 2022) and with public figures such as Ana Rosa Quintana (Puig, 2022) and the influential Hilda Siverio (García, 2023). The re-emergence of sources traditionally associated with the public interest could be evidence of the media's concern for search engine positioning and maintaining visits and/or readership.

Finally, melanoma and non-melanoma skin cancer did not receive sufficient attention in the news stories studied, and a significant increase in coverage was observed from June to August — that is, during the summer in Spain. These results are consistent with the findings of Sánchez Ballestero (2018) on the press and Zurro-Antón, Moreno and Humanes (2023) on scientific output, suggesting that both media attention and research focus on skin cancer as the next big epidemic (Guillén Subirán, 2013) may be temporary rather than constant.

Regarding the limitations of this study, only the journalistic content of the news articles was observed. Therefore, evidence on audience reactions and reception, which could increase the richness of the analysis using the limited effects and prosumer audience model, was ignored. The sources of information and other political and/or social actors around which the media discourse on cancer is constructed were also not examined. Finally, the geographical confinement of the Spanish press precluded the possibility of examining contrasting factors for the same time period, including cultural and sociolinguistic differences within the Spanish-speaking world.

CONCLUSIONS

In Spain, the General Law on Public Health (Law 33/2011) requires the media to collaborate with the health authorities in order to maximize the dissemination of public health recommendations. In particular, Article 19 states the common goal of "reducing the incidence and prevalence of certain diseases" (Ley 33/2011, p. 9). However, most of the headlines in Spain do not fully reflect the official incidence and mortality rates of cancer reported by specialized agencies. These

laws and trends suggest that emotions and social manifestations take precedence over official figures in the media space for cancer information, which in some ways supports the social representation model (Calonge, 2006). The investigation of possible mechanisms to broaden media attention in favor of the affected population and other political and/or social actors related to the most underrepresented neoplasms is therefore recommended.

This study focused on the role of the press in labeling cancer as a public health emergency and on observing the influence of the press on the prevention and containment of oncological diseases. In this way, it fills a research gap by identifying, at least in the European context, under- and over-representations already observed in Chile (Carrasco et al., 2021), Japan (Miyawaki et al., 2017) and South Korea (Min et al., 2020).

The results suggest, first, that the creation and activation of patient and health associations as specific social actors could increase the media representation of certain cancers, regardless of the associated incidence and mortality. Second, coverage of cancer by public figures and/or individuals with emotional media profiles could caution against the impact of new press funding models (e.g., aimed at increasing readership and attendance) on shaping the media agenda and news frames for cancer. Future research should therefore explore in depth how the choice of news source types affects cancer-related content.

REFERENCES

Allard, N. C., & Orom, H. (2023). Examining beliefs and information-seeking behaviors of young adults aged 20-39 to help inform cancer prevention communication. *Preventive Medicine*, *166*, 107353. https://doi.org/10.1016/j.ypmed.2022.107353

Alonso-Belmonte, C., Montero-Vilchez, T., Arias-Santiago, S., & Buendía-Eisman, A. (2022). Situación actual de la prevención del cáncer de piel: una revisión sistemática (Current Status of Skin Cancer Prevention: A Systematic Review). *Actas Dermo-Sifiliográficas*, *113*(8), 781-791 https://doi.org/10.1016/j.ad.2022.04.015

Ansede, M. (2022, August 8). Josep María Borrás, epidemiólogo: "En España no existe un registro nacional del cáncer porque no se ha priorizado" (Josep María Borrás, epidemiologist: "In Spain there is no national cancer registry because it has not been prioritised"). *El País*. https://elpais.com/ciencia/2022-08-08/josep-maria-borras-epidemiologo-en-espana-no-existe-un-registro-nacional-del-cancer-porque-no-se-ha-priorizado.html

Aruguete, N. (2021). Activación de encuadres en red. Un modelo para repensar la circulación de sentidos en el nuevo entorno mediático (Network activated frames. A model to rethink the circulation of senses in the new media environment). *Profesional De La Información*, *30*(2), 1-18. https://doi.org/https://doi.org/10.3145/epi.2021.mar.18

Benassini Felix, C. (2014). De audiencias a prosumidores. Acercamiento conceptual (From audience to prosumer. Conceptual introduction). *Luciérnaga Comunicación*, *6*(12), 16-29. https://doi.org/10.33571/revistaluciernaga.v6n12a2

Blei, D. M., Ng, A. Y., & Jordan, M. L. (2003). Latent Dirichlet Allocation. *Journal of machine Learning research*, *3*, 993-1022. https://www.jmlr.org/papers/volume3/blei03a/blei03a.pdf

Brea Carrasco, M. (2007). El cáncer en los medios de comunicación (Cancer in the media). In E. Aranda Aguilar, M. Benavides Orgaz, A. M. Casas Fernández de Tejerina, E. Felip Font, M. P. Garrido López, & J. Rifá Ferrer (Coords.), *Libro blanco de la oncología médica en España. Dossier 2006* (White Paper on Medical Oncology in Spain. Dossier 2006) (pp. 385-396). Dispublic. https://www.seom.org/seomcms/images/stories/recursos/sociosyprofs/planif_oncologica_espana/libroblanco_25.pdf

Calonge, S. (2006). La representación mediática: teoría y método (Mediatic representation: theory and method). *Psicologia da Educação*, (23), 75-102. https://revistas.pucsp.br/index.php/psicoeduca/article/view/43272

Carrasco, M. A., Neira, C., Klett, B., & Cárcamo, L. (2021). Representación de la incidencia y de la mortalidad por cáncer en los medios de comunicación chilenos (Portrayal of cancer prevalence and mortality in Chilean digital media). Revista Médica de Chile, 149(5), 716-723. https://doi.org/10.4067/s0034-98872021000500716

Castaño Rodríguez, A. M., & Palacios-Espinosa, X. (2013). Representaciones sociales del cáncer y de la quimioterapia (Social representations of cancer and chemoterapy). *Psicooncología*, *10*(1), 79-93. https://doi.org/10.5209/rev_PSIC.2013.v10.41949

Conde Melguizo, R. (2014). Evolución del concepto de discapacidad en la Sociedad contemporánea: de cuerpos enfermos a sociedades excluyentes (Disability concept evolution: from sick bodies to exclusionary societies). *Praxis Sociológica*, (18), 155-175.

Dixon, H., Warne, C., Scully, M., Dobbinson, S., & Wakefield, M. (2014). Agenda-Setting Effects of Sun-Related News Coverage on Public Attitudes and Beliefs About Tanning and Skin Cancer. *Health Communication*, *29*(2), 173-181. https://doi.org/10.1080/10410236.2012.732027

El melanoma será el segundo tumor en incidencia global para 2040 (Melanoma will be the second most common tumour globally by 2040). (2023, May 31). *Infosalus*. https://www.infosalus.com/actualidad/noticia-melanoma-sera-segundo-tumor-incidencia-global-2040-20230531140405.html

Fosado, G. (2019, July 24). Primeros pasos en NLP con SpaCy, un vistazo general (First steps in NLP with SpaCy, an overview). *Medium*. https://yeralway1.medium.com/primeros-pasos-en-nlp-con-spacy-un-vistazo-general-734686843a57

Freire, E. (2021, November 30). Oncólogos y pacientes reclaman más visibilidad para el cáncer de pulmón (Oncologists and patients call for more visibility for lung cancer). *La Vanguardia*. https://www.lavanguardia.com/vida/20211130/7898149/oncologos-pacientes-visibilidad-cancer-pulmon-brl.html

Fujisawa, D., & Hagiwara, N. (2015). Cancer Stigma and its Health Consequences. *Current Breast Cancer Reports*, *7*, 143-150. https://doi.org/10.1007/s12609-015-0185-0

García, A. (2023, January 12). La hija de la 'influencer' Hilda Siverio denuncia amenazas y acoso ante el agravamiento de la enfermedad de su madre (Influencer Hilda Siverio's daughter denounces threats and harassment as her mother's illness worsens). *El País*. https://elpais.com/sociedad/2023-01-12/la-hija-de-la-influencer-hilda-siverio-denuncia-amenazas-y-acoso-ante-el-agravamiento-de-la-enfermedad-de-su-madre.html

Grupo Español de Pacientes con Cáncer. *Informe. Encuesta sobre el cáncer en España 2019* (Report. 2019 Spanish Cancer Survey). https://gepac.es/diadelsuperviviente2019/PDF/INFORME%20SUPERVIVIENTES.pdf

Guillén Subiran, C. (2013). Cáncer de piel, una epidemia que avanza (Skin cancer, an advancing epidemic). *Gestión práctica de riesgos laborales: Integración y desarrollo de la gestión de la prevención*, (107), 48-52.

Instituto Nacional de Estadística. (n.d.). *Covid-19. Avance año 2022 (enero-junio) Principales series. Años 2018-2022 (enero-junio). Defunciones por causa de muerte (lista reducida), provincia de defunción y sexo. Años 2018-2022 (enero-junio)* (Covid-19. Advance year 2022 (January-June) Main series. Years 2018-2022 (January-June). Deaths by cause of death (short list), province of death and sex. Years 2018-2022 (January-June)). https://www.ine.es/jaxi/Datos.htm?tpx=55865

International Agency for Research on Cancer. (n.d.). *Skin cancer*. https://www.iarc.who.int/cancer-type/skin-cancer/

Jiménez Sánchez, L., Moreno, Á., & Zeler, I. (2023). Comunicación para la prevención de cáncer de piel: un análisis del uso de Facebook para la comunicación de salud en España (Communication for skin cancer prevention: an analysis of the use of Facebook for health communication in Spain). *Redmarka. Revista de Marketing Aplicado, 27*(1), 78-94. https://doi.org/10.17979/redma.2023.27.1.9650

Ley 33/2011, de 4 de octubre, General de Salud Pública (Law 33/2011, of October 4, 2011, General Law on Public Health). *Jefatura del Estado.* Madrid, Spain, October 11, 2011. BOE-A-2011-15623.   https://www.boe.es/eli/es/l/2011/10/04/33/con

López Tovar, A. (2023, February 27). Oliver será operado hoy para completar la extirpación del tumor cerebral (Oliver to undergo surgery today to complete removal of brain tumour). *La Vanguardia*. https://www.lavanguardia.com/vida/20230227/8785438/oliver-sera-operado-hoy-completar-extirpacion-tumor-cerebral.html

López Tovar, A. (2022, May 19). María Luisa Marín o cómo superar un cáncer a los 83 años (María Luisa Marín or how to overcome cancer at 83 years old). *La Vanguardia*. https://www.lavanguardia.com/vida/20220519/8279210/maria-luisa-marin-como-superar-cancer-83-anos.html

Luque, C., Rubriche, J. C., Galvis, J., & Sosa, J. (2021). Modelamiento de tópicos para identificar patrones en la investigación científica del Covid-19 (Topic modelling to identify patterns in Covid-19 scientific research). *Comunicaciones en Estadística*, *14*(2), 48-66. https://revistas.usantotomas.edu.co/index.php/estadistica/article/view/7705

Min, H. S., Yun, E. H., Park J., & Kim, Y.A. (2020). Cancer News Coverage in Korean Newspapers: An Analytic Study in Terms of Cancer Awareness. *Journal of Preventive Medicine and Public Health*, 53(2), 126-134. https://doi.org/10.3961/jpmph.19.256

Miyawaki R., Shibata A., Ishii K., & Koichiro O. (2017). News Coverage of Cancer in Japanese Newspapers: A Content Analysis. *Health Communication*, *32*(4), 420-426. https://doi.org/10.1080/10410236.2016.1138391

Morales, F. (2023, October 15). Este es el cáncer que afecta cada año a 7.000 españoles, y del que no existe asociación de pacientes por el estigma social (This is the cancer that affects 7,000 Spanish citizens every year, and for which there is no patient association due to social stigma). *20 minutos*. https://www.20minutos.es/salud/actualidad/cancer-higado-afecta-miles-personas-espana-no-existe-asociacion-5179539/

Moreno Fernández, Á., & Soria, A. (2022, February 16). ¿Será el cáncer de piel la próxima gran epidemia? (Will skin cancer be the next big epidemic?) *The Conversation*. https://theconversation.com/sera-el-cancer-de-piel-la-proxima-gran-epidemia-175946

Observatorio de la Asociación Española Contra el Cáncer. (n.d.). *Dimensiones del cáncer. Incidencia por tipo de cáncer y mortalidad por tipo de cáncer* (Dimensions of cancer. Incidence by type of cancer and mortality by type of cancer). https://observatorio.contraelcancer.es/explora/dimensiones-del-cancer

Organización Mundial de la Salud. (2022, February 2). *Cáncer. Datos y cifras* (Cancer. Facts and figures). https://www.who.int/es/news-room/fact-sheets/detail/cancer

Ortiz, A.M., & Lamet, J. (2022, October 24). Se retrasa el avión medicalizado que debía traer con urgencia a Oliver a España: "Si no volamos, se va a morir aquí" (The medical plane that was to urgently bring Oliver to Spain is delayed: "If we don't fly, he's going to die here"). *El Mundo*. https://www.elmundo.es/espana/2022/10/24/635697bcfdddffc9858b458a.html

Penagos-Corzo, J. C., & Pintado Cucarella, S. (2020). Evaluación del estigma hacia pacientes con cáncer: una aproximación psicométrica (Assessment of stigma toward cancer patients:A psychometric approach). *Psicología y Salud*, *30*(2), 153-160. https://doi.org/10.25009/pys.v30i2.2650

Pilar, S. A. (2022, April 14). Cáncer de próstata, entre la invisibilidad y el rechazo: "Repercute en la autoestima masculina" (Prostate cancer, between invisibility and rejection: "It has an impact on male self-esteem"). *RTVE*. https://www.rtve.es/noticias/20220414/cancer-prostata-entre-invisibilidad-rechazo/2327540.shtml

Puig, F. (2022, December 25). Ana Rosa Quintana, ejemplo de coraje y perseverancia ante la adversidad (Ana Rosa Quintana, an example of courage and perseverance in the face of adversity). *La Vanguardia*. https://www.lavanguardia.com/gente/20221225/8653603/ano-ana-rosa-quintana-cancer-mama-telecinco.html

Red Española de Registros de Cáncer (2022). *Estimaciones de la incidencia del cáncer en España, 2022* (Estimates of cancer incidence in Spain). https://redecan.org/storage/documents/6c2d9c1d-dfe9-40ea-a8b3-a343c4886131.pdf

Rojas, D., Cabieses, B., Obach, A., & Rodríguez, C. (2023). *Palabras que cuidan: comunicación social, ética y empática en cáncer* (Words that matter: social, ethical and empathic cancer communication). Corporación Cáncer de mama Chile. https://repositorio.udd.cl/items/afe57ad6-2e89-48fe-b9d4-335c7238d50d

Sánchez Ballestero, S. (2018). Análisis de contenidos: el cáncer de piel en los principales medios de prensa españoles (Content analysis: skin cancer in Spanish press media). *Revista Española de Comunicación en Salud*, *9*(1), 22-31. https://doi.org/10.20318/recs.2018.4249

Sociedad Española de Oncología Médica (2022). *Las cifras del cáncer en España 2022* (Cancer figures in Spain 2022). https://seom.org/images/LAS_CIFRAS_DEL_CANCER_EN_ESPANA_2022.pdf

Sociedad Española de Oncología Médica (2023). *Las cifras del cáncer en España 2023* (Cancer figures in Spain 2023). https://seom.org/images/Las_cifras_del_Cancer_en_Espana_2023.pdf

Sotelo Rodríguez, D. C. (2020). Pandemias, información y medios: covid-19, un ejemplo a través de la crisis (Pandemics, information and media: covid-19, an example through the crisis). *Medicina*, *42*(2), 143-146. https://doi.org/10.56050/01205498.1531

Stanojlovic, M. (2015). Percepción social de riesgo: una mirada general y aplicación a la comunicación de salud (Public perception of risk: a general perspective and application to health communication). *Revista de Comunicación Y Salud*, *5*, 99-110. https://doi.org/10.35669/revistadecomunicacionysalud.2015.5(1).99-110

Tresnasari, N. A., Adji, T. B., & Permanasari, A.E. (2020). Social-Chil-Case Document Clustering based on Topic Modeling using Latent Dirichlet Allocation. *Indonesian Journal of Computing and Cybernetics Systems*, *14*(2), 179-188. https://doi.org/10.22146/ijccs.54507

Un plan contra el cáncer para Europa (A cancer plan for Europe). (n.d.). *Comisión Europea*. https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/promoting-our-european-way-life/european-health-union/cancer-plan-europe_es

Vara-Miguel, A., Amoedo, A., Moreno, E., Negredo, S., & Kaufmann-Argueta, A. (2022). *Digital News Report España 2022. Conectar con las audiencias de noticias* (Digital News Report Spain 2022. Connecting with news audiences). Servicio de Publicaciones de la Universidad de Navarra. https://doi.org/10.15581/019.2022

Villena, M. (2022, November 28). Por qué el hombre presta menos atención a su salud (y sus consecuencias) (Why men pay less attention to their health (and its consequences)). *El País*. https://elpais.com/salud-y-bienestar/el-medico-de-cerca/2022-11-28/por-que-el-hombre-presta-menos-atencion-a-su-salud-y-sus-consecuencias.html

Wang, X., Zhu, B., Guo, Q., Wang, W., & Zhao, R. (2022). Designing mindfulness information for interaction in social media: The role of information framing, health risk perception and lay theories of health. *Frontiers in Psychology, 13*, 1041016. https://doi.org/10.3389/fpsyg.2023.1041016

Zurro-Antón, N., Moreno, Á., & Humanes, M. L. (2023). CERC as a growing research model: analysis of its application in health emergency communication strategies over the last decade. *Estudios sobre el Mensaje Periodístico, 29*(2), 395-405. https://doi.org/10.5209/esmp.85911

ABOUT THE AUTHORS

NOELIA ZURRO-ANTÓN, master in Applied Communication Research from the Universidad Rey Juan Carlos (URJC). Since 2020 she is a research assistant at the Department of Journalism and Corporate Communication at the URJC. She is currently a member of the working team of the Compreven(p)cancer project (PID2020-116487RB-100), funded by the Spanish State Research Agency. Author of several articles and reports, her main research interests focus on strategic communication and public relations.

https://orcid.org/0000-0002-2787-0239

LUIS CÁRCAMO-ULLOA, Ph.D. in Perception, Communication, and Time, completed doctoral and postdoctoral studies at the Universidad Autónoma de Barcelona and the Universidad Pompeu Fabra. Adjunct professor at the Universidad Austral de Chile, he is a member of the working team of the Compreven(p)cancer project (PID2020-116487RB-100). He has been main researcher and collaborator of Fondecyt and Fondef projects of Chile's National Commission for Research in Science and Technology. His research focuses on communication mediated by social media and educational technologies.

https://orcid.org/0000-0003-0633-9606

ÁNGELES MORENO, Ph.D. with extraordinary award from the Pontificia Universidad de Salamanca, she is a university professor and member of the Advanced Communication Studies Group (GEAC, by its Spanish acronym) of the Universidad Rey Juan Carlos. She leads the Compreven(p)cancer project (PID2020-116487RB-100). Moreno has been president and executive director of the European Public Relations Education and Research Association (EUPRERA), and she has held positions in several commissions and associations. Author of more than 120 publications, she is recognized in the Spanish ranking of the most influential researchers.

https://orcid.org/0000-0002-0777-2957