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IMPROVING PRENATAL HEALTH COMMUNICATION: ENGAGING MEN VIA E-HEALTH

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Abstract

The initial goal of this comparative study that aimed investigate the value of an e-health application to educate men about pregnancy-related health, involving EUA and Portugal, was to design an e-health intervention focused on the importance of prenatal health that would appeal to men and ultimately reinforce paternal involvement in pregnancy health. Through one-on-one in-person interviews with men that used the prototype of the application we could achieve a qualitative evaluation of perceived usefulness and ease of use of the web-based intervention for participants and how this influenced their behavioral intentions in relation with prenatal engagement. In the specific case of research conducted in Portugal, evaluation of e-Health literacy amongst the target group was never conducted in the past so, the specific results of the

project in this aspect also contributed to knowledge in the field. The implementation of a cross-cultural, international comparative approach to the study of e-health interventions is highly original and although a very small sample was used, obtained results show the relevance of such type of research approach.

Keywords

Health Communication, Health Education, Fathering, Behavioral Research, Parental Education

1. Introduction

Improving pregnancy outcomes is one of the goals of the U.S. Healthy People 2020 initiative as well as a major target of the United Nations Sustainable Development Goals (Creanga et al., 2014; "Sustainable Development Goals," n.d.) and the National health Plan for pregnancy in Portugal (DGS, 2013). Healthcare access and support during the prenatal/perinatal phases can reduce the risks associated with factors that drive infant mortality, such as preterm birth (Kassebaum et al., 2014). Examples of these include health promotion programs, nutritional assessments, immunizations, mental health screenings, and more (Creanga et al., 2014; Kassebaum et al., 2014; Khanani, Elam, Hearn, Jones, & Maseru, 2010).

In addressing these burdensome pregnancy outcomes, mass and social media campaigns aimed toward women have thus far played a key role in community driven health research (Alcalay, Ghee, & Scrimshaw, 1993; Shefner-Rogers & Sood, 2004). However, to date, such interventions have almost entirely left men outside of a defined role in prenatal care and pregnancy outcomes (Widarsson, Kerstis, Sundquist, Engström, & Sarkadi, 2012).

Despite the breadth of research that shows that including men in these initiatives can improve outcomes (Alcalay et al., 1993; Shefner-Rogers & Sood, 2004), pregnancy continues to be a domain where men feel "invisible" or "unwelcome"— prompting calls for programs that educate men on pregnancy health (Mackert et al., 2017; Widarsson et al., 2012).

Additional perceived barriers for men being involved in prenatal health include having to work (no time) and the expense of classes or programs (Widarsson et al., 2012).

Given these commonly cited barriers of an unclear role, time, and financial burden, the potential of ehealth to reach men, bridge this gap, and motivate them to be more involved in

prenatal health is promising (Mackert et al., 2017). Ehealth has the ability to educate difficult to reach audiences, such as men, and to tailor information in ways that could resonate better than existing programs designed predominantly for women. Applications on handheld devices such as phones or tablets present even more convenient access to crucial health information.

Given the growing recognition of the importance of health literacy in driving health outcomes, and the proliferation of ehealth applications, it is perhaps no surprise that a concept of "ehealth literacy" was created (Norman & Skinner, 2006). The construct is conceptualized as individuals' ability to use the Internet to find health information.

Considering these assumptions, this study was designed to be a three stages research. Nevertheless, the Portuguese part of the research design only included one of them. While the intervention in the USA involved an initial pilot testing stage followed by qualitative and quantitative data collection, research design in Portugal only involved one mostly qualitative data collection stage.

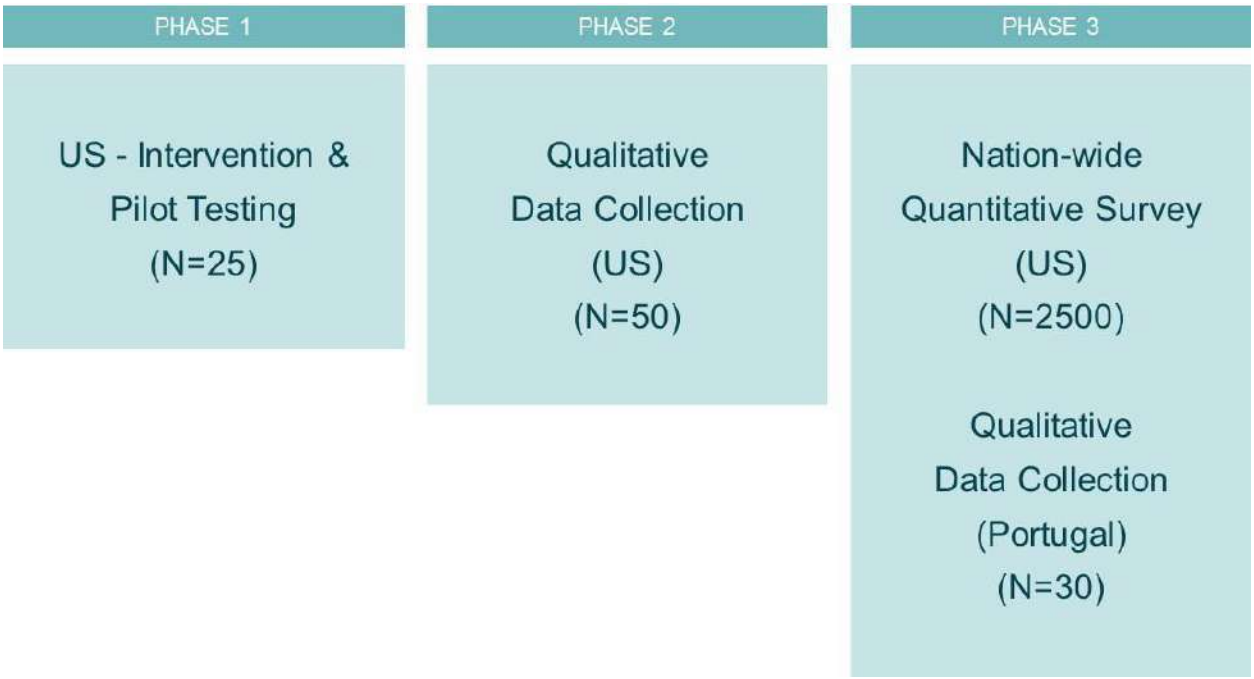


Figure 1: *Research Stage*

The project team firstly develop a web-based e-health intervention focused on prenatal health issues, with a specific focus on the men needs. Visuals and content were pilot tested with potential users to refine the application. This part was initially conducted in the USA. Between January and April 2016 similar testing and refinements were done with a Portuguese version of the same web-based intervention. A specific semi-structured interview was designed by the American team and then later adapted to Portuguese language and context. Minor changes were made to this survey. Other procedures included a "talking loud" based approach to the use of the application and the evaluation of health literacy levels amongst participants using the Newest Vital Sign (NVS) (Weiss et al., 2005).

Most of the interview questions was open-ended, but a mixture of Likert questions was included. It required subjects to discuss issues surrounding general health and prenatal health, education and involvement. It also required the participants to navigate the e-health application dedicated to prenatal health, a process during which participants were observed and questioned on their perceptions of the app, noting issues on usability and engagement. Screen and audio capture of the user's engagement with the application was done throughout the process (files available online).

After the completion of the interview and observation, all participants were then asked questions from the Newest Vital Sign questionnaire – a health literacy tool used to gauge subjects' ability to understand and apply basic health information guidelines. The intervention took approximately 30-45 minutes to complete.

All materials and interviews for the Portuguese data collection stage were in Portuguese.

Research objectives included the evaluation of perceived usefulness and ease of use of the web-based intervention for participants and how this influenced their behavioral intentions in relation with prenatal engagement.

2. The Study

Participants (Portugal)

After Institutional Review Board approval (Lusofona internal), adult male participants were recruited via a public calendar on the website of a largest private university of Portugal. All males 18 years or older were eligible to participate. The men were given a €25 incentive in the form of a voucher for the retail shops FNAC and gave their consent to participate in the study in written format (consents available online). The sample (N=30) had an average age of 36.0 (**SD=6.81)** and consisted of 82.8% white and 17,2% black participants. All participants reported having at least some level of post-secondary education. 67% had at least one child or a partner who was pregnant at the time of participation.

Application Research and Development

The application was built with a responsive website design approach, which ensures the content is optimally shown in the users' environment and not platform or device specific. All topics covered in individual modules were shown in card layout, a container-style design popularized by social media, on the application's homepage. Participants could access a module's content by clicking on the illustrative icon, title, or description on the homepage or from the navigation bar, which remained constant on all pages (See Figure 2).

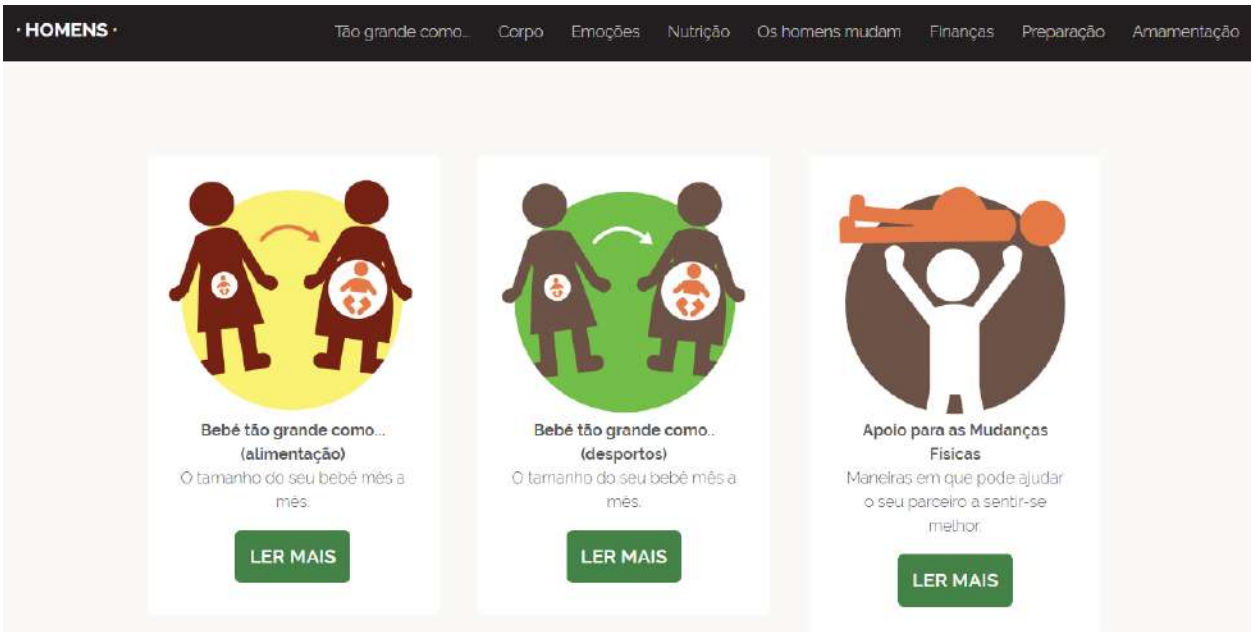


Figure 2: *Access to module's content*

General guidelines for ensuring clear communication – such as sufficient use of white space, consistent headings, relevant visuals to reinforce text, and plain language whenever possible – were followed when developing educational content (National Cancer Institute, 2003). Translation to Portuguese was done assuring complete adherence to the original content and layouts (Portuguese version of the application available at: www.prenatal.ulusofona.pt. Only minor layout changes were done considering the differences in character length between English and Portuguese to ensure the same level of white space and visual affordance. One of the adjustments made concerned the section "baby as big as Sports" since the American example used sports elements related to baseball or softball, two sports that are not well known to the Portuguese public. Though, for the Portuguese version an adaption was made whereby softball was replaced by volleyball and baseball by handball, two more widespread sports in Portugal (see figure 3).

Figure 3: *Example content adaptation 1*

Study Procedures and Data Analysis

A research assistant conducted a semi-structured interview with participants to discuss issues surrounding the role of men in pregnancy health, attitudes toward prenatal health and education programs, ideas on how to get men more involved in pregnancy, and their use/non-use of technology when searching for health information (sample interview online). Interviews and surveys were conducted in Portuguese and audio recorded (transcripts available online). The overall study procedure was modelled on previous research studying the use of technology to engage hard to reach populations (Mackert et al., 2017; Mackert, Champlin, Holton, Muñoz, & Damásio, 2014; Shefner-Rogers & Sood, 2004).

The participants then spent 5-7 minutes navigating through the e-health application on a tablet computer, allowing them to browse at their own pace and explore the content. The same

timing as in the intervention in the US was followed for the intervention in Portugal. Users' navigation was tracked by a screen recording device and the participants were systematically observed by the research assistant to assess general attitudes, actions, navigational issues, and technical trouble (videos available online).

Attitudes while browsing the application could range from 'Highly Engaged' (e.g., taking time to read content) to 'Bored/Distracted' (e.g., not clicking on photos, skimming through content).

Participants were asked to navigate through two slideshows that detailed week-by-week fetal development: one used common fruits and vegetables as visuals to illustrate fetal growth (like widely-downloaded pregnancy applications and webpages) and another slideshow used common sports objects to illustrate week-by-week growth (see figure 3).

The participants were then asked open-ended questions related to the content of the application and use of the tablet computer, such as what they found most interesting on the application and what could be done to make it better. Participants also completed a 12-item survey about prenatal health and future use of similar applications; survey items used 7-point Likert scales from 1 (Strongly Disagree) to 7 (Strongly Agree).

Finally, health literacy was assessed with the Newest Vital Sign (NVS) (Weiss et al., 2005). The NVS is a brief, 6-item assessment of health literacy that correlates well with other established health literacy measures. A score of 0 to 1 on the NVS reflects a 50% or greater chance of limited health literacy, a score of 2 to 3 suggests the possibility (25%) of limited health literacy, and a score of 4 or greater reflects adequate health literacy. The average NVS score for the Portuguese sample was **4.86** (**SD=1.68**), suggesting the sample had adequate levels of health literacy.

Both qualitative and quantitative methods were used to scrutinize the data. Audio files of each interview were transcribed – notes, observations, and screen-tracking recordings were analysed for themes pertinent to the research questions and all materials made available online.

3. Hypothesis, Research Questions, and Goals of the Project

The initial goal of this research was to design an e-health intervention focused on the importance of prenatal health that would appeal to men and ultimately reinforce paternal involvement in pregnancy health. The first portion of the project involved one-on-one, in-person interviews and observations with men using a prototype of the application (N=25 in the USA and N=30 in Portugal). Participation took approximately 30-45 minutes to complete. Evaluation of the intervention was conducted through a mix of qualitative and quantitative methods. In the USA, a larger quantitative data collection stage was later conducted. Research in Portugal mostly dwelt with the qualitative evaluation of perceived usefulness and ease of use of the web-based intervention for participants and how this influenced their behavioral intentions in relation with prenatal engagement. Broader exploratory considerations on the role e-Health can have for men engagement under the specific national context were later developed. A comparative analysis of both USA and Portugal qualitative results was conducted.

This study aimed to investigate the value of an e-health application to educate men about pregnancy-related health. The following research questions guided this investigation:

RQ1: How do men perceive their role in pregnancy health?

RQ2: Is the e-health application a promising avenue for improving men's knowledge of pregnancy-related health information?

RQ3: How can the e-health application be improved to reach and resonate with more men moving forward?

The answers to these questions add to the body of research about how to encourage men to be positively involved in prenatal health to promote better outcomes. Leveraging an e-health application would allow the delivery of this information to male audiences that have time or financial constraints. In the specific case of research conducted in Portugal, evaluation of e-Health literacy amongst the target group was never conducted in the past so the specific results of the project in this aspect also contributed to knowledge in the field. The implementation of a cross-cultural, international comparative approach to the study of e-health interventions is highly

original and although a very small sample was used, obtained results show the relevance of such type of research approach.

4. Background and significance

Background of this research is different when the USA and Portugal are considered, but its significance is high in both cases, namely when the role of e-Health interventions is considered.

Pregnancy outcomes in the U.S. continue to rank among the most troublesome of all nations with a developed healthcare system. Recent vital statistics reports estimate 6.15 infant deaths per 1,000 live births and 15.8 – 28.0 maternal deaths per 100,000 live births, with the largest maternal death rate increase occurring in 2008-2013 (Kassebaum et al., 2014). In addition, an estimated 60,000 women each year suffer pregnancy-related issues considered "near-miss" maternal mortality, in which a woman survives severe complications during pregnancy, childbirth, or the postpartum period (Creanga et al., 2014).

In addressing these burdensome pregnancy outcomes, mass and social media campaigns aimed toward women have thus far played a key role in community-driven health research (Alcalay et al., 1993; Shefner-Rogers & Sood, 2004; Thomas, Hauser, Rodriguez, & Quinn, 2010; VALENTE, 1996). However, to date, such interventions have almost entirely left men outside of a defined role in prenatal care and pregnancy outcomes (Widarsson et al., 2012). Despite the breadth of research that shows that including men in these initiatives can improve outcomes, pregnancy continues to be a domain where men feel "invisible" or "unwelcome"—prompting calls for programs that educate men on pregnancy health (Widarsson et al., 2012). Additional perceived barriers for men being involved in prenatal health include having to work (no time) and the expense of classes or programs (Mackert et al., 2014; Widarsson et al., 2012).

The situation is different in Portugal when compared with the USA in many of these aspects, although completely similar when we look at the fact that men are almost entirely left outside of a defined role in prenatal care and pregnancy outcomes, namely when public policies and communication strategies are considered.

The infant mortality rate has known in Portugal, since 1961, a sharp and consistent decline. If in that year mortality rate stood at 88.8 deaths per thousand babies born, since then the rate has come down quite sharply, having stabilized at about 2.9 deaths per thousand births ("PORDATA - Taxa de mortalidade infantil na Europa," n.d.). If in those distant 60's Portugal stood out negatively from the rest of Europe as the country with the highest rate of infant mortality in Western Europe, currently its highlight is done positively; since this significant reduction resulted in the fact the country nowadays has one of the lowest rates in the Eurozone, closely followed by the Nordic countries.

Taxa - ‰ ver mais

Anos	Taxa bruta de mortalidade	Taxa de mortalidade infantil
+ 1960	10,7	77,5
+ 1970	10,7	55,5
+ 1980	⊥9,7	⊥24,3
+ 1990	10,3	10,9
2000	10,2	5,5
2001	10,1	5,0
2002	10,2	5,0
2003	10,4	4,1
2004	9,7	3,8
2005	10,2	3,5
2006	9,7	3,3
2007	9,8	3,4
2008	9,9	3,3
2009	9,9	3,6
2010	10,0	2,5
2011	9,7	3,1
2012	10,2	3,4
2013	(R) 10,2	2,9
2014	10,1	2,9
2015	10,5	2,9

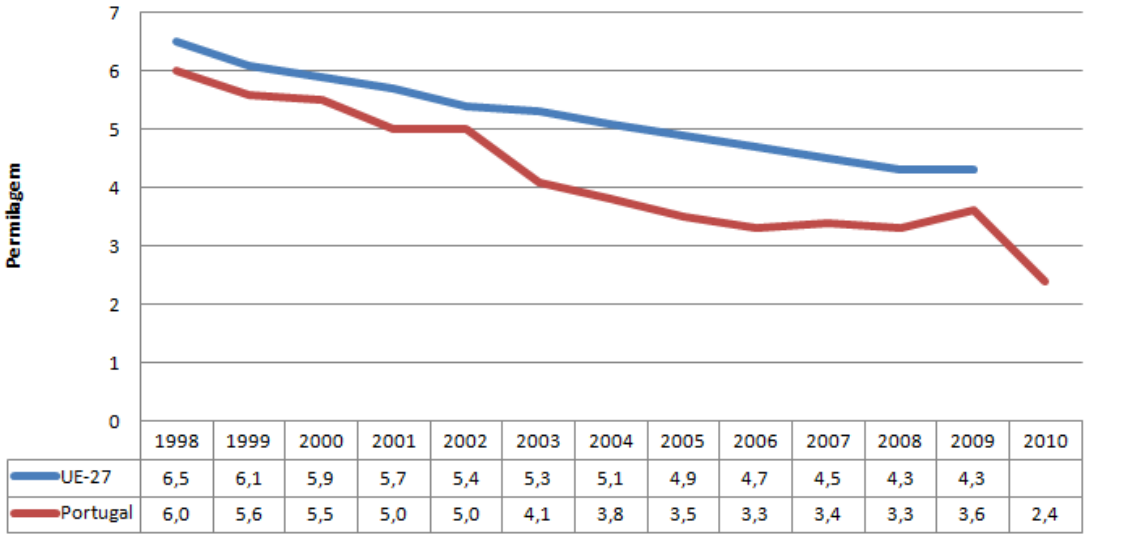
Fontes/Entidades: INE, PORDATA
Última actualização: 2016-06-16

Figure 4: *Infant mortality rate Portugal*

There are several facts that seem to explain this significant reduction. Francisco George, a former director for the National Health Service, summarized the situation this way:

"The strong improvement of the Portuguese living conditions, particularly after 1974, denoted namely by the creation of the National Health Service, that assured the implementation of health programs (such as the National Programme on Immunization, maternal and child care, with emphasis on family planning duly organized) and major public works of environmental sanitation infrastructure construction, as well as better habitat, are the source of success seen in the continuity and speed of reduction of child mortality. To these explanations are associated other determinants that influence positively the favourable rate, including social policy measures and even educational ones. " (George, Francisco, 2011)

According to the literature, the evolution of the infant mortality rate reflects, not only the health situation as well as the socio-economic development stage of the country or region concerned (Barreto & Correia, 2014; George, Francisco, 2011). This may explain that in 2010, one out of eighteen children born worldwide died during the first year of life, and most of these deaths occurred in developing countries, particularly in Africa and Asia (Barreto & Correia, 2014).



	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
UE-27	6,5	6,1	5,9	5,7	5,4	5,3	5,1	4,9	4,7	4,5	4,3	4,3	
Portugal	6,0	5,6	5,5	5,0	5,0	4,1	3,8	3,5	3,3	3,4	3,3	3,6	2,4

Fonte: Eurostat.
Nota1: os dados para a UE-27 em 1998 correspondem a uma quebra de série.
Nota2: não há dados disponíveis para a UE-27 em 2010.
Nota3: os dados para Portugal em 2010 são provisórios.

OBSERVATÓRIO DAS DESIGUALDADES

Figure 5: *Infant mortality rate for Eurozone and Portugal*

Europe is clearly at the other end, and the infant mortality rate in the Eurozone has decreased in the last decades to very low figures (see figure 5). As previously mentioned, the situation in the United States is very different, since infant mortality rate during the first year of life stands at 6.15 per thousand births checked, and this rate has stagnated, after a period of decline, since 2000. Though, despite the large investment made in neonatology services and neonatal intensive care beds, this rate remains high. Various reasons can contribute for these values, including: the asymmetries between the different ethnic and socio-economic groups in the country or, as predicted in this study, the lack of parental engagement in prenatal care. Nevertheless, one should start by asking why the assumption of a relation between socio-economic development and rate of infant mortality cannot be verified for these two countries: USA and Portugal. Considering the mentioned figures, one can clearly affirm that there is a need to explain the structural causes of these differences and the strategies one can follow to improve the situation. This questioning framed part of our discussion on the role of men in prenatal care.

Differently from the case of infant mortality rate, when we are discussing the role of men in prenatal care and pregnancy outcomes, the differences between Portugal and the USA are not that acute. Although one can affirm according to our results that, in the Portuguese case, there is a more effective and sustained involvement of the parents in the pregnancy process, all communication materials and preparations activities are still mainly focused on the figure of the mother, the father figure appearing, not infrequently, as one that supports the women in a more passive way and helps her in suppressing her needs. A very concrete example of this is the huge difference in the number of written communication materials related to the process of pregnancy targeting mothers or fathers published by the Portuguese National Health Service (Espanha, Ávila, & Mendes, 2016).

The greater involvement of men in the process is justified by many of them because of the changing role of women in Portuguese society, with changing socio-economic factors determining an increased participation of women in professional life and the consequent increase in the number of women employed. For this reason, parents end up being called to take a more active role in the pregnancy and postnatal processes, though exercising a greater direct influence in the development of their children (Parke, 1996). This minimizes the emphasis on their

essentially instrumental role and empowers them with a greater need for engagement tools like the one we purposed. The emergence of the role of the father as cooperative one (Lamb, 2010) is probably the main explanation for the very positive way our web-based application was perceived by the men involved in the study.

The role of the central government and the National Health Service is also very different when American and Southern European realities are confronted. In the last decades, the Portuguese State has sought to adapt existing legislation and policies to the need to promote a greater involvement of men in the pregnancy process and in monitoring the infant development during its first years of life. In 2009, a broad restructuring of the system of incentives to the involvement of parents in pregnancy was carried out in Portugal, which included the extension of the duration of paternity leave, greater incentives for sharing of licenses between the father and mother, and a growth in the subsidy for initial parenthood (CITE, n.d.). These amendments to the law resulted in a growth of the birth rate – a core problem in Europe but not in the USA - and a more positive relation of men with pregnancy leave, as one can verify by the data in figure 4. Still and similarly to the USA, our results show, that also in Portugal men still fill somehow excluded from prenatal care and inadequately involved in the pregnancy process, namely when existing communication strategies and public policies are considered. This creates a gap that needs to be filled with more tailored and better designed interventions that have this specific audience in consideration.

5. Results

Results are organized by the research questions and relevant themes that emerged during analysis. Results of the 7-point Likert scale items, taken post exposure to the application, are included in Table 1. The scale items include perceptions about pregnancy health and safety, the use of tablets, and the likelihood of using an application such as this in the future.

Table 1: *Results of the 7-point Likert scale items*

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	7	7	7	7	7	7	6	5	6	6	7	6
2	7	7	7	7	7	7	7	3	6	6	7	5
3	7	7	7	5	7	7	5	5	7	7	7	6
5	7	7	7	7	7	7	6	4	7	7	7	7
6	7	7	7	7	7	7	7	2	7	7	6	6
7	7	7	7	6	7	7	6	6	6	7	7	6
8	7	7	7	5	7	7	7	1	7	7	5	6
9	7	7	7	5	7	7	7	7	6	7	5	6
10	7	7	7	7	7	7	7	4	6	7	7	7
11	7	7	7	6	7	7	7	7	7	7	6	7
12	7	7	7	7	7	7	7	7	6	6	6	6
13	6	7	7	6	7	6	6	5	7	7	6	7
14	7	7	7	6	7	7	6	6	6	6	6	5
15	7	7	7	7	7	7	7	2	7	7	6	5
16	7	7	7	6	7	6	6	3	6	6	7	6
17	7	7	7	7	5	6	7	2	7	7	7	5
18	6	7	7	6	7	7	6	1	4	5	6	4
19	7	7	7	7	7	7	7	1	7	7	7	7
20	7	7	7	7	7	7	7	1	7	7	7	7
21	7	7	7	7	7	7	7	1	7	7	4	6
22	7	7	7	7	7	7	7	1	4	6	7	7
23	7	7	7	7	7	4	7	5	7	7	5	6
24	7	7	6	5	6	7	7	2	6	6	4	5
25	7	7	6	7	6	7	7	5	7	7	6	6
26	7	7	7	7	7	7	7	6	7	7	7	6
27	6	6	6	5	7	6	5	5	7	7	6	6
28	7	7	7	5	7	7	7	6	5	7	7	1
29	7	7	7	7	7	7	7	7	7	7	5	4
30	7	7	7	7	7	7	7	2	6	6	7	7
Average:	6.90	**6.97**	6.90	6.38	6.86	6.76	6.62	**3.86**	6.38	6.66	6.21	5.79

RQ1: How do men perceive their role in pregnancy health?

The participants felt very strongly that knowing about pregnancy is useful (M=6.90) and that it is important to know about things that could hurt a baby during pregnancy (M=6.97). The men agreed that if they knew about things what could harm an unborn baby, they would do their best to help their partner avoid them (M=6.90). There was a somewhat lower, but still relatively

high, perception that they could act (on their own) to ensure their baby was born healthy (M=6.38).

Most of the participants (16) used the word "Accompany/keep up" when asked about the role and responsibility of a man in pregnancy, "being present" was the second more used (4) and "support" appears in the third place (with only 3 usages). When asked to go more in-depth into what "Accompany" means, responses revealed both an instrumental component (e.g., tangible offers to help, taking care of finances, and helping with chores) and an emotional one (e.g., just "being there" for a pregnant woman). As an example, one participant, described "accompany" as:

> *"…to take an interest in all the details inherent in pregnancy, both the health of the partner as the simplest tasks of everyday life, this includes getting involved with the physiological questions (I do not know if this is exactly the word that one should use), but also with everyday tasks pregnancy implies, assuring one is there. I would say the key word is being a permanent company."*

Other respondent said diminishing men's mere instrumental role implies one is there all the time and the levels of responsibility are similar for both men and women.

Understanding the responsibilities of each one in the pregnancy process was clearly referred by all participants as a relevant aspect for their perception of the overall process.

Barriers to Involvement

When the participants were asked about perceived barriers to being involved in pregnancy, the idea of lack of time arose. Other possibility that was often mentioned derived from a pre-conception of Portuguese society as a chauvinist one, an idea that for many of the participants still hangs in society and prevents Portuguese men from being more engaged with pregnancy.

> *"The core assumption is that we still live in a sexist and patriarchal society that actively promotes and encourages men to turn away from this ... this figure of parenting and fatherhood"*

Importance of Communication

Concerning the importance of communication, men felt that they receive 'mixed-messages' on how women and society want them to be involved. Because most of the existing materials and courses are directed to women, or because they receive messages solely via their companions, men feel they are mostly "put aside".

Several participants believed there were culture-based mixed-messages regarding how men should be involved in pregnancy. For example, one of the respondents, said:

> *"I think ... there is also a vision somehow ideologically and culturally marked in Portuguese society in relation to man's role. I have family in various parts of the country and in some areas of the country the role of men during pregnancy is highly undervalued. I think has much to do with the cultural pattern that we have and also obviously with some ideological orientations in our society."*

R2: Does the e-health application appear to be a promising avenue for improving men's knowledge of pregnancy-related health information?

All participants stated they used electronic devices such as cell phones, tablets, or laptop computers to access health information (100%). Google was commonly mentioned as one of the sites used when searching for information about health and illness symptoms. Two scale items indicated that most participants felt comfortable using a tablet (M=6.38) and thought the application itself was easy to use (M=6.66).

All participants were observed as being 'Engaged' with the application. They felt the content was geared towards future fathers'. In general, participants enjoyed the graphics and stated that they were easy-to-understand. They liked the overall 'feel' of the application. The average time spent on the overall application was 8:30

Participants particularly emphasized the immediacy of the application, the instant feedback it provided and the overall design of it. Overall they considered the information contained there to be accurate.

The recorder screen tracked the clicks on the application and the length of time the participant stayed on each content module. The tracking Indicated outside of the two fetal development slideshows, the "The man change too" content was the most clicked on module (17 of 30) Followed by financial preparation (15 of 30). One should also note the high number of clicks in the item about the body (11 of 30). One of the interviewees affirmed that the most interesting feature of the application was precisely the fact

> *"it showed that pregnancy is not only focused on women, this tab Men also change, is something new, usually I do not think much in men in the process of pregnancy, so I think that overall this might be the most interesting feature in the application."*

RQ3: How can the e-health application be improved to reach and resonate with more men moving forward?

Participants had mixed feelings about whether they would use an application such as this one in the future (M=5.79). They were asked to describe ways to improve the particular application and their suggestions were wide-ranging and the word "engaging" was frequently brought up – from adding videos and games inside the application, to personalizing the experience, to changing the font size and colour.

Many respondents noted the importance of creating a personal area through an account where the father could go and input data on the evolution of pregnancy and that the application itself had warnings at the beginning of each week about what would be happening in the near future. It would also be relevant to add tips on relevant information about each phase in which the baby is and the de-dramatization of events (e.g. when will it be possible, on ultrasound, to see the baby's sex, but there is no harm if you do not see, examples of other scans for the parent to know what is supposed to see at a specific time of pregnancy, etc.). Many respondents also mentioned it would be very important that the application could provide alerts and tips on the key aspects the father should on the lookout in relation to the mother over that period. The possibility of sharing pregnancy information on social networks was also mentioned by five respondents. While most of the participants stated the application had "just the right amount of information", several went on to suggest adding links or drop-down content for those who want

to read further into the topic. External links to reputable healthcare websites were recommended as well as the option to view videos about the topic within the application.

> *"*Interviewed – *it would be nice to have pointers to other sites that are relevant in practical terms during this period. For instance, I do not know if there are babies clothing exchange sites. Other important info should include data on the Portuguese health insurance system and the indication of the average costs of pregnancy for a specific region. Virtual Prenatal preparation classes would also be a plus. Communication is also a key aspect. I'm not talking of a simple newsletter but to give the user the possibility to register and say I'm waiting for a son who was conceived today and will born on this date x and once a week the system would send you targeted messages on your infant development*
>
> [Interviewer] – *Automatically?*
>
> [Interviewee] - *Yes, "the baby has so much and it's time to start worrying about it," so I think this would make the application much more attractive. Overall, I think men want more focused guidelines ideally without sponsorship but even if they were sponsored this would not shock me. For instance, that a particular insurer sponsors the application and of course that would focus it was this or that insurance or even stores that sell products for children that would be necessary. What I'm saying is that overall you need* to make it *more interactive and you need it to go a little bit further in terms of information presentation than what it does now."*

LICENÇAS DE PARENTALIDADE

Evolução no uso das licenças de parentalidade (2005-2013)

Anos	2005	2007	2008	2009	2010	2011	2012	2013
Crianças nascidas**	109399	102492	104594	99491	101381	96112	89841	78779
Homens que receberam subsidio por licença parental obrigatória de uso exclusivo do pai	42982	45687	45973	53278	58069	61604	56289	51547
(5 dias até abril de 2009 e 10 dias desde maio de 2009)								
(% no total de crianças nascidos)	39,3%	44,6%	44,0%	53,6%	57,3%	64,1%	62,7%	65,4%
(% no total das licenças das mulheres)	56,5%	60,7%	61,2%	62,6%	62,6%	70,9%	73,7%	72,4%
Homens que receberam subsidio por licença parental facultativa de uso exclusivo do pai	32945	37552	38442	44447	49823	52283	48661	45165
(15 dias até abril de 2009 e 10 dias desde maio de 2009)								
(% no total de crianças nascidos)	30,1%	36,6%	36,8%	44,7%	49,1%	54,4%	54,2%	57,3%
(% no total das licenças das mulheres)	43,3%	49,9%	51,2%	52,2%	57,8%	60,1%	63,7%	63,5%
Homens que partilharam licença de 120/150 dias	413	551	577	8593	19711	20528	20430	20128
(% no total de crianças nascidas)	0,4%	0,5%	0,6%	8,6%	19,4%	21,4%	22,7%	25,5%
(% no total das licenças das mulheres)	0,5%	0,7%	0,8%	10,1%	22,9%	23,6%	26,7%	28,3%
Mulheres que receberam subsidio por licença de 120/150 dias	76125	75297	75128	85085	86242	86941	76409	71175
(% no total de crianças nascidas)	69,6%	73,5%	71,8%	85,5%	85,1%	90,5%	85,0%	90,3%
Homens que receberam subsidio social de paternidade/subsidio social parental*				3945	7100	6601	6869	6639
(% no total de crianças nascidas)	---	---	---	4,0%	7,0%	6,9%	7,6%	8,4%
(% no total das licenças das mulheres que beneficiam do subsidio social de maternidade)	---	---	---	17,9%	33,3%	35,2%	37,3%	37,8%
Mulheres que receberam subsidio social de maternidade/subsidio social parental*			7257	22094	21300	18742	18436	17551
(% no total de crianças nascidas)	---	---	6,9%	22,2%	21,0%	19,5%	20,5%	22,3%

*Esta medida apenas existe desde 2008; o mesmo bebeficiário pode ter tido processamento em mais de um beneficio, pelo que, tal constrangimento deverá ser tido em conta na utilização e análise dos dados.

** Fonte: Instituto de Registos e Notariados

Fonte: Instituto de Informática, IP

Figure 6: *Number of pregnancy leaves in Portugal (2005/2013)*

Given the commonly cited barriers of an unclear role, time, and financial burden, the potential of e-health to reach men, bridge the mentioned gap, and motivate them to be more involved in prenatal health is promising (Mackert et al., 2014). E-health can educate difficult-to-reach audiences, such as men, and to tailor information in ways that could resonate better than existing programs designed predominantly for women. Applications on handheld devices such as phones or tablets present even more convenient access to crucial health information (Pew Research Center, 2015).

In consideration of the promise for e-health interventions targeted toward men, the current study sought to explore the perceived role of men in prenatal health and the potential of e-health to reach men. Specifically, the purpose of this project was to assess e-health intervention content targeted specifically to men regarding prenatal health. The remainder of this report provides a description of study methods and results followed in the Portuguese part of the study, as well as implications for future research and practice.

6. Discussion

Results for the Portuguese part of this study underline two core ideas: although general background measures such as the infant rate mortality are very different in the two countries, perceived levels of men engagement with pregnancy and prenatal care are relatively low in both countries. The way past communication strategies have been designed and existing cultural identity traces might explain this situation.

Clear differences arise once again when we look at perceptions and attitudes towards the studied subject, with results varying a lot between the two countries. Results for Portugal show a much more proactive attitude and a more positive perception by men of their role in pregnancy and prenatal care. One of the explanations for this might come from past public policies towards maternal leave, but age and social factors are also relevant. Consequently, and differently from the USA, “support” is not the dominant role men perceive themselves in in relation with pregnancy, with “keeping up” and “being present” reaching much higher figures than in the case of the US sample. The intention to “take actions” depicted by most of the Portuguese sample might explain this more active and positive understanding of their role. Still on this, one should also note the higher figures for health literacy depicted by the Portuguese sample.

In the case of the Portuguese sample, men do not perceive their role has being purely complementary from an instrumental and emotional point of view, and are willing to be more engaged. Considering this and on a more instrumental note, needs and support may be easier to identify for men, as suggested by their greater interest in financial preparation and national health system related information, and could be an easier way to introduce this topic to men.

Portuguese results for the qualitative testing of the developed pilot have shown that although men, for the most part, are willing to be more involved in the pregnancy process, they

also are aware of the weaknesses of existing communication strategies since they acknowledge that most existing specific materials (i.e National Health System communication materials) are not developed for them and are issued only considering the needs of their pregnant partners. Complementarily, they also sense existing mentalities and social conditions present a barrier to men greater involvement with pregnancy and prenatal care.

The will to be more involved led, in the case of the Portuguese sample, to the replacement of the word "support" by the word "monitoring", described as the ability "to be noticed", "to work as a companion", "to feel along with the women the whole process", core assumptions that indicate perceptions and attitudes very different from those depicted by American men. Although Portugal still is a society marked by a strong sexist bias, respondents felt, in most cases (85%), that their way of interacting and being involved in the pregnancy process is very different from that of previous generations, with their role and level of involvement being much stronger and relevant nowadays. This may indicate a think changes in in the future parents' mind-set and a clear need to adapt existing communication strategies and natality policies to this perceptions, attitudes and willingness to be more actively involved.

In relation to the application, the clear majority considered it to have a high-quality design, however almost all highlighted the lack of interactivity and low response rates that derived from the amount of information provided. Once again, this request for greater levels of interactivity and response based tailored information, indicates a strong desire for greater involvement that parents or future parents feel. Similarly, to what happens in the case of other web-based applications already available in the market targeting future mothers, the possibility the application could provide support and enhance pregnancy monitoring is considered a key feature for this type of application. Similarly, the USA results reveal a very positive reaction towards the developed and tested application and a positive understanding of its future potential.

Discussed results show us that increasing men's involvement in prenatal health is a promising approach to improving maternal and child health outcomes. A preliminary investigation suggested potential in using e-health as an avenue to engage men in this issue (Author, 2015), and this study built on that with targeted content developed specifically for men.

The evaluation of the e-health content used for this study was extremely favourable. Some criticism that aroused was a function of the pilot phase of the research. With this approach validated in this pilot study and the verification that results, namely on what concerns perceptions and attitudes towards pregnancy and prenatal care, vary between different geographical and cultural settings, while positive attitudes towards e-health are similar; clear next steps include both the further development of the application, with the inclusion of more interactive tools such as a financial planning calculator or "push" content that could notify a user of a developing baby's growth; but also the testing of this type of interventions with larger samples, following a comparative approach like the one that was used here, whereby similar interventions are used in different settings with different backgrounds. We consider this cross-cultural and international approach to further evidence the ability e-health based interventions must improve the quality and relevance of health care and health communication.

The primary limitation of this investigation was a small convenience sample, so a broader evaluation of this content and approach is necessary following a comparative approach as the one that was used. But the overwhelming positive reactions of participants – both to the health issue, content, and design of the intervention – are promising and there clearly is room for further developments and testing.

Improving maternal and child health outcomes is a priority for many countries and international health organizations. Engaging men in the topic is a promising, but largely underutilized, approach. Effectively targeting men with well-designed e-health interventions is one promising approach to drive improved maternal and child health outcomes. Following a cross-cultural and international approach like the one that was used in this study clearly reinforces the research relevance and its future impact.

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