

Mobile Media and Trust in Sources of Health Information: A Comparative Study in 26 European Countries

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Abstract

The context in which people consume health information has changed with the diffusion of the mobile media. The interactive health communication influences the health care system with its information dissemination, health promotion and support for health services. The object of this study is to analyze the relationships between mobile media and the credibility of health sources.

The health sources include health professionals, mass media, and family/friends. Mobile media have been conceptualized at two levels. The individual-level analysis sees mobile media as a medium through which users receive information, and examines how the individual use of mobile media affects users' perceived credibility of health sources. The country-level analysis sees mobile media as a context in which trust in health sources is constructed, and examines how mobile contexts affect perceived credibility of health sources. The individual-level data came from a large cross-national survey conducted by the European Barometer in May, 2016, which aims to investigate people's opinions about antibiotics. The country-level data have been obtained from the United Nations and the European Social Survey. All the data have been combined into the final sample, consisting of 25,896 respondents in 26 European countries.

For the main effects, the mobile phone penetration is negatively related to health professionals but positively related to media and family or friends. The wireless broadband penetration is positively related to health professionals but negatively related to family or friends. The health performance is positively related to health professionals but negatively related to family or friends. The post-materialistic culture is negatively related to media. *Clin Ter 2020; 171 (4):e321-327. doi: 10.7417/CT.2020.2234*

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Introduction

Robinson et al. (1) define 'interactive health communication' as 'the interaction of an individual consumer, patient, caregiver or professional with or through an electronic device or communication technology to access or transmit health information or to receive guidance and support on a health-related issue'. Increased consumer participation in interactive health communication influences the health care system with its information dissemination, health promotion, social support and health services functions. Perhaps the most common and influential function of interactive health communication today is health-information seeking by consumers (2) and especially who have difficulty communicating face-to-face may be able to engage in interactive health communication (3). Consumers access online health information in three primary ways: searching directly for health information, participating in support groups and consulting with health professionals. Some studies have shown that used sources of health information may vary by ethnicity (4), race (5), socioeconomic status (6), and acculturation.

Trust is an important component of the relationship between people and health information, and it may vary because the same health information would be perceived differently and this variance may influence health communication outcomes. A defining feature of trust is that it is relational, and Gilson states that as trust "is unequally distributed within societies, its benefits are likely also to be unequally distributed" (7). In this context the trust in health information sources may vary at an individual or at a population level. This variance may also influence health communication outcomes. Giddens (8) proposed two mechanisms of trust-building: facework commitment and faceless commitment. Facework commitment is about interpersonal trust, which is developed through face-to-face interactions between individual people in everyday life.

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Faceless commitment refers to reliance on abstract social systems, which are used to reduce uncertainty and risk in a modern society with overwhelming complexity. Giddens (8) further introduced two abstract systems in faceless commitment: the expert system and the symbolic token. The expert system means “the systems of technical accomplishment or professional expertise that organize large areas of the material and social environments in which we live today”. The symbolic token was defined as “media of interchange which can be passed around without regard to the specific characteristics of individuals or groups that handle them at any particular juncture”.

Mobile media is recognized as an important source of health information today, but it is unclear whether people from different social groups use mobile media for health information and whether or not they trust information obtained (9, 10, 11). Trustworthiness refers to judgments regarding the character or integrity of a source in terms of motivation to be truthful (12). Even authoritative sources may be biased (13). The importance of media context has been widely recognized in communication research (14). Thus, conceptualizing mobile media as social contexts can bring forth a new perspective to explore their impacts on trust in health information. There are two major types of mobile infrastructures: mobile phone and wireless broadband. They represent two major types of ICTs in human history: mass communication and telecommunication. They are built with different design models. Basically, mass communication is an open system that is based on a one-to-all model. Information in the mass communication system can be accessed to by a large audience. In contrast, telecommunication is a closed system that is based on a one-to-one model. Information in a telecommunication system can only be accessed to by a very limited number of people, mostly one caller and one receiver.

Besides informational contexts, the cultural context and the political context also affect people’s trust in sources of health information. Mobile phone infrastructure and wireless broadband infrastructure are important indicators of a country’s overall development level, which are also correlated with the post-materialistic culture and the health performance of a country. The post-materialistic culture and the health performance describe cultural and political contexts in which trust in sources of health information is formed. Tsfaty and Arieli (14) reported that the post-materialistic culture is negatively related to trust in media. On the other hand, people trust the institutions that perform well and distrust the ones that fail to meet their demands (15).

The aim of this study is to analyze the relationships between mobile media and trust in sources of health information, following these research questions:

RQ1a: How does mobile phone infrastructure affect people’s trust in sources of health information?

RQ1b: How does wireless broadband infrastructure affect people’s trust in sources of health information?

RQ2a: How does the post-materialistic culture affect trust in sources of health information?

RQ2b: How does the health performance affects trust in sources of health information?

Method

Sample

The individual-level data came from the Standard Eurobarometer 85 that was conducted in May 2016 and published in July 2016. The Eurobarometer was initiated in 1974. Each survey consists of approximately 1000 face-to-face interviews per country. Reports are published twice yearly. The Standard Eurobarometer 85 has a total of 27,969 respondents from 28 countries in the Europe Union. The country-level data were obtained from the United Nations Development Programme (UNDP) and the European Social Survey. All the data were combined to create the final sample with 25,896 respondents at the individual level and 26 countries at the country level² (see Table 1).

Table 1. The list of 26 countries

Austria	Belgium	Bulgaria	Croatia	Cyprus	Czech
Denmark	Estonia	France	Finland	Germany	Greece
Hungary	Ireland	Italy	Latvia	Lithuania	Netherlands
Poland	Portugal	Romania	Slovakia	Slovenia	Spain
Sweden	United Kingdom				

Measurement

This paper adopted one question (QB11) in the Eurobarometer to measure source credibility. The question’s wording is “Which of the following sources of information would you use in order to get trustworthy information on antibiotics?” The sources include “a doctor”, “a nurse”, “a pharmacy”, “a hospital”, “another health care facility”, “family or friends”, “an official health-related website”, “a health-related personal blog”, “another health-related website”, “online social media”, “TV”, “newspapers or magazines”, and “radio”. The respondents are asked to name the maximum of three sources. These sources are divided into three categories. The category of health professionals includes “a doctor”, “a nurse”, “a pharmacy”, “a hospital”, “another health care facility”, and “an official health-related website”. The category of media includes “TV”, “newspapers or magazines”, and “radio”. The category of family or friends includes only “family or friends”. If a source is mentioned under a category, this category is codes as 1. The number of mentioned sources is calculated for each category. The more sources are mentioned under a category, the higher scores this category has.

The question of D62 was used to measure *the individual use of the Internet*. It asks “Can you tell me if (1) you use the Internet at home, in your home; (2) you use the Internet on your place of work; (3) you use the Internet on your mobile device (laptop, smartphone, tablet, etc.); (4) you use the Internet somewhere else (school, university, cybercafé, etc.)?” The answers include six categories – “everyday or almost everyday”, “two or three times a week”, “about

once a week”, “two or three times a month”, “less often”, and “never”. *The individual use of the mobile Internet* is measured by the score on (3) using the Internet on your mobile device. In addition, the scores on all the other three locations of (1), (2), and (4) are combined to create a scale to measure *the individual use of the Internet at the fixed locations*, which is included into the statistical models as a control variable.

At the individual level, meanwhile, some demographical variables are also included into the models as control variables, including education (D8), life satisfaction (D70), social class (D63), sex (D10), age (D11), and community size (D25).

At the country level, both *mobile phone penetration* and *wireless broadband penetration* are released by the UNDP to calculate the number of subscriptions per 100 people in a country. The *health performance* is a composite index, including two sub-indices - physicians per 10,000 people and public health expenditure (% of GDP), which are from the Human Development Index (HDI) released by the UNDP. The *postmaterialistic culture* is a combined scale of four measures of post-materialist values in the Europe Social Survey, ranging on a 1-6 scale. They are the importance of having fun, the importance of being free, the importance of being creative, and the importance of trying new things. In the Europe Social Survey, these four measures are calculated at the individual level. To measure the country-level score, this paper used the mean of the individual-level combined scale for each country.

Since all the country-level variables are updated every year or every two years, the data in the year of 2016 are singled out for analysis. To diagnose potential multi-collinearity, the country-level variables were centered and condition indices were computed. The results show that all the variables are below the threshold of considering the

multi-collinearity problem. We also run normality tests for these variables and found no outliers.

Results

To account for the nested nature of respondents in countries, a series of hierarchical linear regression models (HLM) are constructed to examine both country-level and individual-level effects. They allow us to see whether or not individual and contextual variables can significantly affect dependent variables and to observe the interactions between the two levels. The ordinal model is used for health professionals, and the logistic models are used for media and family or friends. Group mean centering is used at the individual level and grand mean centering is used at the country level. Table 2 shows the descriptive statistics of all key variables.

Three null models are first created to give full information on the variance components for the two levels of influence, and to serve as baselines for comparison with subsequent models. Chi-square tests for variance components indicate the significance of the results ($p < .001$), suggesting that there are variances in the outcome variables caused by the level-2 groupings. The Intraclass Correlation Coefficients (ICC) are 15% for professionals, 19% for media, and 17% for family or friends, indicating the percentage of the variances for explaining outcomes at the country level.

For each outcome variable, then, two models are created in sequence. They are random-coefficient regression model (Model 1) and intercepts-as-outcomes model (Model 2). The R squares for the country-level variables are 40.8% for professionals, 12.2% for media, and 24.7% for family or friends (see Table 3, 4, and 5).

Table 2. Descriptive statistics

Variables	N	Mean (SD)	Min, Max	Description
Family / Friends	25896	Binary	0, 1	No = 0 (95%), Yes = 1 (5%)
Media	25896	Binary	0, 1	No = 0 (90%), Yes = 1 (10%)
Professionals	25896	Ordinal	1, 4	4 being highest level, 1=7.3%, 2=36.3%, 3=29.7%, 4=26.7%
Fixed Internet use	25896	9.05 (4.82)	3, 18	18 being most frequently used
Mobile Internet use	25896	3.71 (2.36)	1, 6	6 being most frequently used
Life satisfaction	25896	2.01 (0.76)	1, 5	1 being the highest level
Education (years)	25896	10.15 (9.19)	0, 30	30 being the highest level
Social class	25896	2.31 (0.99)	1, 5	5 being the highest level
Sex	25896	Binary	0, 1	Male = 0 (44%), Female = 1 (56%)
Age	25896	51.30 (17.94)	15, 99	Age
Community size	25896	Nominal	1, 3	Rural=1 (33.1%), Town=2 (29.9%), Urban=3 (36.9%)
Mobile phone penetration	26	123.32 (16.45)	95.4, 157.4	The number of mobile phone subscriptions per 100 people
Wireless broadband penetration	26	61.66 (24.01)	27.50, 123.60	The number of wireless broadband subscriptions per 100 people
Health performance	26	0.03 (1.59)	0, 2.67	A composite index of physicians per 10,000 people and public health expenditure (% of GDP)
Postmaterialistic culture	26	13.62 (1.06)	11, 15	4-24, 24 being the highest level

Table 3. Ordinal Multilevel Regression on Health Professionals

	Model1 β (SE)	Model2 β (SE)
Intercept	-1.179*** (.105)	-1.180*** (.082)
Individual level		
Fixed Internet use	0.014** (.004)	0.013** (.004)
Mobile Internet use	0.034** (.011)	0.034** (.011)
Life satisfaction	0.029 (.032)	0.030 (.032)
Education	0.001^ (.001)	0.001^ (.001)
Social class	-0.008 (.020)	-0.008 (.020)
Sex (female)	0.117*** (.030)	0.118*** (.030)
Age	-0.006*** (.002)	-0.006*** (.002)
Town	0.135*** (.039)	0.134*** (.039)
Urban	0.048 (.062)	0.047 (.062)
Country level		
Mobile phone penetration		-0.008* (.004)
Wireless broadband penetration		0.010*** (.002)
Health performance		0.078* (.031)
Postmaterialistic culture		0.068 (.060)
Variance in intercepts	0.184***	0.109***
-2Log Likelihood	6.325	6.327

Table 5. Dichotomous Multilevel Regression on Family / Friends

	Model1 β (SE)	Model2 β (SE)
Intercept	-2.917*** (.109)	-2.958*** (.076)
Individual level		
Fixed Internet use	0.008 (.006)	0.007 (.006)
Mobile Internet use	-0.070*** (.016)	-0.073*** (.017)
Life satisfaction	0.017 (.032)	0.016 (.032)
Education	0.002 (.001)	0.002 (.001)
Social class	0.055 (.035)	0.055 (.036)
Sex (female)	-0.151*** (.037)	-0.154*** (.039)
Age	-0.009*** (.002)	-0.009*** (.003)
Town	0.129** (.049)	0.132* (.052)
Urban	0.185** (.070)	0.188** (.073)
Country level		
Mobile phone penetration		0.014** (.004)
Wireless broadband penetration		-0.005* (.003)
Health performance		-0.118** (.037)
Postmaterialistic culture		-0.056 (.048)
Variance in intercepts	0.231***	0.174***
-2Log Likelihood	3.646	3.651

Note for Table 3, 4 and 5.
 Unstandardized coefficients.
 N = 25, 896. Countries = 26.
 ^p < .1. *p < .05. **p < .01. ***p < .001

Table 4. Dichotomous Multilevel Regression on Media

	Model1 β (SE)	Model2 β (SE)
Intercept	-2.553*** (.102)	-2.556*** (.091)
Individual level		
Fixed Internet use	0.004 (.007)	0.005 (.007)
Mobile Internet use	-0.038* (.018)	-0.041* (.018)
Life satisfaction	0.039 (.035)	0.039 (.035)
Education	-0.003^ (.001)	-0.003^ (.001)
Social class	0.028 (.036)	0.028 (.036)
Sex (female)	0.105^ (.062)	0.104^ (.062)
Age	0.006** (.002)	0.006** (.002)
Town	0.017 (.088)	0.019 (.088)
Urban	0.089 (.080)	0.089 (.080)
Country level		
Mobile phone penetration		0.011* (.005)
Wireless broadband penetration		-0.004 (.004)
Health performance		0.021 (.046)
Postmaterialistic culture		-0.147* (.066)
Variance in intercepts	0.222***	0.195***
-2Log Likelihood	3.659	3.663

For the main effects, the mobile phone penetration is negatively related to health professionals ($\beta = -0.007, t = -1.969, p < .05$) but positively related to media ($\beta = 0.011, t = 2.344, p < .05$) and family or friends ($\beta = 0.014, t = 3.734, p < .001$). The wireless broadband penetration is positively related to professionals ($\beta = 0.010, t = 5.857, p < .001$) but negatively related to family or friends ($\beta = -0.005, t = -1.745, p < .05$). The health performance is positively related to professionals ($\beta = 0.078, t = 2.556, p < .05$) but negatively related to family or friends ($\beta = -0.118, t = -3.182, p < .01$). The postmaterialistic culture is negatively related to media ($\beta = -0.147, t = -2.243, p < .05$).

Discussion

Nowadays are completely changed the ways in which patients consume health and medical information and the patterns of trust that are associated (16, 17). Some research report that health information seeking is by far the most commonly reported online activity (18). Others analysis of the trust present how the physician’s role may be perceived by the public in the changing health information environment (19). One recent research studied the impact of the Internet in the Health Information, the levels of trust and the source preference. The results underline that trust in health information sources is strongly age (younger people) and sex (women) dependent, and that people with higher levels of educations are more trusting in information sources (6). The

object of this study is to analyze the relationships between mobile media and the credibility of health sources.

According to Giddens (8), health professionals represent the expert system, in which trust is developed through faceless commitment to knowledge and expertise. The development of the expert system transforms what would once have been the expertise of one known local expert into an arcane body of knowledge and rules that are systematically produced and impersonally tested to provide guarantees of universal expectations across large time-space distance (8). The results on health professionals show the opposite effects of mobile phone penetration and wireless broadband penetration. Trust in health professional is increased in a country with a high rate of wireless broadband penetration but is decreased in a country with a high rate of mobile phone penetration. As an open communication system, wireless broadband performs a dis-embedding function, which is to lift people's social relations out of the immediacies of local contexts and stretch them into a broader range of time and space. The dis-embedding function consists of two dimensions. First, wireless broadband produces and distributes a tremendous amount of disinformation, misinformation, and out-of-control information. As a result, a context of information overload is created, where uncertainty and chaos are pervasive (20, 21). Second, wireless broadband reduces contextual cues that are abundant in face-to-face interactions and collapses immediate contexts in which interpersonal trust is formed (22, 23, 24, 25, 26). When people are dis-embedded from their local contexts, they have to rely more on the expert system to reduce uncertainties and risks. Thus, they tend to trust health professionals. The dis-embedding function is also supported by the result at the individual level, which reports a positive relationship between individual use of the mobile Internet and trust in health professionals.

On the other hand, mobile phone is a closed system, allowing people to stay in touch on the move and maintain a "nomadic intimacy" of social relationships (27). It performs a function of re-embedding, which refers to "the re-appropriation of recasting of dis-embedded social relations so as to pin them down (however partially or transitorily) to local conditions of time and place". The re-embedding function consists of two dimensions. First, one-to-one communication via mobile phone largely prohibits the massive diffusion of out-of-control information that is enabled by wireless broadband. Second, synchronized mobile communication is direct and personal to restore the richness and immediacy of local contexts that are collapsed by wireless broadband and sustain interpersonal relationships between individual users. Thus, mobile phone creates a context in which people are less likely to rely on health professionals as a source of health information.

The counterbalance between mobile phone and wireless broadband is also expressed in the results on family/friends. Trust in family/friends is about interpersonal trust between individuals, which is developed through face-work commitment. On the one hand, the results show that trust in family/friends is negatively related to both wireless broadband penetration at the contextual level and the mobile Internet use at the individual level. As mentioned above, interpersonal relationships are dis-embedded by the mobile Internet. On the other hand, trust in family/friends is positively related

to mobile phone penetration at the contextual level. Mobile phone functions to re-embed interpersonal trust into locals by prohibiting out-of-control information and rebuilding immediate contexts for face-work commitment.

In addition, the result at the contextual level shows that trust in media is increased in a country with a high rate of mobile phone penetration. According to Giddens (8), media represent the symbolic token, in which trust is developed from faceless commitment to common symbols that are recognized and shared by individuals beyond their local characteristics. These symbols constitute a collective sense of culture and media play a critical role in shaping it. Talking about the formation of national culture, for example, Anderson (28) argued that a sense of nation is created while people read newspapers and are aware that others are reading the same contents. Likewise, Gellner (29) argued that as the literacy rate increases, newspaper reading fosters a unified national culture that goes beyond local ones. Thus, the credibility of media resides in their capability of maintaining a unified culture that can be accepted by individuals across a wide range of time and space. Research indicated that mobile phone has been often used as an important tool of culture building (30, 31, 32, 33, 34). Its re-embedding function makes sure that cultures and identities can be lived and performed in everyday nomadic life as well as be constructed through interactions between ordinary people on the move.

The result at the individual level, however, indicates that trust in family/friends is negatively related to the mobile Internet use. It reflects the dis-embedding function of the mobile Internet, whose de-territorial nature severs people's ties to their cultures and displace the hegemonic position of cultural identity (35). It brings about a wide range of informational options and cultural symbols users can choose, leading to social fragmentation and cultural individualization (21, 36). Consequently, the collective sense of the symbolic token is eroded.

So far, a significant contrast can be made between health professionals and media. Although both are about trust in abstract systems, health professionals and media represent two mechanisms of trust building – the expert system and the symbolic token. The results show that the changes of informational context have opposite effects on them. On the one hand, the symbolic token is a cultural system, which is nurtured in a context where social relationships are re-embedded through information delivery via mobile phone. But it is susceptible to information changes brought by the mobile Internet. A unified culture is likely to be disintegrated in a context where huge and abundant information is pervasive and out of control. On the other hand, the expert system is a technological system, which is more universal and less susceptible to information changes than the symbolic token. To reduce uncertainties brought by the mobile Internet, therefore, people have to rely more on the technological system.

The difference between the expert system and the symbolic token is also expressed in the results about health performance and post-materialistic culture. As a technological system, trust in health professionals is increased in a context where professional health system performs well. It supports the performance theory of trust, where people's confidence in a technological system is based on its effectiveness that can

be evaluated and verified in practice. As a cultural system, however, trust in media is decreased in a context where a cultural shift from materialistic culture to post-materialistic culture. It supports the cultural theory of trust, where cultural hegemony on which media credibility is based is undermined by post-materialistic orientation that calls for self-expression and self-determination of individual people.

Conclusion and limitations

As Cline and Haynes (2) write, evidence to assess trustworthiness includes: disclosure of mission, purpose, and processes and standards for posting information (37); disclosure of potential conflicts of interest by the site's sponsors (38, 39); disclosure of the collection process, use and final destination of information gathered about users (37); warning signs as 'sounds too good to be true' claims, products advertised as cure-alls, phrases like 'scientific breakthrough', 'exclusive product', 'miraculous cure' or 'secret ingredient' (13). On the other hand, criticisms find the on line health information bad and dangerous (40), inaccurate, erroneous, misleading, or fraudulent (41, 38), or based on insufficient scientific evidence (39). At the end, it is important to underline that quality concerns of the mobile media in health information are direct connected to the public's ability to select valid information, and without skills needed to discern validity and familiarity with the scientific review process consumers may: (I) fail to recognize that key information is missing, (II) fail to distinguish between biased and unbiased information, (III) fail to distinguish between evidence-based and non-evidenced-based claims, and (IV) misunderstand health information intended for health professionals (42, 43); (2).

Taking the perspective of media ecology, this paper conceptualized mobile media as a context to explore their impacts on trust in sources of health information – health professionals, media, and family / friends. The findings reveal the opposite functions of wireless broadband and mobile phone perform in shaping the informational context in which trust is developed: dis-embedding and re-embedding. They were explained by Giddens' theory of trust-building, which makes distinctions between facework commitment and faceless commitment as well as between the expert system and the symbolic token.

Although this study offers some insights, a couple of limitations need to be acknowledged. They result from the common problem of causality due to the cross-sectional survey data. Despite a few control variables are included in both levels of analysis, it is still hard to tell whether trust in health sources is the cause or the result of the mobile Internet use at the individual level. At the country level, likewise, the degree of mobile media's impacts varies not only by country but also by time, which may coincide with the changing of trust in health sources (44). Therefore, further longitudinal survey data and time-series analysis should be used to examine this ambiguity and present clear causal relationships.

Notes

- The dataset of the Standard Eurobarometer 85 can be downloaded from their official website <http://ec.europa.eu/commfrontoffice/publicopinion/index.cfm/Survey/getSurveyDetail/instruments/STANDARD/surveyKy/2130>
- The data in this study come from three sources – the Eurobarometer survey (individual-level data), the United Nations Development Programme (the mobile phone penetration, wireless broadband penetration, and the health performance), and the European Social Survey (the postmaterialistic culture). A country would be eliminated if it is not simultaneously included in the three sources. As a result, Luxembourg and Malta are eliminated because their data about the postmaterialistic culture are not available in the European Social Survey.

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