ORIGINAL PAPER

Investigation of the Impact of Extracting and Exchanging Health Information by Using Internet and Social Networks

John Pistolis[1], Stelios Zimeras[2], Kostas Chardalias[1], Zoe Roupa[3], George Fildisis[1], and Marianna Diomidous[1]

[1]University of Athens, Public Health, School of Nursing, Athens, Greece
[2]University of the Aegean, Department of Mathematics, Division of Statistics and Actuarial-Financial Mathematics, Samos, Greece
[3]University of Nikosia, Division of Public Health, Nicosia, Cyprus

Corresponding author: John Pistolis, BEng, MEng, MSc. ORCID ID: orcid.org/0000-0001-6830-0518. Tel: +30 6973205408. E-mail: John.Pistolis@gmail.com

ABSTRACT

Introduction: Social networks (1) have been embedded in our daily life for a long time. They constitute a powerful tool used nowadays for both searching and exchanging information on different issues by using Internet searching engines (Google, Bing, etc.) and Social Networks (Facebook, Twitter etc.). In this paper, are presented the results of a research based on the frequency and the type of the usage of the Internet and the Social Networks by the general public and the health professionals. **Objectives:** The objectives of the research were focused on the investigation of the frequency of seeking and meticulously searching for health information in the social media by both individuals and health practitioners. The exchanging of information is a procedure that involves the issues of reliability and quality of information. **Methods:** In this research, by using advanced statistical techniques an effort is made to investigate the participant's profile in using social networks for searching and exchanging information on health issues. **Results:** Based on the answers 93 % of the people, use the Internet to find information on health-subjects. Considering principal component analysis, the most important health subjects were nutrition (0.719 %), respiratory issues (0.79 %), cardiological issues (0.777%), psychological issues (0.667%) and total (73.8%). **Conclusions:** The research results, based on different statistical techniques revealed that the 61.2% of the males and 56.4% of the females intended to use the social networks for searching medical information. Based on the principal components analysis, the most important sources that the participants mentioned, were the use of the Internet and social networks for exchanging information on health issues. These sources proved to be of paramount importance to the participants of the study. The same holds for nursing, medical and administrative staff in hospitals. **Key words:** Internet, Social Networks, General Public, Health Professionals.

1. INTRODUCTION

Recently the effect of the use of social networks and Internet on shaping and remodeling the health status of the population has been studied extensively. Lack of social support and human ties with others have been proved to be an important risk factor (1, 2) in holding a psychological stability and general well-being. Social networks support enhances a so-called immunity to illness; influences health related behaviors and maximizes adaptation and recovery from illness (2, 3). What this research would like to address specifically is to add to our knowledge the rate of frequency of using social networks (3) in order to extract information on health issues (4). Additionally, efforts are made to investigate the ways in which personal behaviors influenced by social media networks, and what important questions need to be asked and sought by both health practitioners and the general public.

Furthermore, is going to be analyzed the possibility of the true usefulness of extracting information that trigger health practitioners or the general public. Do such findings help in the delineation and designation of a health profile of the general public and the practitioners? Are specific practice approaches suggested by the social media?

A meticulous effort was made to examine the bulk of the research concerning health issues with social media and social networks and the results of this escalating social event worldwide.

2. SOCIAL NETWORKS IN HEALTHCARE

Social networks provide a way to contact individuals and share information among them on different subject

matters. Especially in healthcare, information ought to be exchanged and shared between doctors in order to make better clinical diagnosis. Diagnosis and e-health based on the Internet provide knowledge to the general public, patients and health professionals.

The social networks provide the basis for the establishment of social relationships among people who share different information, activities or backgrounds. Most social network services (4) are web-based and provide ways to the people to interact between them, exchange ideas, information and tools with common goals. Quantitative analysis of social network could be done by using social network analysis based on graph theory. In graph theory, a network usually is defined as a set of actors (nodes, points or vertices) that may have relationships (link, edge or ties), with each other (5).

Healthcare social networks are addressed in cases where medical and/or clinical information is exchanged between doctors or patients, or between individuals who seek valuable information for a medical diagnosis. Based on this connectivity, the search for information is a common everyday practice between people sharing common interests (providing answers to their questions). In addition, the social networks enable the exchange of information between doctors, when they perform clinical research or refine their medical knowledge (5) on recent innovative ideas.

3. STUDY POPULATION

The analysis took place in Athens, where a questionnaire has been distributed to 328 people. From them 55.2% were females, and 43.6% were between 28-37 years old followed by 34.5% pertaining in the age-group between 18-27 years old. Based on their educational level, 35.7% had a Master's Degree. Finally, the 26.2% of the respondents were students and the 25.9% worked in the public sector.

4. RESEARCH METHODOLOGY

The analysis was conducted using SPSS Version 18. Personal identifiers were removed prior to analysis to retain the anonymity of individuals participating in this study. Relative frequencies were calculated for each group and a x2 test (chi-squared test) was conducted in the analysis comparing the distribution of these parameters between groups.

Factor analysis and principal component analysis (PCA) were used for the calculation of communalities for each variable considering Search Health information. Correspondence analysis is appropriate when attempting to determine the proximal relationships among two or more categorical variables. Using correspondence analysis with categorical variables is analogous to using correlation analysis and principal components analysis for continuous or nearly continuous variables. A key part of correspondence analysis is the multi-dimensional map produced as part of the output. The correspondence map allows researchers to visualize the relationships among categories spatially on dimensional axes; in other words, which categories are close to other categories on empirically derived dimensions.

Modeling was performed based on the binary logistic regression analysis. All p-values are two sided with a 0.05 type I error and 95% power. A value of p < 0.05 was considered statistically significant.

5. IT KNOWLEDGE

Considering the knowledge of Internet as the first direction of the questionnaire the following results have been presented.

- 99.2% of the people had a PC, a tablet or a notebook;
- 38.4% of the people had 2 PC's;
- 91.2% of the people were using a PC before;
- 43.3% of the people did not have any qualification of knowledge (learned by themselves);
- 93.9% of the people were using the PC daily;
- 100% of the people had connection with Internet;
- 75.3% of the people were using the Internet daily.

In particular:

Based on the age (28-37 years old):
- 99.3% had a PC, a tablet or a notebook;
- 44.1% had 2 PC's;
- 94.4% were using a PC before;
- 46.9% did not have any qualification of knowledge;
- 96.5% were using the PC daily;
- 78.3% were using the Internet daily.

Based on the educational level (Master's Degree):
- 99.1% had a PC, a tablet or a notebook;
- 39.3% had 2 PC's;
- 96.6% were using a PC before;
- 56.6% did not have any qualification of knowledge;
- 100% were using the PC daily;
- 79.5% were using the Internet daily.

Based on the job classification (students/ public servant):
- 100% had a PC, a tablet or a notebook;
- 29.1%/43.5% had max 2 PC's;
- 88.4%/95.3% were using PC before;
- 53.5%/47.1% did not have any qualification of knowledge;
- 96.5%/91.8% were using the PC daily;
- 81.4%/75.3% were using the Internet daily.

A Comparison between groups based on the x2 test gave the following results:

Based on the gender
- Number of PC - p=0.074, non-significant differences ;
- Qualification of knowledge - p=0.682 no significant differences.

Finally considering correspondence analysis between age and previous knowledge, the correspondence map is illustrated in Figure 1., visualizing the clusters between the two groups.
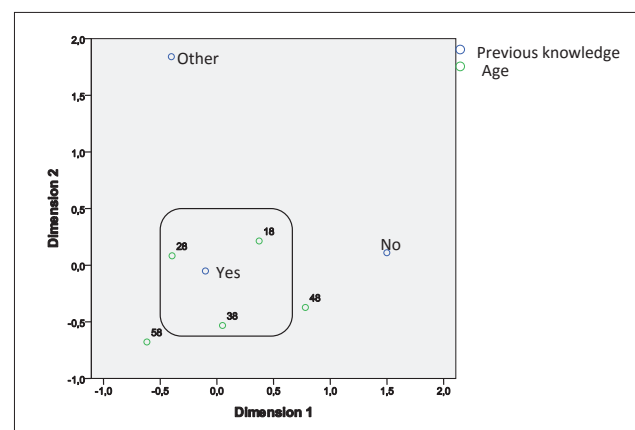

Figure 1. Correspondence Map(1)

The correspondence map shows each category score on both dimensions (at once) for both age and participant's answers for the question of the previous knowledge of IT technology. The scores allowed us to compare categories across variables in (this case) two dimensional space. It is clear that the positive answer (Yes) is clustered between 18-38 years old, with the first factor explaining the 82.4% of the total information.

6. HEALTH INFORMATION

Based on the answers, 93% of the people were using the Internet for finding information on health subjects.

Considering principal components analysis, the most important subjects were:

The analysis is taking place on different health subjects. The reliability of the answers considering the questionnaire, is given by the α-Cronbach measure which is very satisfactory with values for various health subjects' parameters: α=0.82 with KMO MSA=0.76.

Explanation of the Table 1. leads us to the analysis of the variables. Total Variance of the information is calculated based on the communalities, which are given by the measure of sampling adequacy (MSA). High values close to 1 indicate strong relationship between the variables (6, 7). The credibility of the data can be presented by the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (8).

Small Values of the KMO MSA indicate problem with sampling. Values higher than 0.7 are acceptable (9). The parameters from Table 1. are explaining the 73.83% of the total information proposing two factors. These factors are: nutrition including nutrition and psychological subjects; cardiological including cardiological and respiratory. Clustering between the two factors based on the four important variables is given in Figure 2.
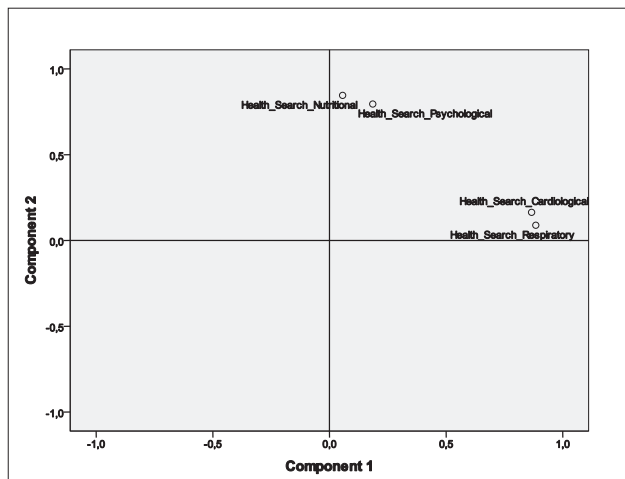

Figure 2. Clustering based on the PCA Analysis

Based on gender:
- 66.8% had previous knowledge on health subjects;
- 18.9% had finished a private school of health sciences;
- 93% searched information on health subjects;
- 61% believed the health information extracted from the Internet/social media (reliability);
- 89.6% adopted sometimes the health information from the Internet/social media;
- 94.2% were searching for a second opinion;

- 67.1% believed that the health information is informative and authentic.

In particular:

Based on the age group (28-37 years old):
- 63.3% had previous knowledge on health subjects;
- 25.2% had finished a private school of health sciences;
- 91.6% searched information on health subjects;
- 60.1% believed the health information from the Internet/social media (reliability);
- 88.8% sometimes adopted the health information from the Internet/social media;
- 93.5% were searching for a second opinion;
- 73.4% believed that the health information is informative and authentic.

Comparison between groups based on the x2 test has given the following results:

Based on the gender:
- Previous knowledge: p=0.348 - no significant difference. Also the proportion of the knowledge between males and females is OR=1.127;
- Education: p=0.131 - no significant difference;
- Health Information searching: p=0.012 - significant difference. Also the proportion of the searching between males and females is OR=3.036;
- Reliability: p=0.819 - no significant difference;
- Second opinion: p=0.5 - no significant difference. Also the proportion of the searching between males and females is OR=1.115.

Based on the age (28-37 years old)
- Previous knowledge: p<0.0001 - significant difference.

Considering the correspondence analysis between age and "adopting sometimes" health information from the Internet/social media, the correspondence map is illustrated in Figure 3., visualizing the clusters between the three groups.
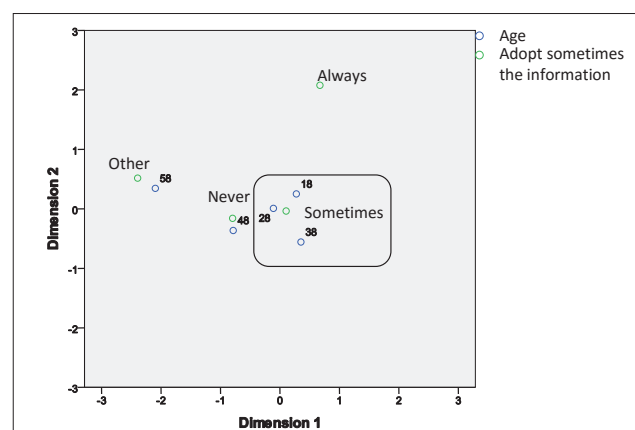

Figure 3. Correspondence Map(2)

It is clear that individuals who sometimes adopted health information from the Internet were between 18-38 years old, with the first factor explaining the 81.1% of the total information. Considering the correspondence analysis between age and the trustworthiness of the health information extracted from the Internet/social media (reliability), the correspondence map is illustrated in Figure 4., visualizing the clusters between the three groups.

It is clear that the positive answers pertain in the age-group of (18-48), with two factors explaining the 98.6% of total information. Finally, binary logistic regression analysis in-
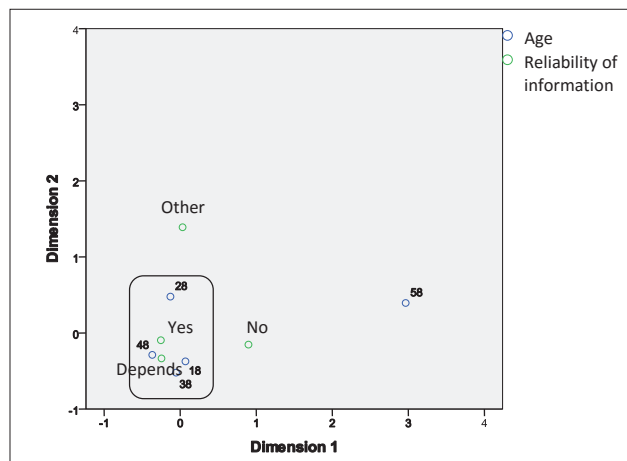
Figure 4. Correspondence Map (3)

dicated that for the gender (male and female), the important health subjects are sexual (OR=0.532, p=0.018) and gynecological issues (OR =3.303, p<0.0001).

Based on the gender 93.9% of the males and 94.5% of the females probably searched for a second opinion regarding a medical problem (OR=1.115). Analysis of the results based on the answers (to whom or where they sought for a second opinion) are represented in Table 2. The Table presents the summary results based on the positive answer (in percentage) based on the gender, compared with OR and p-values using x^2-test.

From the Table 2. it is clear that males and females are inclined to search elsewhere for a secondary opinion. The same holds for the General Doctors (OR=0.866) and health related Specialists (OR=0.805). Especially female participants did so also for nurses (OR=1.207). This is based on recent published research (0R=1.372). After using x^2-test, there was not found any statistical significance between males and females regarding their opinion.

Health Subjects	Nutrition	Respiratory	Cardiological	Psychological	Total Information
Communalities	0.719	0.79	0.777	0.667	73.83%

Table 1. Summarized PCA analysis (MSA=0.596)

	Gender		OR	p-value
	Male	Female		
General Doctor	57.1%	58.6%	0.866	0.288
Specialist	75.5%	71.3%	0.805	0.231
Nurse	45.6%	50.3%	1.207	0.231
Paramedical	21.4%	24.3%	1.253	0.24
Television-Newspapers	21.8%	21%	0.955	0.485
Bibliography	46.3%	54.1%	1.372	0.095
Friends	28.6%	31.5%	1.149	0.326

Table 2. Summary results of the positive answer for males and females, compared with OR and p-values using x^2-test.

7. SOCIAL NETWORKS

Finally considering the effects (6) of the social networks in the everyday life, the 61.2% of the males and the 56.4% of the females intended to use the social networks for searching medical information. Correspondence analysis based on the age suggested that an important cluster is given by the ages between (38-48) years old, explaining the 79.4% of the total information (Figure 5).

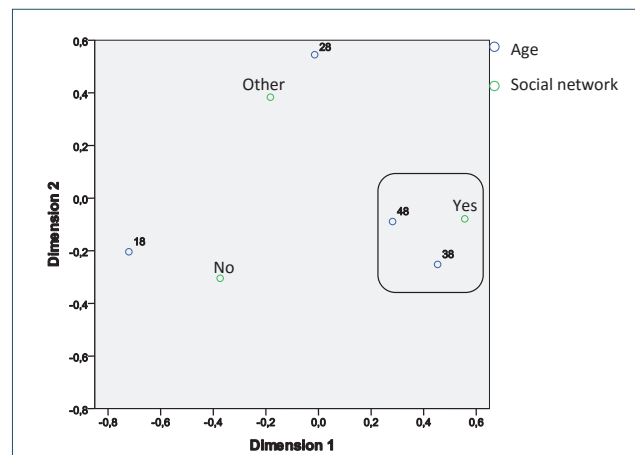Considering principal components analysis (7) for the ex-

Figure 5. Correspondence Map (4)

change of information between various components using social networks, the most important of them based on the answers collected from the questionnaire are illustrated in Table 3. (Communalities, and mean scores).

The parameters from Table 3., are explaining the 70.68% of the total information proposing two factors. These factors are: medical factors, including known patient, hospital, medical staff, nursing staff, organizations defending patients and company factors, including Insurance Company, Pharmacy Company, Pharmacy, Government, Gym and Service Patient Care.

Factors	Communalities	Mean Scores (max 5)
Known patients	0.532	2.24
Hospital	0.849	2.27
Medical Staff	0.885	2.56
Nursing Staff	0.984	2.45
Insurance Company	0.76	1.45
Pharmacy Company	0.74	1.59
Pharmacy	0.631	2.08
Organization defending Patients	0.708	2.4
Government	0.628	1.66
Gym	0.571	1.76
Service Patient Care	0.587	1.66

Table 3. Communalities and Mean Scores of the factors exchanging information in the social networks (MSA=0.893)

8. DISCUSSION AND CONCLUSION

Social networks are a powerful tool (8) embedded in our everyday life, used to establish a connection between individuals and Health Care Professionals (medical doctors, nurses etc.), who are seeking and exchanging information on health matters and specifically extracting information for medical diagnosis and treatment. Based on this process of sharing information, the profile of the people using social networks must be investigated to identify their needs and their common goals.

In this research, an analysis of the profile of the general public and the Health Care Professionals using social networks has been investigated, based on advanced statistical techniques. According to these techniques, the findings were that the 61.2% of the males and 56.4% of the females intended to use the social networks for searching information on health subjects.

Based on the principal components analysis, the most im-

portant sources for exchanging information on health issues that participants mentioned, are Internet and Social Networks (9). This is of paramount importance for the participants of the study. The same holds for nursing, medical and administrative staff in hospitals.

- Author's contribution: John Pistolis: Substantial contribution to conception and design of questionnaire, acquisition of data, critical revision of the article and final approval of the version to be published.
- Conflict of interest: None declared.

REFERENCES

1. Berkman LF. Social networks, support and health: Taking the next step forward, American Journal of Epidemiology. 1986; 123: 559-62.
2. Deri C. Social networks and health service utilization, Journal of Health Economics. 2005; 24: 1076-1107.
3. Smith K, Christakis N. Social networks and health, Annual Review of Sociology. 2008; 34: 40529.
4. Faust K, Wasserman S. Social Networks Analysis: Methods and Applications. Cambridge: Cambridge University Press, 1994.
5. Buts CT. Revisiting the foundations of network analysis, Science. 2009; 325 (5939): 414-6.
6. Anderson TW. Fisher and multivariate analysis. Statistical Science. 1996; 11(1): 20-34.
7. Everitt BS, Dunn G. Applied Multivariate Data Analysis. Arnold, 2nd edition, 2001.
8. Kaiser HF. An Index of Factorial Simplicity, Phyhcometrika. 1974;, 39: 31-6.
9. Norman GR, Streiner DL.Biostatistics: The Bare Essentials McGraw-Hill Europe; 3rd edition, 2008.