

ORIGINAL ARTICLE

Ciencia, Genética, y ¿Desinformación?: A content analysis of genetic testing coverage from US Spanish-language news media

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Abstract

Genetic testing (GT) has become ubiquitous in the United States, either in clinical or direct-to-consumer markets. White and English-speaking populations have primarily benefited from this new technology, leaving other groups, like Hispanic populations, behind. Explanations for this disparity has cited a lack of awareness and knowledge of genetic testing purposes. Science communication from English-language media play an important role in setting initial attitudes and influencing decision-making for audiences. However, Spanish-language media have virtually no research published on documented potential effects for GT utilization despite the continued growth of Hispanic Spanish-speaking groups in the United States. Thus, this study characterized coverage of GT from two of the most prominent US Spanish-language media outlets, Telemundo and Univision. Over a 12-year time period, we identified 235 written articles of GT, mainly focusing on forensics applications, followed by gossip and health. There were 292 sources referenced across all 235 articles drawing from governmental agencies or officials, other news agencies, and medical institutions or officials. The findings suggest that coverage of GT among Spanish-language news outlets is limited. When Spanish-language news outlets do cover GT, they focus on aspects of intrigue or entertainment more than demystifying and explaining GT. Stories tend to cite other published articles, with author attribution often missing, leading to questions of comfort of Spanish-media to cover these topics. Further, the publishing process may lead to confusion of the purpose of genetic testing for health purposes and may bias Spanish-speaking groups towards genetic testing for health purposes. Thus, reconciliation and education initiatives around genetic testing purposes are needed for Spanish-speaking communities from not only media, but also genetics providers and institutions.

KEYWORDS

genetic testing, Hispanic, news media, science communication, Spanish

1 | INTRODUCTION

Genetic testing (GT) whether predictive, or diagnostic for targeted tailored treatment, has become an important scientific and medical topic covered by news agencies. While GT for genetic ancestry may be the more commonly known popular application through direct-to-consumer testing (Kirkpatrick & Rashkin, 2017), within clinical settings, GT has transformed treatment, prevention, and care efforts and continues to grow through precision medicine initiatives (Kensler et al., 2016). However, clinical GT use among Hispanic populations is significantly lower than White populations (Canedo et al., 2019; Cruz-Correa et al., 2017). Hispanic populations appear not to be benefiting from these novel treatments, prevention, and care efforts. Prior research has suggested that lower knowledge and awareness of GT, limited access, and greater concerns about GT among Hispanic populations may explain the lower rates of utilization (Canedo et al., 2019; Chavez-Yenter et al., 2020; Cruz-Correa et al., 2017). Studies that have been able to explore attitudes, knowledge, and perceptions of GT in Hispanic populations (see Cruz-Correa et al., 2017 and Canedo et al., 2019 for comprehensive reviews) have generally been in clinical settings, foci (e.g., cancer, prenatal, etc.), and with primarily English-speaking populations and thus have limited generalizability (Kaphingst et al., 2019). With this dearth of research about Hispanic knowledge, attitudes, and perceptions of GT in larger public settings (Chavez-Yenter et al., 2020), there is a need to analyze mass media's potential role to influence attitudes.

News media plays a substantial role in influencing attitudes, behaviors, and engagement across several platforms such as television, radio, internet, and social media platforms (Darr et al., 2020; de Vreese & Boomgaarden, 2006; Moeller & de Vreese, 2013; Moy et al., 2004). Further, research of mass media from English-language outlets notes they continue to play an important role in communicating science to the public, particularly around genetics and diseases (Garreu & Bird, 2000; Schwitzer et al., 2005). However, research analyzing Spanish-language news outlets and their role especially related to awareness and attitudes towards GT is nonexistent, with science communication often being a seldom discussed topic (Takahashi et al., 2015). Currently, 11.5 million US residents prefer to speak Spanish over English, and the Hispanic population in the United States is projected to grow to 25% of the total US residents self-identifying as Hispanic by 2050 (U.S. Census Bureau, 2021; Passel & Cohn, 2008), noting the importance of studying these groups. Univision and Telemundo drew an average of 1.8 million and 1.5 million prime time viewers for television in 2020, respectively, making them the top Spanish-language news sources among all available news outlets in the United States (Darr et al., 2020; James, 2017). While media scholars have given much attention to the role of the news media in areas such as civic engagement and voting among Hispanic populations, little research has assessed non-ethnic issues like abortion, same-sex marriage, and genetic testing and their potential effects from Spanish-language news media (Darr et al., 2020; Kerevel, 2011). Consistent with a model of informal scientific learning from news media for GT (Gallop et al., 2017)

What is known about this topic

Hispanic communities, especially Spanish-preferring, have notable genetic testing uptake disparities when compared to White counterparts, and explanations have largely focused on individual determinants in a clinical setting. Media, especially, Spanish-language news media can set baseline attitudes for audiences towards certain topics, yet no research has characterized coverage of genetic testing.

What this paper adds to this topic

Through a descriptive analysis, we characterize the past 12 years of genetic testing coverage from the two largest US Spanish-language media outlets, Telemundo and Univision. We find limited coverage that often focuses on non-health aspects of genetic testing, potentially biasing Spanish-speaking populations towards testing that will need addressing by genetics providers.

and previous empirical findings around political issues (Garcia-Rios & Barreto, 2016; Kerevel, 2011; Negrón, 2011), Spanish-language news media may likely influence baseline attitudes and perceptions towards scientific topics. These media, together with other factors, may also impact individuals' decisions in whether to engage with specific advancements, such as GT. Having a better understanding of US Spanish-language news outlets' coverage of GT, when its uses and implications continue to increase, can assist future endeavors in engaging these underserved populations in utilizing these technologies while informing health practitioners and policymakers what pre-existing attitudes certain groups may have for these technologies. Strategic communication campaigns could leverage this knowledge and local media to educate communities through building strategic partnerships with radio or other local media markets to spread messages to promote testing uptake.

Human genetics media coverage (distinct from genetic testing itself, but nonetheless important as a parent overarching topic) has been posited to follow four types: (1) public understanding of science, (2) health education, (3) public relations of science, and (4) public engagement with science (Haran & Kitzinger, 2009). Historical news coverage trends also follow major advancements in genetics, like the Human Genome Project, the cloning of Dolly the sheep, and Angelina Jolie's decision to undergo a mastectomy as a result of a positive *BRCA1* gene mutation (Abrams et al., 2016; Haran & O'Riordan, 2018; Zimmermann, Aebi, et al., 2019). As such, in published stories, journalists seem to try to communicate at least one aspect of coverage (public understanding, health education, etc). This literature notes that news media has become the main source of scientific information for adults after formal education (Gallop et al., 2017). Thus, the ways in which the news media frame and present such information is key to improved scientific

understanding, and potentially, behaviors. Furthermore, trained scientific journalists that have specialized knowledge of topics often are able to better communicate complex information than general reporters (Peters, 2008, 2013), but not all news outlets have these designated journalists. Numerous researchers have expressed concern about news media coverage of genetics as deterministic or discriminatory (Gallop et al., 2017; Lynch et al., 2008). Genetic determinism is the idea that genetics explain ourselves at a molecular level without considerations of environment, epigenetics, or probabilistic inputs and are the sole sources of personality, health, or other individual characteristics (Condit, 1999; Conrad, 1999). Through such a lens, individuals can feel “doomed” to develop certain conditions based on their genomic profile without accounting for other factors (environment, behavior, etc.). Oversimplifying complex genetic concepts can lead to the misconception of genetic determinism disregarding the influence of environmental or lifestyle factors (Wauters & Van Hoyweghen, 2016). Similarly, media coverage may perpetuate stereotypes that lead to the discrimination of individuals or groups based on their genetic makeup in the framing of their articles (Gallop et al., 2017).

In order to properly cover scientific topics in the media and avoid oversimplification of topics that may lead to genetic deterministic/discrimination beliefs, some have asserted that a contextualized scientific public sphere is needed. A contextualized scientific public sphere must contain a variety of stakeholders in media coverage (not solely scientific stakeholders), positive, negative, and neutral tone (as opposed to overly positive or negative tone), and high variety of subtopics (Gerhards & Schäfer, 2009; Zimmermann, Aebi, et al., 2019). A media content analysis of US and German media coverage of human genetics with the contextualized scientific public sphere framework found an overreliance on scientific stakeholders, positive coverage, and focuses on medical and scientific subtopics (Gerhards & Schäfer, 2009). This may contribute to genetics misconceptions and misunderstandings of media audiences.

As there is some empirical evidence in English-speaking and German-speaking populations to support how news media can influence knowledge and attitudes related to genetics, it important to explore Spanish-language media, as there has been evidence that exposure to Spanish-language media has been associated with greater political participation and civic engagement (Garcia-Rios & Barreto, 2016; Kerevel, 2011; Negrón, 2011), formation of attitudes towards specific policy issues like immigration and healthcare (Abrajano & Singh, 2009; Kerevel, 2011; Subervi-Velez, 1999), and mobilization and empowerment of Hispanic groups (Barreto, 2007; Gomez-Aguinaga, 2021; Negrón, 2011). We only found one previous study focused on Spanish-language media coverage of genetic testing from Colombia and how it was presented as unique, heroic, and helped promote the ideology of *mestizaje* (mixed ethnic identity) as part of a nationalistic identity for Colombia (Diaz del Castillo et al., 2012). We offer a distinct analysis here.

This study explores current Spanish-language online news media coverage of GT. We are interested in how GT is covered within Spanish-language news media as more Hispanic populations report

seeking and receiving news online (Retis, 2019). Coverage throughout the rest of the manuscript refers to the stories that have been published online from the reviewed news outlets. Recent research has begun to analyze news media impacts of educating the public about GT (Canary et al., 2018; Holton et al., 2017; Zimmermann, Aebi, et al., 2019; Zimmermann, Elger, & Shaw, 2019). These studies sought to better understand how news media convey complex information in easy to process ways and identify scientific sources, topics, and their framing of the information. These sources can provide insight into how news outlets present GT. For example, in the Canary et al. (2018) and Holton et al. (2017) studies, science experts and GT developers discussed GT as business and breakthroughs rather as something to be considered personal or in health decisions. While these recent studies have been groundbreaking in characterizing news coverage of genetic testing from English-language media outlets, no research has been done in Spanish-language media contexts. Even if exploratory and descriptive, this study reveals significant trends in how GT is presented to Hispanic Spanish-speaking communities with findings that provide clues as to how to improve engagement with Hispanic populations around GT. Thus, this study poses two research questions.

RQ1: To what extent has genetic testing been covered by two key Spanish-media outlets in the United States over the past 12 years?

RQ2: In online news coverage of genetic testing, (a) what topics were covered, (b) what sources were referenced, and (c) what were the features of coverage?

2 | METHODS

Through a content analysis, we collected and analyzed newsprint stories published and available online from both websites of Telemundo and Univision through a directed query using Google Advanced. We used “*prueba genética*” (genetic testing) as the main keyword to search within the whole web domain of both Univision.com and Telemundo.com from March 2008 to August 2020. GT was used to identify stories specifically related to the technology itself rather than to general genetics content. We differentiated between the two topics as we were interested in the technology and its coverage that may influence attitude formation and diffusion rather than genetics as an overarching topic.

News stories were initially screened by the lead author (a native bilingual Spanish-language speaker) for relevancy. Stories needed to include specific information about GT and be published on the Telemundo or Univision web domains (not hosted on another website or story aggregator). Only written articles were included, with video-only news coverage articles excluded for the current analysis. Our rationale for including written articles was predicated on video content accessibility, as many Hispanic populations report difficulties with internet bandwidth (Retis, 2019). Written articles,

additionally, are more easily accessible online than streaming videos and tend to be published much faster than videos.

Initial data collected included news source (Univision, Telemundo, etc.), publication date, author(s), categorization from the outlet (Health, Crime, etc.), and author-created categorization (Forensics, Health, Celebrity, etc.). Author-created categorizations were reflective of the broader theme of the article based on the full review from the lead author and agreement from coders (see below and Table 1 for more detail). Additional information abstracted from the news articles included article length (short [under 250 words], medium [250–500 words], long [500 words or more]), tone (positive, negative, neutral), video inclusion, and sources referenced (business representative, governmental official, individual, medical institutions, etc.). Statistical analysis and graphic development were completed in R.

3 | RESULTS

A total of 244 news articles from Univision and Telemundo initially met inclusion criteria and were aggregated into a database for further analysis. However, nine stories were excluded from the final dataset as they were video-only articles, did not link to the correct story, or no longer existed on the hosted website. We therefore identified 235

published articles from Univision and Telemundo from 2008 to 2020. Two bilingual coders with native Spanish-language proficiency were recruited to ensure that the data abstraction of the articles was accurate, and interpretation was consistent with the lead author's initial interpretations (total of three coders). The lead author met with both coders to train them on the data abstraction protocol. Of the total 235 articles, each of the three coders was given 78 articles to review. To ensure reliability, a coder was assigned to review 20% of all stories collected ($n=49$ from 235 articles, secondary coding) to compare with the lead coder. The codebook was first tested and adapted as needed based upon Scott's Pi, which calculates the reliability score for data abstraction and interpretation (Scott, 2009). The mean reliability was 0.714, ranging from 0.59 to 1. Reliability scores above 0.7 are considered good, while scores above 0.4 are considered medium. Variables with medium reliability scores were improved with additional inter-coder discussions in case of uncertainties to reach a score of 1. To address any other discrepancies, the coding team met, discussed, and reached consensus on codes used in the analysis.

Univision has had slightly more GT coverage ($n=139$, 59.1% of identified articles) compared to Telemundo over the past 12 years ($n=96$, 40.9%; see Figure 1 and Table 2). However, recently Telemundo has published more articles on GT (56 stories, 75.0% compared to 19, 25.0% from Univision in 2019; $p < 0.05$) (see

TABLE 1 Spanish dictionary and categorization definitions for Genetic Testing Application.

News outlet categorization terms	Author created categorization definition	Created categorization term for genetic testing application
<i>Asesinatos</i> (Assassinations), <i>Crimines</i> (Crimes), <i>Criminalidad y Justicia</i> (Crime and Justice), <i>Desapariciones</i> (Disappearances), <i>Pena de Muerte</i> (Death Penalty), <i>Violaciones</i> (Rapes)	These online stories often reviewed crime, domestic or international, and in these reviewed stories how genetic testing was applied to mostly identify bodies, perpetrators, and/or victims of various crimes	Forensics
<i>Salud</i> (Health), <i>Cáncer</i> (Cancer)	These featured stories focused on health and often had subsection terms like Alzheimer's, Diabetes, and Coronavirus-19, but highlighted genetic testing's role related to health applications	Health
<i>Famosos</i> (Famous [people]), <i>Música</i> (music), <i>Entrenamiento</i> (Entertainment)	These online stories focused on celebrities and often were around gossip of potential paternity/maternity of secret children (had with other partners beside one's spouse), but also related to exhumations, and health. Stories here focused more on the celebrity than the application and purpose of genetic testing	Celebrity
<i>Noticias</i> (News), <i>Lifestyle</i> (Lifestyle)	These stories often focused on confirming family relation through genetic testing, and were framed often as general interest, pregnancy, ancestry, and a particular story of an incorrect genetic test that separated a girl in Mexico from her family until a corrected genetic test could be ordered	Family testing
<i>Noticias</i> (News), <i>Política</i> (Politics), <i>Destino 2020</i> (Destination 2020)	These stories focused on political topics, particularly topics of DNA collection of immigrants, Elizabeth Warrens use of ancestral genetic testing, and genetic testing for "false immigrant families." The overarching theme of these stories were more on political topics	Politics
<i>Opinión</i> (Opinion), <i>Estilo de Vida</i> (Lifestyle), <i>Noticias</i> (News)	These set of stories did not fit into preestablished categories, and were stories of often of genetic testing being used to rule out the existence of Bigfoot, ruling out alien DNA for an exhumed body, and Nestle finding horse meat in some of their products (identified via genetic testing)	Other

Figure 1. While many Univision articles had a self-categorization label, such as Crime, Health, or Political, as a genre of the article coverage, Telemundo articles seldom had genre labels. To address this gap, we created our own taxonomy based on the full review of the articles and assessed news coverage by media outlets (see Table 2).

Our findings showed that forensics (e.g., DNA testing used for identifying bodies, suspects, and/or victims of crime) was the most

common topic for news coverage from both outlets ($n=80$, 34.0%; Telemundo $n=33$, 41.3% to Univision $n=47$, 58.7%), followed by health ($n=49$, 20.9%; Telemundo $n=22$, 44.9% to Univision $n=27$, 55.1%), celebrity gossip ($n=40$, 17.0%; Telemundo $n=8$, 20% to Univision $n=32$, 80%), and politics ($n=31$, 13.2%; Telemundo $n=19$, 61.3% to Univision $n=12$, 38.7%) (see Figure 2). Univision tended to focus reporting more on celebrity use of DNA (e.g., confirmation

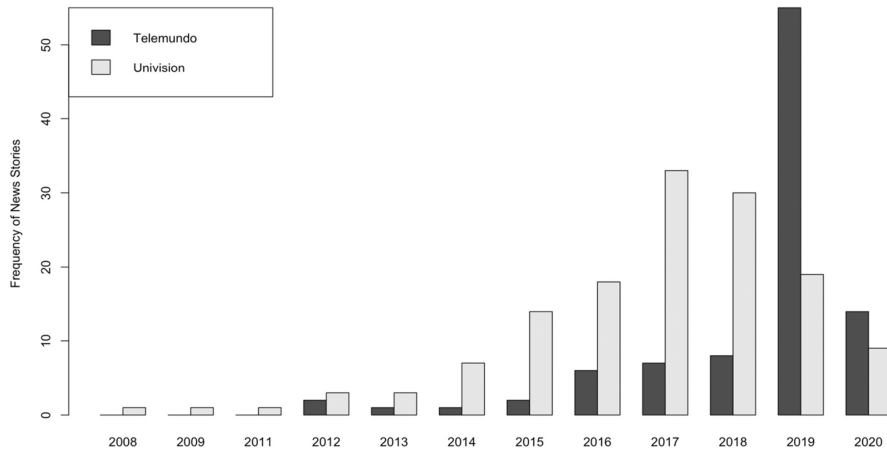


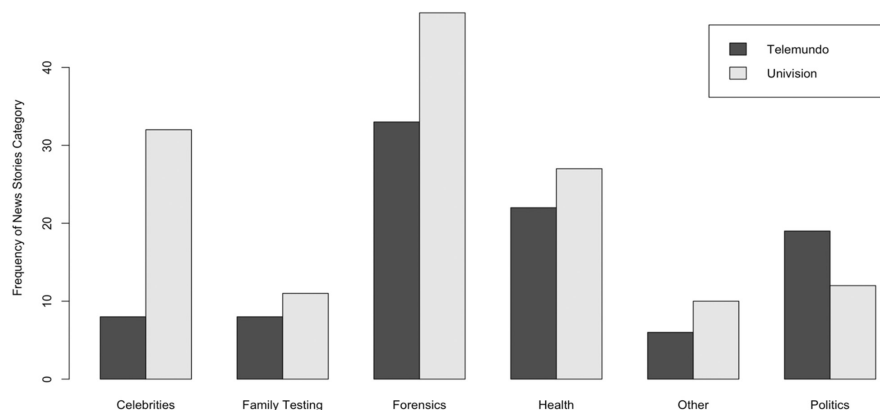
FIGURE 1 News coverage publication by year and outlet.

News coverage characteristics	n (%)	Telemundo	Univision
News outlet			
Telemundo	96 (40.9%)		
Univision	139 (59.1%)		
Category			
Celebrity	40 (17.0%)	8 (20.0%)	32 (80.0%)
Family testing	19 (8.1%)	8 (42.1%)	11 (57.9%)
Forensics	80 (34.0%)	33 (41.3%)	47 (58.7%)
Health	49 (20.9%)	22 (44.9%)	27 (55.1%)
Other	16 (6.8%)	6 (37.5%)	10 (62.5%)
Politics	31 (13.2%)	19 (61.3%)	12 (38.7%)
Tone			
Positive	124 (52.8%)	43 (34.7%)	81 (65.3%)
Neutral	45 (19.1%)	19 (42.2%)	26 (57.8%)
Negative	66 (28.1%)	34 (51.5%)	32 (48.5%)
Length			
Short	15 (6.4%)	6 (40.0%)	9 (60.0%)
Medium	86 (36.6%)	33 (38.4%)	53 (61.6%)
Long	134 (57.0%)	57 (42.5%)	77 (57.5%)
Video included			
Yes	111 (47.2%)	31 (27.9%)	80 (72.1%)
No	124 (52.8%)	65 (52.4%)	59 (47.6%)
Author attributed			
Journalist(s)	33 (14.0%)	4 (12.1%)	29 (87.9%)
Telemundo/Univision	202 (86.0%)	94 (46.5%)	108 (53.5%)
Total articles	235 (100%)		

TABLE 2 News coverage articles characteristics.

Note: Percentages of each News Outlet are row percentages of total news coverage characteristics.

FIGURE 2 News coverage in author created categorizations by outlet.



of secret children through paternity testing) with 80% ($n=32$) compared to 20% Telemundo of total celebrity coverage ($n=8$). Health coverage included GT topics for health purposes (cancer, Alzheimer's, COVID-19) with Univision only slightly having more coverage at 55.1% ($n=27$) compared to Telemundo with 44.9% ($n=22$). Political coverage of GT included stories relating to Elizabeth's Warren use of ancestral GT and the Trump administration collecting DNA samples from migrants to the U.S., with Telemundo in these cases having more coverage at 61.3% ($n=19$) than Univision accounting for only 38.7% ($n=12$). Just more than half of all articles were written with a positive tone to GT (in its ability to solve crimes, identify bodies, reunite families; $n=124$, 52.8%). The articles were primarily long (with over 500 words written; $n=134$, 57.0%), and often included a video accompanying the written article ($n=111$, 47.2%). Interestingly, only 33 of the 235 articles, 14.0%, had an attributed identified author, whereas the remaining 86.0% ($n=202$) of articles had no identified author, with the byline noting either Univision or Telemundo. Although Univision had significantly more attributed authors than Telemundo ($p < 0.001$). An interesting emergent finding was of news articles directly translated to Spanish from an originally published English story, often coming from the parent company (NBC for Telemundo; $n=5$, 2.1%).

There were 292 sources referenced across all 235 articles (Table 3). The most frequently referenced source came from governmental agencies or officials ($n=74$, 25.3%), other news agencies ($n=71$, 24.3%), and medical institutions or officials ($n=58$, 19.9%). This follows the distribution of news coverage via the author-created taxonomy, with stories focused on the use of GT for forensics referencing governmental agencies or officials and health-focused stories citing medical institutions or officials.

4 | DISCUSSION

While a number of studies have emphasized and analyzed the role the news media can and are playing in conveying information about GT to the public, almost none have focused on coverage on Spanish-language outlets. This study thus extends that research to Spanish-language news media by focusing on coverage of GT among two major news outlets in the United States. The findings suggest

TABLE 3 Source referenced in news coverage.

Frequency of sources referenced ^a	<i>n</i> (%)
Business	15 (5.1%)
Governmental agency/representative	74 (25.3%)
Individual	58 (19.9%)
Medical institution/representative	48 (16.4%)
News agency	71 (24.3%)
Other	26 (8.9%)
TOTAL	292 (100%)

^aArticles could have more than one source referenced.

that coverage of GT among Spanish-language news outlets may be lagging behind other news outlets, though we do not have a direct comparison. However, a comparative study done in Europe found English-language coverage from the United Kingdom had 2.5 times more general genetic testing coverage than Swiss German-language media (Zimmermann, Aebi, et al., 2019), suggesting that English-language media coverage may be more prevalent than coverage in other languages. When Spanish-language news outlets do cover GT, they focus on aspects of intrigue or entertainment more than demystifying and explaining GT in ways that could be more meaningful to their audiences, in particular the types of testing that could be useful to them in clinical management and prevention efforts. Additionally, they seem to rely on previous news coverage or content from other news outlets and do not often appear to not have individual reporters for coverage. Collectively, these results suggest that Spanish-language news outlets may be missing an opportunity to better engage, explain, and contextualize GT for their audiences.

Researchers often note that Hispanic populations have less knowledge of GT and their purposes, significance, and benefits. If they do know about testing, they generally have more concerns when compared to their White counterparts (Canedo et al., 2019). Our findings of forensics-focused GT application stories may explain how Hispanic audiences view this technology. It may bias audiences by viewing GT as a complex "black box" that has multiple applications and functions and thus are potentially confusing for health testing purposes, despite a positive tone with its potential. Based on previous theoretical findings, news coverage appears to have some effect

on knowledge, attitudes, and/or behaviors in a given context for Hispanic populations (Subervi-Velez, 2009). While health-focused stories were the second most common news coverage category, celebrity gossip stories were almost equally prevalent. This finding reflects an intriguing dichotomy that may socially cue audiences that GT can be exciting, fun, and perhaps something not to be taken so seriously. With *chismes* (gossip) getting almost as much coverage as health-focused stories, this may reflect the exposures audiences receive towards GT and contribute to a lack of knowledge of the various purposes of GT. Those exposed to the health-specific stories may contribute to their baseline knowledge of genetic testing in a health-specific context, but this may reflect a minority of the audience. Further research should explore actual audience members and how they interact and consume US Spanish-language news media and their potential impacts on engagement and uses of these novel technologies.

Another interesting finding was the use of reporting from other news agencies to supplement their own coverage across all articles focused on GT. This may reflect a lack of confidence from editorial teams or journalists to cover these topics accurately, which reflects a similar apprehension in English-language news media coverage, as often coverage is inaccurate (Abrams et al., 2016; Gallop et al., 2017; Lanie et al., 2004). Moving forward, it would be useful to understand the news production process and information gathering of scientific information of Univision and Telemundo around GT or other types of novel technologies. Through a search of both Univision and Telemundo's websites, there seemingly were not designated science journalists that could be easily identified. Despite having pages dedicated to health, science, and technology, it is unclear who is writing these articles and how confident they feel in being able to cover GT in meaningful ways. Potentially compounding this notable gap is attention given to these scientific topics by editors and news executives in non-English language media markets (Le & Navarro, 2011; Lubinski et al., 2014; Nguyen & Tran, 2019), in this case hiring and giving resources to a dedicated journalist(s) to science and/or health topics. Often general reporters in non-English language media markets are assigned to cover these topics, and these reporters' lack scientific knowledge and specialized reporting skills may impact reporting for lay publics (Appiah et al., 2015; Aram, 2011; Kakonge, 2012; Shanahan, 2009). Future research should consider investigating the reporting processes of scientific communication in Spanish-language news outlets.

Authorship attribution was another intriguing finding reflecting typical editorial processes at Telemundo and Univision. More than 86% of all articles reviewed for this study were attributed to Telemundo or Univision and not a primary journalist(s). While there are limited published data on the editorial practices of Telemundo and Univision due to their wishes to maintain propriety knowledge and practices (Gómez, 2016), their practices mirror that of editors as gatekeepers. From their gatekeeping perspective, they determine what they believe is more important to share with audiences and equally determine how to frame the coverage (Shoemaker & Vos, 2009), but also follows a medialization framework (Peters

et al., 2008), determining extensiveness of coverage about a certain topic, the diversity of stakeholders and content, and level of controversial evaluations of scientific topics. If these media outlets have data showing low lack of public engagement (traffic data), are seemingly only publishing positive stories, and relying on scientific authorities, then there may be less incentive to publish on genetic testing. Editorial decisions and news production may also be predicated on business practices (O'Neill & Harcup, 2009; Phillips et al., 2009), especially within the new digital media environment with outlets focusing on more clickable content to bring in revenue (Coffey & Sanders, 2009). Though this is not unique for Spanish-language media, as all media in the new digital media environment has had to adjust their business models and resource allocation for their coverage of topics (Franklin, 2014). More research is needed to determine if there is a direct relationship between the two. For some topics, if viewed as unimportant or if apathy is perceived from their audiences, the gatekeepers (journalists or editors) will not publish on these stories. As such, this may explain why forensics and gossip stories are either more or equally popular with health-focused coverage as they may be more profitable and seemingly important to their audiences. Future questions should determine if gatekeeping reinforces limited coverage of GT among US Spanish-language news outlets and contributes to a lack of knowledge among Hispanic and Spanish-speaking communities around GT.

Finally, an intriguing emergent finding was that a few studies ($n=5$, 2.1%) reviewed here were direct translations from parent networks. One article we found was by Jacqueline Stenson of NBC News translated into "*Así puede afectar el tipo de sangre al riesgo de contraer COVID-19*" published by Telemundo ("This is how blood type can affect risk of catching/developing COVID-19"). This article falls into the common practice of health agencies and other organizations directly translating from an English-language source. As such, it may not be culturally appropriate or relevant to Hispanic audiences, and they may not engage with the article (Subervi-Velez, 1999). Another potential barrier is that it may not be correctly translated, a common challenge in genomics and genetic testing communication (Gutierrez et al., 2017). Relevancy could be further assessed by topic, stakeholders, impact, susceptibility, sources, and local/community/culture angles. By leveraging these relevancy components, journalists could create a guiding framework to producing culturally appropriate and relevant news coverage for their audiences. Erica Ramos, former president of the National Society of Genetic Counselors, provides an excellent example in an interview with Univision of how genetic counselors and genetic providers can leverage Spanish-language media by communicating the importance of carrier screening and questions to ask if one plans to use DTC testing, while using an anecdotal story of a local Hispanic women using testing (Capiello, 2022). Genetic counselors and providers should engage with local media, online, radio, or print, to spread similar messages to encourage uptake.

This study notably has limitations. First, while the study is novel in assessing GT media coverage in a language other than English, it is exploratory and descriptive. We offer an initial impression of

US Spanish-language media coverage trends and their characteristics of genetic testing over the past 12 years with simple frequencies and percentages of total compiled stories. This impression however still sets a foundation for US Spanish-language media coverage of GT and can contribute to future work like assessing the accuracy of references used by news outlets, the use of hedging language, and better understanding the editorial process of publishing these types of stories. Second, as we used Google Advanced to collect all news coverage stories for this article, there is a possibility that some stories were missed. Yet, this is a larger problem in Spanish-language mass media research as there are not many repositories that aggregate collections together for review (Retis, 2019). Third, we used only one term in collecting news stories. When initial data collection was being done, other terms like genetics and DNA testing were used and yielded primarily studies outside the scope of genetic testing. However, it is possible that articles were inadvertently excluded from this analysis. Finally, we could not speculate on the audience compositions of Telemundo and Univision that could be reading these stories. It is possible that these audiences are more technologically savvy, more educated, and of a higher socioeconomic status, but these demographics are likely only available to these news outlets. However, as we are interested in mass media audiences, we still believe our findings have important implications.

This study provides essential foundational information for further investigation into how Spanish-speaking populations perceive GT and its benefits and how this is shaped by Spanish-language news media coverage. Future research should focus on specific coverage categories, health, political, etc., and their features to better understand their intended and actual effects. While Spanish-language media has documented effects on policy views specific to the domain of immigration (Darr et al., 2020), little research has documented media effects for attitudes on non-ethnic policy issues such as abortion, same-sex marriage, and genetics (Kerevel, 2011). As GT is an emergent novel technology with evolving policy implications, we assert it is worth further study to determine how they may have upstream or downstream effects from media framing. Additionally, relevancy in particular should be better assessed in future work to investigate how audience members perceive and receive these stories. This foundation will allow the examination of the impact of Spanish-language news coverage on intention and motivation to use GT in health-specific contexts. We believe that more Spanish-language news coverage should be assessed to determine how Hispanic audiences formulate baseline knowledge with exposure to these stories. With better integration of this knowledge, genetic providers, researchers, and journalists can work in tandem to improve inequities in knowledge, concerns, and diffusion of genetic testing.

AUTHOR CONTRIBUTIONS

DCY, AH, and KK substantially contributed to the conception or design of the work. DCY, AV, and GZ substantially contributed to the acquisition, analysis, or interpretation of data for the work. DCY,

AH, AV, GZ, and KK all drafted the work or revising it critically for important intellectual content; gave final approval of the version to be published; and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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CONFLICT OF INTEREST STATEMENT

Daniel Chavez-Yenter, Avery Holton, Alexis Vega, Ginger Zamora, and Kimberly Kaphingst declare they have no conflict of interests to report.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICS STATEMENT

Human subjects and informed consent: No human subjects were involved with this research study.

Animal studies: No non-human animal studies were carried out with this study.

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