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Mapping the Health Communication Infrastructure in Rural Senegal: an Assessment to Support Cervical Cancer Screening

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Cervical cancer is the leading cause of women's cancer deaths in Senegal, but few medical personnel are trained to perform cervical cancer screening. In rural areas, the situation is worse. To remedy this, a collaborative of researchers and stakeholders trained local health-care workers in cervical cancer screening through the "training-of-trainers" method. However, lack of cancer screening knowledge, barriers, and a hard-to-reach population may jeopardize the collaborative's efforts. The purpose of this study is to map the health communication infrastructure by applying communication infrastructure theory to assess general health and cancer screening knowledge, as well as attitudes and barriers toward screening. Results from focus groups and interviews show that women have minimal knowledge of cervical cancer. Moreover, health workers report detrimental attitudes in menopausal women. Our findings identified routes for information dissemination and attitude change including community radio and local health talks.

Keywords: Health Communication; Communication Infrastructure Theory; Cervical Cancer Screening; Rural Senegal; Focus Groups

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Among the diseases that afflict the developing world, cervical cancer is the leading cause of cancer deaths for women (Anorlu, 2008; Guilfoyle, Franco, & Gorin, 2007; Masch et al., 2011; World Health Organization [WHO], 2012). The prevalence and mortality of cervical cancer overwhelmingly affect sub-Saharan Africa compared to other regions (WHO, 2012), and Senegal is no exception (WHO/Institut Català d'Oncologia Information Centre on HPV and Cervical Cancer, 2014). Current estimates for Senegal indicate that every year 1,197 women are diagnosed with cervical cancer and 795 die from the disease. This translates into a rate of 25.5 age-adjusted fatalities/100,000 women, a rate that is 2.4 in the USA (Singh, Azuine, & Siahpush, 2012). Most cervical cancers are caused by the human papilloma virus (HPV) infection (Mays et al., 2000), and can be prevented with proper, timely screening—and subsequent therapy if needed (American College of Obstetricians and Gynecologists, 2012). However, low-resource countries like Senegal lack the infrastructure for the prevention and treatment of cervical cancer that are typical of Western countries (Anorlu, 2008). Indeed, until recently, no well-established cervical cancer control program existed outside of the capital city of Dakar, leaving many women in rural areas with no access to cervical cancer prevention services (WHO/ICO Information Centre on HPV and Cervical Cancer, 2014).

There are methods of cervical cancer screening that may be used in low-resource settings. In particular, visual inspection of the cervix after acetic acid application—commonly known as VIA—has gained popularity as an easy, low-cost alternative to traditional methods like Pap smears (Masch et al., 2011). A collaborative led by Peace Care, a US nongovernmental organization, recently implemented a skill-transfer initiative working with locally based stakeholders and engaging Peace Corps Senegal as a liaison. The initiative uses the "training-of-trainers" model (Hiner et al., 2009; Schaefer et al., 2000), and through task shifting emphasizes human capacity building by ensuring that all pertinent health-care workers in rural Senegal will be VIA-trained and able to perform cervical cancer screenings.

Despite this laudable initiative, a profound challenge lies in two overlooked aspects. First, compounding the prevalence of cervical cancer and inadequate screening programs, basic knowledge of cancer is limited (Anorlu, 2008; Sub-Saharan African Cervical Cancer Working Group, 2013). For instance, in some local Senegalese languages, including Pulaar and Malinke, the word cancer does not exist. Therefore, a communication plan that improves knowledge and raises awareness of cervical cancer is essential to a cervical cancer screening program. Second, reaching some of the target women may be challenging due to transportation (Oswalt, 1977), low literacy levels (UNICEF, 2013), and religious constraints (Wittmann, 2008), which present barriers for health behavior in general (Ball-Rokeach & Wilkin, 2009; Wilkin & Ball-Rokeach, 2006).

The purpose of this study is to understand and map the health communication practices of rural Senegalese women, assess the current state of cervical cancer screening knowledge and attitudes toward the disease, and evaluate potential barriers to screening. Communication infrastructure theory (CIT) serves as the theoretical framework. The theory involves the study of individual's storytelling systems

embedded within their communication context (Ball-Rokeach, Kim, & Matei, 2001; Wilkin & Ball-Rokeach, 2006; Wilkin, Stringer, O'Quin, Montgomery, & Hunt, 2011). Storytelling is conceived as a process in which structural location (the area wherein and how individuals reside) and belonging (understood as attachment to a residential area supported by daily exchange behaviors) are intertwined (Ball-Rokeach et al., 2001). Thus, the researcher must look at the specific communication practices of each microenvironment (e.g., women within a village, older and younger women) in order to find prevailing health narratives from different stakeholders. We undertake a novel approach by contrasting and comparing cervical cancer screening information and perceptions across micro-level dimensions (e.g., gender, age, health worker groups), with the purpose of obtaining a more complete picture of the storytelling network.

A second contribution of this study is the application of CIT to the African context, which allows researchers to evaluate the personal networks, local resources, geographic constraints, and media outlets that impact information dissemination and behavior change in low-resource countries. With some exceptions (see Wilkin, Ball-Rokeach, Matsaganis, & Cheong, 2007), most of the literature seeking to achieve health goals in low-resource countries ignores the communication infrastructure that operates and dictates the extent to which these health goals may succeed. This drawback has also been observed in health systems research in low-income countries, which typically adapts to each context/country. These shortcomings may derive from using Western patterns when studying non-Western contexts (Hallin & Mancini, 2011). In contrast, CIT allows researchers to examine low-resource countries on their own terms.

Communication Infrastructure Theory

Researchers working under the logic of CIT begin from the premise that the communication infrastructure of a community is the fundamental communication system relied upon for the informational needs in individuals' daily lives. "A communication infrastructure is a storytelling system set in its communication action context" (Ball-Rokeach et al., 2001, p. 396). CIT consists of two elements: (1) the storytelling network and (2) the communication action context enabling or constraining neighborhood storytelling (for details of CIT, see Ball-Rokeach et al., 2001). The concept of communication infrastructure was developed from media system dependency theory (Ball-Rokeach, 1985, 1988), but CIT is broader in considering the interplay between interpersonal and mediated storytelling systems as well as their contexts (Ball-Rokeach et al., 2001).

The core component of CIT is the storytelling network, which Ball-Rokeach and colleagues conceive as a communication process that residents in a community experience when they go from living in a place to being members of a neighborhood or vicinity. It encompasses macro-, meso- and micro-level actors, and is the process of meaningful socialization in a vicinity (micro-level), learning and exchanging pertinent information of that vicinity, like gossip, the local school, the local market,

or the local well (Ball-Rokeach et al., 2001). Yet, the storytelling network also includes the media, mass (macro-level) or local (meso-level), mainstream or geo-ethnic, old or new (Wilkin & Ball-Rokeach, 2006, see Figure 2, p. 307 for a comprehensive depiction of the storytelling network).

Encompassing the storytelling network, the communication action context is the enabling agent; it determines—along a dimension of openness—whether the discourse preconditions for neighborhood storytelling will flourish. More specifically, an open context fosters communication exchanges among community members, whereas a closed context discourages them. In general, though, contexts are not all-or-nothing in terms of openness; any particular context will have varying elements of openness, and some may become open or closed depending on the case. For instance, transportation that relies on paved road infrastructure, in which lanes are signaled, lit, allow for smooth transportation, and are accessible and affordable to individuals will—*ceteris paribus*—enable neighborhood storytelling. In such an example, transportation would constitute an open context. Now, if transportation is scarce and in disrepair, people have limited access, and some may even not be able to go beyond the limits of the village due to severe weather conditions, then—*ceteris paribus*—transportation will constrain neighborhood storytelling and it would be considered a closed context.

Additional examples of communication action contexts are: residential areas as defined by shared conventions, such as streets, geographic labels, ethnicity, immigration, age of the population, or values. In general, communication infra-structures that facilitate communication foster the emergence of storytelling. In turn, widespread storytelling establishes a foundation from which neighborhood belonging may emerge (Ball-Rokeach et al., 2001).

The storytelling network can act as a dissemination device for health information, but, to achieve this goal, it is essential that health education agents become an active part of the local storytelling network (Wilkin & Ball-Rokeach, 2006). Thus, identifying the specific elements comprising the target population storytelling network is key. When residents experience a strong integration into their storytelling network, higher levels of neighborhood belonging (Ball-Rokeach et al., 2001), as well as civic participation, and collective efficacy are reported (Kim & Ball-Rokeach, 2006). These effects may well translate into higher cervical cancer screening incidence via word of mouth, community radio advertising, health talks, or strengthening doctor–patient communication. Therefore, diagnosing the nature of the storytelling network may be valuable for practitioners aiming at screening women for cervical cancer. By identifying and mobilizing the operative elements of the neighborhood storytelling network and communication action context, health practitioners may be able to deliver screening services to hard-to-reach populations (Broad et al., 2013).

The present research applies CIT to explore the informational role of existing health communication channels for cervical cancer screening in Senegal. We look at actors (individuals, media outlets) from the three levels of the storytelling network (micro-, meso-, and macro-level), thus encompassing all health relationships

(Wilkin & Ball-Rokeach, 2006). Eventually, once the communication infrastructure is mapped, we aim at determining the most efficient manner to reach rural Senegalese women with health messages regarding cervical cancer screening (Ball-Rokeach & Wilkin, 2009).

Communication Infrastructure in Rural Senegal

With a population of nearly 13 million (US CIA, 2012), almost 60% of Senegalese people live in rural areas (US Department of State Bureau of African Affairs, 2011), but the transportation infrastructure is scarce and in dire shape. In 2010, there were only 342,000 landlines, though cell phones soared at over eight million (US CIA, 2012). Although it may seem as if every adult owns a cell phone, this is far from true; cell phones remain an urban phenomenon, most users only receive calls, and calls tend to be short due to cost (Guèye, 2003). Text messaging is free, however its usage is limited by the population's low literacy rate. Only 39% of the population—but 29% of women—are able to read and write (US CIA, 2012). Given literacy constraints, Senegalese communication is primarily oral (Guèye, 2003), which is similar to hard-to-reach populations in the USA (Ball-Rokeach et al., 2001; Wilkin & Ball-Rokeach, 2006). Senegal's oral tradition is arguably rooted in its linguistic diversity: The country is home to 11 official languages and as many as 36 minority languages (Trudell & Klaas, 2010).

In addition to oral communication, the mass media have a reasonable presence, especially television. However, conflicts within the political and media realms (Wittmann, 2008) and a lack of effective media regulation have limited the freedom of the press, resulting in increased reliance on interpersonal communication as a credible way of receiving and exchanging information. Nonetheless, community radio has filled the vacuum left by a weak free press, playing a strong communicative role in Senegal. As of 2007, there were 12 commercial and 44 community radio stations running in the country. A national survey demonstrated that an overwhelming percentage of respondents cited radio as the most reliable and educative media source (Wittmann, 2008)—arguably a critical piece of the storytelling network when it comes to health (Wilkin & Ball-Rokeach, 2006). Nevertheless, Wittmann's survey was limited in its rural reach because only a third of the respondents were drawn from rural areas and they were all within a small radius.

Rural Senegal's Health Communication Infrastructure

Studies suggest that West African women rely on their mothers and other female relatives as primary sources of health information, including reproductive and sexual health, and family planning (Iliyasu, Abubakar, Aliyu, & Galadanci, 2012; Ngom, 1994). However, mothers often possess inaccurate or limited knowledge about reproductive health and are unwilling to discuss that knowledge—including sexual behavior—with their daughters (Iliyasu et al., 2012). Consequently, most women in Senegal initially learn about contraception informally through gossip from other

women and everyday conversation (Ngom, 1994). This practice may result in more negative perceptions of family planning compared to women who receive their information from formal sources like health facilities. Indeed, informal-only networks are prone to carrying misperceptions and strong attitudes against contraception.[1] Conversely, information from formal sources is mostly accurate. Hence, women's reliance on oral communication in the micro-level storytelling network can be a powerful tool for spreading health information, but it can reproduce negative perceptions.

At the meso- and macro-level, radio has been particularly important for the dissemination of and mobilization for better health. For instance, the government used radio to publicly recognize and support community-based and civic organizations actively fighting HIV/AIDS through dialog and community organizing (Diop, 2000). Additionally, this campaign brought more positive and lower-risk HIV/AIDS behavior in rural Senegal. Television and radio, in addition to local health centers, are frequent sources of health information for women, resulting in more favorable attitudes towards condom use, a reduced number of casual partners, and a greater awareness of the risk for HIV/AIDS (Lagarde et al., 2000). Finally, in addition to mass media sources, posters, visual aids, and publicity leaflets have been effective in increasing knowledge and spreading awareness of schistosomiasis, a parasitic infection that can be deadly (Garba, Touré, Dembelé, Bosque-Oliva, & Fenwick, 2006).

While community radio presents opportunities for initiating community health discussions that target women, formal health talks, led or facilitated by knowledge-able health workers, are a successful, cost-effective means of distributing high-quality health information. This is especially true for remote areas where transportation is limited and most women are illiterate (Oswalt, 1977). Many times, these health talks are announced on community radio, thus suggesting openness in the storytelling network (Ball-Rokeach et al., 2001).

Finally, social factors that can serve as barriers or catalysts for executing a successful health campaign, like religion, need to be considered as part of the communication infrastructure. As actors in the storytelling network, many religious leaders and organizations maintain an active political role in the country and have exerted their influence by mobilizing and bringing community awareness to health issues within Senegal (Wittmann, 2008). In turn, these actors influence the broader cultural climate—the communication action context—including perceived religious attitudes. The process can also flow in the opposite direction. For instance, individuals who viewed religion as being important felt a lower threat of HIV/AIDS and had a lower intention to change behaviors that would protect them from HIV/AIDS as a consequence (Lagarde et al., 2000).

Precisely because of the central role of religious actors, in order to bring about positive change, researchers advocate for stronger involvement of religious authorities in HIV/STD prevention as a way to encourage safer sexual behavior and lower disease risk. For example, religious organizations, such as Jamra, an Islamic NGO, and community spiritual leaders like imams, have played a catalyzing role in leading talks and mobilizing communities to engage in health change (Diop, 2000). It is

therefore likely that religious organizations and religious leaders may be able to play a strategic role in cervical cancer screening campaigns as well.

Although Senegal enjoys universal health care, it has limited resources (Witter, Armar-Klemesu, & Dieng, 2008), especially in rural and remote areas. For instance, while obstetric care (deliveries and cesarean sections) is free, general medical costs, such as hospitalization or the cost of medicines or drugs, prevent many individuals from seeking medical care. Additional barriers limiting access to care include long distances to health posts, lack of reliable transportation, as well as the absence of trained health-care workers, equipment, and infrastructure in some rural areas (Witter et al., 2008). A report from the Senegal Ministry of Health recognized inadequate training of health-care providers and a lack of motivation to work in rural regions as factors contributing to ineffective health service delivery and poor organization in the rural health sector (Heyen-Perschon, 2005). Most health workers, with the exception of trained birth attendants, are educated in Dakar—or internationally—and then sent to sites throughout Senegal. These health workers oftentimes do not speak the local language, which can create social and linguistic barriers with the local population (Crawford, 1999; Peace Corps Senegal, 2011).

The assessment of the literature offers a glimpse of the health communication infrastructure, but only few details of what the communication infrastructure is for cervical cancer screening—or whether there are other potential influencing factors that may not have been accounted for by previous scholars working in the region. In particular, the role of the mass media (the macro-level in the neighborhood storytelling), community-based organizations (the meso-level), and interpersonal networks (the micro-level) for inciting changes in health behavior are poorly addressed. We also suspect that there may be elements constricting the openness in the communication action context like prejudices, gendered and religious attitudes, or transportation barriers. Even though Wittmann (2008) conducted surveys, his sample was not diverse and it was highly urban, so little is known about the communicative practices of rural areas, especially remote ones where transportation may be impossible in certain times of the year. Given these considerations, the following research questions are proposed:

> RQ1: How do rural Senegalese usually communicate about health in the storytelling network?
> RQ2: What is the level of information about cervical cancer screening among rural Senegalese?
> RQ3: What are rural Senegalese women's influencing factors toward cervical cancer screening in the communication infrastructure?

Methods

Rationale

Peace Care organized a collaborative group with organizations and stakeholders from a rural Senegalese region—the Saraya District in Kedougou—aided by Peace Corps

Senegal as liaison, and staff from the University of Illinois at Chicago (UIC). Hence, this collaborative engages not only scholars, but community-based organizations in Senegal and the USA, and local stakeholders, which is uncommon in scholarly research (Broad et al., 2013). The Saraya District, part of the southeastern region of Kedougou, was chosen due to current lack of cervical cancer prevention services, the identification of cervical cancer as a local health priority, absence of a strategic plan to address this issue, and the presence of highly motivated and dynamic health leadership and workforce. The goal of the collaborative is to have all women aged 30–50 years VIA screened through the training-of-trainers skill transfer (Hiner et al., 2009; Schaefer et al., 2000).

UIC faculty traveled to the Saraya District in 2011 to instruct local health-care workers in VIA screening. Initially, five health workers were provided technical and educational methodology instruction through a training-of-trainers approach (Hiner et al., 2009; Schaefer et al., 2000). Using the training-of-trainers model ensures local relevance and application, is less expensive than using outside experts, and assures the development of reproductive capacity (Hiner et al., 2009; Schaefer et al., 2000).

The UIC faculty are certified to conduct and teach VIA screening methods in the USA and have experience teaching VIA in similar settings globally. Peace Corps volunteers[2] provided eight hours of instruction to the visiting university team on intercultural competence and local language instruction. The training-of-trainers course was taught in English, with French consecutive interpretation by US personnel with dual fluency.[3] The five health-care workers designated as "Candidate Master Trainers" then trained other health-care personnel in VIA through five-day courses involving 32 hours of didactics and 10 hours of clinical application. The language at these trainings was French with local language consecutive interpretation aided by Peace Corps volunteers. At the end of 2011, 34 local health-care providers had been trained in three separate training sessions. A subsequent trip to train more personnel in February 2012 also included communication researchers to map the communication infrastructure and ensure that the new screening services would be utilized. To date, 63 individuals have been trained, thus providing access to cervical cancer screening services for over 9,000 women throughout the Kedougou Region.

To perform VIA, the provider uses acetic acid in a concentration between 3% and 5% (commonly known as white cooking vinegar), which is then applied to the cervix. Shortly after application, the cervix can be visually inspected with the naked eye (Jeronimo et al., 2005), with abnormal cells turning white (Holschneider, 2007). Abnormal cells are precancerous lesions that can be easily treated with cryotherapy— a low-cost, ablative technique that uses nitrogen or carbon dioxide gas to freeze precancerous lesions in the cervix. VIA accuracy studies have yielded a range of sensitivity and specificity values spanning from approximately 60–90%, which is similar to that observed for other tests, including Pap smears (Gaffikin, McGrath, Arbyn, & Blumenthal, 2007). VIA is also a low-cost, minimal-supplies-needed screening method without secondary effects.

Participants and Procedure

We used focus groups and interviews to answer the research questions posed. Focus groups are an ideal tool to gather information at this stage of the project because they can help capture knowledge and traditional beliefs related to illnesses (Duke, Gordon-Sosby, Reynolds, & Gram, 1994; Flaskerud & Rush, 1989; Hoppe, Wells, Wilsdon, Gillmore, & Morrison, 1994), as well as the health storytelling network (Kim, Jung, & Ball-Rokeach, 2006; Wilkin & Ball-Rokeach, 2006). Individual interviews were conducted with key personnel (community radio director and village main chief).

Triangulation of focus group and interview data is a common methodology (Kitzinger, 1995), especially for hard-to-reach populations (Wilkin et al., 2011). Altogether, 12 focus groups and 2 interviews with key informants were conducted, totaling 76 people (see Table 1 for details). Each focus group had an average of six participants (with a mode of three participants). Focus groups and interviews were held at venues where participants felt comfortable, such as their residence, where they worked, where they socialized, or on hospital grounds.

When sampling participants for the focus groups, the first inclusion criterion was that participants within a group had to be relatively homogeneous to minimize power inequalities (Wilkinson, 1988). The second inclusion criterion was that participants needed to be 18 years or older. Data were gathered from women, men, nurses, midwives, and matrons (birth attendants). Recruitment was done informally, while wandering in towns, at the city center, or surrounding the project activities, and was arranged through Peace Corps Senegal. Institutional Review Board approval was obtained from the host university in the USA.

Before each session, participants were briefed about their rights, privacy concerns, and confidentiality. Those who agreed to participate gave oral informed consent to be

Table 1 Description of focus groups and interviews.

Venue	Participants	N
Maternity ward, Kedougou Hospital	Female skilled birth attendants and one midwife	3
Training facility, Kedougou Hospital	Female midwife trainers	2
Training facility, Kedougou Hospital	Female midwife trainees	3
Training facility, Kedougou Hospital	Male nurses	3
Health post, Bandafassi	Women (some with babies)	3
Health post, Bandafassi	Women (mid-age to older)	3
On the street, Bandafassi	Men (mid-age to older)	8
Private residence, Saraya	Women (young to old)	3
Saraya Radio, Saraya	Male radio director	1
At the village, Tubakuta	Women (mid-age to old)	5
At the village, Saraya	Women (50% with babies, rest older)	30
Village chief's residence, Saraya	Male village chief	1
On the street, Saraya	Older men: imam, village chief, neighborhood chief	7
Near the market, Saraya	Women (three older, one younger)	4
Total		76

Note: *N* = 1 are interviews.

interviewed. The first author assumed the role of facilitator in all of the focus groups and one interview; another author was the facilitator for the other interview. Two researchers took notes during all talks, but the talks were not taped out of concern for power inequalities. All focus groups and interviews were conducted in English and interpreted consecutively into French, Pulaar, or Malinke by Peace Corps volunteers. The information from participants was then interpreted back to English so that the researchers could record the responses. The particular language hinged on the location and language skills of the interviewees. Focus groups and interviews varied in length from 15 to 60 minutes, with the interviews lasting a bit longer. Lead questions for the focus groups and interviews are in the Appendix.

Analysis

To meet trustworthiness criteria in the analysis, the researchers conducted daily peer debriefings and referential adequacy. Peer debriefings provide an external check on the inquiry process by involving a researcher who was not present during focus groups, in this case other Peace Corps volunteers. Referential adequacy refers to checking preliminary findings and interpretations (in the field) against archived raw data (Lincoln & Guba, 1985).

During post-trip analysis, additional researchers who had not been in the field provided supplementary assessments. Data collected from the interviews were transcribed into a data matrix and analyzed for patterns, themes, and specific information to answer the research questions. For each research question, themes were extracted according to frequency and importance (how much elaboration the topic or question obtained beyond yes/no answers), similar to the methods used in grounded theory (Charmaz & Mitchell, 2001; Strauss & Corbin, 1998).

Results reflect both on majority trends in the responses as well as considerations regarding deviations from these majority responses. The rationale about the reasons for the deviations was also examined. Likewise, we emphasized the evaluation of differences, if any, between participant groups, especially target women and health-care workers, along with gender dissimilarities. Finally, communication context was of importance regarding time, place, culture, and situation of the focus groups.

Results

Learning about Health

Largely, women learn about health issues through face-to-face interpersonal communication (micro-level storytelling network). Friends seem to be a reliable network of influence, but so are physicians, especially male ones given that Senegal is a patriarchal society. Confirming previous results in the literature, women report that cell phone use is limited and that most of them do not own one. While receiving messages is free, one still has to afford purchasing the unit, be able to recharge it, and understand the messages, which is problematic when most of the women are

illiterate. Among our participants, those who had cellular phones were some of the health-care workers and men, and were used to briefly receive calls.

Learning about health beyond the close network is restricted by the limitations of mass media. Because Senegal has a low per capita income and an unreliable electrical infrastructure, Internet and television are not widely available. For instance, only one member among our participants (a matron) mentioned watching entertainment media on television (macro-level). Nevertheless, she mentioned that Senegalese soap operas and other television shows do not typically promote health messages by incorporating health themes within their story lines, unlike Western media. Thus, embedding health messages into such entertainment media may not be an effective way to reach rural women.

Community radio is a widespread medium within the storytelling network (meso-level). Focus group and interview data reveal that everyone listens to the community radio at night, when electricity is available in rural areas (for broadcasting and listening). Almost all villages receive the signal from the local community radio. Individuals listen to receive information on a wide range of topics, including health—primarily in their local language. Further, people also listen to the radio to communicate with others in the form of personal messages during the community hour. The director of the Saraya community radio explains:

> [The] program is totally made by the population (whatever the people want, they make). Young people, women's group, older people, all ethnic groups are represented ... [it] cover[s] about a 70 kilometer range (almost the whole Kedougou region). People will go to great lengths to get the signal because it speaks to them.

Thus, community radio appears to be a valuable asset in the community, not only because it allows communication among individuals in remote areas with limited transportation access, but also because it gives people a voice within their community. Finally, village health talks, given by health experts in the area to a group of residents, are also a way in which people learn about health matters via listening, asking questions, and talking in general.

In sum, participants mostly use the micro- and meso-levels of the storytelling network to learn about health. Further, there seemed to be little to no discrepancy between health-care workers and the target population (contrasting groups at the micro-level). To disseminate messages about health, radio and health talks could be critical points of access into interpersonal networks, which are the fastest way to spread messages in rural Senegal. Further, none of these communication routes involve high costs, making them even more attractive.

Information about Cervical Cancer Screening

In the communities where the collaborative has conducted trainings, mass screenings, and current regular screenings during women's health visits, health-care workers state that women knew about cervical cancer but had limited information. Women in our

focus groups confirmed that they had not heard about cervical cancer before the collaborative efforts, but most now know about it and are aware of its importance. However, understanding of specific cervical cancer incidence, its screening, risk factors, and physiology are still limited among the target population, confirming health-care workers' claims and signaling further work to be done to close this gap. All health-care workers interviewed were aware of basic cervical cancer facts. For instance, a midwife, showing a solid understanding of the disease, explained that:

> [Cervical cancer] affects women who are sexually active and have children. It is a pathology of the cervix that affects women over 30. It is a fatal disease if you are not tested (screened). It takes time to develop and as time goes on the number of women getting it is increasing. It can be prevented by doing VIA. [Women] between 45–55 they are still having kids because husbands don't want wives using family planning. As long as they are on their periods they are having children.

An added obstacle is that there is no word for cancer in any of the local languages used in the Kedougou region (Pulaar and Malinke). Nevertheless, some locals are able to express the concept of cancer, thus circumventing this limitation. For instance, one woman referred to it as "the big hurt." Moreover, some health-care workers described cervical cancer to patients as a "disease of the womb." Similar terminology usage has also been found in South Africa (Bradely, Risi, & Denny, 2004). Hence, although language could be a restrictive element in the communication action context, participants found ways to circumvent the lack of the word "cancer" in their language.

Lastly, many health-care workers insisted on village health talks as a dissemination method. They further suggested that the information given to women should be clear, pictorial, and vivid, especially given the difficulty of articulating cervical cancer via language. One matron mentioned:

> After they are shown images [of] cancer and the cervix, they [would] understand that this is a real issue, they would accept the test.

Influencing Factors toward Cervical Cancer Screening

When communicating the importance of cervical cancer screening to the target population, attitudes and other barriers may interfere with this process. In our case, once the effects of cervical cancer were clearly presented and the importance of VIA screening was clarified and understood, Senegalese women became concerned about the importance of protecting their health. Yet, when faced with the concept of screening, multiple women in a focus group voiced concerns about physical discomfort and access to resources:

> If we knew they're not going to take blood […]. If they won't give you a shot […]. If we won't have to pay money […]. If we will get medicine right away that will treat it […]. If we won't have to pay for it.[4]

In light of these findings, cervical cancer screening campaigns should be framed as critical to their health and be clear about the fact that VIA will either be free or inexpensive, does not involve a shot or drawing blood, and does not hurt.

Health-care workers voiced additional attitudes that could hinder widespread VIA screenings and that were not expressed during focus groups by the target population. The most important concern is the universal religious belief that there is little one can do to counter fate or God's will, like getting cervical cancer. Still, despite women sharing this religious belief, health-care workers indicated that framing VIA screening as relevant to women's fertility might make the screening argument prevail over fate.

For menopausal women, though, the fertility frame is not effective. Moreover, older women see fate as more important than science. On top of this, the age difference between patient and health-care worker represents another barrier. In many cases, the health-care worker performing the procedure is a young professional, but older women tend not to like younger health-care workers giving them instructions. In response to this dilemma, a male nurse suggested that female community leaders might be part of the solution. He explained the benefit of these influential women in the following way:

> Women leaders are good for convincing. Matrons are also good to this end; also care group for women—[we should] talk with them. Use women to [convince] women: matrons, women's groups. One nurse has started a caregiver group to talk about women's issues within a women's group.

Further, some village chiefs (older men in a position of power in the village) who were interviewed claimed that their position within the community might also give them convincing power over these older women.

Finally, two barriers affecting women of all ages still prevail. First, some women claimed to need their husbands' permission to get screened. The researchers also observed this at a mass screening in a village, and health-care workers confirmed it. In addition, some *male* health workers perceived the need for permission from husbands as problematic. One male nurse made the following observation:

> [It is] difficult for males nurses to get women to health posts. It is the men who decide for women; they need to ask for permission.

However, there was no strong indication that husbands whom we interviewed had a problem with screening; on the contrary, they would encourage their wives to get screened. It may be a perception rather than an actual issue. Lastly, some health personnel observed that women offer this reason as a polite way to decline screening. Further examination in this area will be necessary in future studies.

A second barrier is health workers' lack of local language acquisition. Many of the health workers with training or education beyond six months are trained in Dakar or overseas, where Senegalese regional languages are not used or studied. In addition, health workers are typically posted to rural areas for short (1–3 year) assignments.

Given this short time period and a lack of local language training programs, health workers are often not proficient in regional languages. Health workers speak Wolof or French, languages the majority of rural Senegalese women do not understand.

Discussion

Cervical cancer is the most deadly cancer among Senegalese women, yet the infrastructure to prevent it through screening is missing, especially in rural areas. With the collaborative training-of-trainers VIA screening initiative comes the roadblock of reaching the target population. This research, therefore, aimed at understanding the state of health communication practices in rural Senegal, evaluating cervical cancer screening knowledge, and examining influencing factors toward screening using CIT (Ball-Rokeach et al., 2001) as a theoretical framework.

Our results indicate that, in areas where the collaborative led screenings, women were aware of the disease and those screened knew about it. In the areas where the collaborative had not fielded, women had no knowledge of cervical cancer or its screening. Therefore, it seems that communicating the need for screening in the local language, with clear terms, and by somebody local suffices for most women to understand the problem. To spread these critical messages about cervical cancer screening, community radio and health talks, combined with the dissemination of information through interpersonal networks, were found to be the most effective routes.

Scholars working with CIT to address health communication needs express the urgency to involve ethnic or local stakeholders in the storytelling network, such as community radio and community organizations (Wilkin & Ball-Rokeach, 2006; Wilkin et al., 2011)—the meso-level of the storytelling network. In turn, when residents are strongly connected to each other and to these local entities, knowledge about health issues travels faster and reaches more individuals (Wilkin, Moran, Ball-Rokeach, Gonzalez, & Kim, 2010). Our results suggest that those connections exist and should be promoted in prospective cervical cancer screening campaigns. In areas where residents are even harder to reach, for instance in villages where they remain isolated for part of the year due to road disrepair, CIT emphasizes the role of health fairs (Wilkin et al., 2011). In rural Senegal, health talks have a strong potential and have been used successfully to inform and discuss health issues (Iliyasu et al., 2012; Ngom, 1994; Oswalt, 1977).

Specifically, we found four ways in which community radio and health talks can stimulate the meso–micro linkages to encourage screening. First, community radio can be critical to announce upcoming health talks in the area. Community radio broadcasts in the many local languages, is listened to by virtually anyone, and offers the opportunity to deliver messages timely. Second, community radio is also used for interpersonal communication. The community hour offers the chance for residents to connect with friends or family that live far enough to not be reached face-to-face. Third, health talks deliver accurate, trustworthy information that can then circulate in the micro storytelling network. Finally, interpersonal networks connect residents

at the micro-level that may have not heard the message in the community radio or health talk. The synergy and dynamism of these levels create a wide web that allows messages to disseminate relatively fast.

At the macro-level, opportunities are more challenging. We are not aware of any organization trying to demand stronger press freedom for the mass media, but they may exist. Even if improved, the mass media still present challenges: (1) the main languages of mass media broadcasts are Wolof and French, which the rural villagers do not understand; (2) not everyone can afford a television or to buy daily newspapers; (3) one still needs to have access to and afford electricity to watch TV since electricity does not reach the entire nation, nor does it provide service 24/7; finally, (4) newspapers require literacy, and only about 40% of the population can read and write. Given these constraints, the meso-level is better suited to disseminate mass information.

In the communication action context, several elements were noted that constricted its openness. The most important are the religious belief in God's will, a patriarchal society, education and wealth differences between caregiver and patient, health-care worker being considerably younger than the patient, and challenges to learn the local language by health-care workers. One avenue for countering some of these concerns is stressing the importance of screening for the good of women's fertility. This is a persuasive tool for women of childbearing age that can counter fatalistic beliefs about illness and death.

Our results should be seen in light of the scant literature about cervical cancer screening and its limiting factors for rural women in Senegal. Thanks to the variety of focus groups conducted, confidence in our results is boosted. We were able to contrast and compare stories between women and men, health worker and not, young and old, and village chiefs and ordinary citizens—and to find potential solutions. Likewise, the versatility of CIT to be applied in the African context is evidenced. Most of the research using CIT has been applied to ethnic or immigrant communities within the USA. Therefore, this project offers an opportunity to bring the CIT approach into new international arenas, demonstrating both the utility of the CIT framework (the levels in the neighborhood storytelling as well as the communication action context), and its promising adaptability in diverse environments (such as other regions in sub-Saharan Africa and potentially elsewhere).

Recommendations for Prospective Cervical Cancer Screening Campaigns

The bulk of this study is concerned with understanding and mapping the health communication infrastructure in rural Senegal. We have emphasized this aspect, rather than message design to persuade women of childbearing age, because without an understanding of the communication infrastructure, messages may never reach their intended audience. Thus, taking on the task to craft tailored messages ought to happen *after* we know how women communicate about health, how we can reach them in rural areas, and how we can communicate the concept of cervical cancer and its screening to a population that lacks the vocabulary to grasp the concept.

Accordingly, the next action item is to propose tailored health messages so that they are culturally relevant to the target community in Kedougou (Wilkin & Ball-Rokeach, 2006). Health messages should contain health stories providing the necessary information for individuals to problem solve—i.e., whether they are at risk, and the steps to undertake in order to prevent and/or treat a health problem (Roth, 1996; Wilkin & Ball-Rokeach, 2006).

In the case of cervical cancer, this is relatively straightforward. All sexually active women in their reproductive years are potentially at risk. The window goes from reproductive age through mid-60s, however 30–50 is the target population the collaborative chose based on limited resources. In order to communicate this risk, framing the issue of cervical cancer screening as beneficial to women's fertility would potentially persuade all women in their childbearing years. For menopausal women, though, a fertility frame would not be persuasive. Moreover, women in this age group are not open to being treated by health-care workers younger than themselves. In these cases, elder male and female leaders in the community may be able to exert some persuasive power. Finally, messages need to be in the local language, and rely on visual information such as pamphlets, posters, or slides. Visuals can illustrate with one look what untreated precancerous lesions can become and how safe, easy, and quick a screening can be. Health talks are a powerful vehicle to transmit these visuals, which the radio cannot do.

Because, in the case of Senegal, the meso-level is best suited for disseminating mass information, reliance on health talks and community radio is crucial. Additionally, scholars, practitioners, and funding agencies need to ensure that the information circulating in the storytelling network is accurate and valid. Trusting community radio and formal health talks would make this possible, as suggested in the literature (Garba et al., 2006; Iliyasu et al., 2012; Ngom, 1994; Wilkin & Ball-Rokeach, 2006) and substantiated here.

Limitations and Future Research

The primary limitation of this study is that participants are a convenience sample, and thus generalization of the results cannot be automatically inferred. However, studies of this kind generally suffer from these shortcomings (Galanes & Carmack, 2013; Wilkin et al., 2011). Moreover, accessing hard-to-reach populations is always a challenging task (see Wilkin et al., 2011) since there is no census or markers to allow for effective random sampling. Yet, the important aspect here is mapping the health communication infrastructure and obtaining testimony of women's influencing factors—not their incidence. The goal is to understand, not generalize. Our relatively large and diverse sample, and the differing perspectives of stakeholders may likely offset this limitation.

The results of our study may be readily applicable to the rest of the rural Senegalese areas that are similar, which includes most of the country except Dakar, St Louis, and Casamanze. Moreover, other campaigns that focus on Senegalese women could also benefit from the lessons learned here. Efforts toward better hygiene, HIV/

AIDS prevention, prenatal care, birth, or vaccination of children could be channeled via imagery, radio ads, or health talks that promote further interpersonal communication (Wilkin & Ball-Rokeach, 2006). In addition, other sub-Saharan countries in which similar cultural and religious norms exist may benefit from the CIT approach when mapping their health communication practices, or even when implementing health campaigns. Scholars and practitioners alike should observe that these barriers are not overwhelming, but, at the same time, neither are they insignificant.

Given that the potential to save many lives and extend longevity for women is notable, institutional efforts in Senegal and in other sub-Saharan African countries need to recognize that to halt the spread of diseases like cervical cancer, local resources are key. These resources within the communication infrastructure are a rich, efficient—given the literacy constraints—and readily accessible means that can be mobilized, even when information about the disease is lacking. We are hopeful that this study offers useful, practical information to health-care providers, clinicians, and public health personnel, as well as researchers working under CIT.

Acknowledgments

Notes

[1]   Senegal is one of the countries with the strongest opposition to birth control (Lipka, 2014).
[2]   Peace Corps undergo training through the established community-Peace Corps-academic partnership prior to placement in the field (i.e., in the USA). During this stage, Peace Corps volunteers are oriented on research ethics, conducting focus groups, community assessments, and on research protocols. Once in the visiting country, they receive three months of intercultural, language, and practical training before going to the field on their own. At that point, they have a good command of the local language of the area they are assigned to (DiMenichi, 2011; Peace Corps (U.S.), 1999).
[3]   All the materials (slides, visual charts, and handouts) were in French.
[4]   This quote represents the voices of several women.

References

American College of Obstetricians and Gynecologists. (2012). Screening for cervical cancer. *ACOG Practice Bulletin*, *120*, 1122–1138.

Anorlu, R. I. (2008). Cervical cancer: The sub-Saharan African perspective. *Reproductive Health Matters, 16*(32), 41–49. doi:10.1016/S0968-8080(08)32415-X

Ball-Rokeach, S. J. (1985). The origins of individual media system dependency: A sociological framework. *Communication Research*, *12*, 485–510. doi:10.1177/009365085012004003

Ball-Rokeach, S. J. (1988). Media systems and mass communication. In E. F. Borgatta & K. S. Cook (Eds.), *The future of sociology* (pp. 317–332). Beverly Hills, CA: Sage.

Ball-Rokeach, S. J., Kim, Y. C., & Matei, S. (2001). Storytelling neighborhood: Paths to belonging in diverse urban environments. *Communication Research, 28*, 392–428.

Ball-Rokeach, S. J., & Wilkin, H. A. (2009). Ethnic differences in health information-seeking behavior: Methodological and applied issues. *Communication Research Reports, 26*(1), 22–29.

Bradely, J., Risi, L., & Denny, L. (2004). Widening the cervical cancer screening net in a South African township: Who are the underserved? *Health Care for Women International*, 25, 227–241. doi:10.1080/07399330490272732

Broad, G. M., Ball-Rokeach, S. J., Ognyanova, K., Stokes, B., Picasso, T., & Villanueva, G. (2013). Understanding communication ecologies to bridge communication research and community action. *Journal of Applied Communication Research*, 41, 325–345. doi:10.1080/00909882.2013.844848

Charmaz, K., & Mitchell, R. (2001). Grounded theory in ethnography. In P. Atkinsons, A. Coffey, S. Delamont, J. Lofland, & L. Lofland (Eds.), *Handbook of ethnography* (pp. 160–174). London: Sage.

Crawford, A. (1999). 'We can't all understand the Whites' language': An analysis of monolingual health services in a multilingual society. *International Journal of the Sociology of Language*, 136, 27–45. doi:10.1515/ijsl.1999.136.27

DiMenichi, S. (2011). *The complete guide to joining the Peace Corps: What you need to know explained simply*. Ocala, FL: Atlantic Publishing Group.

Diop, W. (2000). From government policy to community-based communication strategies in Africa: Lessons from Senegal and Uganda. *Journal of Health Communication,* 5(2), 113–117. doi:10.1080/10810730508956572

Duke, S. S., Gordon-Sosby, K., Reynolds, K. D., & Gram, I. T. (1994). A study of breast cancer detection practices and beliefs in black women attending public health clinics. *Health Education Research,* 9, 331–342. doi:10.1093/her/9.3.331

Flaskerud, J. H., & Rush, C. E. (1989). AIDS and traditional health beliefs and practices of black women. *Nursing Research,* 38, 210–214. doi:10.1097/00006199-198907000-00005

Gaffikin, L., McGrath, J. A., Arbyn, M., & Blumenthal, P. D. (2007). Visual inspection with acetic acid as a cervical cancer test: Accuracy validated using latent class analysis. *BMC Medical Research Methodology,* 7(36), 1–10.

Galanes, G. J., & Carmack, H. J. (2013). "He's really setting an example": Student contributions to the learning environment. *Communication Studies*, 64(1), 49–65. doi:10.1080/10510974.2012.731464

Garba, A., Touré, S., Dembelé, R., Bosque-Oliva, E., & Fenwick, A. (2006). Implementation of national schistosomiasis control programmes in West Africa. *Trends in Parasitology,* 22, 322–326. doi:10.1016/j.pt.2006.04.007

Guèye, C. (2003). New information & communication technology use by Muslim Mourides in Senegal. *Review of African Political Economy,* 30, 609–625.

Guilfoyle, S., Franco, R., & Gorin, S. S. (2007). Exploring older women's approaches to cervical cancer screening. *Health Care for Women International,* 28, 930–950. doi:10.1080/07399330701615358

Hallin, D. C., & Mancini, P. (Eds.). (2011). *Comparing media systems beyond the western world.* Cambridge, MA: Cambridge University Press.

Heyen-Perschon, J. (2005). *Report on current situation in the health sector of Senegal and possible roles for non-motorised transport interventions.* Wohltorf: Institute for Transportation and Development Policy.

Hiner, C. A., Mandel, B. G., Weaver, M. R., Bruce, D., McLaughlin, R., & Anderson, J. (2009). Effectiveness of a training-of-trainers model in a HIV counseling and testing program in the Caribbean Region. *Human Resources for Health*, 7(11), 1–8.

Holschneider, C. H. (2007). Chapter 50. Premalignant and malignant disorders of the uterine cervix. In A. H. DeCherney (Ed.), *Diagnosis & treatment obstetrics & gynecology* (10th ed. pp. 833–854). New York, NY: McGraw-Hill.

Hoppe, M. J., Wells, E. A., Wilsdon, A., Gillmore, M. R., & Morrison, D. R. (1994). Children's knowledge and beliefs about AIDS: Qualitative data from focus group interviews. *Health, Education & Behavior*, 21(1), 117–126. doi:10.1177/109019819402100111

Iliyasu, Z., Abubakar, I. S., Aliyu, M. H., & Galadanci, H. S. (2012). Sexual and reproductive health communication between mothers and their adolescent daughters in northern Nigeria. *Health Care for Women International*, 33(2), 138–152. doi:10.1080/07399332.2011.562996

Jeronimo, J., Morales, O., Horna, J., Pariona, J., Manrique, J., Rubinos, J., & Takahashi, R. (2005). Visual inspection with acetic acid for cervical cancer screening outside of low-resource settings. *Public Health,* 17(1), 1–5.

Kim, Y. C., & Ball-Rokeach, S. J. (2006). Civic engagement from a communication infra-structure perspective. *Communication Theory*, 16, 173–197. doi:10.1111/j.1468-2885.2006.00267.x

Kim, Y. C., Jung, J. Y., & Ball-Rokeach, S. J. (2006). Geo-ethnicity and neighborhood engagement: A communication infrastructure perspective. *Political Communication*, 23, 421–441.

Kitzinger, J. (1995). Qualitative research: Introducing focus groups. *British Journal of Medicine*, 311, 299–302. doi:10.1136/bmj.311.7000.299

Lagarde, E., Enel, C., Seck, K., Gueye-Ndiaye, A., Piau, J. P., Pison, G., … Mboup, S. (2000). Religion and protective behaviours towards AIDS in rural Senegal. *AIDS (London, England)*, 14, 2027–2033. doi:10.1097/00002030-200009080-00019

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Newbury Park, CA: Sage.

Lipka, M. (2014). *Africans among the most morally opposed to contraception. Pew Research Center Fact Tank*. Retrieved April 16, from http://www.pewresearch.org/fact-tank/2014/04/16/africans-among-the-most-morally-opposed-to-contraception/

Masch, R., Ditzian, L. R., April, A. K., Maza, M., Peralta, E., & Cremer, M. L. (2011). Cervical cancer screening and treatment training course in El Salvador: Experience and lessons learned. *Journal of Women's Health*, 20, 1357–1361. doi:10.1089/jwh.2010.2418

Mays, R. M., Zimet, G. D., Winston, Y., Kee, R., Dickes, J., & Su, L. (2000). Human papillomavirus, genital warts, pap smears, and cervical cancer: Knowledge and beliefs of adolescent and adult women. *Health Care for Women International*, 21, 361–374. doi:10.1080/07399330050082218

Ngom, P. (1994). *Women's informal communication about family planning in West Africa* (Doctoral dissertation). University of Pennsylvania. Retrieved from http://search.proquest.com.proxy.cc.uic.edu/dissertations/docview/304123368/abstract/BD53940C70DB4085PQ/3?accountid=14552

Oswalt, R. M. (1977). A review of blood donor motivation and recruitment. *Transfusion*, 17(2), 123–135. doi:10.1046/j.1537-2995.1977.17277151916.x

Peace Corps (U.S.). (1999). *Culture matters: Trainer's guide*. Washington, DC: Peace Corps Information Collection and Exchange.

Peace Corps Senegal. (2011). *Peace Corps training manual*. Unpublished manuscript.

Roth, M. S. (1996). Patterns in direct-to-consumer prescription drug print advertising and their public policy implications. *Journal of Public Policy & Marketing*, 15(1), 63–75.

Schaefer, L., Sullivan, R., Blouse, A. et al. (2000). *Advanced training skills for reproductive health professionals*. Baltimore, MD: JHPIEGO.

Singh, G. K., Azuine, R. E., & Siahpush, M. (2012). Global inequalities in cervical cancer incidence and mortality are linked to deprivation, low socioeconomic status, and human development. *International Journal of MCH and AIDS*, 1(1), 17–30.

Strauss, A., & Corbin, J. (1998). Grounded theory methodology: An overview. In N. K. Denzin & Y. S. Lincoln (Eds.), *Strategies of qualitative inquiry* (pp. 158–183). Thousand Oaks, CA: Sage.

Sub-Saharan African Cervical Cancer Working Group. (2013, October). *6th Scientific Communiqué*. Retrieved November 2, 2013, from http://www.cervicalcancerafrica.org/index.php?controller=resources

Trudell, B., & Klaas, A. R. (2010). Distinction, integration and identity: Motivations for local language literacy in Senegalese communities. *International Journal of Educational Development*, 30(2), 121–129. doi:10.1016/j.ijedudev.2009.08.006

UNICEF. (2013). *Senegal statistics*. Retrieved April 24, 2014, from http://www.unicef.org/infobycountry/senegal_statistics.html

US CIA. (2012). *The world factbook: Senegal*. Retrieved December 13, 2012, from https://www.cia.gov/library/publications/the-world-factbook/geos/sg.html

US Department of State Bureau of African Affairs. (2011). *Background note: Senegal*. Retrieved December 12, 2012, from http://www.state.gov/r/pa/ei/bgn/2862.htm

Wilkin, H. A., & Ball-Rokeach, S. J. (2006). Reaching at risk groups the importance of health storytelling in Los Angeles Latino media. *Journalism*, 7, 299–320. doi:10.1177/1464884906065513

Wilkin, H. A., Ball-Rokeach, S. J., Matsaganis, M. D., & Cheong, P. H. (2007). Comparing the communication ecologies of geo-ethnic communities: How people stay on top of their community. *Electronic Journal of Communication*, 17(1–2).

Wilkin, H. A., Moran, M. B., Ball-Rokeach, S. J., Gonzalez, C., & Kim, Y. (2010). Applications of communication infrastructure theory. *Health Communication, 25*(6–7), 611–612. doi:10.1080/10410236.2010.496839

Wilkin, H. A., Stringer, K. A., O'Quin, K., Montgomery, S. A., & Hunt, K. (2011). Using communication infrastructure theory to formulate a strategy to locate "hard-to-reach" research participants. *Journal of Applied Communication Research, 39*, 201–213. doi:10.1080/00909882.2011.556140

Wilkinson, S. (1988). Focus groups in health research. Exploring the meanings of health and illness. *Journal of Health Psychology, 3*, 329–348. doi:10.1177/135910539800300304

Witter, S., Armar-Klemesu, M., & Dieng, T. (2008). National fee exemption schemes for deliveries: Comparing the recent experiences of Ghana and Senegal. *Studies in Health Services Organization & Policy, 24*, 167–198.

Wittmann, F. (2008). Politics, religion and the media: The transformation of the public sphere in Senegal. *Media, Culture and Society, 30*, 479–494. doi:10.1177/0163443708091178

World Health Organization. (2012). *GLOBOCAN 2012: Estimated cancer incidence, mortality and prevalence worldwide in 2012*. Retrieved April 4, 2014, from www.who.int

World Health Organization/Institut Català d'Oncologia Information Centre on HPV and Cervical Cancer (HPV Information Centre). (2014). *Human papillomavirus and related cancers in Senegal. Fact Sheet 2013*. Retrieved April 14, 2014, from http://www.hpvcentre.net/

Appendix. Focus groups and interviews lead questions

1. Networks of interpersonal discussion (health)
   - How much do you talk with members of your community?
   - Friends, neighbors, family members, leaders, doctors, health workers?
   - Who would you say talks more, you or others?

2. Medium
   - How do you communicate with the people in your community?
   - Cellphone (voice), cellphone (text), Internet, face-to-face, fast line, mail…?

3. Media use (health)
   - What types of media do you consume?
   - Radio, TV, Internet, newspapers…?
   - What is the best way to reach you/which one of them do you pay most attention to: radio, TV, newspaper, text message, Internet, call?

4. Knowledge/beliefs about cervical cancer
   - Have you heard about cervical cancer?
   - What do you know?
   - Where did you get this information?

5. Belief elicitation
   - How do you feel about cervical cancer screening?
   - How good/beneficial/desirable do you think cervical cancer screening is?
   - Why do you feel that way?
   - How strongly do you feel about that?
   - Is that something you feel that you could change your mind about?

6. Norms
   - Now imagine what people who are important to you feel about cervical cancer screening
   - Would these people support it?

7. Efficacy
   - Are there any constrains for you to get screened?
   - Is it up to you to get screened or there is someone else that would make this decision for you?
   - How easy do you think performing a screening for cervical cancer would be?

The following probes were used for each set of questions:
   - Elaboration: Can you give me some examples of this?
   - Inclusion: Does anyone want to add to that?
   - Divergence: Does anyone have a different perspective?