

## **Internet and Social Media Impact on Health and COVID-19 in Puerto Rico**

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*This paper analyzes the impact of social media and Internet in relation to health and COVID-19 in Puerto Ricans from the Information Society perspective, including the impact on patient-to-doctor relationship and health services demand, impact on patient-to-patient relationship, knowledge and understanding of information and Internet impact factors in relation to health. An online survey of 124 cases confirmed its effects on the doctor and patients.*

**Keywords:** *social media, doctor, patient, Internet, COVID-19*

### **Introduction**

In this study analyzing the impact of social media and the internet on health and COVID-19 among Puerto Ricans from the perspective of the information society, we explore how the use of these platforms for health information affects public knowledge of COVID-19 and its relationship with physicians and other patients.

The objective of this study was to identify and characterize the perceptions of internet users in Puerto Rico regarding the use of social media and the internet for health-related purposes, the doctor-patient relationship, the patient-patient relationship, and health knowledge.

We begin with this introduction and then delve into the following topics: the impact on the doctor-patient relationship and the demand for health services, the impact on the patient-patient relationship, and knowledge and comprehension of health information.

### **Literature Review**

Social media initially served as a platform for sharing personal and familial experiences and information among friends, family, and acquaintances. Over time, these platforms have evolved into hubs for the exchange of diverse information on various topics. The Internet has become an increasingly vital resource for individuals seeking health information. Notably, around 60% of Internet users search for health-related information for personal use (Atkinson et al. 2009).

In the healthcare sector, social media platforms are utilized to facilitate communication among professionals and between professionals and patients. Additionally, they are leveraged for promoting institutional branding and enhancing

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the speed of interaction within and across different healthcare domains (Grajales et al. 2014).

The importance of social media extends to emergency and disaster management, as these platforms offer real-time updates, enabling swift and effective responses to evolving situations (Coombs 2016). Particularly during crises like the COVID-19 pandemic, social media's ability to disseminate educational content rapidly has been invaluable (González-Padilla and Tortolero-Blanco 2020).

Another advantage of utilizing social media for communication is its broad reach, encompassing audiences beyond those actively seeking information. This broader dissemination enhances the effectiveness of institutional communication efforts (Mori et al. 2020).

Social media platforms serve as effective tools for promoting COVID-19 prevention behaviors to the public. Health literacy is essential for individual health promotion and influences the extent to which the public engages in preventive behaviors during a pandemic (Li and Liu 2020). However, this requires targeted public information campaigns and the promotion of population health literacy for better navigation of infodemic information environments, identification of disinformation, and decision-making based on reliable and trustworthy information (Okan et al. 2020).

Research by Geldsetzer (2020) revealed significant misconceptions among participants regarding COVID-19, such as the belief that avoiding Chinese restaurants was necessary. Notably, individuals with lower health literacy exhibited higher confusion about coronavirus-related information, underscoring the need for tailored communication strategies (Okan et al. 2020).

This could be a consequence of low exposure to health information, exposure to false information in preferred media, or little interest in adhering to a hygienic regimen. The transmission of moderate to high preventive measures, symptoms, and treatments, in most participants, confirmed that they relied on myths and violated certain preventive measures (Alanezi et al. 2020). However, increased media exposure to the pandemic has positively correlated with adherence to preventive measures, driven by perceived knowledge and fear (Melki et al. 2020).

This relationship between guilt and compliance with social distancing measures is doubly mediated by empathy and responsibility towards people who suffered from COVID-19. This caused part of the population to assume positive behavior and comply with the orders and rules established by governments (Samadara et al. 2020). Tailored communication strategies, such as targeted campaign videos and news articles, have demonstrated efficacy in promoting adherence to preventive measures like thorough handwashing (Yousuf et al. 2020).

In conclusion, social media's role in disseminating health information and promoting preventive behaviors, especially during public health crises, cannot be understated. Addressing misinformation and fostering public understanding through targeted communication strategies are essential for ensuring effective health communication and compliance with recommended guidelines.

## Methodology/Materials and Methods

The study's statistical universe comprised the entire population aged 18 to 64 residing in the San Juan Metropolitan Area, totaling 761,842 individuals according to official United States Census data (2020). A sample size of 124 individuals was selected, ensuring a margin of error of 7.5% for the San Juan Metropolitan Area at a confidence level of 90%. Sampling was conducted online using Google Forms, with participation extending beyond the designated metropolitan area to encompass other municipalities in the country. Notably, 42.1% of respondents fell within the 18 to 21 age bracket, with 45.1% possessing a high school or bachelor's degree, and 55.7% reporting an income of less than \$15,000 USD, with 69.7% being female.

## Results

We began with the question about the use of traditional media to search for health information, and in the "Very frequently" category, it was found that doctors appear first (19.7%), followed by television (15.6%), others (14.8%), press articles (14.8%), advertisements in the press, radio, television, billboards, and others (14%), and friends and family (14%). Table 1 presents the frequency distributions of health information sources.

**Table 1. Health-Related Sources of Information (Percentages)**

Sources	Very often	Often	In Occasions	Rarely	Never
Television	15.6%	9.8%	13.1%	15.6%	18.1%
Radio	5.7%	12.2%	10.6%	19.4%	22.9%
Press Articles	14.8%	15.4%	13.6%	14.5%	12.0%
Magazines	1.6%	5.7%	11.1%	18.3%	18.1%
Advertising	13.9%	9.8%	12.1%	14.5%	10.2%
Friends & Family	13.9%	19.5%	17.1%	5.4%	5.4%
Medical	19.7%	18.7%	16.1%	8.1%	3.6%
Other	14.8%	8.9%	6.5%	4.3%	9.6%

When it comes to using the Internet to search for health information, 66.4% of respondents reported doing so. Among them, 27.9% said they did it sometimes, while 5.7% rarely did, and no one reported never using it. Other media frequently used to search for health information included doctors (34.6%), television (13.4%), advertisements in various media (7.8%), radio (5.5%), newspaper articles (5.5%), magazines (2.8%), and others. Despite the variety of sources, doctors remained the primary source of health information.

On the Internet, health information websites were the most frequently mentioned (78.7%), followed closely by social media (73%) and doctors' websites (70.5%). The most used social networks for health information searches were YouTube (58.2%) and Facebook (50%), followed by Instagram (35.2%), Twitter (17.2%), Quora (5.7%), and Telegram (1.6%), among others. The topics searched

for on Internet pages mainly included illness or medical problems (85.2%), medical treatments or procedures (82.8%), doctors or other professionals (62.3%), hospitals and other facilities (39.3%), and health insurance (23.8%), among others.

On social networks, the topics included illness or medical problems (41%), medical treatments or procedures (39.3%), doctors or other professionals (45.1%), hospitals and other facilities (36.1%), and health insurance (15.6%), among others. While all topics were searched for on both the Internet and social networks, the frequency was generally lower on social networks.

Regarding specific diseases searched for on websites, they included cancer (63.1%), COVID-19 (91.8%), depression, anxiety, or other mental conditions (70.5%), diabetes (45.1%), erectile dysfunction (11.5%), heart disease (36.9%), respiratory diseases (41%), stress (68.9%), high blood pressure (31.1%), and women's health (49.2%), among others.

On social media, the diseases searched for included cancer (27%), COVID-19 (73.8%), depression, anxiety, or other mental conditions (47.5%), diabetes (19.7%), erectile dysfunction (9%), heart disease (16.4%), respiratory diseases (16.4%), stress (47.5%), high blood pressure (12.3%), and women's health (36.9%). Notably, searches about COVID-19 were prominent in both cases, with 91.8% on the Internet and 73.8% on social networks.

#### *Impact on the Doctor-Patient Relationship and the Demand for Healthcare Services*

We set out to investigate whether the use of websites and social media to search for health information would have any effect on the demand for health services and therefore on the doctor-patient relationship. The first effect observed is the perception of some improvement in the doctor-patient relationship, due to the fact of being able to share health information found on the Internet and social networks. Participants were asked if they had shared COVID-19 information found online with their doctors. 52.5% indicated never, while 7.4% very frequently, 9.8% frequently, 15.6% occasionally, and 14.8% rarely.

In terms of social media information, 9% very frequently, 7.5% frequently, 13.9% sometimes, 13.9% rarely, and 55.7% never. Participants were asked whether sharing information from the Internet had improved the doctor-patient relationship. 11.5% completely agreed, 28.7% agreed, 42.6% were not sure if the relationship was evolving positively, 9% disagreed, and 8.2% strongly disagreed. Although almost half of the undecided voters are undecided, 40.2% indicate that there has been an improvement. If we analyze the characterization by gender, we find the following (See Table 2).

**Table 2.** *Characterization of a Certain Perception of Improvement in the Doctor-Patient Relationship due to the Fact of Being Able to Share Health Information Found on the Internet and Social Networks (Percentages)*

<b>Gender</b>	<b>Completely agree</b>	<b>I agree</b>	<b>Undecided</b>	<b>In Disagreement</b>	<b>Strongly disagree</b>
Man	1.6%	6.6%	14.8%	0%	2%
Woman	9.0%	20.5%	14.8%	9%	6%

When we addressed the issue of whether health information about COVID-19 found on websites had led to more questions being asked of the doctor, respondents answered very frequently, 13.1%; frequently, 19.7%; sometimes, 32.8%; rarely, 18.9%; and never, 15.6% of the participants. We asked the same question about COVID-19 information found on social media, and respondents answered very frequently, 12.3%; frequently, 18%; sometimes, 27.9%; rarely, 16.4%; and never, 25.4% of the participants. When contrasting these data, we found that both the information on websites and social networks led them to ask more questions to the doctor, with 31.8% in the affirmative with page data and 30.3% from social media. If we analyze the characterization by gender, we find the following about the information found on web pages (See Table 3).

**Table 3.** *Characterization of the Health Information Found on Websites had Led to More Questioning of the Doctor (Percentages)*

<b>Gender</b>	<b>Very Frequently</b>	<b>Frequently</b>	<b>Ocassionaly</b>	<b>Rarely</b>	<b>Never</b>
Man	4.1%	4.9%	8.2%	3%	5%
Woman	9.0%	13.1%	23.8%	0%	9%

The gender characterization indicates that women (12.1%) asked slightly more questions to the doctor than men (9%) after having found health information on websites, although the result is very similar. If we analyze the characterization by gender, we find the following about the information found on web pages (See Table 4).

**Table 4.** *Characterization of the Health Information Found on Social Media had Led to More Questioning of the Doctor (Percentages)*

<b>Gender</b>	<b>Very Frequently</b>	<b>Frequently</b>	<b>Ocassionaly</b>	<b>Rarely</b>	<b>Never</b>
Man	2.5%	4.9%	8.2%	2%	7%
Woman	9.8%	11.5%	18.0%	13%	16%

The gender characterization indicates that women (21.3%) asked slightly more questions to the doctor than men (7.4%) after having found health information on social media.

Internet health data may need to be clarified with a health professional, so patients were asked if the information found on the Internet had motivated them to visit the doctor. When examining these responses, we see that 5.7% answered very frequently, 12.3% said frequently, 26.2% said sometimes, only 23% said rarely, and 32.8% never. We ask the same question about information found on social media. When examining these responses, we see that 4.9% answered very frequently, 8.2% said frequently, 20.5% said sometimes, only 19.7% said rarely, and 46.7% never. When contrasting these data, we see that more visits were generated by web pages than by social networks, with 18% affirmative with page data and 13.1% by social media. If we analyze the characterization by gender, we find the following about the information found on websites (See Table 5).

**Table 5.** *Characterization of the Information Found on the Internet had Motivated them to Visit the Doctor (Percentages)*

Gender	Very Frequently	Frequently	Ocassionally	Rarely	Never
Man	0.8%	4.9%	7.4%	5%	7%
Woman	4.1%	6.6%	17.2%	18%	23%

The gender characterization indicates that women (10.7%) asked more questions to the doctor than men (5.7%) after having found health information on websites. There is a chance that there will be people who feel that it is not necessary to go to the doctor if they find the medical information on the Internet. In this regard, we found the following results: 7.4% answered very frequently, 9% said frequently, 32.8% said sometimes, 9.8% said rarely, and 41% never. In the case of information from social networks, the results were: 5.7% answered very frequently, 6.6% said frequently, 24.4% said sometimes, 10.7% said rarely, and 52.5% never. When comparing these data, we did not find much difference between trust placed in websites versus in social networks, with 16.4% in the affirmative with page data and 12.3% on social media.

*Impact on the Patient-Patient Relationship*

The aspect related to sharing information about COVID-19 with other patients was addressed. The initial inquiry was whether internet users share such information with other patients on social networks. We found that 12.3% answered very frequently, 16.4% said frequently, 28.7% said sometimes, 18% said rarely, and 24.6% never. This suggests that the majority share information at some point. Upon analyzing the characterization by gender, we find the following results (See Table 6).

**Table 6.** *Characterization of Sharing Information with Other Patients on Social Networks (Percentages)*

Gender	Very Frequently	Frequently	Sometimes	Rarely	Never
Man	0.8%	2.5%	6.6%	5%	11%
Woman	4.1%	5.7%	12.3%	14%	33%

The gender characterization indicates a slightly more extensive tendency among women (9.8%) than men (3.3%) regarding sharing information with other patients on social networks. However, the majority did not engage in this behavior. For those who did share, the question of its benefit was posed. The findings revealed that 22.1% completely agreed, 35.2% agreed, 30.3% were unsure, 5.7% disagreed, and 6.6% completely disagreed. If we analyze the characterization by gender, we find the following results (See Table 7).

**Table 7.** *Characterization of Sharing Information with other patients on Social Networks has been Beneficial (Percentages)*

Gender	Strongly agree	I agree	Undecided	In Disagreement	Strongly disagree
-Man	6.6%	10.7%	7.4%	0%	1%
-Woman	14.8%	22.1%	21.3%	6%	5%

*Knowledge and Understanding of Information*

The acquisition of knowledge and understanding of information are crucial factors in determining the effective use of obtained data. Therefore, we investigated whether COVID-19 information found online helped patients better understand COVID-19 prevention. It was observed that a large majority agreed they had a better understanding of disease prevention after researching it on the Internet. The detailed results were as follows: 43.4% completely agreed, 45.1% agreed, 8.2% were unsure, 0.8% disagreed, and at least 2.5% strongly disagreed. We posed the same question about social media, and the responses were: 23% strongly agreed, 50% agreed, 14.8% were unsure, 3.3% disagreed, and 9% strongly disagreed. When contrasting these data, we found greater trust in websites than in social networks, with 88.5% in the affirmative with website data and 73% on social media. If we analyze the characterization by gender, we find the following about those who searched for information on websites (See Table 8).

**Table 8.** *Characterization: The Information Found on Websites Helps Patients Better Understand COVID-19 Prevention (Percentages)*

<b>Gender</b>	<b>Strongly agree</b>	<b>I agree</b>	<b>Undecided</b>	<b>In Disagreement</b>	<b>Strongly disagree</b>
Man	13.9%	8.2%	2.5%	0%	1%
Woman	27.0%	34.4%	4.9%	1%	2%

The gender characterization reveals a more significant improvement in the understanding of COVID-19 prevention among women (61.4%) compared to men (22.1%), after searching for health information on websites. If we analyze the characterization by sex, we find the following regarding those who sought information on social networks (See Table 9).

The gender characterization reveals a more significant improvement in the understanding of COVID-19 prevention among women (50.8%) compared to men (18.8%), after searching for health information on social media pages.

Interaction with COVID-19 information on the Internet provides knowledge regarding symptoms of the disease. When asked whether they have better understood the symptoms after acquiring more information through the Internet, the vast majority expressed agreement. The responses were: 42.6% completely agreed, 49.2% agreed, 4.9% were unsure, 0.8% disagreed, and 2.5% strongly disagreed.

**Table 9.** *Characterization of Whether the Information Found on Social Networks Helps Patients Understand COVID-19 Prevention (Percentages)*

<b>Gender</b>	<b>Strongly agree</b>	<b>I agree</b>	<b>Undecided</b>	<b>In Disagreement</b>	<b>Strongly disagree</b>
Man	4.9%	13.9%	4.9%	0%	2%
Woman	16.4%	34.4%	8.2%	3%	7%

The same question was posed about social networks, yielding these results: 26.2% completely agreed, 45.9% agreed, 17.2% were unsure, 1.6% disagreed, and 9% strongly disagreed. Contrasting these data, there appears to be greater trust in websites than in social networks, with 91.8% affirming agreement with information from web pages compared to 72.1% from social media.

The majority of respondents expressed a better understanding of COVID-19 testing after obtaining information from the internet and social media. The responses were: 34.4% completely agreed, 46.7% agreed, 9.8% were unsure, 3.3% disagreed, and 5.7% strongly disagreed.

When we asked the same question about social media, the responses were as follows: 23.8% strongly agreed, 38.5% agreed, 13.1% were unsure, 7.4% disagreed, and 17.2% strongly disagreed. Contrasting these data, we find a greater understanding of vaccines with information from websites than from social networks, with 78.7% in agreement with data from pages and 51.6% from social media, although the difference is not considerably wide.

Respondents have felt better informed about COVID-19 treatment after finding information online and on social media. The responses were: 35.2% completely agreed, 35.2% agreed, 18% were unsure, 4.9% disagreed, and 6.6% strongly disagreed.

When we asked the same question about social media, the responses were as follows: 18.9% strongly agreed, 32.8% agreed, 27% were unsure, 7.4% disagreed, and 18.9% strongly disagreed. Contrasting these data, we find a greater understanding of vaccines with information from websites than from social networks, with 70.4% in agreement with data from pages and 51.7% from social media, although the difference is not considerably wide.

We also asked whether respondents have felt better informed about the aftermath of COVID-19 after finding information on the Internet and social media. The responses were: 28.7% completely agreed, 35.2% agreed, 19.7% were unsure, 9% disagreed, and 7.4% strongly disagreed.

When we asked the same question about social media, the responses were as follows: 16.4% completely agreed, 32.8% agreed, 24.6% were unsure, 11.5% disagreed, and 14.8% strongly disagreed. Contrasting these data, we find a greater understanding of vaccines with information from websites than from social networks, with 70.4% in agreement with data from pages and 51.7% from social media, although the difference is not considerably wide.

We asked Internet users whether they would return to using websites to find COVID-19 or health information in general, and the results were as follows: 45.1% completely agreed, 39.3% agreed, 9.8% were unsure, 4.1% disagreed, and 4.1% completely disagreed.

We also asked the same question regarding social media, and the results were as follows: 23% completely agreed, 36.9% agreed, 20.5% were undecided, 10.7% disagreed, and 9% completely disagreed. When comparing the results, we observed that more people would return to using websites (84.4%) to search for health information than those who would return to social media (59.9%), although in both cases, the majority of the answers were affirmative. (See Table 10).



**Table 10.** *I would go back to using the Internet or Social Media to find COVID-19 or Health Information*

Medium	Strongly agree	I agree	Undecided	Disagree	Strongly disagree
Websites	45.1%	39.3%	9.8%	4.1%	4.1%
Social Media	23%	36.9%	20.5%	10.7%	9%

If we analyze the characterization by gender, we find the following about those who searched for information on websites (See Table 11).

**Table 11.** *Gender Characterization on Whether they Would Return to using Websites to find Health and COVID-19 Data (Percentages)*

Gender	Strongly agree	I agree	Undecided	In Disagreement	Strongly disagree
Man	10.7%	9.8%	3.3%	2%	0%
Woman	32.0%	23.8%	8.2%	2%	2%

Gender characterization tells us that there were more women (55.8%) than men (20.5%) who affirmed that premise regarding returning to using websites to find health and COVID-19 data. If we analyze the characterization by gender, we find the following about those who sought information on social networks (See Table 12).

**Table 12.** *Gender Characterization on whether they would Return to using Social Media to find Health Data (Percentages)*

Gender	Strongly agree	I agree	Undecided	In Disagreement	Strongly disagree
Man	5.7%	9.8%	6.6%	2%	1%
Woman	15.6%	22.1%	16.4%	7%	7%

The gender characterization tells us that there were more women (37.7%) than men (15.5%) who affirmed that premise regarding returning to using social networks to find health and COVID-19 data.

Finally, we asked the question of what source you were thinking of when you needed health or COVID-19 information. The results are as follows: 42.6% websites, 28.7% their doctor, 9.8% relatives, 5.7% specialized magazines and books, 4.1% insecure, 3.3% friends, 3.3% social networks, 1.6% nurse, 0.8% health application (app) on their cell phone, pharmacist 0%.

If we analyze the characterization by gender, we find the following about the sources used primarily when they needed health or COVID-19 information (See Table 13).

**Table 13.** Gender Characterization of the Primary Sources used for Health Search and COVID-19 (Percentages)

Gender	Web	Doctor	Relative	Specialized Books and Magazines	Insec	Friend	Soc Med	Nurse	App	Pharma
Man	14.8%	4.1%	4.1%	0%	2%	0%	0%	0%	0%	0%
Woman	27.0%	24.6%	4.1%	5%	2%	2%	0%	2%	0%	0%
Total	41.8%	28.7%	8.2%	5%	4%	2%	0%	2%	0%	0%

The table indicates that women tend to search for more health and COVID-19 information both online and offline compared to men. Regarding websites, 27% of women consider them as their primary source of health information, while only 14.8% of men do so. Following websites, doctors are cited by 24.6% of women and 4.1% of men. Relatives are the third most mentioned source, with 4.1% for both men and women. Specialized books and magazines were mentioned only by women (5%). Other sources such as friends, social media, nurses, mobile apps, and pharmacists received less than 5% from both men and women.

## Discussion

Our study observed that internet and social media users are seeking information on various topics, conditions, and diseases, with COVID-19 becoming one of the most requested and sought-after subjects.

The doctor-patient relationship is impacted by information from social media and the Internet, generally positively, although not with a significant impact. Doctors have gradually accepted that patients are empowered with information from the Internet and even from social networks. However, it is a process that has not concluded and may be years away from reaching a generalized level of acceptance.

Patients communicate with each other, so we examined the patient-patient relationship and how the internet, especially social media, intervenes and serves as a base of operations for that relationship. Sharing information with peers has definitely had an impact, but not as much as sharing information with doctors.

In terms of knowledge acquisition, perhaps this is where we see the greatest effect. Internet users claim, in several instances, to have been informed, both through websites and social networks, about different aspects of COVID-19, denoting trust in these media to take the information they obtain seriously.

In general, there is a tendency to trust websites more than social networks, which may be due to the source of this information. It is interesting and contradictory that social networks are not mentioned as primary sources of health and COVID-19 information, yet they are consistently utilized and influencing healthcare.

## Conclusions

In this analysis of the impact of social media and the Internet on Puerto Ricans' health and COVID-19 decisions, we have found that doctors hold the greatest importance when it comes to making health-related decisions, but the Internet and social media are increasingly influencing people's health choices. Additionally, traditional media continue to play a role, albeit facing significant competition from the aforementioned digital platforms.

The diseases and conditions for which information is sought have been evolving, with COVID-19 occupying a prominent position. In this study, conducted during the pandemic, COVID-19 ranked first in search queries.

The doctor-patient relationship is being affected by health and COVID-19 information available on websites and social media. This impact is evident in the perceived improvement in the relationship, the increase or decrease in questions for healthcare professionals, and the decision whether to visit the doctor after obtaining information from these digital sources.

Regarding the patient-patient relationship, social media plays a significant role in fostering communication and information-sharing among patients. They find value in exchanging health and COVID-19 information through these platforms.

The knowledge acquired through these channels also influences health decisions. Users report a greater understanding of COVID-19 prevention, symptoms, testing, vaccine information, treatment, and the aftermath of the virus after accessing information online and through social networks.

The satisfaction with this information is evident in respondents' willingness to use websites or social networks to find health and COVID-19 information, with the majority expressing a positive inclination. Interestingly, respondents mentioned considering websites as their primary source of information, followed by consulting their doctor. It's worth noting that while websites are readily accessible, consulting a doctor may not always be as convenient.

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