

The Determinants of the Use of Telemedicine in Senegal

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List of Acronyms

\$ CAN: Canadian Dollar

‰: Percent or percentage

‰: Per 1000

A: Attitude

ACART: Assessing Care Agencies' Readiness for Telehealth Tool

ADB: African Development Bank

AMREF: African Medical and Research Foundation

ANOVA: Analysis of Variance

ANSD: Statistic and Demography National Agency

CCSDH: Canadian Council on Social Determinants of Health

CIHR: Canadian Institutes of Health Research

CNERS: Senegal's National Ethics Committee on Health Research

CRDI (IDRC): International Development Research Centre

D: Dakar

DGS: General Direction for Health

DHR: Direction of Human Resources

DPRS: Direction for Statistic and Research Planning

eHealth : Electronic Health

EHS: Electronic Health Services

F: Female

FGPS: Faculty of Graduate and Postdoctoral Studies

FISSA: Self-supported Health and Satellite Intervention Task

G: General practitioner

GHPG: Global Health Practicum Grant

Gouv: Government

HIV: Human Immunodeficiency Virus

I: Intention

ICF: Inner City Fund

ICT: Information and Communication Technology

INMARSAT: International Marine/Maritime Satellite

IPRES: Senegal Retirement Provident Institution

JICA: Japan International Cooperation Agency

M: Male

M: Mean

MD: Medical Doctor

MÉPOCS: Measure of Organization Readiness for ehealth

mHealth: Mobile Health

MPH: Master of Public Health

MSAS: Ministry of Health and Social Action

MSc: Master of Science

N: Number

N/A: Not Applicable

N^o: Number

O: Outside Dakar

OECD: Organisation for Economic Co-operation and Development

OITIRS: Organizational Information Technology/Systems Innovation Readiness Scale

ORC: Organizational Readiness for Change

P: Probability

PBC: Perceived Behavioural Control

Ph.D.: Philosophiæ Doctor

RAFT: French Speaking Africa Telemedicine Network

S: Specialist Physician

SD: Standard Deviation

SENELEC: Senegal's National Electricity Company

SMRF: School of Management Research Funds

Sn: Senegal

SN: Subjective norm

SNIS: Health Information National System

SONATEL: Senegal's Telecommunication National Company

SPSS: Statistical Package for the Social Science

T: total

TAM: Technology Acceptance Model

TIB: Theory of interpersonal behaviour

TPB: Theory of planned behaviour

TRA: Theory of reasoned action

TRAT: Telehealth Readiness Assessment Tools

UMVF: French Medical Virtual University

US \$: American Dollar

USA: United-States of America

WHO: World Health Organization

Dedications

This work is dedicated to my father Sekou LY and my big brother Mamadou LY, who were brutally snatched from our affections on 28 January, 2012, and 23 March, 2011, respectively. They never stopped encouraging me to complete this Ph.D. in Population Health, and wanted to see me hold my diploma, but God decided otherwise. May their souls rest in peace!

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Preface

The idea to conduct this research was germinating ever since I found out that physicians are unevenly distributed between well served and underserved areas in most countries, had led to health inequalities negatively affecting population health. I also discovered that most of the solutions adopted to address these problems have failed or led to unsatisfactory results. In looking for more effective solutions to address these issues, I thought about telemedicine as a viable solution. This technology is considered to be a good way to address the uneven distribution of physicians resulting health inequalities, but it remains underused in most countries. Previous studies indicate that many telemedicine projects fail at their early stages, and of those that succeed, most of them fail to be adopted for widespread use. The determinants of these failures are not well known.

This thesis gave me the opportunity to focus on these determinants in Senegal, specifically at the individual (micro) and contextual (meso and macro) levels. This thesis reports the main results of this study. It involved two trips to Senegal. Each trip required approval from the Research Ethics Board of the University of Ottawa and Senegal's National Ethics Committee on Health Research. They both required authorization from Senegal's Ministry of Health, General Directorate of Health, Faculty of Medicine of Cheikh Anta Diop University, Telemedicine Research and Expertise Interdisciplinary Centre (CIRET), hospitals and district health centers. The realization of this thesis was possible thanks to the supervision of Ronald Labonté and Ivy Lynn Bourgeault.

It contains six chapters:

- Chapter 1: introduction, problem, overview on telemedicine, study context, objective, method, theoretical framework and organization of the thesis
- Chapter 2: the perception of Senegal's physicians of the impact of telemedicine on their recruitment and retention in underserved areas
- Chapter 3: the beliefs of Senegal's physicians toward the use of telemedicine
- Chapter 4: the intention of Senegal's physicians to use telemedicine in their professional activities
- Chapter 5: the contextual factors that influence the use of telemedicine in Senegal.
- Chapter 6: General discussion

Chapters 2, 3, 4 and 5 will be published in scientific journals to ensure the wider dissemination of our results.

Contributions of authors

Chapters 2, 3 and 5

The lead author designed the research project, developed interview guides and led the validation of these interview guides. He conducted individual interviews, recorded these interviews, participated in their transcription, coded transcripts and synthesized the data. He also wrote the first draft of these three chapters and incorporated co-authors' comments. Ronald Labonté and Ivy Lynn Bourgeault reviewed the research project, participated in the validation of the interview guides, supervised the writing process, and reviewed the various versions of the three chapters. Mbayang Ndiaye Niang facilitated the data collection related to these three chapters in Senegal.

Chapter 4

The lead author designed the research project, developed the two questionnaires, conducted the validation of these questionnaires, administered the questionnaires, built databases, analyzed data, drafted the first version of the chapter, and incorporated supervisors' feedback on the first and subsequent drafts of this chapter. Elizabeth Kristjansson supervised questionnaire validation and data analysis. Ronald Labonté and Ivy Lynn Bourgeault reviewed the research project, participated in the validation of the two questionnaires, supervised the writing process, and reviewed the various versions of this chapter. Mbayang Ndiaye Niang facilitated the data collection related to this chapter in Senegal.

Thesis abstract

Introduction

In Senegal, as in many countries, physicians are unevenly distributed. This situation leads to health inequalities, but the solutions adopted to distribute physicians equitably do not give satisfactory results. This situation pushes decision-makers and researchers to look for other solutions such as telemedicine. This technology-based solution is considered to be a good means to improve physician recruitment and retention in underserved areas, thus improving access to healthcare in these areas, but it is still underused in Senegalese health facilities.

Objective

This study aimed to identify the determinants of the use of telemedicine in Senegal. More specifically, it aimed to identify the individual (micro) and contextual (meso and macro) factors that influence the use of telemedicine in Senegal.

Method

The study involved mixed methods: a descriptive qualitative study involving individual interviews and a cross-sectional quantitative study involving questionnaires. The first method was used to study the individual (micro) factors such as physicians' beliefs on the use of telemedicine and physicians' perception of the impact of telemedicine on their recruitment and retention in underserved areas. It was also used to study the contextual meso (technical, organizational and ethical) and macro (financial, political, legal and socioeconomic) factors that influence the use of telemedicine. The second method was used to study participants' intention to use telemedicine in their professional activities, another

individual (micro) factor. This study included physicians working in public hospitals, those working in district health, and telemedicine projects managers. Qualitative data was collected through individual interviews, transcribed and imported into NVivo 10 where they were coded thematically. Quantitative data was collected by administering questionnaires and analyzed using SPSS 23.

Results

The results showed that telemedicine could contribute to, but could not guarantee the recruitment and retention of Senegalese physicians in underserved areas. It was found that physicians in Senegal have both positive and negative behavioural, normative and control beliefs that can encourage or discourage them from using telemedicine in their professional practice. The most salient behavioural beliefs were that telemedicine makes experts' opinions accessible across distances (positive behavioural belief), but could lead to medical errors (negative behavioural belief). The most common normative beliefs were that their patients would most probably approve the use of telemedicine (positive normative belief) while their colleagues working in the public sector might disapprove of it (negative normative belief). The most reported control beliefs were that the use of telemedicine is easy (positive control belief), but could be time-consuming (negative control belief). For physicians in Senegal, the findings also demonstrate that the probability that they will use telemedicine in their professional activities is moderate and influenced by their perceived behavioural control which, in turn, is influenced by their positive and negative control beliefs. Finally, the results demonstrate that many contextual meso (technical, organizational and ethical) and macro (financial, political, legal and socioeconomic) factors influence the use of telemedicine in Senegal.

Conclusion

The results of this study can inform the choice of telemedicine development strategies. These strategies can help to promote the use of telemedicine in Senegal, which in turn can help to increase physician recruitment and retention in underserved areas, resulting in better access to healthcare and, and as a result improved population health.

Chapter 1

Introduction

Physicians are much less numerous in rural and remote (underserved) areas than in more urbanized regions (Grobler et al., 2009). The dearth of physicians negatively impacts population health, particularly in underserved areas, because without access to physicians, there is no access to critical healthcare services. With respect to health systems, one of the main causes of this shortage is the inability of health systems to recruit and retain physicians in underserved areas. During the last few decades, many interventions have been made to promote physicians' recruitment and retention in underserved areas (Dussault & Franceschini, 2006; Henderson & Tulloch, 2008; Lehman, Dieleman, & Martineau, 2008). These interventions have included selection, education, coercion, incentive and supportive strategies (Dolea., Stormont, & McManus, 2010; Wilson et al., 2009). None of these strategies has produced a satisfactory result (Grobler et al., 2009). As a result, decision makers are still looking for solutions that guarantee physicians' recruitment and retention in underserved areas.

Telemedicine is seen as not only a good solution to address this problem, but also a way to improve access to healthcare through electronic transfer of expertise from well served to underserved areas (Pradhan, 2009). The use of telemedicine, however, depends on a number of individual and contextual factors that merit attention (Broens et al., 2007; Tanriverdi & Iacono, 1999).

This study explores these factors by focusing on Senegal, a West African country. The decision to choose this country was motivated by many factors, including the uneven distribution of its physicians (SNIS, 2012; Zurn., Codjia, Sall, & Braichet, 2010). More than 60% of Senegal's physicians work in Dakar, the capital region, but only 23% of its population lives in

this region (Zurn. et al., 2010). This situation negatively impacts population health in underserved areas (ANSD & ICF International, 2012; SNIS, 2011). Several solutions were adopted by Senegal's health system in the last few decades to recruit and retain physicians in underserved areas (Zurn, Codjia, & Sall, 2010). Despite these efforts, the majority of physicians are concentrated in Dakar. Most of the telemedicine projects that were implemented failed in the early stages or were unable to gain widespread use. Today, the use of telemedicine is limited to a few hospitals and district health centres. The factors that explain this failure are unknown. The main goal of this research is to identify these factors by focusing on individual and contextual factors. The main questions that guided the conduct of this research were twofold: 1) What are the individual factors that influence the use of telemedicine in Senegal? 2) What are the contextual factors that influence the use of telemedicine in Senegal? Answering these two questions can help inform strategies going forward.

Problems

Physicians are unevenly distributed within countries. Worldwide, 75% of them work in well-served areas, yet only 55% of the population live in these areas (OMS, 2006). As a result, a significant proportion of the population is unable to access healthcare services, progress is slow in achieving health goals, and achievement of health for all is impeded (Dolea, Stormont, Zurn, Shaw, & Braichet, 2009). The uneven distribution of physicians is also a barrier to reducing child mortality, improving maternal health, and combating HIV/AIDS, malaria and other diseases like tuberculosis (Dreesch et al., 2005; Kyomuhendo, 2003; Nullis-Kapp, 2005). Finally, it negatively impacts population health, particularly rural population health (Evans, Whitehead, Diderichsen, Bhuiya, & Wirth, 2001).

Determinants of the uneven distribution of physicians

The factors that determine the uneven distribution of physicians are numerous. One of the best known is the inability of health systems to recruit and retain physicians in underserved areas. Recruitment refers to physicians' decision to settle and work in a given area while retention refers to the ability to keep them in that area for an acceptable period (Fournier, Contandriopoulos, Diene, & Trottier, 2004). The factors that determine the recruitment and retention of physicians in underserved areas include individual, professional, organizational, institutional, environmental, familial, and community factors, as well as factors related to care and medical training systems. The following Table summarizes some of these factors identified in the literature.

Table 1: Factors determining physicians' recruitment and retention in underserved areas

Categories of factors	Factors	References
Individual	Age, education, ethnicity, gender, values, and beliefs	(Bilodeau & Leduc, 2003; Dussault & Franceschini, 2006; Fournier et al., 2004)
Professional	Specialization and working hours	(Bilodeau & Leduc, 2003; Fournier et al., 2004)
Organizational	Management style, incentives, career structure, pay scales and recruitment strategies	(Dussault & Franceschini, 2006; Fournier et al., 2004)
Institutional	Structure, organization and role of national and international institutions	(Dussault & Franceschini, 2006)
Environmental	Economic, political, social and historical	(Bilodeau & Leduc, 2003; Dussault & Franceschini, 2006)
Familial	Schooling opportunities for children, job opportunities for spouse and opinion of spouse	(Fournier et al., 2004)
Community	Promoting medical career among the communities' young people, improving the ability of communities to recruit and the integration within the community	(Fournier et al., 2004)
Care system	Care system	(Dussault & Franceschini, 2006; Fournier et al., 2004)
Training systems	Medical education system, training content, exposure to rural areas during medical training, financial incentives during medical training	(Dussault & Franceschini, 2006; Fournier et al., 2004)

The factors that determine the recruitment and retention of physicians in underserved areas also include international migration, which increases the lack of physicians and produces work overload (Dussault & Franceschini, 2006). The result is exhaustion, lack of motivation, and the departure of physicians from underserved areas (Dussault & Franceschini, 2006). These problems are accentuated by the increased demand for physicians in developed countries which face an aging population, increased health needs and lack of interest for students entering medical professions (OMS, 2006). Further, the number of migrant physicians working in OECD countries has increased by 60% since 2004 (OECD, 2015), and could continue to increase over time (Bourgain, Pieretti, & Zou, 2010). The factors that influence international migration have been categorized as ‘push’ and ‘pull’. Pull factors are those that attract a person to a new destination (Lehman et al., 2008). Some examples of pull factors are better job opportunities, career prospects, income, living conditions and working conditions (OMS, 2006). Push factors are those that compel an individual to leave a country (Lehman et al., 2008). Some examples of push factors are the lack of jobs, low income and poor working conditions (OMS, 2006). A study in sub-Saharan Africa has found that pull and push factors are equally important in the decision to stay or leave a country (Awases, Gbary, Nyoni, & Chatora, 2004).

Limits of the solutions used to equitably distribute physicians

In recent decades, many solutions have been adopted to reduce the uneven distribution of physicians (Dolea. et al., 2010; WHO, 2009), with most of them proving to be ineffective (Grobler et al., 2009). One of the best-known solutions is one that aims to provide financial incentives such as allowances or grants to physicians working in underserved areas (Grobler et al., 2009; Willis - Shattuck et al., 2008; Wilson et al., 2009). There is evidence that this solution yields satisfactory results in countries like Canada and Vietnam (Grobler et al., 2009; Henderson

& Tulloch, 2008), but it has a number of limits. The sustainability of financial incentives depends on the availability of financial resources, which can be a problem for developing countries since the financing of their health system is based, in part, on international aid (donor assistance). In addition, international financing is often irregular and not sustainable over the long-term, and its availability does not depend on receiving countries' needs.

Another well-known solution is student selection (Dolea. et al., 2010). This solution focuses on the criteria used to accept students into medical training programs based on various factors that may increase the likelihood of retaining their services in underserved areas once they become qualified (Wilson et al., 2009). Selection criteria include geographic origin, ethnicity, gender, career intent and service orientation (Grobler et al., 2009). Many authors, however, contest the effectiveness of this solution in increasing the number of physicians in underserved areas (Grobler et al., 2009).

A third solution is students' exposure to underserved areas (Dolea. et al., 2010; Wilson et al., 2009). The effectiveness of this solution is also contested because of the weakness of the existing evidence (Grobler et al., 2009; Henderson & Tulloch, 2008).

A fourth solution is the provision of scholarships to physicians working in underserved areas (Dolea. et al., 2010). This solution is considered as a good means to encourage physicians in working in underserved areas, but its effectiveness is disputed (Grobler et al., 2009) and has shown variable success in different countries (Grobler et al., 2009). Furthermore, it is dependent on the availability of funds, and its long-term benefit and cost effectiveness requires further investigation (Grobler et al., 2009). According to some authors, financial incentives alone are not enough to retain physicians in underserved areas, and need to be associated with other retention strategies (Henderson & Tulloch, 2008; Willis - Shattuck et al., 2008).

A fifth solution involves coercive measures, where medical councils, professional bodies, and governments require new physicians to practice in underserved areas, usually for a defined period (i.e., a return of service agreement) (Wilson et al., 2009). It is considered as a good means to reduce the uneven distribution of physicians and has been adopted by countries such as Russia, Mexico, Ecuador, Bolivia, Cuba, Dominican Republic, South Africa and Nigeria (Grobler et al., 2009). There are several types of coercive instruments. The first compels new graduates to spend some time in underserved areas; the second forces general practitioners to spend some time in underserved areas before they secure the authorization to start their specialization; while the third requires internationally educated physicians to practice in underserved areas for a period (Grobler et al., 2009). In the short term, these solutions have proved effective, but their long-term efficacy is contested, since physicians may leave underserved areas after their compulsory stay (Grobler et al., 2009; Wilson et al., 2009).

A sixth solution provides for the use of more supportive measures which focuses on the different ways to support physicians working in underserved areas (Wilson et al., 2009). The nature of the support varies according to countries, with the best-known supports listed in Table 2. These supportive measures may encourage physicians to work in underserved areas (Grobler et al., 2009). A study conducted by Willis-Shattuck and colleagues (2008) demonstrates the importance of the development of professional careers, continuing education, quality of infrastructure, availability of resources, quality of health facility management, recognition, and assessment from supervisors in motivating and retaining physicians in underserved areas. The effectiveness of this solution in increasing the number of physicians in underserved areas, however, remains questionable (Grobler et al., 2009).

Table 2: Best known supportive measures

Supportive measures	References
Creating optimal conditions for continued professional development	(Wilson et al., 2009)
Providing regular specialist outreach services	(Wilson et al., 2009)
Providing periods of relief (weekends, holidays, sabbaticals)	(Wilson et al., 2009)
Providing flexible working schedules for female physicians	(Wilson et al., 2009)
Creating child minding services	(Wilson et al., 2009)
Providing subsidized schooling	(Wilson et al., 2009)
Improving living conditions	(Dolea. et al., 2010; Wilson et al., 2009)
Opening recreational facilities	(Wilson et al., 2009)
Increasing the standard of workplace	(Dolea. et al., 2010)
Fostering interaction between urban and rural health workers	(Dolea. et al., 2010)
Designing career ladders for rural health workers	(Dolea. et al., 2010)
Facilitating knowledge exchange	(Dolea. et al., 2010)
Improving the profile of rural health workers	(Dolea. et al., 2010)

A seventh solution is the substitution of physicians with other health professionals from lower ranks such as nurses, midwives or, as in many sub-Saharan African countries, clinical officers (Bourgain et al., 2010; Dovlo, 2004). The best-known types of substitution are direct and indirect substitution (Bourgain et al., 2010; Dovlo, 2004). Direct substitution aims to create a new qualification, more specific and less specialized, but allows other health professionals to do tasks usually done by general practitioners or specialist physicians (Bourgain et al., 2010; Dovlo, 2004). Indirect substitution or delegation does not require any new qualification, but allows other health professionals to complete tasks usually done by general practitioners or specialist physicians (Bourgain et al., 2010; Dovlo, 2004). These solutions were adopted in Ghana, Malawi, Tanzania, Kenya and Mozambique (Dovlo, 2004), but some experts fear their negative impact on the quality of healthcare services (Bourgain et al., 2010). The evaluations undertaken on them were also not very conclusive (Bourgain et al., 2010) so more assessments are needed (Dovlo, 2004)

In sum, to date there is no fully effective solution to recruit and retain physicians in underserved areas. Some authors recommend adjusting the existing solutions to the context of

the countries that adopt them, and combining many solutions (Henderson & Tulloch, 2008). The evidence on the effectiveness of these recommendations and suggestions is not yet available.

A potential solution not discussed in the review above is the role telemedicine might play in retaining physicians in underserved areas. There is reason to believe that this option could improve access to healthcare in underserved areas as the following review discusses.

Overview on telemedicine

Definition of telemedicine

There are a number of definitions of telemedicine (Sood et al., 2007), and telemedicine is used interchangeably with terms like telehealth, eHealth, mHealth, and telecare (Fatehi & Wootton, 2012; van Dyk, 2014). These terms have, in turn, many definitions. (Oh, Rizo, Enkin, & Jadad, 2005; Pagliari et al., 2005; Solli, BjØrk, Hvalvik, & HellesØ, 2012). Some authors have tried to elucidate the difference between telemedicine and these terms (Bashshur, Shannon, Krupinski, & Grigsby, 2011; Fatehi & Wootton, 2012; Sood et al., 2007). In doing so, they have defined telemedicine as a subset of telehealth (Bashshur et al., 2011; Sood et al., 2007).

Telemedicine is restricted to focus on healthcare while telehealth is more broadly delineated to include health promotion and disease prevention (Bashshur et al., 2011; Sood et al., 2007; van Dyk, 2014). Telecare is considered a telehealth application (van Dyk, 2014) while eHealth and telehealth are differentiated by the notion of distance, which is included in the definition of telehealth and not in that of eHealth (van Dyk, 2014). Regarding mHealth, it has been defined as an ehealth application executed through mobile technology (van Dyk, 2014). These distinctions are interesting on paper, but less so on the ground because the boundaries between the different concepts are still unclear. We also note that, in French-speaking countries, the terms (telehealth, eHealth, mHealth and telecare) and their French translations (telesant , eSant , mSant , and

télésoin) are used concomitantly which aggravates confusion surrounding the concept of telemedicine.

Despite these confusions, a definition is still required for the purposes of this study. Thus, we have relied on the definition of Jones and colleagues (2004), which stipulates that telemedicine is the practice of medicine at a distance and includes diagnosis, training, and treatment (Jones, Banwell, & Shakespeare, 2004). The advantages of this definition are manifold. First, it shows the relationship between medicine and telemedicine. Second, it specifies the areas of medicine that are concerned. Third, it takes into account the concept of distance. The only problem with this definition is that it does not specify the means needed in the use of telemedicine. For this reason, telemedicine is defined in this study as the practice of medicine through the use of information and communication technologies (cell phones, tablets, and computers) and includes diagnosis, training, and treatment. Defined in this way, telemedicine is easier to operationalize. This definition is broad and includes all telemedicine delivery applications and methods, as well as many information and communication technologies. Although broad, it corresponds to our understanding of telemedicine and is relevant to the context of this study.

Telemedicine Delivery Methods

There are two way of delivering telemedicine: the "store and forward"/asynchronous method, and the "real-time"/synchronous (Desai, 2009; Kaddu, Kovarik, Gabler, & Soyer, 2009) method. The "store and forward" method is more accessible and less demanding regarding technology, time, and resources (Desai, 2009; Kaddu et al., 2009). In consequence, it is more widely used than the "real time" method. By contrast, the "real-time" method allows the performance of medical procedures that more resemble traditional methods of practice (face to

face) (Desai, 2009; Kaddu et al., 2009). Therefore, it is more suited to emergency cases and more appropriate for physician-patient interactions (Desai, 2009; Kaddu et al., 2009). However, it is more demanding in terms of time and resources (Kaddu et al., 2009). Both methods proved reliable and accurate when they were compared with the traditional method (face to face) (Kaddu et al., 2009).

Applications of telemedicine

There are several applications of telemedicine. The best known are teleassistance and teletraining. Teleassistance includes teleconsultation, remote diagnosis and opinion exchanges (Kaddu et al., 2009). Teletraining refers to remote education (Kaddu et al., 2009). Some authors believe that teleconsultation represents less than 25% of the applications used (Perednia & Allen, 1995). Others believe that its use does not exceed 30% (Edwards & Patel, 2003). Teletraining seems to be the most used application (Al-Qirim, 2007).

Contributions of telemedicine in improving access to physicians

Telemedicine is considered as a good means to improve access to physicians, particularly specialist physicians (Mueller, Potter, MacKinney, & Ward, 2014; Potter, Mueller, Mackinney, & Ward, 2014) by acting positively on their recruitment and retention in underserved areas (Brebner et al., 2004; Dolea, Stormont, & Braichet, 2010; Potter et al., 2014). It acts positively on physicians' recruitment and retention by reducing their professional isolation (Potter et al., 2014), decreasing their overload at work (Jennett, Watson, & Watanabe, 2000; Watanabe, Jennett, & Watson, 1999), and allowing them to obtain advice from experts (Brebner et al., 2004). It also impacts physicians' recruitment and retention by acting on the individual (Duplantie, Gagnon, Fortin, & Landry, 2007), professional (Duplantie et al., 2007; Fortin et al.,

2006), organizational (Duplantie et al., 2007; Fortin et al., 2006) and educational (Duplantie et al., 2007; Fortin et al., 2006) factors that determine these problems.

Telemedicine has, therefore, the potential to improve physicians' recruitment and retention, but it is not enough in itself to attract and retain them in underserved areas (Duplantie et al., 2007) (Gagnon, Duplantie, Fortin, & Landry, 2007; Gagnon, Fortin, & Landry, 2005). Physicians' recruitment and retention in underserved areas depend on many other factors, including living conditions, working conditions, income, education opportunities, training possibilities, professional development opportunities, supervision strategies, management style, job descriptions, criteria for promotion, career progression, social recognition (Henderson & Tulloch, 2008). Additional elements also include bonding and mandatory service, payment systems, benefits, allowances, job opportunities for spouses and education opportunities for children (Henderson & Tulloch, 2008). In consequence, to better attract and retain physicians in underserved areas, telemedicine would need to be combined with other solutions such as financial, education, coercive, supportive and substitution solutions.

Contributions of telemedicine in improving access to healthcare

Telemedicine is seen as a good means to ensure access to healthcare. Some studies show that it can improve equitable access to healthcare through electronic transfer of expertise from well served to underserved areas (Pradhan, 2009). Others demonstrate that it can improve access to specialized healthcare through exchanges with specialist physicians (Mueller et al., 2014). Some suspect that it facilitates support to physicians during critical events, shortens waiting time, improves health coordination, promotes more patient-centered care, increases the range of services offered in underserved areas, and improves the reputation of rural health facilities (Mueller et al., 2014). It is also presumed to facilitate consultations, diagnosis, treatment,

transfer of patient data, case management, training, and performance of clinical and administrative meetings (Al-Qirim, 2007). It is equally thought to help healthcare providers to supply quality, fast, and economical medical services to rural patients and hence, to save physicians and patients valuable time wasted in commuting large distance (Oakley et al., 2000).

Limits of telemedicine

Telemedicine is an interesting potential solution to provide healthcare in underserved areas. If it is combined with other recruitment and retention strategies, it is also a potentially interesting way to attract and retain physicians in underserved areas. Despite these promises, many telemedicine projects fail or are abandoned (Zanaboni & Lettieri, 2011). Berg estimates that 75% of telemedicine projects fail during their operational phase (Berg, 1999), hence the importance of determining why these projects fail so early in their implementation. Authors who studied this issue explain these failures by assessing individual, technical, financial, organizational, political and legislative factors (Broens et al., 2007; Tanriverdi & Iacono, 1999).

With respect to individual factors, it is important to note that patients can have a negative attitude toward telemedicine (Hofstede, de Bie, van Wijngaarden, & Heijmans, 2014 ; Wojtuszek, Kachnic, Krysta, & Wutke, 2015), and that physicians themselves can have a negative attitude towards its use (Wojtuszek et al., 2015). Physicians can doubt its effectiveness and its abilities to guarantee data security and patients' privacy (Ashley, 2002; Caryl, 1997; Courtney, 2008). They can also prefer traditional methods to provide healthcare or doubt the ability of telemedicine to guarantee their salary (Jang-Jaccard, Nepal, Alem, & Li, 2014; Moffatt. & Eley, 2011). Physicians may equally think that telemedicine is time-consuming and increases work overload (Taylor & Coates, 2015; Uscher-Pines & Kahn, 2014). These various individual factors may push physicians not to participate or to participate inadequately in

telemedicine activities. Shiferaw and Zolfo (2012) found that 15% of physicians have never participated in a telemedicine pilot project in Ethiopia while 65% have used the system for other purposes such as medical web-browsing and e-mail communication (Shiferaw & Zolfo, 2012).

Regarding technical factors, the poor quality of internet connection can impede the use of telemedicine (Steele & Lo, 2013). In some countries, internet connection speed is very slow. This situation can prevent the use of certain telemedicine applications (Shiferaw & Zolfo, 2012). Lack of training can also impede the use of telemedicine because physicians are not always familiar with telemedicine equipment (Darkwa, 2000; Shiferaw & Zolfo, 2012), and they are not always trained in medical schools to use them (Shiferaw & Zolfo, 2012).

Organizational factors are also important as the use of telemedicine can be hampered by the lack of working protocols for telemedicine (Broens et al., 2007). It is also important to note that the novel working practices introduced by telemedicine do not always fit with the existing traditional working protocols in healthcare organizations (Broens et al., 2007). Other important factors include legal issues such as data security (Caryl, 1997), confidentiality (Ashley, 2002) and providers' liability (Granade & Sanders, 1996; Williatte-Pellitteri, 2013). These factors can hinder the use of telemedicine by engendering fear among telemedicine providers.

Regarding political factors, it is important to know that the success of telemedicine depends on the collaboration and commitment of national and international political actors (Dzenowagis, 2005). This collaboration is not always acquired, and telemedicine is not a political priority in many countries. Another impediment can be financial resources; it is important to recall that telemedicine suffers from a lack of funding (El-Mahalli, El-khafif, & Al-Qahtani, 2012; Jarosławski & Saberwal, 2014). Telemedicine tends to be funded as part of pilot or research projects with funding coming mostly from non-governmental organizations, foreign

universities, foreign hospitals, telecommunication operators, manufacturers, international and regional organizations, commercial and semi-commercial organizations and armies (Wright, 1999). Government funding is rare partly owing to its high costs (Hoerbst & Schweitzer, 2015; Schmeida, McNeal, & Mossberger, 2007; Wright, 1999). In sub-Saharan Africa, the cost of 20 hours of internet connection in 2009 was US\$55 on average, compared to the USA, where the cost of 20 hours internet connection was only US\$15 (Mars, 2009). These high internet connection costs may limit the use of telemedicine in many developing countries.

These various, individual and contextual, factors have largely been studied in developed countries. There is less research focused on developing countries, which led to research on the use of telemedicine in Senegal.

Study context

Geographical context

This study was conducted in Senegal, a West African country, which covers a land area of 196,722 km² and is bordered to the north by Mauritania, to the east by Mali, to the south by Guinea and Guinea-Bissau and to the west by the Atlantic Ocean (see Image 1). It is one of the few countries that hosts another country, Gambia, located within the territory of Senegal and surrounded by seven of its regions (Ba et al., 2012).

Administrative context

Senegal is subdivided into 14 administrative regions including Dakar, Diourbel, Fatick, Kaffrine, Kaolack, Kedougou, Kolda, Louga, Mattam, Saint-Louis, Sedhiou, Tambacounda, Thies and Ziguinchor (Ba et al., 2012) (see Image 1). These regions are subdivided into 45 departments, 123 "arrondissements", 126 communes, five cities, 46 "communes d'arrondissement" and 385 rural communities (République du Sénégal, 2015).



Image 1: Administrative map of Senegal (Source: ANSD & ICF International, 2012a)

Each region is subdivided into departments, and each department is subdivided into communes and "arrondissements". Each "arrondissement" is divided into rural communities; a city is a commune that has "communes d'arrondissement" which correspond to city branches that have a legal personality and financial autonomy. A rural community represents a group of villages belonging to the same land, while a village is a group of families living within the same agglomeration. The village represents the basic administrative unit (République du Sénégal, 2008).

Regions are headed by governors and the presidents of regional councils; departments by prefects and arrondissements by sub-prefects. Cities are led by mayors, rural communities by the

presidents of rural communities and villages by the chiefs of the villages (République du Sénégal, 2008).

Population

The population of Senegal is estimated to be 14,799,859 (ANSD, 2016). Women (50.1%) are slightly more numerous than men (49.9%). The average age is estimated to be 19 years and a median age of 18 years. Individuals aged between 0 and 14 years-old represent 16.22%, those between 15 and 64 years-old 54.5% while those aged 65 and over represent 3.63% of the population. Women of childbearing age (15 to 49) represent 48.09% of women. The demographic dependency ratio is estimated to be 0.83 or 83 dependents per 100 persons aged 15-64. Singles represent 43% of the population while 32.5% of the population is polygamous. The average age at first marriage is 26 years. The crude birth rate is estimated to be 37.3 ‰ while the crude death rate is 7.5 ‰. Life expectancy is 66 years and is slightly higher among women (67.2 years) than men (64.8 years). Senegalese are more numerous in rural (53.78%) than in urban areas (46.22%). The majority of the population is Muslim (94%), and French is the official language (Third World Institute, 2003).

Socioeconomic context

Senegal is one of the most stable countries in Africa (World Bank, 2015). Since its independence in 1960, it was governed by four democratically elected presidents. The last of these presidents was elected in 2012 with 65.8% of the votes for a term of 7 years. Senegal has the third largest economy in West Africa (Ba et al., 2012), but since 2006, it has demonstrated a lower economic growth (3.3%) compared to Sub-Saharan African countries (6%). Services, particularly financial services and telecommunications, are the most dynamic sectors. Agriculture depends on rainfall, and in recent years agricultural production has declined (World

Bank, 2015). The fisheries sector is suffering from the decline in fish stocks and the increase in fuel costs for the fish boats, while the textile clothing industry is experiencing a boom (Ba et al., 2012). The tourism industry was seriously affected the by Ebola virus in 2014 and 2015 (Ba et al., 2012; World Bank, 2015). The diaspora remittances are important (Ba et al., 2012; Some et al., 2009) and are considered to be higher than the financial resources coming from international aid (Ba et al., 2012). Senegal's diaspora is estimated to be between 2.5 and 3 million people (Some et al., 2009). Every year, 33,791 migrants leave the country for USA, Canada, Europe or other African countries (Some et al., 2009), including physicians and other health professionals. Poverty affects about 46.7% of the population (World Bank, 2015). The number of poor people is about 6.3 million. This number is lower than the average observed in Sub-Saharan Africa, but there are geographic disparities with two out of three people being poor in underserved areas against just one out of four people being poor in Dakar.

Healthcare context

Senegal has one of the best-organized health systems in West Africa (Ba et al., 2012). Its health policy is based on its constitution, which guarantees the right to health in article 8 and discloses in article 17 that "The State guarantees to families, in general, and those living in underserved areas, in particular, access to health and well-being" (Republique du Sénégal, 2009). Senegal's health system has two pyramids: the Pyramid of Health and the Pyramid of Care. The Pyramid of Health comprises three levels: central, intermediate and peripheral (Ba et al., 2012). The central level regroups the structures of coordination such as the office of the Minister of Health and the Directorates of Health. The intermediate level comprises medical regions, which were 14 in 2010. The peripheral level encompasses health districts, which numbered 75 in 2010 (OMS, 2009; République du Sénégal, 2012).

The Pyramid of Care espouses the architecture of the Pyramid of Health (SNIS, 2010). At the top, national hospitals (third-level public health facility) represent the highest level of reference. They are followed by regional hospitals (second-level public health facility), first-level public health facilities, district health centres, health posts, and health huts. In 2011, Senegal had ten national hospitals, ten regional hospitals, ten first-level public health facilities, 88 district health centres, 1,257 health posts and 1603 health huts (ANSD & ICF International, 2012; SNIS, 2012). National hospitals were all in Dakar (nine hospitals) and Diourbel (one hospital). Of the 88 district health centres, 19 were in Dakar. The rest were in the other regions (SNIS, 2012).

Both the Pyramid of Health and Care are managed by the Ministry of Health. Outside these pyramids, there are other public health facilities (Zurn et al., 2010). Of these facilities, Dakar's Principal Hospital, Ouakam' Military Hospital and garrisons' health centres are under the management of the Ministry of Defense. There are medical inspections for schools, and health centres for high schools, colleges and universities that are under the responsibility of the Ministry of Education. There are also health centres for the police and fire brigades that are under the control of the Ministry of Internal Affairs. Health centres for the prisons are under the responsibility of the Ministry of Justice. Health centres for customs depend on the Ministry of Economy and Finance, and IPRES, the social security fund and companies are under the responsibility of the Ministry of Labour. There are, equally, health centres for the promotion of adolescent health that depend on the Ministry of Youth. Finally, health centres for the national parks are under the control of the Ministry of Environment.

Senegal can also rely on health facilities from the private sector, even if these facilities are more numerous in Dakar and Thiès than in other regions. These private services include one

private Catholic hospital, 32 private clinics, 70 private maternity clinics, 131 private medical centres and 180 church health posts (Zurn et al., 2010). Senegalese patients can also rely on the services of the non-governmental organisations and associations, as well as on the aid of private laboratories and imaging centres. It is important to recall that an important portion of Senegal's population uses traditional medicine. There is evidence that in Senegal 8% of deliveries are assisted by traditional birth attendants (Zurn et al., 2010).

Uneven distribution of Senegal's physicians

In 2010, Senegal had 1039 physicians. This statistic includes physicians working in the Pyramid of Care, the private sector and the defense sector (SNIS, 2011). The statistics concerning other sectors were not available. There were 833 physicians working in the Pyramid of Care, and 206 practicing in the private and Defense sectors. Of the 833 physicians who were working in the Pyramid of Care, 568 (68%) were practicing in Dakar and 265 (32%) in the other regions. Of the 206 physicians who were working in the private and Defense sectors, 107 (52%) were practicing in Dakar and 99 (48%) in the other regions (SNIS, 2011). Physicians are therefore unevenly distributed and more numerous in Dakar than in other regions (SNIS, 2011; Zurn et al., 2010; Zurn. et al., 2010). This uneven distribution of physicians is more pronounced with specialist physicians. There is some evidence that more than 80% of the specialist physicians practice in Dakar. Access to some of them is only possible in Dakar (SNIS, 2011). In other words, all the specialist physicians from certain disciplines work in Dakar (Zurn. et al., 2010).

Consequences of the uneven distribution of Senegal's physicians

The uneven distribution of physicians can be seen as one of the causes of health inequalities in the country (WHO, 2006). In Senegal, the rate of neonatal mortality, post-

neonatal mortality, infant mortality and child mortality are significantly higher in rural than urban areas (ANSD & ICF International, 2012). The following Table shows these disparities.

Table 3: Neonatal, post-neonatal, infant and child mortality in Senegal

Mortality	Rural (Per 1000)	Urban (Per 1000)
Neonatal mortality	35	28
Post-neonatal mortality	24	16
Infant mortality	59	44
Child mortality	102	62

The uneven distribution also has a negative impact on immunization coverage and access to healthcare (OMS, 2006).

Determinants of the uneven distribution of Senegal's physicians

In Senegal, the uneven distribution of physicians can be explained by many factors including occupational, personal, familial and community factors (Zurn et al., 2010). Occupational factors refer to the negative impact of underserved areas on career development, equipment availability, the level of information on training opportunities and workload. Personal and familial factors refer to schooling opportunities for children and job opportunities for spouses. Community factors refer to the failure of physicians to integrate into local communities. Integrating into these communities requires soft skills that are not always taught in medical schools; most of these skills are learned on the ground. This situation can lead to some mistakes that can push physicians to leave underserved areas. International migration is another factor that explains the uneven distribution of Senegal's physicians. More than 51% of Senegal's physicians work abroad (Clemens & Pettersson, 2007). Their favorite destinations are France, USA, Canada, Belgium, Spain and South Africa (Clemens & Pettersson, 2007). International migration contributes to the lack of physicians and increases workload in underserved areas (OMS, 2006) which lead to exhaustion and demoralization among the physicians working in these areas, and pushes them to leave their region (OMS, 2006).

Solution adopted to equitably distribute Senegal's physicians

In recent years, Senegal has adopted some solutions to recruit and retain physicians in underserved areas. These solutions are essentially those aiming to improve the management and production of physicians.

Solutions aiming to improve the management of physicians

The solutions aiming to improve the management of physicians include the creation of the Directorate of Human Resources (DHR) in 2004, the revision of the status of public health workers, the provision of financial incentives, and the provision of transportation subsidies (Zurn et al., 2010). Most of these solutions, similar to what was found in the broader literature, have had limited impact on the recruitment and retention of physicians in remote areas.

Senegal created the Directorate of Human Resources (DHR) within the Ministry of Health to improve the coordination of human resources management (Zurn et al., 2010); however, the Directorate requires significant financial and human resources. The mobilization of these resources is not obvious because much of the financing of Senegal's health system comes from foreign donors. With regards to the revision of the status of public health workers, Senegal set up a commission in which the Ministry of Health, the Ministry of Civil Service and union activists were represented (Zurn et al., 2010). The goal of this commission was to revise the conditions of public health workers including physicians. Revisions focused on career development and continuing education; the results of this commission are not available yet (Zurn et al., 2010).

With respect to the provision of financial incentives, its effectiveness to recruit and retain physicians in underserved areas is disputed (Zurn et al., 2010). According to the theory of Harris and Todaro (1970), the decision to leave one area for another is an individual decision that seeks

to maximize the expected income. This implies that physicians will continue to migrate to Dakar where income is higher (Zurn et al., 2010).

In terms of the provision of transportation subsidies, Senegal have provided some means of transportation to its physicians with the support of the African Development Bank (ADB). These means were offered to physicians working in remote regions such as Kolda, Tambacounda, Ziguinchor and Matam (Zurn et al., 2010). This solution aimed to encourage physicians to stay in these regions, but its impact is not clear.

Solutions aimed at increasing the number of physicians

The solutions aimed at producing more physicians include the opening of new private medical schools, and the provision of rural practicum grants to medical students (Zurn et al., 2010). These solutions increase the number of physicians, but may increase the medical unemployment rate if they are not followed by an increase in available positions in the public sector. This unintended consequence can inadvertently lead to an increase in the internal and international migration because unemployed physicians can migrate to the private sector (mostly located in Dakar) or foreign countries.

In sum, Senegal has not yet implemented a fully effective solution to recruit and retain physicians in underserved areas. There remains an uneven distribution of physicians with more physicians in Dakar than in the other regions.

Senegal's telemedicine projects

Telemedicine as a potential means to recruit and retain physicians in underserved areas has a long history of experimentation in Senegal (see Table 4).

Table 4: Senegal's telemedicine initiatives

Senegal's telemedicine initiatives
Non-government organizations
- AMREF Flying Doctors - Force d'Intervention sanitaire et satellitaire autoportée (FISSA) - SatelLife (HealthNet)
Associations
- Pesinet
Hospitals
- Regional University Hospital in Lille and European Telemedicine Institute in Toulouse - Appolo - Pan-African Network of Online Services - Francophone Virtual Medical University (UMVF) - Tele-cardiology and tele-neurology between Dakar and Saint-Louis - Black Skin Teledermatology Project
Universities
- Thiès Polytechnic School (INMARSAT) - Francophone Africa Network for Telemedicine (RAFT) - TOCOMAT-TELEAFRICARE
Health Ministry and health programs
- Tele-ophthalmology - Health Ministry, OMS et Datadyne
Telecommunication companies
- Senegal's national company of telecommunication (Sonatel) - Initiative du Réseau Alcatel de Télémedecine
International organizations
- Health Ministry, OMS et Datadyne
Research centres
- Acacia (CRDI)
Others
- Midjan group

Many projects were initiated by non-governmental organizations, associations, hospitals, universities, the Health Ministry, health programs, telecommunication companies, research centres and international institutions. They focused on teleassistance, teletraining and telemonitoring. Teletraining is the most frequently used form of telemedicine in Senegal. Most of these projects failed at an early stage. Few of them were successful beyond the experimental or pilot stage, and none of them was successful in becoming widely used. The determinants of

their failure are unknown, which is why this study was undertaken, with a focus on physicians working in public hospitals and district health centres, and on telemedicine projects managers. In the public health sector, physicians are present only in hospitals and district health centres; health posts and health huts do not have a physician (SNIS, 2012).

Telemedicine project managers are usually physicians, but some have no medical training. In 2013, Senegal's health authorities informed us that there were 187 physicians in district health centres and 596 physicians in public hospitals. The number of telemedicine project managers was unknown, as there was no directory of telemedicine projects in Senegal at the time.

Research objectives

This study pursued two objectives. The first objective focused on the individual factors and the second on the contextual factors that determine the use of telemedicine in Senegal. Individual factors referred to physicians' perception of the impact of telemedicine on their recruitment and retention in underserved areas, their beliefs about the use of telemedicine, and their intention to use telemedicine in their professional activities. Contextual factors referred to the technical, organizational, ethical, financial, political, legal and socioeconomic factors that influence the use of telemedicine in Senegal.

The main goal of this study was to gain greater insight on the determinants of telemedicine use in Senegal to better inform decision makers, researchers, telemedicine projects managers and health professionals on the factors on which actions could be undertaken to better encourage the use of telemedicine in the country. As noted earlier, the assumption is that improving the use of telemedicine will likely enhance the recruitment and retention of

physicians in underserved areas, improving access to healthcare for the rural population and, in turn, overall population health.

Theoretical frameworks

A theory presents a systematic way of understanding events or situations (Glanz, Rimer, & Su, 2005). It is a set of concepts, definitions, and propositions that explain and predict these events or situations by illustrating the relationships between variables. Most theories used in population health are adapted from social and behavioural sciences. They are called conceptual frameworks or theoretical frameworks. Models may draw on some theories to help understand a particular problem in a certain setting or context, but are not always as specific as theory (Glanz et al., 2005).

To study the factors that determine the use of telemedicine, many theories, models and conceptual frameworks have been used. Among them are the theory of reasoned action (TRA) (Araújo, Paiva, Jesuino, & Magalhães, 2000), the theory of planned behaviour (TPB) (Hu & Chau, 1999; Kuo, Talley, Lee, & Yen, 2015), the technology acceptance model (TAM) (Blanas et al., 2014; Saigí-Rubió, Torrent-Sellens, & Jiménez-Zarco, 2014) and the theory of interpersonal behaviour (TIB) (Gagnon et al., 2003). Others include the model of Broens (Broens et al., 2007), the model of Rogers (Rogers, 1995), the theory of Attewell (Tanriverdi & Iacono, 1999) and the model of Tanriverdi and Iacono (Tanriverdi & Iacono, 1999). There are numerous organisational readiness tools that have also been developed for telemedicine (Touré, 2010).

In this study, we used a social-ecological framework (micro, meso and macro framework) to explain the individual and contextual factors that determine the use of

telemedicine in Senegal, but to better understand the individual (micro) factors, the TPB was used. The following sections describe this framework and this theory.

Micro, meso and macro framework

To study the individual and contextual factors that influence the use of telemedicine in Senegal, we based our research on the micro, meso and macro framework, which is a social-ecological framework (see Figure 1).

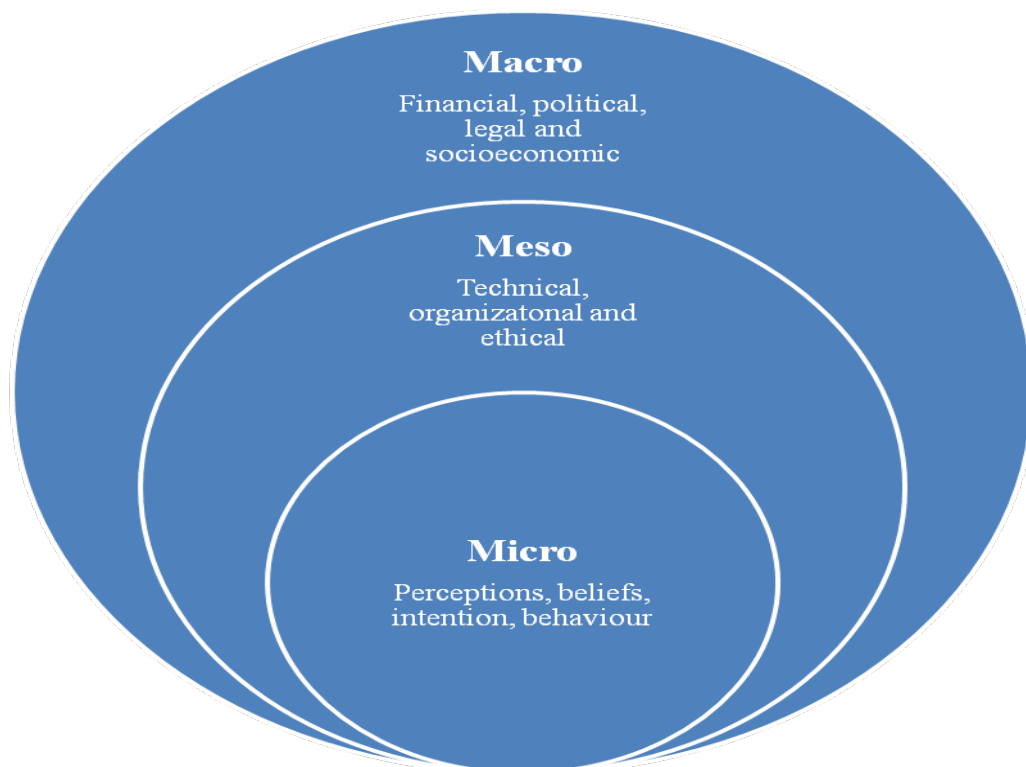


Figure 1: The micro, meso and macro framework of the use of telemedicine

Social-ecological frameworks emphasize the interaction between, and interdependence of, factors within and across all levels of a specific health problem. They highlight the interactions of individuals with their physical and socio-cultural environments. They show that individuals' behaviours can affect and can be affected by multiple levels of influence. Finally, they show that individuals' behaviours can shape and can be shaped by their social environment (Glanz et al., 2005).

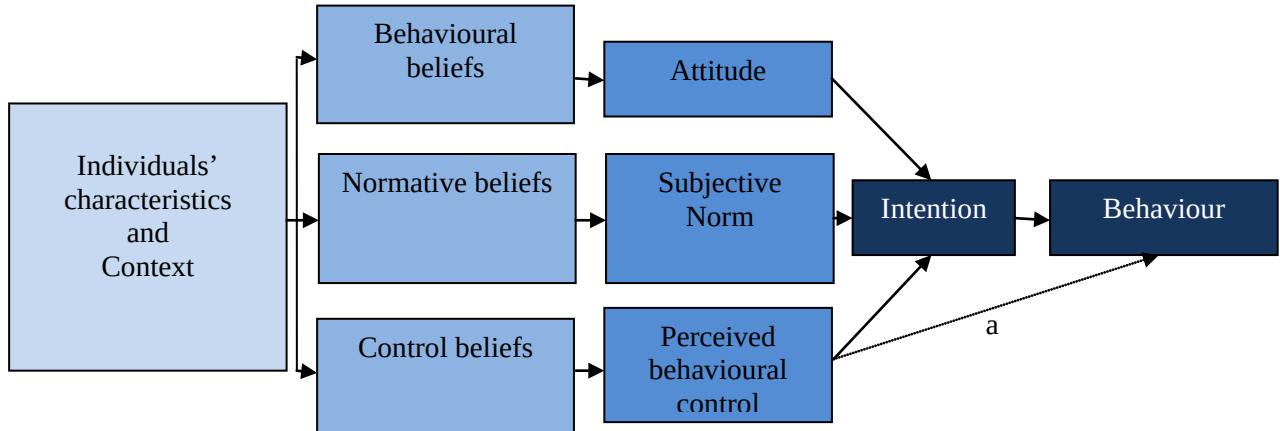
One of the best-known social-ecological frameworks is the model of Dahlgren & Whitehead (1991). It was developed to explain the determinants of health. It comprises five levels of influence. The upper level includes the major structural factors such as the general socioeconomic, cultural and environmental conditions. The next level includes the material and social conditions in which people live and work such as education, housing, and healthcare. The third level includes social and community support such as mutual support from family, friends, neighbours and the local community. The fourth level corresponds to individuals' behaviour such as their eating, smoking and drinking habits. The lower level represents individuals' characteristics such as age, sex, genetic make-up (Dahlgren & Whitehead, 1991). For each of the four upper levels, the model of Dahlgren and Whitehead (1991) proposes an intervention level.

The micro, meso and macro framework is an adaptation of this model and proposes three levels of influence (see Figure 1). In this study, the macro-level includes the financial, legal, political and socioeconomic factors that influence the use of telemedicine in Senegal. The meso-level includes the technical, organizational and ethical factors. The micro-level refers to individual factors and includes individuals' perception, beliefs, intention, and behaviour. As in the Dahlgren and Whitehead (1991) model, this framework proposes interventions for each of the different levels.

Theory of Planned Behaviour (TPB)

This social-ecological framework provides a broader view of the factors that determine the use of telemedicine and shows the interaction between, and the interdependence of, these factors. It also allows the development of interventions suited to the different levels, which would be helpful for decision makers and planners when addressing telemedicine barriers.

The micro factors, also called individual factors (behaviour, intention, and beliefs), were studied based on the TPB. This theory is one of the best known and more effective psychosocial theories in predicting and understanding individual factors such as behaviour, intention, and beliefs (Armitage & Conner, 2001; Godin, 2012). It is an adaptation of the theory of reasoned action (TRA) and indicates that individuals' behaviour depends on their intention to adopt this behaviour (Fishbein & Ajzen, 1975). Intention corresponds to their motivation to adopt the behaviour and depends on their attitude, subjective norm and perceived behavioural control. Attitude refers to the degree to which the performance of the behaviour is positively or negatively valued (Godin, 2012). Subjective norm refers to the perceived social pressure to either engage in behaviour or not (Godin, 2012). Perceived behavioural control refers to individuals' perceptions of their ability to perform the behaviour (Ajzen, 1991, 1988; Godin, 2012).



(a) Direct line of prediction when behaviour is not volitional

Figure 2: Adaptation of the TPB (Ajzen, 1991)

Perceived behavioural control can act directly on individual's behaviour or indirectly through intention when the behaviour is not under the volitional control of individual (Ajzen, 1991).

Individuals' attitude, subjective norm and perceived behavioural control depend respectively on their behavioural, normative and control beliefs. Behavioural belief refers to the subjective probability that behaviour will produce a given outcome. Normative beliefs refer to the perceived behavioural expectations of important referents, including individuals or groups. Control beliefs refer to the perceived presence of factors that may facilitate or impede the performance of the behaviour (Ajzen, 1991).

The TPB is open to adding other variables if they explain an additional proportion of the variance of individuals' intention (Ajzen, 1991). Some researchers have demonstrated that adding other variables may explain an additional proportion of the variance of individuals' intention (Armitage & Conner, 2001). In this study, no variable was added.

The TPB has already been used to explain physicians' intention and behaviour regarding telemedicine. For example, it was used to explore the factors that influence physicians' intention to use telemedicine (Kuo et al., 2015). The results showed that attitude, subjective norm, and perceived behavioral control were positively related to intention (Kuo et al., 2015). It was also helpful in exploring telemedicine acceptance among the physicians working in public tertiary hospitals in Hong-Kong (Hu & Chau, 1999). The results determined that attitude and perceived behavioral control are crucial to physicians' technology acceptance (Hu & Chau, 1999). By contrast, to the best of our knowledge, the TPB has never been employed to explain the intention of Senegal's physicians to use telemedicine in their professional activities. To our knowledge, this study is the first to apply it in exploring the intention of these physicians.

Our assumption is that the use of telemedicine by Senegal's physicians, particularly those working in public hospitals and district health centres, is influenced by their intention to use telemedicine. Intent is induced by their attitude, subjective norm and perceived behavioural

control toward the use of telemedicine. These three variables depend respectively on physicians' behavioural, normative and control beliefs toward the use of telemedicine. These three beliefs, in turn, are shaped by physicians' characteristics and context. As suggested by the TPB, physicians' perceived behavioural control can directly influence their behaviour regarding the use of telemedicine. These various assumptions are represented in Figure 2.

Methods

This study used various methods to examine the individual (micro) and contextual (meso and macro) factors that determine the use of telemedicine in Senegal. These methods are presented below and detailed in Table 5.

Individual (micro) factors

To analyze physicians' perceptions of the impact of telemedicine on their recruitment and retention in underserved areas, we conducted an exploratory qualitative study involving individual interviews among 30 physicians working in public hospitals and 30 physicians working in district health centres. Physicians were selected based on a purposeful random sampling strategy and interviewed individually through face-to-face interviews using a semi-structured interview guide. Interviews focused on the ability of telemedicine to attract and retain them in underserved areas, and lasted 5 to 15 minutes. Data was analyzed descriptively using both SPSS 23 and NVivo 10 software.

To explore physicians' behavioural, normative and control beliefs about the use of telemedicine in their professional activities, we undertook a qualitative descriptive study involving individual interviews. The participants of this study included 32 physicians working in public hospitals and 37 physicians working in district health centres.

Table 5: methods used to examine the individual and contextual factors that determine the use of telemedicine in Senegal

	Perceptions	Beliefs	Intention	Contextual factors
Design	Exploratory qualitative study	Qualitative descriptive study	Cross-sectional study	Qualitative descriptive study
Participants	30 physicians from PHs	32 physicians from PHs	168 physicians from PHs	30 physicians from PHs
	30 physicians from DHCs	37 physicians from DHCs	153 physicians from DHCs	36 physicians from DHCs
Sampling techniques	Purposeful random sampling	Purposeful random sampling	Random selection	10 telemedicine projects managers
				Purposeful random sampling Snowball sampling
Data collection techniques	Individual interview	Individual interview	Individual interview	Individual interview
Data collection tools	Semi-structured interview guide	Semi-structured interview guide	Questionnaires	Semi-structured interview guide
Length of interviews	5 to 15 min	10 to 45 min	10 to 15 min	30 to 85 min
Data analysis	Thematic analysis	Thematic analysis	Descriptive statistics, correlations, and linear regression	Thematic analysis
Software	NVivo 10	NVivo 10	SPSS 23	NVivo 10

They were selected randomly using a purposeful random sampling. Physicians were interviewed individually in person using a semi-structured interview guide. They were asked about the advantages and challenges associated with the use of telemedicine (behavioral beliefs), the people around them that can approve or disapprove the fact that they use telemedicine (normative beliefs), and the barriers or facilitators that encourage or discourage them to use

telemedicine in their professional activities (control beliefs). Interviews lasted 10 to 45 minutes, and data was analyzed using the Attride-Stirling thematic network analysis framework which is a method for conducting a thematic analysis of qualitative or textual data.

To investigate physicians' intention to use telemedicine in their professional activities, we conducted a cross-sectional study which involved 168 physicians working in public hospitals and 153 physicians working in district health centres. These physicians were randomly selected and asked about their intention, attitude, subjective norm and perceived behavioural control toward the use of telemedicine. They were also asked about their professional and socio-demographic characteristics. Data was collected through two questionnaires adapted specifically for physicians working in public hospitals and district health centres. These questionnaires were validated. Data was analyzed using descriptive statistics, correlations, and linear regression.

Contextual (meso and macro) factors

To identify the contextual meso (technical, organizational and ethical) and macro (financial, political, legal and socioeconomic) factors that influence the use of telemedicine in Senegal, we performed a descriptive qualitative study involving individual interviews among 30 physicians working in public hospitals, 36 physicians working in 36 district health centres and ten telemedicine projects managers. Physicians were randomly selected while managers were recruited using a snowball sampling strategy. Both physicians and managers were interviewed in person using a semi-structured interview guide. Interviews focused on the meso (technical, organizational and ethical) and macro (financial, political, legal and socioeconomic) factors that influence the use of telemedicine in Senegal, and lasted 30 to 85 minutes. Data was analyzed thematically using NVivo 10 software.

Thirty physicians working in public hospitals and 30 physicians working district health centres participated in the four studies. To conduct these various studies on individual and contextual factors, some ethical and administrative approvals were needed both in Canada and Senegal. Thus, we secured the approval from an examining committee of the population health program, the University of Ottawa Research Ethics Board, the National Ethics Committee on Health Research in Senegal, the Ministry of Health in Senegal, the General Director of Health in Senegal, the head-physicians of Senegal's medical regions, the Directors of Senegal's hospitals and the head physicians of Senegal's district health centres. Before answering our questions, each participant provided written informed consent. The anonymity of their information was respected in both Senegal and Canada.

Organization of the Thesis

The study is organized into four empirical chapters that explore how the use of telemedicine in Senegal is influenced by many individual and contextual factors.

Chapter 2 focuses on the impact of telemedicine on physicians' recruitment and retention in underserved areas. It seeks to understand if this impact is positively or negatively perceived by Senegal's physicians, and to identify the factors that determine that perception. It also tries to understand if telemedicine is considered by Senegal's physicians to be a sufficient means to recruit and retain them in underserved areas. Finally, it identifies which factors explain whether or not telemedicine is sufficient in itself to recruit and retain physicians in underserved areas.

Chapter 3 emphasizes physicians' beliefs. More specifically, it focuses on physicians' behavioural, normative and control beliefs toward telemedicine. It identifies physicians' positive and negative behavioural, normative and control beliefs that can influence their use of telemedicine in their professional activities. It also examines whether these beliefs change with

physicians' age, gender, region of practice, specialization, and type of health facilities (hospital or district health centre). In sum, it pinpoints which beliefs could encourage or discourage physicians to use telemedicine.

Chapter 4 investigates physicians' intention, which is considered to be the main determinant of their behaviour. It describes the intention of Senegal's physicians to use telemedicine in their professional activities by considering how that intention changes with age, gender, region of practice, specialization, and type of health facilities. It also describes the factors correlated with physicians' intention as well as the factors that explain that intention. In other words, it tries to understand if physicians' intention favours the use of telemedicine and what are the factors on which actions are needed to promote that intention.

Chapter 5 addresses the contextual factors that influence the use of telemedicine in Senegal. It demonstrates that the use of telemedicine in Senegal is influenced by many micro (technical and ethical), meso (organizational and financial) and macro (political, legal and socioeconomic) factors, that these various factors interact with each other, and that they are interdependent.

The final chapter presents the general discussion of our dissertation. It examines the main individual, and contextual factors identified, by highlighting the main contributions of this work to the improvement of scientific knowledge concerning telemedicine interventions. By doing so, it compares our results with those from other studies and proposes some recommendations for Senegal's decision makers, planners, telemedicine projects managers, researcher, academics, and physicians. It also describes the limits of this study and identifies some areas for future research.

Chapter 2

Perceptions of Senegalese physicians of the impact of telemedicine on their recruitment and retention in underserved areas

Running title: perception of Senegal's physicians on telemedicine

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Abstract

Introduction

In Senegal, physicians are very unevenly distributed, which can contribute to health inequalities. Telemedicine is considered as a potential solution to this problem, but the physicians' perceptions in Senegal of the impact of telemedicine on their recruitment and retention in underserved areas is unknown.

Objective

This study aimed to investigate the perceptions of Senegal's physicians on the impact of telemedicine on their recruitment and retention in underserved areas.

Method

We conducted an individual research interview between January and June 2014 with a random sample of 60 physicians including 30 physicians working in public hospitals and 30 physicians working in district health centres. Data was collected using a semi-structured interview guide including close-ended and open-ended questions. Interviews were recorded and transcribed; transcripts were coded thematically using NVivo 10 software. Participants' characteristics were analyzed descriptively using IBM SPSS Statistics 23 software.

Results

Telemedicine's impact on physicians' recruitment and retention in underserved areas was perceived differently by individual physicians in Senegal. Among the physicians who were interviewed, 36 (60%) thought that telemedicine could have a positive impact on their recruitment and retention while 24 (40%) believed the opposite. Those who thought that telemedicine could have a positive impact on their recruitment and retention acknowledged some of its advantages but recognized that it is not sufficient in itself. Similarly, physicians who

believed the opposite said that telemedicine was not the only factor that determined their recruitment and retention. Thus, all the physicians surveyed agreed, but with different emphasis, that telemedicine is not the only factor that determines their recruitment and retention. The other factors that were reported were individual, family, contextual, professional, organizational, educational, and economic factors.

Conclusions

Senegalese physicians suggest that telemedicine should be used with caution as a means to recruit and retain physicians in underserved areas. They also show that telemedicine should be associated with other interventions that address the multiple factors which influence physicians' recruitment and retention in these areas.

Keywords: Physicians' perception, telemedicine, Senegal

Abstract word count: 322 words

Manuscript word count: 5803 words

Introduction

In Senegal, physicians are more numerous in Dakar, the national capital, than in other regions (Zurn. et al., 2010). Dakar has 0.2 physicians per 1,000 inhabitants while regions such as Fatick, Kolda, Kaolack and Matam count only 0.04 physicians per 1,000 inhabitants (Zurn. et al., 2010). Some data indicate that Dakar contains more than 60% of physicians while its population represents only 23% of the total population (Zurn. et al., 2010). This uneven distribution of physicians jeopardizes access to healthcare in underserved areas and creates health inequities. For example, evidence shows that neonatal mortality ranges from 35 per 1,000 in well-served areas to 28 per 1,000 in underserved areas (ANSD & ICF International, 2012).

To reduce the uneven distribution of physicians, Senegal undertook several initiatives to improve physicians' recruitment and retention in underserved areas (Zurn et al., 2010). Today, it is hard to determine the impact of these measures as their effectiveness was never fully assessed. Also, the uneven distribution of physicians has worsened. Meanwhile, telemedicine, which is defined as the practice of medicine at a distance (Jones et al., 2004), is seen as a potential means to improve physicians' recruitment and retention in underserved areas. Several studies have demonstrated its positive impact on physicians' recruitment and retention in underserved areas (Fortin et al., 2006; Gagnon et al., 2007). However, these studies were most often conducted in developed countries. None were conducted in Senegal.

Our overall research was comprised of studies created to address two objectives:

- What are the individual (micro) factors that influence the use of telemedicine in Senegal?
- What are the contextual (meso and macro) factors that influence the use of telemedicine in Senegal?

The particular study reported in this paper explores the perceptions of Senegalese physicians on the impact of telemedicine on their recruitment and retention in underserved areas. Together with the findings of the related studies, it will help to determine whether telemedicine can play a useful role in improving access to physicians in underserved areas in Senegal, with potentially transferable lessons to African countries facing similar shortages in underserved areas.

State of Knowledge

Telemedicine is considered to be a good means to improve physicians' recruitment and retention in underserved areas (Potter et al., 2014). In a literature review published in 2011, Gagnon and colleagues identified 13 studies that examined the effects of information and communication technologies (ICT) on the recruitment and retention of health professionals (Gagnon, Pollender, Trepanier, Duplaa, & Ly, 2011). Of the 13 studies, nine showed that ICT can have a positive impact on the recruitment and retention of health professionals in underserved areas (Gagnon et al., 2011). In another literature review, Dolea and colleagues identified telemedicine as an effective retention strategy (Dolea et al., 2010).

Duplantie and colleagues (2007) conducted a literature review to identify the factors that determine physicians' recruitment and retention in underserved areas, and the role of telemedicine (Duplantie et al., 2007). They identified seven factors including individual, family, contextual, professional, organizational, educational and economic factors. They then conducted a Delphi study with 12 Canadian telemedicine experts to confirm the recruitment and retention factors that could be affected by telemedicine (Duplantie et al., 2007). This Delphi study demonstrated that telemedicine could have an impact on the individual, professional, organizational and educational factors, but it failed to demonstrate the impact of telemedicine on

family, contextual and economic factors. Based on these findings, Duplantie and colleagues (2007) concluded that telemedicine alone cannot solve the problems of physicians' recruitment and retention in underserved areas. Gagnon and collaborators reached the same conclusion based on a study among medical residents (Gagnon et al., 2005). All of these studies, however, are based on high-income countries; little is known about telemedicine's role in more resource-constrained settings, and no study of physician perceptions of the role of telemedicine in their recruitment and retention in Senegal exists.

Method

Study design and participants

An exploratory qualitative approach involving short individual interviews was undertaken between January and June 2014. This method is typical of qualitative research that seeks to understand a new phenomenon where little previous information is available (Creswell, 2007; Crotty, 1998; Kelly, 2010), which was the case with respect to the determinants of Senegalese physicians' use of telemedicine. The research participants were comprised of Senegal's physicians who worked in public hospitals and district health centres. In 2014, Senegal had 596 physicians working in public hospitals and 187 physicians working in district health centres.

Sampling and recruitment

We used purposive sampling to select physicians who worked in the two key settings: public hospitals and district health centres. The purposive sampling strategy is one of the best known in qualitative research (Creswell, 2007). Using this strategy, we then randomly selected 30 physicians among the 596 physicians working in public hospitals and 30 physicians among the 187 working in district health centres. These physicians were contacted to establish their

availability, willingness to participate in the study, and consent to be interviewed and audio-recorded. Those physicians who were available, willing to participate, and gave consent to be interviewed and audio-recorded were retained. Two physicians working in district health centres refused to participate. They were replaced by two other physicians also working in district health centres.

Data collection

The 60 physicians were interviewed individually through face-to-face interviews by the lead researcher, and interviews were recorded using a digital recorder. They were conducted in public hospitals, district health centres, physicians' homes, hotels, restaurants, the airport, training centres and Cheikh Anta Diop University. Interviews lasted 5 to 15 minutes, and interview locations depended on the availability and preference of physicians.

Instruments

We used a semi-structured interview guide to collect physicians' perceptions. This interview guide comprised both open-ended and close-ended questions. Participants were asked about their perceptions of the impact of telemedicine on their recruitment and retention in underserved areas. Table 1 shows this interview guide. All the questions were formulated with respect to our research objectives. The interview questions were tested by the lead author to identify ambiguous and troublesome wording with the interview guide and to ensure the questions were extrapolating the data required. Afterwards, they were submitted to an expert committee to be judged. Later, the same questions were tested with a small sample of three physicians working in public hospitals and three physicians working in district health centres. These physicians' answers were recorded and listened to in order to detect mistakes related to the questions and the administration of the interview guide.

Table 1: Interview guide used in interviews

N°	Questions
1	Do you think that telemedicine could have a positive impact on physicians' recruitment and retention in underserved areas?
2	If no,
2.1.	Why does telemedicine could not have a positive impact on physicians' recruitment and retention in underserved areas?
3	If yes,
3.1.	Why does telemedicine could have a positive impact on physicians' recruitment and retention in underserved areas?
3.2.	Do you think that telemedicine is enough to recruit and retain physicians in underserved areas?
	3.2.1. If yes, why it is enough?
	3.2.2. If no, what are the other factors that determine physicians' recruitment and retention in underserved areas?

Analysis

We began with a descriptive analysis, identifying participants' characteristics using SPSS 23. All the interview recordings were transcribed by the lead author and exported into NVivo 10. In this qualitative analysis software, data was coded thematically, and the responses were compared to the characteristics of the physicians. This enabled an analysis of physicians' characteristics according to their perceptions (positive or negative) of telemedicine's impact on their recruitment and retention in underserved areas. Afterwards, we described the other recruitment and retention factors mentioned by the participants according to the classification of Duplantie et al. (2007) which included individual, familial, contextual, professional, organizational, educational and economic factors.

Ethical and administrative approvals

Approval for this study was secured from the Research Ethics Board of the University of Ottawa (N° H 09-13-12), and from Senegal's National Ethics Committee on Health Research (N°

205 MSAS/ DPRS/ CNERES). We also secured authorization from the Ministry of Health (N° 111 MSAS/ DPRS/ DR) and the General Director of Health (N° 0678/ DGS/ SP) to interview physicians in Senegal, and obtained permission from the head-physicians of medical regions that received instruction from the General Director of Health to facilitate our research and to invite the physicians working in public hospitals, the physicians working in district health centres, and telemedicine projects managers to participate. Afterwards, we contacted each hospital and district health centre to obtain their permission to interview physicians and telemedicine projects managers. Before answering our questions, each participant provided their written informed consent. The anonymity of each participant's information was respected during the whole research process.

Results

The results of this study are organized into two parts: the first focusing on participants' characteristics, and the second on their perceptions.

Participants' characteristics

The study included 60 participants equally divided between those working in public hospitals and district health centres. Table 2 presents the characteristics of physicians. Those working in public hospitals were all specialist physicians (100 %) and were mainly male except five (16.7%). Those working in public hospitals were more numerous in Dakar (80 %), and their average age was 44 years with a minimum of 29 years and a maximum of 61 years. The average age of the physicians working in district health centres was 40 years with a minimum of 33 and a maximum of 53 years.

These physicians were also predominantly male (93.3%) with only two female physicians (6.7%), but they were less numerous in Dakar (6.7%). Most were specialist physicians (66.7%).

It is important to recall that in Senegal, specialist physicians represent 71% of all physicians (OMS & JICA, 2013) and that they are more numerous in hospitals than district health centres. Female physicians represent 29% of all physicians. The physicians whose age is between 31 and 40 years are more numerous than the rest of the physicians (36.9%). They are followed respectively by the physicians whose age is between 41 and 50 years (30.9%), equal or more than 51 years (27.8%), and equal or less than 30 years (4.3%).

Table 2: Participants' Characteristics

Characteristics		Physicians working in public hospitals		Physicians working in district health centres	
		N	%	N	%
Age	≤ 30	2	6.7	0	0.0
	31-35	3	10.0	9	30.0
	36-40	3	10.0	9	30.0
	41-45	8	26.7	7	23.3
	45-50	6	20.0	4	13.3
	51-55	7	23.3	1	3.3
	56-60	0	0.0	0	0.0
	≥ 61	1	3.3	0	0.0
Sex	Male	25	83.3	28	93.3
	Female	5	16.7	2	6.7
Specialization	General Practitioners	0	0.0	10	33.3
	Specialist physicians	30	100.0	20	66.7
Region	Dakar	24	80.0	2	6.7
	Outside Dakar	6	20.0	28	93.3
Total		30	100	30	100

N: Number; %: Percentage

Participants' perceptions

Perceptions of the positive impact of telemedicine on physicians' recruitment and retention

Some physicians showed a positive perception whereas others were more negative about telemedicine's potential impacts on their recruitment and retention in underserved areas. The

following sections describe the characteristics of the two groups of physicians and the factors influencing their opinions.

Positive perceptions

Of the 60 physicians who were interviewed, 36 (60%) thought that telemedicine can positively impact their recruitment and retention in underserved regions. Of these 36 participants, 22 were working in public hospitals and 14 in district health centres. Of the 22 physicians who were working in public hospitals, 18 were male physicians, and four were female. Seventeen were working in Dakar and five outside the city. Of the 14 physicians who were working in district health centres, 13 were male, and one was female. Ten were general practitioners, and four were specialist physicians. Finally, two were working in Dakar and 12 outside the capital region.

The reasons provided by these physicians are numerous. Out of the 36 physicians, 16 participants thought that telemedicine would have a positive impact on their recruitment and their retention by breaking professional isolation and allowing them to communicate with their colleagues and experts. One of these 16 participants, a male specialist physician working in a public hospital in Dakar, said:

"Yes! This is really important because if telemedicine is available, physicians who work outside Dakar will feel more connected to the other physicians who work in the bigger cities. That will allow them to break down this lack of communication."

Another 16 participants thought that telemedicine would have a positive impact on their recruitment and their retention by facilitating distance learning, with a typical response being:

"Of course, it could retain us because we don't need to travel to Dakar to learn" (Male specialist physician working in a district health centre outside Dakar)

Some 11 participants thought that it could improve their working conditions, which would encourage them to go and stay in underserved areas. Among these participants, one male physician working in district health centres said:

"It can encourage physicians to stay at the local level because they know that they can always count on the advice of people who have more experience than them if they meet problems and difficulties." (Male general practitioner working in a district health centre outside Dakar)

Seven participants thought that it could help to reduce the stress related to their professional isolation by offering the possibility to seek support from experts, which would incentivize them to stay in their areas. As one of these participants noted:

"I believe that it will contribute to reducing the stress of physicians in all cases. Maybe, there are other factors." (Male specialist physician working in a public hospital in Dakar)

Finally, four participants thought that it would help them to have the same level of information and knowledge as the physicians practicing in Dakar. As one the participant working in district health centres summarized:

"Many physicians, who work in remote areas, believe that they don't have the latest information. I think with telemedicine, information will circulate more quickly. They will then be informed at the same level as the physicians working in Dakar." (Male specialist physician working in a district health centre outside Dakar)

Negative perceptions

Of the 60 physicians who were interviewed, 24 thought that telemedicine would not have a positive impact on their recruitment and retention. Of these physicians, eight were working in

public hospitals and 16 in district health centres. Of the eight physicians who were working in public hospitals, seven were male, and one was female. Seven of these eight physicians were working in Dakar while one was working in another region. The only female physician was working in Dakar. Of the 16 physicians who were working in district health centres, 15 were male, and one was female. These physicians were all specialists and were working outside Dakar. According to these 24 physicians, telemedicine would not have a positive impact on their recruitment and retention because it was not the only factor that determined physicians' decisions. As one physician working in public hospitals stated, capturing this theme:

"You put, for them, all the possible and imaginable telemedicine machines, if their work environment is not good, if the prospects for professional advancement are not good, if the schools where they send their children are not good schools, if his wife cannot stay there, he will leave." (Male specialist physician working in a public hospital in Dakar)

Perceptions of whether telemedicine is sufficient to recruit and retain physicians

The 36 physicians who thought that telemedicine can have a positive impact on their recruitment and retention were asked whether it would be sufficient to do so. All said that telemedicine would not be sufficient. As one of the physicians working in district health centres noted:

"To retain physicians in the regions, there is not just telemedicine. It is a factor, but it's not the only factor. There are other factors such as salary treatment, money, and all those things. People think that they are always monetarily well treated in Dakar than in the regions. This is a reality." (Male general practitioner working in a district health centre outside Dakar)

Other respondents spoke to issues of living and working conditions that needed improvement, alongside the use of telemedicine. For example, one female physician working in Dakar's public hospitals said:

"Telemedicine could retain them, but I think that it is not sufficient. Their living and working conditions must be improved. Some colleagues are assigned in some remote facilities but don't have any house. This is a problem. This is a huge problem. We are all humans. Who among us will accept to work in a remote area in these conditions?"

(Female specialist physician working in a public hospital in Dakar)

While supportive of telemedicine as playing a positive role in their recruitment and retention in underserved areas, these respondents were also clear that telemedicine could not have much impact if that was the only intervention used to improve conditions for physicians posted in such areas. In that respect, they shared many of the same concerns as those physicians who were more skeptical of telemedicine's role, mostly because of the emphasis they placed on these other contextual factors.

Other factors that determine physicians' recruitment and retention in underserved areas

Since all our participants agreed that telemedicine was not the only factor that would determine their recruitment and retention in underserved areas, they were asked about other factors that determine their recruitment and retention. They cited many which were classified into individual, familial, contextual, professional, organizational, educational and economic factors.

Individual factors

The only individual factor was mentioned by one of the male physicians working in district health centres outside Dakar. He spoke of the desire to get closer to the region selected for retirement which, in his case, would be in the city of Dakar.

"Naturally, a physician just like other people needs to get closer to his family, to the region in which he wants to finish his career, in which he wants to spend the rest of his life." (Male specialist physician working in a district health centre outside Dakar)

Familial factors

Familial factors that were reported focused on the difficulties in finding schools for children (n=9) and the lack of job opportunities for spouses (n=1). About the difficulties in finding schools for children, one physician working in district health centres commented:

"If you go to some regions, your children cannot find good schools. The best investment is to invest in his children. We have to ensure their future. Competition is increasingly harder. Therefore, they have to go to the best schools. In remote regions, your children cannot go to school." (Male general practitioner working in a district health centre in Dakar)

Difficulties in finding schools for their children or job opportunities for their spouses led to their families staying in Dakar or in another place that offered more opportunities. This situation increased their family costs and pushed them to leave (or consider leaving) the regions that offered fewer opportunities for their families. One of the physicians working in Dakar's district health centres evoked some factors that explain why their family costs increase.

"They are in very remote areas and, in general, their family is not there. Their family lives in Dakar for various reasons. The main reason is the education of children. Thus,

they rent an apartment in Dakar. They have a family over there. They have like another family where they work. There is schooling of children. There is food. There are also social problems to cover financially." (Male general practitioner working in a district health centre in Dakar)

Professional factors

Professional factors highlighted by participants included the lack of professional development (n=2) and professional isolation (n=3). The participants, who spoke to these professional factors, believed that Dakar offers more opportunities for professional development and fewer possibilities to be isolated professionally. One male physician working in public hospitals outside Dakar said:

"After some years, we realize that we are silly. We realize that we are here, but Dakar offers more opportunities to develop professionally and more chance to stay in touch with experts." (Male specialist physician working in a public hospital outside Dakar)

These beliefs pushed them to stay in Dakar and jeopardized the opportunity to retain them in underserved areas.

Educational factors

Related educational factors identified included that underserved areas offer fewer opportunities to train than Dakar (n=8). Consequently, for them, it is better to be in Dakar. One of the male specialist physicians said:

"If you are in Tambacounda, for example, you cannot participate in post-graduate studies. Thus, you cannot improve your knowledge. You work with only your knowledge acquired at school. Good things happen only in Dakar. People learn and advance. If you stay in areas

like Tambacounda, you will work with only your knowledge acquired 20 years ago." (Male specialist physician working in a public hospital in Dakar)

Organizational factors

The organizational factors that were identified were the poor working conditions (n=14), the extended stays in underserved areas (n=8) and the inequities in assigning physicians to their posts (n=5). About the poor working conditions, one female specialist physician working in public hospitals said:

"What is the connection? I don't see the connection. Certain physicians don't want to stay in remote areas because of poor working conditions. This has nothing to do with telemedicine. They just want to have good working conditions. If you appoint a physician in a remote area in which there is nothing and ask him to do tasks normally reserved for nurses, he will leave. He does not need to stay there. It is better to replace him by a nurse." (Female specialist physician working in a public hospital in Dakar)

Contextual factors

The contextual factors mentioned included poor living conditions in rural communities (n=12), the bad climatic conditions (n=2), and the limited number of patients (n=1).

About the limited number of patients, one of the physicians working in district health centres said:

"In some district, there is nothing to do. The centre is in full Savannah. There are not a lot of patients. You get bored." (Male specialist physician working in a district health centre outside Dakar)

Economic factors

The economic factors that were mentioned included the lack of incentive (n=22), the low income (n=12) and the lack of a remoteness premium (n=11). These physicians highlighted the inadequacy of their income and the lack of discriminatory financial benefits. For them, there is no financial motivation to stay in underserved areas. One of the female specialist physicians working in district health centres said:

"This is difficult. This is different than Dakar. In Dakar, there is everything. This is not the case outside Dakar. Thus, discriminatory financial measures are needed. The physicians working outside Dakar should not have to be treated in the same way as the physicians working in Dakar. That is it." (Female specialist physician working in a district health centre outside Dakar)

Similarities or differences between the physicians who were favourable about telemedicine, and those that were not

Similarities

The two groups of physicians had almost the same proportion of male and female physicians. The proportion of male physicians was higher than that of female physicians in the two groups. This result leads to the assumption that there was no gender difference between the physicians who were favourable or not about telemedicine, but there was insufficient representation from female physicians to confirm this conclusion. Likewise, the average age of the two groups of physicians seems to be the same with 41.2 years (maximum 52 – minimum 29) for the physicians who demonstrated positive perceptions and 43.8 years (maximum 61 – minimum 33) for those who did not. Table 3 shows the distributions of physicians according to their perceptions, gender, facility, region, specialisation and age.

Differences

The proportion of the physicians who thought that telemedicine could have a positive impact on their recruitment and retention in underserved areas was higher in public hospitals (61.1%) than in district health centres (38.9%) while the proportion of those who thought the opposite was higher in district health centres (66.7%) than in public hospitals (33.3%).

Table 3: Distributions of physicians according to their perceptions, gender, facility, region, specialisation and age

Characteristics		Positive perceptions		Negative perceptions	
		N	%	N	%
Health facilities	Hospitals	22	61.1	8	33.3
	District health centres	14	38.9	16	66.7
Gender	Male	31	86.1	22	91.7
	Female	5	13.9	2	8.3
Medical Region	Dakar	19	52.8	7	29.2
	Outside Dakar	17	47.2	17	70.8
Specialisation	General practitioner	10	27.8	0	0.0
	Specialist physician	26	72.2	24	100.0
Age	≤ 30	2	5.5	0	0.0
	30-35	7	19.4	5	20.8
	35-40	7	19.4	5	20.8
	40-45	8	22.2	7	29.2
	45-50	8	22.2	2	8.3
	50-55	4	11.1	4	16.7
	55-60	0	0.0	0	0.0
	≥ 60	0	0.0	1	4.2

N: Number; %: Percentage

Similarly, the proportion of the physicians who thought that telemedicine could have a positive impact on their recruitment and retention in underserved areas was higher in Dakar (52.8%) than outside Dakar (47.2%) while the proportion of those who thought the opposite was higher outside Dakar (70.8%) than in Dakar (29.2%). All the physicians who thought the opposite were specialist physicians. The ten general practitioners involved in this study thought that telemedicine could play an important role in their recruitment and retention in underserved areas. These results show that the negative perceptions of physicians regarding the role of

telemedicine in their recruitment and retention in underserved areas could be associated with working in district health centres outside the capital region as specialist physicians.

Discussion

These results show that the impact of telemedicine on physicians' recruitment and retention in underserved areas is perceived somewhat differently by Senegal's physicians who worked in public hospitals and district health centres, although the majority of them thought that telemedicine could have a positive impact on their recruitment and retention. These results call for caution about the use of telemedicine as a means to recruit and retain physicians in underserved areas unless the factors that support the perceptions of the two groups of physicians are well known. This study looked at these factors.

The physicians who thought that telemedicine could have a positive impact on their recruitment and retention in underserved areas emphasized how it could reduce stress related to their professional isolation, allow them to communicate with their colleagues and exchange information with experts, facilitate distance education, improve their working conditions and have the same level of information and knowledge as their colleagues working in Dakar. These results corroborate those of Brebner et al. (2004), who found that telemedicine can have a positive impact on the recruitment of physicians in rural areas if it allows them to have experts' opinion in the same way as their colleagues in larger cities. They also corroborate those of other studies that found that telemedicine improved recruitment and retention by reducing professional isolation, allowing physicians to have the views of remote experts and reducing overload at work (Jennett et al., 2000; Potter et al., 2014; Watanabe et al., 1999). These findings recall the advantages of telemedicine and invite Senegal's policy-makers to consider them when promoting telemedicine. They also invite planners and researchers to consider them because they

highlight the attributes of telemedicine that are valued by Senegal's physicians that can help to improve their recruitment and their retention in underserved regions.

The physicians who thought that telemedicine was unlikely to have a positive impact on their recruitment and retention in underserved areas believed this would be the case primarily because it was not the only factor that determined their decisions about where to locate, a finding consistent with many other studies (Duplantie et al., 2007; Sargeant, Allen, & Langille, 2004; Zurn et al., 2010). The other factors identified included individual, familial, environmental, professional, organizational, educational and economic factors.

Regarding the individual factors, only one of our participants mentioned the desire to get closer to the region selected for their retirement. There is little research exploring where physicians want to spend their retirement and what factors motivate their choice. Similarly, there is not much research investigating the impact of this individual factor on physicians' decision to leave or stay in an area. These results show the need to focus on these questions in future research.

The familial factors physicians mentioned were the difficulties in finding schools for their children and the lack of job opportunities for their spouses. These results are consistent with findings from several other studies (Duplantie et al., 2007; Ellsbury, Baldwin, Johnson, Runyan, & Hart, 2002). They also reflect the fact that, in Senegal, schooling and job opportunities are limited in underserved areas (Zurn et al., 2010). These circumstances lead physicians to live at a distance from their family because their children and spouses have to stay somewhere that offers more schooling and job opportunities. As one of our respondents noted, this situation is difficult socially and also economically because it leads to additional costs (Zurn et al., 2010). The physicians who live alone in underserved areas have to travel regularly to visit

their family. They also need to rent two houses in two different regions if they don't have an official residence in their workplace (Zurn et al., 2010). These findings demonstrate the need to improve schooling and job opportunities in underserved areas.

Environmental factors that were mentioned by our participants are the poor living conditions and the limited number of patients. For poor living conditions, a healthy and less stressful environment is known to influence positively physicians' recruitment (Hankins, Guo, & Bentley, 2002). Access to social and recreational activities can also have a positive impact on both physicians' recruitment and retention (Bilodeau & Leduc, 2003; Szafran, Crutcher, & Chaytors, 2001). These results reveal the need to improve physicians' living conditions in underserved areas. The limited number of patients depends on the type and size of the population, which are recognized as factors that can positively impact physicians' recruitment and retention (Bilodeau & Leduc, 2003; Rabinowitz, Diamond, Markham, & Paynter, 2001). The small size of the population can lead to a small number of patients which can create boredom among physicians, and aggravate their feeling of being isolated. These conclusions underscore the need to appoint physicians where they can find a satisfactory number of patients.

Professional factors that were reported in this study are the lack of career advancement and lack of professional development. Opportunities for advancement and professional development are well known to improve retention in underserved regions (Bilodeau & Leduc, 2003) while in Senegal working in underserved areas is perceived to be a disadvantage for the rest of a professional career and a barrier to professional development (Zurn et al., 2010). These results call for actions to improve the professional development for physicians who work in underserved areas. Telemedicine could be useful in this regard. Senegal's health authorities could think of working in that direction.

Our results revealed organizational factors such as poor working conditions, extended stays in underserved areas and the inequities in assigning physicians to their post. These results corroborate those of Szafan et al. (2001) who found that good working conditions can encourage physician recruitment. They coincide with the results of authors who stated that isolation, fatigue and stress at work can prevent physicians' retention (Duplantie et al., 2007). They are also consistent with the results of the authors who believe that limited access to resources, equipment and infrastructure can prevent physicians' retention in underserved regions (Hankins et al., 2002; Matsumoto, Inoue, & Kajii, 2001). Finally, they are consistent with Zurn et al. (2010) who found that the extended stays in underserved areas and the inequities in assigning physicians to their post are sometimes the most important factors that determine physicians' recruitment and retention in underserved areas. These results highlight the need to improve the working conditions of the physicians working in underserved areas to enhance the management of physicians' stay in their position, and to apply equity when assigning physicians to their position.

Our participants also reported how educational factors such as training and access to continuing medical education can have a positive impact on physicians' recruitment and retention in underserved areas (Wilson, Woodhead-Lyons, & Moores, 1998). These results suggest that Senegal's health authorities could provide more training opportunities to the physicians working in underserved areas.

Finally, economic factors identified are low income and lack of incentives. It is well established that the remuneration of professionals has a positive influence on physicians' recruitment (Bilodeau & Leduc, 2003; Hankins et al., 2002). It has also been recognised that the payment of loans, benefits and compensations encourage physicians' recruitment and retention

(Ellsbury et al., 2002; Labonte et al., 2015). These results suggest that Senegal's health authorities could consider increasing the incomes of the physicians working in underserved areas. They could also consider providing more attractive incentives to the physicians that decide to work in underserved areas.

These findings demonstrate that physicians' recruitment and retention are influenced by many factors, of which individual, family, contextual, professional, organizational, educational and economic factors, whereas telemedicine only influences individual, professional, organizational and educational factors (Duplantie et al., 2007; Fortin et al., 2006; Gagnon et al., 2007). The impact of telemedicine on the family, economic and contextual factors that influence physicians' recruitment and retention in underserved areas has not as yet been well demonstrated (Duplantie et al., 2007; Gagnon et al., 2007). To address these factors, telemedicine should be paired up with other solutions.

The negative perceptions of physicians regarding the role of telemedicine in their recruitment and retention in underserved areas appear to be associated with the fact that they worked in district health centres, outside Dakar, and as specialist physicians. This study cannot explain these differences. Another study, particularly using quantitative methods and a larger sample, would be needed to show the correlation between physicians' perceptions and their health facility, medical region, and specialization. This study could include other factors to better explain the factors that explain the perceptions of physicians.

Conclusion

This study explored how physicians working in public hospitals and district health centres perceived the impact of telemedicine on their recruitment and retention in underserved areas. These results indicate that telemedicine should be used with caution as a means to recruit

and retain physicians in such areas. This study also identified the attributes of telemedicine that explain its positive impacts, which can inform government efforts to promote telemedicine and its use. This study equally demonstrates that telemedicine is not the only factor that determines physicians' recruitment and retention in underserved areas, and identified those that our respondents considered being the most important ones. Being cognizant of these factors allows Senegal's authorities to prioritize actions that are needed to improve physicians' recruitment and retention in underserved areas. Finally, this study demonstrates that telemedicine should be associated with other solutions to ensure better recruitment and retention of physicians in underserved areas. These solutions may be equally or even more important than telemedicine in recruiting and retaining physicians.

Chapter 3

The beliefs of Senegal's physicians about the use of telemedicine

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Abstract

Introduction

Telemedicine is seen as a potential solution to improving access to specialist services and possibly retaining physicians in underserved areas, but using telemedicine depends on physicians' beliefs about its use. According to the theory of planned behaviour, there are three kinds of beliefs: behavioural, normative and control beliefs.

Objective

This study aimed to determine the behavioural, normative and control beliefs of physicians about the use of telemedicine in Senegal.

Method

To study these beliefs, a qualitative descriptive study involving individual interviews was conducted between January and June 2014. It included 32 physicians working in public hospitals and 37 physicians working in district health centres. Interviews were transcribed and their contents coded thematically using the NVivo 10 software.

Results

The most significant positive behavioural belief was that telemedicine makes experts' opinions accessible despite distance, while the most important negative behavioural belief was that telemedicine leads to medical errors. The most mentioned positive normative belief was that patients will approve the use of telemedicine while the most reported negative normative belief was that the patient will disapprove of it. The prevailing positive control belief was that physicians will use telemedicine if it is easy to use and the most cited negative control belief was that physicians will not use telemedicine if they have insufficient time. The results also showed that physicians' beliefs depend on the type of health facility they work in (hospital or district

health centre), their gender (male or female), specialization (specialist physician or general practitioner) and medical region (Dakar or outside Dakar).

Conclusions

The results of this study provide a better understanding of the beliefs of Senegal's physicians regarding telemedicine, which can help in designing interventions to promote its use. Such interventions, if successful, may help promote physicians recruitment and increase retention and access to healthcare in rural areas.

Keywords: beliefs, theory of planned behaviour, Senegal, district health centre, hospital

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Introduction

Physicians are unevenly distributed, in Senegal, with only 24% of them working in rural areas where 60 % of the country's population lives (OMS & JICA, 2013). This uneven distribution leads to unequal access to healthcare and consequently to health inequalities (OMS, 2006). One of the leading causes of this uneven distribution of physicians is the failure of Senegal's health system in recruiting and retaining them in rural areas. This failure is influenced by many factors; the best-known being occupational, personal, family and community factors (Zurn et al., 2010). These were explored in an earlier paper from this study (see Chapter 2). International migration is also an important factor. More than 51% of Senegalese-trained physicians work abroad (Clemens & Pettersson, 2007).

During the last few decades, Senegal has adopted a number of measures to recruit and retain physicians in rural areas. These measures targeted the production and management of physicians. Production measures include the opening of private medical schools and the provision of fellowships to students who accept to practice in rural areas (Zurn et al., 2010). Management measures include the creation of the Directorate of Human Resources (DHR) in 2004 within the Ministry of Health to improve the coordination of the management of human health resources; the revision of the status of public health workers by a commission comprised of the representatives of the Ministry of Health, the Ministry of Civil Service and union activists in order to improve the professional and educational conditions of these workers; and, the provision of financial incentives and transportation subsidies to rural physicians (Zurn et al., 2010). To date, none of these measures has resulted in the most equitable distribution of physicians between rural and urban areas. In this context, telemedicine, which is the practice of medicine from a distance through Information and Communication Technologies (ICT) (Jones et

al., 2004), could be a useful means to recruit and retain physicians, as well as to improve access to healthcare in rural areas, but physicians' beliefs regarding the use of telemedicine are not yet well known. No prior study of these beliefs amongst Senegalese physicians has been undertaken.

The purpose of this study was to determine the behavioural, normative and control beliefs concerning the use of telemedicine in Senegal. These three beliefs came from the TPB and are described in chapter 1 (conceptual framework). This particular study focused on the physicians working in the public sector, particularly those working in public hospitals and district health centres. The physicians working in the private sector were not included because of logistical, temporal and financial limitations.

State of Knowledge

The literature provides some information on physicians' behavioural, normative and control beliefs toward the use of telemedicine. With respect to behavioural beliefs, telemedicine is thought to reduce the transportation of patients and to save costs (Ganapathy, 2005; Mars, 2013; Moffatt & Eley, 2010). It is also thought to facilitate access to continuing education, research and professional exchanges (Mars, 2013; Moffatt & Eley, 2010; Schmeida et al., 2007). Telemedicine is also seen as a good means to improve the quality of health services and to reduce medical errors (Moffatt & Eley, 2010; Mueller et al., 2014; Schmeida et al., 2007). By contrast, telemedicine is suspected to have a negative impact on data security, patients and physicians relationship, and the overload of physicians at work (Ganapathy, 2005; Hiratsuka, Delafield, Starks, Ambrose, & Mala Mau, 2013; Mars, 2013). Telemedicine is equally considered as a strategy that could lead to medical errors, and an inefficient means to guarantee a good income for physicians (Kaddu et al., 2009).

In relation to normative beliefs, nurses, physicians and patients are suspected of approving the use of telemedicine by physicians (Archambault et al., 2012; Desroches, Lapointe, Deschênes, Gagnon, & Légaré, 2011; Tsiantou et al., 2013). By contrast, physicians and patients are considered as the potential opponents to their use of telemedicine (Desroches et al., 2011).

With respect to control beliefs, it is thought that the use of telemedicine can be encouraged by the ease of use of telemedicine equipment, familiarity with computers, access to handheld devices (e.g., a smartphone), and accessibility to the internet (Archambault et al., 2012; Saigí-Rubió et al., 2014). Conversely, it is thought to be prevented by issues related to data security, data conservation, technical problems, lack of training and non-adhesion of the population to telemedicine services (Dünnebeil, Sunyaev, Blohm, Leimeister, & Krcmar, 2012; Gagnon, Cloutier, & Fortin, 2004; Hiratsuka et al., 2013; Shiferaw & Zolfo, 2012).

Most of these studies were carried out in developed countries. None of them focused on the behavioural, normative and control beliefs of Senegal's physicians. This study aimed to provide the first information on the behavioural, normative and control beliefs of these physicians.

Conceptual Framework

This study is based on the TPB (Ajzen, 1991), depicted in Figure 1. According to this theory, there are three kinds of beliefs: behavioural, normative and control beliefs (Ajzen, 1991). These three beliefs are influenced by individuals' characteristics and the context in which the behaviour is adopted and, in turn, affect individuals' attitude towards the behaviour, their subjective norm and their perceived behavioural control (Ajzen, 1991). Attitude, subjective norm, and perceived behavioural control are well defined in chapter 1 (conceptual framework). These three constructs, in turn, influence individuals' intention toward the behaviour and hence

the behaviour itself (Ajzen, 1991). Intention and behaviour are also described in chapter 1 (conceptual framework).

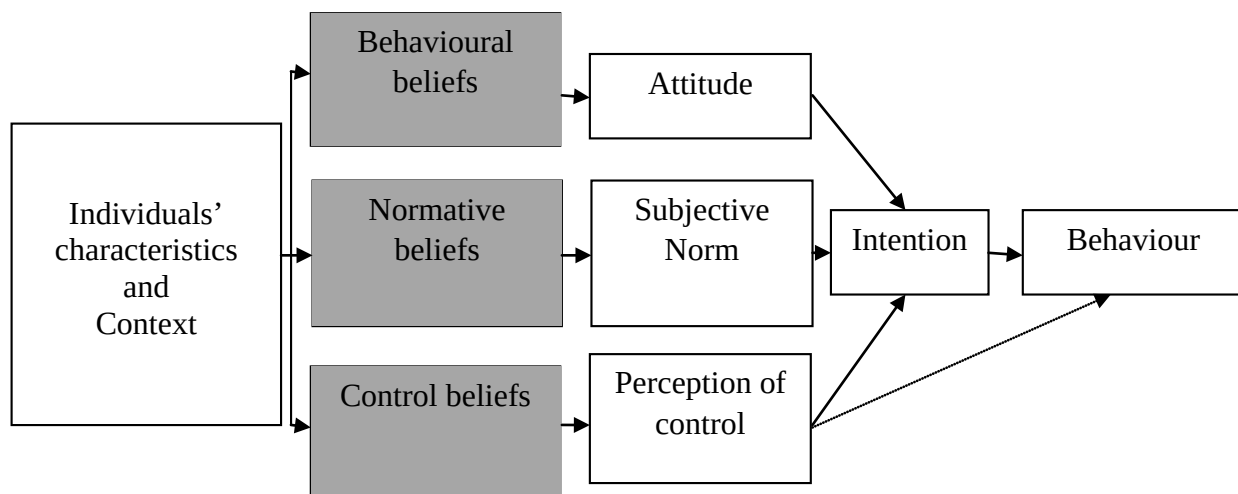


Figure 1: Adaptation of the TPB (Ajzen, 1991)

Methods

Study design, participants, and sampling

To determine the behavioural, normative and control beliefs of Senegal's physicians toward the use of telemedicine, we conducted a qualitative descriptive study involving individual interviews. Participants comprised physicians who practiced in public hospitals and district health centres in Senegal. In 2013, those practicing in public hospitals numbered 596 while those practicing in district health centres totaled 187. Using purposive random sampling, 32 physicians were selected among those practicing in public hospitals and 37 among those practicing in district health centres. These physicians were then contacted to establish their availability, willingness to participate in the study, and consent to be interviewed and audio-recorded.

Data collection

The selected physicians were interviewed individually in person. Individual interviews were chosen over focus groups to ensure that respondents would be comfortable discussing their beliefs about telemedicine. The presence of other physicians was considered awkward for respondents. All interviews were audio-recorded and took place in public hospitals, district health centres, physicians' homes, hotels, restaurants, the airport, training centres and at Cheikh Anta Diop University, depending on each physician's availability and preference. An interview guide was designed and used to facilitate the conduct of individual interviews. Physicians were asked about their positive (advantages of using telemedicine) and negative (inconvenience of using telemedicine) behavioural beliefs, positive (people who approve of the use of telemedicine) and negative (people who disapprove of the use of telemedicine) normative beliefs, and positive (facilitators of the use of telemedicine) and negative (barriers to the use of telemedicine) control beliefs. Table 1 outlines the different questions posed. During interviews, the principle was to allow the physicians to talk at length, on their own terms, and with enough time to reflect. Clarifications were sought whenever needed. Interviews lasted from 10 to 45 minutes.

Analysis

Data were analysed using the Attride-Stirling thematic network analysis framework (Attride-Stirling, 2001). This framework is a method of conducting a thematic analysis of qualitative or textual data which helps in identifying emergent concepts, themes, and relationships. This analysis involved several steps. First, interviews were transcribed by four assistants. Second, all transcripts were imported into NVivo 10 software, where data were both deductively and inductively coded by the lead author. Data coding continued until theoretical

saturation was reached. In other words, data coding continued until no new concepts emerged from successive coding of data. Third, the completed code structure was applied to develop and report themes. Finally, all the themes identified were collated into a thematic chart to reflect global, organizing and basic themes in line with the Attride-Stirling's thematic network analysis framework (Attride-Stirling, 2001). Figure 2 shows the thematic chart with the global (beliefs regarding the use of telemedicine), organizing (positive/negative behavioural, normative and control beliefs) and basic themes. Global and organizing themes were identified a priori based on the conceptual framework while basic themes were identified inductively. Physicians were then compared based on the type of their health facility, gender, regions of practice and specialization.

Table 1: Interview guide for the study of physicians' beliefs

N°	Beliefs	Questions
Behavioural beliefs regarding the use of telemedicine		
1	Positive behavioural beliefs	<i>What do you believe are the advantages of using telemedicine in your professional activities?</i>
2	Negative behavioural beliefs	<i>What do you believe are the disadvantages of using telemedicine in your professional activities?</i>
Normative beliefs regarding the use of telemedicine		
3	Positive normative beliefs (positive normative referents)	<i>Are there any individuals or groups of individuals who would approve of your decision to use telemedicine in your professional activities?</i>
4	Negative normative beliefs (negative normative referents)	<i>Are there any individuals or groups of individuals who would disapprove of your decision to use telemedicine in your professional activities?</i>
Control beliefs regarding the use of telemedicine		
5	Positive control beliefs	<i>What factors or circumstances would enable you to use telemedicine in your professional activities?</i>
6	Negative control beliefs	<i>What factors or circumstances would make the use of telemedicine in your professional activities difficult or impossible?</i>

Ethical and Administrative Approval

This study was approved by the Research Ethics Board of the University of Ottawa (N° H 09-13-12). The protocol was approved by Senegal's National Ethics Committee on Health Research (N° 205 MSAS/ DPRS/ CNERES). Participants provided their written informed consent before answering questions, and their anonymity was respected. This research also required administrative approval, for which we secured authorization from the Ministry of Health (N° 111 MSAS/ DPRS/ DR). The General Director of Health, based on this authorization, communicated through an official letter (N° 0678/ DGS/ SP) to head-physicians of medical regions, instructing them to invite physicians working in public hospitals and district health centres to participate in the research.

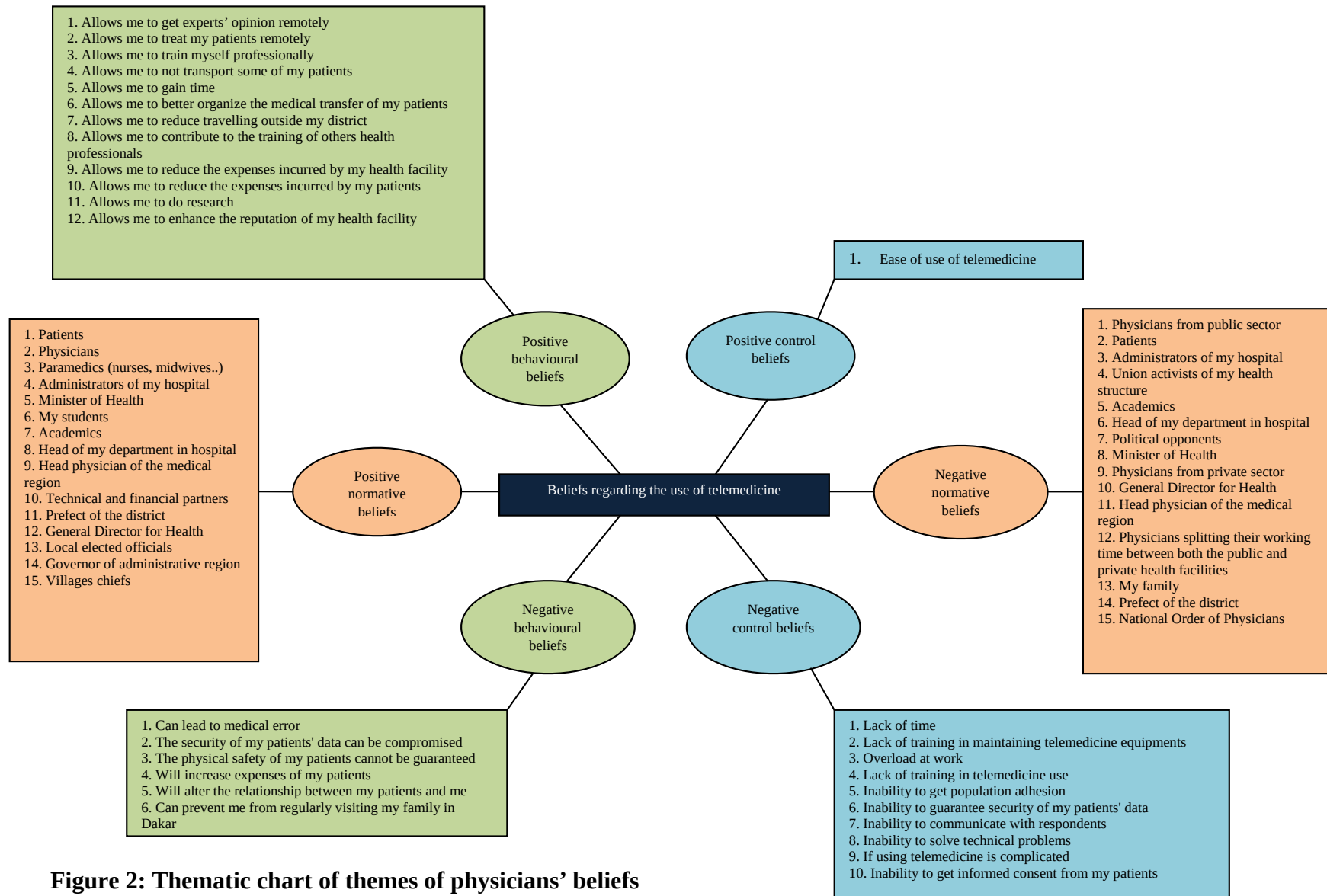


Figure 2: Thematic chart of themes of physicians' beliefs

Results

Socio-demographic and professional characteristics of participants

Table 2 shows the socio-demographic and professional characteristics of the physicians working in public hospitals.

Table 2: Socio-demographic and professional characteristics of the physicians working in public hospitals and district health centres

Characteristics		Physicians working in public hospitals		Physicians working in district health centres	
		N	%	N	%
Sex	Male	25	78.13	35	94.59
	Female	7	21.87	2	5.40
Age	≤ 30	2	6.25	0	0
	31-35	3	9.37	10	27.03
	36-40	5	15.62	13	35.13
	41-45	7	21.87	7	18.92
	46-50	6	18.75	6	16.22
	51-55	8	25.00	1	2.70
	56-60	0	0.00	0	0.00
	> 60	1	3.12	0	0.00
	General practitioner	0	0.00	13	35.13
	Specialist physician	32	100	24	64.86
Medical Region	Dakar	26	81.25	2	5.40
	Outside Dakar	6	18.75	35	94.60

N: number, %: percentage

The 32 physicians working in public hospitals were selected from 13 public hospitals spread across five administrative regions. Their average age was 44, with a range of 29 to 61

years. There were more male (25) than female (7) participants. The proportion of female physicians among Senegal's physicians is 29% (OMS & JICA, 2013). All females were specialist physicians working in Dakar (6) and Thies (1). Their average age was 39 with a range of 29 to 46 years. All males were also specialist physicians working in 5 regions including Dakar. Their average age was 46 with a range of 32 to 61 years.

The 37 physicians working in district health centres were selected from 37 district health centres spread across 12 administrative regions. Their average age was 40, with a range of 33 to 53. They were also more male (35) than female (2) physicians. Both females were specialist physicians, one working in Dakar and the other in Thies. The majority of males (22) were specialist physicians. They were working in 12 regions including Dakar, and their average age was 39, with a range of 33 to 50.

Behavioural beliefs regarding the use of telemedicine

Physicians mentioned both positive and negative behavioural beliefs concerning the use of telemedicine, generally corresponding to their expectations and concerns about the use of telemedicine.

Positive behavioural beliefs

A total of 12 positive behavioural beliefs were reported by physicians (see Figure 3). These beliefs varied by physicians' characteristics: health facility (hospital versus district health centre), gender (male versus female), region of practice (Dakar versus outside Dakar) and specialization (specialist physician versus general practitioner) (see Appendix 3).

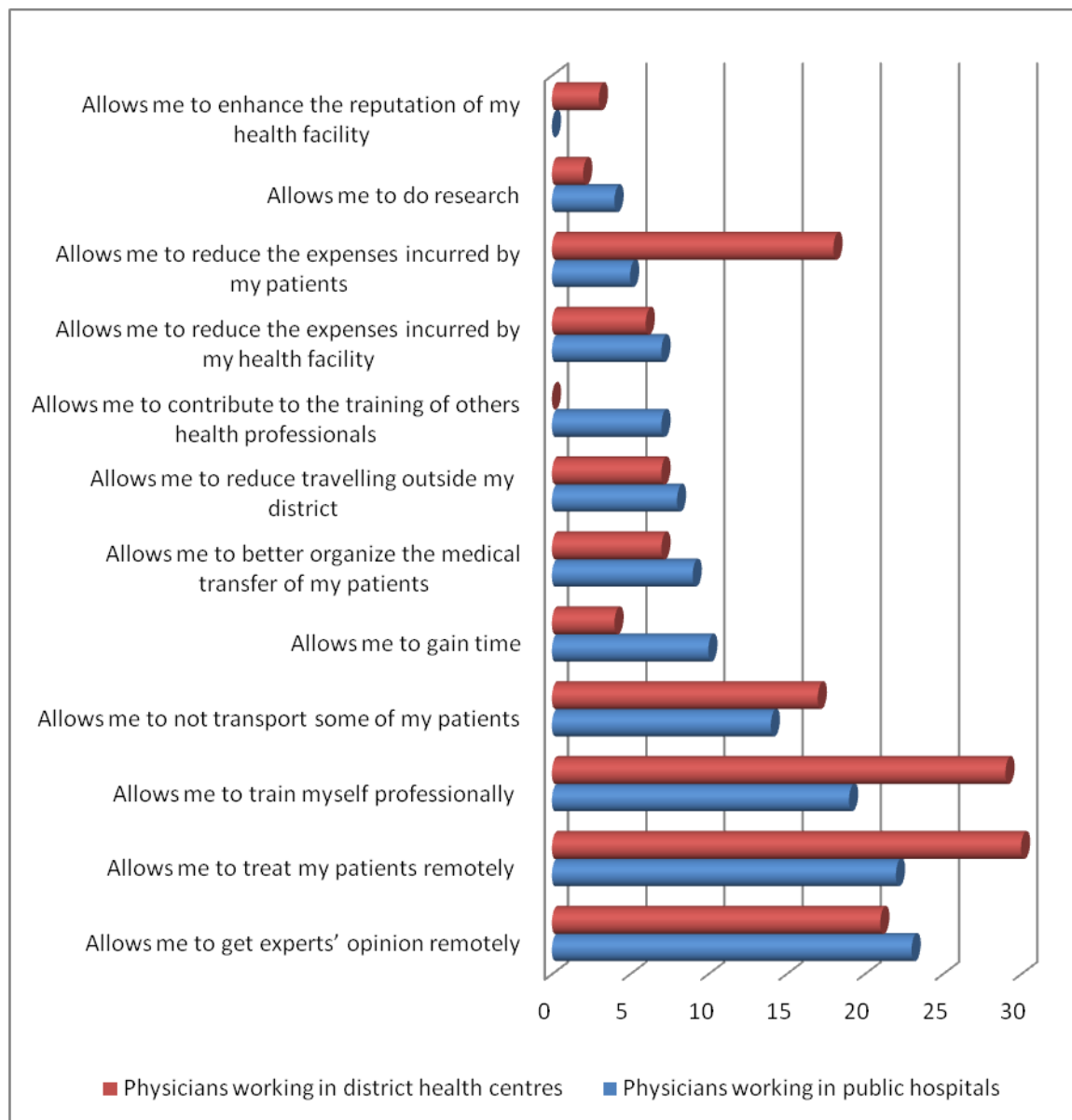


Figure 3: Physicians' positive behavioural beliefs

Type of health facility

Physicians working in public hospitals believe that telemedicine allows them to access experts' opinions remotely, to treat their patients remotely, to train themselves continuously, to conduct research, to reduce travel outside their work locations, and to save time. They also believe that telemedicine enables their patients' to avoid transportation costs and time as well as to better organize their patients' transfer if needed. They equally believe that telemedicine

enables their health facility to save costs. Finally, they think that telemedicine can contribute to the training of other health professionals. In relation to remote treatment and exchanges with experts, one of the physicians working in public hospitals said:

"Well! With telemedicine, I can provide care to patients. I can give advice. I can share my impressions on radiographic images. I can propose a strategy to treat each patient. I can do all these things." (Male specialist physician working in a public hospital in Dakar)

The physicians working in district health centres identified similar beliefs. For example, one of them noted:

"As I said, its benefits include knowledge exchanges between health professionals and saving patients' time and money" (Male general practitioner working in a district health centre outside Dakar)

The only difference between hospitals and district health centre responses was that in the latter locale physicians did not mention that telemedicine can contribute to the training of other health professionals. Conversely, physicians in district health centres reported one belief that was not mentioned by the physicians working in public hospitals: the installation of telemedicine equipment (telecommunications and medicine equipment), which is essential to its use, will improve the technical platform and consequently the reputation of their district health centre.

Gender

Male and female physicians who work in public hospitals identified almost the same beliefs (see Appendix 3). The only difference is that male physicians indicated that telemedicine allows them to do research:

"It can really help us to advance on all fronts: regarding medical expertise, regarding medical practice but also regarding research. So, for me, these are the benefits of telemedicine" (Male specialist physician working in a public hospital in Dakar)

Female physicians who work in district health centres did not mention many of the beliefs that were mentioned by their male colleagues. For example, they did not say that telemedicine allows them to save time, to better organize their patients' transfer, to help their health facility to save costs, to do research or to improve the image of their health facility. All of these beliefs were evoked by their male counterparts. Both male and female physicians working in district health centres said that telemedicine could allow them to get expert opinions at a distance, to treat their patients at a distance, to train themselves professionally, to avoid transport of some of their patients to other health facilities, to reduce travelling outside their health district, and to reduce the expenses incurred by their patients.

Region of practice

The physicians working in Dakar's public hospitals and those in public hospitals outside Dakar shared almost the same beliefs, the only difference being that the physicians who work outside Dakar did not report that telemedicine enables their patient and their health facility to save costs (see Appendix 3).

"Transfer of patients, from one place to another, is very expensive today. Therefore, telemedicine has a financial advantage. If through exchanged information, we can solve problems locally; this already helps saving time and money. Beyond the benefit regarding a life saved, there is a benefit in terms of time and money just by not moving patients and solving their problems locally" (Male physicians working in a public hospital in Dakar)

The physicians who work in district health centres outside Dakar mentioned five beliefs that were not been reported by the physicians who work in Dakar: telemedicine allows them to

save time, enhance the reputation of their health facility, better organize their patients' transfer, avoid the transportation of their patients, and save their patients money.

Specialization

In district health centres, specialist physicians reported almost the same beliefs as general practitioners (see Appendix 3). The only difference is that specialist physicians did not state that telemedicine allows them to do research, which was cited only by general practitioners.

Negative behavioural beliefs

Physicians mentioned a total of six negative behavioural beliefs. These beliefs are described below according to the type of health facility, gender, region of practice and specialization of physicians (see Appendix 4).

Type of health facility

The physicians working in public hospitals believe that medical errors can occur, the security of their patients' data can be compromised, the expenses of their patients can increase, and the physical safety of their patients cannot be guaranteed due to the potential for increased medical tests that pose some risk (see Appendix 4). Regarding the belief in the security of their patients' data, one physician working in a public hospital, reflecting a frequently cited concern, commented that:

"...the main drawback (with telemedicine) that I find is disclosure of patients' confidential medical information through communication technologies which are not totally secure."

(Female specialist physician working in a public hospital in Dakar)

In relation to the physical safety of their patients, another physician working in a public hospital said:

"Patients need to be protected. I mean that the prescription of various medical tests needs to be justified. People (physicians) will ask for medical tests that are not always needed and that can put patients in more danger. I think that this is part of telemedicine's inconvenience" (Male specialist physician working in a public hospital in Dakar)

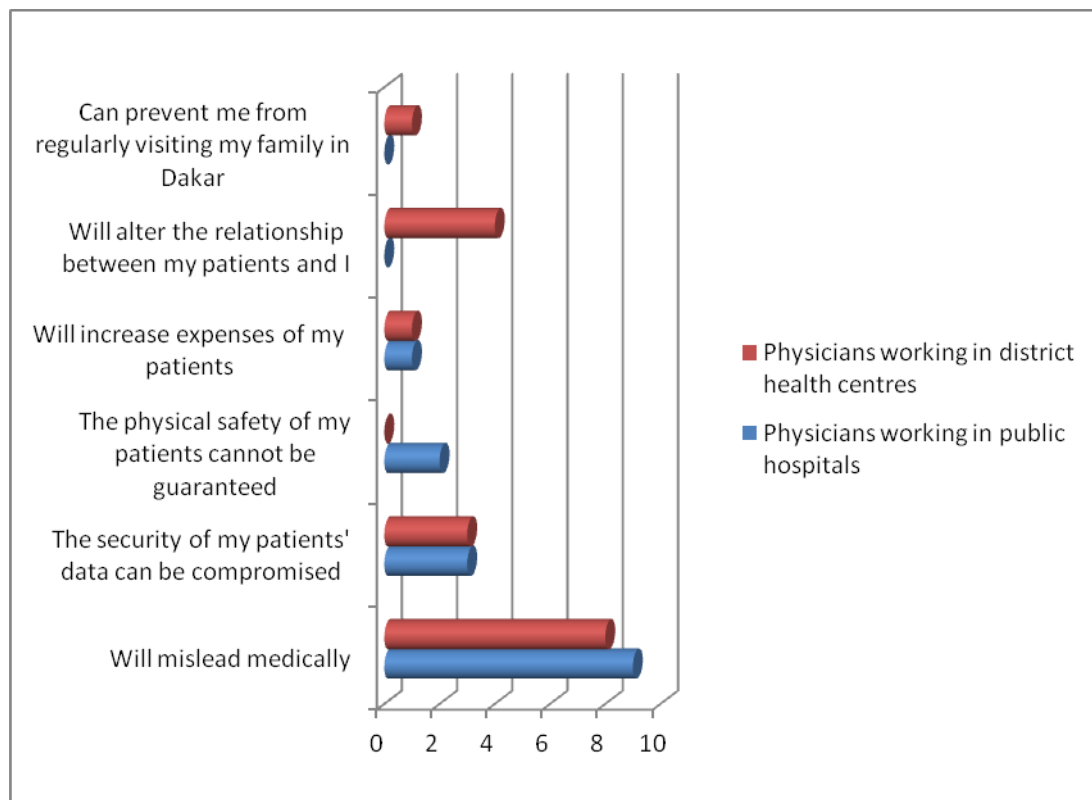


Figure 4: Physicians' negative behavioural beliefs

Physicians working in district health centres held the same beliefs except that concerning the physical safety of their patients (see Appendix 4). This belief was mentioned only by the physicians working in public hospitals. Conversely, two beliefs were mentioned only by the physicians working in district health centres, the first concerning how telemedicine affects their relationship with their patients by reducing patients' trust.

"Some patients think that we are supermen. They won't understand that we consult another physician to treat them. They could say that we are not skilled enough. They can

become distrustful of us" (Male general practitioner working in a district health centre outside Dakar)

The second relates to the way telemedicine can prevent physicians from regularly visiting their families in Dakar by reducing their travel to Dakar for training, conferences, meetings and other professional activities that can be addressed through telemedicine.

"Telemedicine will reduce my moves outside my area, but my family, which is in Dakar, can dislike that. My wife and my children would like that I frequently come home because I don't live with them. Here, I live alone. Do you understand? This is what I mean" (Male specialist physician working in a district health centre outside Dakar)

Gender

The female physicians who work in public hospitals mentioned a single negative behavioural belief: that the security of their patients' data can be compromised. The male physicians who work in public hospitals reported the same belief, but added others such as that medical errors can occur, the physical safety of their patients cannot be guaranteed, and the medical expenses of their patients can increase. Regarding medical errors, one male physician said:

"When one is at a distance, he gives advice. He is not sure about what is really happening on the ground. He gives advice based on the descriptions made by someone else. He does not know the real situation on the ground. He can, thus, give wrong advice."

(Male specialist physician working in a public hospital in Dakar)

One physician working at a district health centre explained that two factors can also lead to increased costs for patients. The first is related to physicians' abusive prescription of medical tests which compels patients to spend more money than usual.

"Physicians can focus on medical tests and forget their semiology. They could prescribe these tests in the very irrational way and create additional costs for patients. This is a problem" (Male specialist physician working in a district health centre outside Dakar)

The second is related to investment, operation and maintenance costs. The introduction of these costs can result in increased charges for patients.

"Telemedicine can also increase the operation costs of health facilities because there are some installations to do. After these installations, there is the maintenance of the various installed tools. This leads to additional costs for health facilities and of course additional costs for patients." (Male specialist physician working in a district health centre outside Dakar)

The two female physicians who worked in district health centres did not report any negative behavioural beliefs. All five negative behavioural beliefs, mentioned by the physicians working in district health centres, were reported only by male physicians.

Region of practice

Physicians who work in public hospitals within Dakar and those working outside Dakar mentioned similar beliefs (see Appendix 4). The only difference was that the physicians who work in public hospitals outside Dakar did not suggest that telemedicine can increase their patients' costs. The physicians who work in the district health centres of Dakar did not mention any negative behavioural belief.

Specialization

In district health centres, specialist physicians evoked five negative behavioural beliefs (see Appendix 4). Of these beliefs, three were cited by general practitioners: medical errors can

occur, the security of their patients' data can be compromised, and the relationships they have with their patients can be affected. Regarding medical errors, one general practitioner said:

"Errors can occur because when the respondent is remote, He is not in front of patients. It is not always easy for him to understand the problems in a more refined manner. Some errors can occur at this level, which can cause errors in patients' care" (Male general practitioner working in a district health centre outside Dakar)

Normative beliefs regarding the use of telemedicine

Our participants reported both positive and negative normative beliefs. Positive normative beliefs (positive normative referents) relate to individuals or groups who would approve the use of telemedicine by physicians. Negative normative beliefs (negative normative referents) refer to individuals or groups who would disapprove of their use of telemedicine. Both types of referents are likely to influence physicians' decision to use telemedicine.

Positive normative beliefs

This study identified 15 individuals or groups that would be supportive of physicians who use telemedicine in their professional activities (see Figure 5). These referents are presented below with respect to participants' characteristics (see appendix 5).

Type of health facility

The physicians working in public hospitals believe that their patients, their colleagues, nurses, midwives, their hospital administrators, the Minister of Health, their students, academics, and the head of their department would approve their use of telemedicine (see Figure 5).

"I believe that professionals who work in hospital, whether they are nurses, midwives, physicians or administrators, will approve telemedicine if procedures are well respected" (Male specialist physician working in a public hospital in Dakar)

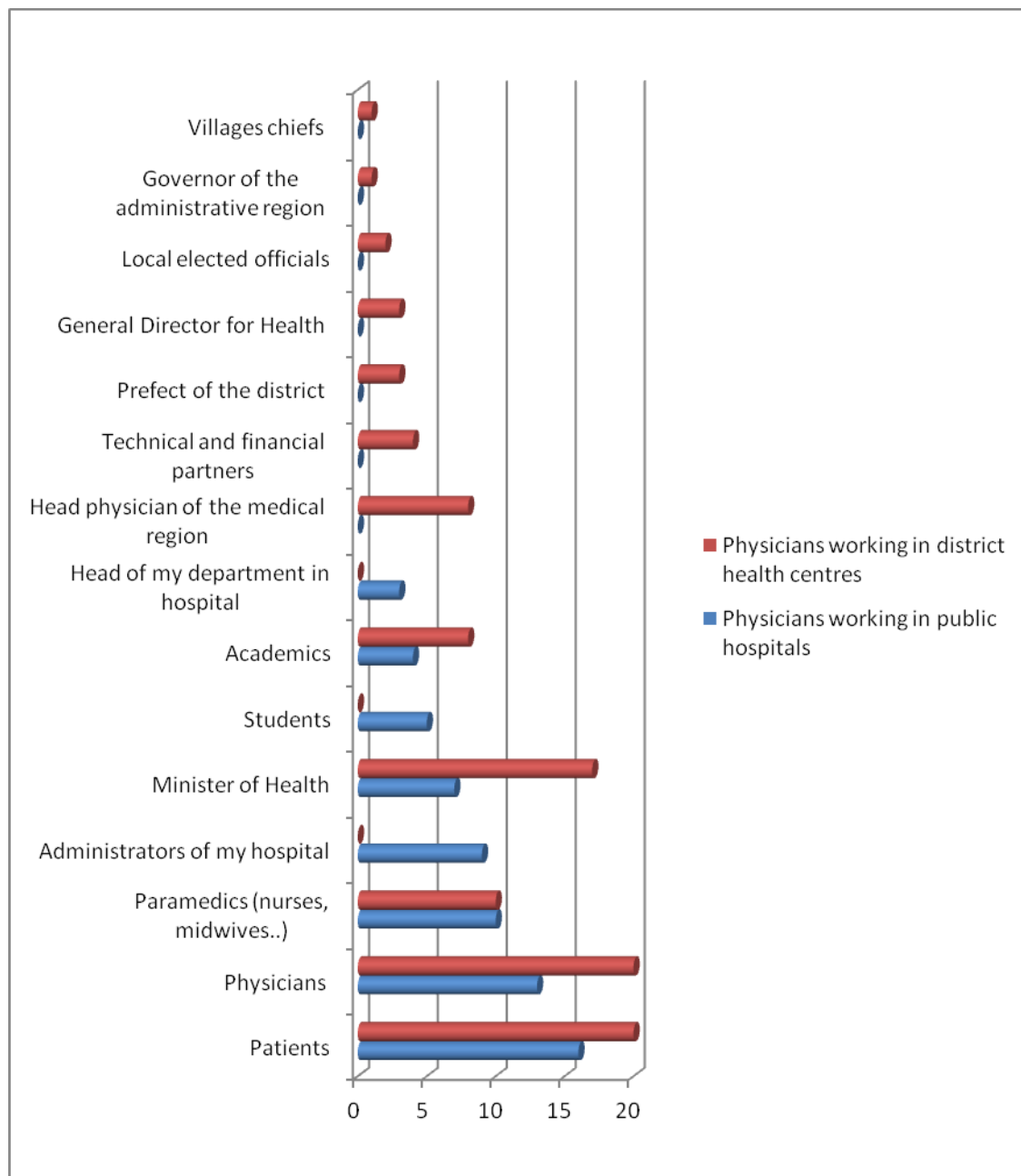


Figure 5: Physicians' positive normative beliefs

The physicians working in district health centres identified the same set of referents (see Figure 5), but also mentioned the head physician of their medical region, their technical and financial partners, the district Prefect, the General Director of Health, the local elected community officials, the regional Governor and village chiefs, indicating a larger and more local

network of normative referents. With respect to the head physicians and the General Director of Health, one physician working in a district health centre said:

"Who are the people that can influence me in using telemedicine? First, there is the head-physician of the medical region. Then, there is the General Director of Health. We depend on these people" (Female specialist physician working in a district health centre in Dakar)

Gender

Male and female physicians who work in public hospitals mentioned almost identical influences (see appendix 5). The only difference is that female physicians did not mention academics or their department head.

"Who will disapprove of telemedicine? First, for those who will approve, I say, all professors in medicine will agree. No one will disagree with that" (Male specialist physician working in a public hospital in Dakar)

In district health centres, male physicians reported eight more referents than their female counterparts who mentioned only their patients, the Minister of Health, the head physician of their medical region and the General Director of Health (see appendix 5).

Region of practice

Physicians who work in Dakar's public hospitals and those who work in public hospitals outside Dakar mentioned almost identical referents (see appendix 5). The only difference is that the physicians who work in public hospitals outside Dakar did not mention their students, although those working in Dakar did:

"I am thinking, right now, about my students who are in remote regions, who would like to have, whenever possible, the opinion of an expert...." (Male specialist physician working in a public hospital in Dakar)

The physicians who work in the district health centres outside Dakar also mentioned more referents than the physicians who work in the district health centres of Dakar (see appendix 5).

Specialization

In district health centres, specialist physicians mentioned the head physician of their medical region, the General Director of Health, the regional Governor, and village chiefs (see appendix 5). Regarding village chiefs, one specialist physician said:

"Yes, village chiefs! Village chiefs help us. You know, during vaccination campaigns, there are some cases of refusal. We are compelled to go with village chiefs to force them to participate in vaccination campaigns" (Male specialist physician working in a district health centre outside Dakar)

These referents were not mentioned by the general practitioners who work in district health centres.

Negative normative beliefs

Our study identified 15 individuals or groups who could potentially disapprove of physicians' use of telemedicine (see Figure 6). These are presented below according to physicians' characteristics (see Appendix 6).

Type of health facility

Physicians working in public hospitals think that their patients, colleagues from the public sector, the administrators of their hospital, the hospital union activists, academics, their department head, and political opponents might disapprove of their use of telemedicine.

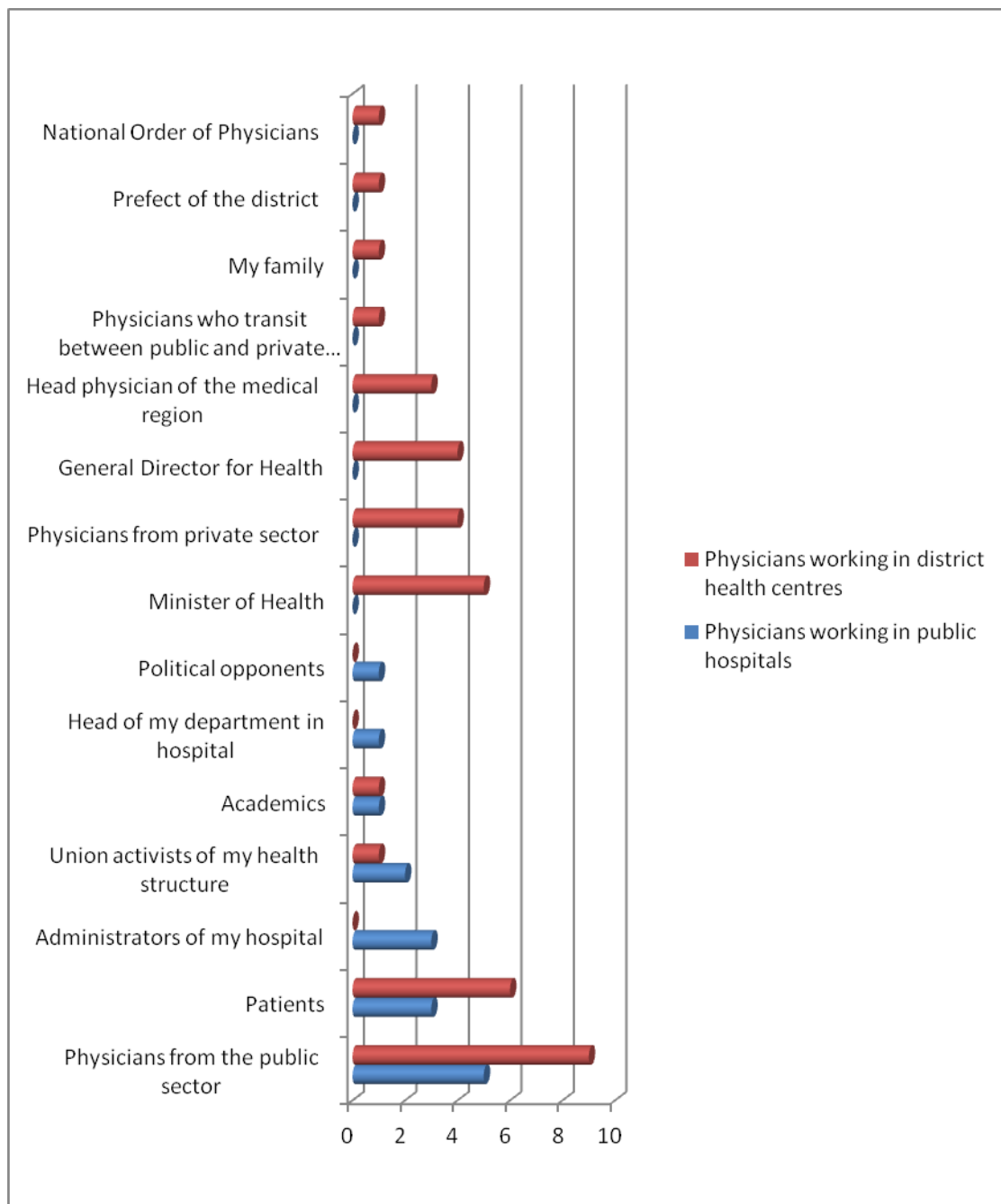


Figure 6: Physicians' negative normative beliefs

Regarding the administrators of their hospitals, one physician said:

"Yes, if the implementation of telemedicine is expensive, the administrators of the hospital can cause problems" (Female specialist physician working in a public hospital in Dakar)

The physicians working in district health centres mentioned the same referents except hospital administrators, department heads and political opponents (see Figure 6). These three referents do not have a direct relationship with the physicians working in district health centres. By contrast, the physicians working in district health mentioned the Minister of Health, the General Director of Health, the head physician of their medical region, the district Prefect, their colleagues from the private sector, their colleagues splitting their work schedule between both the public and private health facilities, their family and the National Order of Physicians (National Medical Association). These referents seem to have a more direct relationship with the physicians working in district health centres.

Gender

Female physicians who work in public hospitals named only three referents: their patients, colleagues from the public sector and their hospital administrators (see Appendix 6).

"There will always be some reluctance, especially among the aged physicians. They could be less interested because they could have some problems to use the new technologies.

Maybe, they would be a little reluctant." (Female specialist physician working in a public hospital in Dakar)

Female physicians who work in district health centres reported only their colleagues from the public sector.

Region of practice

Physicians who work in Dakar's public hospitals cited their colleagues from the public sector, their department head and political opponents of the government in power. Regarding political opponents, one physician said:

"Political opponents might say that our country is not ready enough for such technology"

(Male specialist physician working in a public hospital in Dakar)

The physicians, who work in the public hospitals outside Dakar enumerated their patients, colleagues from the public sector, the administrators of their hospital, the hospital union activists, and academics.

Specialization

In district health centres, specialist physicians named union activists, the Minister of Health, the General Director of Health, the head physician of their medical region, their family, the district Prefect, and the National Order of Physicians (National Medical Association). These referents were not mentioned by the general practitioners. Conversely, general practitioners cited academics and the physicians splitting their work schedules between both public and private health facilities. These referents were not evoked by specialist physicians (see Appendix 6).

Control beliefs regarding the use of telemedicine

The surveyed physicians reported positive and negative control beliefs. Positive control beliefs focus on the factors that can facilitate the use of telemedicine by Senegal's physicians in their professional activities. In contrast, negative control beliefs refer to the factors that can prevent the use of telemedicine by Senegal's physicians. These beliefs are described in the following sections.

Positive control beliefs

Only one positive control belief was identified: the ease of use of telemedicine which refers to how easily physicians can use telemedicine equipment (see Figure 7).

"If it is something easy in which I will not waste too much time, for example, to start the connection or to download something, I am ready to use it" (Male specialist physician working in a public hospital in Dakar)

This belief was mentioned by two physicians working in public hospitals and five physicians working in district health centres. The two physicians working in public hospitals who mentioned it were male specialist physicians and were working in Dakar. The five physicians working in district health centres were male physicians and were working in Dakar. Of them, one was a general practitioner and the other a specialist physician (see Appendix 7).

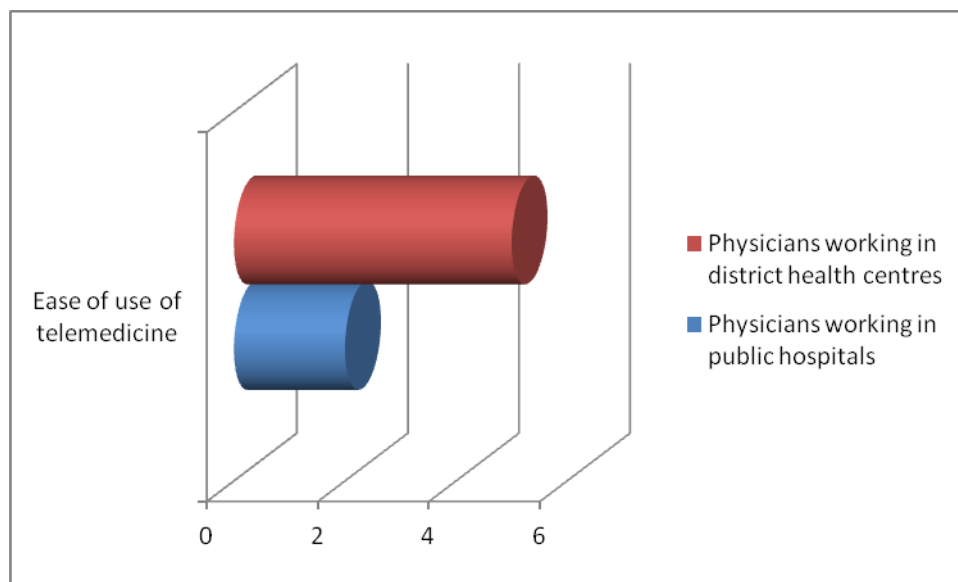


Figure 7: Physicians' positive control beliefs

Negative control beliefs

This study identified ten control beliefs that can prevent physicians from using telemedicine in Senegal (see Figure 8). These beliefs are described below according to participants' characteristics (see Appendix 8).

Type of health facility

Physicians working in public hospitals believe that a lack of time, of training in telemedicine use and of maintaining telemedicine equipment, and work overload could prevent them from using it.

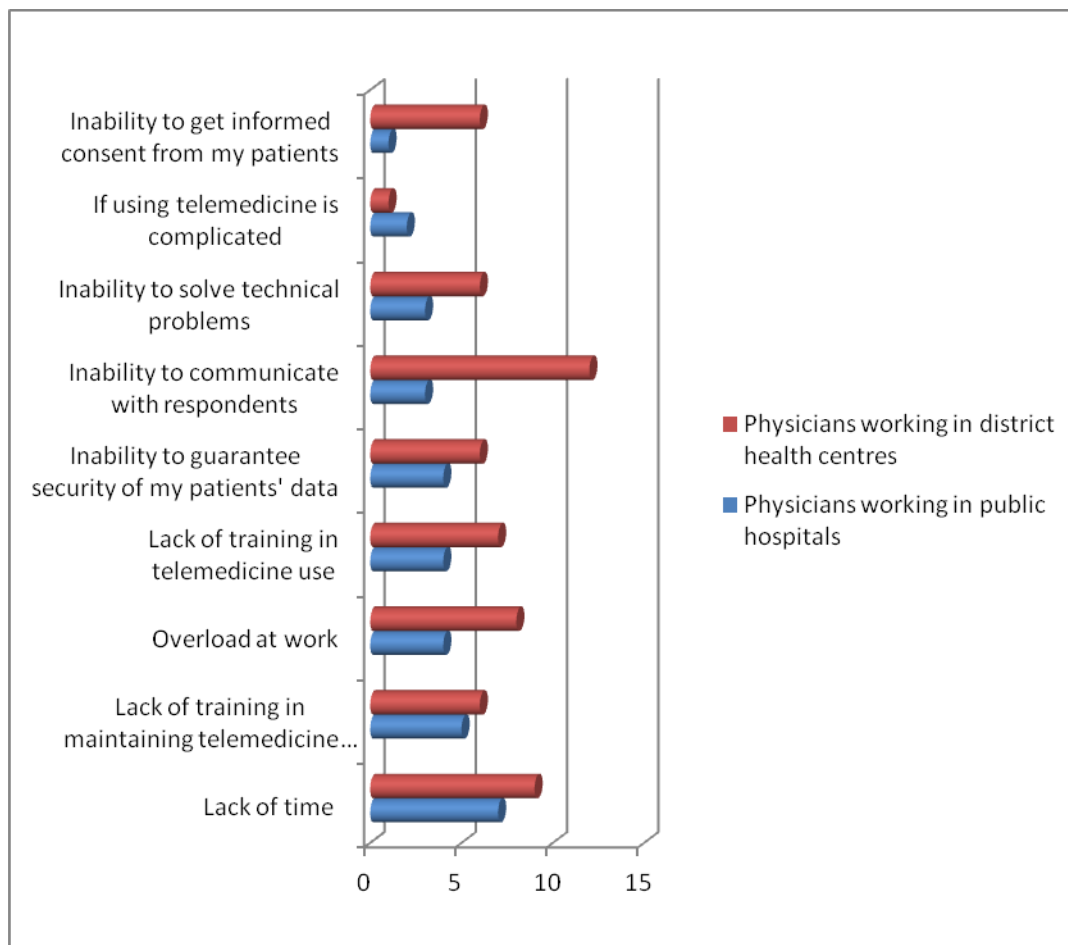


Figure 8: Physicians' negative control beliefs

Regarding the lack of time, one physician said:

"You know, we are in particular conditions of medical practice. We handle a large volume of patients. So, time is not enough. We are, all the time, busy with patients, consultations or other things. I think we do not have enough time, which can prevent us from using telemedicine" (Male specialist physician working in a public hospital outside Dakar)

The physicians working in public hospitals also said that they will not use telemedicine, or they will stop using it if the data security of their patients is not guaranteed, if they are unable to communicate with respondents at the time they need them, if they are not able to solve technical problems (internet, electricity and equipment), if patients do not give their consent or if

the use of telemedicine is complicated. The physicians working in district health centres expressed the same opinions.

Gender

Female physicians who work in public hospitals mentioned only five negative control beliefs (see Appendix 8). These control beliefs include the lack of time, training in telemedicine use and equipment maintenance, work overload, and the inability to protect their patients' data. Regarding the lack of training in the use of telemedicine, one female physician observed:

"It takes training. If there is no training, we cannot use telemedicine" (Female specialist physician working in a public hospital in Dakar)

In district health centres, female physicians reported only one belief: that if the use of telemedicine is complicated they won't use it. This belief was not mentioned by their male counterparts.

Region of practice

Physicians who work in public hospitals outside Dakar mentioned only six of the ten negative control beliefs that were mentioned by the physicians working in Dakar's public hospitals (see Appendix 8). Conversely, the physicians who work in Dakar's district health centres cited only one of the ten negative control beliefs that were evoked by the physicians who work in the district health centres outside Dakar.

Specialization

Specialist physicians from both public hospitals and district health centres named the same negative control beliefs (see Appendix 8). All the general practitioners included in this study worked in district health centres. Thus, we cannot compare their beliefs with those of general practitioners who worked in public hospitals.

Discussion

Our results show that Senegal's physicians perceived some advantages (positive behavioural beliefs) and disadvantages (negative behavioural beliefs) of using telemedicine in their professional activities. These results are consistent with those indicating that telemedicine has positive therapeutic effects (Ekeland, Bowes, & Flottorp, 2010), helps patients to save costs (Ganapathy, 2005; Moffatt & Eley, 2010), reduces patient transportation (Mars, 2013), facilitates access to continuing education (Mars, 2013; Moffatt & Eley, 2010), facilitates research (Mars, 2013), facilitates professional exchanges (Schmeida et al., 2007), improves the quality of health services (Moffatt & Eley, 2010; Mueller et al., 2014; Schmeida et al., 2007) and reduces medical errors (Schmeida et al., 2007). They are also consistent with those that demonstrated that telemedicine can put patients' medical data in danger (Ganapathy, 2005; Mars, 2013), affect patients and physician relationships (Hiratsuka et al., 2013), require more time, worsen the overload of physicians, lead to medical errors, be ineffective in treating patients medically, and be unable to guarantee physicians income (Kaddu et al., 2009). These perceived advantages and disadvantages of using telemedicine determine the future attitude of physicians toward that technology. For example, those who perceived more advantages to using telemedicine may have a better attitude toward it and be more tempted to use it, as compared to those who perceived more disadvantages and who may be less tempted to use it in their professional activities.

These results are thus important to predict the attitude and intention of physicians, particularly when we know that our participants perceived more advantages than disadvantages of using telemedicine in their professional activities. They mentioned 12 advantages against just six disadvantages. This demonstrates that Senegal's physicians may hold a positive attitude toward the use of telemedicine. They could also have a positive intention, but their intention does

not depend only on their attitude. Their subjective norm and perceived behavioural control also influence their intention. These two variables depend on their normative and control beliefs.

Normative beliefs refer to the individuals and groups of individuals that can influence their use of telemedicine. This study identified many of these individuals and groups of individuals. Among them, there are patients, physicians, nurses, midwives, hospital administrators, the Minister of Health, students, academics, head of hospital departments, head-physicians of medical regions, technical and financial partners, district Prefects, the General Director of Health, the elected officials of local communities, the regional Governors, the village chiefs, hospital union activists, political opponents, the family of physicians, and the National Order of Physicians (National Medical Association). Among these identified individuals and groups of individuals, some were suspected to positively influence physicians' use of telemedicine, and others were considered as potential opponents to its use. Paradoxically, many were recognized, at the same time, as supporters and opponents of their use of telemedicine. These results coincide with those of researchers that found that nurses (Archambault et al., 2012), physicians (Archambault et al., 2012; Desroches et al., 2011; Tsiantou et al., 2013) and patients (Desroches et al., 2011; Tsiantou et al., 2013) can approve of the use of telemedicine, and that physicians and patients can also disapprove of it (Desroches et al., 2011). These results suggest that the development of telemedicine requires a multi-sectoral approach involving individuals and groups of individuals from various sectors whose approval of its use will likely positively influence physicians in their use of the technology.

Our participants had a different perception of the individuals and groups of individuals that could influence their use of telemedicine. This can be explained by their experience and the quality of their interpersonal relationship with the mentioned referents. For example, a physician

working in a public hospital can have a good interpersonal relationship with the administrators of his hospital while another can have a bad one. The opinion of these two physicians regarding their administrators can be different. These results are an indication to Senegal's health authorities to conduct important awareness campaigns among the mentioned referents on the necessity to support physicians in using telemedicine.

Control beliefs refer to the factors that can encourage or prevent the use of telemedicine by physicians. This study identified some of these factors: ease of use of telemedicine equipment, lack of time, lack of training in telemedicine use, lack of training in maintaining telemedicine equipment, work overload, data security, inability to communicate with respondents, frequent technical problems (internet, electricity and equipment), inability to get patients' consent and the complexity of using telemedicine. Other researchers found similar factors: ease of use (Archambault et al., 2012; Saigí-Rubió et al., 2014), data security (Dünnebeil et al., 2012), lack of training (Shiferaw & Zolfo, 2012) and the non-adhesion of patients to telemedicine services (Gagnon et al., 2004). Ease of use was considered as the only factor that can encourage the participants' use of telemedicine while the nine other factors were recognized as those that can prevent its use. These results indicate that Senegal's physicians perceived more barriers than facilitators regarding the use of telemedicine. This could negatively affect their perceived behavioural control and by consequence their intention and their behaviour regarding telemedicine (see figure 1). According to the TPB, the perceived behavioural control can have a direct influence or an indirect impact on individuals' behaviour through their intention (Godin, 2012). Many studies demonstrated that perceived behavioural control can influence physicians' behaviour regarding telemedicine (Hsieh, 2015; Hu & Chau, 1999; Kuo et al., 2015). Control beliefs are thus important to understand physicians' behaviour regarding telemedicine.

Identifying these behavioural, normative and control beliefs about telemedicine is important in understanding and planning for the future behaviour of Senegal's physicians regarding the use of the technology.

Finally, this study revealed some differences and similarities in physicians' beliefs depending on the type of their health facility (public hospitals or district health centres), their gender (male or female), their specialization (specialist physicians or general practitioners) and their region of practice (Dakar or outside Dakar). For example, unlike their male counterparts, female physicians who work in district health centres did not mention that telemedicine would allow them to do research. A study by Waljee similarly suggests that female physicians are less likely to participate in research activities (Waljee et al., 2015). Knowing these differences and similarities allows Senegal's health authorities to identify the beliefs of each group of physicians (physicians working in public hospitals, physicians working in district health centres, male physicians, female physicians, physicians working in Dakar, physicians working outside Dakar, specialist physicians, general practitioners), thus permitting targeted adjustments to future interventions of telemedicine to match the beliefs of each group of physicians.

In adjusting telemedicine interventions based on this study's findings, telemedicine planners would have to consider that this study included only two (5.40%) female physicians from district health centres and seven (21.87%) female physicians from public hospitals. The proportion of female physicians among Senegal's physicians is 29% (OMS & JICA, 2013). The proportion of female physicians in our study is thus not a representative sample. Similarly, this study included only two (5.4 %) physicians from Dakar's district health centres. It did not include any general practitioners working in public hospitals. These proportions are not representative of the physicians working in Dakar's district health centres or of the general practitioners working in

public hospitals (OMS & JICA, 2013). These limitations resulted from our sampling strategy that was based mainly on the type of health facility where physicians worked (hospitals and district health centres) rather than on their gender, region of practice, age or specialization.

Conclusion

This study identified the various behavioural, normative and control beliefs of Senegal's physicians with respect to telemedicine use. In other words, it allowed us to better understand the expectations and fears of Senegal's physicians towards telemedicine. It helps to identify the non-physician individuals or groups who hold normative influence over physicians, which should be considered when developing telemedicine projects or promoting its use. Finally, it identifies some of the perceived barriers and facilitators that prevent or encourage the use of telemedicine in Senegal. Physicians' beliefs are sometimes similar and sometimes different depending on the type of their health facility, their gender, their specialization and their region of practice. These results provide useful information for the development of telemedicine which, in turn, may improve the recruitment and retention of physicians in rural and remote areas, and contribute to improved health care access and population health.

Chapter 4

Determinants of the intention of Senegal's physicians to use telemedicine in their professional activities

Running title: Intention of Senegal's physicians towards telemedicine

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Abstract

Introduction

In Senegal, the ratio of physicians to population inside Dakar is far greater than outside the city. This situation, which is more pronounced among specialist physicians, leads to uneven access to healthcare. To date, health authorities in Senegal have been unable to find a suitable solution for ensuring equitable distribution of physicians. Pending such a solution, telemedicine may help to improve access to healthcare outside Dakar, and to enhance physicians' recruitment and retention, but this presumes that physicians intend to use the technology.

Objective

Applying the theory of planned behaviour (TPB), this study aimed to determine the intention of Senegal's physicians who work in public hospitals and district health centres to use telemedicine in their professional activities, and to identify what factors influence that intention.

Method

We conducted a cross-sectional study between January and March 2015 with a random sample of 168 physicians working in hospitals and 153 physicians working in district health centres in Senegal. Data were collected using two questionnaires of which one was designed for each group of physicians. These questionnaires consisted of two parts of which one focused on the sociodemographic and professional characteristics of physicians, and the second on the constructs of the TPB, namely intention, attitude, subjective norm and perceived behavioural control. The lead researcher and three trained investigators administered these questionnaires. Data were analyzed using descriptive statistics, correlations, and linear regression. The linear regression models included physicians' socio-demographic and professional characteristics and the constructs of the TPB.

Results

The intention of the physicians working in public hospitals and district health centres to use telemedicine in their professional activities was moderate, which means that it was not unfavourable but needs to be improved. The intention of the physicians working in public hospitals differed significantly by medical region and number of years in practice while the intention of the physicians working in district health centres differed significantly by age. The physicians working in public hospitals outside Dakar and with fewer years of practice had a more favourable intention than the rest of the physicians working in public hospitals. In district health centres, younger physicians and those aged between 46 to 50 years old had the strongest intention to use telemedicine. The intention of both the physicians working in public hospitals and district health centres was influenced by their perceived behavioural control, which refers to their perceptions of their ability to use telemedicine in their professional activities. Intention changed positively when physicians' attitude, subjective norm, and perceived behavioural control changed positively. The intention of the physicians working in public hospitals also changed positively when their region and status as contract-employee changed positively, but negatively when their status as government employee changed positively. For physicians working in district health centres, we found that their intention also changed positively when their age and years of practice increased.

Conclusions

These results revealed that physicians' intention needs to be improved and could be improved by acting on their perceived behavioural control which is supported by their control beliefs (see chapter 3). The findings also demonstrated that some physicians' characteristics produced stronger intention which is useful information for telemedicine planners in targeting efforts to encourage these physicians to adopt the technology.

Keywords: Physicians' intention, telemedicine use, Senegal

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Introduction

In many countries, physicians are unevenly distributed geographically (Dolea et al., 2009). In Senegal, more than 60% work in Dakar, the capital city, for a population of only 23% (Zurn. et al., 2010). This uneven distribution is more pronounced among specialists, with 80% of them working in Dakar (SNIS, 2011). This uneven distribution leads to uneven access to healthcare and, in turn, poor health outcomes. For example, infant mortality ranges between 43/1,000 in Dakar to more than 68/1,000 in some regions such as Sedhiou, Kolda, Diourbel and Kedougou (ANSD & ICF International, 2012).

One of the main causes of the uneven distribution of physicians is the difficulty in recruiting and retaining them outside Dakar. This difficulty could be attributed to many factors; those well known being occupational, personal, family and community factors (Zurn et al., 2010). International migration may also exacerbate these distribution issues with data showing that more than 51% of Senegal's physicians work abroad (Clemens & Pettersson, 2007). Senegal has adopted a number of measures to promote the recruitment and retention of physicians outside Dakar including the increase in the number of physicians through the creation of new medical schools, and the improvement of their management (Zurn et al., 2010). To date, however, these measures have not resulted in improved equitable distribution of physicians between Dakar and the rest of the country, evidenced by the fact that the majority of physicians still work in Dakar.

Telemedicine, defined as the practice of medicine from a distance through use of information and communication technologies (ICTs), is seen as an effective way of increasing access to healthcare by increasing access to scarce health professionals (Ellenby & Marcin, 2015). It has also been proposed as a useful means of increasing physicians' recruitment and retention in remote regions (Duplantie et al., 2007; Fortin et al., 2006; Gagnon et al., 2007). During the last decade, many telemedicine projects have been implemented in Senegal

(Balancing act, 2013; Colomé et al., 2009) although many of them fail at an early stage (Berg, 1999). These failures challenge the expectations of the benefits of telemedicine.

The determinants of these failures are not well known. According to Broens and others, the factors that determine the success or failure of telemedicine projects can be categorized as individual, technological, financial, organizational, political and legislative (Broens et al., 2007; Tanriverdi & Iacono, 1999; Yaya & Raffelini, 2009). This phase of our study focused on the individual factors that determine the success or failure of telemedicine projects. Specifically, it focused on physicians' intention to use telemedicine in their professional activities. Physicians themselves, in their reticence to use telemedicine technology, are considered one of the largest barriers to telemedicine adoption (Call et al., 2015). In Senegal's public health sector, physicians usually work either in hospitals or district health centres (SNIS, 2012). For that reason, this study was aimed at determining the intention of Senegal's physicians who work in public hospitals and district health centres to use telemedicine in their professional activities. The objective was also to identify the factors that influence their intention. This study did not include the physicians working in the private sector due to its limited time frame, the difficulty in recruiting physicians in the private sector and the costs associated with the inclusion of these physicians.

State of Knowledge

During the last decade, many researchers have studied the determinants of physicians' intention to use telemedicine (Gagnon, 2003; Gagnon et al., 2003). Gagnon et al. (2003) assessed the determinants of physicians' intention to use telemedicine in their clinical practice, finding that physicians who perceived professional and social responsibilities regarding the use of telemedicine in their clinical practice had a stronger intention to use it (Gagnon, 2003). Saigi-Rubió et al (2014) analyzed the determinants of Spain's, Colombia's and Bolivia's physicians to use telemedicine and found that in all three countries the level of physicians' use of Information

and Communication Technologies (ICTs) in their personal life was the strongest determinant of telemedicine use (Saigí-Rubió et al., 2014). The findings in Spain revealed that ease-of-use of ICTs in clinical practice and propensity to innovate were the best determinants (Saigí-Rubió et al., 2014). By contrast, the results in Colombia and Bolivia revealed that the level of optimism about ICTs was the best determinant of telemedicine use (Saigí-Rubió et al., 2014).

Hu and Chau (1999) investigated telemedicine acceptance among physicians who practice in public tertiary hospitals in Hong Kong. Their results revealed that attitude and perceived behavioural control are the most important determinants of telemedicine acceptance among physicians (Hu & Chau, 1999). Their findings also showed that physicians' intention was influenced by the perceived usefulness of telemedicine (Hu., Chau, Sheng, & Tam, 1999). Rho et al. (2014) also found that the perceived usefulness and perceived ease-of-use had an effect on physicians' intention to use telemedicine. Dünnebeil et al. (2012) studied the intention of German physicians to accept e-health in ambulatory care and found that the perceived importance of standardization and current ICT utilization were the most significant drivers for accepting electronic health services (EHS) in their practice (Dünnebeil et al., 2012).

Kuo et al. (2015) found that physicians' intentions were positively correlated with attitude, subjective norm and perceived behavioural control. They also noted that the relationships between intention and attitude, intention and subjective norm, and intention and perceived behavioural control varied significantly between experienced and inexperienced physicians (Kuo et al., 2015).

All these studies were carried outside of Senegal and under different cultural and economic conditions, making it difficult to determine whether these factors apply to Senegal. The only study on physician use of ICTs carried out in Senegal assessed the availability, ease of use, usefulness, and job relevance of mobile phones by health workers in Saraya, which is one of the

districts of Kedougou, the southeastern region of Senegal (Blanas et al., 2014). This study revealed that participants valued using phones to address training, stock (healthcare materials) management, program reporting and transportation challenges. Other studies are therefore needed to better understand the intention of Senegal's physicians to use telemedicine in their professional activities.

Conceptual Framework

This study utilized an adaptation of the theory of planned behaviour (TPB) (see Figure 1), which is known to be effective in studying intention of health professionals (Ajzen, 1985; Godin, 2012).

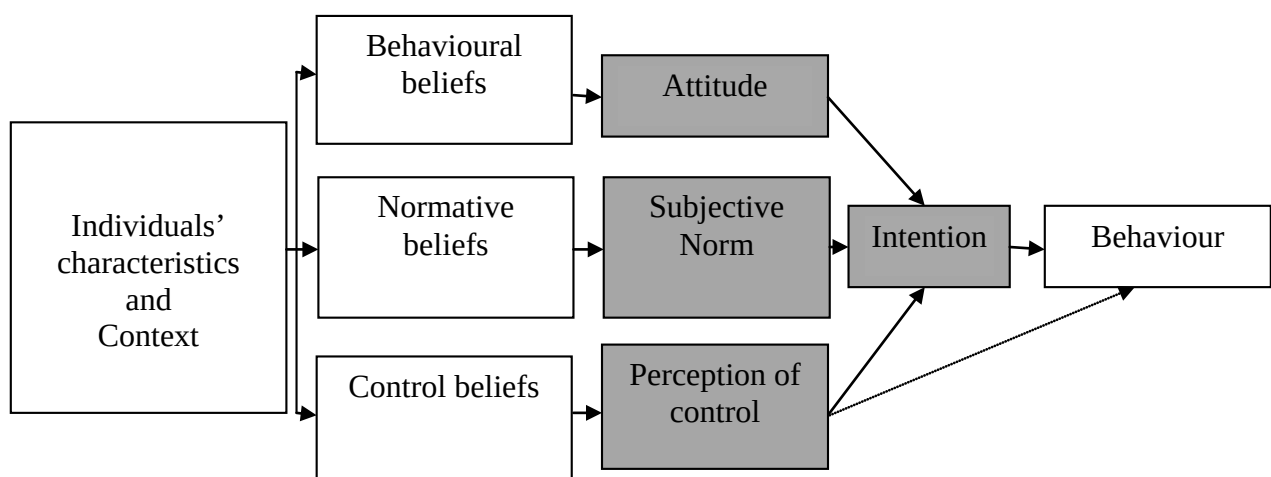


Figure 1: Adaptation of the Theory of Planned Behaviour (Ajzen, 1991)

This theory defends that intention is the proximal determinant of behaviour (Ajzen, 1985; Godin, 2012). It provides the needed motivation for a person to implement a new behavior, and depends on attitude toward the behaviour, subjective norm and perceived behavioural control. These three constructs are largely described in chapter 1. They depend respectively on behavioural, normative, and control beliefs, also described in chapter 1. They are influenced by individuals' characteristics and the context in which the behaviour is adopted. This theory has

already been used to study the determinants of telemedicine use and has provided very satisfactory results (Hu & Chau, 1999; Kuo et al., 2015).

Method

Study design

A cross-sectional study was conducted in Senegal, between January and February 2015. This design is a descriptive approach commonly used in epidemiology (Hennekens, Buring, & Mayrent, 1998). It consists of measuring a specific outcome and factors associated with it at a specific point in time. It is also relatively inexpensive and does not require much time to be conducted nor for researchers to follow up on participants since they are surveyed only once (Levin, 2006).

Population, sampling and recruitment

The population studied consisted of physicians working in public hospitals and district health centres. In 2014, physicians working in public hospitals in Senegal numbered 596 while 187 worked in district health centres. For this study, 200 physicians working in public hospitals and all 187 physicians working in district health centres were preselected. The 200 physicians working in public hospitals were randomly preselected. These physicians and the 187 physicians working in district health centres were then contacted to establish their availability, willingness to participate in the study, and consent to respond to the questionnaire. The final sample consisted of 168 physicians working in public hospitals and 153 physicians working in district health centres.

Data collection

Questionnaires were administered by the lead researcher and three trained investigators through individual interviews between January and March 2015. Interviews were carried out in person in hospitals, district health centres, hotels, conferences room, and physicians' homes,

depending on each physician's availability and preference. Physicians were asked about their intention, attitude, subjective norm and perceived behavioural control toward the use of telemedicine. They were also asked about their socio-demographic and professional characteristics (sex, age, region of practice, employment status, specialization, number of years in practice and number of years in current position). In cases of missing data, physicians were called to either complete or correct the information.

Instruments

Data were collected using two questionnaires. The first was developed specifically for the physicians working in public hospitals (Appendix 15), while the second was conceived for the physicians working in district health centres (Appendix 18). Each of the two questionnaires was comprised of two parts. The first part solicited physicians' socio-demographic and professional characteristics, and the second asked questions about physicians' intention, attitude, subjective norm and perceived behavioural control.

The items used to assess physicians' intention were informed by the literature. The items used to assess their attitude, subjective norm and perceived behavioural control were developed by studying their beliefs. The items used to assess their attitude were developed by studying their positive and negative behavioural beliefs. The items used to measure their subjective norm were created by studying their positive and negative normative beliefs, and the items used to evaluate their perceived behavioural control were formed by studying their positive and negative control beliefs. Identifying these beliefs was part of an earlier phase of the overall study (see Chapter 3).

Survey items were content validated by a group of seven experts from the University of Ottawa and Laval University to revise, add or remove certain items (see Appendices 9, 12, 15, 16 and 17). The final number of items for each of the four theoretical constructs (intention, attitude, subjective norm and perceived behavioural control) varied from three to eleven for the first

questionnaire, and from three to ten for the second questionnaire. Table 1 shows the number of items of each theoretical construct in each questionnaire. These various items were measured using a seven-point Likert scale. We scored each item by physician, then by group of physicians. Next, we scored each construct by group of physicians. Table 1 shows the mean score and standard deviation of each item and construct by group of physicians.

Table 1: Descriptive analysis of TPB constructs for physicians

Item	Physicians working in hospitals		Physicians working in district health centres	
	Mean	Standard deviation	Mean	Standard deviation
Intention	4.29	1.77	4.28	1.69
- Over the 12 coming months, I intend to use telemedicine in my professional activities	4.99	1.91	5.19	1.73
- Over the 12 coming months, I will use telemedicine in my professional activities	4.39	2.03	4.21	1.99
- Over the 12 coming months, the probability that I use telemedicine in my professional activities is very low or very high.	3.50	2.11	3.45	2.03
Attitude	5.93	0.81	5.80	0.92
- To me, using telemedicine in my professional activities over the 12 coming months is very useless or very useful	6.26	0.81	6.18	1.22
- To me, using telemedicine in my professional activities over the 12 coming months is very harmful or very beneficial	6.25	0.79	6.23	0.95
- To me, using telemedicine in my professional activities over the 12 coming months is very imprudent or very prudent	5.78	1.12	5.61	1.22
- Using telemedicine in my professional activities over the 12 coming months would allow me not to evacuate some of my patients	5.43	1.62	5.66	1.46
- Using telemedicine in my professional activities over the 12 coming months would allow me to gain time	6.08	1.07	5.92	1.36
- Using telemedicine in my professional activities over the 12 coming months would allow me to avoid medical errors	5.75	1.39	5.93	1.31
- Using telemedicine in my professional activities over the 12 coming months would allow me to train myself professionally	6.10	1.59	5.84	1.67
- Using telemedicine in my professional activities over the 12 coming months would allow me to treat my patients at distance	5.49	1.83	5.14	1.90

- Using telemedicine in my professional activities over the 12 coming months would allow me to get the experts' opinions at distance	6.31	1.44	6.07	1.70
- Using telemedicine in my professional activities over the 12 coming months would allow me to better organize the evacuation of my patients	6.15	1.22	N/A	N/A
- Using telemedicine in my professional activities over the 12 coming months would allow me to contribute to the training of other health professionals	5.61	1.85	N/A	N/A
- Using telemedicine in my professional activities over the 12 coming months would allow me to reduce the expenses incurred by my patients	N/A	N/A	5.44	1.86
Subjective norm	5.95	0.76	5.81	0.82
- My Health Ministry would strongly approve or disapprove that I use telemedicine in my professional activities over the 12 coming months	6.12	0.93	6.08	1.09
- My population would strongly approve or disapprove that I use telemedicine in my professional activities over the 12 coming months	5.85	1.03	5.67	1.26
- My colleagues (physicians) would strongly approve or disapprove that I use telemedicine in my professional activities over the 12 coming months	6.09	0.92	5.71	1.26
- My patients would strongly approve or disapprove that I use telemedicine in my professional activities over the 12 coming months	5.68	1.21	5.56	1.27
- My paramedical staff would strongly approve or disapprove that I use telemedicine in my professional activities over the 12 coming months	5.95	0.97	5.54	1.12
- My students would strongly approve or disapprove that I use telemedicine in my professional activities over the 12 coming months	6.33	0.80	N/A	N/A
- The administrators of my hospital would strongly approve or disapprove that I use telemedicine in my professional activities over the 12 coming months	5.67	1.33	N/A	N/A
- The head physician of my medical region would strongly approve or disapprove that I use telemedicine in my professional activities over the 12 coming months	N/A	N/A	5.94	1.06
- The academics would strongly approve or disapprove that I use telemedicine in my professional activities over the 12 coming months	N/A	N/A	6.05	0.98
- The financial and technical partners of my structure would strongly approve or disapprove that I use telemedicine in my professional activities over the 12 coming months	N/A	N/A	5.93	1.04
Perceived behavioural control	5.47	0.81	4.99	0.95
- To me, using telemedicine in my professional activities over the 12 coming months will be very difficult or very easy.	4.53	1.85	4.12	1.87
- If I want, I can easily use telemedicine in my professional activities over the 12 coming months	4.12	2.10	3.68	2.09
- I feel that I will be able to use telemedicine in my professional activities over the 12 coming months	5.34	1.69	5.60	1.50

- I will use telemedicine in my professional activities over the 12 coming months if the security of my patients' data is guaranteed	6.52	0.84	6.28	1.04
- I will use telemedicine in my professional activities over the 12 coming months despite my time constraints	5.62	1.33	5.32	1.48
- I will use telemedicine in my professional activities over the 12 coming months if I'm able to communicate with the respondents	6.28	0.90	5.75	1.49
- I will use telemedicine in my professional activities over the 12 coming months if I'm able to manipulate telemedicine equipment	3.74	2.06	3.42	1.88
- I will use telemedicine in my professional activities over the 12 coming months if I'm trained to use it	6.52	0.77	N/A	N/A
- I will use telemedicine in my professional activities over the 12 coming months if I'm able to protect my patients	6.56	0.65	N/A	N/A
- I will use telemedicine in my professional activities over the 12 coming months if I'm able to get the adhesion of my population	N/A	N/A	5.21	1.56
- I will use telemedicine in my professional activities over the 12 coming months if I'm able to get the informed consent of my patients	N/A	N/A	5.53	1.50

N/A: Not applicable

The mean score was considered very unfavourable when it ranged between 1 and 2, unfavourable when it ranged between 2 and 3, slightly unfavourable when it ranged between 3 and 4, moderate when it ranged between 4 and 5, slightly favourable when it ranged between 5 and 6, favourable when it ranged between 6 and 7 and very favourable when it was 7.

Later, we calculated Cronbach's alpha coefficients. These coefficients are shown in Table 2 and indicate satisfactory internal consistency for all constructs and both groups of physicians

Table 2: Cronbach's alpha coefficients

Constructs of TPB	Physicians working in hospitals	Physicians working in district health centres
Intention	0.85	0.85
Attitude	0.81	0.82
Subjective norm	0.85	0.87
Perceived behavioural control	0.72	0.75

Data analysis

We performed analyses using SPSS version 23. We first conducted descriptive analyses of physicians' characteristics, intention, attitude, subjective norm and perceived behavioural control. During these analyses, we calculated the frequency of each characteristic of physicians

and estimated the mean scores by characteristic (sex, age, region of practice, employment status, specialization, number of years in practice and number of years in the current position). We then compared these mean scores using a one-way ANOVA.

Second, we conducted correlation analyses to explore the relationship between intention and the three other theoretical constructs (attitude, subjective norm, and perceived behavioural control) on the one hand, and between intention and socio-demographic and professional characteristics on the other. In these analyses, we used Pearson's correlation coefficients to investigate the relationships between intention and the three other theoretical constructs, and Spearman's correlation coefficients to look at the relationships between intention and physicians' socio-demographic and professional characteristics. Pearson correlation coefficient measures the strength of the linear relationship between normally distributed variables. When variables are not normally distributed, or the relationship between the variables is not linear, it is more appropriate to use the Spearman correlation coefficient (Ancelle, 2006).

To identify factors associated with physicians' intention to use telemedicine in their professional activities, we performed a two-step multiple regression analysis. In the first step, we introduced only the three theoretical constructs (attitude, subjective norm, and perceived behavioural control) into the model. Afterwards, we added the characteristics of physicians that were significantly correlated with intention at $p < .05$, namely region, government employee status and contract employee status for the physicians working in hospitals, and age and number of years in practice for the physicians working in district health centres. For each variable, the criteria for inclusion and retention in the final models were fixed at $p < .10$ (inclusion) and $p < .05$ (retention).

Before performing the regression analysis, we checked for outliers and respected the postulates of linear regression (namely, the linearity of the relation between intention and the

various constructs of the TPB and the normality of errors). For physicians working in public hospitals, we used Mahalanobis distance to identify three outliers that we took out of the database. The number of physicians working in public hospitals who were included in the final analysis was 165. We did not find any multicollinearity, and all kurtosis statistics were below 2, whereas attitude skewness was 1. Square root transformation did not eliminate the skewness score, so we retained its original value in the regression model for ease of interpretation. For physicians working in district health centres, we took two outliers out of the database using Mahalanobis distance. The number of physicians working in district health centres who were included in the final analysis was 151. We did not find any multicollinearity; all skewness statistics were below 1 and all kurtosis statistics below 2.

Ethical and administrative approval

This study was approved by the Research Ethics Board of the University of Ottawa (Dossier H 09-13-12C). In addition, authorization to carry out the study was obtained from the National Ethics Committee on Health Research (MSAS/DPRS/CNERS of January 30th, 2015). Participants gave their written informed consent before answering the questionnaire, and their anonymity was respected. This research also required administrative approval, for which we secured authorization from the Ministry of Health (No 083 MSAS/ DPRS/ DR). We also secured collaboration and support from the General Director of Health, who instructed head-physicians in medical regions to invite head-physicians from district health centres, with the public hospital Director of facilitating the research. Head-physicians from district health centres and public hospital Directors then invited their physicians to participate in the research.

Results

Descriptive analysis of physicians' characteristics

In total, 165 physicians working in hospitals and 151 physicians working in district health centres were included in the analyses. Table 3 shows the distribution of these physicians by sex, age, region of practice, specialization, employment status, number of years in medical practice and number of years in the current post. The 165 physicians working in public hospitals were selected from 18 public hospitals spread across eight administrative regions including Dakar, Diourbel, Kaffrine, Louga, Saint-Louis, Thiès, Fatick and Kaolack. The 151 physicians working in district health centres were selected in 70 district health centres spread across the 14 administrative regions of Senegal. In the two groups, the physicians working in Dakar are more numerous.

Based on administrative data, this distribution is consistent with that of physicians in Senegal, 71% of whom worked in Dakar (SNIS, 2011, 2012). The physicians working in district health centres were younger (39 years) than their colleagues who worked in public hospitals (41 years). Data from 2013 indicate that physicians aged between 31 and 40 years of age are more numerous (51.51%) (OMS & JICA, 2013), followed by those aged between 41 and 50 years old. In both groups (public hospitals and district health centres), male physicians were more numerous (OMS & JICA, 2013). Female physicians represented 32.5% of the physicians working in public hospitals and 35.76% of the physicians working in district health centres. In Senegal, the total proportion of female physicians is estimated to be 29% (OMS & JICA, 2013).

In the two groups, specialist physicians and government employees were also more numerous than general practitioners, trainees physicians, and contract employees.

Table 3: Socio-demographic characteristics of physicians

Characteristics		Physicians working in hospitals		Physicians working in district health centres	
		N	%	N	%
Sex	Male	112	67.88	97	64.24
	Female	53	32.12	54	35.76
Age	≤ 30	10	6.10	16	10.59
	31-35	39	23.64	38	25.16
	36-40	46	27.88	45	29.80
	41-45	26	15.76	20	13.24
	46-50	22	13.33	18	11.92
	> 50	22	13.33	14	9.27
Medical regions	Dakar	125	75.76	100	66.23
	Out of Dakar	40	24.24	51	33.77
Specialization	General practitioners	30	18.18	64	42.38
	Specialist physicians	135	81.82	74	49.01
	Trainees physicians	0	0.00	13	8.61
Employment status	Government employee	112	67.88	96	63.58
	Contract employee	38	23.03	42	27.81
	Trainee physicians	15	9.09	13	8.61
Number of years in medical practice	≤ 5	32	19.39	48	31.79
	6-10	50	30.30	47	31.13
	11-15	44	26.67	36	23.84
	16-20	19	11.51	13	8.61
	> 20	20	12.12	7	4.63
Number of years in their current centre or hospital	≤ 5	68	41.21	126	83.44
	6-10	56	33.94	23	15.23
	11-15	26	15.76	2	1.32
	16-20	7	4.24	0	0.00
	> 20	8	4.85	0	0.00

N: Number, %: Percentage

In Senegal's public health sector, specialist physicians (70.92%) are more numerous than general practitioners (29.08%) (OMS & JICA, 2013). The number of years of practice was higher among the physicians working in public hospitals (12 ± 7) than among those working in district health centres (9 ± 6). Similarly, the number of years in the current post was higher among the physicians working in public hospitals (8 ± 6) than among those working in district health centres (3 ± 3).

Descriptive analysis of the constructs of the TPB

Table 4 shows the scores of intention (I), attitude (A), subjective norm (SN) and perceived behavioural control (PBC) of the physicians working in public hospitals and district health centres by sex, age, region, employment status, specialty, number of years in medical practice and number of years in the current post.

Table 4: Socio-demographic characteristics of physicians[illegible]

Government employee	4.05	1.77	5.87	0.81	5.91	0.77	5.42	0.83	4.30	1.75	5.86	0.91	5.89	0.81	5.02	0.97
Contract employee	4.82	1.82	6.18	0.75	6.13	0.69	5.59	0.77	4.33	1.55	5.86	0.83	5.62	0.87	5.06	0.87
Trainee physicians	4.71	1.45	5.67	0.84	5.76	0.82	5.41	0.79	4.02	1.59	5.31	1.21	5.70	0.89	4.68	1.00
Number of years in medical practice																
≤ 5	4.92	1.44	5.89	0.87	5.81	0.79	5.46	0.68	4.53	1.53	5.69	1.06	5.78	0.83	5.02	1.04
6-10	4.32	1.89	5.95	0.65	5.95	0.79	5.48	0.85	4.52	1.68	5.64	0.85	5.67	0.86	4.93	0.86
11-15	3.92	1.67	5.82	0.89	6.03	0.72	5.42	0.79	4.18	1.75	5.99	0.76	5.92	0.72	5.13	0.96
16-20	3.67	1.75	5.82	1.09	5.83	0.77	5.39	1.04	3.13	1.74	6.01	1.00	5.81	0.98	4.79	0.93
> 20	4.70	1.92	6.19	0.55	6.09	0.68	5.63	0.78	3.57	1.57	6.24	0.89	6.39	0.56	4.82	0.92
Number of years in their current centre or hospital																
≤ 5	4.33	1.80	5.84	0.87	5.85	0.77	5.41	0.77	4.20	1.62	5.75	0.94	5.78	0.83	4.99	1.03
6-10	4.32	1.81	5.98	0.74	5.99	0.78	5.50	0.78	4.62	1.95	5.99	0.82	5.91	0.83	5.04	0.90
11-15	3.97	1.43	5.86	0.88	6.06	0.71	5.46	0.99	5.00	2.82	6.65	0.07	6.06	0.44	4.38	2.91
16-20	5.05	1.88	6.31	0.36	5.96	0.61	5.73	0.78								
> 20	4.33	2.38	6.02	0.77	6.11	0.80	5.57	0.89								

I: Intention, A: Attitude, SN: Subjective norm, PBC: Perceived behavioural control, M: Mean, SD: Standard Deviation

Intention***Physicians working in public hospitals***

The average with respect to the intention of physicians working in public hospitals to use telemedicine in their professional activities was moderate (4.29 ± 1.77) (see Table 1). Intention was considered to be moderate when it ranged from 4 to 5 on a seven-point scale. This result shows that the intention of these physicians was not unfavourable to the use of telemedicine, but still needs to be improved through actions on its determinants.

The ANOVAs test revealed that there was no significant statistical difference between the intention of men and women ($F: 3.11, p: 0.08$), between the intention of specialist physicians, general practitioners and trainees physicians ($F: 1.27, p: 0.28$), and between the intention of government employees, contract employees and trainees physicians ($F: 2.25, p: 0.08$). It also indicated that intention did not differ significantly with respect to age ($F: 0.95, p: 0.45$) or number of years in the post ($F: 0.53, p: 0.71$). By contrast, there was a significant statistical difference between the intention of physicians who work within and outside Dakar ($F: 5.48, p: 0.02$). The physicians who work outside Dakar had a stronger intention (4.86 ± 1.79) than those working in Dakar (4.11 ± 1.73). Finally, the ANOVA revealed that the intention of the physicians working in public hospitals was significantly different depending on the number of years in medical practice ($F: 2.39, p: 0.05$). The physicians whose number of years in practice was below or equal to 5 years exhibited more favourable intention (4.92 ± 1.44) than the other physicians.

Physicians working in district health centre

The average with regards to the intention of the physicians working in district health centres to use telemedicine in their professional activities was also moderate (4.28 ± 1.69) (see Table 1). This result suggests that the intention of these physicians was not unfavourable and could be improved by acting on the factors that determine it. The ANOVA revealed that there

was no significant difference between the intention of male and female physicians (F: 0.32, p: 0.57); between the intention of the physicians who work within and outside Dakar (F: 0.05, p: 0.82); between the intention of specialist physicians, general practitioners and trainees physicians (F: 1.04, p: 0.35); and, between the intention of government employees, contract employees and trainees physicians (F: 0.96, p: 0.43). The ANOVA also showed that the intention of the physicians who work in district health centres was not significantly different by the number of years in medical practice (F: 0.55, p: 0.65) and the number of years in the post (F: 1.64; 0.14). Moreover, the ANOVA showed that there was a significant difference between the intention of physicians from different age groups (F: 3.78, p: 0.003). The physicians who were between 31 and 35 years old (4.88 ± 1.36) and those who were between 46 and 50 years old (4.78 ± 1.89) showed more favourable intention towards the use of telemedicine than the rest of physicians (see Figure 2).

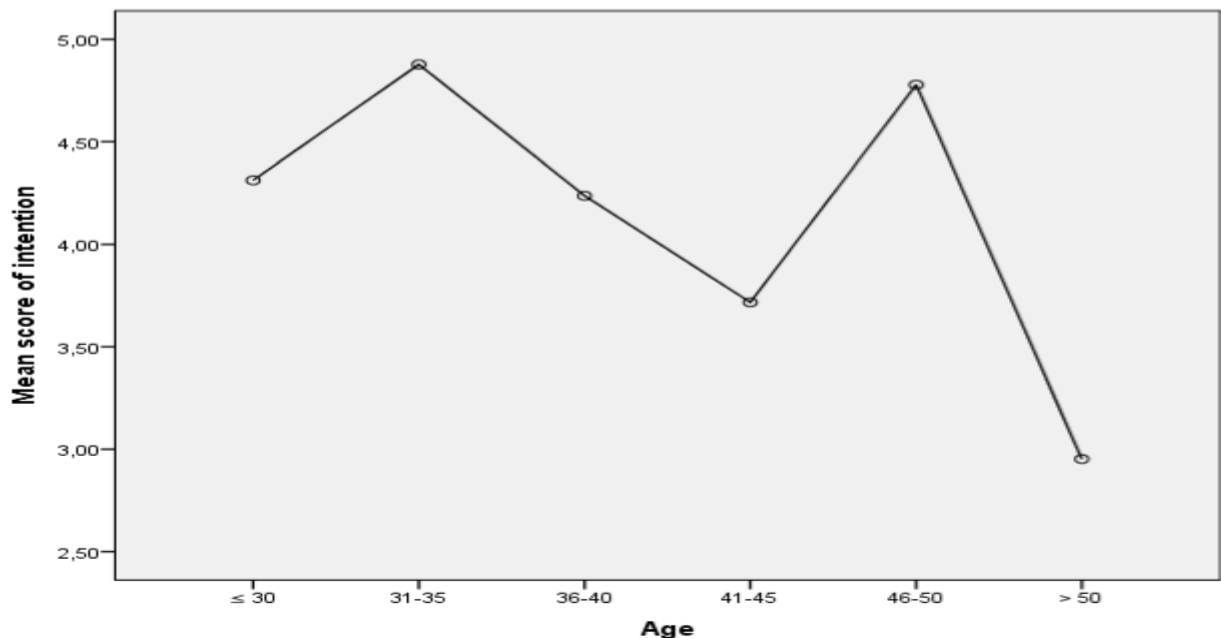


Figure 2: Means plots of physicians' intention by age

Attitude

Physicians working in public hospitals

The average attitude of public hospitals physicians towards the use of telemedicine in their professional activities was slightly favourable (5.93 ± 0.81). Attitude was considered to be slightly favourable when it ranged from 5 to 6 on a seven-point scale (see Table 1). This result means that the attitude of these physicians was not unfavourable and could be improved. This improvement may require appropriate actions on physicians' behavioural beliefs. Chapter 3 presents these beliefs with more details.

The ANOVA demonstrated that there was a significant difference between the attitude of male and female physicians ($F: 4.51, p: 0.03$). Male physicians expressed more favourable attitude towards the use of telemedicine (6.02 ± 0.79) than female physicians (5.73 ± 0.83). The ANOVA also established that there was a significant statistical difference between the attitude of the physicians who practice within and outside Dakar ($F: 5.32, p: 0.02$). The physicians who practice outside Dakar showed a more favourable attitude (6.18 ± 0.80) towards the use of telemedicine than the physicians who practice in Dakar (5.84 ± 0.80).

An ANOVA revealed no significant statistical difference between the attitude of specialized physicians, general practitioners and trainee physicians ($F: 0.003, p: 0.99$) or between the attitude of government employees, contract employees and trainees physicians ($F: 2.44, p: 0.06$). Similarly, it demonstrated that the attitude of public hospital physicians was not significantly different by age ($F: 1.19, p: 0.31$), number of years in medical practice ($F: 0.83, p: 0.50$) or number of years in the post ($F: 0.69, p: 0.59$).

Physicians working in district health centres

The average with respect to the attitude of the physicians working in district health centres towards the use of telemedicine was slightly favourable (5.80 ± 0.92) (see Table 1). Their attitude

varied from slightly unfavourable to very favourable. The ANOVA found no significant difference between the attitude of the physicians working within and outside Dakar ($F: 0.23, p: 0.63$), between the attitude of specialist physicians, general practitioners and trainees physicians ($F: 2.69, p: 0.07$), and between the attitude of the government employees, contract employees and trainee physicians ($F: 1.59, p: 0.19$). It additionally revealed that there was no significant difference by years of practice ($F: 1.46, p: 0.22$) and years in the post ($F: 1.53, p: 0.22$). There was, however, a significant difference between the attitude of male and female physicians ($F: 5.51, p: 0.02$). The attitude of male physicians (5.95 ± 0.84) was more favourable than that of female physicians (5.57 ± 1.03). Also, there was a significant difference by age ($F: 3.73, p: 0.003$). The physicians who were 46 to 50 years old (6.19 ± 0.88) and who were over 50 years old (6.20 ± 0.75) demonstrated a more favourable attitude than the rest of physicians (see Figure 3).

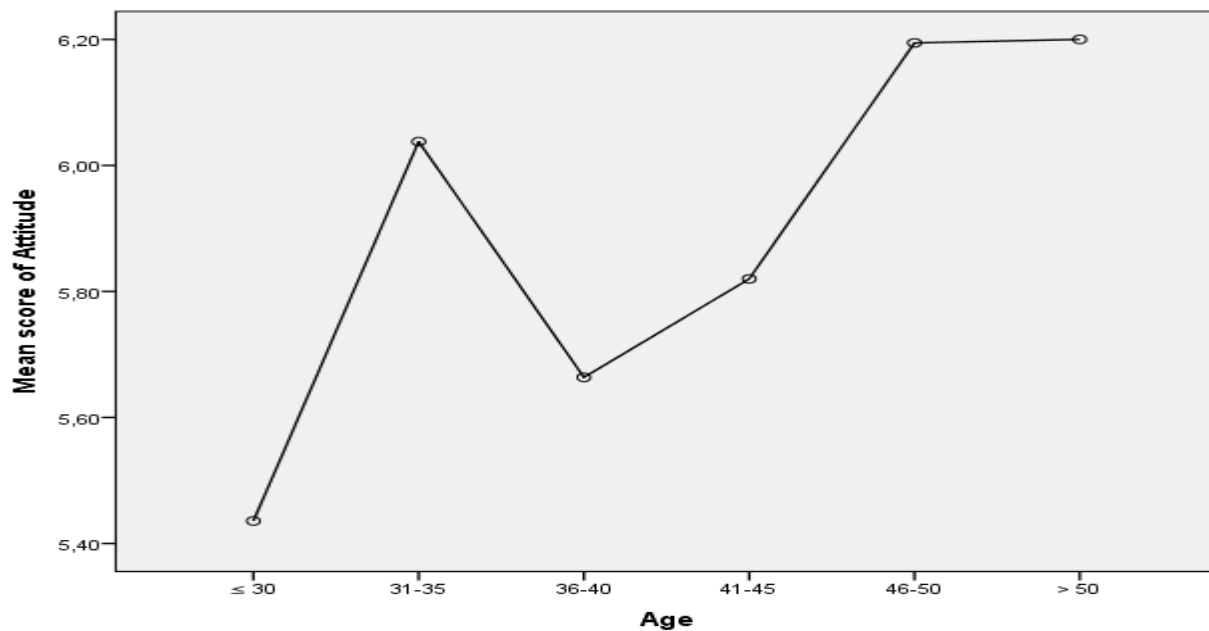


Figure 3: Means plots of physicians' attitude by age

Subjective norm***Physicians working in public hospitals***

The average subjective norm of the physicians working in public hospitals towards the use of telemedicine was slightly favourable (5.95 ± 0.76) (see Table 1). Subjective norm was considered to be slightly favourable when it ranged from 5 to 6 on a seven-point scale. This means that regarding the use of telemedicine, the average subjective norm of the physicians working in public hospitals was favourable, but not completely. It can thus be improved if appropriate actions are undertaken on physicians' normative beliefs. The ANOVA established that there was a significant difference between the subjective norm of male and female physicians ($F: 4.43, p: 0.04$). The subjective norm of male physicians (6.04 ± 0.72) was more favourable than that of female physicians (5.78 ± 0.82). The ANOVA also showed that there no difference in the subjective norm of the physicians who work within and outside Dakar ($F: 1.03, p: 0.31$); in that of specialist physicians, general practitioners and trainee physicians ($F: 0.62, p: 0.54$); and, in that of government employees, contract employees and trainee physicians ($F: 1.50, p: 0.22$). The ANOVA further found that the subjective norm of the physicians working in public hospitals was not significantly different across age groups ($F: 1.49, p: 0.19$), number of years in medical practice ($F: 0.69, p: 0.60$) and number of years in their post ($F: 0.52, p: 0.72$).

Physicians working in district health centres

The subjective norm of the physicians working in district health centres towards the use of telemedicine was also slightly favourable (5.80 ± 0.82) (see Table 1). This means that the subjective norm of these physicians was positive, but not maximal. It can thus be improved by acting on the normative beliefs. Chapter 3 provides more details on these beliefs. We found no significant difference between the subjective norm of male and female physicians ($F: 3.45, p: 0.06$); between that of the physicians working inside and outside Dakar ($F: 0.08, p: 0.77$);

between that of specialists, general practitioners and trainee physicians ($F: 1.92, p: 0.15$); and, between that of government employees, contract employees and trainee physicians ($F: 0.97; p: 0.43$). Furthermore, the subjective norm of the physicians working in district health centres was not significantly different by the number of years of practice ($F: 1.40; p: 0.24$) and the number of years in the post ($F: 0.33, p: 0.72$). By contrast, it was significantly different by age ($F: 2.36, p: 0.04$), with physicians over the age of 50 scoring better (6.13 ± 0.77) than other physicians (see Figure 4).

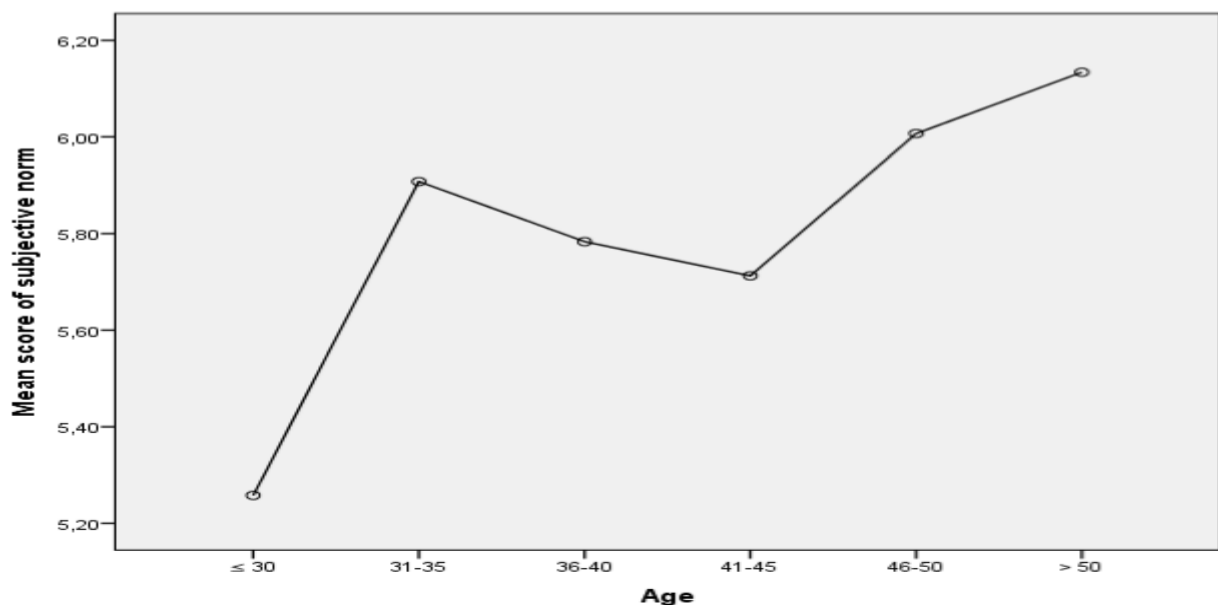


Figure 4: Means plots of subjective norm by age

Perceived behavioural control

Physicians working in public hospitals

The perceived behavioural control towards the use of telemedicine for physicians working in public hospitals was slightly favourable (5.47 ± 0.81) meaning that efforts are still needed to improve it. No significant difference was found between the perceived behavioural control of male and female physicians ($F: 0.82, p: 0.36$); between that of the physicians working inside and outside Dakar ($F: 1.04, p: 0.31$); between that of specialized physicians, general practitioners and

trainee physicians (F: 0.29, p: 0.97); and, between that of government employees, contract employees and trainee physicians (F: 1.12, p: 0.34). Similarly, no significant difference was found between the perceived behavioural control of physicians according to their age (F: 1.19, p: 0.31), number of years in medical practice (F: 0.27, p: 0.89) and number of years in current position (F: 0.32, p: 0.87).

Physicians working in district health centres

The average perceived behavioural control with respect to the use of telemedicine for physicians working in district health centres was moderate (4.99 ± 0.95) (see Table 1). This suggests that the perceived behavioural control of these physicians was not unfavourable, but not favourable enough regarding the use of telemedicine. It needs to be improved by acting on the control beliefs that determine it. Chapter 3 details these control beliefs.

The ANOVA found that there was no significant difference between the perceived behavioural control of male and female physicians (F: 0.47, p: 0.49); between that of the physicians working inside and outside Dakar (F: 0.03, p: 0.87); between that of specialists, general practitioners and trainee physicians (F: 0.04, p: 0.96); and, between that of government employees, contract employees and trainee physicians (F: 0.87, p: 0.48). Furthermore, there was no significant difference between the perceived behavioural controls according to physicians' age (F: 1.16, p: 0.33) number of years in medical practice (F: 0.44, p: 0.78) and number of years in their position (F: 0.43, p: 0.65).

Correlations between intention and theoretical constructs

Physicians working in public hospitals

We calculated Pearson's correlation between intention and the three theoretical constructs corresponding to this group of physicians, and between the three theoretical constructs themselves. All correlations were significant at $p < .01$, indicating a significant statistical

relationship between intention and the three theoretical constructs for physicians working in public hospitals, and between the three theoretical constructs themselves (see Table 5).

Table 5: Correlations between intention and theoretical constructs

Scale	Intention	Attitude	Subjective norm	Perceived behavioural control
Intention	1			
Attitude	.348**	1		
Subjective norm	.262**	.521**	1	
Perceived behavioural control	.607**	.404**	.453**	1

** Correlation is significant at 0.01 (bilateral)

Physicians working in district health centres

We performed the same tests for this group of physicians. Again, all correlations were significant at $p < .01$ (see Table 6).

Table 6: Correlation between intention and theoretical constructs

Scale	Intention	Attitude	Subjective norm	Perceived behavioural control
Intention	1			
Attitude	.349**	1		
Subjective norm	.247**	.484**	1	
Perceived behavioural control	.663**	.454**	.432**	1

** Correlation is significant at 0.01 (bilateral)

Correlation between intention and physicians' characteristics

Physicians working in public hospitals

We calculated Spearman's correlation between intention and physicians' characteristics, namely their sex, age, region of practice, specialization, employment status, number of years in medical practice and number of years in their current post (see Table 7). Only the correlations between intention and region of practice, government employee status, and contract employee status were

significant ($p < .05$). Consequently, the regression model for this group of physicians included only these three characteristics.

Table 7: Correlation between intention and the characteristics of the physicians working in public hospitals

	Intention	Region	Age	Sex	Specialist	Generalist	Years in current hospital	Years in practice	Government employee	Contract employee	Trainee doctors
Intention	1										
Region	.192*	1									
Age	-.103	-.087	1								
Sex	-.143	-.056	.008	1							
Specialists	-.117	-.283**	.444**	-.080	1						
Generalists	.117	.283**	-.444**	.080	-1.000**	1					
Years in current hospital	-.008	-.359**	.639**	-.040	.527**	-.527**	1				
Years in practice	-.128	-.295**	.727**	-.092	.491**	-.491**	.791**	1			
Government employee	-.208**	-.277**	.232**	-.083	.450**	-.450**	.389**	.318**	1		
Contract employee	.171*	.318**	-.006	.014	-.093	.093	-.172*	-.157*	-.768**	1	
Trainee physicians	.071	.018	-.368**	.099	-.562**	.562**	-.383**	-.287**	-.460**	-.167*	1

* Correlation is significant at 0.05 (bilateral)/ ** Correlation is significant at 0.01 (bilateral)

Physicians working in district health centres

We performed the same test for this group of physicians. Only the correlations between intention and physicians' age, and number of years in practice were significant ($p < .05$) (see Table 8). Consequently, the regression model included only age and number of years in medical practice.

Table 8: Correlation between intention and the characteristics of the physicians working in district health centres

	Intention	Region	Age	Sex	Specialist	Generalist	Years in current hospital	Years in practice	Government employee	Contract employee	Trainee doctors
Intention	1										
Region	,000	1									
Age	-,168*	-,140	1								
Sex	-,045	-,344**	-,074	1							
Specialists	-,084	-,234**	,477**	,052	1						
Generalists	,036	,168*	-,233**	-,063	-,841**	1					
Years in current centre	,054	-,068	,575**	-,028	,353**	-,142	1				
Years in practice	-,178*	-,134	,884**	-,072	,545**	-,292**	,555**	1			
Government employee	,033	,245**	,428**	-,124	,347**	-,204*	,333**	,465**	1		
Contract employee	,026	-,179*	-,319**	-,007	-,212**	,158	-,185*	-,353**	-,753**	1	
Trainee physicians	-,021	-,080	-,326**	,165*	-,250**	,067	-,394**	-,359**	-,405**	-,120	1

* Correlation is significant at 0.05 (bilateral)/** Correlation is significant at 0.01 (bilateral)

Regression analysis**Physicians working in hospitals**

Table 9 shows the results of the regression analysis for this group of physicians. The results indicate that the intention of these physicians to use telemedicine in their professional activities is influenced by perceived behavioural control ($p < .0001$), that is, their perception of their ability to use telemedicine in their professional activities. The final regression models explain 36.80% of the variance in the intention of physicians working in public hospitals.

Table 9: Regression coefficients for the physicians working in public hospitals

Model	Non-standardised coefficients		Standardised coefficients	T	p-value
	A	Standard error	Beta		
Constant	-2.788	1.043		-2.672	.008
Attitude	.293	.162	.134	1.804	.073
Subjective norm	-.189	.176	-.081	-1.071	.286
Perceived behavioural control	1.248	.153	.573	8.155	.000
Region	.373	.268	.090	1.390	.166
Contract employee	-.215	.416	-.050	-.517	.606
Government employee	-.586	.362	-.155	-1.621	.107

Dependent Variable: Intention

Physicians working in district health centres

Table 10 shows the results of regression analysis for this group of physicians. The results show that the intention of physicians in this group to use telemedicine in their professional activities is similarly influenced by perceived behavioural control ($p < .0001$). The final regression models explain 43.90% of the variance in the intention of physicians working in district health centres.

Table 10: Regression coefficients for the physicians working in district health centres

Model	Non-standardised coefficients		Standardised coefficients	T	p-value
	A	Standard error	Beta		
(Constante)	-1.083	1.056		-1.026	.307
Attitude	.242	.133	.133	1.813	.072
Subjective norm	-.089	.148	-.044	-.604	.547
Perceived behavioural control	1.098	.126	.616	8.680	.000
Age	-.017	.028	-.074	-.603	.548
Number of years in practice	-.037	.034	-.132	-1.105	.271

Dependent Variable: Intention

Discussion

To sum up briefly, our results showed that the average with respect to the intention of the physicians working in public hospitals and district health centres was moderate, which means that it was not unfavourable and not favourable enough regarding the use of telemedicine in professional activities. These results are consistent with those of Hu and Chau (1999) who found that the intention of the physicians working in public tertiary hospitals in Hong Kong was moderate. Our results also showed that the intention of the physicians working in public hospitals was not affected by their gender, age, number of years in the post, specialty and employment status, but by their medical region (Dakar and outside Dakar) and their number of years in practice. The physicians working outside Dakar and those with fewer numbers of years of practice had more favourable intention than the rest of physicians to use telemedicine in their professional activities.

Ly et al. (2015) found similar results and showed that physicians' intention changed with their number of years in practice (Ly, Gagnon, Légaré, Rousseau, & Simonyan, 2015). They explained their findings as being the result of the lack of time and motivation among physicians.

The physicians who have been practicing for several years generally have more administration and management responsibilities than those with fewer years of practice (Ly et al., 2015). They are regularly invited to seminars and training which may affect their intention to use telemedicine. The more experienced physicians could also be susceptible to losing their motivation over time because of the lack of incentive and poor working conditions (Agyepong et al., 2004; Dieleman, Toonen, Touré, & Martineau, 2006). These results suggest that health authorities should consider allocating the posts requiring the use of telemedicine in public hospitals to physicians with fewer years in practice and sensitizing the physicians with more years in practice to using telemedicine.

Our results cannot explain why the intention of the physicians working in public hospitals changed according to their medical region and why it is better among those working outside Dakar. Further research is needed to better answer these questions. Nevertheless, the physicians working outside Dakar could be more tempted to use telemedicine because they have less access to specialist physicians than their colleagues who work in Dakar. 80% of Senegal's specialist physicians work in Dakar (SNIS, 2011). Specialist expertise is, therefore, less accessible to the physicians working outside Dakar than those working in Dakar. These results suggest that health authorities need to incentivize specialist physicians working in Dakar, since without their participation, telemedicine to consult with specialists in Dakar would not be available to physicians outside Dakar.

The intention of the physicians working in district health centres, in contrast, did not change with their medical region or number of years in practice. Likewise, it did not change with their gender, specialty, employment status and number of years in the current post. It changed only according to their age. Physicians working in district health centres who were between 31

and 35 years old and between 46 and 50 years old exhibited a more favourable intention than the rest of the physicians. Young physicians tend to be more familiar and more tempted to use new technologies than their older colleagues (Dorup, 2004; Parekh, Nazarian, & Lim, 2004; Scher, 2012). It is, however, not clear why the physicians aged between 46 and 50 years old had a more favourable intention than the physicians aged between 36 and 45 years old. Our findings cannot explain this result. Another study is needed to elucidate that difference. Meanwhile, Senegal's health authorities should consider allocating the posts requiring the use of telemedicine in district health centres to young physicians and physicians aged between 46 and 50 years old.

The intention of the physicians working in public hospitals and district health centres was positively correlated with attitude, subjective norm and perceived behavioural control. These results are consistent with the findings of Kuo et al. (2015). The intention of the physicians working in public hospitals was also found to be positively correlated with their medical region and their status as contract-employees, and negatively with their government employee status. The intention of the physicians working in district health centres was found to be negatively correlated with their age and number of years in practice. These results suggest that health authorities could consider attitude, subjective norm, perceived behavioural control, medical region, contract-employee status and government employee status when formulating strategies to influence the physicians who work in public hospitals to adopt telemedicine. Similarly, they could consider attitude, subjective norm, perceived behavioural control, age and number of years in practice when formulating strategies to influence the physicians who work in district health centres to use telemedicine. The beliefs that support physicians' attitude, subjective norm and perceived behavioural control, and on which action is needed, are largely developed in our previous chapter (Chapter 3).

The intention of the physicians working in public hospitals is, at 36.80%, explained by their perceived behavioural control, while the intention of the physicians working in district health centres is, at 43.90%, explained by the same psychosocial determinant (perceived behavioural control). These results are consistent with the findings of other researchers (Hsieh, 2015; Hu & Chau, 1999; Kuo et al., 2015). Perceived behavioural control refers to their perception of their ability to use telemedicine (Godin, 2012). It can have a direct influence on physicians' intention and behaviour (see Figure 1). It was examined, in this study, based on some physicians' control beliefs (see Chapter 3). The results indicated that physicians are likely to use telemedicine if they believe that they can manage their time, to communicate with their respondents when they need them, to guarantee the security of their patients' data, to easily use the technology, to get the adhesion of their population, to secure their patients' informed consent and to maintain telemedicine equipment. Lack of time can be a barrier to the use of telemedicine (Hoerbst & Schweitzer, 2015; Taylor & Coates, 2015), as it is known that issues related to data security (Sabin & Skimming, 2015), ease of use of technologies (Archambault et al., 2012; Saigí-Rubió et al., 2014), population adhesion (Gagnon et al., 2004), and patients' informed consent (Arne, 2014; Dreezen, 2004) can prevent the use of telemedicine. Acting on these various factors could positively influence physicians' perceived behavioural control and, in consequence, their intention and behaviour regarding the use of telemedicine. This could positively influence their recruitment and retention where there are needed and, in consequence, improved access of the population to their services.

Conclusion

The findings from this study revealed that the intention of both the physicians working in public hospitals and district health centres was moderate. They demonstrated that the intention of

these physicians could be improved by acting on their perceived behavioural control. This means by acting on their perception about their control on their time, their communication with experts, the security of their patients' data, the use of the technology, the adhesion of population, their patients' informed consent and the maintenance of telemedicine equipment.

Physicians' intention could be strengthened by acting on these various perceptions and on the factors that support them. By improving their intention, their use of telemedicine and their recruitment and retention outside Dakar can be bolstered, leading to better access to healthcare and population health.

Besides perceived behavioural control, physicians' intention was found to be correlated with some factors, meaning that it changed when these factors changed. These factors included their attitude, subjective norm, contract employee status, government employee status and medical region for the physicians working in public hospitals, and attitude, subjective norm, age and number of years in practice for those who work in district health centres. Acting on these various factors could lead to changes in physicians' intention, and in consequence to improved recruitment and retention, increased access to healthcare and improved population health.

These results are, therefore, useful for Senegal's decision makers, planners, and researchers who now have information on physicians' intention and the factors that influence their intention.

Chapter 5

The contextual determinants of the use of telemedicine in Senegal

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Abstract

Introduction

In Senegal, as in many countries, physicians are unevenly distributed, and the measures adopted to solve this problem have produced unsatisfactory results. Telemedicine is considered as a potentially effective solution to address this problem, thereby improving equitable access to healthcare. However, the use of telemedicine depends on a number of contextual factors that need to be known in order to be addressed.

Objective

The objective of this paper was to study the broader contextual factors that influence the use of telemedicine in Senegal by using a micro, meso and macro framework. Contextual factors refer to the factors at meso and macro-levels. Factors at the micro-level relate more to individual factors (intention, beliefs and perceptions) and were the subject of our previous studies.

Method

A qualitative descriptive study involving individual interviews was undertaken between February and June 2014, with 30 physicians working in public hospitals, 36 physicians working in district health centres and ten telemedicine project managers. Physicians were selected using purposeful random sampling, and managers using snowball sampling. Interviews were recorded, transcribed and coded thematically using NVivo 10 software.

Results

The results showed that the use of telemedicine in Senegal can be influenced by some contextual meso and macro factors. At the meso level, this includes technical, organizational and ethical factors while at the macro level it includes financial, political, legal, socioeconomic and cultural factors. Individual or micro-level factors are influenced by meso-level factors, which are in turn affected by macro-level factors. The results also showed that macro-level factors seem to

influence each other while the meso-level factors seem to interact and to be interdependent with each other.

Conclusions

These results provide a broad overview of the contextual factors that influence the use of telemedicine and identify the meso and macro factors that are most likely to determine the use of telemedicine in Senegal. Knowledge of these contextual factors can assist actors in the health sector in their support for the development of telemedicine. In turn, this may improve the recruitment and retention of physicians in underserved areas, which in time is likely to increase Senegal's overall population health and particularly that of populations living in currently underserved regions.

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Keywords: contextual factors, Senegal, telemedicine

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Introduction

As with many countries, Senegal suffers from an inadequate supply and misdistribution of physicians (SNIS, 2011; Zurn. et al., 2010). Eighty percent of its specialist physicians work in Dakar, the national capital, yet this region includes only 23% of the population (SNIS, 2011). Certain specialist physicians are available only in Dakar (SNIS, 2011). To access these physicians, patients from underserved areas sometimes have to travel very long distances. This situation negatively affects their health and exacerbates health inequities (ANSD & ICF International, 2012). This inequitable distribution of physicians is influenced by professional, personal, family and community factors (Zurn et al., 2010). Professional factors include professional isolation, an inequitable process in assigning physicians to their position, extended stay in underserved areas and lack of professional development (Zurn et al., 2010). Personal factors include the individual reasons why physicians choose to not work and stay in underserved areas. Family factors comprise issues such as the lack of good schools for children and jobs for spouses. Community factors include difficulties to integrate within local communities (Zurn et al., 2010). Uneven distribution of physicians in Senegal is further affected by a high rate of emigration, with more than half of Senegalese-trained physicians estimated to be working abroad (Clemens & Pettersson, 2007).

In recent decades, several measures were adopted in Senegal to increase the number of physicians in underserved areas. They were aimed essentially at improving the production and management of physicians (Zurn et al., 2010). These measures are described in the previous chapters. To date, none of these measures have given satisfactory results, with a disproportionate number of physicians still located in Dakar. This situation compels decision-makers, planners,

and researchers to find other solutions to equitably distribute physicians between the underserved and other areas.

Several researchers over the past decade have been studying telemedicine and consider it to be a potential solution to the uneven distribution of physicians (Gagnon, Duplantie, Fortin, & Landry, 2006; Shiferaw & Zolfo, 2012). Technology can have a positive impact on physicians' recruitment and retention in underserved areas by reducing their professional isolation, allowing them to get experts' opinions from a distance and decreasing their workload (Brebner et al., 2004; Jennett et al., 2000; Potter et al., 2014; Watanabe et al., 1999). This tool can have a positive impact on the consequences of the uneven physician distribution, particularly improving equitable access to healthcare (Mueller et al., 2014; Pradhan, 2009).

These considerations and beliefs about telemedicine have also been present in Senegal where, during the last two decades, several telemedicine projects have emerged. Most of these projects, however, ended in their early stages, with the use of telemedicine now limited to just some public hospitals and district health centres. The health system has failed to disseminate its use widely, and the influential factors are not well known. Many authors think that these factors could involve individual, technical, organisational, financial, ethical, legal, political and socio-cultural influence (Broens et al., 2007; Tanriverdi & Iacono, 1999; Yaya & Raffelini, 2009). Broens et al. (2007) describe individual factors such as the acceptance of individuals concerning the use of telemedicine; technical factors such as those related to the support, training, usability of equipment and the quality of the technology used in telemedicine; financial factors such as investment, maintenance and operating costs of telemedicine, and organizational factors such as internal and external changes following the introduction of telemedicine. Finally, they describe political and legal factors such as the laws, policies, and standards related to the use of

telemedicine (Broens et al., 2007). Earlier phases of our overall study focused on individual factors (physician perceptions, beliefs and intentions regarding telemedicine use; see Chapters 2, 3 and 4). They revealed that telemedicine can contribute to recruiting and retaining physicians in underserved areas, but that is not enough by itself to do so. They identified negative and positive behavioural, normative and control beliefs that can encourage or discourage physicians from using telemedicine. Finally, they demonstrated that the intention of physicians to use telemedicine in their professional activities was moderate and influenced by their perceived behavioural control. This paper extends these studies by identifying contextual factors. In other words, it explores the technical, organisational, financial, ethical, legal, political and socio-economic factors that influence the use of telemedicine in Senegal.

State of Knowledge

Below we summarize the current literature on how these factors influence telemedicine use. We also note that most of these studies took place in high-income countries, and only a few examined these factors in countries with more resource-constrained settings, similar to those found in Senegal.

Technical factors

There are a number of technical factors identified in the literature that affect the use of telemedicine. One of the best-known factors is the quality of internet connections (Hiratsuka et al., 2013; Shiferaw & Zolfo, 2012). The poor quality of internet connections is considered as a potential barrier to the use of some telemedicine applications or methods such as real-time telemedicine services (Hiratsuka et al., 2013). Another technical factor is lack of training (Brebner, Brebner, & Ruddick-Bracken, 2005). This problem is seen as one of the most important barriers to the use of telemedicine because, in general, health professionals are not instructed in

the use of this tool during their medical school training (Shiferaw & Zolfo, 2012). A third technical factor is the frequency of technical failures. In a study published in 2001, technical failures were reported in 17% of consultations (Simpson, Doze, Urness, Hailey, & Jacobs, 2001). These technical failures may cause delays in the use of telemedicine (Hiratsuka et al., 2013), or discourage some telemedicine services users (Shiferaw & Zolfo, 2012).

Organisational factors

There are many organizational factors that influence the use of telemedicine. One of the best-known is lack of time, which has been reported by many authors as one of the main barriers to the use of telemedicine (El-Mahalli et al., 2012; Hoerbst & Schweitzer, 2015; Taylor & Coates, 2015). Another organizational factor is work overload, again widely recognized as one of the most important obstacles to the use of telemedicine (Joseph, West, Shickle, Keen, & Clamp, 2011; Uscher-Pines & Kahn, 2014). There are also the organizational changes following the introduction of telemedicine in healthcare organizations which can upset habits and impose internal and external changes in services organization (Aas, 2007; Broens et al., 2007). These organizational factors can negatively influence the use of telemedicine.

Financial factors

Some of the main financial factors are the investment, operational and maintenance costs related to telemedicine (Broens et al., 2007). These costs can be very high (Schmeida et al., 2007), which may limit the development of that tool. There is also the issue of compensation for telemedicine providers, with many governments refusing to reimburse physicians practicing telemedicine (Al-Qirim, 2007), which may discourage some physicians from using it (Larsen, Gjerdrum, Obstfelder, & Lundvoll, 2003). There is equally the lack of stable funding. Many telemedicine projects are financed by governments, universities, hospitals, telecommunication

operators, equipment manufacturers, international and regional organizations, semi-commercial organizations and armies (Wright, 1999). The funding is often short-term and unsustainable, which leads to the early failure of many projects (Brebner et al., 2005; Broens et al., 2007).

Ethical factors

There are many ethical factors, the best-known of which is data security. This factor is often cited as a main concern, and one of the main causes of physicians' resistance towards telemedicine (Dünnebeil et al., 2012). Another ethical factor is the lack of an ethical framework to guide the use of telemedicine (Dünnebeil, Sunyaev, Blohm, Leimeister, & Krcmar, 2010). These factors can pose additional hurdles to telemedicine use.

Political factors

The political factors that influence the use of telemedicine are the collaboration and commitment of political actors (Dzenowagis, 2005), government policy (Zailani, Gilani, Nikbin, & Iranmanesh, 2014), legislation (Broens et al., 2007) and standardization (Broens et al., 2007). Standardization consists in ensuring quality and uniform practice, but standards are not always available or enforced (Broens et al., 2007).

Legal factors

There are many legal factors that influence the use of telemedicine. One of these is the issue of liability of telemedicine providers mentioned by many authors and which extends to civil, penal, disciplinary and ordinal liability (Williatte-Pellitteri, 2013). There is also the lack of a legal framework for telemedicine care in many countries (Dünnebeil et al., 2010) which may discourage the use of telemedicine or fail to prevent harmful practices in its use.

Socioeconomic factors

Finally, there is a broader range of socioeconomic factors that include cultural and religious beliefs which may affect telemedicine use, since rural patients are known to prefer practitioners that are familiar with their culture (Jang-Jaccard et al., 2014). Socioeconomic factors also include poverty; people with low income will not be able to pay telemedicine costs if they are high and not available as a free service within a public program (Jang-Jaccard et al., 2014; Wright, 1999). Health worker strikes and social conflicts can also disrupt telemedicine use. These problems are known for their ability to paralyze the entire health system (Abbasi, 2014; Chima, 2013; Évans, 2002).

Conceptual framework

We based our study on the contextual factors that determine the use of telemedicine in Senegal on a micro, meso and macro socioecological framework (see Figure 1). This framework is an adaptation of the Dahlgren & Whitehead (1991) model, which is one of the most widely known and used frameworks in population health (CCSDH, 2015). It organizes the various factors that influence individuals' health into five categories and presents them in a series of five levels, one on top of the other. The upper level includes major structural factors such as general socioeconomic, cultural and environmental conditions. The level below includes the material and social conditions in which people live and work such as education, housing, and healthcare. The third level includes social and community support such as mutual support from family, friends, neighbours and the local community. The next level corresponds to individuals' behaviour such as their eating, smoking and drinking habits while the lowest level represents individuals' characteristics such as age, sex, genetic make-up which are regarded as fixed, and so outside of

the ability of policy makers to control them (Dahlgren & Whitehead, 1991). Interventions, instead, tend to focus on the upper four levels.

The micro, meso and macro layered conceptual framework for this research follows the same logic. It proposes three categories of factors and layers them in three levels, one on the top of the other. The upper level is the macro-level, followed by the meso, and micro-levels. In this study, the macro-level includes the financial, legal, political and socio-cultural factors that influence the use of telemedicine in Senegal, which correspond to the structural factors described by Dahlgren and Whitehead (1991) in their top layer. The meso-level includes the technical, organizational and ethical factors. The micro-level refers to individual factors, particularly individuals' perception, beliefs, intention, and behaviour. This framework is useful in that it affords insight into the various factors that influence the use of telemedicine. Also, it suggests that there is interaction between, and interdependence of, these different factors. It also proposes different intervention levels which should be interesting for decision makers and planners when developing telemedicine.

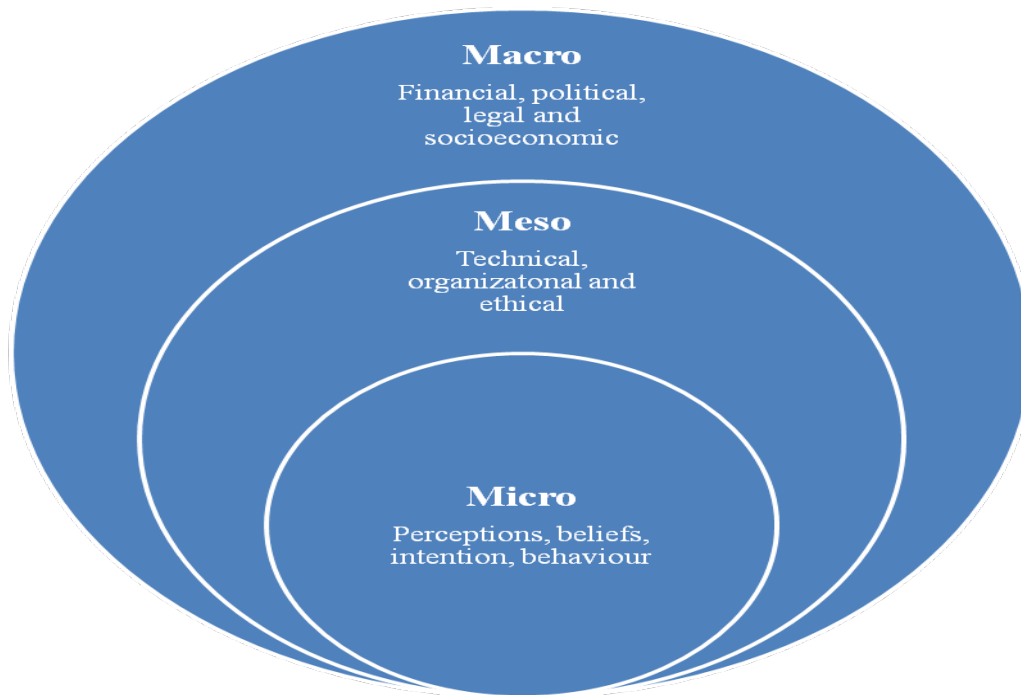


Figure 1: The micro, meso and macro framework of the use of telemedicine

This paper focuses on the macro and meso-levels since the micro-level factors (physicians' perceptions, beliefs, and intention) were addressed in earlier phases of this study (Chapters 2, 3 and 4).

Method

Study design, participants & sampling

A qualitative descriptive study involving individual interviews was conducted between February and June 2014. The research participants comprised physicians and telemedicine project managers. In Senegal's public health sector, the vast majority of physicians work either in public hospitals or district health centres. In 2014, 596 worked in public hospitals and 187 in district health centres. Telemedicine project managers included those managing the telemedicine projects implemented in Senegal. Their total number was unknown in 2014. Physicians were selected using a purposive sampling. This sampling strategy is commonly used in qualitative research (Creswell, 2007). We selected 30 physicians in 12 public hospitals and 36 physicians in 36

district health centres. Managers were selected using a snowball sampling strategy recruiting ten managers in ten different telemedicine projects.

Data collection

The selected participants were individually interviewed. Physicians were interviewed in their office, home, hotel room, restaurants, the airport and training centres, and telemedicine project managers in their office. Both physicians and managers were asked about the meso and macro factors that influence the use of telemedicine in Senegal (see Table 1). They were allowed to talk at length, on their terms, and with enough time to reflect. Clarifications were sought whenever needed. Interviews lasted 30 to 85 minutes. All interviews were audio-recorded.

Table 1: Interview guide for the study of the contextual factors that influence the use of telemedicine

Contextual factors		Questions
Meso	Technical	What are the technical factors that influence the use of telemedicine in Senegal?
	Organizational	What are the organizational factors that influence the use of telemedicine in Senegal?
	Ethical	What are the ethical factors that influence the use of telemedicine in Senegal?
Macro	Financial	What are the financial factors that influence the use of telemedicine in Senegal?
	Political	What are the political factors that influence the use of telemedicine in Senegal?
	Legal	What are the legal factors that influence the use of telemedicine in Senegal?
	Socioeconomic	What are the socioeconomic factors that influence the use of telemedicine in Senegal?

Interview Guide

We used a semi-structured interview guide that contained seven open-ended questions related to our research goals. This guide was tested by the lead researcher for ambiguous and

troublesome wording, and assessed by an expert committee. Afterward, it was tested with a small sample of three physicians working in public hospitals, three physicians working in district health centres and three managers. These nine participants were interviewed and recorded in order to detect any problems related to the questions and their administration.

Analysis

A descriptive thematic analysis was performed on the transcripts of the interviews using NVivo 10 software. Data were analyzed both deductively and inductively by the lead author. Certain codes were identified a priori based on the conceptual framework. These codes include the technical, organizational, financial, ethical, legal, political and socio-economic factors. Other codes within these categories were identified inductively. These emergent codes are described explicitly in each of the sections below. Data are described and presented below according to the broad meso and macro layers of the conceptual framework.

Ethical & Administrative Approval

This study secured approval from the Research Ethics Board of the University of Ottawa (N° H 09-13-12). It also secured, in Senegal, approval from the National Ethics Committee on Health Research (N° 205 MSAS/ DPRS/ CNER), the Ministry of Health (N° 111 MSAS/ DPRS/ DR) and the General Director of Health (N° 0678/ DGS/ SP). It was accepted by the head-physicians of medical regions and by the physicians working in public hospitals, as well as those working in district health centres and telemedicine projects managers. Each physician and manager who agreed to participate provided written informed consent. The anonymity of their information was respected in both Senegal and Canada.

Results

Participants' characteristics

A total of 30 physicians working in hospitals, 36 physicians working in district health centres and ten telemedicine project managers were interviewed (see Table 2). Participants were predominately men in all three groups.

Table 2: Socio-demographic and professional characteristics of participants

Characteristics		Physicians/ public hospitals		Physicians/ district health centres		Telemedicine project managers	
		N	%	N	%	N	%
Sex	Male	24	80.00	34	94.44	10	100.00
	Female	6	20.00	2	5.56	0	0.00
Age	≤ 30	2	6.67	0	0	1	10.00
	31-35	3	10.00	10	27.77	1	10.00
	36-40	4	13.33	13	36.11	0	0.00
	41-45	7	23.33	7	19.44	0	0.00
	46-50	6	20.00	6	16.66	2	20.00
	51-55	7	23.33	0	0.00	2	20.00
	56-60	0	0.00	0	0.00	3	30.00
	> 60	1	3.33	0	0.00	1	10.00
Specialization	General practitioner	0	0.00	13	36.11	0	0.00
	Specialist physician	30	100	23	63.89	7	70.00
	Not a physician	0	0.00	0	0.00	3	30.00
Medical Region	Dakar	24	80.00	2	5.56	8	80.00
	Outside Dakar	6	20.00	34	94.44	2	20.00

N: number, %: percentage

The average age of the physicians working in hospitals was 44, with a range of 29 to 61. Physicians working in district health centres were slightly younger, with an average age of 40 and

a range of 33 to 48. Telemedicine project managers were older, their average age being 50 with a range of 29 to 63.

The physicians working in public hospitals and district health centres were predominately specialist physicians. Telemedicine project managers were all specialists, but three were not physicians. The latter were specialized in education, Information and Communication Technologies (ICT) and health business development. The physicians working in public hospitals and telemedicine project managers were mostly working in Dakar, while the physicians working in district health centres were mostly working outside Dakar.

Meso factors

At the meso-level, the factors influencing the use of telemedicine reported by interviewees were categorized as technical, organizational and ethical. These factors appear to exert the most influence on the micro-level factors (individual factors), represented in this study by physicians' perception, beliefs, and intention reported in earlier chapters.

Technical factors

This study identified five technical factors that can have a direct effect on individual factors and that can also influence each other.

Lack of telemedicine equipment in health facilities

Telemedicine use, logically enough, can be prevented by a lack of computer equipment (computers, cameras, scanners, and printers), medical equipment (surgical material, etc.) or medical exploration equipment (ultrasound, X-ray, electrocardiogram, etc.). The availability of this equipment was considered by almost all our participants as essential prerequisites to their use of telemedicine:

"If we ask for a colleague's support for a disease without having the needed medical equipment to manage that disease, this can lead to a problem. Even if we have the diagnosis, if we don't have the needed instruments and tools, we cannot treat the patient. Even if the colleague tells us to do this, to do that, we cannot solve the problem, unfortunately. This is important." (Male general practitioners working in a district health centre outside Dakar)

Lack of maintenance of telemedicine equipment

Participants also noted that the lack of equipment maintenance was another weak link in the health system which could have a negative impact on the sustainable development of telemedicine:

"Another technical factor, I just mentioned it, is equipment maintenance. The weak point of the system is, particularly, equipment maintenance. That is at all levels. The problem of equipment maintenance is a serious problem for our health system. It is true that it is getting gradually developed." (Male specialist physician working in a district health centre outside Dakar)

Lack of or poor quality of internet connection

Our participants noted that internet connection was not available in some health facilities and that its quality was bad in others. One of the physicians working in public hospitals said:

"Currently, I have a computer, but internet connection is interrupted. I don't know since when. In any case, I wanted to connect, but I have been told that internet connection didn't work for one week." (Male specialist physician working in a public hospital outside Dakar)

These participants believed that scarcity of internet connections could prevent the large scale use of telemedicine and that the poor quality of internet connection could jeopardize the security and comfort of that technology.

Lack of or poor quality of electricity

Our results showed that some health facilities were not supplied with the electricity produced by the national electricity company (SENELEC). Some of these facilities worked with generators or solar panels. Others had no source of electricity. For our participants, this situation is not suited to the use of telemedicine because everything, including internet connection, depends on electricity.

"We have electricity, but sometime, there are power cuts. For example, last week, we spent three days without any electricity from 8 am to 5 pm." (Male specialist physician working in a district health centre outside Dakar)

In some health facilities, the electricity produced by the national electricity company (SENELEC) was available, but power cuts happened frequently. For our participants, these interruptions can be a real danger for their patients.

Lack of technical training

Lack of training on the technical aspects of telemedicine could also have a negative impact on its use since telemedicine introduces new equipment, the use of which is not always taught in medical schools:

"Telemedicine uses a particular technology. This technology is not mastered by practitioners. We are not technicians, and if we don't master all the technology installed for telemedicine. That is a problem. Therefore, it is necessary that providers are trained

in the use of the technology. If not, we are heading towards trouble." (Male specialist physician working in a district health centre outside Dakar)

Organizational factors

This study identified two organizational factors that can influence the use of telemedicine: the dearth of information on telemedicine and deficient human resources.

Lack of information on telemedicine

Our participants reported that they were not well informed about the telemedicine interventions carried out by health authorities. They stated that they did not have enough information on telemedicine interventions even though they believe that they are the first to be informed.

"Telemedicine is too centralized. There is no decentralization. I am in my region, almost for five years, but we never talked about telemedicine in this region. ... That is a problem. There is asymmetry of information. Only the people of central level have information. At peripheral level, we don't have anything. That is a problem. We have to have certain information." (Male specialist physician working in a district health centre outside Dakar)

This problem was seen as stemming from the Telemedicine National Steering Committee's dysfunction.

Lack of human resources

Our results demonstrated that the lack of human resources, particularly the lack of physicians and technicians, can prevent the use of telemedicine. For the physicians involved in this study, the dearth of physicians and technicians leads to work overload, which leaves no room for the use of telemedicine.

"I used to say that the system is itself faulty since only one person is called to do several tasks at the same time. Here, I come back to the lack of human resources that compel us to be multifunctional. That is an important barrier." (Male specialist physician working in a district health centre outside Dakar)

What is interesting here is that there is a cyclical issue. Telemedicine aims to address the lack of human resources, but it needs human resources to run effectively.

Ethical factors

This study identified one main ethical factor that exerts influence at the micro-level: the lack of an ethical framework to guide telemedicine use. According to our participants, in Senegal there was no ethical text governing, for example, confidentiality, medical secrets and informed consent. This problem raised a number of questions, and could dissuade physicians from using telemedicine in their professional activities. One of the female physicians said:

"I really don't know. I speak like a neophyte. I don't know. Will confidentiality be respected?" (Female specialist physician working in a public hospital in Dakar)

In sum, this study identified, as meso-level factors, five technical, two organizational and one ethical factor. Technical factors include the lack of internet connection, electricity, technical training and telemedicine equipment maintenance in underserved areas. They also include the poor quality of internet connections and electricity in these areas. Organizational factors include the lack of information on telemedicine and the scarcity of human resources. Ethical factors are essentially represented by the lack of an ethical framework to guide telemedicine use.

Macro factors

At the macro-level, we consider the most distal factors influencing the use of telemedicine categorised here as legal, political, financial and socioeconomic factors. These factors seem to have a direct impact on the meso-level factors, but they also seem to influence each other.

Legal factors

The main legal factor identified in this study is the absence of a legal framework. According to our participants, there was no legal framework governing the use of telemedicine in Senegal, and so no regulatory text that guarantees the protection of data, patients, and providers. One of the physicians working in district health centres said:

"Are we protected with respect to that? Is the provider covered? Does the medical order cover us with respect to that? Does Health Ministry, in the case of a problem, endorse that? We don't know what can happen to us by using it [telemedicine]. Is there any law to protect us? Do laws exist? If they exist, what is their content? All these things must be checked." (Male specialist physician working in a district health centre outside Dakar)

This situation, according to our participants, could create distrust toward telemedicine and eventually be a major obstacle to its use.

Political factors

This study describes four political factors that can influence the use of telemedicine in Senegal: the dysfunction of the Telemedicine National Steering Committee, the non-translation of political will into concrete actions, the lack of consideration of telemedicine as a political priority and the lack of a national telemedicine strategy.

Dysfunction of the Telemedicine National Steering Committee

Our participants pointed to the challenges resulting from what they viewed to be

dysfunctionality at the level of the National Telemedicine Steering Committee, some of which was reflected in the difficulty experienced in the simple gathering of its members for meetings. Although it could be used as a mechanism to coordinate telemedicine efforts, the Committee has not achieved its full potential in effectively organizing and coordinating telemedicine activities at a national level. The result, according to three telemedicine projects managers, is a proliferation of telemedicine projects, which has at times led to the unnecessary duplication of efforts.

"There is much duplication. If you go into certain health facilities, you will find three telemedicine programs." (Male telemedicine projects manager working in Dakar)

This lack of coordination was expressed by respondents across the various hospitals and district health care facilities.

Non-translation of political will into concrete actions

Our participants believed that political will is imperceptible, timid or not translated into concrete action. According to them, this problem can be an obstacle to the development of telemedicine.

"Yes, I think there is political will, but it remains the problem of realization. It is clear that when we contact them, they will tell us that they are in agreement. They are always in agreement, but when the time of realization comes. That is something else." (Male specialist physician working in a public hospital in Dakar)

This in turn has an impact on the meso-level expressed in the dysfunction of the Telemedicine National Steering Committee.

Lack of consideration of telemedicine as political priority

Our participants also mentioned that telemedicine is not as prioritised as universal health coverage, maternal health, infant health, malaria, HIV, tuberculosis and Ebola. This situation, according to them, relegates telemedicine to a position that is not favourable to its development.

"No! Telemedicine is not a political priority. Currently, the political priority is universal health coverage. It is access to healthcare." (Male specialist physician working in a district health centre outside Dakar)

But this is perplexing in light of the role of telemedicine as a potential tool to increase access.

Lack of a National Telemedicine Strategy

The physicians that were interviewed in this study noted that there is no national telemedicine strategy in Senegal.

"Now, there is no national telemedicine strategy. In any case, I am not aware. I don't have any information. In my view, we must first set up this strategy." (Male specialist physician working in a public hospital in Dakar)

For them, the lack of national strategy corresponds to the lack of directives on telemedicine. Consequently, they don't see the necessity in using telemedicine because they are evaluated according to the directives received from health authorities. This situation, according to them, does not favour the use of telemedicine.

Financial factors

Financial factors are critical for the effective uptake of telemedicine. Telemedicine itself is costly and if there is little-dedicated funding to sustain its use, it is challenging to scale up. One must also consider the costs associated with the time various health workers must take to utilize

telemedicine. These are some of the key challenges raised by our participants. These challenges can influence some of the meso-level factors and can be influenced by some of the macro-level factors.

High costs of telemedicine

Participants recalled that the use of telemedicine involves investment, operating, training and maintenance costs. They believed that these costs could be exorbitant and become an obstacle to the development of telemedicine. Concerning training costs, one of the telemedicine projects managers said:

"We have to organize a lot of training workshops, and these workshops require a lot of resources because we have to convene not only physicians from regions but also from health facilities to exchange with them. These workshops require a lot of money. They are organized in hotels. Sometimes, they last one day. Sometimes, they last several days."

(Male telemedicine projects manager working in Dakar)

This problem could be addressed by acting on legal factors such as revising existing laws or regulations, or implementing taxes on telemedicine equipment, electricity, and the internet. This supposes that telemedicine is a political priority and requires political will.

Scarcity of funding sources

Health committees, local communities, hospitals, government and development partners are the usual sources of funding in the public health sector. Participants commented that health committees, local communities, and hospitals won't be able to finance telemedicine, because of existing financial difficulties. For example, and with respect to the financial difficulties of hospitals, one the physicians working in hospitals noted:

"Hospital cannot finance. It has other problems. It is not able to finance even medical equipment. Even tensiometer, it is not able to pay." (Female specialist physician working in a public hospital outside Dakar)

Lack of financial compensation for telemedicine providers

A minority of the physicians surveyed (n=4) believed that they should be remunerated for overtime and private telemedicine practice. According to these physicians, the non-resolution of this issue can have a negative impact on their motivation to use telemedicine and consequently on the success of that technology.

"From my understanding, telemedicine will be part of our daily activities. In this case, we can register it in our schedule, but if one has to work overtime, he must be paid for that." (Male specialist physician working in a public hospital in Dakar)

Socio-economic and cultural factors

This study identified four socioeconomic and cultural factors that can influence the use of telemedicine in Senegal.

Religious and socio-cultural beliefs

According to our participants, religious and socio-cultural beliefs can have a negative impact on the success of telemedicine because patients can rely on them to avoid using telemedicine services.

"There are some religious families that don't use modern medicine. They use traditional medicine. There are also some families in which women and girls don't see male physicians. These socio-cultural and religious beliefs are here and can hinder telemedicine use." (Male general practitioner working in a district health centre outside Dakar)

Strikes

Our results revealed that strikes in health facilities can have an impact on the availability of respondents and hence prevent the use of telemedicine.

"When there are strikes, everybody leaves, and everything gets stuck. To make things, including telemedicine, work permanently, it is necessary to have stability in institutions. If there are ruptures because there are some imponderables such as strikes, this is a problem." (Male specialist physician working in a public hospital in Dakar)

Social conflicts

Social conflicts can also create a stressful climate that prevents providers from doing their work and therefore from using telemedicine.

"There is also the conflict of Casamance that creates insecurity in Casamance. These things can prevent us from working and using telemedicine. In 2011, we were invaded by rebels in the centre. Then, we were scared, and we could not go to work. We stayed, at least, one week at home. The staff did not go to work." (Male general practitioner working in a district health centre outside Dakar)

Poverty

According to the physicians involved in this study, patients will not be able to pay for telemedicine services if associated costs are too high. For them, the low purchasing power of rural people does not allow them to pay costly telemedicine services.

"Here, people are poor. They don't have money, and we know that they don't have insurance to cover their costs. They have to pay everything and from their pockets." (Male general practitioner working in a district health centre outside Dakar)

This problem, according to them, can have a negative impact on the attendance and sustainability of telemedicine services because health services are not always covered by health insurance, forcing most patients to pay directly out of pocket.

In sum, this study identified, as macro-level factors, four political, one legal, three financial and four socioeconomic and cultural factors. Political factors include a dysfunctional Telemedicine National Steering Committee, the non-translation of political will into concrete actions, the failure to view telemedicine as a political priority, and the lack of a national telemedicine strategy. Legal factors include the absence of a legal framework to guide the use of telemedicine. Financial factors involve the high cost of telemedicine, scarcity of funding sources and lack of financial compensation for telemedicine providers. Socioeconomic and cultural factors consist of religious and socio-cultural beliefs, strikes, social conflicts and poverty.

Discussion

To examine the contextual factors that determine the use of telemedicine in Senegal, this study used a micro, meso and macro framework adapted from the social-ecological framework of Dahlgren & Whitehead (1991). To the best of our knowledge, this study is the first to use this framework in examining the contextual factors that determine the use of telemedicine in Senegal. Using this framework, a considerable number of contextual factors including meso and macro factors were identified.

The meso factors include the technical factors such as the absence or poor quality of internet connections, the lack or poor quality of electricity, the shortage of technical training and the insufficiency of telemedicine equipment maintenance. . They also include organizational factors such as the dearth of information on telemedicine and the scarcity of human resources. They also include the nonexistence of an ethical framework. It is clear that the lack of an ethical

framework can prevent the use of telemedicine by creating fear among physicians (Granade & Sanders, 1996). It is also well known that the poor quality of internet connection, (Jang-Jaccard et al., 2014; Steele & Lo, 2013), the lack of training (Hoerbst & Schweitzer, 2015; LeRouge & Monica, 2013), the shortage of equipment (Moffatt. & Eley, 2011) and the deficiency of information on telemedicine (El-Mahalli et al., 2012; Taylor & Coates, 2015) can all be barriers to its use.

The macro factors that were identified include political factors such as the Telemedicine National Steering Committee's dysfunction, the non-translation of political will into concrete actions, the lack of consideration of telemedicine as a political priority and the lack of a national telemedicine strategy. They also include the financial factors such as the high cost of telemedicine, the scarcity of funding and the lack of financial compensation for telemedicine providers. Socioeconomic factors such as religious and socio-cultural beliefs, strikes, social conflicts and poverty are also influential. Finally, they include the lack of a legal framework to guide the use of telemedicine. The high investment, operating, maintenance and training costs involved are constantly mentioned in the literature as important barriers to the use of telemedicine (Hoerbst & Schweitzer, 2015; Schmeida et al., 2007), and suspected to have a negative impact on the development of telemedicine and to increase the cost of telemedicine services among patients. The scarcity of funding is also commonly reported by researchers (El-Mahalli et al., 2012; Jarosławski & Saberwal, 2014) and is considered to be one of the main challenges to the large-scale development of telemedicine (Jarosławski & Saberwal, 2014). The insufficiency of compensation for physicians using telemedicine is known as another important barrier to its use (Larsen et al., 2003). The impact of policy (Jennett et al., 2004), social and cultural beliefs (Jang-Jaccard et al., 2014), as well as poverty on the use of telemedicine were

also clearly demonstrated. For example, Jang-Jaccard and colleagues (2014) found that rural and remote population do not have sufficient income to pay the fees related to telemedicine.

These various contextual factors seem to interact with each other and to be interdependent. For example, a Senegalese physician who is interested in using telemedicine needs, at a minimum, telemedicine equipment, electricity, an internet connection, and training. The availability of these technical elements and the performance of that training are influenced by the availability of financial resources. This financial factor is recognized as one of the most important determinants of the success of telemedicine (El-Mahalli et al., 2012; Jarosławski & Saberwal, 2014). It is, in turn, influenced by the political factors such as considering telemedicine as a political priority, translating political will into concrete action or having telemedicine policy and dedicated funding. It is well known that political factors such as the lack of policy can prevent the use of telemedicine (Jennett et al., 2004).

This illustration demonstrates that a physician's use of telemedicine depends on meso factors such as technical factors, which rely on macro factors such as financial factors. It also shows that macro factors such as political and financial factors could interact with each other. These lead us to conclude that individual factors or micro factors are influenced by meso factors which are affected by macro factors. They also lead us to believe that the macro factors themselves could interact with each other. Similarly, the meso factors also seem to interact with each other. For example, the availability and the quality of electricity can influence the availability and quality of internet connection (Brebner et al., 2004; Simpson et al., 2001).

The results of this study are useful for Senegalese health system actors wishing to intervene on the contextual factors that could guarantee the sustainable development of telemedicine in Senegal. These actors also have a better idea on where to begin if they want to have an impact on

a greater number of factors; for example, knowing that acting on political factors can positively impact financial factors and may also have a positive impact on technical factors.

Conclusion

This study provides one of the most comprehensive insights on the contextual factors that influence the use of telemedicine, and pinpoints the meso (technical, organizational and ethical) and macro (financial, political, legal and socioeconomic) factors that determine the use of that technology in Senegal. Knowing these contextual factors can assist actors in the health sector in their support for the development of telemedicine in Senegal. In turn, this can improve the recruitment and retention of physicians in underserved areas, which in time is likely to improve Senegal's overall population health and particularly that of populations living in currently underserved regions.

Chapter 6

General discussion and conclusion

Physicians are unevenly distributed in most of countries worldwide (Grobler et al., 2009). This uneven distribution is a very real problem for health systems and has many negative impacts on population health, especially for underserved populations (Evans et al., 2001). One of its main consequences is unequal access to healthcare (Dussault & Franceschini, 2006; Grobler et al., 2009; OMS, 2006), and one of its main causes is the health systems' inability to recruit and retain health workers including physicians in underserved areas (OMS, 2006). In recent decades, many interventions were conducted to ensure physicians' recruitment and retention in underserved areas (Dussault & Franceschini, 2006; Henderson & Tulloch, 2008; Lehman et al., 2008; Willis - Shattuck et al., 2008) which have yet to yield a satisfactory result (Grobler et al., 2009).

Health policy-makers, researchers, and leaders in civil society are still looking for solutions that can ensure physicians' recruitment and retention in underserved areas. Meanwhile, telemedicine appears as an opportunity to ensure equitable access to healthcare through electronic transfer of expertise from well-served to underserved areas (Pradhan, 2009). It is also recognized as a good means to recruit and retain physicians in underserved areas (Duplantie et al., 2007), but its success depends on a number of factors, including individual and contextual factors (Broens et al., 2007; Tanriverdi & Iacono, 1999). In this study, we examined a number of influential factors at the individual (micro) and contextual (meso and macro) levels that influence the use of telemedicine by physicians in Senegal. Senegal was selected because physicians are very unevenly distributed in this country (SNIS, 2011; Zurn. et al., 2010), and most of the measures adopted to solve this problem have failed (Zurn et al., 2010). Though several efforts in

telemedicine have been initiated, most have been abandoned with health authorities failing so far to promote widespread use of this technology.

This study pursued two main objectives. The first was to examine in depth the individual (micro) factors affecting the use of telemedicine by physicians, and the second to determine the contextual (meso and macro) factors that further influence their use of this tool. The results showed that a majority of physicians thought that telemedicine could have a positive impact on their recruitment and retention in underserved areas, even though a sizeable minority believed the opposite. Telemedicine's main positive attributes included breaking professional isolation, allowing communication with colleagues and experts, facilitating distance learning, improving working conditions, reducing professional stress and facilitating information and knowledge exchanges. These results are consistent with many findings in the literature that demonstrating that telemedicine can improve physicians' recruitment and retention in underserved areas by reducing professional isolation (Jennett et al., 2000; Potter et al., 2014), allowing physicians to have the opinion of remote experts (Brebner et al., 2004; Watanabe et al., 1999), and reducing overload at work (Potter et al., 2014).

Telemedicine's potential to increase physician supply in underserved areas, however, seems to be limited. Our results showed that this technology alone is not enough, and that the recruitment and retention of physicians in underserved areas depend on many other factors such as individual (desire to get closer to the region selected for retirement), family (difficulties in finding schools for children and the lack of job opportunities for spouses), environmental (poor living conditions and limited number of patients), professional (lack of career advancement and lack of professional development), organizational (poor working conditions, extended stays in underserved areas and inequities in assigning physicians in their post), educational (lack of

training opportunities), and economic (low income and lack of financial incentives) factors. Our findings are similar to those of many other studies (Duplantie et al., 2007; Sargeant et al., 2004; Zurn et al., 2010) and imply that while telemedicine can contribute to, it cannot ensure the recruitment and retention of Senegal's physicians in underserved areas.

To contribute to physicians' recruitment and retention, telemedicine needs first to be used. To be used, physicians need to be interested in it. This depends, in turn, on their beliefs and intention regarding telemedicine. This study demonstrated that Senegal's physicians, particularly those working in public hospitals and district health centres, have a considerable number of positive and negative behavioural, normative and control beliefs that can encourage or discourage them to use telemedicine in their professional activities. These beliefs are detailed in chapter 3.

The most important positive behavioural beliefs were that telemedicine allows physicians to get experts' opinion at distance, to treat their patients at distance, to train themselves professionally, to not transport their patients to other health facilities, to gain time, to better organize the medical transfer of their patients, to reduce travelling outside their district, to contribute to the training of others health professionals, to reduce the expenses incurred by their health facility and patients, to do research, and to enhance the reputation of their health facilities. Many authors identified similar beliefs (Hiratsuka et al., 2013; Moffatt & Eley, 2010), including that telemedicine allows physicians to save their patients money (Ganapathy, 2005; Moffatt & Eley, 2010), reduces patient transportation (Mars, 2013), enables physicians to access continuing education (Mars, 2013; Moffatt & Eley, 2010) and to undertake or participate in research (Mars, 2013). The most important negative behavioural beliefs were that telemedicine can lead to medical errors, compromise the security of their patients' data as well as their physical safety, increase patient expenses, potentially affect the relationship with their patients, and preclude

family visits in Dakar. These results are consistent with those of authors who found that the use of telemedicine can lead physicians to medical error (Kaddu et al., 2009) and alter their relationship with their patients (Hiratsuka et al., 2013).

The most important positive normative beliefs were that patients, physicians, nurses, midwives, administrators of hospitals, Minister of Health, students, academics, hospital department heads, head physicians of medical regions, technical and financial partners, district prefects, the General Director of Health, local elected officials, Governors of administrative regions and Villages chiefs may approve their use of telemedicine. These results corroborate those of researchers that found that physicians (Archambault et al., 2012; Desroches et al., 2011; Tsiantou et al., 2013), nurses (Archambault et al., 2012) and patients (Desroches et al., 2011; Tsiantou et al., 2013) may approve physicians' use of telemedicine. The most important negative normative beliefs were that physicians from the public sector, patients, administrators of hospitals, union activists of health facilities, academics, hospitals department heads, political opponents, the Minister of Health, physicians from the private sector, the General Director of Health, head physicians of medical regions, physicians transiting between public and private sectors, physicians' families, district prefects and the National Order of Physicians may disapprove of their use of telemedicine. These results coincide with those supporting the view that physicians may disapprove of other physicians using telemedicine (Desroches et al., 2011).

The main positive control belief concerning telemedicine was its ease of use. Ease of use is recognized as one of the important determinants of the acceptance of technologies (Archambault et al., 2012; Saigí-Rubió et al., 2014). The most important negative control beliefs included the belief that the use of telemedicine can be prevented because of time constraints, lack of training in telemedicine use and maintenance of telemedicine equipment, and work overload.

They also included the inability to obtain population uptake and adherence, guarantee the security of patients' data, to communicate with respondents, solve technical problems, and acquire informed consent from patients. These results coincide with findings suggesting that the use of telemedicine can be precluded as a result of lack of training (Shiferaw & Zolfo, 2012), overload at work (Kaddu et al., 2009) and technical problems (Hiratsuka et al., 2013; Simpson et al., 2001).

These effects on physicians' beliefs will enable Senegal's health authorities to appreciate the range of perceived advantages and inconveniences of telemedicine, the most influential people to be considered in terms of affecting physician behaviour, and the perceived facilitators and barriers to the use of telemedicine in Senegal. Having knowledge of these beliefs provides a clue to physicians' behaviour, though not without a certain amount of uncertainty. To have a better idea of their behaviour, this study focused on their intention. This is well accepted because intention is the proximal antecedent of individuals' behaviour (Godin, 2012). The results showed that physicians' intention to use telemedicine in their professional activities was moderate. Hu and Chau (1999) found similar results. Senegal's physicians were thus determined to use telemedicine even though this determination was not maximal.

By focusing on the factors that determine their intention, our study found that the intention of Senegal's physicians was influenced by their perceived behavioural control. In other words, their intention can be bolstered if they believe that they have more control over their time, their communication with respondents, the security of their patients' data, the use of telemedicine equipment, the uptake and adherence of their population, the behaviour of their patients, and the maintenance of telemedicine equipment. Other studies demonstrated that perceived behavioural control is one of the main determinants of the use of telemedicine (Hsieh, 2015; Hu & Chau,

1999; Kuo et al., 2015). These results can provide Senegal's health authorities with an idea of their physicians' intention. They will also allow them to anticipate behaviour with respect to telemedicine, and understand the factors which determine intention, both important components to improved involvement in future telemedicine interventions.

To obtain a broader view of the factors that determine physician utilization of telemedicine, this study focused on the contextual factors in Senegal based on the meso and macro elements of the overall contextual framework adapted from the one developed by Dahlgren and Whitehead (1991). These meso contextual factors detailed in chapter 5 include technical, organizational and ethical factors while the macro factors include legal, political, financial and socioeconomic factors. Technical factors comprised the lack or poor quality of internet connections and of electricity, as well as the insufficiency of technical training and telemedicine equipment maintenance . Many researchers found that the absence (Jang-Jaccard et al., 2014; Moffatt. & Eley, 2011), or poor quality of internet connections (Shiferaw & Zolfo, 2012), the scarcity of computer equipment (Moffatt. & Eley, 2011) and the lack of training (Taylor & Coates, 2015) can be obstacles to the use of telemedicine. Organizational factors were the dearth of information on telemedicine and the scarcity of human resources. Many authors concluded that the lack of information on telemedicine activities could discourage telemedicine providers (El-Mahalli et al., 2012; Taylor & Coates, 2015). The ethical factor was the absence of an ethical framework to guide the use of telemedicine. Financial factors encompassed the high cost of telemedicine, the scarcity of funding and the lack of financial compensation for telemedicine providers. Some authors demonstrated that the high investment, operating and maintenance cost of telemedicine (Hoerbst & Schweitzer, 2015), the lack of funding (Jarosławski & Saberwal, 2014) and the lack of financial compensation for telemedicine providers (Larsen et

al., 2003) can hinder the use of telemedicine. Political factors included a dysfunctional Telemedicine National Steering Committee, the non-translation of political will into concrete actions, the failure to consider telemedicine as a political priority, and the absence of a national telemedicine strategy. The importance of these factors in the development of telemedicine is largely recognized (Jennett et al., 2004). Legal factors were represented by the lack of legal framework (Granade & Sanders, 1996). Finally, socioeconomic factors comprised religious and socio-cultural beliefs, strikes, social conflicts and poverty. These factors are known for their negative impact on the entire health system (Évans, 2002; Fall, 2010; Jang-Jaccard et al., 2014).

These results showed that the use of telemedicine in Senegal depends on many contextual and interrelated factors operating at different levels. The macro factors seem to interact with the meso factors which intermingle with the micro (individual) factors. The macro factors themselves seem to interact with each other, as do the meso factors. These results suggest that changes in one factor can lead to changes in other factors including those of the same level. For example, a positive or negative change in political and legal factors can lead to financial and organizational changes. These changes can lead to technical and ethical changes, which can lead to changes in physicians' intention to use telemedicine. Thus, future interventions in telemedicine should take into account this interaction and interdependency between the various factors that determine the use of telemedicine in Senegal.

Implications for policy and practice

These results provide findings that will be useful for policy makers in differentiating and acting differently upon the individual (micro) and contextual (meso and macro) barriers that currently hinder the use of telemedicine in Senegal. At the individual level they could, for example, improve physicians' intention by acting on their perceived behavioural control which is

related to their control beliefs. These beliefs, as well as normative and behavioural beliefs, could change if they undertake effective action on the meso (technical, organizational and ethical) and macro (financial, political, legal, and socioeconomic) contextual factors. In other words, if they act at financial, political, legal and socioeconomic levels, they could break down the technical, organizational and ethical barriers. For instance, by reducing taxes related to telemedicine equipment, providing financial compensation to telemedicine providers, addressing the Telemedicine National Steering Committee's shortcomings, undertaking more concrete actions regarding telemedicine and adopting a legal framework, they could address the lack of electricity, internet connection, human resources, information, equipment, training and ethical framework. This would probably have a positive impact on physicians' beliefs and intention, and encourage them to use telemedicine. These results are useful in designing future telemedicine programs. They could also be used to improve the current use of telemedicine. Improving the existing and future use of telemedicine would have a positive impact on physicians' recruitment and retention in areas where they are needed. In consequence, they would help increase access of the population to their services which would be beneficial for population health.

These results are useful for many West African countries because most of them share similar individual and contextual factors. Findings from this study can assist these countries in their own efforts to improve the use of telemedicine, which in turn could improve the recruitment and retention of their physicians in their underserved regions. Doing so should also lead to improvements in their population's health. It is, however, important to conduct similar studies to this one to develop more precise and specific answers on the determinants of the use of telemedicine.

Strengths and limitations**Strengths**

To the best of our knowledge, this study is the first to focus on physicians' perception in Senegal of telemedicine's impact on their recruitment and retention in underserved areas, and one of only a few focused on telemedicine use in under-resourced countries. It is also the first to study the behavioral, normative and control beliefs of Senegal's physicians toward the use of telemedicine. It is equally the first to focus on the intention of these physicians to use telemedicine in their professional activities. Finally, it is the first to examine the meso (technical, organizational and ethical) and macro (financial, political, legal and socioeconomic) contextual factors that influence the use of telemedicine in Senegal.

One of the strengths of this study is its use of two theoretical frameworks. The first is the social-ecological (micro, meso and macro) framework which is adapted from the model of Dahlgren & Whitehead (1991). This framework is widely known and frequently used in population health. Its use in this study helped to organize the various factors found in the literature into micro or individual (behaviour, intention, beliefs and perception), meso (technical, organizational and ethical) and macro (financial, political, legal and socioeconomic) factors, and to have a broader view of the determinants of telemedicine use. Using this framework helps to elucidate the various layers of influence and understand how interventions intended to improve telemedicine use and its potential to ameliorate population health inequities will need to be equally multi-faceted.

The second theoretical framework used in this study is the TPB. It was used to study the micro factors (physicians' beliefs and intention). It postulates that individuals' behaviour is influenced by their intention, which, in turn, is influenced by their attitude, subjective norm, and

perceived behavioural control (Ajzen, 1991; Godin, 2012). It is one of the most effective theories in studying individuals' behaviours and intentions (Godin, 2012). It was frequently used to understand physicians' behaviour and intention regarding the use of telemedicine and gave satisfactory results (Hu & Chau, 1999; Kuo et al., 2015). It helps to identify the beliefs affecting the use of telemedicine by Senegal's physicians, describe the intention of these physicians and determine the factors influencing the intention of these physicians.

Another merit of this study is the use of a mixed-method including quantitative and qualitative methods. The use of quantitative methods helped to determine physicians' intention to use telemedicine in their professional activities. Qualitative methods were used to study physicians' beliefs about the use of telemedicine, perception of the impact of telemedicine on their recruitment and retention in underserved areas, and perceptions of the contextual factors that determine the use of telemedicine. Using mixed-method allows a broader understanding of the individual (micro) and contextual (meso and macro) factors that influence the use of telemedicine in Senegal.

The number of participants involved in the different parts of this study is also an important strength: 321 physicians participated in the study of physicians' intention, 69 in the study of physicians' beliefs, 60 in the study of physicians' perception of the impact of telemedicine on their recruitment and retention in underserved areas, and 76 in the study of the contextual factors that influence the use of telemedicine in Senegal. Thirty physicians working in public hospitals and 30 physicians working in district health participated in the four studies of this work.

A final strong point of this study is the participation rate amongst our sample, which was 83% for the study of physicians' intention, 91% for the study of physicians' beliefs, 80% for the

study of physicians' perception of the impact of telemedicine on their recruitment and retention in underserved areas, and 88% for the study of the contextual factors that influence the use of telemedicine. These rates are high compared to those observed in other studies (M.P. Gagnon, 2003; Galea & Tracy, 2007).

Limitations

This study included fewer female physicians than is representative of the Senegalese physician population for the qualitative components: only two female physicians working in district health centres and seven female physicians working in public hospitals which correspond to only 5.40% of the physicians recruited in district health centres, and 21.87% of the physicians recruited in public hospitals. These rates are largely under the national rate which is 29% of Senegal's physicians (OMS & JICA, 2013). All the telemedicine projects managers included in this study were male. This situation may have introduced a gender bias in the studied beliefs, intention, and perceptions. Future research should consider recruiting more female physicians.

This study focused on physicians' intention, beliefs rather than their actual behaviour. According to Godin (2012), individuals' behaviour refers to their observable actions. It is influenced by individuals' intention to perform the behaviour, which, in turn, is influenced by their attitude, subjective norm and perceived behavioural control toward that behaviour (Godin, 2012). These three constructs are influenced by individuals' behavioural, normative and control beliefs (Godin, 2012). It would be useful to measure directly physicians' behaviour, but their intention is frequently calculated to estimate their behaviour (Eccles et al., 2006; Hu & Chau, 1999; Kuo et al., 2015).

Related to this, the use of individual interviews and the audio recording may have introduced some social desirability bias in qualitative studies. Similarly, the use of questionnaires

administered by interviewers potentially created some social desirability bias in the quantitative study. These various limits do not affect the quality of that work, which can be considered as pioneering in understanding the determinants of telemedicine use in Senegal.

Finally, this study focused only on physicians working in public hospitals, those working in district health centres and telemedicine projects managers. It did not focus on patients and other health professionals like nurses, midwives, pharmacists and the physicians working in the private sector. Other studies are needed to explore the intention, beliefs and perception of these health workers toward the use of telemedicine. This kind of more inclusive research would provide a complete picture of the dynamics at play in telemedicine use and its promise or potential to ameliorate population health inequities.

Implications for future research

Future research could include recruiting a more comparable number of male and female physicians and telemedicine project managers to avoid a potential gender bias. Research could also focus on physicians' behaviour instead of their intention, beliefs and perceptions in order to provide better information on their willingness to use telemedicine. They could equally consider the best ways to limit the risk of social desirability bias. They could then explore the intention, beliefs and perception of patients and other health professionals including those from the private sector. The exploration of these individual factors among these populations would provide a broader understanding of the determinants of the use of telemedicine in Senegal. Also, they could complete the proposed micro, meso and macro framework, which could be strengthened by other factors.

Knowledge dissemination

The results of this study will be disseminated at two levels. The first level is within Senegal's health system. Disseminating our results at this level aims to inform Senegal's health professionals, particularly Senegal's physicians, and Senegal's telemedicine projects managers, on the individual and contextual factors that influence their use of telemedicine. Most of these health professionals and managers have limited access to scientific journals. The determinants of this limited access won't be discussed in this work, but it compels us to publish our results on Senegal's Health Ministry website (<http://www.sante.gouv.sn/>). This website is freely accessible anyone who has access to an internet connection. Our results will also be shared through formal meetings with health professionals and telemedicine project managers. These meetings will be organized with the collaboration of Senegal's health authorities and the Telemedicine National Steering Committee. Our results will also be presented in a number of conferences that will be held in Senegal.

The second level at which our results will be disseminated is the scientific community. Disseminating our results at this level aims to inform researchers, evaluators, decision makers, planners, and academics worldwide on the individual and contextual factors that influence the use of telemedicine in Senegal. By doing so, our results regrouped in four scientific papers will be published in scientific journals that can ensure wider dissemination. Our results will also be presented at various Canadian and international conferences. The results concerning physicians' beliefs were already presented at the Student Conference on ICT and Health which took place on March 31, 2015, at the Institute of Public Health Research of the University of Montreal.

Conclusion

The results of this study revealed that the potential for telemedicine to have an influence on physicians' recruitment and retention in underserved areas is positively perceived by the majority of physicians, but is considered as an insufficient means in itself to guarantee the recruitment and retention of physicians in these areas. The recruitment and retention of physicians are influenced by many other factors over which telemedicine does not have much effect. The findings also revealed that Senegal's physicians hold a number of important behavioural, normative and control beliefs about the use of telemedicine which need to be taken into account when planning interventions to improve telemedicine use. The findings also showed that the intention of these physicians to use telemedicine in their professional activities is moderate and is determined by their perception of control. Finally, the studies revealed that the use of telemedicine in Senegal can be affected by many contextual factors including meso (technical, organizational and ethical) and macro (financial, political, legal and socioeconomic) factors.

These results will help in the development of policies and programs to improve the use of telemedicine in Senegal. This, in turn, is thought likely to improve physicians' recruitment and retention in underserved areas, if other factors affecting recruitment and retention are also given simultaneous consideration. Telemedicine can increase access to healthcare in underserved areas to the extent that it supports physicians' recruitment and retention in these areas, which can significantly contribute to the improvement of population health in Senegal.

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Appendices

Appendix 1: Oral presentation on ICT and Health during Student Day in Montreal



**Journée étudiante sur les TIC en santé
Mardi 31 mars 2015, IRSPUM, 7101 avenue du Parc
3e étage, salle 3019
De 9h00 à 17h00**

Les projets de télémédecine du Sénégal : une revue exploratoire de la littérature.

Birama Apho LY, Rolande Labonté, Ivy Lynn Bourgeault, Mbayang Ndiaye Niang.

Au cours des dernières décennies, plusieurs projets de télémédecine ont été mis en œuvre au Sénégal, mais il n'existe aucun répertoire de ces projets. Objectif : L'objectif de cette étude était d'identifier les projets de télémédecine du Sénégal et de déterminer les services proposés par ces projets. Méthodes : Une revue de la littérature a été conduite, entre janvier et décembre 2013, dans PubMed, Embase, CINAHL, Web of Science, Cochrane Library, IGO Search Engine, Telemedicine and Telecare, Telemedicine and E-Health, Dakar Médical, Vie et santé, Google scholar et dans les bases de données de la bibliothèque universitaire de l'UCAD, du portail national SIST et de la FMPO. Ainsi, la littérature grise et scientifique a été explorée et les informations

pertinentes ont été extraites. L'analyse des données a été descriptive. Résultats : Au total 914 études ont été identifiées. Parmi ces études, 32 ont été incluses. L'analyse de ces études a permis d'identifier 19 projets de télémédecine en rapport avec le Sénégal. Parmi ces projets, 10 se proposaient d'offrir des services de téléformation, neuf des services de téléassistance et cinq des services de télésuivi. Cinq des neuf projets de télémédecine, qui se proposaient d'offrir des services de téléassistance, et un des cinq projets, qui se proposaient d'offrir des services de télésuivi, se proposaient aussi d'offrir des services de téléformation. Ainsi, six des 19 projets du Sénégal se proposaient d'offrir deux types de services. Conclusion : Les résultats de cette revue serviront à mieux connaître les anciens projets et mieux planifier les futurs projets. Ainsi, ils seront utiles pour les chercheurs, les décideurs et les universitaires.

**Les croyances des médecins des hôpitaux du Sénégal face à l'utilisation de la
télémédecine.**

Birama Apho LY, R. Labonté, I.L. Bourgeault, M.N. Niang.

Le succès de la télémédecine dépend des croyances comportementales, normatives et de contrôle des médecins des hôpitaux. Objectif : L'objectif de cette étude était de déterminer les croyances comportementales, normatives et de contrôle des médecins des hôpitaux du Sénégal face à l'utilisation de la télémédecine. Méthode : Une étude transversale a été conduite, entre janvier et juin 2014, auprès d'un échantillon de 32 médecins des hôpitaux du Sénégal. Les données ont été collectées à travers des entretiens individuels. Les entretiens ont été transcrits selon les principes des naturalistes par quatre

transcripteurs. Le contenu des entretiens a été codé en utilisant le logiciel NVivo.

Résultats : Au total, 32 médecins ont été interrogés. Ces médecins ont été sélectionnés dans 13 hôpitaux répartis dans 5 régions administratives. Ils étaient tous des spécialistes. L'âge moyen était de 44, 13 avec des extrêmes de 29 et 61 ans. Les hommes étaient majoritaires avec 25 hommes contre 7 femmes. Les résultats montrent les croyances, comportementales, normatives et de contrôle, qui influencent l'utilisation de la télémédecine chez les médecins des hôpitaux du Sénégal. Conclusions : Les résultats de cette étude donnent une meilleure compréhension des croyances comportementales, normatives et de contrôle des médecins des hôpitaux du Sénégal. Ils seront probablement utiles pour la planification, la mise en œuvre, la recherche et l'enseignement de la télémédecine. Ainsi, ils pourront contribuer à améliorer l'accès aux soins.

Appendix 2: Oral presentation at the International Symposium on Biomedical Technologies in Sub-Saharan Africa (Lisbon)

International Symposium :
Biomedical Technologies in Sub-Saharan Africa
March 24-25, 2014
ISCSP Auditorium
Rua Almerindo Lessa
1300-663 Lisbon

Determinants of telemedicine use in Senegal : a proposal

Birama Apho Ly, Ronald Labonté, Ivy Lynn Bourgeault

Introduction

Telemedicine is presented as a good means to improve healthcare access and retention of health care workers in rural areas. Its success in doing so, however, depends on certain factors about which relatively little is known.

Theoretical background

The conceptual framework for our study is based on the model of Broens & al (2007), which suggests that telemedicine diffusion depends on behavioral, technical, organizational, financial, political and legal factors.

Objective

The study pursues three objectives : (1) describe telemedicine projects implemented in Senegal, (2) identify behavioral, technical, organizational, financial, political and legal factors that influence telemedicine use in Senegal, and (3) determine

the perception of telemedicine managers and physicians about the potential impact of telemedicine on physician retention and equitable health care access in rural areas.

Methods

Three methods will be used: (1) a scoping review to describe different telemedicine projects implemented in Senegal, (2) a quantitative study to identify behavioral factors of telemedicine use, and (3) a qualitative study to identify technical, organizational, financial, political and legal factors of telemedicine use. The qualitative study also aims to determine the perception of telemedicine managers and physicians.

Results

The results of this study will allow us to better assess enablers and barriers to implementation of telemedicine projects in Senegal, including what are physician beliefs and intentions about telemedicine use and the determinants of these beliefs and intentions. This will help telemedicine implementers to better design the technical, organizational and financial aspects of telemedicine expansion, and the political and legal factors that must be considered. Finally, the results will enrich an understanding of how telemedicine projects might improve physician retention and health care access in rural areas.

Conclusion

Better understanding determinants of telemedicine use can improve the success of future telemedicine projects through better planning, coordination and implementation of telemedicine activities.

Keywords : Telemedicine, telehealth, e-Health, Senegal

Appendix 3: Physicians' positive behavioural beliefs

[illegible]

DETERMINANTS OF TELEMEDICINE USE IN SENEGAL

b

training of others
health professionals

9	Allows me to reduce the expenses incurred by my health facility	7 (22%)	5 (71%)	2 (29%)	7 (100%)	0 (0%)	7 (100%)	0 (0%)	6 (16%)	6 (100%)	0 (0%)	1 (17%)	5 (83%)	3 (50%)	3 (50%)
10	Allows me to reduce the expenses incurred by my patients	5 (16%)	4 (80%)	1 (20%)	5 (100%)	0 (0%)	5 (100%)	0 (0%)	18 (49%)	17 (94%)	1 (6%)	0 (0%)	18 (100%)	9 (50%)	9 (50%)
11	Allows me to do research	4 (13%)	4 (100%)	0 (0%)	3 (75%)	1 (25%)	4 (100%)	0 (0%)	2 (6%)	2 (100%)	0 (0%)	1 (50%)	1 (50%)	0 (0%)	2 (100%)
12	Allows me to enhance the reputation of my health facility	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (8%)	3 (100%)	0 (0%)	0 (0%)	3 (100%)	2 (67%)	1 (33%)

T: total, M: male, F: female, D: Dakar, O: outside Dakar, S: specialist physician, G: general practitioner

Appendix 4: Physicians' negative behavioural beliefs

N°	Beliefs	Physicians working in public hospitals						Physicians working in district health centres							
		T	M	F	D	O	S	G	T	M	F	D	O	S	G
1	Will mislead medically	9 (28%)	9 (100%)	0 (0%)	7 (78%)	2 (22%)	9 (100%)	0 (0%)	8 (22%)	8 (100%)	0 (0%)	0 (0%)	8 (100%)	5 (63%)	3 (37%)
2	The security of my patients' data can be compromised	3 (9%)	2 (67%)	1 (33%)	2 (67%)	1 (33%)	3 (100%)	0 (0%)	3 (8%)	3 (8%)	0 (0%)	0 (0%)	3 (100%)	2 (67%)	1 (33%)
3	The physical safety of my patients cannot be guaranteed	2 (6%)	2 (100%)	0 (0%)	1 (50%)	1 (50%)	2 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
4	Will increase expenses of my patients	1 (3%)	1 (100%)	0 (0%)	1 (100%)	0 (0%)	1 (100%)	0 (0%)	1 (3%)	1 (100%)	0 (0%)	0 (0%)	1 (100%)	1 (100%)	0 (0%)
5	Will alter the relationship between my patients and I	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	4 (11%)	4 (100%)	0 (0%)	0 (0%)	4 (100%)	1 (25%)	3 (75%)
6	Can prevent me from regularly visiting my family in Dakar	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (3%)	1 (100%)	0 (0%)	0 (0%)	1 (100%)	1 (100%)	0 (0%)

T: total, M: male, F: female, D: Dakar, O: outside Dakar, S: specialist physician, G: general practitioner

Appendix 5: Physicians' positive normative beliefs

Nº	Beliefs	Physicians working in public hospitals							Physicians working in district health centres						
		T	M	F	D	O	S	G	T	M	F	D	O	S	G
1	Patients	16 (50%)	13 (81%)	3 (19%)	13 (81%)	3 (19%)	16 (100%)	0 (0%)	20 (54%)	19 (95%)	1 (5%)	0 (0%)	20 (95%)	12 (60%)	8 (40%)
2	Physicians	13 (41%)	9 (69%)	4 (31%)	13 (100%)	0 (0%)	13 (100%)	0 (0%)	20 (54%)	20 (100%)	0 (0%)	1 (5%)	19 (95%)	12 (60%)	8 (40%)
3	Paramedics (nurses, midwives..)	10 (37%)	7 (70%)	3 (30%)	9 (90%)	1 (10%)	10 (100%)	0 (0%)	10 (27%)	10 (100%)	0 (0%)	0 (0%)	10 (100%)	5 (50%)	5 (50%)
4	Administrators of my hospital	9 (28%)	6 (67%)	3 (33%)	6 (67%)	3 (33%)	9 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
5	Minister of Health	7 (22%)	5 (71%)	2 (29%)	6 (86%)	1(14%)	7 (100%)	0 (0%)	17 (46%)	15 (88%)	2 (12%)	1 (6%)	16 (94%)	12 (70%)	5 (29%)
6	Students	5 (16%)	4 (80%)	1 (20%)	5 (100%)	0 (0%)	5 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
7	Academics	4 (12%)	4 (100%)	0 (0%)	3 (75%)	1 (25%)	4 (100%)	0 (0%)	8 (22%)	8 (100%)	0 (0%)	1 (12%)	7 (88%)	1 (12%)	7 (88%)
8	Head of my department in hospital	3 (9%)	3 (100%)	0 (0%)	2 (67%)	1 (33%)	3 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
9	Head physician of the medical region	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	8 (22%)	7 (88%)	1 (12%)	1 (12%)	7 (88%)	8 (100%)	0 (0%)
10	Technical and financial partners	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	4 (11%)	4 (100%)	0 (0%)	0 (0%)	4 (100%)	3 (75%)	1 (25%)

DETERMINANTS OF TELEMEDICINE USE IN SENEGAL

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11	Prefect of the district	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (8%)	3 (100%)	0 (0%)	0 (0%)	3 (100%)	2 (67%)	1 (33%)
12	General Director for Health	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (8%)	1 (33%)	2 (67%)	1 (33%)	2 (67%)	3 (100%)	0 (0%)
13	Local elected officials	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (5%)	2 (100%)	0 (0%)	0 (0%)	2 (100%)	1 (50%)	1 (50%)
14	Governor of the administrative region	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (3%)	1 (100%)	0 (0%)	0 (0%)	1 (100%)	1 (100%)	0 (0%)
15	Villages chiefs	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (3%)	1 (100%)	0 (0%)	0 (0%)	1 (100%)	1 (100%)	0 (0%)

T: total, M: male, F: female, D: Dakar, O: outside Dakar, S: specialist physician, G: general practitioner

Appendix 6: Physicians' negative normative beliefs

N°	Beliefs	Physicians working in public hospitals							Physicians working in district health centres						
		T	M	F	D	O	S	G	T	M	F	D	O	S	G
1	Physicians from the public sector	5 (16%)	3 (60%)	2 (40%)	4 (80%)	1 (20%)	5 (100%)	0 (0%)	9 (24%)	8 (89%)	1 (11%)	2 (22%)	7 (78%)	6 (67%)	3 (33%)
2	Patients	3 (9%)	2 (67%)	1 (33%)	3 (100%)	0 (0%)	3 (100%)	0 (0%)	6 (16%)	6 (100%)	0 (0%)	0 (0%)	6 (100%)	5 (83%)	1 (17%)
3	Administrators of my hospital	3 (9%)	2 (67%)	1 (33%)	3 (100%)	0 (0%)	3 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
4	Union activists of my health structure	2 (6%)	2 (100%)	0 (0%)	2 (100%)	0 (0%)	2 (100%)	0 (0%)	1 (3%)	1 (100%)	0 (0%)	0 (0%)	1 (100%)	1 (100%)	0 (0%)
5	Academics	1 (3%)	1 (100%)	0 (0%)	1 (100%)	0 (0%)	1 (100%)	0 (0%)	1 (3%)	1 (100%)	0 (0%)	1 (100%)	0 (0%)	0 (0%)	1 (100%)
6	Head of my department in hospital	1 (3%)	1 (100%)	0 (0%)	0 (0%)	1 (100%)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
7	Political opponents	1 (3%)	1 (100%)	0 (0%)	0 (0%)	1 (100%)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
8	Minister of Health	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	5 (13%)	5 (100%)	0 (0%)	0 (0%)	5 (100%)	5 (100%)	0 (0%)
9	Physicians from private sector	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	4 (11%)	4 (100%)	0 (0%)	0 (0%)	4 (100%)	2 (50%)	2 (50%)

DETERMINANTS OF TELEMEDICINE USE IN SENEGAL

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10	General Director for Health	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	4 (11%)	4 (100%)	0 (0%)	0 (0%)	4 (100%)	4 (100%)	0 (0%)
11	Head physician of the medical region	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (8%)	3 (100%)	0 (0%)	0 (0%)	3 (100%)	3 (100%)	0 (0%)
12	Physicians who transit between public and private sectors	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (3%)	1 (100%)	0 (0%)	0 (0%)	1 (100%)	0 (0%)	1 (100%)
13	My family	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (3%)	1 (100%)	0 (0%)	0 (0%)	1 (100%)	1 (100%)	0 (0%)
14	Prefect of the district	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (3%)	1 (100%)	0 (0%)	0 (0%)	1 (100%)	1 (100%)	0 (0%)
15	National Order of Physicians	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (3%)	1 (100%)	0 (0%)	0 (0%)	1 (100%)	1 (100%)	0 (0%)

T: total, M: male, F: female, D: Dakar, O: outside Dakar, S: specialist physician, G: general practitioner

Appendix 7: Physicians' positive control beliefs

Nº	Beliefs	Physicians working in public hospitals						Physicians working in district health centres							
		T	M	F	D	O	S	G	T	M	F	D	O	S	G
1	Ease of use of telemedicine	2 (6%)	2 (100%)	0 (0%)	2 (100%)	0 (0%)	2 (100%)	0 (0%)	5 (13%)	5 (100%)	0 (0%)	0 (0%)	5 (100%)	4 (80%)	1 (20%)

T: total, M: male, F: female, D: Dakar, O: outside Dakar, S: specialist physician, G: general practitioner

Appendix 8: Physicians' negative control beliefs

N°	Beliefs	Physicians working in public hospitals						Physicians working in district health centres							
		T	M	F	D	O	S	G	T	M	F	D	O	S	G
1	Lack of time	7 (22%)	5 (71%)	2 (28%)	6 (86%)	1 (14%)	7 (100%)	0 (0%)	9 (24%)	9 (100%)	0 (0%)	0 (0%)	9 (100%)	5 (55%)	4 (45%)
2	Lack of training in maintaining telemedicine equipments	5 (16%)	4 (80%)	1 (20%)	5 (100%)	0 (0%)	5 (100%)	0 (0%)	6 (16%)	6 (100%)	0 (0%)	0 (0%)	6 (100%)	3 (50%)	3 (50%)
3	Overload at work	4 (12%)	3 (75%)	1 (25%)	3 (75%)	1 (25%)	4 (100%)	0 (0%)	8 (22%)	8 (100%)	0 (0%)	0 (0%)	8 (100%)	5 (62%)	3 (38%)
4	Lack of training in telemedicine use	4 (12%)	3 (75%)	1 (25%)	3 (75%)	1 (25%)	4 (100%)	0 (0%)	7 (19%)	7 (100%)	0 (0%)	0 (0%)	7 (100%)	5 (71%)	2 (29%)
5	Inability to guarantee security of my patients' data	4 (12%)	2 (50%)	2 (50%)	2 (50%)	2 (50%)	4 (100%)	0 (0%)	6 (16%)	6 (100%)	0 (0%)	0 (0%)	6 (100%)	3 (50%)	3 (50%)
6	Inability to communicate with respondents	3 (9%)	3 (100%)	0 (0%)	3 (100%)	0 (0%)	3 (100%)	0 (0%)	12 (32%)	12 (12%)	0 (0%)	0 (0%)	12 (12%)	5 (42%)	7 (58%)
7	Inability to solve technical problems	3 (9%)	3 (100%)	0 (0%)	2 (67%)	1 (33%)	3 (100%)	0 (0%)	6 (16%)	6 (100%)	0 (0%)	0 (0%)	6 (100%)	3 (50%)	3 (50%)

DETERMINANTS OF TELEMEDICINE USE IN SENEGAL

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8	If using telemedicine is complicated	2 (6%)	2 (100%)	0 (0%)	2 (100%)	0 (0%)	2 (100%)	0 (0%)	1 (3%)	0 (0%)	1 (100%)	0 (0%)	1 (100%)	1 (100%)	0 (0%)
9	Inability to get informed consent from my patients	1 (3%)	1 (100%)	0 (0%)	1 (100%)	0 (0%)	1 (100%)	0 (0%)	6 (16%)	6 (100%)	0 (0%)	0 (0%)	6 (100%)	3 (50%)	3 (50%)

T: total, M: male, F: female, D: Dakar, O: outside Dakar, S: specialist physician, G: general practitioner

Appendix 9: Information sheet - Physicians' perception of the impact of telemedicine on recruitment and retention in underserved areas

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Feuillet d'information

Titre du Projet

La perception des médecins sénégalais sur l'impact de la télémédecine sur leur recrutement et leur rétention dans les régions desservies.

Présentation des chercheurs

Chercheur principal : Birama Apho Ly

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- Directrice scientifique, Réseau ontarien de recherche sur les ressources humaines en santé
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- Conseiller technique responsable de la télésanté du Ministère de la Santé et de la Prévention du Sénégal
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Contexte

Cette étude porte sur la perception des médecins sénégalais sur l'impact de la télémédecine sur leur recrutement et leur rétention dans les régions desservies. Elle représente une partie d'une thèse de doctorat en Santé

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des Populations qui est intitulée « *Déterminants de l'utilisation de la télémédecine au Sénégal* ».

But de l'étude

L'étude a pour but de déterminer la perception des médecins sénégalais sur l'impact de la télémédecine sur leur recrutement et leur rétention dans les régions desservies.

Description de ce qui est attendu des participants

Votre contribution dans cette étude consistera à participer à un entretien individuel d'une durée de 15 minutes. Dans cet entretien, vous serez interrogés sur votre perception sur l'impact de la télémédecine sur votre recrutement et votre rétention dans les régions desservies. L'entretien sera enregistré avec un enregistreur audio.

Avantages ou inconvénients

Le fait de participer à cette étude vous offre l'occasion de contribuer à la détermination de la perception des médecins sénégalais sur l'impact de la télémédecine sur leur recrutement et leur rétention dans les régions desservies. L'identification de cette perception est importante pour le succès des futures interventions de télémédecine. Par ailleurs, le fait de consacrer 15 minutes de votre temps à cette recherche pourrait nuire à votre agenda déjà probablement chargé.

Participation volontaire et droit de retrait

Vous êtes libre de participer à cette étude. Vous êtes aussi libre de refuser sans conséquence négative ou préjudice et sans avoir à justifier votre décision. Aucune personne ne sera informée de votre décision d'accepter ou non de participer à l'étude. Si vous décidez de ne pas participer, il est important de prévenir le chercheur dont les coordonnées sont incluses dans ce document. Toutes les informations que vous avez fournies seront alors détruites.

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Coordonnées des participants

Nous ne disposons pas et nous ne chercherons pas à disposer de vos coordonnées personnelles. Nous ne disposons que de vos coordonnées de services. Ces dernières nous ont été fournies par le Ministère de la Santé, afin de nous permettre de vous rejoindre pour l'entretien. Toutefois, ces coordonnées ne seront pas utilisées dans nos analyses.

Confirmation de participation

Dans la période du 15 décembre 2013 au 15 avril 2014, vous recevrez un appel téléphonique pour confirmer votre intérêt à participer à cette étude.

Confidentialité et gestion des données

La confidentialité des informations fournies par les participants sera assurée par les mesures suivantes :

- les noms des participants ne paraîtront dans aucun rapport;
- les divers documents de la recherche seront codifiés et seul le chercheur aura accès à la liste des noms et des codes;
- les résultats individuels des participants ne seront jamais communiqués;
- Les données vous concernant seront conservées pendant 5 ans. Elles seront conservées en lieu sûr dont l'accès ne sera autorisé qu'à l'étudiant et à son encadrement. Elles seront détruites après ces 5 ans, précisément le 15 avril 2019.
- Le matériel et les données seront conservés sous clé et l'accès au fichier contenant les données électroniques sera protégé par un mot de passe;
- La recherche fera l'objet de publications dans une revue scientifique, et aucun participant ne pourra y être identifié ou

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reconnu;

- Un résumé des résultats de la recherche sera expédié aux participants qui en feront la demande en indiquant l'adresse où ils aimeraient recevoir le document, juste après l'espace prévu pour leur signature.
- La liste des participants de la recherche ainsi que leurs coordonnées seront conservées pendant au moins un an après la fin du projet, de manière à ce que, en cas de nécessité, ceux-ci puissent être rejoints rapidement.

Renseignements supplémentaires

Si vous avez des questions sur l'étude ou sur les implications de votre participation, veuillez communiquer avec le Dr Birama Apho LY, étudiant au Doctorat en Santé des Populations de l'Université d'Ottawa, aux coordonnées suivantes :

- **Sénégal :**
 - o Centre Interdisciplinaire de Recherche et d'Expertise en Télémédecine/E. santé (CIRET)
 - o Faculté de Médecine, de Pharmacie et d'Odontostomatologie (FMPOS)
 - o Université Cheikh Anta Diop de Dakar (UCAD)
 - o Téléphone :
 - o E.mail : bly022@uottawa.ca ou apholyca@yahoo.fr.
- **Canada :**
 - o Institut de recherche sur la santé des populations
 - o Faculté des études supérieures et postdoctorales
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Remerciements

Votre collaboration est précieuse pour nous permettre de réaliser cette étude et nous vous remercions d'y participer.

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Appendix 10: Consent form - Physicians' perception of the impact of telemedicine on recruitment and retention in underserved areas



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Formulaire de consentement

Titre du Projet

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Présentation des chercheurs

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- Professeure, École interdisciplinaire des sciences de la santé
- Chaire de recherche IRSC/Santé Canada sur les ressources humaines en santé
- Directrice scientifique, Réseau ontarien de recherche sur les ressources humaines en santé
- Directrice scientifique, Réseau de recherche sur l'amélioration de la santé des populations (RRASP)
- Institut de recherche sur la santé des populations
- Faculté des études supérieures et postdoctorales
- Université d'Ottawa, 1, Stewart, Pièce 227, Ottawa, Canada, K1N 6N5
- Téléphone de bureau : (+1) 613-562-5800 ext. 8614
- Fax : (+1) 613-562-5658
- Courriel : ivy.bourgeault@uottawa.ca

Chercheur associé : Pr Mbayang Ndiaye NIANG

- Spécialiste des maladies neuromusculaires
- Chef de service du laboratoire de physiologie et d'explorations fonctionnelles de l'Université Cheikh Anta Diop de Dakar
- Conseiller technique responsable de la télésanté du Ministère de la Santé et de la Prévention du Sénégal
- Téléphone : (+221) 76-589-0420
- Fax : (+221) 33-825-2952
- Courriel : mbaniang@yahoo.fr

Contexte

Cette étude porte sur la perception des médecins sénégalais sur l'impact de la télémédecine sur leur recrutement et leur rétention dans les régions desservies. Elle représente une partie d'une thèse de doctorat en Santé des Populations qui est intitulée « *Déterminants de l'utilisation de la télémédecine au Sénégal* ».

But de l'étude

L'étude a pour but de déterminer la perception des médecins sénégalais sur

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l'impact de la télémédecine sur leur recrutement et leur rétention dans les régions desservies.

Description de ce qui est attendu des participants

Votre contribution dans cette étude consistera à participer à un entretien individuel d'une durée de 15 minutes. Dans cet entretien, vous serez interrogés sur votre perception sur l'impact de la télémédecine sur votre recrutement et votre rétention dans les régions desservies. L'entretien sera enregistré avec un enregistreur audio.

Avantages ou inconvénients

Le fait de participer à cette étude vous offre l'occasion de contribuer à la détermination de la perception des médecins sénégalais sur l'impact de la télémédecine sur leur recrutement et leur rétention dans les régions desservies. L'identification de cette perception est importante pour le succès des futures interventions de télémédecine. Par ailleurs, le fait de consacrer 15 minutes de votre temps à cette recherche pourrait nuire à votre agenda déjà probablement chargé.

Participation volontaire et droit de retrait

Vous êtes libre de participer à cette étude. Vous êtes aussi libre de refuser sans conséquence négative ou préjudice et sans avoir à justifier votre décision. Aucune personne ne sera informée de votre décision d'accepter ou non de participer à l'étude. Si vous décidez de ne pas participer, il est important de prévenir le chercheur dont les coordonnées sont incluses dans ce document. Toutes les informations que vous avez fournies seront alors détruites.

Coordonnées des participants

Nous ne disposons pas et nous ne chercherons pas à disposer de vos coordonnées personnelles. Nous ne disposons que de vos coordonnées de services. Ces dernières nous ont été fournies par le Ministère de la Santé,

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afin de nous permettre de vous rejoindre pour l'entretien. Toutefois, ces coordonnées ne seront pas utilisées dans nos analyses.

Confirmation de participation

Dans la période du 15 décembre 2013 au 15 avril 2014, vous recevrez un appel téléphonique pour confirmer votre intérêt à participer à cette étude.

Confidentialité et gestion des données

La confidentialité des informations fournies par les participants sera assurée par les mesures suivantes :

- les noms des participants ne paraîtront dans aucun rapport;
- les divers documents de la recherche seront codifiés et seul le chercheur aura accès à la liste des noms et des codes;
- les résultats individuels des participants ne seront jamais communiqués;
- Les données vous concernant seront conservées pendant 5 ans. Elles seront conservées en lieu sûr dont l'accès ne sera autorisé qu'à l'étudiant et à son encadrement. Elles seront détruites après ces 5 ans, précisément le 15 avril 2019.
- Le matériel et les données seront conservés sous clé et l'accès au fichier contenant les données électroniques sera protégé par un mot de passe;
- La recherche fera l'objet de publications dans une revue scientifique, et aucun participant ne pourra y être identifié ou reconnu;
- Un résumé des résultats de la recherche sera expédié aux participants qui en feront la demande en indiquant l'adresse où ils aimeraient recevoir le document, juste après l'espace prévu pour leur signature.
- La liste des participants de la recherche ainsi que leurs coordonnées seront conservées pendant au moins un an après la fin du projet, de manière à ce que, en cas de nécessité, ceux-ci puissent être rejoints rapidement.

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Renseignements supplémentaires

Si vous avez des questions sur l'étude ou sur les implications de votre participation, veuillez communiquer avec le Dr Birama Apho LY, étudiant au Doctorat en Santé des Populations de l'Université d'Ottawa, aux coordonnées suivantes :

- **Sénégal :**

- o Centre Interdisciplinaire de Recherche et d'Expertise en Télémédecine/E. santé (CIRET)
- o Faculté de Médecine, de Pharmacie et d'Odontostomatologie (FMPOS)
- o Université Cheikh Anta Diop de Dakar (UCAD)
- o Téléphone :
- o E.mail : bly022@uottawa.ca ou apholyca@yahoo.fr.

- **Canada :**

- o Institut de recherche sur la santé des populations
- o Faculté des études supérieures et postdoctorales
- o Université d'Ottawa, 1, Stewart, Pièce 230, Ottawa, Canada, K1N 6N5
- o Téléphone portable : (+1) 819-921-1880
- o Courriel : Bly022@uottawa.ca ou apholyca@yahoo.fr.

Remerciements

Votre collaboration est précieuse pour nous permettre de réaliser cette étude et nous vous remercions d'y participer.

Signatures

Je soussigné (e) _____

consens librement à participer à cette partie de l'étude intitulée : « Déterminants de l'utilisation de la télémédecine au Sénégal ». J'ai pris connaissance du formulaire et j'ai compris le but, la nature, les avantages, les risques et les inconvénients du projet de recherche. Je suis satisfait (e) des explications, précisions et réponses que le chercheur m'a fournies, le cas

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échéant, quant à ma participation à ce projet.

Signature du participant, de la participante

Date

Un court résumé des résultats de la recherche sera expédié aux participants qui en feront la demande et qui indiqueront leur adresse. Les résultats ne seront pas disponibles avant août 2015.

Si cette adresse changeait d'ici cette date, vous êtes invité (e) à informer Birama Apho LY de la nouvelle adresse où vous souhaitez recevoir ce document.

L'adresse électronique ou postale à laquelle je souhaite recevoir les résultats est la suivante : _____

J'ai expliqué le but, la nature, les avantages, les risques et les inconvénients du projet de recherche au participant. J'ai répondu au meilleur de ma connaissance aux questions posées et j'ai vérifié la compréhension du participant.

Signature de l'enquêteur

Date

Plaintes ou critiques

Toute plainte ou critique sur ce projet de recherche pourra être adressée au responsable de l'éthique de la recherche :

Bureau d'éthique et d'intégrité de la recherche de l'Université d'Ottawa

- Pavillon Tabaret, 550, rue Cumberland, Pièce 154, Ottawa, Canada, K1N 6N5
- Téléphone de Bureau : (+1) 613-562-5387
- Fax : (+1) 613-562-5338
- Courriel : ethique@uOttawa.ca

Comité national d'Éthique pour la Recherche en Santé (CNERS) du Sénégal

- Rue Aime Césaire, Fann Residence Dakar, Sénégal

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- BP 4024, Dakar Fann
- Téléphone : (+221) 33 869
- Fax : (+221) 33 869
- Courriel : cnrs2008@live.fr
- Site internet : www.der.sn

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Appendix 11: Information sheet - Physicians' beliefs concerning the use of telemedicine



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Feuillet d'information

Titre du Projet

Les croyances des médecins des hôpitaux et des centres de santé de district du Sénégal envers l'utilisation de la télémédecine au Sénégal

Présentation des chercheurs

Chercheur principal : Birama Apho Ly

- Doctorant en Santé des Populations
- Institut de recherche sur la santé des populations
- Faculté des études supérieures et postdoctorales
- Université d'Ottawa, 1, Stewart, Pièce 230, Ottawa, Canada, K1N 6N5
- Téléphone portable : (+1) 819-921-1880
- Courriel : Bly022@uottawa.ca ou apholyca@yahoo.fr.

Superviseur : Roland Labonté

- Chaire de recherche du Canada en mondialisation et équité en matière de santé
- Professeur titulaire, Faculté de médecine
- Institut de recherche sur la santé des populations
- Faculté des études supérieures et postdoctorales
- Université d'Ottawa, 1, Stewart, Ottawa, Canada, K1N 6N5
- Téléphone de bureau : (+1) 613-562-5800 ext.2288
- Fax : (+1) 613-562-5659/Téléphone portable : (+1) 613-818-6579
- Courriel: rlabonte@uottawa.ca

Co-superviseur : Ivy Lynn Bourgeault

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- Professeure, École interdisciplinaire des sciences de la santé
- Chaire de recherche IRSC/Santé Canada sur les ressources humaines en santé
- Directrice scientifique, Réseau ontarien de recherche sur les ressources humaines en santé
- Directrice scientifique, Réseau de recherche sur l'amélioration de la santé des populations (RRASP)
- Institut de recherche sur la santé des populations
- Faculté des études supérieures et postdoctorales
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- Fax : (+1) 613-562-5658
- Courriel : ivy.bourgeault@uottawa.ca

Chercheur associé : Pr Mbayang Ndiaye NIANG

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- Chef de service du laboratoire de physiologie et d'explorations fonctionnelles de l'Université Cheikh Anta Diop de Dakar
- Conseiller technique responsable de la télésanté du Ministère de la Santé et de la Prévention du Sénégal
- Téléphone : (+221) 76-589-0420
- Fax : (+221) 33-825-2952
- Courriel : mbaniang@yahoo.fr

Contexte

Cette étude porte sur les croyances comportementales, normatives et de contrôle des médecins sénégalais face l'utilisation de la télémédecine. Elle représente une partie d'une thèse de doctorat en Santé des Populations qui est intitulée « *Déterminants de l'utilisation de la télémédecine au Sénégal* ».

But de l'étude

L'étude a pour but d'identifier les croyances comportementales, normatives

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et de contrôle des médecins des hôpitaux et des centres de santé de district du Sénégal envers l'utilisation de la télémédecine.

Description de ce qui est attendu des participants

Votre contribution dans cette étude consistera à participer à un entretien individuel d'une durée de 45 minutes. Dans cet entretien, vous serez interrogés sur vos croyances comportementales, normatives et de contrôle face à l'utilisation de la télémédecine. Vous serez aussi interrogées sur certaines de vos caractéristiques sociodémographiques comme le sexe et l'âge. L'entretien sera enregistré avec un enregistreur audio.

Avantages ou inconvénients

Le fait de participer à cette étude vous offre l'occasion de contribuer à l'identification des croyances des médecins sénégalais face à l'utilisation de la télémédecine. L'identification de ces croyances est importante pour le succès des futures interventions de télémédecine. Par ailleurs, le fait de consacrer 45 minutes de votre temps à cette recherche pourrait nuire à votre agenda déjà probablement chargé.

Participation volontaire et droit de retrait

Vous êtes libre de participer à cette étude. Vous êtes aussi libre de refuser sans conséquence négative ou préjudice et sans avoir à justifier votre décision. Aucune personne ne sera informée de votre décision d'accepter ou non de participer à l'étude. Si vous décidez de ne pas participer, il est important de prévenir le chercheur dont les coordonnées sont incluses dans ce document. Toutes les informations que vous avez fournies seront alors détruites.

Coordonnées des participants

Nous ne disposons pas et nous ne chercherons pas à disposer de vos coordonnées personnelles. Nous ne disposons que de vos coordonnées de services. Ces dernières nous ont été fournies par le Ministère de la Santé,

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afin de nous permettre de vous rejoindre pour l'entretien. Toutefois, ces coordonnées ne seront pas utilisées dans nos analyses.

Confirmation de participation

Dans la période du 15 décembre 2013 au 15 avril 2014, vous recevrez un appel téléphonique pour confirmer votre intérêt à participer à cette étude.

Confidentialité et gestion des données

La confidentialité des informations fournies par les participants sera assurée par les mesures suivantes :

- les noms des participants ne paraîtront dans aucun rapport;
- les divers documents de la recherche seront codifiés et seul le chercheur aura accès à la liste des noms et des codes;
- les résultats individuels des participants ne seront jamais communiqués;
- Les données vous concernant seront conservées pendant 5 ans. Elles seront conservées en lieu sûr dont l'accès ne sera autorisé qu'à l'étudiant et à son encadrement. Elles seront détruites après ces 5 ans, précisément le 15 avril 2019.
- Le matériel et les données seront conservés sous clé et l'accès au fichier contenant les données électroniques sera protégé par un mot de passe;
- La recherche fera l'objet de publications dans une revue scientifique, et aucun participant ne pourra y être identifié ou reconnu;
- Un résumé des résultats de la recherche sera expédié aux participants qui en feront la demande en indiquant l'adresse où ils aimeraient recevoir le document, juste après l'espace prévu pour leur signature.
- La liste des participants de la recherche ainsi que leurs coordonnées seront conservées pendant au moins un an après la fin du projet, de manière à ce que, en cas de nécessité, ceux-ci puissent être rejoints rapidement.

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Renseignements supplémentaires

Si vous avez des questions sur l'étude ou sur les implications de votre participation, veuillez communiquer avec le Dr Birama Apho LY, étudiant au Doctorat en Santé des Populations de l'Université d'Ottawa, aux coordonnées suivantes :

- **Sénégal :**

- o Centre Interdisciplinaire de Recherche et d'Expertise en Télémédecine/E. santé (CIRET)
- o Faculté de Médecine, de Pharmacie et d'Odontostomatologie (FMPOS)
- o Université Cheikh Anta Diop de Dakar (UCAD)
- o Téléphone :
- o E.mail : bly022@uottawa.ca ou apholyca@yahoo.fr.

- **Canada :**

- o Institut de recherche sur la santé des populations
- o Faculté des études supérieures et postdoctorales
- o Université d'Ottawa, 1, Stewart, Pièce 230, Ottawa, Canada, K1N 6N5
- o Téléphone portable : (+1) 819-921-1880
- o Courriel : Bly022@uottawa.ca ou apholyca@yahoo.fr.

Remerciements

Votre collaboration est précieuse pour nous permettre de réaliser cette étude et nous vous remercions d'y participer.

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Appendix 12: Consent form - Physicians' beliefs concerning the use of telemedicine

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Formulaire de consentement

Titre du Projet

Les croyances des médecins des hôpitaux et des centres de santé de district du Sénégal envers l'utilisation de la télémédecine

Présentation des chercheurs

Chercheur principal : Birama Apho Ly

- Doctorant en Santé des Populations
- Institut de recherche sur la santé des populations
- Faculté des études supérieures et postdoctorales
- Université d'Ottawa, 1, Stewart, Pièce 230, Ottawa, Canada, K1N 6N5
- Portable : (+1) 819-921-1880
- Courriel : Bly022@uottawa.ca ou apholyca@yahoo.fr.

Superviseur : Roland Labonté

- Chaire de recherche du Canada en mondialisation et équité en matière de santé
- Professeur titulaire, Faculté de médecine
- Institut de recherche sur la santé des populations
- Faculté des études supérieures et postdoctorales
- Université d'Ottawa, 1, Stewart, Ottawa, Canada, K1N 6N5
- Bureau : (+1) 613-562-5800 ext.2288/ portable : (+1) 613-818-6579/Fax : (+1) 613-562-5659
- Courriel : rlabonte@uottawa.ca

Co-superviseur : Ivy Lynn Bourgeault

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- Professeure, École interdisciplinaire des sciences de la santé
- Chaire de recherche IRSC/Santé Canada sur les ressources humaines en santé
- Directrice scientifique, Réseau ontarien de recherche sur les ressources humaines en santé
- Directrice scientifique, Réseau de recherche sur l'amélioration de la santé des populations (RRASP)
- Institut de recherche sur la santé des populations
- Faculté des études supérieures et postdoctorales
- Université d'Ottawa, 1, Stewart, Pièce 227, Ottawa, Canada, K1N 6N5
- Bureau : (+1) 613-562-5800 ext. 8614/Fax : (+1) 613-562-5658
- Courriel : ivy.bourgeault@uottawa.ca

Chercheur associé : Pr Mbayang Ndiaye NIANG

- Spécialiste des maladies neuromusculaires
- Chef de service du laboratoire de physiologie et d'explorations fonctionnelles de l'Université Cheikh Anta Diop de Dakar
- Conseiller technique responsable de la télésanté du Ministère de la Santé et de la Prévention du Sénégal
- Portable : (+221) 76-589-0420/Fax : (+221) 33-825-2952
- Courriel : mbaniang@yahoo.fr

Contexte

Cette étude porte sur les croyances comportementales, normatives et de contrôle des médecins sénégalais face l'utilisation de la télémédecine. Elle représente une partie d'une thèse de doctorat en Santé des Populations qui est intitulée « *Déterminants de l'utilisation de la télémédecine au Sénégal* ».

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But de l'étude

L'étude a pour but d'identifier les croyances comportementales, normatives et de contrôle des médecins des hôpitaux et des centres de santé de district du Sénégal envers l'utilisation de la télémédecine.

Description de ce qui est attendu des participants

Votre contribution dans cette étude consistera à participer à un entretien individuel d'une durée de 45 minutes. Dans cet entretien, vous serez interrogés sur vos croyances comportementales, normatives et de contrôle face à l'utilisation de la télémédecine. Vous serez aussi interrogées sur certaines de vos caractéristiques sociodémographiques comme le sexe et l'âge. L'entretien sera enregistré avec un enregistreur audio.

Avantages ou inconvénients

Le fait de participer à cette étude vous offre l'occasion de contribuer à l'identification des croyances des médecins sénégalais face à l'utilisation de la télémédecine. L'identification de ces croyances est importante pour le succès des futures interventions de télémédecine. Par ailleurs, le fait de consacrer 45 minutes de votre temps à cette recherche pourrait nuire à votre agenda déjà probablement chargé.

Participation volontaire et droit de retrait

Vous êtes libre de participer à cette étude. Vous êtes aussi libre de refuser sans conséquence négative ou préjudice et sans avoir à justifier votre décision. Aucune personne ne sera informée de votre décision d'accepter ou non de participer à l'étude. Si vous décidez de ne pas participer, il est important de prévenir le chercheur dont les coordonnées sont incluses dans ce document. Toutes les informations que vous avez fournies seront alors détruites.

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Coordonnées des participants

Nous ne disposons pas et nous ne chercherons pas à disposer de vos coordonnées personnelles. Nous ne disposons que de vos coordonnées de services. Ces dernières nous ont été fournies par le Ministère de la Santé, afin de nous permettre de vous rejoindre pour l'entretien. Toutefois, ces coordonnées ne seront pas utilisées dans nos analyses.

Confirmation de participation

Dans la période du 15 décembre 2013 au 15 avril 2014, vous recevrez un appel téléphonique pour confirmer votre intérêt à participer à cette étude.

Confidentialité et gestion des données

La confidentialité des informations fournies par les participants sera assurée par les mesures suivantes :

- les noms des participants ne paraîtront dans aucun rapport;
- les divers documents de la recherche seront codifiés et seul le chercheur aura accès à la liste des noms et des codes;
- les résultats individuels des participants ne seront jamais communiqués;
- Les données vous concernant seront conservées pendant 5 ans. Elles seront conservées en lieu sûr dont l'accès ne sera autorisé qu'à l'étudiant et à son encadrement. Elles seront détruites après ces 5 ans, précisément le 15 avril 2019.
- Le matériel et les données seront conservés sous clé et l'accès au fichier contenant les données électroniques sera protégé par un mot de passe;
- La recherche fera l'objet de publications dans une revue scientifique, et aucun participant ne pourra y être identifié ou

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reconnu;

- Un résumé des résultats de la recherche sera expédié aux participants qui en feront la demande en indiquant l'adresse où ils aimeraient recevoir le document, juste après l'espace prévu pour leur signature.
- La liste des participants de la recherche ainsi que leurs coordonnées seront conservées pendant au moins un an après la fin du projet, de manière à ce que, en cas de nécessité, ceux-ci puissent être rejoints rapidement.

Renseignements supplémentaires

Si vous avez des questions sur l'étude ou sur les implications de votre participation, veuillez communiquer avec le Dr Birama Apho LY, étudiant au Doctorat en Santé des Populations de l'Université d'Ottawa, aux coordonnées suivantes :

- **Sénégal :**
 - o Centre Interdisciplinaire de Recherche et d'Expertise en Télémédecine/E. santé (CIRET)
 - o Faculté de Médecine, de Pharmacie et d'Odontostomatologie (FMPOS)
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Remerciements

Votre collaboration est précieuse pour nous permettre de réaliser cette étude et nous vous remercions d'y participer.

Signatures

Je soussigné (e) _____
consens librement à participer à cette partie de l'étude intitulée :
« *Déterminants de l'utilisation de la télémédecine au Sénégal* ». J'ai
pris connaissance du formulaire et j'ai compris le but, la nature, les
avantages, les risques et les inconvénients du projet de recherche. Je
suis satisfait (e) des explications, précisions et réponses que le
chercheur m'a fournies, le cas échéant, quant à ma participation à ce
projet.

Signature du participant, de la participante

Date

Un résumé des résultats de la recherche sera expédié aux participants
qui en feront la demande et qui indiqueront leur adresse. Les
résultats ne seront pas disponibles avant août 2015.

Si cette adresse changeait d'ici cette date, vous êtes invité (e) à
informez Birama Apho LY de la nouvelle adresse où vous souhaitez
recevoir ce document.

L'adresse électronique ou postale à laquelle je souhaite recevoir les
résultats est la suivante : _____

J'ai expliqué le but, la nature, les avantages, les risques et les
inconvénients du projet de recherche au participant. J'ai répondu au
meilleur de mes connaissances aux questions posées et j'ai vérifié la
compréhension du participant.

Signature de l'enquêteur

Date

Plaintes ou critiques

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Toute plainte ou critique sur ce projet de recherche pourra être adressée au responsable de l'éthique de la recherche :

Bureau d'éthique et d'intégrité de la recherche de l'Université d'Ottawa

- Pavillon Tabaret, 550, rue Cumberland, Pièce 154, Ottawa, Canada, K1N 6N5
- Téléphone de Bureau : (+1) 613-562-5387
- Fax : (+1) 613-562-5338
- Courriel : ethique@uOttawa.ca

Comité national d'Éthique pour la Recherche en Santé (CNER) du Sénégal

- Rue Aime Césaire, Fann Residence Dakar, Sénégal
- BP 4024, Dakar Fann
- Téléphone : (+221) 33 869
- Fax : (+221) 33 869
- Courriel : cnrs2008@live.fr
- Site internet : www.der.sn

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Appendix 13: Information sheet - Contextual factors that influence the use of telemedicine in Senegal



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Feuillet d'information

Titre du Projet

Les facteurs contextuels de l'utilisation de la télémédecine au Sénégal.

Présentation des chercheurs

Chercheur principal : Birama Apho Ly

- Doctorant en Santé des Populations
- Institut de recherche sur la santé des populations
- Faculté des études supérieures et postdoctorales
- Université d'Ottawa, 1, Stewart, Pièce 230, Ottawa, Canada, K1N 6N5
- Portable : (+1) 819-921-1880
- Courriel : Bly022@uottawa.ca ou apholyca@yahoo.fr.

Superviseur : Roland Labonté

- Chaire de recherche du Canada en mondialisation et équité en matière de santé
- Professeur titulaire, Faculté de médecine
- Institut de recherche sur la santé des populations
- Faculté des études supérieures et postdoctorales
- Université d'Ottawa, 1, Stewart, Ottawa, Canada, K1N 6N5
- Bureau : (+1) 613-562-5800 ext.2288/ portable : (+1) 613-818-6579/Fax : (+1) 613-562-5659
- Courriel: rlabonte@uottawa.ca

Co-superviseur : Ivy Lynn Bourgeault

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- Professeure, École interdisciplinaire des sciences de la santé
- Chaire de recherche IRSC/Santé Canada sur les ressources humaines en santé
- Directrice scientifique, Réseau ontarien de recherche sur les ressources humaines en santé
- Directrice scientifique, Réseau de recherche sur l'amélioration de la santé des populations (RRASP)
- Institut de recherche sur la santé des populations
- Faculté des études supérieures et postdoctorales
- Université d'Ottawa, 1, Stewart, Pièce 227, Ottawa, Canada, K1N 6N5
- Téléphone de bureau : (+1) 613-562-5800 ext. 8614
- FAX : (+1) 613-562-5658
- Courriel : ivy.bourgeault@uottawa.ca

Chercheur associé : Pr Mbayang Ndiaye NIANG

- Spécialiste des maladies neuromusculaires
- Chef de service du laboratoire de physiologie et d'explorations fonctionnelles de l'Université Cheikh Anta Diop de Dakar
- Conseiller technique responsable de la télésanté du Ministère de la Santé et de la Prévention du Sénégal
- Téléphone : (+221) 76-589-0420
- Fax : (+221) 33-825-2952
- Courriel : mbaniang@yahoo.fr

Contexte

Cette étude porte sur les facteurs techniques, organisationnels, financiers, politiques, juridiques, éthiques et socioéconomiques qui influencent l'utilisation de la télémédecine au Sénégal. Elle correspond à une partie de la thèse de doctorat en Santé des

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Populations intitulée « *Déterminants de l'utilisation de la télémédecine au Sénégal* ».

But de l'étude

L'étude a pour but d'identifier les facteurs techniques, organisationnels, financiers, politiques, juridiques, éthiques et socioéconomiques qui influencent l'utilisation de la télémédecine au Sénégal.

Description de ce qui est attendu des participants

Votre contribution dans cette étude consistera à participer à un entretien individuel d'une durée de 60 minutes. Dans cet entretien, vous serez interrogés sur les facteurs techniques, organisationnels, financiers, politiques, juridiques, éthiques et socioculturels qui influencent l'utilisation de la télémédecine au Sénégal. Vous serez aussi interrogées sur certaines de vos caractéristiques sociodémographiques. L'entretien sera enregistré avec un enregistreur audio.

Avantages ou inconvénients

Le fait de participer à cette étude vous offre l'occasion de contribuer à l'identification des facteurs techniques, organisationnels, financiers, politiques, juridiques, éthiques et socioéconomiques qui influencent l'utilisation de la télémédecine au Sénégal. L'identification de ces facteurs permettra d'améliorer l'utilisation de la télémédecine au Sénégal. Par ailleurs, le fait de consacrer 60 minutes de votre temps à cette étude pourrait nuire à votre agenda déjà probablement chargé.

Participation volontaire et droit de retrait

Vous êtes libre de participer à cette étude. Vous êtes aussi libre de refuser sans conséquence négative ou préjudice et sans avoir à

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justifier votre décision. Aucune personne ne sera informée de votre décision d'accepter ou non de participer à l'étude. Si vous décidez de ne pas participer, il est important de prévenir le chercheur dont les coordonnées sont incluses dans ce document. Toutes les informations que vous avez fournies seront alors détruites.

Coordonnées des participants

Nous ne disposons pas et nous ne chercherons pas à disposer de vos coordonnées personnelles. Nous ne disposons que de vos coordonnées de services. Ces dernières nous ont été fournies par le Ministère de la Santé ou par un des gestionnaires de projet de télémédecine, afin de nous permettre de vous rejoindre pour l'entretien. Toutefois, ces coordonnées ne seront pas utilisées dans nos analyses.

Confirmation de participation

Dans la période du 15 décembre 2013 au 15 avril 2014, vous recevrez un appel téléphonique pour confirmer votre intérêt à participer à cette étude.

Confidentialité et gestion des données

La confidentialité des informations fournies par les participants sera assurée par les mesures suivantes :

- les noms des participants ne paraîtront dans aucun rapport;
- les divers documents de la recherche seront codifiés et seul le chercheur aura accès à la liste des noms et des codes;
- les résultats individuels des participants ne seront jamais communiqués;
- Les données vous concernant seront conservées pendant 5 ans. Elles seront conservées en lieu sûr dont l'accès ne sera

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autorisé qu'à l'étudiant et à son encadrement. Elles seront détruites après ces 5 ans, précisément le 15 avril 2019.

- Le matériel et les données seront conservés sous clé et l'accès au fichier contenant les données électroniques sera protégé par un mot de passe;
- La recherche fera l'objet de publications dans une revue scientifique, et aucun participant ne pourra y être identifié ou reconnu;
- Un résumé des résultats de la recherche sera expédié aux participants qui en feront la demande en indiquant l'adresse où ils aimeraient recevoir le document, juste après l'espace prévu pour leur signature.
- La liste des participants de la recherche ainsi que leurs coordonnées seront conservées pendant au moins un an après la fin du projet, de manière à ce que, en cas de nécessité, ceux-ci puissent être rejoints rapidement.

Renseignements supplémentaires

Si vous avez des questions sur l'étude ou sur les implications de votre participation, veuillez communiquer avec le Dr Birama Apho LY, étudiant au Doctorat en Santé des Populations à l'Université d'Ottawa, aux coordonnées suivantes :

- **Sénégal :**
 - o Centre Interdisciplinaire de Recherche et d'Expertise en Télémédecine/E. santé (CIRET)
 - o Faculté de Médecine, de Pharmacie et d'Odontostomatologie (FMPOS)
 - o Université Cheikh Anta Diop de Dakar (UCAD)
 - o Téléphone :
 - o E.mail : bly022@uottawa.ca ou apholyca@yahoo.fr.

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- **Canada :**

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- o Université d'Ottawa, 1, Stewart, Pièce 230, Ottawa,
Canada, K1N 6N5
- o Téléphone portable : (+1) 819-921-1880
- o Courriel : Bly022@uottawa.ca ou apholyca@yahoo.fr.

Remerciements

Votre collaboration est précieuse pour nous permettre de réaliser
cette étude et nous vous remercions d'y participer.

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Appendix 14: Consent form - Contextual factors that influence the use of telemedicine in Senegal



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Formulaire de consentement

Titre du Projet

Les facteurs contextuels de l'utilisation de la télémédecine au Sénégal.

Présentation des chercheurs

Chercheur principal : Birama Apho Ly

- Doctorant en Santé des Populations
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- Fax : (+221) 33-825-2952
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Contexte

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But de l'étude

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Participation volontaire et droit de retrait

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- Le matériel et les données seront conservés sous clé et l'accès au fichier contenant les données électroniques sera protégé par un mot de passe;
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qui en feront la demande en indiquant l'adresse où ils aimeraient recevoir le document, juste après l'espace prévu pour leur signature.

- La liste des participants de la recherche ainsi que leurs coordonnées seront conservées pendant au moins un an après la fin du projet, de manière à ce que, en cas de nécessité, ceux-ci puissent être rejoints rapidement.

Renseignements supplémentaires

Si vous avez des questions sur l'étude ou sur les implications de votre participation, veuillez communiquer avec le Dr Birama Apho LY, étudiant au Doctorat en Santé des Populations à l'Université d'Ottawa, aux coordonnées suivantes :

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 - o Faculté de Médecine, de Pharmacie et d'Odontostomatologie (FMPOS)
 - o Université Cheikh Anta Diop de Dakar (UCAD)
 - o Téléphone :
 - o E.mail : bly022@g.uottawa.ca ou apholyca@yahoo.fr.
- **Canada :**
 - o Institut de recherche sur la santé des populations
 - o Faculté des études supérieures et postdoctorales
 - o Université d'Ottawa, 1, Stewart, Pièce 230, Ottawa, Canada, K1N 6N5
 - o Téléphone portable : (+1) 819-921-1880
 - o Courriel : Bly022@uottawa.ca ou apholyca@yahoo.fr.

Remerciements

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Signatures

Je soussigné (e) _____
consens librement à participer à cette partie de l'étude intitulée :
« *Déterminants de l'utilisation de la télémédecine au Sénégal* ». J'ai pris
connaissance du formulaire et j'ai compris le but, la nature, les avantages,
les risques et les inconvénients du projet de recherche. Je suis satisfait (e)
des explications, précisions et réponses que le chercheur m'a fournies, le cas
échéant, quant à ma participation à ce projet.

Signature du participant, de la participante

Date

Un résumé des résultats de la recherche sera expédié aux participants qui en
feront la demande et qui indiqueront leur adresse. Les résultats ne seront pas
disponibles avant août 2015.

Si cette adresse changeait d'ici cette date, vous êtes invité (e) à informer
Birama Apho LY de la nouvelle adresse où vous souhaitez recevoir ce
document.

L'adresse électronique ou postale à laquelle je souhaite recevoir les résultats
est la suivante : _____

J'ai expliqué le but, la nature, les avantages, les risques et les inconvénients
du projet de recherche au participant. J'ai répondu au meilleur de mes
connaissances aux questions posées et j'ai vérifié la compréhension du
participant.

Signature de l'enquêteur

Date

Plaintes ou critiques

Toute plainte ou critique sur ce projet de recherche pourra être adressée au
responsable de l'éthique de la recherche :

Bureau d'éthique et d'intégrité de la recherche de l'Université d'Ottawa

- Pavillon Tabaret, 550, rue Cumberland, Pièce 154, Ottawa, Canada,
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Sénégal**

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- BP 4024, Dakar Fann
- Téléphone : (+221) 33 869
- Fax : (+221) 33 869
- Courriel : cnrs2008@live.fr
- Site internet : www.der.sn

Appendix 15: Questionnaire for physicians working in public hospitals - Intention to use telemedicine in professional activities

Ce questionnaire est destiné à l'étude de l'intention des médecins des hôpitaux du Sénégal d'utiliser la télémédecine dans leurs activités professionnelles. Nous vous prions de bien vouloir le remplir et nous le retourner, dans les deux semaines qui suivent sa réception, à l'adresse bly022@uottawa.ca ou apholyca@hotmail.com ou à la direction régionale de la santé. La confidentialité et l'anonymat de vos informations seront rigoureusement respectés.

- **La télémédecine est définie comme l'exercice de la médecine à distance. Elle implique l'utilisation des technologies de l'information et de la communication (ordinateur, téléphone, tablette, fax et autres) et englobe le diagnostic, le traitement, le suivi et la formation.**
- **Par activités professionnelles, nous entendons les activités de diagnostic, de traitement, de suivi et de formation qui font partie de vos devoirs de médecin des hôpitaux.**

1. N° du questionnaire : /___/___/(réservez à l'équipe de recherche)

Pour répondre aux questions, inscrire la bonne réponse ou mettre une croix dans les espaces réservés à cet effet.

2. Date d'administration du questionnaire : /___/___/20___/
3. Téléphone : /_____/
4. Courriel : /_____/
5. Région médicale : /_____/
6. Hôpital : /_____/
7. Service : /_____/
8. Date de naissance : /___/___/___/
9. Sexe : Homme : /___/ Femme : /___/
10. Spécialité médicale : /_____/
11. Nombre d'années dans le présent hôpital : /___/
12. Nombre d'années de pratique médicale : /___/
13. Statut professionnel : Fonctionnaire/___/Autre/___/
- Si autre, précisez : /_____/

14. Est-ce que vous utilisez la télémédecine dans vos activités professionnelles?

Jamais	Très rarement	Rarement	Souvent	Très souvent	Toujours

15. Utiliser la télémédecine dans mes activités professionnelles au cours des 12 prochains mois me permettrait...

a. de contribuer à la formation des professionnels de la santé qui sont sous ma responsabilité

Très improbable	Assez improbable	Légèrement improbable	Ni l'un, ni l'autre	Légèrement probable	Assez Probable	Très probable

b. de me former du point de vue professionnel

Très improbable	Assez improbable	Légèrement improbable	Ni l'un, ni l'autre	Légèrement probable	Assez Probable	Très probable

c. de soigner mes malades à distance

Très improbable	Assez improbable	Légèrement improbable	Ni l'un, ni l'autre	Légèrement probable	Assez Probable	Très probable

d. d'avoir l'avis des experts à distance

Très improbable	Assez improbable	Légèrement improbable	Ni l'un, ni l'autre	Légèrement probable	Assez Probable	Très probable

16. Pensez-vous que les personnes suivantes approuveraient/désapprouveraient que vous utilisiez la télémédecine dans vos activités professionnelles au cours des 12 prochains mois?

a. Mes collègues médecins

Désapprouveraient très fortement	Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement	Approuveraient très fortement

b. Mes patients

Désapprouveraient très fortement	Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement	Approuveraient très fortement

c. Les paramédicaux (infirmiers, sages-femmes, aides-soignants) qui sont sous ma responsabilité

Désapprouveraient très fortement	Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement	Approuveraient très fortement

d. Les administrateurs de mon hôpital

Désapprouverait très fortement	Désapprouverait fortement	Désapprouverait légèrement	Ni l'un, ni l'autre	Approuverait légèrement	Approuverait fortement	Approuverait très fortement

17. Pour moi, utiliser la télémédecine dans mes activités professionnelles au cours des 12 prochains mois serait...

Très difficile	Assez difficile	Un peu difficile	Ni l'un, ni l'autre	Un peu facile	Assez facile	Très facile

18. J'utiliserais la télémédecine dans mes activités professionnelles au cours des 12 prochains mois,...

a. Si je suis formé dans l'utilisation de la télémédecine

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

b. Si je suis capable d'assurer la sécurité de mes patients

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

19. J'ai l'intention d'utiliser la télémédecine dans mes activités professionnelles au cours des 12 prochains mois.

Très improbable	Assez improbable	Légèrement improbable	Ni l'un, ni l'autre	Légèrement probable	Assez probable	Très probable

20. Si je le voulais, je pourrais facilement utiliser la télémédecine dans mes activités professionnelles au cours des 12 prochains mois.

Très en désaccord	Assez en désaccord	Légèrement en désaccord	Ni l'un, ni l'autre	Légèrement en accord	Assez en accord	Très en accord

21. Utiliser la télémédecine dans mes activités professionnelles au cours des 12 prochains mois me permettrait...

a. d'éviter l'évacuation sanitaire de certains de mes malades

Très improbable	Assez improbable	Légèrement improbable	Ni l'un, ni l'autre	Légèrement probable	Assez Probable	Très probable

b. de gagner du temps

Très improbable	Assez improbable	Légèrement improbable	Ni l'un, ni l'autre	Légèrement probable	Assez Probable	Très probable

c. de mieux organiser l'évacuation sanitaire de mes malades

Très improbable	Assez improbable	Légèrement improbable	Ni l'un, ni l'autre	Légèrement probable	Assez Probable	Très probable

d. d'éviter les erreurs médicales

Très improbable	Assez improbable	Légèrement improbable	Ni l'un, ni l'autre	Légèrement probable	Assez Probable	Très probable

22. Pensez-vous que les personnes suivantes approuveraient/désapprouveraient que vous utilisiez la télémédecine dans vos activités professionnelles au cours des 12 prochains mois?

a. Le Ministère de la Santé

Désapprouverait très fortement	Désapprouverait fortement	Désapprouverait légèrement	Ni l'un, ni l'autre	Approuverait légèrement	Approuverait fortement	Approuverait très fortement

b. La population qui est sous ma responsabilité

Désapprouverait très fortement	Désapprouverait fortement	Désapprouverait légèrement	Ni l'un, ni l'autre	Approuverait légèrement	Approuverait fortement	Approuverait très fortement

c. Mes étudiants

Désapprouveraient très fortement	Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement	Approuveraient très fortement

23. J'utiliserais la télémédecine dans mes activités professionnelles au cours des 12 prochains mois,...

a. Même si je ne suis pas capable d'assurer la sécurité des données de mes patients

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

b. Même si je n'ai pas beaucoup de temps

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

c. Si je suis capable de communiquer avec les répondants

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

d. Même si je ne suis pas capable de faire la maintenance des équipements de télémédecine

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

24. Je vais utiliser la télémédecine dans mes activités professionnelles au cours des 12 prochains mois.

Très improbable	Assez improbable	Légèrement improbable	Ni l'un, ni l'autre	Légèrement probable	Assez probable	Très probable

25. La probabilité que j'utilise la télémédecine dans mes activités professionnelles au cours des 12 prochains mois est :

Très faible	Assez faible	Légèrement faible	Ni l'un, ni l'autre	Légèrement forte	Assez forte	Très forte

26. Pour moi, utiliser la télémédecine dans mes activités professionnelles au cours des 12 prochains mois serait...

a.

Très Inutile	Assez Inutile	Légèrement Inutile	Ni l'un, ni l'autre	Légèrement Utile	Assez utile	Très Utile

b.

Très Nuisible	Assez Nuisible	Légèrement Nuisible	Ni l'un, ni l'autre	Légèrement bénéfique	Assez bénéfique	Très Bénéfique

c.

Très Imprudent	Assez Imprudent	Légèrement imprudent	Ni l'un, ni l'autre	Légèrement prudent	Assez prudent	Très prudent

27. Je me sens capable d'utiliser la télémédecine dans mes activités professionnelles au cours des 12 prochains mois.

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

**Appendix 16: Information sheet for physicians working in public hospitals -
Intention to use telemedicine in professional activities**



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Feuillet d'information

Titre du Projet

Étude de l'intention des médecins des Hôpitaux du Sénégal d'utiliser la télémedicine.

Présentation des chercheurs

Chercheur principal : Birama Apho Ly

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- Institut de recherche sur la santé des populations
- Faculté des études supérieures et postdoctorales
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Sénégal : (+221) 77-256-1824
- Courriel : Bly022@uottawa.ca ou apholyca@yahoo.fr.

Superviseur : Roland Labonté

- Chaire de recherche du Canada en mondialisation et équité en matière de santé
- Professeur titulaire, Faculté de médecine
- Institut de recherche sur la santé des populations
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- Université d'Ottawa, 1, Stewart, Ottawa, Canada, K1N 6N5
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- Téléphone portable : (+1) 613-818-6579

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- Courriel : rlabonte@uottawa.ca

Co-superviseur : Ivy Lynn Bourgeault

- Professeure, École interdisciplinaire des sciences de la santé
- Chaire de recherche IRSC/Santé Canada sur les ressources humaines en santé
- Directrice scientifique, Réseau ontarien de recherche sur les ressources humaines en santé
- Directrice scientifique, Réseau de recherche sur l'amélioration de la santé des populations (RRASP)
- Institut de recherche sur la santé des populations
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- Courriel : ivy.bourgeault@uottawa.ca

Chercheur associé : Pr Mbayang Ndiaye NIANG

- Spécialiste des maladies neuromusculaires
- Chef de service du laboratoire de physiologie et d'explorations fonctionnelles de l'Université Cheikh Anta Diop de Dakar
- Conseiller technique responsable de la télésanté du Ministère de la Santé et de la Prévention du Sénégal
- Téléphone : (+221) 76-589-0420
- Fax : (+221) 33-825-2952
- Courriel : mbaniang@yahoo.fr

Contexte

Cette étude porte sur l'intention des médecins des Hôpitaux du Sénégal d'utiliser la télémédecine. Elle représente une partie de la thèse de doctorat en Santé des Populations de Monsieur Birama Apho Ly qui est intitulée « *Déterminants de l'utilisation de la télémédecine au Sénégal* ».

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But de l'étude

L'étude vise à étudier l'intention des médecins des Hôpitaux du Sénégal d'utiliser la télémédecine.

Description de ce qui est attendu des participants

Votre contribution dans cette étude consistera à remplir un questionnaire autoadministrable. Cela vous prendra environ 15 minutes. À travers ce questionnaire, vous serez interrogés sur vos caractéristiques sociodémographiques et sur les construits de la théorie du comportement planifié.

Avantages ou inconvénients

Le fait de participer à cette étude vous offre l'occasion de contribuer à la détermination de l'intention des médecins des Hôpitaux du Sénégal d'utiliser la télémédecine. Cette détermination est très importante pour le succès des futures interventions de télémédecine. Par ailleurs, le fait de consacrer 15 minutes de votre temps à cette recherche pourrait nuire à votre agenda déjà probablement chargé.

Participation volontaire et droit de retrait

Vous êtes libre de participer à cette étude. Vous êtes aussi libre de refuser sans conséquence négative ou préjudice et sans avoir à justifier votre décision. Aucune personne ne sera informée de votre décision d'accepter ou non de participer à l'étude. Si vous décidez de ne pas participer, il est important de prévenir le chercheur dont les coordonnées sont incluses dans ce document. Toutes les informations que vous avez fournies seront alors détruites.

Coordonnées des participants

Nous ne disposons pas et nous ne chercherons pas à disposer de vos coordonnées personnelles. Nous ne disposons que de vos coordonnées de

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services. Ces dernières nous ont été fournies par le Ministère de la Santé, afin de nous permettre de communiquer avec vous. Toutefois, ces coordonnées ne seront pas utilisées dans nos analyses.

Confirmation de participation

Dans la période du 21 janvier 2015 au 1er avril 2015, vous recevrez un appel téléphonique pour confirmer votre intérêt à participer à cette étude.

Confidentialité et gestion des données

La confidentialité des informations fournies par les participants sera assurée par les mesures suivantes :

- les noms des participants ne paraîtront dans aucun rapport;
- les divers documents de la recherche seront codifiés et seul le chercheur aura accès à la liste des noms et des codes;
- les résultats individuels des participants ne seront jamais communiqués;
- Les données vous concernant seront conservées pendant 5 ans. Elles seront conservées en lieu sûr dont l'accès ne sera autorisé qu'à l'étudiant et à son encadrement. Elles seront détruites après ces 5 ans, précisément le 1er avril 2020.
- Le matériel et les données seront conservés sous clé et l'accès au fichier contenant les données électroniques sera protégé par un mot de passe;
- La recherche fera l'objet de publications dans une revue scientifique, et aucun participant ne pourra y être identifié ou reconnu;
- Un résumé des résultats de la recherche sera expédié aux participants qui en feront la demande en indiquant l'adresse où ils aimeraient recevoir le document, juste après l'espace prévu pour leur signature.
- La liste des participants de la recherche ainsi que leurs coordonnées seront conservées pendant au moins un an après la fin du projet, de manière à ce que, en cas de nécessité, ceux-ci puissent être rejoints

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rapidement.

Renseignements supplémentaires

Si vous avez des questions sur l'étude ou sur les implications de votre participation, veuillez communiquer avec le Dr Birama Apho LY, étudiant au Doctorat en Santé des Populations de l'Université d'Ottawa, aux coordonnées suivantes :

- **Sénégal :**

- o Centre Interdisciplinaire de Recherche et d'Expertise en Télémédecine/E. santé (CIRET)
- o Faculté de Médecine, de Pharmacie et d'Odontostomatologie (FMPOS)
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Remerciements

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Appendix 17: Consent form for physicians working in public hospitals - Intention to use telemedicine in professional activities

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Formulaire de consentement

Titre du Projet

Étude de l'intention des médecins des Hôpitaux du Sénégal d'utiliser la télémedicine.

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- o E.mail : bly022@uottawa.ca ou apholyca@yahoo.fr.

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- o Université d'Ottawa, 1, Stewart, Pièce 230, Ottawa, Canada, K1N 6N5
- o Téléphone portable : (+1) 819-921-1880
- o Courriel : Bly022@uottawa.ca ou apholyca@yahoo.fr.

Remerciements

Votre collaboration est précieuse pour nous permettre de réaliser cette étude et nous vous remercions d'y participer.

Signatures

Je soussigné (e) _____

consens librement à participer à cette partie de l'étude intitulée : « Déterminants de l'utilisation de la télémédecine au Sénégal ». J'ai pris connaissance du formulaire et j'ai compris le but, la nature, les avantages, les risques et les inconvénients du projet de recherche. Je suis satisfait (e)

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des explications, précisions et réponses que le chercheur m'a fournies, le cas échéant, quant à ma participation à ce projet.

Signature du participant, de la participante

Date

Un résumé des résultats de la recherche sera expédié aux participants qui en feront la demande et qui indiqueront leur adresse. Les résultats ne seront pas disponibles avant août 2015.

Si cette adresse changeait d'ici cette date, vous êtes invité (e) à informer Birama Apho LY de la nouvelle adresse où vous souhaitez recevoir ce document.

L'adresse électronique ou postale à laquelle je souhaite recevoir les résultats est la suivante : _____

J'ai expliqué le but, la nature, les avantages, les risques et les inconvénients du projet de recherche au participant. J'ai répondu au meilleur de mes connaissances aux questions posées et j'ai vérifié la compréhension du participant.

Signature de l'enquêteur

Date

Plaintes ou critiques

Toute plainte ou critique sur ce projet de recherche pourra être adressée au responsable de l'éthique de la recherche :

Bureau d'éthique et d'intégrité de la recherche de l'Université d'Ottawa

- Pavillon Tabaret, 550, rue Cumberland, Pièce 154, Ottawa, Canada, K1N 6N5
- Téléphone de Bureau : (+1) 613-562-5387/Fax : (+1) 613-562-5338
- Courriel : ethique@uOttawa.ca

Comité national d'Éthique pour la Recherche en Santé (CNERS) du Sénégal

- Rue Aime Césaire, Fann Residence Dakar, Sénégal, BP 4024, Dakar Fann

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- Téléphone : (+221) 33 869 /Fax : (+221) 33 869
- Courriel : cnrs2008@live.fr
- Site internet : www.der.sn

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Appendix 18: Questionnaire for physicians working in district health centres -

Intention to use telemedicine in professional activities

Ce questionnaire est destiné à l'étude de l'intention des médecins des centres de santé de district du Sénégal d'utiliser la télémedecine dans leurs activités professionnelles. Nous vous prions de bien vouloir le remplir et nous le retourner, dans les deux semaines qui suivent sa réception, à l'adresse bly022@uottawa.ca ou apholyca@hotmail.com ou à la direction régionale de la santé. La confidentialité et l'anonymat de vos informations seront rigoureusement respectés.

- **La télémedecine est définie comme l'exercice de la médecine à distance. Elle implique l'utilisation des technologies de l'information et de la communication (ordinateur, téléphone, tablette, fax et autres) et englobe le diagnostic, le traitement, le suivi et la formation.**
- **Par activités professionnelles, nous entendons les activités de diagnostic, de traitement, de suivi et de formation qui font partie de vos devoirs de médecin-chef de district.**

1. N° du questionnaire : /___/___/(réservez à l'équipe de recherche)

Pour répondre aux questions, inscrire la bonne réponse ou mettre une croix dans les espaces réservés à cet effet.

2. Date d'administration du questionnaire : /___/___/20___/

3. Téléphone : /_____/

4. Courriel : /_____/

5. Région médicale : /_____/

6. Centre de santé : /_____/

7. Date de naissance : /___/___/___/

8. Sexe : Homme : /___/ Femme : /___/

9. Spécialité médicale : /_____/

10. Nombre d'années dans le présent centre : /___/

11. Nombre d'années de pratique médicale : /___/

12. Statut professionnel : Fonctionnaire/___/Autre/___/

Si autre, précisez : /_____/

13. Est-ce que vous utilisez la télémedecine dans vos activités professionnelles?

☐	☐	☐	☐	☐	☐	☐
Jamais	Très rarement	Rarement	Ni l'un, ni l'autre	Souvent	Très souvent	Toujours

14. Utiliser la télémedecine dans mes activités professionnelles au cours des 12 prochains mois me permettrait...

a. de faire soigner mes malades à distance

☐	☐	☐	☐	☐	☐	☐
Très improbable	Assez improbable	Légèrement improbable	Ni l'un, ni l'autre	Légèrement probable	Assez Probable	Très probable

b. de me former du point de vue professionnel

Très improbable	Assez improbable	Légèrement improbable	Ni l'un, ni l'autre	Légèrement probable	Assez Probable	Très probable

c. d'avoir à distance l'avis des experts

Très improbable	Assez improbable	Légèrement improbable	Ni l'un, ni l'autre	Légèrement probable	Assez Probable	Très probable

d. de réduire les dépenses encourues par mes malades

Très improbable	Assez improbable	Légèrement improbable	Ni l'un, ni l'autre	Légèrement probable	Assez Probable	Très probable

15. Pensez-vous que les personnes suivantes approuveraient/désapprouveraient que vous utilisiez la télémédecine dans vos activités professionnelles au cours des 12 prochains mois?

a. Mes collègues médecins du secteur public

Désapprouveraient très fortement	Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement	Approuveraient très fortement

b. Mes patients

Désapprouveraient très fortement	Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement	Approuveraient très fortement

c. Le ministère de la Santé

Désapprouveraient très fortement	Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement	Approuveraient très fortement

d. La population qui est sous ma responsabilité

Désapprouveraient très fortement	Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement	Approuveraient très fortement

16. Je me sens capable d'utiliser la télémédecine dans mes activités professionnelles au cours des 12 prochains mois.

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

17. J'utiliserais la télémédecine dans mes activités professionnelles au cours des 12 prochains mois,...

a. Si je suis capable de communiquer avec les répondants

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

b. Même si je n'ai pas beaucoup de temps

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

c. Même si je ne suis pas capable d'assurer la sécurité des données de mes patients

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

18. J'ai l'intention d'utiliser la télémédecine dans mes activités professionnelles au cours des 12 prochains mois.

Très improbable	Assez improbable	Légèrement improbable	Ni l'un, ni l'autre	Légèrement probable	Assez probable	Très probable

19. Pour moi, utiliser la télémédecine dans mes activités professionnelles au cours des 12 prochains mois serait...

a.

Très Inutile	Assez inutile	Légèrement Inutile	Ni l'un, ni l'autre	Légèrement Utile	Assez Utile	Très Utile

b.

Très Nuisible	Assez Nuisible	Légèrement Nuisible	Ni l'un, ni l'autre	Légèrement bénéfique	Assez bénéfique	Très Bénéfique

c.

Très Imprudent	Assez imprudent	Légèrement imprudent	Ni l'un, ni l'autre	Légèrement prudent	Assez prudent	Très prudent

20. Utiliser la télémédecine dans mes activités professionnelles au cours des 12 prochains mois me permettrait...

a. d'éviter l'évacuation sanitaire de certains de mes malades

Très improbable	Assez improbable	Légèrement improbable	Ni l'un, ni l'autre	Légèrement probable	Assez Probable	Très probable

b. de gagner du temps

Très improbable	Assez improbable	Légèrement improbable	Ni l'un, ni l'autre	Légèrement probable	Assez Probable	Très probable

c. d'éviter les erreurs médicales

Très improbable	Assez improbable	Légèrement improbable	Ni l'un, ni l'autre	Légèrement probable	Assez Probable	Très probable

21. Pour moi, utiliser la télémédecine dans mes activités professionnelles au cours des 12 prochains mois serait...

Très difficile	Assez difficile	Un peu difficile	Ni l'un, ni l'autre	Un peu facile	Assez facile	Très facile

22. Pensez-vous que les personnes suivantes approuveraient/désapprouveraient que vous utilisiez la télémédecine dans vos activités professionnelles au cours des 12 prochains mois?

a. Les paramédicaux (infirmiers, sages-femmes, aides-soignants..) qui sont sous ma responsabilité

Désapprouveraient très fortement	Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement	Approuveraient très fortement

b. Mon Médecin-chef de région

Désapprouveraient très fortement	Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement	Approuveraient très fortement

c. Les universitaires avec qui je suis en relation

Désapprouveraient très fortement	Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement	Approuveraient très fortement

d. Les partenaires techniques et financiers avec qui je suis en relation

Désapprouveraient très fortement	Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement	Approuveraient très fortement

23. Je vais utiliser la télémédecine dans mes activités professionnelles au cours des 12 prochains mois.

Très improbable	Assez improbable	Légèrement improbable	Ni l'un, ni l'autre	Légèrement probable	Assez probable	Très probable

24. La probabilité que j'utilise la télémédecine dans mes activités professionnelles au cours des 12 prochains mois est :

Très faible	Assez faible	Légèrement faible	Ni l'un, ni l'autre	Légèrement forte	Assez forte	Très forte

25. J'utiliserais la télémédecine dans mes activités professionnelles au cours des 12 prochains mois,...

a. Si je suis capable d'obtenir l'adhésion de la population qui est sous ma responsabilité à l'utilisation de la télémédecine

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

b. Si je suis capable d'obtenir le consentement éclairé de mes malades

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

c. Même si je ne suis pas capable de faire la maintenance des équipements de télémédecine

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

26. Si je le voulais, je pourrais facilement utiliser la télémédecine dans mes activités professionnelles au cours des 12 prochains mois.

Très en désaccord	Assez en désaccord	Légèrement en désaccord	Ni l'un, ni l'autre	Légèrement en accord	Assez en accord	Très en accord

**Appendix 19: Information sheet for physicians working in district health centres -
Intention to use telemedicine in professional activities**



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Feuillet d'information

Titre du Projet

Étude de l'intention des médecins des centres de santé de district du Sénégal d'utiliser la télémédecine.

Présentation des chercheurs

Chercheur principal : Birama Apho Ly

- Doctorant en Santé des Populations
- Institut de recherche sur la santé des populations
- Faculté des études supérieures et postdoctorales
- Université d'Ottawa, 1, Stewart, Pièce 230, Ottawa, Canada, K1N 6N5
- Téléphone portable : Canada : (+1) 819-921-1880
Sénégal : (+221) 77-256-1824
- Courriel : Bly022@uottawa.ca ou apholyca@yahoo.fr.

Superviseur : Roland Labonté

- Chaire de recherche du Canada en mondialisation et équité en matière de santé
- Professeur titulaire, Faculté de médecine
- Institut de recherche sur la santé des populations
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- Téléphone portable : (+1) 613-818-6579

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- Courriel: rlabonte@uottawa.ca

Co-superviseur : Ivy Lynn Bourgeault

- Professeure, École interdisciplinaire des sciences de la santé
- Chaire de recherche IRSC/Santé Canada sur les ressources humaines en santé
- Directrice scientifique, Réseau ontarien de recherche sur les ressources humaines en santé
- Directrice scientifique, Réseau de recherche sur l'amélioration de la santé des populations (RRASP)
- Institut de recherche sur la santé des populations
- Faculté des études supérieures et postdoctorales
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- Téléphone de bureau : (+1) 613-562-5800 ext. 8614/Fax : (+1) 613-562-5658
- Courriel : ivy.bourgeault@uottawa.ca

Chercheur associé : Pr Mbayang Ndiaye NIANG

- Spécialiste des maladies neuromusculaires
- Chef de service du laboratoire de physiologie et d'explorations fonctionnelles de l'Université Cheikh Anta Diop de Dakar
- Conseiller technique responsable de la télésanté du Ministère de la Santé et de la Prévention du Sénégal
- Téléphone : (+221) 76-589-0420
- Fax : (+221) 33-825-2952
- Courriel : mbaniang@yahoo.fr

Contexte

Cette étude porte sur l'intention des médecins des centres de santé de district du Sénégal d'utiliser la télémédecine. Elle représente une partie de la thèse de doctorat en Santé des Populations de Monsieur Birama Apho Ly qui est intitulée « *Déterminants de l'utilisation de la télémédecine au Sénégal* ».

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But de l'étude

L'étude vise à étudier l'intention des médecins des centres de santé de district du Sénégal d'utiliser la télémédecine.

Description de ce qui est attendu des participants

Votre contribution dans cette étude consistera à remplir un questionnaire autoadministrable. Cela vous prendra environ 15 minutes. À travers ce questionnaire, vous serez interrogés sur vos caractéristiques sociodémographiques et sur les construits de la théorie du comportement planifié.

Avantages ou inconvénients

Le fait de participer à cette étude vous offre l'occasion de contribuer à la détermination de l'intention des médecins des centres de santé de district du Sénégal d'utiliser la télémédecine. Cette détermination est très importante pour le succès des futures interventions de télémédecine. Par ailleurs, le fait de consacrer 15 minutes de votre temps à cette recherche pourrait nuire à votre agenda déjà probablement chargé.

Participation volontaire et droit de retrait

Vous êtes libre de participer à cette étude. Vous êtes aussi libre de refuser sans conséquence négative ou préjudice et sans avoir à justifier votre décision. Aucune personne ne sera informée de votre décision d'accepter ou non de participer à l'étude. Si vous décidez de ne pas participer, il est important de prévenir le chercheur dont les coordonnées sont incluses dans ce document. Toutes les informations que vous avez fournies seront alors détruites.

Coordonnées des participants

Nous ne disposons pas et nous ne chercherons pas à disposer de vos coordonnées personnelles. Nous ne disposons que de vos coordonnées de

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services. Ces dernières nous ont été fournies par le Ministère de la Santé, afin de nous permettre de communiquer avec vous. Toutefois, ces coordonnées ne seront pas utilisées dans nos analyses.

Confirmation de participation

Dans la période du 21 janvier 2015 au 1er avril 2015, vous recevrez un appel téléphonique pour confirmer votre intérêt à participer à cette étude.

Confidentialité et gestion des données

La confidentialité des informations fournies par les participants sera assurée par les mesures suivantes :

- les noms des participants ne paraîtront dans aucun rapport;
- les divers documents de la recherche seront codifiés et seul le chercheur aura accès à la liste des noms et des codes;
- les résultats individuels des participants ne seront jamais communiqués;
- Les données vous concernant seront conservées pendant 5 ans. Elles seront conservées en lieu sûr dont l'accès ne sera autorisé qu'à l'étudiant et à son encadrement. Elles seront détruites après ces 5 ans, précisément le 1er avril 2020.
- Le matériel et les données seront conservés sous clé et l'accès au fichier contenant les données électroniques sera protégé par un mot de passe;
- La recherche fera l'objet de publications dans une revue scientifique, et aucun participant ne pourra y être identifié ou reconnu;
- Un résumé des résultats de la recherche sera expédié aux participants qui en feront la demande en indiquant l'adresse où ils aimeraient recevoir le document, juste après l'espace prévu pour leur signature.
- La liste des participants de la recherche ainsi que leurs coordonnées seront conservées pendant au moins un an après la fin du projet, de manière à ce que, en cas de nécessité, ceux-ci puissent être rejoints

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rapidement.

Renseignements supplémentaires

Si vous avez des questions sur l'étude ou sur les implications de votre participation, veuillez communiquer avec le Dr Birama Apho LY, étudiant au Doctorat en Santé des Populations de l'Université d'Ottawa, aux coordonnées suivantes :

- **Sénégal :**

- o Centre Interdisciplinaire de Recherche et d'Expertise en Télémédecine/E. santé (CIRET)
- o Faculté de Médecine, de Pharmacie et d'Odontostomatologie (FMPOS)
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Remerciements

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**Appendix 20: Consent form for physicians working in district health centres -
Intention to use telemedicine in professional activities**



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Formulaire de consentement

Titre du Projet

Étude de l'intention des médecins des centres de santé de district du Sénégal d'utiliser la télémédecine.

Présentation des chercheurs

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- les divers documents de la recherche seront codifiés et seul le chercheur aura accès à la liste des noms et des codes;
- les résultats individuels des participants ne seront jamais communiqués;
- Les données vous concernant seront conservées pendant 5 ans. Elles seront conservées en lieu sûr dont l'accès ne sera autorisé qu'à l'étudiant et à son encadrement. Elles seront détruites après ces 5 ans, précisément le 1er avril 2020.
- Le matériel et les données seront conservés sous clé et l'accès au fichier contenant les données électroniques sera protégé par un mot de passe;
- La recherche fera l'objet de publications dans une revue scientifique, et aucun participant ne pourra y être identifié ou reconnu;
- Un résumé des résultats de la recherche sera expédié aux participants qui en feront la demande en indiquant l'adresse où ils aimeraient recevoir le document, juste après l'espace prévu pour leur signature.
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Renseignements supplémentaires

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- o Université Cheikh Anta Diop de Dakar (UCAD)
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- o Institut de recherche sur la santé des populations
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- o Courriel : Bly022@uottawa.ca ou apholyca@yahoo.fr.

Remerciements

Votre collaboration est précieuse pour nous permettre de réaliser cette étude et nous vous remercions d'y participer.

Signatures

Je soussigné (e) _____

consens librement à participer à cette partie de l'étude intitulée : « Déterminants de l'utilisation de la télémédecine au Sénégal ». J'ai pris connaissance du formulaire et j'ai compris le but, la nature, les avantages, les risques et les inconvénients du projet de recherche. Je suis satisfait (e)

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des explications, précisions et réponses que le chercheur m'a fournies, le cas échéant, quant à ma participation à ce projet.

Signature du participant, de la participante

Date

Un résumé des résultats de la recherche sera expédié aux participants qui en feront la demande et qui indiqueront leur adresse. Les résultats ne seront pas disponibles avant août 2015.

Si cette adresse changeait d'ici cette date, vous êtes invité (e) à informer Birama Apho LY de la nouvelle adresse où vous souhaitez recevoir ce document.

L'adresse électronique ou postale à laquelle je souhaite recevoir les résultats est la suivante : _____

J'ai expliqué le but, la nature, les avantages, les risques et les inconvénients du projet de recherche au participant. J'ai répondu au meilleur de mes connaissances aux questions posées et j'ai vérifié la compréhension du participant.

Signature de l'enquêteur

Date

Plaintes ou critiques

Toute plainte ou critique sur ce projet de recherche pourra être adressée au responsable de l'éthique de la recherche :

Bureau d'éthique et d'intégrité de la recherche de l'Université d'Ottawa

- Pavillon Tabaret, 550, rue Cumberland, Pièce 154, Ottawa, Canada, K1N 6N5
- Téléphone de Bureau : (+1) 613-562-5387/Fax : (+1) 613-562-5338
- Courriel : ethique@uOttawa.ca

Comité national d'Éthique pour la Recherche en Santé (CNERS) du Sénégal

- Rue Aime Césaire, Fann Residence Dakar, Sénégal, BP 4024, Dakar Fann

- Téléphone : (+221) 33 869 /Fax : (+221) 33 869
- Courriel : cnrs2008@live.fr
- Site internet : www.der.sn

Université d'Ottawa
Institut de recherche
sur la santé des
populations

University of Ottawa
Institute of Population
Health

1 Stewart
Ottawa ON K1N 6N5
Canada

www.uOttawa.ca

Appendix 21: Questions to experts for questionnaire content analysis**Questions adressées aux experts pour l'analyse de contenu**

Ces questionnaires a été développés pour évaluer l'intention des médecins sénégalais envers l'utilisation de la télémédecine dans leurs activités quotidiennes. Ils ont été construits en se basant sur la Théorie du Comportement planifié (Godin, 2012). Nous voulons juste noter que les croyances comportementales, normatives et de contrôle viennent des entretiens conduits auprès des médecins des hôpitaux et des centres de santé de district du Sénégal.

Comme vous êtes des experts de la Théorie du comportement planifié et de l'intention envers la télémédecine, nous vous seront reconnaissants de réviser ces questionnaires et de répondre aux questions suivantes :

- Les items sont ils pertinents pour nos objectifs? Pourquoi ?
- Que pensez-vous de la longueur des questionnaires?
- Est-ce qu'il y a des items qui pourraient être supprimés (c.-à-d. des items qui ne sont pas importants)?
- Est-ce qu'il y a des items qui pourraient être ajoutés (c.-à-d. des items importants qui manquent)?
- Est ce qu'il y a des items qui ne sont pas clairs?
- Avez-vous d'autres suggestions ou commentaires pour nous?

Nous vous remercions pour votre temps!

La version anglaise suit/ English version follows

Questions to experts for content analysis

These questionnaires have been developed to assess intention of Senegal's physicians towards the use of telemedicine in their daily activities. They were built on the theory of planned behaviour (Godin, 2012). Just note that behavioural, normative and control beliefs came from interviews with Senegal hospitals and district health centers Physicians.

As you are experts in the theory of planned behaviour and /or intention towards telemedicine, I would be very grateful if you would carefully review the questionnaires and answer the following questions:

- Are these items all relevant to my objectives? Please explain
- What do you think about the questionnaire length?
- Are there any items that could be removed (e.g. are all items important)?
- Are there any items that could be added (e.g. important items that miss)?
- Are there any items that are unclear?
- Do you have any other suggestions or comments for us?

Thank you very much for your time!

Appendix 22: Non-validated questionnaire for Senegalese physicians who work in public hospitals - Intention to use telemedicine in professional activities

Questionnaire destiné à l'étude de l'intention des médecins hospitaliers du Sénégal d'utiliser la télémedecine dans leurs activités quotidiennes

Description du questionnaire

Il s'agit d'un questionnaire destiné à l'étude de l'intention des médecins hospitaliers du Sénégal d'utiliser la télémedecine dans leurs activités quotidiennes. Cette étude est une partie de la thèse de doctorat en santé des populations de Birama Apho LY. La confidentialité et l'anonymat de vos informations seront rigoureusement respectés.

Information sur le questionnaire

1. N° du questionnaire : /___/___/
2. Date d'administration du questionnaire : /___/___/2014

Informations sur les variables externes

3. Région médicale : /_____/
4. Hôpital : /_____/
5. Service : /_____/
6. Âge: /___/ ans
7. Sexe : Homme : /___/ Femme : /___/
8. Spécialité médicale : /_____/
9. Grade : Professeur Titulaire /___/ Professeur Agrégé /___/ Assistant chef de clinique /___/ Assistant /___/ CES /___/ Autre /___/
- Si autre, précisez /_____/
10. Nombre d'années dans le présent hôpital : /___/
11. Nombre d'années de pratique médicale : /___/
12. Statut professionnel : Fonctionnaire /___/ Autre /___/
- Si autre, précisez : /_____/
13. Pays d'obtention du doctorat en médecine générale : /_____/
14. Université d'obtention du doctorat en médecine générale : /_____/
15. Année d'obtention du doctorat en médecine générale : /___/
16. Pays d'obtention de la spécialité médicale : /_____/
17. Université d'obtention de la spécialité médicale : /_____/
18. Année d'obtention de la spécialité médicale : /___/

Information sur l'utilisation de la télémedecine

19. Est-ce que vous utilisez la télémedecine dans vos activités quotidiennes ?

Jamais	Très rarement	Rarement	Souvent	Très souvent	Toujours

Informations sur les variables directes**20. Attitude****20.1. Croyances comportementales**

Si j'utilisais chaque jour la télémédecine dans mes activités quotidiennes au cours des 12 prochains mois, cela...

a. Me permettrait de contribuer à la formation du personnel de santé

Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable

b. Me permettrait d'échanger avec mes collègues du niveau national

Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable

c. Me permettrait de soigner les malades à distance

Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable

d. Me permettrait d'avoir l'avis des experts à distance

Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable

e. Me permettrait de me former

Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable

f. Me permettrait de poser des diagnostics à distance

Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable

g. Me permettrait d'améliorer l'accès des populations aux soins

Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable

h. Me permettrait d'éviter l'évacuation sanitaire de certains malades

Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable

i. Me permettrait d'échanger avec mes collègues du niveau international

Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable

j. Permettrait de gagner du temps				
Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable
k. Permettrait de mieux préparer les évacuations sanitaires indispensables				
Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable
l. Quand j'utilise la télémédecine, les médecins de la périphérie se déplaceront moins hors de leur région				
Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable
m. Me permettrait d'interpréter les résultats à distance				
Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable
n. Il y aura des erreurs diagnostiques				
Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable
o. Il y aura des erreurs thérapeutiques				
Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable
p. La sécurité des données de mes malades ne sera pas garantie				
Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable

21. Normes

21.1. Norme subjective

a. La plupart des personnes qui sont importantes pour moi me recommanderaient d'utiliser la télémédecine dans mes activités quotidiennes au cours des 12 prochains mois.

Très en désaccord	Plutôt en désaccord	Ni l'un, ni l'autre	Plutôt en accord	Très en accord

b. Si j'exerçais la télémédecine dans mes activités quotidiennes au cours des 12 prochains mois, la plupart des personnes qui sont importantes pour moi....

Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement
c. Les personnes les plus importantes pour moi pensent que je devrais utiliser la télémédecine dans mes activités quotidiennes au cours des 12 prochains mois.				
Très en désaccord	Plutôt en désaccord	Ni l'un, ni l'autre	Plutôt en accord	Très en accord

21.2. Croyances normatives

Pensez-vous que les personnes suivantes approuveraient/désapprouveraient que vous utilisez la télémédecine dans mes activités quotidiennes?

a. Les médecins

Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement

b. Les patients

Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement

c. Les infirmiers

Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement

d. Les techniciens supérieurs

Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement

e. Les sages femmes

Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement

f. Les administrateurs de l'hôpital

Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement

g. Le ministre de la santé

Désapprouverait fortement	Désapprouverait légèrement	Ni l'un, ni l'autre	Approuverait légèrement	Approuverait fortement

h. La population

Désapprouverait fortement	Désapprouverait légèrement	Ni l'un, ni l'autre	Approuverait légèrement	Approuverait fortement

i. Les étudiants

Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement

j. Les autorités politiques

Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement

k. Le directeur de l'hôpital

Désapprouverait fortement	Désapprouverait légèrement	Ni l'un, ni l'autre	Approuverait légèrement	Approuverait fortement

l. Les professeurs

Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement

m. Le chef de service

Désapprouverait fortement	Désapprouverait légèrement	Ni l'un, ni l'autre	Approuverait légèrement	Approuverait fortement

n. Les partenaires techniques et financiers

Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement

o. Le doyen de la Faculté de Médecine

Désapprouverait fortement	Désapprouverait légèrement	Ni l'un, ni l'autre	Approuverait légèrement	Approuverait fortement

p. Les syndicalistes

Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement

21.3. Norme descriptive

a. Plusieurs des médecins que je connais utilisent la télémédecine dans leurs activités quotidiennes.

Très	Plutôt en	Ni l'un, ni l'autre	Plutôt en accord	Très

en désaccord		désaccord				en accord	
b. Selon toi, parmi les 3 médecins que tu connais le mieux, combien utilisent la télémédecine dans leurs activités quotidiennes.							
Aucun		1 seul médecin		2 médecins		3 Médecins	
c. Selon vous, quelle est la proportion des médecins qui utilisent la télémédecine dans leurs activités quotidiennes.							
10 % et moins		20 %		30 %		40 %	
50 %		60 %		70 %		80 %	
90 % et plus							
d. Selon vous, quelle est la proportion des médecins de votre entourage qui utilisent la télémédecine dans leurs activités quotidiennes.							
Aucune		Le quart		La moitié		Les trois quarts	
0 %		25 %		50 %		75 %	
100 %							

22. Contrôle perçu

22.1. Perception du Contrôle

a. Pour moi, utiliser la télémédecine dans mes activités quotidiennes au cours des 12 prochains mois serait...						
Très difficile	Assez difficile	Un peu difficile	Ni l'un, ni l'autre	Un peu facile	Assez facile	Très facile
b. Si je le voulais, je pourrais facilement utiliser la télémédecine dans mes activités quotidiennes au cours des 12 prochains mois.						
Très improbable	Assez improbable	Légèrement improbable	Ni l'un, ni l'autre	Légèrement probable	Assez probable	Très probable
c. Je me sens capable d'utiliser la télémédecine dans mes activités quotidiennes au cours des 12 prochains mois.						
Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord
d. À quel point croyez-vous exercer un contrôle sur le fait d'utiliser la télémédecine dans vos activités quotidiennes au cours des 12 prochains mois.						
Très incontrôlable	Assez incontrôlable	Un peu incontrôlable	Ni l'un, ni l'autre	Un peu contrôlable	Assez contrôlable	Très contrôlable

e. Il n'en tient qu'à moi d'utiliser la télémédecine dans mes activités quotidiennes au cours des 12 prochains mois.

Très en désacco rd	Assez en désacco rd	Un peu en désacco rd	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

22.2. Croyances de contrôle

J'utiliserais la télémédecine dans mes activités quotidiennes au cours des 12 prochains mois,...

a. Même si la connexion internet n'est pas stable

Très en désacco rd	Assez en désacco rd	Un peu en désacco rd	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

c. Même si la sécurité des données de mes patients n'est garantie

Très en désacco rd	Assez en désacco rd	Un peu en désacco rd	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

d. Même si je n'ai pas beaucoup de temps

Très en désacco rd	Assez en désacco rd	Un peu en désacco rd	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

e. Même si certains la maintenance du matériel n'est faite

Très en désacco rd	Assez en désacco rd	Un peu en désacco rd	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

f. Même si les infrastructures ne sont pas adaptées

Très en désacco rd	Assez en désacco rd	Un peu en désacco rd	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

g. Même si les répondants ne sont pas disponibles

Très en désacco rd	Assez en désacco rd	Un peu en désacco rd	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

h. Même si je suis surchargé par le travail

Très en désacco rd	Assez en désacco rd	Un peu en désacco rd	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

i. Même si je ne suis pas formé sur la manipulation des équipements de télémédecine

Très en désacco rd	Assez en désacco rd	Un peu en désacco rd	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

j. Même si la population n'adhère pas à l'utilisation de la télémédecine

Très en désacco rd	Assez en désacco rd	Un peu en désacco rd	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

k. Même s'il n'y pas d'agent qualifié sur la maintenance des équipements de télémédecine

Très en désacco rd	Assez en désacco rd	Un peu en désacco rd	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

l. Même s'il n'y a pas de technicien qualifié sur la manipulation des équipements de télémédecine

Très en désacco rd	Assez en désacco rd	Un peu en désacco rd	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

m. Malgré la susceptibilité des répondants

Très en désacco rd	Assez en désacco rd	Un peu en désacco rd	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

n. Malgré l'impatience des répondants

Très en désacco rd	Assez en désacco rd	Un peu en désacco rd	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

o. Malgré le manque d'organisation dans les services

Très en désacco rd	Assez en désacco rd	Un peu en désacco rd	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

p. Malgré le manque de personnel

Très en désacco rd	Assez en désacco rd	Un peu en désacco rd	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

q. Malgré les pannes techniques

Très en désacco rd	Assez en désacco rd	Un peu en désacco rd	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

23. Intention

a. J'ai l'intention d'utiliser la télémédecine dans mes activités quotidiennes au cours des 12 prochains mois.

Très improba ble	Assez improba ble	Légèrement improba ble	Ni l'un, ni l'autre	Légèrement probable	Assez probabl e	Très probabl e

b. Je vais utiliser la télémédecine dans mes activités quotidiennes au cours des 12 prochains mois.

Très improba ble	Assez improba ble	Légèrement improba ble	Ni l'un, ni l'autre	Légèrement probable	Assez probabl e	Très probabl e

c. Je vais essayer d'utiliser la télémédecine dans mes activités quotidiennes au cours des 12 prochains mois.

Très improba ble	Assez improba ble	Légèrement improba ble	Ni l'un, ni l'autr e	Légèrement probable	Assez probab le	Très probab le

Appendix 23: Non-validated questionnaire for Senegalese physicians who work in district health centres - Intention to use telemedicine in professional activities

Questionnaire destiné à l'étude de l'intention des médecins des centres de santé de district du Sénégal d'utiliser la télémedecine dans leurs activités quotidiennes

Description du questionnaire

Il s'agit d'un questionnaire destiné à l'étude de l'intention des médecins des centres de santé de district du Sénégal d'utiliser la télémedecine dans leurs activités quotidiennes. Cette étude est une partie de la thèse de doctorat en santé des populations de Birama Apho LY. La confidentialité et l'anonymat de vos informations seront rigoureusement respectés.

Information sur le questionnaire

1. N° du questionnaire : /___/___/
2. Date d'administration du questionnaire : /___/___/2014

Informations sur les variables externes

3. Région médicale : /_____/
4. Centre de santé : /_____/
5. Âge: /___/ ans
6. Sexe : Homme : /___/ Femme : /___/
7. Spécialité médicale : /_____/
8. Nombre d'années dans le présent centre : /___/
9. Nombre d'années de pratique médicale : /___/
10. Statut professionnel : Fonctionnaire /___/ Autre /___/
- Si autre, précisez : /_____/
11. Pays d'obtention du doctorat de médecine générale : /_____/
12. Université d'obtention du doctorat de médecine générale : /_____/
13. Année d'obtention du doctorat de médecine générale : /___/
14. Si spécialiste, répondez à la question 15 à 17
15. Pays d'obtention de la spécialité médicale : /_____/
16. Université d'obtention de la spécialité médicale : /_____/
17. Année d'obtention de la spécialité médicale : /___/

Information sur l'utilisation de la télémedecine

18. Est-ce que vous utilisez la télémedecine dans vos activités quotidiennes ?

Jamais	Très rarement	Rarement	Souvent	Très souvent	Toujours

Informations sur les variables directes

19. Attitude

19.1. Croyances comportementales

Si j'utilisais chaque jour la télémedecine dans mes activités quotidiennes au cours des 12 prochains mois, cela...

- a. Me permettrait de faire soigner mes malades à distance

	Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable
b. Me permettrait de me former					
	Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable
c. Me permettrait d'échanger avec mes collègues					
	Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable
d. Me permettrait d'avoir un diagnostic à distance					
	Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable
e. Me permettrait d'avoir à distance l'avis des experts					
	Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable
f. Me permettrait de réduire les dépenses des malades					
	Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable
g. Me permettrait d'éviter l'évacuation sanitaire de certains malades					
	Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable
h. Me permettrait de gagner du temps					
	Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable
i. Me permettrait d'améliorer la qualité des évacuations sanitaires indispensables					
	Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable
j. Permettrait de me déplacer moins hors de ma région					
	Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable
k. Permettrait de réduire les dépenses du centre					

Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable

l. Il y aura des erreurs diagnostiques

Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable

m. Il y aura des erreurs thérapeutiques

Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable

n. Mon personnel sera dépendant de la télémédecine

Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable

o. Mon personnel abusera de la télémédecine en me sollicitant même pour les cas les plus banaux

Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable

p. La sécurité des données de mes patients ne sera pas garantie

Très improbable	Plutôt improbable	Ni l'un, ni l'autre	Plutôt Probable	Très probable

20. Normes

20.1. Norme subjective

a. La plupart des personnes qui sont importantes pour moi me recommanderaient d'utiliser la télémédecine dans mes activités quotidiennes au cours des 12 prochains mois.

Très en désaccord	Plutôt en désaccord	Ni l'un, ni l'autre	Plutôt en accord	Très en accord

b. Si j'exerçais la télémédecine dans mes activités quotidiennes au cours des 12 prochains mois, la plupart des personnes qui sont importantes pour moi...

Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement

c. Les personnes les plus importantes pour moi pensent que je devrais utiliser la télémédecine dans mes activités quotidiennes au cours des 12 prochains mois.

Très en désaccord	Plutôt en désaccord	Ni l'un, ni l'autre	Plutôt en accord	Très en accord

20.2. Croyances normatives

Pensez-vous que les personnes suivantes approuveraient/désapprouveraient que vous utilisez la télémédecine dans vos activités quotidiennes?

a. Les médecins du secteur public

Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement

b. Les patients

Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement

c. Le ministre de la santé

Désapprouverait fortement	Désapprouverait légèrement	Ni l'un, ni l'autre	Approuverait légèrement	Approuverait fortement

d. La population

Désapprouverait fortement	Désapprouverait légèrement	Ni l'un, ni l'autre	Approuverait légèrement	Approuverait fortement

e. Les infirmiers du secteur public

Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement

f. Le Médecin chef de la région

Désapprouverait fortement	Désapprouverait légèrement	Ni l'un, ni l'autre	Approuverait légèrement	Approuverait fortement

g. Les universitaires

Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement

h. Les sages femmes du secteur public

Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement

i. Les partenaires techniques et financiers

Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement

j. Les médecins du secteur privé

Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement

k. Le directeur de l'hôpital

Désapprouverait fortement	Désapprouverait légèrement	Ni l'un, ni l'autre	Approuverait légèrement	Approuverait fortement

l. Le préfet

Désapprouverait fortement	Désapprouverait légèrement	Ni l'un, ni l'autre	Approuverait légèrement	Approuverait fortement

m. Le sous-préfet

Désapprouverait fortement	Désapprouverait légèrement	Ni l'un, ni l'autre	Approuverait légèrement	Approuverait fortement

n. Le maire

Désapprouverait fortement	Désapprouverait légèrement	Ni l'un, ni l'autre	Approuverait légèrement	Approuverait fortement

o. Le président de la communauté rurale (PCR)

Désapprouverait fortement	Désapprouverait légèrement	Ni l'un, ni l'autre	Approuverait légèrement	Approuverait fortement

p. Les médecins traditionnels

Désapprouveraient fortement	Désapprouveraient légèrement	Ni l'un, ni l'autre	Approuveraient légèrement	Approuveraient fortement

20.3. Norme descriptive

a. Plusieurs des médecins que je connais utilisent la télémédecine dans leurs activités quotidiennes.

Très en désaccord	Plutôt en désaccord	Ni l'un, ni l'autre	Plutôt en accord	Très en accord

b. Selon toi, parmi les 3 médecins que tu connais le mieux, combien utilisent la télémédecine dans leurs activités quotidiennes.

Aucun	1 seul médecin	2 médecins	4 Médecins

c. Selon vous, quelle est la proportion des médecins qui utilisent la télémédecine dans leurs activités quotidiennes.

10 % et moins	20 %	30 %	40 %	50 %	60 %	70 %	80 %	90 % et plus

d. Selon vous, quelle est la proportion des médecins de votre entourage qui utilisent la télémédecine dans leurs activités quotidiennes.

Aucune 0 %	Le quart 25 %	La moitié 50 %	Les trois quarts 75 %	Toutes 100 %

21. Contrôle perçu

21.1. Perception du Contrôle

a. Pour moi, utiliser la télémédecine dans mes activités quotidiennes au cours des 12 prochains mois serait...

Très difficile	Assez difficile	Un peu difficile	Ni l'un, ni l'autre	Un peu facile	Assez facile	Très facile

b. Si je le voulais, je pourrais facilement utiliser la télémédecine dans mes activités quotidiennes au cours des 12 prochains mois.

Très improbable	Assez improbable	Légèrement improbable	Ni l'un, ni l'autre	Légèrement probable	Assez probable	Très probable

c. Je me sens capable d'utiliser la télémédecine dans mes activités quotidiennes au cours des 12 prochains mois.

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

d. À quel point croyez-vous exercer un contrôle sur le fait d'utiliser la télémédecine dans vos activités quotidiennes au cours des 12 prochains mois.

Très incontrôlable	Assez incontrôlable	Un peu incontrôlable	Ni l'un, ni l'autre	Un peu contrôlable	Assez contrôlable	Très contrôlable

e. Il n'en tient qu'à moi d'utiliser la télémédecine dans mes activités quotidiennes au cours des 12 prochains mois.

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

21.2. Croyances de contrôle

J'utiliserais la télémédecine dans mes activités quotidiennes au cours des 12 prochains mois,...

a. Malgré le manque de matériel

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

b. Malgré les problèmes de connexion internet

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

c. Malgré les problèmes de courant électrique

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

d. Même si les répondants ne sont pas disponibles

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

e. Malgré le manque de temps

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

f. Même si je suis surchargé par le travail

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

g. Même si la sécurité des données de mes patients n'est pas garantie

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

h. Même si je ne suis pas formé sur la manipulation des équipements de télémédecine

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

DETERMINANTS OF TELEMEDICINE USE IN SENEGAL

mmmm

i. Même si la population n'adhère pas à l'utilisation de la télémédecine

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

j. Même si le malade ne donne pas son consentement éclairé

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

k. Même s'il n'y a pas d'agent qualifié sur la maintenance des équipements de télémédecine

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

l. Malgré le manque de personnel de santé

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

m. Malgré le manque de maintenance

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

n. Malgré les pannes techniques

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

o. Même si les infrastructures ne sont pas adaptées

Très en désaccord	Assez en désaccord	Un peu en désaccord	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

p. Malgré le manque de médicament ou de solution au niveau des régions périphériques

Très en désacco rd	Assez en désacco rd	Un peu en désacco rd	Ni l'un, ni l'autre	Un peu en accord	Assez en accord	Très en accord

22. Intention

a. J'ai l'intention d'utiliser la télémédecine dans mes activités quotidiennes au cours des 12 prochains mois.

Très improbable	Assez improbable	Légèrement improbable	Ni l'un, ni l'autre	Légèrement probable	Assez probable	Très probable

b. Je vais utiliser la télémédecine dans mes activités quotidiennes au cours des 12 prochains mois.

Très improbable	Assez improbable	Légèrement improbable	Ni l'un, ni l'autre	Légèrement probable	Assez probable	Très probable

c. Je vais essayer d'utiliser la télémédecine dans mes activités quotidiennes au cours des 12 prochains mois.

Très improbable	Assez improbable	Légèrement improbable	Ni l'un, ni l'autre	Légèrement probable	Assez probable	Très probable

Appendix 24: Approval - Examining committee Population Health program**Report on thesis proposal defense**

Name of the student: Birama Apho Ly

Student number: 6472417

Thesis title: Les déterminants de l'utilisation de la télémédecine au Sénégal

Supervisors : Dr. Ron Labonte – Supervisor

Dr. Ivy Bougeault – Co-supervisor

The meeting was Chaired by Dr. James Gomes

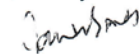
The meeting commenced with introductory comments and directions were provided for the thesis proposal meeting. Mr. Birama at the outset presented the proposal using powerpoint presentation. Following the presentation the first round of questioning was initiated by Dr. Audrey Giles followed by Dr. Sanni Yaya and Dr. Elizabeth Kristjansson. A healthy discussion ensured during the first round of questioning and suggestions were made to modify the proposed plan. The second round of questioning was shorter and followed the same order of questioning as the first round.

During these questioning sessions the student and the supervisors took notes and kept track of proposed changes to the thesis proposal. After the questioning by the examiners the supervisors were given an opportunity to comment or make suggestions at which time Dr. Bourgeault followed by Dr. Labonte made their remarks.

At this time the student and the visitors were asked to leave the room so that the examiners could deliberate and develop a consensus on the outcome of the defense of the thesis proposal. Having made a decision the student was asked to come in and the verdict of the committee was delivered to the student. It was decided that the student makes the required minor modifications to the thesis proposal and that the supervisors confirm that changes have been made. The thesis proposal was accepted subject to minor modifications and the supervisors were given the responsibility of approving the incorporated changes.

Having conducted the business for the meeting the called the Chair closed the meeting at 12.30pm. This report is an attachment to the thesis proposal defense form signed by all parties involved in the examination.

Sincerely



James Gomes

Appendix 25: Approvals - University of Ottawa Research Ethics Board

Numéro de dossier: H 09-13-12

Date (mm/jj/aaaa): 02/20/2014



Université d'Ottawa
Bureau d'éthique et d'intégrité de la recherche

University of Ottawa
Office of Research Ethics and Integrity

Certificat d'approbation éthique**CÉR Sciences et science de la santé****Chercheur principal / Superviseur / Co-chercheur(s) / Étudiant(s)**

<u>Prénom</u>	<u>Nom de famille</u>	<u>Affiliation</u>	<u>Rôle</u>
Ronald	Labonté	Médecine / Médecine	Superviseur
Ivy	Bourgeault	Sciences de la santé / Autres	Co-Superviseur
Birama Apho	Ly	Sciences de la santé / Autres	Étudiant-chercheur

Numéro du dossier: H 09-13-12

Type du projet: Thèse de doctorat

Titre: Croyances des médecins généralistes et spécialistes sénégalais face à la télémédecine

Date d'approbation (mm/jj/aaaa)	Date d'expiration (mm/jj/aaaa)	Approbation
02/20/2014	02/19/2015	Ia

(Ia: Approbation complète, Ib: Autorisation préliminaire de libération de fonds de recherche)

Conditions Spéciales / Commentaires:

N/A

Numéro de dossier: H09-13-12

Date (mm/jj/aaaa): 02/20/2014



Université d'Ottawa
Bureau d'éthique et d'intégrité de la recherche

University of Ottawa
Office of Research Ethics and Integrity

La présente confirme que le Comité d'éthique de la recherche (CER) de l'Université d'Ottawa identifié ci-dessus, opérant conformément à l'Énoncé de politique des Trois conseils et toutes autres lois et tous règlements applicables de l'Ontario, a examiné et approuvé la demande d'approbation éthique du projet de recherche ci-nommé. L'approbation est valide pour la durée indiquée plus haut et est sujette aux conditions énumérées dans la section intitulée "Conditions Spéciales / Commentaires".

Lors de l'étude, le protocole ne peut être modifié sans approbation préalable écrite du CER sauf si le sujet doit être retiré en raison d'un danger immédiat ou s'il s'agit d'un changement ayant trait à des éléments administratifs ou logistiques de l'étude comme par exemple un changement de numéro de téléphone. Les chercheurs doivent aviser le CER dans les plus brefs délais de tout changement pouvant augmenter le niveau de risque aux participants ou affecter considérablement le déroulement du projet. Ils devront aussi rapporter tout événement imprévu et / ou dommageable et devront soumettre toutes les nouvelles informations pouvant nuire à la conduite du projet et/ou à la sécurité des participants. Toutes modifications apportées au projet, aux lettres d'information / formulaires de consentement ainsi qu'aux documents de recrutement doivent être soumises pour approbation à ce Service en utilisant le document intitulé "Modification au projet de recherche" au: <http://www.recherche.uottawa.ca/deontologie/formulaires.html>.

Veuillez soumettre un rapport annuel au Responsable d'éthique de la recherche, quatre semaines avant la date d'échéance indiquée afin de fermer le dossier ou demander un renouvellement de l'approbation déontologique. Le document nécessaire est disponible en ligne au: <http://www.recherche.uottawa.ca/deontologie/formulaires.html>.

Pour toutes questions, vous pouvez communiquer avec le bureau d'éthique en composant le poste 5387 ou en nous contactant par courriel à: ethique@uOttawa.ca.

Germain Zongo
Responsable de l'éthique de la recherche
Pour Dr. Daniel Lagarec, président du CÉR en Sciences de la santé et Sciences

Numéro de dossier: H09-13-12C

Date (mm/jj/aaaa): 11/18/2014



Université d'Ottawa **University of Ottawa**
 Bureau d'éthique et d'intégrité de la recherche Office of Research Ethics and Integrity

Certificat d'approbation déontologique**CÉR Sciences et science de la santé****Chercheur principal / Superviseur / Co-chercheur(s) / Étudiant(s)**

<u>Prénom</u>	<u>Nom de famille</u>	<u>Affiliation</u>	<u>Rôle</u>
Ronald	Labonté	Médecine / Santé des populations	Superviseur
Ivy	Bourgeault	École de gestion / École de gestion	Co-Superviseur
Birama Apho	Ly	Sciences de la santé / Santé des populations	Étudiant-chercheur

Numéro du dossier: H09-13-12C**Type du projet:** Thèse de doctorat**Titre:** Étude de l'intention des médecins des hôpitaux et des centres de santé de district du Sénégal envers l'utilisation de la télémédecine

Date d'approbation (mm/jj/aaaa)	Date d'expiration (mm/jj/aaaa)	Approbation
11/18/2014	11/17/2015	la

(Ia: Approbation complète, Ib: Autorisation préliminaire de libération de fonds de recherche)**Conditions Spéciales / Commentaires:**

N/A

Numéro de dossier: H09-13-12C

Date (mm/jj/aaaa): 11/18/2014



Université d'Ottawa **University of Ottawa**
Bureau d'éthique et d'intégrité de la recherche Office of Research Ethics and Integrity

La présente confirme que le Comité d'éthique de la recherche (CER) de l'Université d'Ottawa identifié ci-dessus, opérant conformément à l'Énoncé de politique des Trois conseils et toutes autres lois et tous règlements applicables de l'Ontario, a examiné et approuvé la demande d'approbation éthique du projet de recherche ci-nommé. L'approbation est valide pour la durée indiquée plus haut et est sujette aux conditions énumérées dans la section intitulée "Conditions Spéciales / Commentaires".

Lors de l'étude, le protocole ne peut être modifié sans approbation préalable écrite du CER sauf si le participant doit être retiré en raison d'un danger immédiat ou s'il s'agit d'un changement ayant trait à des éléments administratifs ou logistiques de l'étude comme par exemple un changement de numéro de téléphone. Les chercheurs doivent aviser le CER dans les plus brefs délais de tout changement pouvant augmenter le niveau de risque aux participants ou affecter considérablement le déroulement du projet. Ils devront aussi rapporter tout événement imprévu et / ou dommageable et devront soumettre toutes les nouvelles informations pouvant nuire à la conduite du projet et/ou à la sécurité des participants. Toutes modifications apportées au projet, aux lettres d'information / formulaires de consentement ainsi qu'aux documents de recrutement doivent être soumises pour approbation en utilisant le document intitulé "Modification au projet de recherche" au: <http://www.recherche.uottawa.ca/deontologie/formulaires.html>.

Veillez soumettre un rapport annuel au Bureau d'éthique quatre semaines avant la date d'échéance indiquée afin de renouveler de l'approbation éthique. Afin de fermer le dossier, un rapport final doit être soumis. Ces documents sont disponibles en ligne au: <http://www.recherche.uottawa.ca/deontologie/formulaires.html>

Pour toutes questions, vous pouvez communiquer avec le Bureau d'éthique en composant le poste 5387 ou par écrit à: ethique@uOttawa.ca.

Signature:

Germain Zongo
Responsable d'éthique en recherche
Pour Daniel Lagarec, Président du CÉR en Sciences de la santé et sciences

Numéro de dossier: H09-13-12B

Date (mm/jj/aaaa): 02/19/2014



Université d'Ottawa
Bureau d'éthique et d'intégrité de la recherche

University of Ottawa
Office of Research Ethics and Integrity

Certificat d'approbation éthique

CÉR Sciences et science de la santé

Chercheur principal / Superviseur / Co-chercheur(s) / Étudiant(s)

<u>Prénom</u>	<u>Nom de famille</u>	<u>Affiliation</u>	<u>Rôle</u>
Ronald	Labonté	Médecine / Médecine	Superviseur
Ivy	Bourgeault	Sciences de la santé / Autres	Co-Superviseur
Birama Apho	Ly	Sciences de la santé / Autres	Étudiant-chercheur

Numéro du dossier: H09-13-12B

Type du projet: Thèse de doctorat

Titre: Les déterminants de l'utilisation de la télémédecine au Sénégal

Date d'approbation (mm/jj/aaaa)	Date d'expiration (mm/jj/aaaa)	Approbation

02/19/2014

02/18/2015

Ia

(Ia: Approbation complète, Ib: Autorisation préliminaire de libération de fonds de recherche)

Conditions Spéciales / Commentaires:

Numéro de dossier: H09-13-12B

Date (mm/jj/aaaa): 02/19/2014



Université d'Ottawa
Bureau d'éthique et d'intégrité de la recherche

University of Ottawa
Office of Research Ethics and Integrity

La présente confirme que le Comité d'éthique de la recherche (CER) de l'Université d'Ottawa identifié ci-dessus, opérant conformément à l'Énoncé de politique des Trois conseils et toutes autres lois et tous règlements applicables de l'Ontario, a examiné et approuvé la demande d'approbation éthique du projet de recherche ci-nommé. L'approbation est valide pour la durée indiquée plus haut et est sujette aux conditions énumérées dans la section intitulée "Conditions Spéciales / Commentaires".

Lors de l'étude, le protocole ne peut être modifié sans approbation préalable écrite du CER sauf si le sujet doit être retiré en raison d'un danger immédiat ou s'il s'agit d'un changement ayant trait à des éléments administratifs ou logistiques de l'étude comme par exemple un changement de numéro de téléphone. Les chercheurs doivent aviser le CER dans les plus brefs délais de tout changement pouvant augmenter le niveau de risque aux participants ou affecter considérablement le déroulement du projet. Ils devront aussi rapporter tout événement imprévu et / ou dommageable et devront soumettre toutes les nouvelles informations pouvant nuire à la conduite du projet et/ou à la sécurité des participants. Toutes modifications apportées au projet, aux lettres d'information / formulaires de consentement ainsi qu'aux documents de recrutement doivent être soumises pour approbation à ce Service en utilisant le document intitulé "Modification au projet de recherche" au: <http://www.recherche.uottawa.ca/deontologie/formulaires.html>.

Veuillez soumettre un rapport annuel au Responsable d'éthique de la recherche, quatre semaines avant la date d'échéance indiquée afin de fermer le dossier ou demander un renouvellement de l'approbation déontologique. Le document nécessaire est disponible en ligne au: <http://www.recherche.uottawa.ca/deontologie/formulaires.html>.

Pour toutes questions, vous pouvez communiquer avec le bureau d'éthique en composant le poste 5387 ou en nous contactant par courriel à: ethique@uOttawa.ca.

Germain Zongo
Responsable de l'éthique de la recherche
Pour Dr. Daniel Lagarec, président du CÉR en Sciences de la santé et Sciences

Appendix 26: Approvals - Senegal's Health Research National Ethics Committee

REPUBLIQUE DU SENEGAL
Un Peuple – Un But – Une Foi

MINISTERE DE LA SANTE
ET DE L'ACTION SOCIALE



N° 0205-MSAS/DPRS/CNERS

Dakar, le 17 FEB 2014

Le Coordonnateur

Objet : Avis éthique et scientifique

REFERENCE : Protocoles SEN14/04 : « Déterminants de l'utilisation de la télémédecine au Sénégal »

Docteur,

A la suite de l'examen des documents qui suivent :

- 1- Réponses apportées aux questions posées par le comité
- 2- Protocole révisé intégrant les remarques du comité d'éthique
- 3- Attestation du doyen de la FMPOS du 07 novembre 2013
- 4- Attestation de la coordonnatrice du Centre Interuniversitaire de Recherche et de 'Expertise en Télémédecine E-Santé du 20 Août 2013
- 5- Reçu de paiement des frais de soumission au CNERS du 03 janvier 2014

Le Comité d'éthique émet un avis favorable pour la mise en œuvre de l'étude qui rentre dans le cadre d'une formation doctorale.

L'étudiant est invité à déposer au niveau du secrétariat du comité une copie physique du protocole dans sa version corrigée avant de pouvoir disposer de l'autorisation administrative. Le présent avis est actif dès la date de sa signature et a une durée d'une année. Son renouvellement est assujéti à la fourniture d'un rapport d'étape et d'une demande de renouvellement.

Tout événement indésirable grave survenu dans le cadre de l'étude devra dans les 48 heures être porté à l'attention du comité national d'éthique.

Je vous prie de croire, **Docteur** à l'assurance de mon profond respect et de mes encouragements renouvelés.

Dr Birama Apho Ly
Chercheur Principal
Université OTTAWA



DETERMINANTS OF TELEMEDICINE USE IN SENEGAL

WWW

REPUBLIQUE DU SENEGAL

Un Peuple – Un But – Une Foi

MINISTRE DE LA SANTE
ET DE L'ACTION SOCIALE



00016-22

N° _____ MSAS/DPRS/CNERS

Dakar, le 30 JAN 2015.

Le Coordonnateur

AVIS ETHIQUE ET SCIENTIFIQUE

Objet : Demande de prolongation

Protocole SEN14/04 : « Déterminants de l'utilisation de la télémédecine au Sénégal »

Docteur,

J'accuse réception des documents ci-dessus accompagnant votre demande de prolongation.

Il s'agit :

- 1- La lettre d'introduction n° 0678/DGS/SP du 24/02/2014
- 2- L'avis éthique et scientifique n° 0205/MSAS/DPRS/CNERS du 17/02/2014
- 3- L'autorisation administrative de la DPRS du 19/02/2014
- 4- L'accord de l'UCAD du 07/11/2013
- 5- L'accord du CIRET du 26/08/2013
- 6- Les questionnaires
- 7- Les feuillets d'information
- 8- Les formulaires de consentement

Le Comité d'éthique émet un avis favorable pour la continuation dudit projet.

Je vous prie de croire, Docteur à l'assurance de mon profond respect et de mes encouragements renouvelés.

Dr Birama Apho Ly
Chercheur Principal
Université OTTAWA



Appendix 27: Authorization - Health Ministry of Senegal

REPUBLICQUE DU SENEGAL
Un Peuple – Un But – Une Foi

MINISTERE DE LA SANTE
ET DE L'ACTION SOCIALE

DIRECTION DE LA PLANIFICATION
DE LA RECHERCHE ET DES STATISTIQUES

LE DIRECTEUR

N° MSAS/DPRS/DR

Dakar, le 19 FEB 2014

AUTORISATION ADMINISTRATIVE

Protocoles SEN14/04 : « Déterminants de l'utilisation de la télémédecine au Sénégal »

Docteur,

Sur la base de la non objection du Comité National d'Ethique pour la Recherche en Santé, je vous accorde une autorisation administrative d'une année (**Février 2014 – Février 2015**) pour vous permettre de mettre en œuvre votre étude.

Je vous prie de croire, *Docteur*, à l'assurance de ma parfaite considération et de mes encouragements renouvelés.

Dr Birama Apho Ly
Chercheur Principal
Université OTTAWA

Le Directeur

Dr Amadou Djibril BA

Appendix 28: Authorization - General Direction for Health of Senegal

0678

N°..... /DGS/SP

Dakar, le

124 FEB 2014


REPUBLIQUE DU SENEGAL
Un Peuple - Un But - Une Foi

 *Ministère de la Santé
et de l'Action sociale*

DIRECTION GENERALE DE LA SANTE

LE DIRECTEUR GENERAL

OBJET : Etude sur les déterminants de l'utilisation de la télémédecine au Sénégal

Mesdames, Messieurs,

Dans le cadre de la mise en œuvre de l'Etude sur les déterminants de l'utilisation de la télémédecine au Sénégal, **Monsieur Birama Apho LY**, étudiant en santé des populations à l'Université d'Ottawa va mener une enquête citée en objet. Il souhaiterait visiter vos structures et discuter avec les responsables et les personnels sanitaires pour bien mener cette étude.

A cet effet, je vous saurai gré des dispositions que vous voudrez bien prendre pour lui faciliter la réalisation de l'étude.

Veuillez agréer, **Mesdames, Messieurs**, l'assurance de ma considération distinguée.

//-)

Mesdames, Messieurs les Médecins-chefs de Région
Mesdames, Messieurs les Directeurs d'Hôpital

Ampliations :

- MSAS/CAB
- MSAS/SG
- Gouverneurs de Région
- intéressé X

Rue Aimé Césaire - Fann Résidence, près du Centre National d'Appareillage Orthopédique (C.N.A.O) - BP : 4024 Dakar
Tél. : 33 869-42-97 Fax : 33 869 42 06 Email : direction_sante@yahoo.fr


Dr Papa Amadou DIACK

Appendix 29: Authorization - Cheikh Anta Diop University Faculty of Medicine

UNIVERSITE CHEIKH ANTA DIOP DE DAKAR

FACULTE DE MEDECINE, DE PHARMACIE ET D'ODONTOLOGIE

CABINET DU DOYEN

Dakar, le 07 novembre 2013

--: ATTESTATION --:

Je soussigné Professeur Abdurahmane DIA, Doyen de la Faculté de Médecine, de Pharmacie et d'Odontologie de l'Université Cheikh Anta Diop de Dakar, atteste que le **Docteur Birama Apho LY**, étudiant en santé des populations à l'Université d'Ottawa, est autorisé à mener une étude sur « *les déterminants de l'utilisation de la télémédecine au Sénégal* », sous le couvert du Professeur Mbayang NDIAYE NIANG, coordonnatrice du Centre Interdisciplinaire de Recherche et d'Expertise en Télémédecine e-santé (CIRET) de l'Université Cheikh Anta Diop de Dakar.

En foi de quoi, cette attestation est établie pour servir et valoir ce que de droit.

Le Doyen
Faculté de Médecine de Pharmacie
et d'Odonto-stomatologie
Le Doyen
Prof. Abdurahmane DIA

Avenue Cheikh Anta Diop - BP 5005 Dakar Fann - Sénégal
Tél. : +221 33 825 85 93 / Fax : +221 33 825 29 52
Courriel : auditfac@yahoo.fr / Site Web : <http://fmpos.ucad.sn>

Appendix 30: Authorization - Research and Expertise Interdisciplinary Centre in Telemedicine/eHealth (CIRET)



UNIVERSITE CHEIKH ANTA DIOP DE DAKAR

Faculté de Médecine, Pharmacie et d'Odontologie

Centre Interuniversitaire de Recherche et d'Expertise en
Télémédecine E-santé – CIRET



Pr Mbayang Ndiaye Niang
Coordonnatrice

Dakar le 26 Aout 2013

ATTESTATION

Nous venons par la présente attester la participation du Centre interuniversitaire de recherche et d'expertise en Télémédecine e-santé de l'Université Cheikh Anta Diop de Dakar à la thèse du Docteur Birama Apho Ly, étudiant en Santé des populations à l'Université d'Ottawa portant sur « les déterminants de l'utilisation de la télémédecine au Sénégal ».

Il s'agit d'un thème original dont les résultats pourraient, très probablement, permettre d'améliorer l'utilisation de la télémédecine au Sénégal grâce à une double analyse situationnelle qualitative et quantitative sur les principaux déterminants de cette innovation de la pratique médicale destinée à améliorer l'équité dans l'accès à des soins de santé de qualité.

Attestation établie sur la demande de l'intéressé

Fait pour servir et valoir ce que de droit

Fait à Dakar le 20 Aout 2013

