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Impact of Social Support on Malaria Management by Burundian Community Health Workers

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This is to certify that the doctoral dissertation by

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Abstract

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MPH, Institute of Tropical Medicine, Antwerp, 2005

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Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Malaria is the main cause of mortality for children under the age of 5 in Burundi. The access to malaria diagnostics and treatment is hampered not only because of logistical issues, but also due to the lack of qualified human resources and their inequitable distribution across the country. To mitigate the lack of human resources for health, the government of Burundi, along with its partners, shifted some tasks to community health workers (CHWs) to cover unmet healthcare needs for selected diseases such as malaria, diarrhea, and pneumonia. The purpose of this study was to determine whether the social support provided to CHWs had an impact on morbidity due to malaria for children under the age of 5. The social networks and social support theoretical framework was used to explore the type of social support received by CHWs and its impact on the number of children treated. The 88 CHWs who participated in this cross sectional survey, were randomly selected from a pool of 719 CHWs who were part of a pilot project that was implemented in the districts of Gahombo, Gashoho, and Mabayi, from 2011 to 2014. The study findings showed mixed results with a positive correlation between the instrumental support received and the number of children under the age of 5 treated. However, a statistically significant correlation was not established between the emotional, informational, and appraisal support received and the number of children under the age of 5 treated. The positive social change implications of the study include providing evidence to build and enhance human resource capacity for improving the health of children living in Burundi, an under-resourced country, through the development of a support package that can be offered to CHWs to help them perform their duties in a more effective way.

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Dedication

To my wife, Pulchérie, and our sons, Kelly, Billy, and Joe, for your love and patience

Acknowledgments

First and foremost, I give thanks to the Lord who gave me the strength to pursue this Walden University journey. I would like to thank my family members for their patience, love, support, and encouragement. I would like to thank my previous chair, Dr. Vincent Agboto, who supported me since the beginning of the dissertation process. I would like to thank the actual chair and committee member, Drs. Tolulope Osoba and Xianbin Li, for their insight and guidance. Dr. Tolulope has been a great support since the time my previous chair was no longer in the position to continue his support to me. Dr. Xianbin Li always provided a thoughtful critique and asked questions to improve the quality of the study. I would also like to thank my University Researcher Reviewer, Dr. Mehdi Agha for reviewing my work. Last, but not the least, I would like to thank all the persons who facilitated the dissertation process including the Ministry of Health and the Ministry of Home affairs of Burundi who allowed me to have access to the CHWs and the CHWs who took the time to respond to the questionnaire.

Table of contents

List of Tables

List of Figures

Chapter 1: Introduction to the Study

Introduction

According to the world malaria report 2015, almost a half of the world's population (more than 3.2 billion population) was at risk of malaria (World Health Organization [WHO], 2015c). In the report, the WHO (2015c) said that there was an estimate of 214 million new cases and 438,000 deaths the same year. 87 % of malaria cases and 91% of deaths were from the sub-Saharan African region (Ruizendaal et al., 2014).

Burundi is considered to be in a high transmission zone with more than 1 case per 1,000 population (WHO, 2015a). According to the Malaria Indicators Survey (MIS; 2012), the disease represented 75% of the total patients received in health facilities (all age groups) and 17% of the consultations for children under the age of 5. This proportion has increased in the country from 17% to 27% from 2012 to 2017 as revealed by the third demographic and health survey (DHS) performed in Burundi during 2016–2017. Four types of protozoan parasites, also called plasmodium (P.), are responsible for malaria: P. falciparum, P. malariae, P. ovale, and P. vivax; the deadliest parasite, the P. falciparum, is the only species present in Burundi (WHO, 2015a).

Young, Wolfhein, Marsh, and Hammamy (2012) argued that chronic lack of qualified human resources especially in hard-to-reach areas of sub-Saharan African countries have hampered the access to healthcare services. Young et al. reported that malaria, pneumonia, and diarrhea are the main causes of death in those countries. To mitigate the lack of human resources and reduce the burden of those diseases, the WHO has recommended an integrated program on community case management

(ICCM) for malaria, pneumonia, and diarrhea through community health workers (CHWs; Ruizendaal et al., 2014). Studies have demonstrated that ICCM significantly reduced the malaria specific mortality and severe malaria morbidity worldwide for children under 5 years old (Perry & Zullinger, 2012). However, the performance of CHWs differs from one country to another and from an area to another within the same country (Pallas et al., 2013).

Studies describing the support, capacity, motivation, and challenges associated with community case management of malaria as well as benefits that the CHWs receive from such programs have been performed elsewhere (Banek et al., 2014; Brunie et al., 2014; Christopher, Le May, Lewin, & Ross, 2011; Greenspan et al., 2013; Gopalan, Mohanty, & Das, 2012; Kisia et al., 2012; Lunsford, Fatta, Stover, & Shrestha, 2015; Maes & Kalofonos, 2013). However, according to my knowledge and research, such kind of studies have not been carried out in Burundi. The results of an unpublished, cross-sectional survey organized after 11 months of a pilot project developed in three health districts (Gahombo, Gashoho, and Mabayi) in Burundi showed a lack of knowledge of the danger signs of malaria. Furthermore, the retention rate of the CHWs was very low after the 11 month duration of the project. Therefore, the problem that I addressed during this study was to understand whether the social support received from the healthcare system, the communities, and the peer support had an impact on the performance of CHWs. I defined the performance of CHWs as the health outcome for the patients who had been treated by CHWs.

The positive social change implications of this study could be that the findings, at the national level, help the CHW program designers to better understand which kind of social support is needed to make Burundian CHWs more efficient. The

findings could help to design a more adapted educational and supportive package to offer to CHWs. Understanding and covering the needs of the CHWs regarding social support may improve the quality of the services to the community and potentially reduce the mortality due to the disease.

In Chapter 1, I will provide the background for this research, the problem statement, the purpose of the study, and the research questions. I will detail the significance of this study and its connotation to social change. In Chapter 1, I will also describe the operational definitions, scope and delimitations, assumptions, and limitations. I used a quantitative research approach in this study to better understand who is providing the support for CHWs, which kind of support was being provided, and how the support reached CHWs.

Background of the Study

The use of CHWs has gained a lot of interest among the public health planners in low and middle-income countries (Pallas et al., 2013). A wealth of literature has demonstrated how well-planned CHWs programs reduced the mortality rate of children under 5 years old and improved various preventive programs in experimental settings (Lunsford et al., 2015). However, this task shifting from health professionals to CHWs has been done with very limited resources in many low and middle-income countries, giving the impression of being a panacea (Banek et al., 2014).

Lunsford et al. (2015) stated that during a trial/pilot project period, the CHWs showed a high performance essentially because the programs were new and the communities as well as CHWs were still enthusiastic about it. Furthermore, the programs received consistent support from donors, being governments or nongovernmental organizations (Lunsford et al., 2015). In many cases, the attrition of

CHW programs occurred when the initial enthusiasm waned (Turinawe et al., 2015). What keeps the CHWs motivated after the trial period and withdrawal of financial support from international donors is constantly under debate and seems to differ from one context to another (Pallas et al., 2013). And, given the fact that international funding for such programs is foreseen to plateau, it is critical to think how to sustain such programs using existing local or national resources (Rao, Schellenberg, & Ghani, 2013).

Studies performed in India and Uganda concluded that extrinsic factors, like the lack of social support from the communities, lack of logistical support, lack of recognition, as well as the lack of compensation, were the main factors that negatively affected the work of CHWs (Brunie et al., 2014). Other factors including receptivity of advice by community members, the knowledge acquired during the training, social prestige, social responsibility, and self-efficacy contributed to improving the motivation and retention rate of CHWs; Gopalan et al., 2012). In contrary, after a study performed in Tanzania, Mpembeni et al. (2015) concluded that people wanted to become and remain CHWs by altruism (i.e., to serve people and God) and intrinsic needs (pride, help the community, improve the health of others) and that they were less interested in external rewards (salary/incentives, respect from the community, or employment expectation). In the same vein, Greenspan et al. (2013) argued that Tanzanian CHWs who were working without salary were motivated by the support they receive from their respective families when other sources of motivation are insufficient. There is a need to understand why there is a difference of motivators from one country to another.

Previous studies have analyzed the issue of sustainability in the angle of rewarding models. Singh, Negin, Otim, Orach, and Cumming (2015), after reviewing different reward models for CHWs from Bangladesh, Ethiopia, India, Iran, and Nepal, concluded that the type of remuneration should depend on the context and the expected outcomes from the CHWs. Lunsford et al. (2015) concluded that the status of CHWs, nonmonetary incentives, and community social support may increase the productivity, motivation, and sustainability of the programs. While performing a literature review to assess enabling factors and barriers for scale-up and sustainability of a community health workers program, Pallas et al. (2013) concluded that all the factors may be related to program design and management, community fit, and integration of the program in the broader environment. A CHW program that is successful in a region may not have the same success once replicated in a different environment. In this study, the problem that I addressed was analyzing, through a cross-sectional survey, which type of social support received by CHWs had an effect on their performance (the number of children under the age of 5 treated). Descriptive and inferential statistics were used to assess the possible correlation between the independent variables (type of social support) and dependent variable (number of consultations by CHW per week).

Problem Statement

Sub-Saharan Africa has the highest morbidity and death rate for children under the age of 5 while its health workforce represents only 3% of the global health workforce available worldwide (Christopher et al., 2011). More than the half of the deaths are related to malaria, diarrhea, and pneumonia, and the majority could be prevented if patients were managed during the first 24 hours following the onset of

clinical signs (Christopher et al., 2011). Young et al. (2012) reported that less than 20% of children with fever can have access to malaria diagnosis by rapid tests. The authors also argued that only 30% of children with pneumonia have access to antibiotics, and 39% of children with diarrhea have access to correct treatment by oral rehydration salt solutions in Africa.

The WHO recommended the use of CHWs for targeted diseases to overcome the lack of qualified human resources and meet the millennium development goals that are related to health (Young et al., 2012). CHWs interventions have considerably reduced the malaria specific mortality rate for children under the age of 5 as well as it has reduced the severe malaria morbidity (Perry & Zullinger, 2012). However, the capacity to sustain CHW programs after the experimental period remain understudied (Banek et al., 2014; Druetz, Kadio, Haddad, Kouanda & Ridde, 2015). Moreover, the reasons why CHWs programs are successful in some areas and not others needs to be explored through further studies (Banek et al., 2014).

Burundi has implemented a CHW program for malaria since 2011 with a pilot project in three districts of Gahombo, Gashoho, and Mabayi. Although a cross-sectional survey performed 11 months after the beginning of the pilot project (Concern Worldwide, 2014) showed an overall satisfaction of the different stakeholders involved in the program (CHWs, health professionals, and community members), the factors associated with the success of the program (e.g., the type of social support received by CHWs) were not explored. Therefore, the problem that I addressed in this research was to analyze which type of social networks and social support for CHWs could impact the performance of CHWs by reducing the morbidity and mortality of children under the age of 5 due to malaria.

Purpose of the Study

The purpose of this study was to determine whether there is a correlation between the social networks and social support received by CHWs and their performance (number of malaria cases treated in children under the age of 5) in the three districts covered by the CHWs pilot project in Burundi. I used a questionnaire to establish the correlation and descriptive and inferential statistics to analyze the relationship between the dependent variable (number of consultations) and the independent variables (health system support, community social support, and social networks between CHWs).

Research Questions and Hypotheses

The following research questions and hypotheses guided the study:

Research Question 1: Is there any correlation between the instrumental, informational, and appraisal support received from the health professionals and the number of children under the age of 5 with malaria treated by CHWs in the districts covered by the pilot project in Burundi?

$H_0$1: There is no correlation between the instrumental, informational, and appraisal support received from health professionals and the number of children under the age of 5 with malaria treated by CHWs in the districts covered by the pilot project in Burundi.

H_a1: There is a correlation between the instrumental, informational, and appraisal support received from the health professionals and the number of children under the age of 5 with malaria treated by CHWs in the districts covered by the pilot project in Burundi.

Research Question 2: Is there any correlation between the emotional, instrumental, and appraisal support received from the community members and the number of children under the age of 5 with malaria treated by CHWs in the districts covered by the pilot project in Burundi?

$H_0$2: There is no correlation between the emotional, instrumental, and appraisal support received from communities and the number of children under the age of 5 with malaria treated by CHWs in the districts covered by the pilot project in Burundi.

H_a2: There is a correlation between the emotional, instrumental, and appraisal support received from the community members and the number of children under the age of 5 with malaria treated by CHWs in the districts covered by the pilot project in Burundi.

Research Question 3: Is there any correlation between the social networks and peer support of CHWs and the number of children under the age of 5 with malaria treated by CHWs in the districts covered by the pilot project in Burundi?

$H_0$3: There is no correlation between the social networks and peer support between CHWs and the number of children under the age of 5 with malaria treated by CHWs in the districts covered by the pilot project in Burundi.

H_a3: There is a correlation between the social networks and peer support between CHWs and the number of children under the age of 5 with malaria treated by CHWs in the districts covered by the pilot project in Burundi.

Conceptual Framework

I used the social networks and social support theoretical framework as described by Heaney and Israel (2008). According to the author, the social networks and social support theoretical framework is based on some social functions that determine the way members of a community interact to support each other in solving social and health issues. Heaney and Israel stated that the social networks can be described in terms of *dyadic characteristics* (the specific relationship between two individuals) and in terms of *characteristics of the network as a whole*. The dyadic relationship is defined in terms of intensity and strength of a relationship, reciprocity, existence of a formal structure materializing the relationship, and its complexity (Heaney & Israel, 2008). While analyzing the whole network, the user of this theoretical framework may consider the homogeneity of the members of the network, the geographical dispersion of the members, and the density of their interactions (Heaney & Israel, 2008).

On the other side, Heaney and Israel (2008) defined the social support based on four supportive behaviors: *emotional, instrumental, informational,* and *appraisal support*. Emotional support involves the trust and empathy, while instrumental support includes the provision of needed support. Informational support is related to technical advice and suggestions that are needed, and appraisal support involves the provision of constructive feedback (Heaney & Israel, 2008).

This theoretical framework helped me to understand the support the CHWs received from both the community members and the health system as well as the mutual (peer) support between CHWs. Statistical analysis was used to analyze the effect of this social support on the performance of the CHWs. Heaney and Israel

(2008) stated that the potential effects of social networks and social support on organizational and community competence are not well studied, and I hope the results of this study will contribute to filling this gap.

Nature of the Study

In this study, I used a quantitative approach to explore the correlation between the social support and social networks (independent variables) and the outcomes of the work done by CHWs (number of consultations for children under the age of 5) in Burundi as dependent variable. I performed a cross-sectional survey (using Ashida and Sarason's (1987) social support questionnaires adapted to Burundian CHW's context). The adapted questionnaire helped to test the theoretical framework and to understand the type of support received by CHWs. I used SPSS 24 statistical test to establish the correlation.

Definitions

Community health workers: Members of the communities who are health workers and selected by and answerable to the communities they are working for. They are usually supporting the local health system and receive less training as compared to formal health professionals (Greenspan et al., 2013). They receive a training varying from 1 week (Uganda) to 4 months (Mozambique), or even 1 year and more (China; (Pallas et al., 2013; Perry & Crigler, 2013; Strachan et al., 2015)

Social networks: The ties and social relationships that are between and surround individuals (Heaney & Israel, 2008). Social networks might have an impact on the well-being of its members, and this impact may be positive or negative depending on the quality on networks.

Social support: One of the six functions of the social relationships. Social networks refer to linkages between people who may or may not provide social support and that may serve other purposes than social support. Social support includes emotional, instrumental, informational, and appraisal support. The other functions of social relationships are social influence, social control, social undermining, social comparison, and companionship (Heaney & Israel, 2008).

Assumptions

The level of integration of CHWs in the health systems is different from one country to another. CHWs can range from volunteers who do not receive any material or financial support to paid staff by the health system (Pallas et al., 2013). The CHWs with a status of volunteers may receive compensation from communities or family members (Pallas et al., 2013; Strachan et al., 2015). The Burundian CHWs in the districts covered by the pilot project received financial and material support from an international nongovernmental organization but did not receive any salary (Concern Worldwide, 2014).

According to Franklin, Bernhardt, Lopez, Long-Middleton, and Davis (2015), in the case of an integrated CHW program, six assumptions have to be made:

- Health workers, CHWs, and community members have a shared/common understanding of their roles and responsibilities in the health system.
- Patients and families are part of the health system and their inputs, goals, and decision making are respected (egalitarianism).
- There is a full cooperation between the health workers, CHWs, and community members.
- There is an interdependence between the members of the health system.

- If the team members are supporting each other, the health outcome could be better than each health system member working alone (synergy) (Franklin et al., 2015)

For this particular research, we expected all the respondents to be truthful while responding to the questionnaire.

Scope and Delimitations

The study was limited to CHWs working in the districts of Mabayi, Gahombo, and Gashoho covered by the pilot study. The independent variables I explored were social networks and social support, and the dependent variable was the number of children under the age of five 5 with malaria received by CHW per week. Keeping in mind that there could be other actors involved in the management of malaria cases in the region, I concentrated my study only on CHWs who were part of the pilot project by providing the questionnaire only to them. In this study, I was not concerned with qualified health workers or other community members from those districts.

Limitations

The first limitation of this study was related to its design. The study was a cross-sectional survey, and for that reason, was not able to capture the sequence of events (see Pourhoseingholi, Baghestani, & Vahedi, 2012). In the study, I analyzed the effect of social networks and social support at the given time of the project. Therefore, I could imagine that the health outcomes are associated with other confounding variables (i.e., sex of the respondent, education level, socioeconomic status, marital status, family composition etc.). Restriction, matching, and randomization are techniques that can be used during the study design to adjust for possible confounding effects (Pourhoseingholi et al., 2012). Unfortunately, those

methods may have affected the sample size because the number of CHWs was limited.

Another limitation of this study could have been the response rate from the CHWs. Generally, during working days, CHWs do not stay at home; they are either at their regular work or moving from home to home as part of their CHW duty. For that reason, they may have missed the interview. To minimize the low response rate, after selection of the sample using a random technique (I used the list of CHWs and selected every fifth CHW until I achieved the desired sample size), I made phone calls to CHWs to set appointments.

Internal validity, as well as construct validity of this study may be questioned. It may be difficult to conclude that the changes in morbidity and mortality of children under the age of 5 are only attributed to the CHWs' intervention or to say that the CHWs' intervention is the right intervention that has brought changes in the health outcomes. There may be other factors that can influence the morbidity and mortality during the period of the intervention (i.e., possible parallel interventions such as sanitation programs, sensitization programs against malaria, mosquito nets distribution, and nutrition programs) that may have an indirect effect on the number of malaria cases and their gravity.

This study was performed in three districts out of 45 that comprise the country (Ministry of Health [MOH], 2011). These three areas benefited from an extensive support as they were piloting the project. Therefore, the findings may not apply to other districts of the country that will not receive the same financial assistance.

Significance of the Study

Significance to Theory

I used the social networks and social support theoretical framework to analyze the networks and support systems utilized by community members to improve health conditions of individuals. The framework helped me analyze the support and networks between community members and CHWs. The potential effects of social networks and social support on organizational and community competence to improve healthcare delivery had not been studied so far in Burundi. Therefore, I proposed to analyze the possible peer support between CHWs and the support provided by health professionals and community members to CHWs to improve their healthcare interventions.

Significance to Practice

The government of Burundi has the intention to scale up the CHW program at the national level (MOH, 2011). To understand the effect of CHW program on communities, there is a need to know who is providing what to whom and when. There is also a need to evaluate whether the social support provided to CHWs during the pilot project is correlated to the reduction of the morbidity and mortality due to malaria in the areas concerned by the pilot project. The conclusions of this study could help the government of Burundi to decide which corrective measures regarding support are needed to build and scale up a better-designed CHW program.

Significance to Social Change

At the national level, the study findings may help the CHW program designers to better understand which kind of appropriate social support is needed to make

Burundian CHWs more efficient. The findings could help to design a more adapted training and support package that could be offered to CHWs. The positive social change implications of this study could be that understanding and covering the needs may improve the quality of the services provided to the community by CHWs and potentially reduce the mortality rate due to the disease.

Summary

There is an evidence that CHWs can improve health care outcomes, disease prevention, and health promotion for underserved people (Franklin et al., 2015). Specifically, the CHW program has reduced the malaria death rate for children under the age of 5 in low and middle-income countries (Pallas et al., 2013; Perry & Zullinger, 2012; Ruizendaal et al., 2014). However, the results of CHW programs differ from one area to another and the reasons why CHW programs are effective in some countries and not others are unknown. There is an interest in building new CHW models that may help to increase the efficiency of such programs (Franklin et al., 2015). I conducted this study in hopes of closing this gap in knowledge.

In Chapter 2, I will provide an in-depth review of the literature, focusing on an overview of the CHW programs for malaria worldwide, in sub-Saharan Africa and Burundi in particular, as well as the social support and social networks in health. Chapter 3 will include the rationale of the study, the methodology to be used, the population to be studied and its sampling methods. The participants' recruitment procedures and data collection and analysis plan, as well as the instrumentation and operationalization of the constructs and the ethical procedures will be analyzed in this chapter. The chapter 4 will display and analyze the results of the research. In chapter 5, I will interpret the findings, compare them with the literature. I will discuss how the

theory was applied and its added value compared to the results. I will describe the strengths and limitations of the study, its validity and reliability. I will propose some recommendations, state the positive social change and possible implications of the study and provide a conclusion.

Chapter 2: Literature Review

Introduction

Despite an increase in interest in the use of CHWs as frontline providers for preventive and curative healthcare services for selected diseases, the capacity to sustain such programs after the lifespan of pilot projects remains understudied (Druetz et al., 2015; Druetz, Ridde, & Haddad, 2015). Sustainability of a health program involves a number of prerequisites to be taken into consideration (e.g., mechanisms in place to insure logistics, human resources, and acceptance of the program over the time; Yasuoka et al., 2012). Studies performed in India, Nepal, and Uganda concluded that CHWs are motivated to remain at work by extrinsic factors like salary and rewards, and social consideration (Brunie et al., 2014; Gopalan et al., 2012). In Tanzania, on the contrary, people want to work as CHWs because of intrinsic factors like to serve people and God (Greenspan et al., 2013). Since 1961, Tanzania developed different types of community-based healthcare initiatives using voluntary CHWs; unfortunately, none of those programs has been sustained so far (Semu, Mkoba, Mabwe, & Killewo, 2015). The use of paid CHWs seemed to have the potential to be effective, efficient, sustainable, and equitable (Semu et al., 2015). To my knowledge, what motivates Burundians to become and remain CHWs and what influences their performances has not been studied yet; I could not find any previous studies on the topic.

The purpose of this study was to use the social networks and social support theoretical framework, as described by Heaney and Israel (2008), to better understand whether there was a correlation between the social networks and social support and the health outcomes using malaria as a case study. I focused on malaria as a case

study for various reasons including the fact that (a) malaria is a major cause of mortality and morbidity for children under the age of 5 in Burundi, (b) CHWs are fully involved in the fight against malaria, (c) and they are the key elements of the community case management of malaria (see Druetz et al., 2015). The foundation of this literature review consisted of empirical data, seminal literature, theoretical literature, and literature on the scale-up and sustainability of CHWs programs. Understanding the needs of CHWs and what keeps them dedicated to their work is paramount for a better delivery of healthcare services in rural and hard-to-reach areas in Burundi.

Literature Search Strategy

In my search for literature to support this study, I used the Walden University online library and Google Scholar. My search comprised various databases including MEDLINE, CINAHL Plus, ProQuest, PubMed, and PsycINFO. The Health and Psychosocial Instruments (HAPI) and PsycTest databases were used to find adequate social networks and social support measurement instruments (questionnaires). Google Scholar helped me search for literature that was not found at Walden University library. I used www.chwcentral.org as a global resource to capture accurate information on CHWs programs worldwide. The national database for malaria was used to retrieve statistical information on malaria for the concerned districts at the given period of study. Key terms used to search for literature included *community health workers, CHWs, malaria, program scale–up, motivation, social networks, social support, integrated community case management, iCCM, low and middle–income, Africa, Burundi, human resources for health, morbidity,* and *mortality*. I used these terms in various combinations to obtain articles and/or chapters of books. This

review of the literature will include six categories: (a) epidemiology of malaria in Burundi, (b) CHW programs in low and middle-income countries, (c) scale-up of CHW programs, (d) social networks, (e) social support for CHWs, and (f) motivation of CHWs. I have included these categories of literature to help the reader understand: (a) what is already known about CHW activities, (b) the motivators and barriers to scaling-up CHW programs and (c) understand the real needs of CHWs.

Conceptual Framework

Introduction

I used the social networks and social support theoretical framework as described by Heaney and Israel (2008) for this study. Since the 1970s, seminal researchers have explored the benefit of social networks on the health outcomes. The epidemiologists, John Cassel and Sidney Cobb (1976), were the first to demonstrate the relationship between social ties and health (Berkman and Glass, 2000). Individuals with diversified social networks (interacting with family members, friends, religious groups, coworkers, etc.) live healthier and longer life than those who are isolated due to supportive functions of social networks (Adams, Nababan, & Hanifi, 2015). Other mechanisms through which social networks impact health include social influence, social engagement, and access to resources (Adams et al., 2015). Although all the ties are not supportive, what is important about social networks is the support functions they provide (Berkman & Glass, 2000).

Definitions

Heaney and Israel (2008) classified the social networks into two categories: dyadic networks and social relations. The authors defined the dyadic relationship

(relationship between two individuals) in terms of emotional closeness, reciprocity, formality, and its complexity. The emotional closeness refers to the intensity and the strength of the relationship; reciprocity refers to extent to which support is given and received; formality refers to the existence of a formal structure materializing the relationship; and complexity refers to the extent to which a relationship serves a variety of functions (Heaney & Israel, 2008).

According to Heaney and Israel, while analyzing the social relations of the whole network, the homogeneity of the members of the network, the geographical dispersion of the members, and the density of their interactions are key elements to take into account. Homogeneity refers to the extent to which network members are similar in terms of demographic characteristics such as age, race, and socioeconomic status; geographic dispersion refers to the extent to which network members live in close proximity to the focal person; and the density refers to the extent to which network members know and interact with each other (Heaney & Israel, 2008). On the other side, social support is based on four supportive behaviors: emotional, instrumental, informational, and appraisal support (Berkman & Glass, 2000; Heaney & Israel, 2008). According to the authors, emotional support involves trust and empathy (love, care, sympathy, and understanding); instrumental support involves provision of needed support (money, labor, and resources according to the needs); informational support is related to technical advice and suggestions that are needed; and appraisal support involves provision of constructive feedback and support to decision-making. Instrumental, informational, and appraisal supports directly influence physical health by improving access to resources and material goods, while emotional support influences mental health (Berkman & Glass, 2000).

Functions and Characteristics of Social Networks

The analysis of social networks showed a possibility of various social functions including social influence, social control, social undermining, social comparison, companionship, and social support (Heaney & Israel, 2008). In this study, I focused on social support as a catalyst of good healthcare outcomes. Social support is always understood as the willingness of the provider of the support to help, thus distinguishing it from intentional negative interactions like social undermining behaviors (Heaney & Israel, 2008).

The source of social support can be from the community, the supervisor, and/or coworkers (Crigler, Gregen, & Perry, 2013). According to the authors, social support from a supervisor, also called supportive supervision, is the most difficult to implement. The main challenges related to that type of support are related to travel expenses and logistics for the supervisor (Crigler et al., 2013). Other challenges are related to the rigidity of healthcare professionals to recognize the added value of CHWs and lack of a common vision and understanding of what a health system should be (Druetz, Ridde, et al., 2015). In many contexts, the tools to be used while conducting supportive supervision are even missing. Crigler et al. (2013) proposed to develop a peer support system where senior CHWs are given intellectual and material tools to supervise junior CHWs.

Conceptual Model for the Relationship of Social Networks and Social Support to Health

Heaney and Israel (2008) stated that social networks and social support are starting points for a causal flow towards health outcomes. From that assumption, they built a theoretical framework that helps to assess mechanisms through which social

networks and social support have a positive effect on physical and mental health. The authors developed the following assumptions for the theory.

Social networks and social support and health status influence each other. Adam et al. (2015) stated that health status determines the extent to which a person can mobilize or maintain a social network. They argued that a healthier person will be more active and will create and maintain more social networks, and at the same time, being part of a social network can influence the health status by meeting basic human needs (Heaney & Israel, 2008). Adams et al. (2015) stated that social networks influence health status by acting as a channel for social learning and health behavior change.

Social networks and social support can enhance individual and community capacity to develop coping mechanisms in case of public health issues. As an example, social networks can help to have access to new contact and new information that can help to solve their problems (Heaney & Israel, 2008). Individuals who are highly interconnected have more chances to access new information earlier that can influence their health behavior (Adams et al., 2015).

Social networks and social support may influence the frequency and the duration of exposure to stressors (Heaney & Israel, 2008). For example, a supportive supervisor may ensure that CHWs get responses to questions they are facing including logistical and administrative issues in a quicker manner. Finally, social networks and social support may have an influence on health behaviors. Individuals may be influenced by exchanges they are having within the social networks (Heaney & Israel, 2008). Some public health programs are using this function to develop preventive programs as well as illness behavior and adherence to treatments (Heaney

& Israel, 2008).However, all social networks do not have a positive impact on health. Some social relationships are unwanted as the relational strain provoked may have a bad influence on the decision-making process related to health behavior (Adams et al., 2015).

Literature Review

Introduction

Malaria is one of the major public health problems worldwide. Although the pace of decline of the disease has accelerated since the introduction of the millennium development goals (the mortality rate decreased of 54% for children under the age of 5 between 2000 and 2012; United Nations Children's Fund [UNICEF], 2013), it is estimated that malaria still accounts for 20%–30% of the hospitalizations and 30%–50% of the outpatients globally (Moise, Roy, Nkengurutse, & Ndikubagenzi, 2016). The MOH (2011) reported that malaria remained the main cause of morbidity and mortality in the country and that the disease represents 74% of the total consultations and 34% of the total deaths in the country. The access to diagnosis and treatment is very limited in the country. The malaria indicator survey organized in 2012 indicated that only 59% of children under the age of 5 who had fever had access to medical consultation, 28% of them benefited from a diagnostic test, and only 18% of the sick children had access to treatment (DHS, 2013).

The situation was considered to be better in the three health districts of Gahombo, Gashoho and Mabayi covered by the CHW pilot project because 82% of children under the age of 5 with fever were seen by CHWs within 24 hours. However, there was a clear lack of knowledge about malaria signs among the CHWs as only 15% of the total CHWs involved in the pilot project ($N = 719$) were able to cite the

five clinical signs of severe malaria (Concern Worldwide, 2014). Furthermore, almost all the children who consulted the CHWs benefited from a rapid diagnostic test (97%) highlighting the misuse of resources due to the lack of clinical knowledge.

Malaria is a poverty disease and source of poverty for the affected families due to absenteeism from work both for the patients and attendants, the days lost for education, and the direct and indirect costs related to healthcare services (Moise et al., 2016). Malaria also generates extra burden on healthcare providers who are already in a limited number and unevenly distributed (MOH, 2011). It is in that context of shortage of human resources in healthcare that WHO and UNICEF issued a joint statement highlighting the importance of community-based management of malaria, diarrhea, and pneumonia, the most deadly diseases in the childhood in low and middle income countries (Young et al., 2012). Community-based management of malaria can reduce overall mortality rate due to malaria up to 40%, reduce the mortality rate due to malaria for children under the age of 5 up to 60%, and reduce severe malaria morbidity up to 53% (Young et al., 2012). Although the community-based management of malaria has good results by reducing the mortality rate for children under the age of 5, a number of researchers have demonstrated that results performed during trial/pilot projects were better than when the programs are at scale (Adams et al., 2015; Dynes et al., 2014; Druetz et al., 2015).

History of community health worker's programs

According to Perry (2013), the first CHW program was developed in Russia in late 1800s where literate and well-trained members of the community were in charge of primary health programs in rural areas. In 1920, the first large scale CHW program was developed in China with an aim to train illiterate farmers how to register births

and deaths, vaccinate, provide first aid and help communities to maintain and keep their wells clean. The Chinese CHWs program grew quickly and in 1972, China accounted one million "barefoot doctors" (farmers who were given three months training before they started their jobs) serving 800 million population meaning 1 barefoot doctor per 800 people (Perry, 2013). In 1960s, the barefoot doctor program served as a guiding concept to develop the first CHWs programs in some countries like India, Indonesia, Tanzania, Honduras, and Venezuela (Perry, 2013). The Christian Medical Commission (based in Geneva) started developing, at the same period, a new conceptual model to provide healthcare services in developing countries that took into account social justice, equity, community participation, prevention, multisectoral collaboration, decentralization of health services to periphery as close as possible to the communities, appropriate technology, and provision of healthcare services by CHWs. The concept inspired WHO to publish the first book dedicated to CHWs entitled *Health by people* in 1975 and was the foundation of the Alma-Ata declaration in 1978 (Perry, 2013).

Although the first wave of CHW programs were established during the 1960s – 1980s, CHW Program designers and managers are still facing the same issues today namely (a) how to sustain such programs financially; (b) how to design a well-functioning CHW Program; (c) how to recruit, supervise, train, and maintain CHWs; (d) and how to insure a sustained logistical support (Perry & Crigler, 2013). The lack of acceptance and fear of competition by qualified healthcare providers was foreseen to be an increasing issue in some contexts (Druetz et al., 2015). A renewed interest of CHW programs emerged in 2000s with the sense of the emergency to achieve the Millennium Development Goals 4, 5 and 6 that intended towards reducing child and

maternal mortality, as well as to combat HIV/AIDS, malaria and other diseases; and evidence that CHW programs can contribute to some extent to the improvement of health status of the populations (Perry, 2013).

Burundi has started to implement the "community participation" concept in 2000 by creating health committees and managing committees affiliated to each health facility (Concern Worldwide, 2014). The community participation showed limitations quickly related to (a) the resistance from the health workers towards the health committees; (b) the limited decision-making power devoted to the health committees, (c) the lack of coaching of health committees by health professionals that contributed to the mistrust from communities; and (d) the lack of legal cadre to empower health committees (Concern Worldwide, 2014). The community participation was an initiative from international organizations and donors and seemed not to be owned by communities.

The community case management of malaria was introduced in 2011 where CHWs were recruited to perform various tasks including distribution of mosquito nets, perform rapid diagnostic test and administer treatment (artemisinin combined treatments, ACTs) to patients (UNICEF, 2014). The country counted 5,816 CHWs among the 719 CHWs were running the malaria pilot program (160 CHWs for Gashoho, 242 CHWs for Gahombo, and 317 CHWs for Mabayi districts). Their supervision was insured by a health promoter technician from the health district but was considered to be irregular due to logistical issues (transport and external funding dependency).

Who are Community health workers?

Maes and Kalofonos (2013) defined the CHWs as lay personnel trained to provide basic care services and healthy behaviors promotion for their own communities. They are at the frontline in achieving public health goals both for preventive and curative interventions including promoting healthy behaviors, and linking communities to the health facilities (Pallas et al., 2013). The CHWs have various names depending on the contexts: village health workers, community health promoters, lay health workers, lady health visitors in Pakistan, accredited health activist in India… (Hodgins, Crigler, & Perry, 2013; Pallas et al., 2013). Their remunerations vary from one context to another, some of them being fully paid, other partially and other receiving non- monetary incentives like preferential access to healthcare and access to microcredit (Pallas et al., 2013).

To have a good understanding of the CHWs concept, Perry and Crigler (2013) conceptualized the CHWs in four categories: (a) *auxiliary health workers* (AHWs) who are salaried, full – time workers, trained for 1 or 2 years and not necessarily recruited from the area. They provide routine clinical preventive services like immunization, and may be running a peripheral clinic like a health post. (b) *The health extension workers* are also salaried, more or less full-time appointed, trained less than a year before the recruitment, and may be coming from the area but not necessarily working for the same community. (c) *Community health volunteers – Regular* (CHV-Rs) have regular duties and receive regular trainings that can last for weeks. They are from the community and work for the community. They may be involved in case management of childhood illness and dispensing oral pills, condoms, and antenatal iron as an example. They are rewarded based on performance or are

commission based. (d) *Community health volunteers – Intermittent (CHV-Is)* are local CHWs who intervene relatively lightly with a minimum orientation or training. Their function is limited to health promotion even if they can intervene during some campaigns like insecticide-treated bed net distribution. This conceptualization might be helpful for the comparability of CHWs programs within a given country or between countries.

The CHWs in districts other than who piloted the project in Burundi were part-time volunteers without any salary from the government and receiving some incentives like (a) the CHW's personalized kit, (b) implication of CHWs in organization of social events, (c) participation in trainings and sponsored meetings where food and travel allowances were provided, and (d) possible support from community members. They can be classified as CHV-Rs. CHWs were aged of 20 years or more, and having completed at least the primary school level and reputed of having good morality by other community members (UNICEF, 2014).

Variations in CHWs Programs

Since 2000s, the implementation of Millennium Development Goals (MDGs) 4 (reduce child mortality), 5 (improve maternal health), and 6 (combat HIV /AIDS, malaria and other diseases), raised an issue on the importance of enough human resources to cover the needs generated by such ambitions (Singh & Sachs, 2013). The status of CHW Program has slightly changed from an approach of unpaid and less trained to well-trained and fully paid CHWs. In many contexts, the programs are considered as integral part of WHO's health building blocks namely: service delivery, workforce capacity, information management, medicines availability, financing and governance and leadership (Singh & Sachs, 2013). A literature review performed by

Pallas et al. (2013) showed a wide range of clinical activities that can be performed by the CHWs including HIV /AIDS and / or tuberculosis, maternal and child health including immunization and nutritional programs, river blindness, malaria, environmental health and pneumonia. The programs were funded by governments, non-governmental organizations (NGOs) or community-based organizations (CBOs) (Perry and Crigler, 2013).

Mwai et al. (2013), analyzing the literature related to HIV /AIDS programs performed by CHWs concluded that the CHWs enhanced the access to quality health care services, as well as the dignity and quality of life, and retention of HIV patients in the treatment programs. The waiting time was reduced by the presence of CHWs who streamlined the patients at the health facility. Perry and Zullinger (2012) stated that CHWs can improve childhood nutrition and reduce mortality for children with the age under 5 by promoting exclusive breastfeeding, identifying moderately and severely malnourished children in communities, and administrating vitamin A and zinc. They can also manage diarrhea, pneumonia and malaria at the early stage of the onset of symptoms, as well as promoting immunization. Perry and Zullinger concluded that if all those CHW interventions are combined and scaled up in the most affected countries, the mortality rate for children under the age of 5 may be reduced by up to 47%. In Burundi, since 2000, given the lack of strategic direction of the government in community health, various community engagement approaches have been developed under the leadership of some NGOs or other stakeholders especially with HIV/AIDS and community management of onchocerciases. Since 2011, malaria was added to the CHW program and for now, the ICCM with an integrated

management of malaria, diarrhea and pneumonia is about to be implemented (UNICEF, 2014).

Community health worker's malaria programs

The world malaria report 2015 estimated that 88% of malaria cases were from WHO African region, followed by Asia with only 10% of the cases. Although its incidence decreased by 37% between 2000 and 2015, malaria remains the biggest killer for children of under the age of 5 with approximately one child death every 2 minutes in Africa (WHO, 2015). A well-planned community- based intervention can reduce the mortality for children under the age of 5 by improving the healthcare seeking behavior and increasing access to healthcare services at a low cost (McCord, Liu, & Singh, 2013). During the 1970s, there was need to reorient the healthcare policy from occidental medico-centered systems process that may encourage health inequities to a system that uses local actors as healthcare promoters and empowering communities (Druetz, Ridde, Haddad, 2014). A tendency of shifting some clinical tasks from health professionals to CHWs was introduced since 1980s and CHWs were no longer only promoters of health behavior change, but also frontline clinicians.

Despite the increase of funding for malaria programs, the healthcare human resources crisis linked to the emergence of other infectious diseases like HIV, tuberculosis, pneumonia… renewed the interest in CHWs for malaria in early 1990s (McCord et al., 2013). The creation of roll back malaria, the establishment of the global fund against HIV, tuberculosis and malaria, and the adoption of artemisinin combinations as first line treatment for malaria in early 2000s, have paved a way for developing malaria autonomous and separate programs involving CHWs as clinicians (Druetz et al., 2014). The logic behind such interventions was to minimize the

geographical, financial, and cultural barriers by involving CHWs from the communities. The authors noted that neglecting the integration of malaria programs in the health system was a source of incoherence e.g. the referral system from community to the health center, or the medical logistics for CHWs that should normally pass through the health system (Druetz et al., 2014).

Although very successful in Asia, scaling up malaria CHW programs in Africa showed some limitations (Yasuoka et al., 2012). First of all, the lack of functioning health system in Africa could not help overcome the barriers that stop the expansion of CHW programs. Secondly, the community participation was felt as an initiative from outside and less owned by communities. Thirdly, the interaction and power sharing with local health officers was problematic resulting in difficulties of integration of CHWs in the health (Druetz et al., 2014; Perry & Zullinger, 2012). Other cultural aspects, power dynamics and contextual factors are also affecting the community engagement to the programs (McCoy, Hall, & Ridge, 2012). On the other side, the issue of sustainability of funding that was one of the reasons of the decline of CHWs in 1970s is not solved yet, CHW programs being long-term programs that needs to be sustained.

Human resources for health in Africa

At the same time, Africa is facing a chronic shortage of well–trained human resources for health: a study performed in Tanzania showed that only 14% of nurses and 20% of the clinicians required to run health facilities were available. Furthermore, the study highlighted a high level of absenteeism (44% of the employed clinicians were not present the day of survey for various reasons including short training, long term training, seminar, or vacation), and a low level of productivity (nurses were

productive only for 57% of their time; Manzi et al, 2012). In Rwanda, the combined health provider's density is 0.84 physicians, nurses and midwives per 1, 000 population, far from the 2. 3 providers per 1'000 population recommended by WHO (Binagwaho et al., 2013). In South Africa, a study showed that the shortage of human resources in terms of number was one facet of a broader problem including misdistribution, production of wrong skills for nurses, attrition, and retention of health staff from public health services (George, Quilan, Reardon, & Aguilla, 2012). Burundi has 1 medical doctor per 19, 231 inhabitants, 1 nurse per 1,349 inhabitants, and 1 midwife per 124, 312 child age bearing women. Furthermore, 40% of the general practitioners, 75% of specialists, 69% of midwives, 63% of pharmacists, 65% of anesthetists, and 41% of laboratory technicians, are settled in the capital city, Bujumbura (Observatoire national des ressources humaines en santé du Burundi, 2012).

To overcome the human resources issues, WHO and UNICEF recommended the use of CHWs as healthcare providers in settings with limited resources (Ndiaye et al., 2013). CHW programs have been developed in many developing countries in Africa. As an example, Rwanda hired more than 45, 000 CHWs to cover 14, 837 villages, meaning three CHWs per village (Binagwaho et al., 2013). South Africa accounted for 1, 636 NGOs with around 38,500 CHWs, Brazil accounted for 246, 076, Nepal, 54, 500, and Pakistan, around 100, 000 lady health workers (Daniels et al, 2014).

The increase of the use of CHWs services in Kenya has reduced the pressure on the public health services, and increased the access to health services on a timely manner (Kisia et al., 2012). In Tanzania, Uganda and Zambia, randomized trial

studies showed that use of rapid diagnostic tests (RDTs) by CHWs was a good opportunity to improve access to treatment for malaria at community level, and pneumonia at health facility level (Mubi et al., 2012; Mukanga et al., 2011; Yeboah-Antwi et al., 2010).

These findings were nuanced by assessments performed in Ethiopia, Malawi and Rwanda that showed that such community programs will not be successful if there is no social support from community members, as well as a good quality logistical support for keys products commonly used for targeted illnesses (Chandini et al., 2012). Furthermore, Druetz et al. (2015) founded that some cultural aspects, power dynamics and local and contextual factors reduced the efficacy of community-based programs. Some criticism was also raised regarding the malaria presumptive treatment as a potential source of misdiagnosis, misuse of medicines and potentially increase of risks of artemisinin combination therapies (ACTs) resistance (Druetz et al., 2015).

The ACTs have been introduced in Burundi in 2002 at primary health care (PHC) level free of charge for the patients. This program was considered as a big step to control the morbidity and mortality due to malaria, but the lack of human resources became the biggest barrier to attain the objective (Gerstl et al., 2007). To mitigate the lack of qualified human resources, it has been decided to use CHWs as first responders in the communities both for curative and preventive care for malaria. Burundi has implemented a CHW program for malaria since 2011 with a pilot project in three districts of Gahombo, Gashoho and Mabayi. Although a cross-sectional survey (unpublished) performed eleven months after the beginning of the pilot project (Concern Worldwide, 2014) showed an overall satisfaction of the different

stakeholders involved in the program (CHWs, health professionals, community members), the factors associated with the success of the program and the type of social support received by community health workers were not explored.

Dynes, Hadley, Stephenson, and Sibley (2014) stated that collaboration among healthcare coworkers can improve the health outcomes. It is therefore important to understand factors that promote or erode collaboration between coworkers and their networks as well as dyadic variables that can potentially influence the relationship between two co-workers at community level. I used the social networks and social support framework to explore those factors.

Social Networks

The social networks, as defined by Heaney and Israel (2008) represent the web of relationships between member of a community or co-workers. Although CHWs running a same program are expected to work in close collaboration, they usually constitute a very heterogeneous group with wide differences in training, work experience, demographics and varied perspectives for health (Dynes et al., 2014). CHWs and the healthcare professionals will develop good social networks (as a proxy of good working relationship) if they have a shared understanding of their roles, goals and value within the team, accept to work interdependently, and cooperate to develop a synergy (Franklin et al., 2015).

The analysis of social networks has been used in needs assessments, community program evaluation, and participatory – action research strategies (Maya-Jariego & Holgado, 2015) and public health campaigns (Chambers, Wilson, Thompson, & Harden, 2012). The main intervention strategies based on social

networks are mainly (a) identification of community leaders and agents for change, (b) segmentation into groups to apply a given intervention, (c) promoting strategies that enhance multiplier effect of social networks, and (d) alteration of social networks to add or remove particular relationships (Maya-Jariego and Holgado, 2015).

The strength of ties and working relationship between two individuals depends on (a) the social and demographic similarities or differences between the two individuals (homophily), (b) how they trust each other, (c) how close they are geographically, (d) how strong is the motivation to work together and (e) how often they meet or benefit from training together (Dynes et al., 2014). For this research, the independent variables that will be used to explore the social networks are *reciprocity, intensity and strength and formality*. Theses independent variables will be measured using Likert scale of measurement (with 5 scales) and for this reason will be considered as a continuous variable.

Homophily is defined as the tendency of people to associate with other people having similar traits [homogeneity] (Colub and Jackson, 2012). According to this principle, social and demographic similarities may reinforce social relations, ease communication and increase trust (Dynes et al., 2014). I can then hypothesize that the extent to which one CHW interacts with another CHW is positively associated with the extent to which they have social and demographic similarities.

Trust in fellow healthcare provider's ability to convoy culturally appropriate care increases the desire and commitment to work together, while lack of trust creates avoidance (Isaacs et al., 2013). We hypothesize that the extent to which a CHW engages in working with another CHW is positively associated with the extent to which the first CHW trust the second

Distance: Dynes et al. (2014) stated that geographic proximity increased communication, coordination and mutual support, cohesion and information transaction between coworkers. In contrary, people located in different area were less integrated in the team (geographic dispersion). I can hypothesize that the extent to which a CHW interacts with another CHW is negatively associated with the distance between the homes of the two CHWs.

Shared motivations: Maes (2012) stated that CHWs have many motivations ranking from direct salary, acquiring knowledge, nonmonetary incentives, to pro-social motivations such reducing the suffering of people or serving God. Dynes et al. (2014) stated that healthcare providers who have the same motivations have a potential to build a good teamwork. Therefore, we can hypothesize that the extent to which a CHW is engaged in working with another CHW is positively associated with the extent to which they are similarly motivated to do health work.

Social networks can also be analyzed from the angle of the number of CHWs involved in the networks: dyadic social networks that involve two individuals in the network or the network as a whole. Characteristics of dyadic social networks are (a) the extent to which resources are exchanged in a relationship (reciprocity), (b) the closeness of the relationship (strength / intensity), (c) the extent to which the relationship is formal (formality), (d) and the complexity of the relationship (Heaney and Israel, 2008). The following analysis takes into account dynamic networks where the ties can be altered (added or deleted) other the time.

Reciprocity: A dyadic relationship is maintained by the strength of exchange between two individuals. Melamed and Simpson (2015) differentiated cooperators (those individuals who are ready to share) from defectors (those who are ready to

benefit from a relationship without sharing) and concluded that cooperators may be exploited by defectors. They stated that reciprocity increases the ties value and the stability of the relationship over the time. The independent variable *reciprocity* will be measured using Likert scale of measurement using a question formulated as following: How reciprocal is the relationship between you and your neighboring CHWs? The answers could be: not at all, to a small extent, to some extent, to a great extent, to a very great extent

Intensity and strength: Granovetter (1973) as cited by Melamed and Simpson (2015) defined the strength of a relationship as a combination of the amount of time, the emotional intensity, the intimacy (mutual confiding) and the reciprocal services that characterize the tie. The strength of a relationship is linked with the benefit that the two actors are expecting from the relationship, the existence of alternative relations, or the emotional value attributed to the relationship (Melamed & Simpson, 2015). The strength of the relationship is also associated with the length/duration of the relationship and the frequency of contact (Melamed & Simpson, 2015). The strength of ties has been used to explain employment, information flows, and social support (Melamed & Simpson, 2015). The length of the ties between CHWs is important as relationship that endure allow the development of trust and commitment within the dyad. The *intensity and strength* independent variable will be measured using Likert scale of measurement using a question formulated as following: How strong is your relationship with the CHW of the neighboring village (intensity or strength of the relationship)? The answers will be chosen among: no relationship at all, poor relationship, fair relationship, good relationship, very god relationship.

Formality: The extent to which a relationship is embedded in a formal/institutional structure may reinforce the dyadic relationship. Literature showed that CHW programs implemented in countries where they are fully encouraged to work with the healthcare providers had better outcomes as there is a clear definition of (a) the role of each other, (b) the personalized needs in terms of training and supervision by a senior CHW, (c) and shared leadership (Findley, Matos, Hicks, Chang, & Reich, 2014). The independent variable *formality* will be measured using Likert scale of measurement using a question formulated as following: How connected are you with the CHWs with whom you have a formalized relationship? The answers will be chosen among: not at all, to a small extent, to some extent, to a great extent, to a very great extent.

Social Support

Lakey and Cohen (2000) presented the social support in three important theoretical perspectives: the stress and coping perspective, the social constructionist perspective and the relationship perspective. The *stress and coping perspective* proposes that social support contributes to health by protecting people from the adverse effect of stress. The *constructionist perspective* proposes that the social support influences health by directly promoting self-esteem and self-regulation regardless the presence of the stress. The *relationship perspective* predicts that the health effects of social support cannot be separated from relationship process that often occur with the support, such as companionship, intimacy and low social conflict.

Wilcox and Vernberg (2013), citing House (1981) defined social support as an interpersonal transaction involving one or more of the following: (a) emotional

concern (liking, love, empathy); (b) instrumental aid (goods and services), (c) information (about the environment), (d) and appraisal (information relevant to self-evaluation). All those concepts have been defined when discussing the conceptual framework. The independent variables that will analyze the social support (emotional, instrumental, informational and appraisal support) will be measured on a Likert Scale (5 scales) by responding to the question "to which extend" do you receive support from other CHWs (peers support), from community, or / and from the supervisors.

Motivation of CHWs

CHWs are increasingly used as frontline healthcare providers in low and middle-income countries to address the shortage of qualified human resources for health (Adams et al., 2015; Binagwaho et al., 2013; Crigler et al., 2013; Gopalan et al., 2015). However, their motivation is considered being the biggest barrier to the success of such programs (Strachan et al., 2015). Previous studies focusing on motivation, retention and performance of CHWs emphasized on the dire need of defining the right incentives for CHWs and did not focus much on their working environment (Strachan et al., 2015). Therefore, Strachan et al. (2015), citing Kanfer et al. (2004) divided the determinants of CHW's motivation into three levels of motivation: the individual, work context and organizational, and society and culture levels. From that perspective, a CHW program may be effective if (a) there is a correspondence between the CHWs and the program goals, (b) there is a feeling of shared experience and collective identity among CHWs, (c) there is a clarity in the duties of each member of CHW's team, and the program focuses on what is within the CHW's power to deliver (Strachan et al., 2015).

In Uganda, CHWs were motivated by helping fellow community members, not wishing to let them down and gaining their trust, respect and appreciation; in Mozambique, the CHWs were motivated by the fact of being chosen by community members, which increased the recognition of doing great job and contributing to a healthier environment. However, the CHWs suggested that they may leave if they get a better paid job (Strachan et al., 2015). The performance of CHWs was also linked to the technical and logistical support they received, health-related information and feedback received from the health officers or from health committees (Gopalan et al., 2015). From a formative research perspective, the CHWs were motivated by (a) their status and standing within the community, (b) the feedback and supportive encouragement received from supervisors and community members, (c) the connections they have both with the health system and the community, (d) the adequate medical resources, (e) participatory activities that engage other members of the community and (f) interventions that improve communication such us the use of mobile phones to transmit/receive supportive information (Gopalan et al., 2015).

Integration of CHW Programs Into Health Systems

CHW programs in low-income countries are facing several issues in their implementation and sustainability namely the lack of political will, financial constraints, fragmentation of the programs, and lack of strategies to enhance and sustain the programs (Asweto, Alzain, Andrea, Alexander, & Wang, 2016). CHWs who perceived that their efforts are recognized and well-compensated were in a better position to provide better quality healthcare to the communities they served (Asweto et al., 2016). Recognition meant clear responsibilities within the health system, a reasonable reward (monetary and nonmonetary incentives) and possibility of

developing, in some cases, a career path (Asweto et al., 2016). Nonmonetary incentives included free (or reduced costs) access to healthcare services for CHWs and their families, continuing education, supportive supervision including performance review, mentoring, adequate supplies of medical and non-medical needed items, visible rewards such identification items (t-shirts, umbrellas, bicycles, mobiles phones with stickers), and career growth (Asweto et al., 2016).The package of incentives should be enough to compensate the time spent doing the CHW activities in order to reduce the dependency of performing CHWs on their families.

The support supervision and collaboration from community members is essential as it increased the number of supervision contacts and improved the accountability towards the community (Asweto et al., 2016). Therefore, it is important to involve the administrative lowest level in the supervision process. At national level, the governments were not able to finance and sustain the CHW programs and relied on external funding (Asweto et al., 2016). NGOs played an important role in alleviating the lack of resources, however, it was found that they operated in a substitution mode rather than support mode (Asweto et al., 2016). CHWs tend to be accountable to NGOs rather than to the healthcare system. The NGO pullout was a discouraging factor for CHWs emphasizing the issue of sustainability of such programs. The governments should be accountable for policy making and logistical support to avoid shortage of medicines and other medical equipments.

Summary and Conclusions

CHWs play an important role in facilitating access to healthcare for people living in hard-to-reach areas of low and middle-income countries. CHWs vary from fully-paid, well-trained to occasional volunteers, unpaid and less trained. The range of

their activities has evolved from health promoters to frontline clinicians in areas with limited human resources. Although CHW programs reduced mortality for under five children during the lifespan of pilot projects, less progress has been noticed after scale-up of the programs. In general, literature showed that the motivation of CHWs waned when external donors stopped their funding. How to keep CHWs motivated and focused on their work is under debate and few interventions ranging from giving salary to nonmonetary incentives are being explored.

The social networks and social support has shown a positive impact on health. Well-connected members of networks have a quicker access to new health information that can help healthcare seeking behaviors change, improve adherence to treatments, and reduce duration of stressors. CHWs who have support from their supervisors (support supervision including positive feedback and logistical support), the community members (emotional support, and incentives) and who support each other (peer support, supervision by senior CHWs) have better clinical performances.

Chapter two demonstrated the need to perform this study. It highlighted the gaps in understanding the type of support needed to insure continuation of CHW malaria programs after the withdrawal of international donors. The chapter three will describe the research design and will provide details about the methodology and the participants to the study.

Chapter 3: Research Method

Introduction

Community case management for malaria started in Burundi in 2011 as a pilot project in the districts of Gahombo, Gashoho and Mabayi. After 11 months of the project, 62,746 children under the age of 5 were treated by 719 CHWs in the three districts (about eight children per CHW per month). The purpose of this study was to determine whether there is a correlation between the social networks and social support received by CHWs and their performance (number of cases of children under the age of 5 with malaria treated) in the three districts covered by the CHW pilot project. I used questionnaires to investigate the possible correlation. Descriptive and inferential statistics were used to analyze the relationships between the dependent variables (number of children under the age of 5 treated) and the independent variables (health system support, community social support, and social networks between CHWs). In Chapter three, I will describe the rationale of this study; the methodology used; the population studied; the sampling methods; the participant recruitment procedures and data collection; the instrumentation and operationalization of the constructs; the data collection analysis plan; the threats to validity (internal, external, and constructs validity); and the ethical procedures.

Research Design and Rationale

In this study, I explored the impact of social support and social networks on the work of CHWs involved in the management of malaria for children under 5 years old in the communities. The independent variables for the social networks construct were the reciprocity, the strength, the formality, and the complexity of the ties (relationships) between two CHWs, one CHW and a community member, and one

CHW and the supervisor; the homogeneity of CHWs; the geographic dispersion (distance between CHW and supervisor); and the density (interactions between CHWs). For the social support construct, the independent variables were emotional, instrumental, informational, and appraisal support (who is providing support other CHWs, community and/or family members, or supervisors, and which kind of support is provided). The dependent variables for the constructs was the number of children under the age of 5 treated by CHWs. The covariates related to CHWs were the age, sex, education level, socioeconomic status, and number of children per CHW. Those variables can also be considered as mediating variables, which are defined as variables that can modify the path from independent variable to the dependent variables and whose modification can affect the dependent variable (Pourhoseingholi et al., 2012). Another covariate/confounding variable (a variable that can considerably modify the dependent variable if not controlled; see Pourhoseingholi et al., 2012) could be the existence of other community interventions that affect the reduction of malaria cases or its severity in the community (e.g., mosquito nets distribution, area sanitation, nutritional interventions, etc.).

I developed three research questions to address the correlation between the support received from health professionals, supervisors, community, and peer support between CHWs and the trends in number of consultations for children under 5 years old. I also developed and analyzed research sub questions related to the extent to which CHWs have social and demographic similarities, trust each over, distance between them, similar motivation to work as CHW, and that they tend to work together. For that reason, I used a descriptive, quantitative research design using cross-sectional survey method. In a cross-sectional study, the relationship between

independent and dependent variables is assessed once and the researcher draw conclusions from this analysis (Creswell, 2013). Cross-sectional studies do not alter any variables and produce a snapshot picture of the situation at the moment of the research, which means that it is possible to infer *correlation* and not *causality* with this design (Creswell, 2013).

According to Creswell (2013), quantitative research design is chosen to confirm an already existing theory or theoretical framework. The design is also useful as the hypotheses are built before the collection of the data. In respect to the sampling methods, I expected that the results were representative and was able to infer them to the rest of CHWs. Using statistical techniques, I eliminated the effect of confounding variables. The advantage of using statistical techniques and software is that the statistical results are less dependent on the researcher (Creswell, 2013). However, the quantitative research design had also some limitations in this study, including that (a) the theoretical framework that was used for the research might not reflect the local understandings, (b) the focus of existing theoretical framework or hypothesis testing might limit the understanding of a participant's dynamics, and (c) the knowledge gained from the study might be to general and not applicable to the local context (Creswell, 2013).

Methodology

Population

In this study, I focused on the CHWs who were involved in the pilot project from the three districts in Burundi (Gahombo, Gashoho, and Mabayi). According to the Concern Worldwide (2014) report, a total of 719 CHWs were recruited from the community members at the beginning of the pilot project (160 CHWs for Gashoho, 242 for Gahombo, and 317 CHWs for Mabayi). The selection of CHWs was made after interviews were conducted with all potential candidates. The results were announced publically during meetings organized at the community level by community leaders. The participants were aged between 20 and 50 years old, agriculturalists in the majority (97%), and majority of them had a primary school certificate. To be selected as a CHW, some prerequisite had to be met (e.g., being married, having a good reputation in the community, residing within the community, and accepting to work as a volunteer; Concern Worldwide, 2014).

Sampling and Sampling Procedures

The total population covered by this study was 719 people. Therefore, it was difficult for me to organize interviews of all those CHWs considering time and financial constraints. Therefore, I needed a representative sample of CHWs. I used G*Power 3 software to calculate the size of the sample for my research. Assuming that I would use logistic regression to analyze the data, with an effect size of 0.5, alpha error of 5%, and the power of 95%, I calculated that I needed a sample of 88 CHWs to be interviewed. I used a probabilistic sampling method (the systematic sampling technique) to get the desired sample size. Systematic sampling is a technique used when the subjects to be studied are known and arranged in some order

(e.g., lists, files in a cabinet, etc.; Bujang et al., 2012). In this case, each of the three districts had the list of CHWs that was used in the pilot project for me to select the sample from. The systemic sampling technique says that a researcher should divide the population to be studied (N) by the sample size (n), and the value (k; Bujang et al., 2012). The value k was added to first selected number to find the following one. I randomly selected the first participant to survey by figuring out the distance between 1 and k:

$N = 719$; $n = 88$; $k = 719/88 = 8$

In this case, with $k = 8$, the first participant to survey was randomly selected between number 1 and 8. The randomly selected participant was 6. The second participant was be number 6+8 = 14, the third would be 14+8 = 22, and so on until I reached 88 participants. Because all the CHWs were recruited and trained under almost same conditions, they had the same chances to be part of the study. In this study, I focused on active CHWs who were recruited during the pilot phase of the project. Those recruited after the pilot period were not part of the study.

Procedures for Recruitment, Participation, and Data Collection

I recruited the 88 CHWs who participated in the study from the active CHWs from the three districts that hosted the pilot project. After receiving the needed authorization from the Ministry of Health of Burundi and Walden University institutional review board approval (IRB Approval No 05-04-17-038159 that will expire on 05/03/2018), I organized a meeting with the health authorities at the district level to explain the objectives of the study and the methodology of the research and present the content of questionnaire in order to get a formal approval at the district level.

Once I received approval at the district level, I made an individual appointment with CHWs who participated in the study. If a CHW was not willing to participate in the study, they were replaced by the following one on the list. A written consent was produced and signed by each participant, and all the questions related to the research (from the participant) were answered before I administered the questionnaire. Because the CHWs were living in various villages within the districts, I invited the participants at the nearest health facility of their choice. An amount of equivalent of 5 dollars was given to the participants to cover some of the expenses including transportation and food and drink costs. Participants were reminded that they could exit the interview at any time and that they did not need to give an answer to questions that they felt uncomfortable answering. The questionnaire took approximately 20 to 30 minutes for the participants to complete.

Pilot Study

Before carrying out the interviews, I tested the questionnaire with five volunteers that allowed me to know an approximation of the time I would be spending with each participant. The test for the questionnaire allowed me to anticipate questions that may be asked by participants, difficulties in the understanding of some questions, misinterpretations, and the order of questions to be followed that helped to improve the questionnaire. The volunteers who participated in the pilot study were not part of the final study.

Archival Data

The health information management system of the Ministry of Health (MOH) is organized in a way that all the data collected from the public health facilities are centralized in one unit at the MOH level (Ministry of Public Health, 2011). For the purpose of this study, I requested the authorization from the MOH to use the data collected from the three districts related to malaria for the period from 2011 and 2014. From that data, I analyzed the trends of morbidity and mortality due to malaria for children under the age of 5 from 2010 to 2014 to have an idea of the possible impact of the intervention in the three districts.

Instrumentation and Operationalization of Constructs

Constructs are defined as phenomena that we believe to exist but that cannot be observed directly (Miller et al., 2009). Using that definition, constructs are abstract, not directly observable, and may be complex. *Variables* are operational forms of constructs that define the way a construct has to be measured in a given context (Barbara, Glanz, and U.S. National Cancer Institute, 2013). When a researcher assesses the relationships between variables, they infer the relationships between the constructs they are intended to measure (Miller et al., 2009)

The purpose of this study was to understand whether there was a correlation between the social networks and social support received by CHWs and the number of children under 5 years old treated by CHWs. I operationalized social networks (as a construct) in three variables: ties between CHWs, CHWs and community members, and CHWs and health professionals. I analyzed the reciprocity, the strength, the formality, and the complexity of those ties. The social support (as second construct) was operationalized in three variables: support received from health professionals;

from community members; and peer support focusing on emotional, instrumental, informational, and appraisal support (see Heaney & Israel, 2008).

The instrument I used for this research was a questionnaire (Sarason's and Ashida's (1987) social networks support questionnaires) that was delivered to the sample of CHWs. Miller et al. (2009) stated that the process of development, testing, and using a questionnaire (instrumentation) depends on a good understanding of the definitions of the constructs. A clear definition of the constructs helps to generate and select the items used to develop/find a suitable questionnaire. I selected and adapted the instruments from the HAPI and PsycTest databases (Walden University, 2016). The HAPI and PsycTest databases allows a researcher to search for a specific test when they are clear about the test they want to use, to find a test for a particular variable, or to find test reviews.

Reliability. Kimberlin and Winterstein (2008) stated that the observed score obtained by a measurement instrument is composed of a true score and error. According to these researchers, the true score is the result that would be obtained if the measurement instrument was perfect. The main focus while developing and validating an instrument is to reduce as much as possible the measurement error (Kimberlin & Winterstein, 2008). Pretesting or piloting an instrument is one of the techniques that allows the researcher to identify the source of error and increases the reliability of the instrument (Kimberlin & Winterstein, 2008). For the questionnaire that I used in this study, it was tested on five volunteers before I carried out the interviews. The five volunteers were not taken into account as part of sample.

Reliability estimate is used to evaluate the stability of the measurement instrument by administrating the same test to same individuals at different times. This

exercise is called *test – retest* reliability. The reliability estimate is also used to evaluate the *internal consistency* of an instrument e.g. estimates the equivalence of sets of items from the same test (Kimberlin & Winterstein, 2008).

Validity. Kimberlin and Winterstein (2008) defined the validity of a research as the extent to which an instrument measures what it purports to measure. Validity requires that the instrument is reliable but all reliable instruments are not necessarily valid. The construct validity can be gained through an accumulation of evidence from a high number of studies using the same (specific) measurement instrument. The content validity examines how well the instrument items were developed, while criterion-related validity analyzes how well scores on a new measure correlate with other measures of the same construct (Kimberlin & Winterstein, 2008). To keep my questionnaire valid, I made sure that it aligned with the purpose of the study. I made sure all the items that were used were appropriate, using what I learnt from the theoretical framework and my proper judgment (Laerd Dissertation, 2012).

Data Analysis Plan

The data were collected using a questionnaire administered to 88 CHWs. The data collected from the cross-sectional survey were analyzed using SPSS Version 24. The statistics from the MOH were reviewed to analyze the trends of malaria morbidity and mortality during the period of study. The results of the analysis were presented as tables and graphs.

Research questions

For this particular survey, the independent variables were evaluated using Likert scale (continuous variables) and for that reason, the correlation was used as statistical method to evaluate the extent to which the independent variable influenced

the dependent variable individually, and the regression was used to assess the extent to which the independent variables influenced the dependent variable collectively. The following research questions and hypotheses guided the study:

Research Question 1: Is there any correlation between the instrumental, informational, and appraisal support received from the health professionals and the number of children under the age of 5 with malaria treated by CHWs in the districts covered by the pilot project in Burundi?

$H_0$1: There is no correlation between the instrumental, informational, and appraisal support received from health professionals and the number of children under the age of 5 with malaria treated by CHWs in the districts covered by the pilot project in Burundi.

H_a1: There is a correlation between the instrumental, informational, and appraisal support received from the health professionals and the number of children under the age of 5 with malaria treated by CHWs in the districts covered by the pilot project in Burundi.

Research Question 2: Is there any correlation between the emotional, instrumental, and appraisal support received from the community members and the number of children under the age of 5 with malaria treated by CHWs in the districts covered by the pilot project in Burundi?

$H_0$2: There is no correlation between the emotional, instrumental, and appraisal support received from communities and the number of children under the age of 5 with malaria treated by CHWs in the districts covered by the pilot project in Burundi.

H_a2: There is a correlation between the emotional, instrumental, and appraisal support received from the community members and the number of children under the age of 5 with malaria treated by CHWs in the districts covered by the pilot project in Burundi.

Research Question 3: Is there any correlation between the social networks and peer support of CHWs and the number of children under the age of 5 with malaria treated by CHWs in the districts covered by the pilot project in Burundi?

$H_0 3$: There is no correlation between the social networks and peer support between CHWs and the number of children under the age of 5 with malaria treated by CHWs in the districts covered by the pilot project in Burundi.

$H_a 3$: There is a correlation between the social networks and peer support between CHWs and the number of children under the age of 5 with malaria treated by CHWs in the districts covered by the pilot project in Burundi.

Analysis plan and interpretation of the results

The analysis and interpretation of the results was done using statistical tests from SPSS. Nayat and Hazra (2011) stated that the appropriate statistical test must be decided before a study starts, at the stage of planning the research. The statistical test that was used was chosen at the same time when I decided for the sample size. The authors stated that while choosing a statistical test, the researcher need to take into account (a) the research questions to be answered, (b) number and the type of

independent and dependent variables and their scale of measurement, (c) and the number of groups or data sets involved in the study as well as the relationships between the groups (paired or unpaired).

The number of independent variables that covary with the dependent variable would determine whether the researcher uses bivariate statistical tests (if only one independent variable covary) or multivariate statistical tests (if more than one independent variable involved). The level of measurement of the independent variable is also important to know as it determines whether the hypothesis would be comparative (nominal independent variables) or relationship hypothesis (ratio or interval variables). If the independent variable is on an ordinal level of measurement, the hypothesis would be either comparative or relationship depending on whether the ordinal variable is considered as set of categories or a set of continuously varying classes (Nayat & Hazra, 2011).

While choosing a statistical test, the researcher would need also to determine whether the groups or data sets are unpaired (no possibility of values in one data set to influence the value of the other data set) or paired (data sets are derived by repeated measurements e.g. measurement before and after an intervention or multiples measurement across the time; Field, 2013). For a quantitative / numerical data, if the groups were unpaired, the researcher would need to analyze whether there is a normal distribution of the data (Gaussian curve) in which case parametric tests would be used. If the data are not normally distributed, non-parametric tests will be used (Field, 2013). The researcher needs also to state whether the study cover all the population or a sample of the population and that the results would be inferred to the rest of the population.

For my dissertation, I used a sample of 88 CHWs to answer to three research questions. For the Research Question 1 [Is there any correlation between the instrumental, informational and appraisal support received from the health professionals and the number of the children of less than five years treated], I have two independent unpaired groups (those receiving support, those who don't receive support), three independent variables (instrumental, informational and appraisal support) and one dependent variable (number of consultations for children of under age of 5). The independent variables are continuous variables measured on a Likert scale and the dependent variables are continuous variables. In this case where we have two categories of independent groups, I used multiple linear regression to predict the probability of an observation to fall in one of the two independent groups.

The Research Question 2 [Is there any correlation between the emotional, instrumental and appraisal support received from the community members and the number of children of under age of 5 treated] has the same characteristics as the research question 1 and I will use the same statistical test (multiple linear regression). The Research Question 3 [Is there any correlation between the social networks and peer support of CHWs and the number of children of under age of 5 treated treated] has two independent groups (those belonging in a social network and those who are not), four independent variables (formality, density and strength, and reciprocity) and one dependent variable. The independent variables are on a Likert scale of measurement with five items. As for the two previous research questions, the first choice of statistical test was multiple linear regression. In this case the assumption of normality was not met, Kruskal-Wallis, a nonparametric statistical test ANOVA-like was used. The nonparametric tests (also called assumption-free tests) can be helpful

when the central tendency is missing and then help to eliminate the effect of outliers (Field. 2013).

The trends of morbidity and mortality during the span of the pilot project were analyzed using the data set that is kept in the archives of the MOH. To get the data consolidated, monthly reports were sent to the supervisor who compiled the data and sent them to the provincial health office. The compiled data at the provincial level were sent to the MOH. The data comprises the number of consultations and the number of children tested positive for malaria. The dataset comprises also demographic information such as age, sex, province/district of origin and date of consultation. All the malaria cases with signs of complications were referred to the health facilities. For that reason, all the deaths were recorded at the health facility level. From the data, I calculated the prevalence of malaria (as a proxy variable for the morbidity) among the targeted population and compared the trends across the years. As a recall, the malaria prevalence is the number of malaria cases (both new and old cases) within a given population in a defined time period. In this case, the prevalence reflects "the penetration" of malaria within the population of under-five children and can be used to evaluate the impact of the CHWs interventions that in fighting the disease over the time. Malaria specific mortality rate for children of under age of 5 treated is calculated by taking all the deaths that occurred during a particular time period due to malaria for the same age group and dividing by the total number of under five children during the same time frame multiplied by 1,000 (Wang et al., 2013).

Even if the CHW project had an influence on the trends in morbidity and mortality for the children of under age of 5 treated in the areas covered by the pilot

project, there were a number of covariates and confounding variables that have been already described earlier (socioeconomic status, transportation, knowledge that medicines are available at CHWs level, other community interventions etc.) that may influence the prevalence of malaria among the children of under age of 5 treated. Failing to control covariates and confounding variables may lead to misinterpretation by giving a changing power of an independent variable towards a dependent variable that does not really exist.

Treats to Validity

External Validity

The external validity of a research is referred to as the extent to which the results of the given research can be generalized to other situations and/or other people. The external validity is divided into two subgroups, the population validity (how the sample is representative for the population, and how widely the results apply) and the ecological validity (how results generalize across settings including interaction effect of testing, interaction effects of selection biases and experimental treatment, reactive effects of experiment arrangements, multiple treatment interference, and the experimenter effect (Laerd Dissertation, 2012). Although the threats to external validity is very important for empirical studies, in theory developing than theory testing (Calder, Phillips, & Tybout, 1982), it is also important for my cross sectional study that (a) the volunteers for the pretest are not part of the research to avoid the reactive effects of testing; (b) the selection bias for the sample is avoided by a random selection; (c) and I was the one who delivered the questionnaire to make sure that all the questions are understood and asked in a same way reducing the effects of experiment arrangements.

Internal Validity

The internal validity is referred to as the extent to which the observed changes in the dependent variables are related to the changes in the independent variables. The researcher must control all extraneous variables that may compete with the independent variables e.g. confounding variables (extraneous variables that influence the dependent variable; Kimberlin & Winterstein, 2008). Not controlling those confounding variables may compromise our confidence in saying that a relationship exists between the dependent and independent variables.

In my research, the administration of the questionnaire was as short as possible (20 to 30 minutes) to avoid the threats of history (an anticipated event that occurs during the experiment) and maturation (the normal developmental processes that occur to the research participant during the course of research. The more an experiment is long, the more the participant gain knowledge). To avoid the statistical regression (the tendency for extreme scores to move towards the mean) and selection (participants randomly assigned, or self-selected) threats of internal validity, the participants were selected randomly and not classified according to the "perceived performance" (Laerd Dissertation, 2012). In case of the participants dropped out or refused to respond to the interviews, they were replaced by the following CHWs on the list. The testing threat for internal validity will be avoided by excluding the volunteers to the pretest from the final research questionnaires.

Construct Validity

The construct validity is comprised of other forms of validity e.g. consent validity, convergent and divergent validity, and criterion validity (Messeck, 1980 as cited by Laerd Dissertation, 2012). For the construct validity, the researcher has to

make sure that (a) the instrument used for the research (questionnaire) is relevant and representative for the construct; (b) and make sure the questionnaire measures only the construct we are interested in. For this reason, I needed to develop a clear operational definition of the construct to be studied. Laerd Dissertation (2012) stated that although it's a good practice to inquire for threats of construct validity, the research will not be able to demonstrate a construct validity in a single study.

Ethical Procedures

A number of permissions were required before starting the data collection (permission from the Ministry of Health of Burundi and the consent form). All those documents were attached to the IRB form that was submitted to Walden University for approval (IRB Approval No 05-04-17-038159 that will expire on 05/03/2018). I used anonymous method while collecting the data e.g. the identity of the respondent was not displayed. To mark their approval to be part of the study, the participant to the research responded to the questionnaire. I aligned the questionnaire to the research question to make sure that the data collected respond to the research question.

The recruitment of the participant was done randomly. The participants were briefed on the nature of the research before data collection. They were given the opportunity to withdraw from the research at any time of the interview, as well as to respond or not respond to questions that were considered as being "sensitive" for the participants. The questionnaires will be stored in a secured place and will be destroyed after 5 years as required by the University. There is no conflict of interest foreseen and I am funding the research as part of the academic development.

Summary

Chapter three described the rationale of this study, the methodology to be used, the population to be studied, the sampling methods, the participant's recruitment procedures and data collection. , The chapter also described the instrumentation and operationalization of the constructs, the data collection analysis plan, the treats to validity (internal, external and constructs validity). The ethical procedures and the IRB approval were also presented. The chapter four will display and analyze the results of the research.

Chapter 4: Results

Introduction

The purpose of this study was to determine whether there was a correlation between the social networks and social support received by CHWs and their performance (the number of malaria cases of children under the age of 5 treated) in the three districts covered by the CHW pilot project. I used paper-based questionnaires to establish the correlation. Descriptive and inferential statistics were used to analyze the relationship between the dependent variables (number of children under the age of 5 treated by CHWs) and the independent variables (health system support, community social support, and social networks between CHWs).

This study was guided by three research questions:

Research Question 1: Is there any correlation between the instrumental, informational, and appraisal support received from the health professionals and the number of children under the age of 5 with malaria treated by CHWs in the districts covered by the pilot project in Burundi?

RQ2: Is there any correlation between the emotional, instrumental, and appraisal support received from the community members and the number of children under the age of 5 with malaria treated by CHWs in the districts covered by the pilot project in Burundi?

RQ3: Is there any correlation between the social networks and peer support between CHWs and the number of children under the age of 5 with malaria treated by CHWs in the districts covered by the pilot project in Burundi?

In Chapter 4, I will describe the type of data used in this study and how they were collected. The chapter will also include some information on the pilot study, the

data analysis processes, and the results. I will conclude the chapter with a summary of the findings and possible answers to the research questions.

Pilot Study

Before the administration of the questionnaire, I conducted a pilot study with five CHWs who volunteered and were not part of the final study. The objective of the pilot study was (a) to test the efficacy of the research procedures to answer to the research questions, (b) to ensure that the settings would be conducive for the research, (c) to determine the exact duration of the questionnaire, and (d) to allow the participants to the research to ask questions related to the understanding of the questionnaire. This step was crucial as some of the questions were not well understood by the pilot study volunteers and there was a need for rephrasing the questions. The pilot study also helped me solve some logistical questions that were not foreseen during the planning process.

Data Collection

I recruited the 88 CHWs who responded to the questionnaire from the active CHWs from the three districts that hosted the pilot project. After receiving the needed authorization from the Ministry of Health of Burundi and Walden University IRB approval (IRB Approval Number 05-04-17-038159 that will expire on 05/03/2018), I scheduled an appointment with each of the selected CHW at the neighboring health center. To insure confidentiality and less disturbance, the nurse in charge of each health center availed a room where I could stay with the CHW alone to deliver the questionnaire. A written consent was delivered to each participant and after reading through the form, those that accepted to be a part of the study responded to the questionnaire. The questionnaire lasted between 20 and 30 minutes.

Study Results

The purpose of this study was to determine whether there was a correlation between the social networks and social support received by CHWs and their performance (number of children under the age of 5 treated from malaria) in the three districts covered by the CHW pilot project. I used questionnaires to establish the correlation. Descriptive and inferential statistics were used to analyze the relationship between the dependent variable (the number of children under the age of 5 treated) and the independent variables (health system support, community social support, and social networks between CHWs).

Burundi Malaria Database Analysis (2010–2014)

Before analyzing the results of the survey, I wanted to understand the magnitude of malaria in the three districts covered by the project during the period of 2010–2014. My analysis of the statistics from the primary health care facilities from Mabayi, Gahombo and Gashoho showed a stabilized number of malaria cases from 2010 to 2014 (except in 2012 where the number of malaria cases dropped in almost all the health facilities) and a decreased number of deaths as shown by the following graphs.

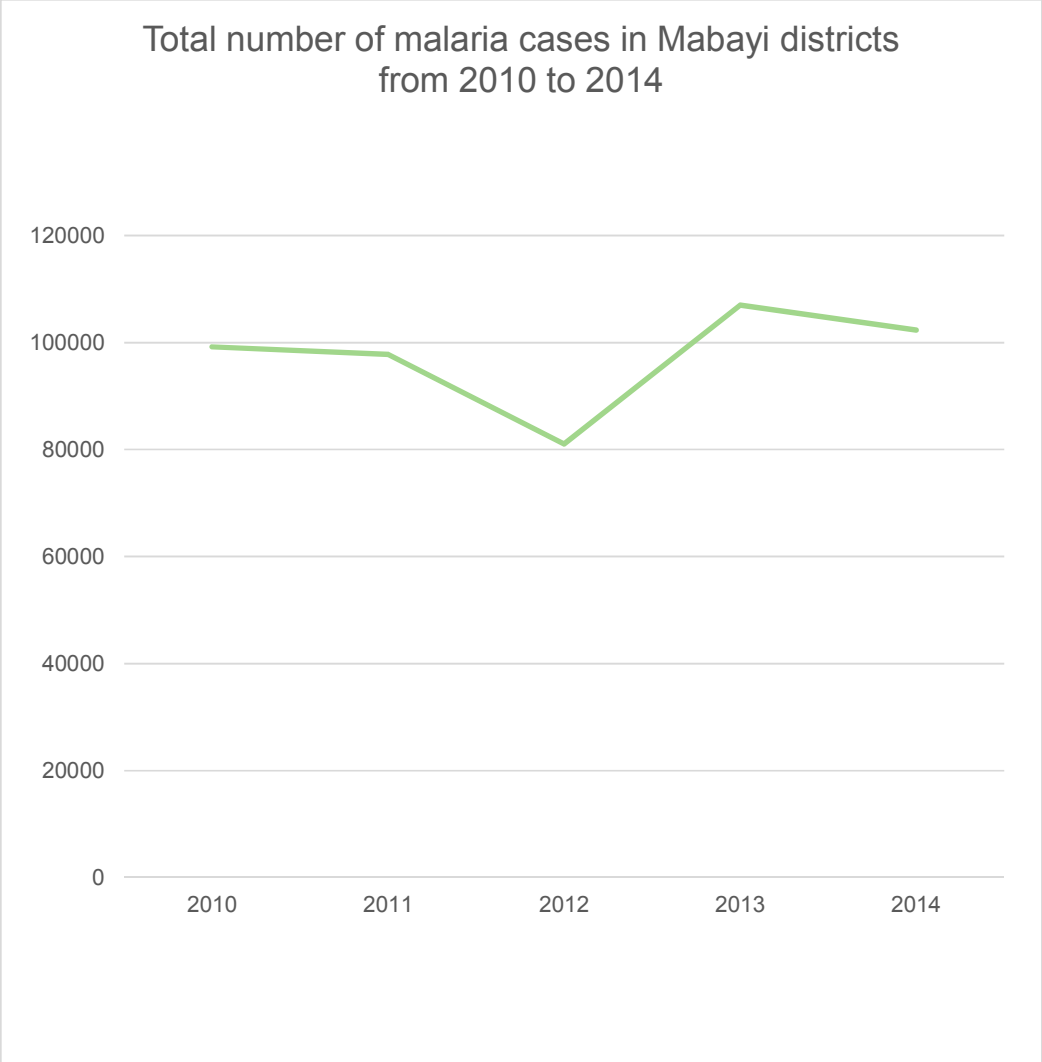


Figure 1. Malaria cases treated in Mabayi district for the period of 2010–2014.

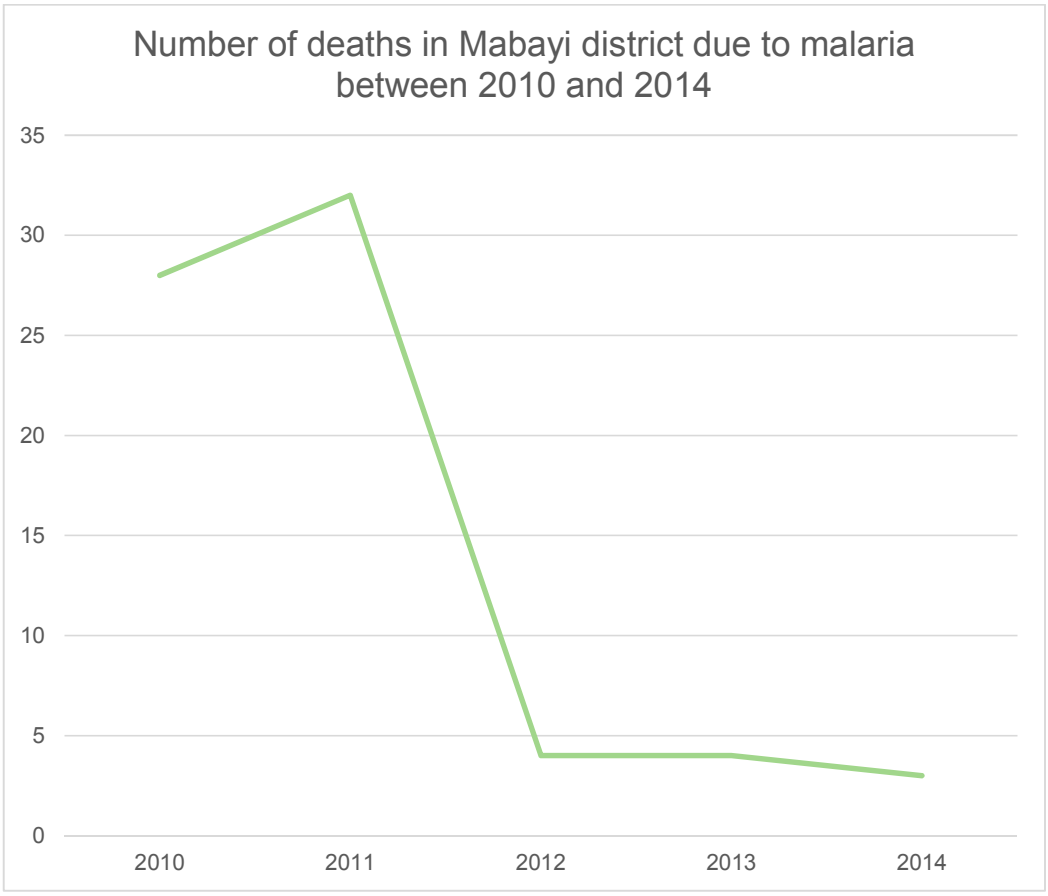


Figure 2. Deaths due to malaria in Mabayi district between 2010 and 2014.

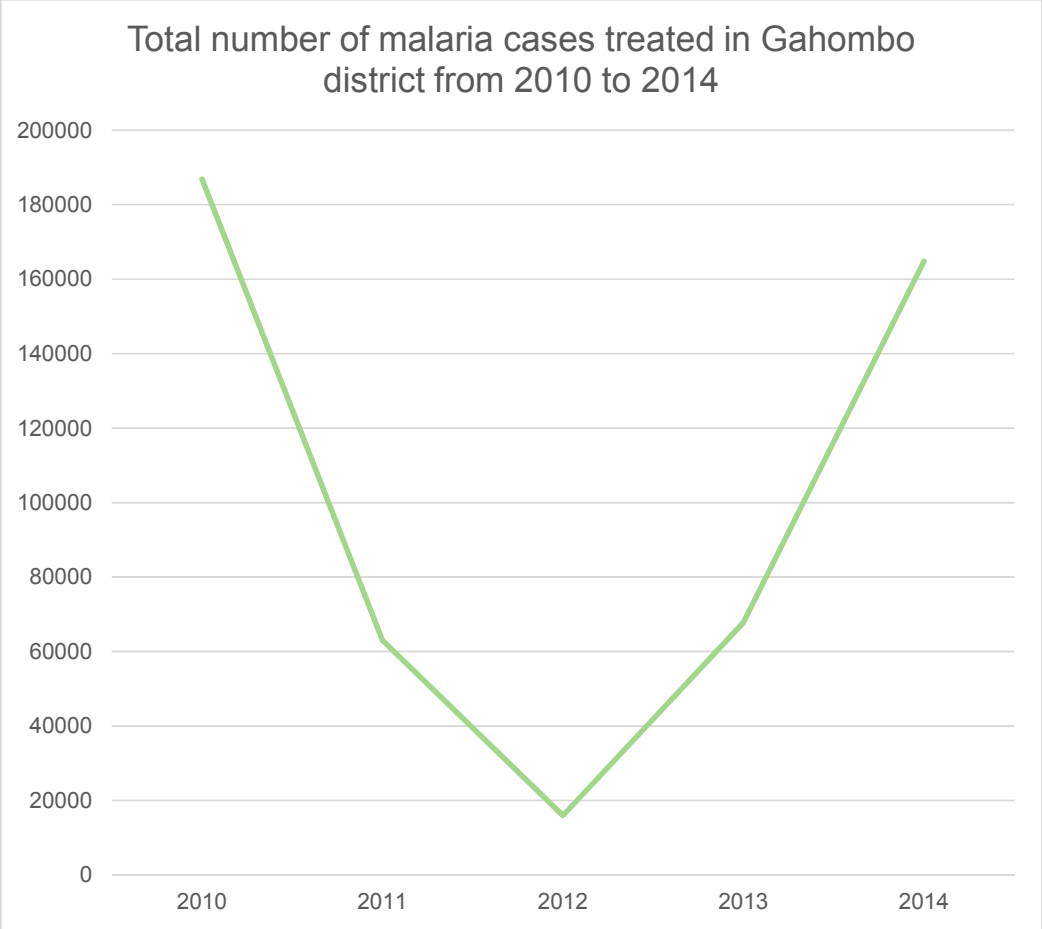


Figure 3. Malaria cases Mabayi health district for the period of 2010–2014.

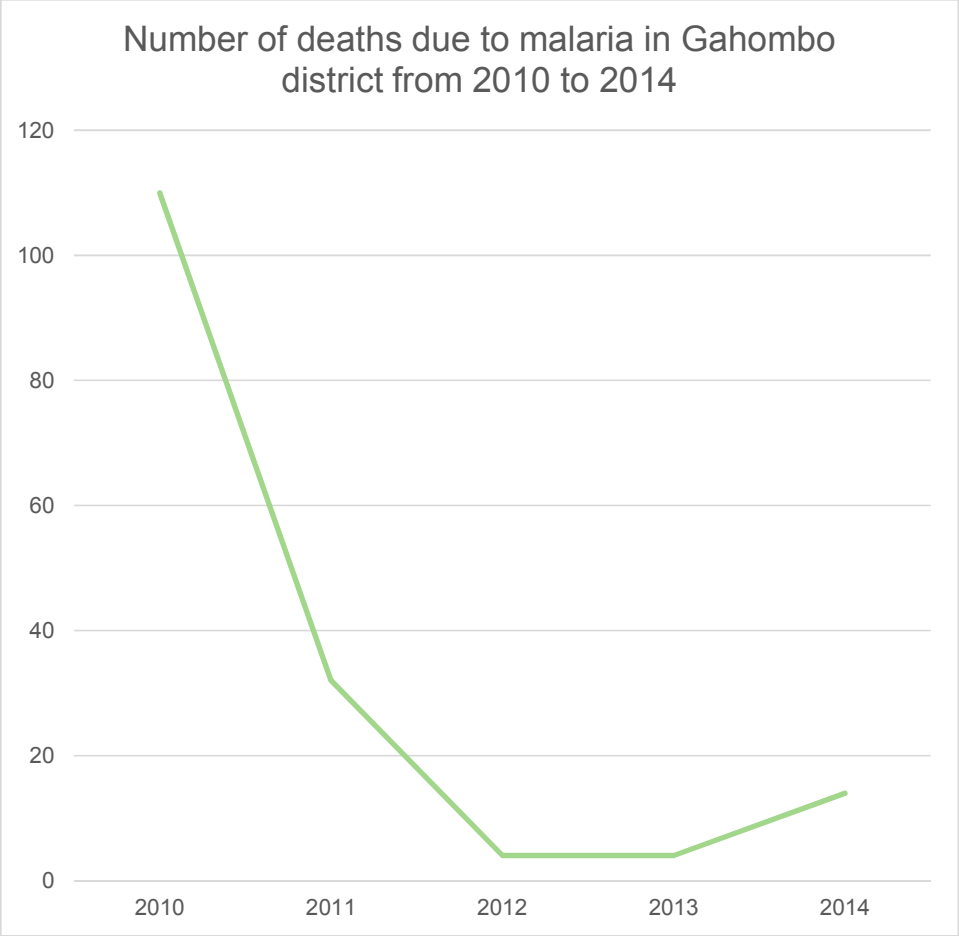


Figure 4. Deaths due to malaria in Gahombo district between 2010 and 2014

Descriptive Statistics

Eighty-eight CHWs responded to the questionnaire, with 39 CHWs (44.3%) from the district of Mabayi, 31 CHWs (35.2%) from Gahombo, and 18 CHWs (20.5%) from Gashoho. Of the participants in the study, 64.8% were women compared to 35.2% men. The age of the participants ranged between 25 and 65 years with a majority of them being between 35 and 39 years old. Eighty-four participants (95.5%) were married, three were widowed, and one was divorced. Eighty-six (97.7%) had children, with the number of children ranging between two and 10 per family. The mean was five children, the median was five children, and the mode was

four children. The standard deviation of the sample, which is the spread of the scores within the sample, was 2.022 and the variance was 4.089, which means that the scores are spread closely around the mean (see Laerd, 2013).All the participants to the study were speaking Kirundi, the national language. They had at least the primary school level (as it was one of the requirement in order to be selected as a CHW) and 35.2% of the CHWs had the secondary school level. No CHW with university background was part of the survey.

Table 1

Sociodemographic Characteristics of the CHWs who Participated in the Study

Sociodemographic characteristics		Frequency	Percent
Age (years)		9	10.2
	25-29		
	30-34	17	19.3
	35-39	24	27.3
	40-44	13	14.8
	45-49	7	8.0
	50-54	9	10.2
	55-60	5	5.7
	more than 60	4	4.5
	Total	88	100.0
Gender			
	Male	31	35.2
	Female	57	64.8
	Total	88	100
Marital status			
	Married	84	95.5
	Widowed	3	3.4
	Divorced	1	1.1
	Total	88	100.0

……(table continues)

Sociodemographic	characteristics	Frequency	Percent
Education level			
	Primary school	57	64.8
	Secondary school	31	35.2
	Total	88	100
Number of children per CHW			
	2	11	12.5
	3	12	13.6
	4	17	19.3
	5	13	14.8
	6	15	17
	7	6	6.8
	8	8	9.1
	9	3	3.4
	10	1	1.1
	Total	86	97.7
Missing	System	2	2.3

Activities of community health workers.

Days worked as a CHW per month. It was not possible for 13 CHWs to give the exact number of days they worked as CHW per month. Their explanation was that the work as CHW is part of their routine activities, and they did not have dedicated days they worked as CHW. For the other 75 CHWs who answered this question, the mean number of days worked was 12 days, with a minimum of 3 days and a maximum of 20 days worked per month as a CHW. The median was 12 days, and the mode was 20 days. The CHWs who worked more than 20 days could be considered as

full-time workers, which cannot be envisaged if the CHW is not gaining a full salary.

Number of patients that were children under 5 years old received per month. Eighty-four participants were able to answer to the question. On a monthly basis, the mean number of patients received by community workers was 12, the median was 12, and the mode was 20. Thirty-five CHWs received more than 15 patients per month which is considered to be a high number compared to the mean number (eight patients) received during the first 11 months of the project.

Social Networks Between CHWs.

Intensity of the relationship between CHWs. Eighty-six participants in the study confirmed the existence of a relationship between CHWs to a great or very great extent, with one CHW saying that the relationship exists to some extent, and another one saying that there was no relationship between CHWs at all. I defined the strength of a relationship as the combination of the amount of time spent together, the emotional intensity, the intimacy, and the reciprocal services the individuals shared (see Melamed & Simpson, 2015). The strength of a relationship is linked with the benefit that the two actors are expecting from the relationship, the existence of alternative relations, or the emotional value attributed to the relationship (Melamed & Simpson, 2015). The strength of the relationship is also associated with the length of the relationship and the frequency of contact (Melamed & Simpson, 2015). The strength of ties has been used to explain employment, information flows, and social support (Melamed & Simpson, 2015).

Reciprocity of the relationship between CHWs

All the 87 CHWs who confirmed the existence of the relationship between them said that the relationship was reciprocal to a great extent (58 CHWs) and a very

great extent (28 CHWs). As a recall, the dyadic relationship can only be maintained by the strength of exchange between two CHWs. From the answers to this question, it can be concluded that majority of CHWs were “cooperators” (those individuals who are ready to share) and that there is no risk of being exploited by “defectors” (those who are ready to benefit from a relationship without sharing). The reciprocity is very important as it is believed to increase the ties value between CHWs and the stability of the relationship (Melamed & Simpson, 2015). However, the relationship between CHWs is *not formalized* for 83 participants to the study (94.3%), while three participants stated that the relationship was formalized, and one participant said that there was no relationship between CHWs.

Social Support

The type of social support needed includes emotional, instrumental, informational, and appraisal support. Emotional support involves the trust and empathy (love, care, sympathy and understanding); instrumental support involves provision of needed support (money, labor, resources according to the needs); informational support is related to technical advice and suggestions that are needed; and appraisal support involves provision of constructive feedback and support to decision-making. Instrumental, informational and appraisal supports directly influence physical health by improving access to resources and material goods, while emotional support influences mental health (Berkman & Glass, 2000). Although those type of supports are separated conceptually, it has been proven that a relationship that provides one type of support often provides other type of supports as well.

The social support to CHWs was provided from health professional, community members, family members and CHWs could support each other. In the

health professional group, we have subgroups of supporters' including doctors from the district hospital, nurses from the district hospital, and nurses from the primary health facility. From the community members' group, we included administrative officials, head of villages, and other community members, family members (including husband/spouse, children/grandchildren, and other family members.

There was a perceived *peer support* among CHWs as 87 out of 88 CHWs indicated that they support each other in various areas where they need support including informational, instrumental, emotional, appraisal, or both types of support. 91% expressed that they received from other CHWs more than one type of support, proving that a relationship that provides one type of support may provide other type of support. For the other groups of supporters, 85.3% of the participants stated that the support they received was provided by more than one group of supporters.

Table 2

People who supported the CHWs during the span of pilot project

Supportive person towards CHWs		
	Frequency	Percent
health staff	11	12.5
Coworker / CHW	2	2.3
Health staff and community member	5	5.7
Health staff and colleagues	17	19.3
Health staff, community member and colleagues	21	23.9
Both category of supporters	32	36.4
Total	88	100

Although the CHWs are recruited from and answerable to the community, the support they need goes beyond the capacity of community members. Some aspects of the support were covered by community members, others by family members, and others by health staff. I wanted to understand to which extent each group of supporters taken individually is believed to support CHWs. The perceived support varied from one CHW to another and from a health district to another. The following pages provide details on the perceived support received by CHWs from district health officer, the doctors and nurses from the district hospital, the nurses from the basic health units, the local administration, the community and family members, as well as the other CHWs individually.

District health officer

The district health officer (DHO) is in charge of the overall management of health care services in the district. He is generally supervising the activities from district hospitals and primary healthcare facilities. He provides the technical and administrative support to all the health workers under his responsibility. From this survey, 16 participants (18.2%) reported that the DHO was not supportive at all, 13.6% said that he /she was poorly supportive, 22.7% said that she/he was fairly supportive, 39.8% said that he was very supportive and 2.3% said that he / she was extremely supportive. Three CHWs were not even aware that there was a DHO in their health district of origin. This can be understandable as the DHO is directly interacting with medical staff at hospital and basic health unit levels. He / she rarely interacts directly with the CHWs (who are under the direct supervision of the nurses running the basic health units or health agent promoters). When it comes to the

frequency of meetings between CHWs and health authorities, 10 CHWs (11.4%) stated that they never attended a meeting, while 50 (56.8%) stated that they attend monthly meetings, five (5.7%) attended quarterly meetings, three (3.4%) attended biannually meetings and 20 (22.7%) attended annually meetings.

Nurses from the district hospital

Twenty nine participants to the study (33%) reported that the nurses from the hospital were not supportive at all, 17% said that they were poorly supportive, 31.8% said that they were fairly supportive, 12.5% said that they were very supportive and 3.4% said that they were extremely supportive. Usually, the CHWs interact with the nurses at the hospital level when they refer complicated patients to the hospital. The quality of interactions between the nurses at the hospital and the CHWs who refer patients would dependent on the quality of services that are offered at that particular hospital.

Doctors from district hospital

One of the CHWs stated that he/she was not aware of the existence of such person in his environment, while 23 CHWs (26.1%) stated that the doctors were not supportive at all. 16 participants to the study (18.2%) reported that the doctors from the district hospital were poorly supportive, 34.1% said that the doctors were fairly supportive, 17% said that he was very supportive and 2.3% said that he/she was extremely supportive. Again here, the relationship between the CHWs and the doctors at the hospital level is only related to the referral system. It is however believed that doctors are more welcoming than nurses in the public hospitals in Burundi.

Support from the local administration

The local administration has an important role to play when it comes to

organizing community-based activities. The local administration plays the role of catalyzer in the mobilization of the community to achieve common goals. For this particular community health program, the local administration has been heavily involved in the identification and recruitment process of the CHWs. From the survey, we can see that 72.7% of the respondents to the questionnaire are happy with the support received from the local administration, while 10.2% said that the administration was poorly supportive and 17% reported that the local administration was not supportive.

Support from nurses of the primary health center

The nurses at the primary health level have a very special relationship with the CHWs. According to their job description, they are directly supervising the CHWs and collecting the weekly reports from them. They are supposed to be the interface between the CHWs and the rest of the health system. From the survey, only two participants to the study (2.3%) reported that the nurses from the primary healthcare were not supportive at all, 62 (70.5%) reported that they were very supportive or extremely supportive. This important recognition might be related to the proximity of the CHWs and the nurses working at the basic health unit level.

Support from the head of villages

The head of village played an important role in the recruitment and the CHWs. I wanted to understand whether after the recruitment process, the head of village had been supportive to CHWs. Five CHWs (5.7% of the total participants to the study) found that the head of the village was not supportive at all and seven CHWs (8%) found them poorly supportive. Twenty one CHW (23.9%) reported that the head of

village was fairly supportive while 55 CHWs (62.5%) reported that the head of village was very or extremely supportive**.**

Support form community members

Only one CHW couldn't recognize the support from community members and two said that the community members were poorly supportive. The rest of the CHWs said that the community members were fairly supportive (23 CHWs), very supportive (32), and extremely supportive for 30 CHWs. This is a community-based program that involves all community members to a certain extent. I therefore I could expect such percentage of positive answers.

Support from wife/husband

The support from the wife/husband is essential in this kind of job where CHWs commit for hours of work on a voluntarily basis as the partner might take over the responsibilities when working as a CHW. Eleven CHWs representing 12.5% of the total participants couldn't respond to the question. Three of them were widowed. From those who responded to the question, only four (4.5%) founded that the husband/wife was not supportive at all, other four said that they were poorly supportive, 15 said that they were fairly supportive and the rest said that they were very or extremely supportive (51 CHWs).

Support from children

Majority of the CHWs had young children (under 12 years) that could not provide any support to their parents. This, therefore impacted on the number of CHWs who were happy with the support received from their children. Also, the response rate to this question was low as 11 CHWs couldn't respond to the question. Four CHWs said that they do not have children. The number of CHWs who said that

the children or grandchildren were not supportive was high (24 CHWs representing 27.3% of the total respondents) probably because these children were in the younger age.

Support from other family members

The other family members can be of an important support especially in a country like Burundi where the family ties are very important. The support can be from keeping/feeding the children when the CHW is not available for professional reasons, to cooking for the rest of family members, or even performing other duties like cultivating on behalf of the CHW who is not available. The support might be linked to the relationship the other family members had with the CHW before, as well as his / her influence on the rest of the family members. It is exceptional that CHWs expect a kind of financial support from the family members. Twelve CHWs said that the other family members were not supportive at all (13.6%), and 16 said that they were poorly supportive. Twenty six CHWs responded that the other family members were fairly supportive, while 19 said that they are very supportive and five CHWs said that they were extremely supportive.

Support from other CHWs

The peer support is considered to be one of the most important element to be considered for a success a community-based program. Because the support from the health professionals is not always easy to have due to issues already discussed (logistical issues, financial issues, mistrust between CHWs and health professionals etc.), it has been advised that senior CHWs are given the material and intellectual capacities to support junior ones. On the other side, the strength of ties between CHWs is linked to their homophily (social and demographic similarities), the trust

between CHWs, the distance between a CHW and another, the shared motivation and the reciprocity. From this survey, majority of the CHWs (80) said that the CHWs supported each other to various extent. Only three CHWs believed that CHWs were not supporting each other and five couldn't respond to the question.

Which kind of social support is provided?

From the analysis of the data, it was very clear that the social support (emotional, material, informational, and appraisal support) has been provided by all the groups of supporters to a different extent. It was rarely stated that a particular group provided only one type of support. As an example, emotional support was perceived to be provided by only health staff by four CHWs, only community members by four CHWs, only family members only by one CHW, or only between two CHWs by only one CHW. However, when it comes to specific support like material support, specific groups (health staff, community members and family members) played a prominent role. For the informational support, the health staff and other CHWs seemed to be the most important providers of such support. For the appraisal support, community members were the first to provide support type of support. Instrumental support like provision of medicines, provision of non-medical equipment and consumables, provision of salary, trainings, supportive supervision, were provided mainly by health officials. From this analysis, it has been very clear that while emotional support is provided by both groups of supporters, the community plays an important role in the appraisal support while the health professionals played an important role in the instrumental and informational support.

Inferential statistics

Introduction

From the descriptive statistics, CHWs recognized the support received from the various groups of supporters although the extent to which the support was provided differed from one group to another. It was clearly mentioned for example that the support from nurses from primary health level, as well as from head of villages and other administrative officers, husband/ wife, and the peer support was recognized by majority of CHWs. The support from groups like doctors and nurses from the hospital, as well children / grandchildren was less recognized by CHWs. It was therefore necessary to perform more complex statistical tests to understand whether there was a correlation between the support received and the number of children under the age of 5 treated.

For this study, I wanted to test the correlation between a continuous dependent variable (number of children treated) and more than three independents variables (district of origin, age, sex, marital status, number of children under 12 years old, level of education, and number of days worked). Some of these independent variables are continuous, other are nominal or ordinal. I used the statistical test selector (Laerd Statistics, 2013), an online resource that helps to select the most appropriate statistical test given the study design, the number of variables, and the scale of measurement of the independent and the dependent variables. In my case, the dependent variable is on a continuous scale of measurement and for this reason, a Chi-square couldn't be an option.

Multiple regression analysis was the best choice. According to Laerd statistics (2013), multiple regression is used to predict the value of a dependent variable based

on the values of two or more independent variables. The multiple regression is also useful to determine the overall fit of a model as well as to determine the contribution of each independent variable on the changes in values of the dependent variable.

Regression Models

Model 1: Effect of the covariates

Before I respond to the research questions, I wanted to understand whether the changes in the dependent variable, number of children of under the age of 5 treated, can be explained by the variations in the independent variables: district of origin, age, gender, marital status, and number of children under 12 years, level of education and the number of days worked as a CHW (defined as covariates in this study). The first choice to test a possible correlation was a multiple regression. The multiple regression has eight assumptions that need to be checked before running the statistical test. According to Laerd Statistics (2013), the assumptions allow the researcher to (a) check the accuracy of the predictions of the changes in the dependent variable; (b) check how well the model fits the data; (c) determine whether the changes in the dependent variable are explained by the changes in the independent variables; and (d) test hypotheses on the regression equation. In case the assumptions are violated, there is a need of either make corrections in the data or choose an alternative statistical test.

The first assumption, (a) dependent variable on a continuous scale of measurement and the second one (b) the independent variables are on a continuous or categorical scale were met. For the other six assumptions, I needed to perform some statistical tests to check whether they were met or violated.

The independence of the observations. To test the independence of the observations (also referred to as "independence of residuals"), I had to look at

Durbin-Watson statistic that I found in the model summary from the SPSS outputs after running the multiple regression. By definition, the Durbin-Watson statistic ranges between 0 and 4 and the value should be around 2 to conclude that there is independence of observations. In this model, there was an independence of residuals as assessed by Durbin-Watson statistic of 1.734.

Linearity. There is a need to be a linear relationship between the dependent variable and each of the independent variables on one side, and the dependent variable and the independent variables collectively on the other side. The scatterplot generated by SPSS after running the multiple regression shows visually that all residuals are a horizontal band, which means that the assumption of linearity is met.

Homoscedasticity of residuals. To meet this assumption, the residuals are equal for all values of the predicted dependent variable. Plotting the studentized residuals against the unstandardized predicted values showed that the spread of the residuals did not increase or decrease across the predicted values. Therefore, I can conclude that there was homoscedasticity, as assessed by visual inspection of the plot of studentized residuals versus unstandardized predicted values.

Normality of the distribution. The assumption of normality of the distribution is very important as it determines whether a researcher is able to run inferential statistics (i.e**.** determine statistical significance). To determine if the residuals are normally distributed, I needed to analyze the curve of the histogram (normal curve) and the P-P plot (Laerd statistics, 2013). I was therefore able to conclude that the residuals were normally distributed.

Multicollinearity. There is a risk of multicollinearity when, with a regression analysis, there is a high correlation of at least one independent variable with a

combination of other independent variables (Laerd Statistics, 2013). To make sure there is no issues of collinearity, all the tolerance has to be greater than 0.1 or variance inflation factor (VIF) is less than 10 (Laerd Statistics, 2013). As shown in the Logistic regression table (see table 3), the tolerance of each independent variable is greater than .1 (or VIF less than 10), with the lowest VIF is .515, meaning that I should not have problem of collinearity in this model.

Outliers. An outlier is an observation where the observed value of the dependent variable is very different to its predicted value and the data point does not follow the usual pattern of points when observing the graph. In case of existence of outliers, casewise diagnostic table will automatically appear in the SPSS outputs while performing a multiple regression (Laerd statistics, 2013). In this case, the Casewise diagnostic table didn't show up while performing the multiple regression in SPSS. This mean that no participant where the standardised residual greater than ±3 standard deviations was found.

Interpreting the results

SPSS generated a number of tables that helped to make a multiple regression output analysis. I was interested in three tables: the multiple regression table that holds a number of information linked to the effect of each independent variable on the dependent variable if the other independent variables are held constant, as well as the test of collineality. The second table determines how well the Model 1 fits, and the last table shows the significance of the Model 1.

The regression table showed the following results:

Table 3

Multiple regression for the Model1

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity	Statistics
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	21.200	5.001		4.239	.000		
	District of origin	-2.899	.818	-.420	-3.546	.001	.658	1.519
	What is your age	.026	.434	.008	.061	.952	.515	1.940
	What is your gender	-2.448	1.323	-.190	-1.850	.068	.875	1.143
	Are you married	-.059	1.360	-.005	-.044	.965	.807	1.239
	How many children under 12 years old	-.020	.023	-.111	-.888	.377	.589	1.697
	How many years of school did you complete	.210	1.294	.016	.162	.872	.902	1.109
	How many days do you work as a CHW per week?	.049	.107	.048	.460	.647		

Estimates of coefficients. Unstandardized coefficients B indicate how much the dependent variable changes with an independent variable when the other independent variables are held constant. As an example, if I consider the age of the CHWs, the unstandardized coefficient B is .026, which means that each year increase of age will increase the number of children treated of .026. If I consider the variable how many years of schooling for CHWs, one year spent at school will increase the number of consultations of .210. When I consider the number of days spent working as a CHW, I find that one extra day working as CHW increase the number of consultation of .049. On the other hand, the number of children owned per CHW will negatively affect the number of consultations (for each additional CHWs' child, there will be a reduction of -.020 in consultations), and being married reduced consultation number of -.059. The difference in gender resulted in the difference in number of consultations of -2.448 and the difference in district of origin resulted in difference in number of consultations of - 2.889. The equation to predict the number of consultations from district of origin, age, gender, marital status, number of children per CHW, education and number of worked days is the following:

Predicted number of consultations = 21.20 + (.026 x age) – (.20 x number of children) + (.210 x number of years of studies) + (.049 x number of days worked as a CHW)- (2.899 x 1) – (2.448 x 1) – (.059 x 1) (see Laerd, 2013).

The statistical significance of each of the independent variables. The table 3 shows in the column Sig. the statistical significance of each variable. This tests whether the unstandardized (or standardized) coefficients are equal to 0 in the population. If unstandardized coefficients are equal to 0, it means that the independent variable did not have any effect of the dependent variable. In this study, I can

conclude that the coefficients are not statistically significantly different to 0.

Pearson correlation. While unstandardized coefficients B measured the proportion of changes of the dependent variable linked to the changes in one independent variable, Pearson correlation R indicates the proportion of the variations on the dependent variable that can be explained by the variations in all the independent variables (Laerd statistics, 2013). The R is the Pearson correlation coefficient between the scores predicted by the regression Model 1 and the actual values of the dependent variables. R measures the strength of the association between the dependent variable and the independent variables and therefore can give an indication of the goodness of the model fit with value that is comprised between 0 and 1. If R equals 0, it means that there is no linear association and if R equals 1, it means that there is perfect linear association. For this model, R = .529 indicates a moderate to high level of association.

R Square indicates the proportion of variance accounted for by the regression model, the value .280 means that 28% of the changes in the dependent variable are linked to the variations in the independent variables that constitute the model 1. However, R Square is using samples and therefore considered as a positively- biased estimate of the proportion of the variance of the dependent variable accounted for by the regression model (i.e., it is larger than it should be when generalizing to a larger population). Therefore, the use of Adjusted R Square corrects the positive bias and provides values that would be expected in the population. In our model 1, adjusted R Square 0.215, meaning that only 21.5% of the changes in the dependent variable are associated with the model 1. For this study, we can conclude that 21.5% of the changes in the dependent variables can be linked to the covariates. However, as the R

Square for the overall model was 28% with an adjusted R Square of 21.5%, this is considered as small effect size according to Cohen, meaning that the strength of the relationship between covariates and the dependent variable is considered as being weak. As a recall, effect size measures the strength of the relationship between the dependent and the independent variables. The greater the effect size is, the greater is the relationship will be. The effect size varies between -1 and +1 with a low effect size if the *R* is around 0.1, median if *R* is around 0.3 and large if *R* varies more than 0.5

Statistical significance of the model. Although all the majority of independent variables did not statistically significantly influence the changes in the dependent variable when analysed separately, we can see that the independent variables in the Model 1: district of origin, age, gender, marital status, number of children under 12 years, level of education and number of days worked as a CHW taken together statistically significantly predicted the number of under-five years treated per month, F (7, 78) = 3.217, p = .000

Table 4

ANOVA for the Model 1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	908.057	7	129.722	4.332	.000[b]
	Residual	2335.525	78	29.943		
	Total	3243.581	85			

a. Dependent Variable: How many patients do you receive per month?

b. Predictors: (Constant), How many days do you work as a CHW per month, What is your gender, How many children under 12 years old, How many years of school did you complete, District of origin, Are you married, What is your age

Model 2: Answering the research questions

Correlation between who provides instrumental, informational, emotional and appraisal support and the number of under-five children received per month.

The statistical analysis of the Model 1 showed that 21.5% of the changes in the dependent variable are attributed to the changes in the covariates (small effect size according to Cohen, and therefore a weak relationship between the dependent variable and the covariates). In model 2, I wanted to predict how much the changes in the independent variables "who provides emotional support", "who provides instrumental support", "who provides informational support", "who provides appraisal support", and "to which extent that support is provided" can explain the variations in the dependent variable "How many children of under 5 age do you treat per month?". The first two assumptions that are related to the study design (dependent variable on a continuous level and two or more independent variables measured on a continuous or nominal level) were met. The other assumptions: assumption 3 (there should be an independence of the observations), assumption 4 (Linearity), assumption 5 (Homoscedasticity), assumption 6 (Multicollinearity), and assumption 7 (absence of outliers) were met. However, the assumption of *Normality of the distribution* was violated. The inspection of the histogram generated from SPSS showed that the residuals were not normally distributed as the distribution of the residuals are not

following a superimposed normal curve. The mean should have an approximate value around 0 (the mean is 8.33 in this model) and the standard deviation a value of approximately 1 (which is the case in this model, standard deviation = 0.976).

Failing to meet the assumption of normality is a good indication for running a non-parametric test and the choice was the Kruskal-Wallis test. The Kruskal-Wallis test is used to determine whether there is a statistically significant difference between two or more groups of an independent variable on a continuous or ordinal dependent variable. It is considered to be the non-parametric alternative of the one-way ANOVA and an extension of the Mann-Whitney U test to allow a comparison of more than two independent groups (Laerd Statistics, 2013).

Before running the Kruskal – Wallis H test, I had to check whether the four pre-requisites (assumptions) to run the test were met: the first three are related to the study design (the dependent variable has to be on a continuous or ordinal level of measurement, the independent variable consists of two or more categorical independent groups, and there should be independence of observations). To check the fourth assumption, the distribution of the scores of each group are in a same shape (having same shape means that the groups have the same variability), SPSS generated boxplot that have been visually inspected to determine whether the distributions of the scores of the dependent variable had the same shape. If the distributions of the scores have the same shape, this means that I will have to make inferences about the difference in medians between groups (i.e. whether the social support is from health staff, colleagues, community members, family members, or both supporters) and not only means.

a. Correlation between who provides instrumental support and the number of children under the age of 5 treated for malaria by CHWs.

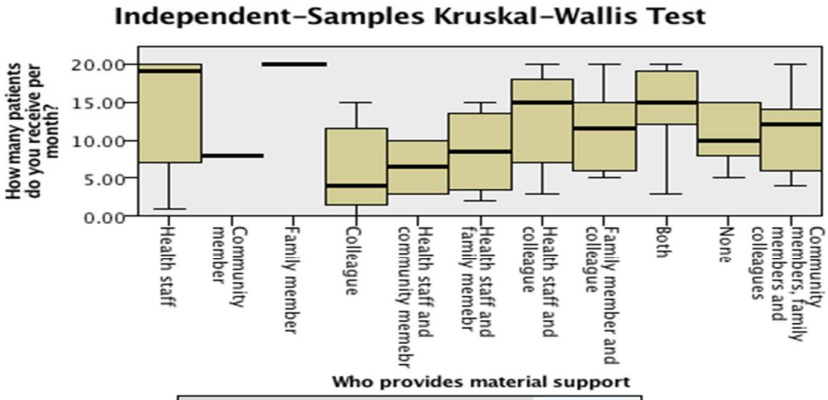
Table 6

Correlation between who provides instrumental support and the number of under-five years treated.

	Mean Ranks		
	Who provides instrumental support	N	Mean Rank
How many patients do you receive per month?	Health staff	16	57.91
	Community member	1	29.50
	Family member	1	80.00
	Colleagues	8	20.75
	Health staff and community member	2	20.75
	Health staff and family member	4	29.50
	Health staff and colleague	9	46.50
	Family member and colleague	10	41.80
	Both supporters	17	53.12
	None	5	38.30
	Community members, family members and colleagues	14	38.25
	Total	87	

According to Laerd Statistics (2013), it is important to consider the number of observations when interpreting the mean ranks. Generally, the mean value can be inferred only if the number of participants/observations is more than five (Laerd statistics, 2013). In this statistics table, only the means for health staff (*N*=16) and colleagues (*N*=8) can be inferred. I visually inspected the boxplot generated by SPSS from Kruskal-Wallis test to check whether the distributions of number of under five children treated scores were similar for groups of supporters (health staff, community

members, family members, colleagues). The inspection of the boxplot showed that all the scores have a similar shape, I can therefore infer my statistics using medians.



Total N	87
Test Statistic	20.592
Degrees of Freedom	10
Asymptotic Sig. (2-sided test)	.024

1. The test statistic is adjusted for ties.

Figure 5. Assumption of similarly shaped distributions for Who provides instrumental support

Taking into account the number of observations, only the independent variables health staff and colleagues have been inferred (Laerd, 2013). A Kruskal-Wallis test was run to determine if there were differences in how many patients received per month scores, between groups of supporters. The distributions were similar in all groups, as assessed by visual inspection of the boxplot. Median scores of the

dependent variable were statistically significantly different between two groups, X^2 (10) = 20.592, p = .024 with a mean rank score of 57.91 for the health staff and 20.75 for colleagues. It is, however, important to highlight that Kruskal-Wallis is an omnibus test that tells us that there is a statistically difference between the groups but doesn't tell us which group is statistically different from each other (see Laerd, 2013). In this study, health staff and colleagues independent variables have a statistically significant influence on the number of consultations but I don't know which of the two groups

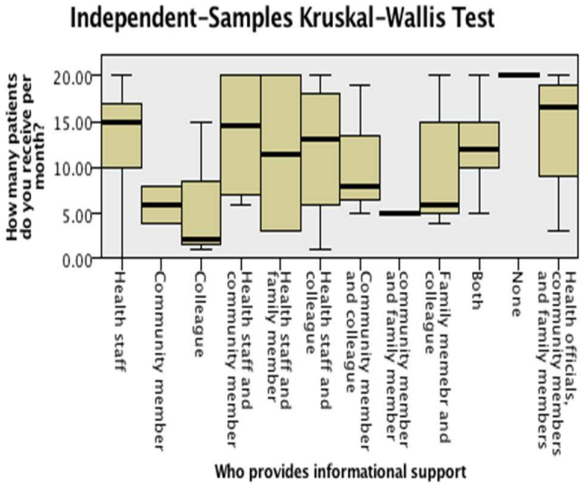
Correlation between who provides informational support and the number of under-five years children treated for malaria by CHWs.

As for the instrumental support, a Kruskal-Wallis test was run to determine if there were differences in how many patients received per month scores between groups who provided informational support. The distributions were similar in all groups, as assessed by visual inspection of the boxplot. Median scores of the dependent variable were not statistically significantly different between groups, X^2 (11) = 11.085, p =.436. Therefore, I failed to reject the null hypothesis (there is no correlation between informational support and the number of children of the age under 5 treated).

Table 7

Correlation between who provides instrumental support and the number of under-five years treated.

	Mean ranks		
	Who provides informational support	N	Mean Rank
How many patients do you receive per month?	Health staff	17	49.00
	Community member	2	19.75
	Colleague	3	20.67
	Health staff and community member	6	51.42
	Health staff and family member	2	43.00
	Health staff and colleague	25	43.90
	Community member and colleague	3	38.17
	community member and family member	1	15.50
	Family member and colleague	8	33.38
	Both supporters	14	45.18
	None	1	79.00
	Health officials, community members and family members	4	51.50
	Total	86	



Total N	86
Test Statistic	11.085
Degrees of Freedom	11
Asymptotic Sig. (2-sided test)	.436

1. The test statistic is adjusted for ties.
2. Multiple comparisons are not performed because the overall test does not show significant differences across samples.

Figure 6. Assumption of similarly shaped distributions for "Who provides informational support"

Correlation between who provides appraisal support and the number of under-five years children treated for malaria by CHWs.

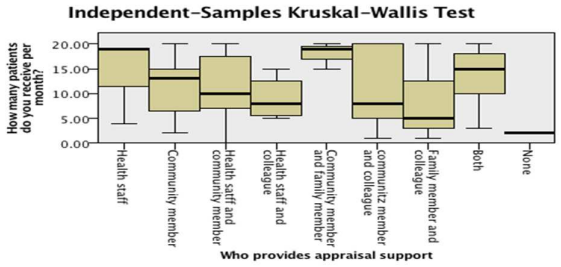
Table 8

Correlation between who provides appraisal support and the number of under-five years treated.

Mean ranks

	Who provides appraisal support	N	Mean Rank
How many patients do you receive per month?	Health staff	3	50.33
	Community member	19	41.61
	Health staff and community member	15	43.40
	Health staff and colleague	4	31.88
	Community member and family member	3	69.00
	community member and colleague	9	39.11
	Family member and colleague	3	32.83
	Both supporters	31	49.48
	None	1	4.50
	Total	88	

A Kruskal-Wallis test was run to determine if there were differences in how many patients received per month scores between groups who provided appraisal support. The distributions were similar in all groups, as assessed by visual inspection of the boxplot. Median scores of the dependent variable were statistically significantly different between groups, X^2 (8) = 8.928, p =.348. Therefore, I failed to reject the null hypothesis.



Total N	88
Test Statistic	8.928
Degrees of Freedom	8
Asymptotic Sig. (2-sided test)	.348

1. The test statistic is adjusted for ties.
2. Multiple comparisons are not performed because the overall test does not show significant differences across samples.

Figure 7. Assumption of similarly shaped distributions for "Who provides informational support"

Correlation between who provides emotional support and the number of under-five years children treated for malaria by CHWs.

For this independent variable, the number of observations for each group was less than five as shown in the table 9, and therefore, could not be inferred.

Table 12

Correlation between who provides emotional support and the number of under-five years treated.

Mean Ranks

	Who provides emotional support	N	Mean Rank
How many patients do you receive per month?	Health staff	4	44.88
	Community members	4	42.25
	Family member	1	10.00
	Peer support	1	1.00
	Health staff and community member	2	67.00
	health staff and colleague	3	46.00
	Community member and family member	1	69.50
	Community member and colleague	5	45.90
	Family member and colleague	3	22.17
	Both supporters	42	48.19
	None	2	35.25
	Community members, family members and colleagues	8	46.44
	Health staff, community members and colleagues	10	27.80
	Total	86	

Answering to the research questions

R.Q.1. Is there any correlation between the instrumental, informational and appraisal support received from the health professionals and the number of under-five years treated for malaria by CHWs? A Kruskal-Wallis test was run to determine if there were differences in how many patients received per month scores between groups of supporters. The distributions were similar in all groups, as assessed by visual inspection of the boxplot. Median scores of the dependent variable were statistically significantly different between groups, X^2 (10) = 20.592, p=.024 with a mean rank of 57.91 for the health staff. Therefore, the null hypothesis was rejected. However, it was not possible to perform inferential statistics for the variable who provides emotional support as the number of observations of each group was less than five. For the rest of the independent variables, there was no statistically significant difference in number of patients received between who provided informational support, X^2 (11) = 11.085, p = 0.436; and who provided appraisal support, X^2 (8) = 8.928, p = 0.348. When I analyzed to which extent the support provided influenced the number of patients received, there was a statistically significant difference in the number of patients received between the support from doctors from the hospital, X^2 (4) = 9.172, p = 0.057; and between the support from nurses at the primary healthcare, X^2 (3) = 10.8, p = 0.013. I can therefore conclude that the instrumental support provided by doctors from the district hospital and nurses from primary health centers positively affected the number of children treated by CHWs. However, the emotional, informational and appraisal support provided by the health professional didn't statistically significantly influence the performance of CHWs, which implies that the null hypothesis for the three components of the social support might be true.

R.Q.2. Is there a correlation between the instrumental, informational and appraisal support received from the community members and the number of under-five years treated by CHWs? The Kruskal-Wallis test demonstrated a statistically significant difference in the number of patients received between who provides instrumental support, $X^2(10) = 20.592$, $p = 0.024$, with a mean rank of 29.50 for community members, and 80 for family members. However, there was no statistically significant difference in number of patients received between informational support, $X^2 (11) = 11.085$, $p = 0.436$; and appraisal support, $X^2 (8) = 8.928$, $p = 0.348$. When I analyzed to which extent the support provided influenced the number of patients received, there was a statistically significant difference in the number of patients received between the support from head of villages, $X^2 (3) = 9.797$, $p = 0.021$. These statistics cannot be inferred as the number of participants in the two groups of supporters (community members and family members is less than 5 participants). I can therefore conclude that the instrumental support received from family members and community members cannot be inferred due to the lack on required number of participants, while the emotional, informational and appraisal support didn't statistically significantly affect the work of CHWs which implies a non-rejection of the null hypothesis for the three types of support.

R.Q.3 Is there any correlation between the instrumental, informational and appraisal support received from peers and the number of under-five children treated by CHWs? The Kruskal-Wallis test showed that there was a statistically significant difference in the number of patients received between who provides instrumental support, $X^2(10) = 20.592$, $p = 0.024$, with a mean rank of 20.75 for colleagues. However, there was no statistically significant difference in number of

patients received between informational support, X^2 (11) = 11.085, p = 0.436; and appraisal support, X^2 (8) = 8.928, p = 0.348. When I analyzed to which extent the support provided influenced the number of patients received, there was a statistically significant difference in the number of patients received between the support from other community health workers, X^2 (2) = 3.657, p = 0.05. I can therefore conclude that extent to which the CHWs provide instrumental support to each other influences the number of patients they receive. However, the emotional, informational and appraisal support provided by other CHWs didn't statistically significantly affect the number of children treated which implies a non-rejection of the null hypothesis the three types of support.

Summary

The descriptive statistics recognized the valuable support from the health staff (nurses from primary health level), from the community members (head of villages and other administrative officers, husband/ wife), and the support between CHWs (peer support). Performing the inferential statistics allowed me to discover that even if the instrumental support from the doctors from the hospital was perceived as less important, it had a statistically significant impact on the number of patients treated by CHWs, X^2 (4) = 9.172, p = 0.057. The inferential statistics also confirmed the fact that the instrumental support from nurses at the primary healthcare has statistically significantly impacted the number of patients treated, X^2 (3) = 10.8, p = 0.013; the support from head of villages, X^2 (3) = 9.797, p = 0.021; and the support from other CHWs, X^2 (2) = 3.657, p = 0.05. Who pays salaries also seems to influence the number of under-five children treated by CHWs, X^2 (3) = 8.667, p = 0.034. It was however interesting to see that, even if the CHWs believed that administrative officers

and family members (wife/husband) were very supportive, there was no statistically significant difference in number of patients received between the residuals of these groups.

In conclusion, there is a correlation between the instrumental support received from health professionals, community members and from other community health workers and therefore the null hypothesis was rejected. However, the research failed to reject the null hypothesis related to the existence of correlation between the emotional, informational and appraisal support received and the number of under-five children received by CHWs. It is therefore plausible that the null hypothesis might be true.

In chapter five, I will interpret the findings, compare them with the literature to conform whether the social support and social networks can help to improve the work of community health workers. I will discuss how the theory was applied and its added value compared to the results. I will describe the strengths and limitations of the study, its validity and reliability, will propose some recommendations, state the positive social change and possible implications of the study and provide a conclusion.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this study was to determine whether the social networks and social support received could positively influence the performance of the CHWs in the three districts covered by the community management of malaria pilot project in Burundi. In the study, I used a cross-sectional survey where 88 CHWs responded to a paper-based questionnaire. Descriptive and inferential statistics were used to analyze the relationship between the dependent variable (the number of children under the age of 5 received by CHWs) and the independent variables (health system support, community social support, and social networks between CHWs). I intended to address to the following three RQs:

RQ1: Is there any correlation between the instrumental, informational, and appraisal support received from the health professionals and the number of children under the age of 5 treated by CHWs?

RQ2: Is there any correlation between the emotional, instrumental, and appraisal support received from the community members and the number of children under the age of 5 treated by CHWs?

RQ3: Is there any correlation between the social networks and peer support of CHWs and the number of children under the age of 5 treated by CHWs?

I performed a series of parametric statistical tests (multiple regression) to evaluate whether the changes in covariates influenced the changes in the dependent variable. Similarly, nonparametric tests (Kruskal-Wallis) were conducted to analyze whether the variations in the independent variables positively affected the dependent variable. The results of the multiple linear regression showed that the covariates

analyzed together statistically significantly predicted the number of children under the age of 5 that the CHWs treated per month even if the relationship between the dependent variable and the covariates was weak (adjusted *R* square = .215, meaning that the covariates were responsible of 21.5% of the changes in the dependent variable, which is considered as a low effect size according to Cohen (1992). At the same time, the covariates taken individually did not statistically significantly influence the number of consultations.

The results of the Kruskal-Wallis statistical test were mixed and revealed that the instrumental support received from specific medical staff, namely doctors working at the district hospital and nurses working at the primary health care level, specific community members namely head of the village, and from other CHWs, was positively associated with the number of consultation performed by CHWs. The instrumental support received from nurses working at the district hospital, administrative officers, and family members (wife or husband and children or grandchildren) was not statistically significantly associated with the number of consultations performed. The results of the statistical tests could not establish a statistically significant correlation between the informational, appraisal, and emotional support and the number of consultations performed.

Interpretation of Findings

Creating jobs for health and other social activities has been difficult to be sustained by governments and donors in middle and low-income countries (Ferguson, 2010). The reason behind this fact is that none of those organizations want to commit to a long-term investment in human social resources (Watt et al., 2011). It has been particularly difficult for sub-Sahara African countries to hire required human

resources to take care of growing double burden of chronic and acute infectious diseases, such as HIV/AIDS and malaria prevention and treatments, relying instead on the services of CHWs (Watt et al., 2011). At least for a short time, CHWs can be an important support to a health care system that is chronically lacking qualified human resources, and for that reason, deserve fair wages (Watt et al., 2011).

Despite the full recognition of CHWs as frontline providers for preventive and curative health care services for selected diseases in low and middle-income countries, the capacity to maintain and sustain the pace of their work after the lifespan of pilot projects remains disparate from one country to another (Druetz, Kadio, et al., 2015; Druetz, Ridde, et al., 2015). While in India, Nepal, and Uganda, CHWs remain motivated by extrinsic factors (Brunie et al., 2014; Gopalan et al., 2012), in Tanzania, they remained motivated by intrinsic factors (Greenspan et al., 2013). Extrinsic factors included instrumental (salaries and other benefits) and informational elements (training and other types of advice), and intrinsic factors included appraisal and emotional elements (Brunie et al., 2014). In this study, I found that although the CHWs highly appreciated and recognized the instrumental, informational, emotional, and appraisal support received from various supporters, statistical analysis showed that the instrumental support greatly influenced the performance of the CHWs, while emotional, informational, and appraisal support did not statistically significantly make any difference. This situation can be explained by the fact that the average unemployment rate in Burundi was 20.73% between 1992 and 2008, which increased up to 35% of the total population in 2009 (Trading Economics, 2017). In such a context of high rate of unemployment, any project that can bring hope in terms of job opportunities is welcomed. A majority of CHWs saw in this particular project an

employment opportunity rather than volunteerism. On the other hand, the results of this study revealed that the support supervision from the direct supervisors of the CHWs (the district hygiene promoter) was very limited due to logistic constraints. A number of CHWs stated that they hardly attended a technical meeting once a quarter, if not biannually. In this situation, it was difficult for the supervisors to transmit valuable technical information that was much needed for the CHWs to improve their performance.

In the following sections, I will provide an in-deep analysis of the support provided by each of the groups of supporters in order to clarify the support needed to sustain the work of the CHWs work, and therefore, help to devise policies that can improve our understanding of CHW retention processes.

Support From the Health Professionals

The support received from the health system can be linked to the degree of integration of the CHW program into the national health system. Asweto et al. (2016) defined integration as clearly delineated responsibilities of the CHWs within the health system, fair remuneration, and professional growth path. The CHWs who were involved in the pilot project in Mabayi, Gahombo, and Gashoho had clear responsibilities within the health system (with a clear reporting line). They received support, including material and support supervision from the healthcare providers, although the rhythm of the visits was irregular. However, the CHWs did not receive any salary and the only incentives received was the working equipment and training provided by an international NGO. The equipment provided to CHWs was not standardized as the content of differed depending on the founding organization (Concern Worldwide, 2014).

According to Singh and Sachs (2013), the new CHW models should be fully integrated into the health systems with clear reporting lines, financial and nonfinancial incentives, trainings, and supervision. Nonfinancial incentives should include, but not limited to, priority access to healthcare services for the CHW and its family (free of charge, if possible); career growth opportunities; visibility (identification card with photograph, uniforms, bicycles, etc.); strong logistical support (transportation means, etc.; Asweto et al., 2016). In the same vein, Singh and Sachs stated that CHWs should be seen as well-trained and well-paid corps who give advice and treatments and implement preventive measures at community level. Perry and Crigler (2013) developed a matrix of CHW program subsystems and their interactions that clearly demonstrate how the relationships with the health systems as well as with the communities have to be built and maintained.

The participants working on this pilot project reported that the supervision from health staff was not consistent. Eighty-five percent of CHWs also indicated that they received the visit from health officials once in the last 3 months, and only 45% received a visit the last month. The main problem seemed to be the lack of human and material resources to perform regular support supervisions. The issue of support supervision has also been described by other researchers as one of the most important points to sustain CHW programs. Asweto et al. (2016) stated that maintaining connections between CHWs and health professionals is the main facilitator to improve the quality of services rendered by CHWs and to scale up the CHW program countrywide.

The statistical analysis showed a statistically significant correlation between the support received from the DHO and the number of children under the age of 5

treated. This result was surprising as the CHWs stated that they did not have much interaction with the DHO. However, as the DHO is in charge of the overall health care system in a given district, they are the most senior health staff in the district who provides valuable inputs during meetings. Their trainings sessions, although somehow limited, had a positive impact on the knowledge of the CHWs and on their performance.

The same result was seen while analyzing the impact of the support received from the doctors from the district hospitals. Here, the participants emphasized the quality of the knowledge transmitted to the CHWs by those senior health staff at the district level. The clinical trainings organized by doctors is seen by CHWs as the most beneficial activity that can be organized for them. Giving the opportunity for CHWs to manage clinical cases and hosting frequent meetings with qualified health professionals empowers CHWs by exchanging technical information with them and giving them the impression of being part of the health system (Asweto et al., 2016). As a result, the CHWs take more responsibilities and gain more autonomy. However, in the results of this study there was no statistically significant correlation between the meetings organized by the direct supervisors of CHWs (hygiene promoters) and the number of children under the age of 5 treated by CHWs. This might be linked to the lack of consistency in the regularity of meetings that have been described by participants of the survey. Some of the participants stated that the meetings were organized on a monthly basis for some areas, quarterly, biannually, and even annually for others. A review of studies performed in various countries in low and middle-income countries highlighted the fact that the simple dissemination of written guidelines is often ineffective, monitoring and audit with feedback are generally

effective, and multifaceted interventions might be more effective than single intervention (Perry & Crigler, 2013).

In this study, I found that the instrumental support has the most influence on the number of children under 5 years old treated by CHWs, while informational, appraisal, and emotional support did not make any difference on the number of consultations. While it was obvious that the availability of material, consumables, medicines, and equipment has an effect of the number of children that can be treated, in this study I did not analyze the quality of care provided by CHWs (that can be linked to the informational and appraisal support). It can be hypothesized that the increase in amount of support supervision could be linked with the improvement of the quality of care provided by CHWs to children under the age of 5. Dynes et al. (2014) stated that the strength of ties (proxy for social support) and working relationship between two individuals depend on (a) the social and demographic similarities or differences, (b) how they trust each other, (c) how close they are geographically, (d) how strong is the motivation to work together, and (e) how often they meet or benefit from training together. A better integration of the CHW program into the health systems might increase the strength of these ties.

Support From Community Members

The results of this study showed a statistically significant correlation between the instrumental support received from community and family members and the number of sick children under the age of 5 treated. However, there was no statistically significant correlation between emotional, informational, and appraisal support received from community members and the performance of CHWs. The CHWs are recruited from and answerable to the community (Maes & Kalofonos, 2013). The

support supervision from community members is essential as it increases the number of supervision contacts and improves the accountability towards the community (Asweto et al., 2016). As an example, a study performed in Tanzania showed that facility-based supervisors reached CHWs in their villages on an average of only once every 2.8 months mainly to check reports from CHWs (Roberton et al., 2015). In another comparative study between community-linked and facility-linked supervision, there were over 50 times more contacts recorded during community-linked approach compared to facility-linked approach (Mkumbo, Hanson, Penfold, Manzi, & Schellenberg, 2014). In many contexts, the meetings with the district officials were infrequent and not well scheduled, focusing on checking monthly reports rather than problem-solving (Mkumbo et al., 2014).

Although the technical staff is essential, they are not necessarily the best mentors for CHWs for specific tasks such as community relationship-building. Therefore, it is clear that community members can be more supportive than they are today if they are prepared for and mentally well-equipped to do so. Unfortunately, I did not determine what the possible contribution of the communities could be because that was outside the scope of this study. The communities and the local administration are left to decide which kind of support they can offer to the CHWs. However, the participants proposed that, at least, CHWs should be invited to the celebration of special events in the communities (Concern Worldwide, 2014).

Peer Support Among Community Health Workers

The study showed a strong social support among community health workers. All the 87 CHWs who confirmed the existence of the relationship between them said that the relationship was reciprocal to a great extent (58 CHWs) and a very

great extent (28 CHWs). The reciprocity is essential as it is believed to increase the ties value between CHWs and the stability of the relationship (Melamed & Simpson, 2015). However, the relationship between CHWs is not formalized for 83 participants to the study (94.3%). Peer support is critical for CHWs in the daily management of cases, as well as social and emotional support to cope with bad emotions, linking the case management to the local resources (Fisher et al., 2015). To maximize the benefits of peer support, there is a need of selecting the senior CHWs and give them enough knowledge to be able to provide a supportive supervision to the junior CHWs. Singh and Sachs (2013) and Perry and Crigler (2013) proposed to organize CHW programs as a health subsystem where CHWs are managed in a group of six persons and headed by a senior colleague who is trained in support supervision and able to report to the managers of the CHW programs at the primary health care level. The team leader has to have enough technical knowledge to guide the rest of the team. This kind of organization was proposed in the CHWs manual that was published before the beginning of the pilot project but was not transformed into action. There is a need to identify CHWs who are more qualified than others and provide to them a training of trainers (TOT) so that they can continue the supervision at the community level. The supervisors at the health facility should be involved only to check on the quality of the monitoring and improving the knowledge of these who benefitted from TOTs.

The transfer of the responsibilities from the health facility-based to community-based supervisors can do only if the relationship between CHWs is recognized and formalized and if the CHWs are well integrated into the health system. To do so, Singh and Sachs recommended that CHWs subsystems are part of

the WHO's building blocks of the health system namely service delivery, health workforce, information, medicines, financing and governance.

In conclusion, the social support received from health professionals, community members and the peer support between CHWs seemed to be incomplete. While there was a will to build an integrated CHWs program into the health system, accompanying measures to insure a full integration were not taken. At the health system level, the supervisors need more means to be able to visit the CHWs on a regular basis. At community level, the communities should have enough guidance on how they should better support the CHWs under their responsibility. And lastly, clearly formalized relationship between CHWs has to be built and formalized as it happens that peer support has an importance on the sustainability of CHW's programs.

Limitations of the Study

The study was a cross-sectional survey towards CHWs from three districts that benefitted from a pilot project on the management of malaria cases by CHWs. The study analyzed the possible effects of social support and social networks on the performance of CHWs. The first limitation of this study was, therefore, linked with its design. By definition, a cross-sectional study captures events at a given period and not the sequence of its occurrence. Therefore, we could imagine that the health outcomes are associated with other confounding variables such as sex of the respondent, education level, socioeconomic status, living area (urban or rural), level of education, etc. To mitigate the effects of those possible confounding variables, I performed restriction, matching and randomization techniques during the study design.

Internal validity, as well as construct validity of this study, may be questioned. It may be difficult to conclude that the changes in the number of consultations of under-five children are only attributable to the support received by CHWs or to say that the CHW intervention is the right intervention that has brought changes in the health outcomes. There may be other factors that can influence the number of consultations during the period of the intervention (alternative causes of the outcome) such as possible parallel interventions such as sanitation programs, sensitization programs against malaria, mosquito nets distribution, nutrition programs, etc. that may have an indirect effect on the number of malaria cases and their gravity.

The study was performed in three districts out of 45 that comprise the country. These three areas benefited from an extensive support as they were piloting the project. Therefore, the findings may not apply to other districts of the country that will not receive the same financial assistance.

Last but not the least, the study was performed in a period of political instability in the country. The CHWs who participated in the survey reported that due to security reasons, it had been very long since officials visited them. There were, therefore, some expectations related to the survey (possible extension of funding, job opportunities, etc.) that may affect the quality of the responses. To mitigate that limitation, I explained the objectives of the research and the use of the research results once the study is completed. I also provided to them a well-detailed consent form that they read and approved by answering to the questionnaire.

Recommendations for Future Research

This is the first time the social support and social networks theoretical framework has been used to assess the support provided to CHWs and its impact on

their work in Burundi. This preliminary study focused on the activities of the CHWs but not on the shorter and longer-term outcomes. Future studies should concentrate on the impact of the support received by CHWs on the health status on a larger scale and in districts that were not covered by the pilot project to gauge the effectiveness of the project by comparing the areas who received full support against those who did not. It would also be interesting to analyze the cost effectiveness of the project and the return on investment and eventually propose new funding options. Another area of research could be related to building teams within CHWs with a well-trained team leader and what could be its impact on the health of hard-to-reach communities. Lastly, an in deep analysis of the community participation to provide guidance on possible ways of involving community members in a better support to CHW programs is needed.

Implications

Positive Social Change

The social networks and social support theoretical framework was used to analyze the strength of the ties between CHWs and other CHWs, community members, and health professionals. The strength of the ties was considered as a proxy for the quality of the support provided to CHWs. Analyzing the type of support needed and who is providing such support is necessary both for the CHWs themselves, the health planners and the communities.

The government of Burundi has the intention to scale up the CHW program at the national level. To understand the effect of CHW program towards communities, there is a need to know who is providing what to whom and when. There is also a need to evaluate whether the social support provided to CHWs during the pilot project is correlated to the reduction of the morbidity and mortality due to malaria in the areas

concerned by the pilot project. The positive social change will be that, understanding and covering the needs will improve the quality of the services provided to the community by CHWs and potentially reduce the mortality due to the disease.

Recommendations for Practice

The government has drawn a scenario of expansion of the program on other 26 districts out of the 45 districts of the country by the end of 2018 and increase the number of CHWs from 719 in 2011 to 5,698 in 2018. To reach that target, the program designers need to better understand what the needs in terms of support to CHWs are, and the study findings will help to meet this need. The findings will help, therefore, to design a more adapted package that could be offered to CHWs to make them more effective. Understanding and covering the needs will improve the quality of the services provided to the community by CHWs and potentially reduce the mortality due to malaria.

Conclusions

The community health programs have been identified as being a partial solution to the lack of qualified human resources in low and middle-income countries (Asweto et al., 2013; Lunsford et al., 2015). A wealth of literature has demonstrated how well-planned CHW programs reduced the mortality rate of under-five children and improved various preventive programs in an experimental setting (Lunsford et al., 2015). However, this task shifting from health professionals to CHWs has been done with very limited resources in many low and middle-income countries, giving the impression of being a panacea (Banek et al., 2014). Interventions to increase social support may have an impact on human behavior and health status (Fischer et al., 2015).

This study provided mixed results with a positive correlation between instrumental support provided and the number of children of children under the age of 5 treated. Surprisingly, there was no significant association between the emotional, informational and appraisal support received and the number of children under the age of 5 treated by CHWs. While the findings went against what I found in the literature, this situation might be related to lack of maturity of the pilot project, the inconsistency of the visits for the health officials, the lack of clarity in the role that should be played by community members, and the lack of clear mentoring processes between senior and junior CHWs. Future studies should be conducted to provide more guidance to the health authorities on how to involve more community members in support supervision, as well as on how to improve the peer mentoring and support.

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Appendix A: Questionnaire for the Participants of the Survey

DEMOGRAPHICS

What is your age? [BOX]

What is your gender? [BOX]

Marital status? [BOX]

If you are married, do live with your spouse / Husband? [BOX]

If you are married, do you have children? [BOX]

How many children do you have? [BOX]

If you have children, how many children with less than 12 years live with you? [BOX]

What is your primary spoken language? [BOX]

How many years of school did you complete? [BOX]

Province, and district: [BOX]

How many hours do you send per week for this work? [BOX]

SOCIAL NETWORKS AND SOCIAL SUPPORT [CORE QUESTIONNAIRE]

Social support of CHWs:

People who give personal support

[A *supportive person* is one who is helpful, who will listen to you, or who will back you up when you are in trouble.]

INSTRUCTIONS: Please look at the following list and decide how much each person (or group of persons) is supportive of you at this time in your work. Check with (√) your answer.

How supportive are the following persons	**Extremely supportive**	**Very supportive**	**Fairly supportive**	**Poorly supportive**	**Not supportive at all**	**There is no such person**
District health officer						
Doctors at the hospital						
Nurses at the hospital						
Nurses at the primary healthcare						
Administrative officer						
Health promotor						
Head of village						
Community member						

Wife or Husband
Children/grandchildren
Other family members
Co-worker / CHW

Which kind of support do you receive from you supporter?

Type of support	**Definitions**	**Answer**	**Any comments**
Emotional support	*Emotional support* involves the provision of empathy, love, trust, and caring.		
Instrumental support	*Instrumental support* involves the provision of tangible aid and services that directly assist a person in need.		

Informational support	*Informational support* is the provision of advice, suggestions, and information that a person can use to address problems.
Appraisal support	*Appraisal support* involves the provision of information that is useful for self-evaluation; purposes constructive feedback and affirmation.

Who provide Emotional support

Health staff 2. Community members 3. Family member 4. Peer support

Who provide Instrumental support

Health staff 2. Community members 3. Family member 4. Peer support

Who provide Informational support

Health staff 2. Community members 3. Family member 4. Peer support

Who provide Appraisal support

Health staff 2. Community members 3. Family member 4. Peer support

Dyadic social networks :

How connected are you with the CHW of the neighboring village (intensity or strength of the relationship)?

1: Not at all, 2: to a small extent, 3: to some extent, 4: to a great extent, 5: to a very great extent

If there is any connection, how reciprocal is the relationship between you and your neighboring CHW (Reciprocity)?

Reciprocal 2. Not reciprocal

If not reciprocal, do you **GIVE** or do you **RECEIVE** (circle the correct verb)?

Is the relationship formally recognized by the supervisor and institutionalized (Formality)?

Yes 2. No

If you support each other, in which domain you and your neighboring CHW are collaborating (complexity)?

(You can circle more than one answer)

Technical support Material support Emotional support Appraisal support

How do you rate the connection with the supervisor (health promotor)?

1: not at all, 2: to a small extent, 3: to some extent, 4: to a great extent, 5: to a very great extent

If you support each other, in which domain you and your neighboring CHW are collaborating (complexity)?

(You can circle more than one answer)

Technical support Material support Emotional support Appraisal support

How often CHWs meet at the district level / supervisor / Health promotor?

Monthly Quarterly Biannually Annually Never

How do you rate the connection with the supportive community member / family member?

1: not at all, 2: to a small extent, 3: to some extent, 4: to a great extent, 5: to a very great extent

If you support each other, in which domain you and your neighboring CHW are collaborating (complexity)?

(You can circle more than one answer)

Technical support Material support Emotional support Appraisal support

Areas where I needed social support and who provided it

	H ealth officials	Com munity members	Fa mily members	Colle agues	Com ments

Availability of drugs

Availability of non-medical equipment (notebooks, pens…)

Training

Supervision (weekly, monthly, quarterly, biannually, yearly)

Meetings

Salary / incentives

Emot

ional support

Appendix B: Sarason's Social Support Questionnaire

Social Support Questionnaire—Short Form (SSQSR)

Record Type: Master Test Record

Acronym: SSQSR

Test Year: 1987

Test Child Records: Social Support Questionnaire—Short Form (SSQSR) [Test Development]
A Brief Measure of Social Support: Practical and Theoretical Implications. (AN: 2004-20745-007 from PsycINFO) Dec, 1987.
Authors: **Sarason**, Irwin G.; **Sarason**, Barbara R.; Shearin, Edward N.; Pierce, Gregory R.;
Source: Journal of Social and Personal Relationships. 4(4), Sage Publications, US.
Age Group: Adulthood (18 yrs & older)
Population: Human; Male; Female; Sample: Undergraduates
Keywords: Social Support Questionnaire--Short Form; perceived social support; test development;
Subjects: Questionnaires; Social Support; Test Construction; Test Forms; Test Reliability;

Authors: **Sarason**, Irwin G., University of Washington, Seattle, Washington, United States
Sarason, Barbara R., University of Washington, Seattle, Washington, United States
Shearin, Edward N., University of Washington, Seattle, Washington, United States
Pierce, Gregory R., University of Washington, Seattle, Washington, United States

Address: **Sarason**, Irwin G., University of Washington, Psychology Department, NI-25, Seattle, Washington, United States, 98195

Source: PsycTESTS, 1987.

Language: English

Construct: Perceived Social Support

Purpose: Social Support Questionnaire--Short Form is a brief measure of a subject's perceived social support as well as their appraisal of that social support.

Description: The Social Support Questionnaire--Short Form (SSQSR; **Sarason** et al, 1987) is a brief measure of a subject's perceived social support as well as their appraisal of that social support. The authors attempted to develop 3-item (SSQ3) and 6-item (SSQ6) short versions of the 27-item Social support Questionnaire (SSQ; **sarason** et al, 1983). The short versions were then administered to college students alongside the longer version so that the comparability of the different forms could be determined. The internal reliabilities of SSQ3-Number and SSQ3-Satisfaction were α = 0.75 and α = 0.79 respectively. The internal reliabilities of SSQ Number and Satisfaction were higher α = 0.97 for each. Because three items might be too few to provide all the psychometric properties deemed desirable, Study 2 was performed to identify a somewhat larger subset of items from the twenty-seven item SSQ which might have greater internal reliability while maintaining the highly similar correlations exhibited by the three item form compared to the 27-item SSQ. In this study, rather than use an a priori selection of items likely to be representative of the SSQ as a whole, we sought to collect the items through statistical analysis. The greater internal reliability (αs) of the SSQ6 suggests that it is the preferable measure. (PsycTESTS Database Record (c) 2016 APA, all rights reserved)

Format: 12 items; 6 point rating scale; responses include 6 (very satisfied), 5 (fairly satisfied), 4 (a little satisfied), 3 (a little dissatisfied), 2 (fairly dissatisfied), or 1 (very dissatisfied)

Instrument Type: Inventory/Questionnaire

Administration Method: Paper

PsycTESTS Classification: Social, Group, and Interpersonal Relationships (7600)

Commercial Availability: No

Permissions: May use for Research/Teaching

Fee: No

Other Version: 9999-48518-000, Social Support Questionnaire--6--Modified, Revision

Release Date: 20110912

Correction Date: 20160509

Digital Object Identifier: http://dx.doi.org.ezp.waldenulibrary.org/10.1037/t01518-000

Test File: Full

Accession Number: 9999-01518-000

Sarason, I.G., Sarason, B.R., Shearin, E.N., & Pierce, G.R. (1987)
A brief measure of social support: Practical and theoretical implications,
Journal of Social and Personal Relationships, 4, 497-510.

Social Support Questionnaire (Short Form)

SSQSR

INSTRUCTIONS:

The following questions ask about people in your environment who provide you with help or support. Each question has two parts. For the first part, list all the people you know, excluding yourself, whom you can count on for help or support in the manner described. Give the persons' initials, their relationship to you (see example). Do not list more than one person next to each of the numbers beneath the question.

For the second part, circle how satisfied you are with the overall support you have.

If you have had no support for a question, check the words "No one," but still rate your level of satisfaction. Do not list more than nine persons per question.

Please answer all the questions as best you can. All your responses will be kept confidential.

EXAMPLE:

Who do you know whom you can trust with information that could get you in trouble?

No one	1) T.N. (brother)	4) T.N. (father)	7)
	2) L.M. (friend)	5) L.M. (employer)	8)
	3) R.S. (friend)	6)	9)

How satisfied?

6 - very satisfied	5 - fairly satisfied	4 - a little satisfied	3 - a little dissatisfied	2 - fairly dissatisfied	1 - very dissatisfied

---

1. Whom can you really count on to be dependable when you need help?

No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

2. How satisfied?

6 - very satisfied	5 - fairly satisfied	4 - a little satisfied	3 - a little dissatisfied	2 - fairly dissatisfied	1 - very dissatisfied

3. Whom can you really count on to help you feel more relaxed when you are under pressure or tense?

No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

4. How satisfied?

6 - very satisfied	5 - fairly satisfied	4 - a little satisfied	3 - a little dissatisfied	2 - fairly dissatisfied	1 - very dissatisfied

5. Who accepts you totally, including both your worst and your best points?

No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

6. How satisfied?

6 - very satisfied	5 - fairly satisfied	4 - a little satisfied	3 - a little dissatisfied	2 - fairly dissatisfied	1 - very dissatisfied

7. Whom can you really count on to care about you, regardless of what is happening to you?

No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

8. How satisfied?

6 - very satisfied	5 - fairly satisfied	4 - a little satisfied	3 - a little dissatisfied	2 - fairly dissatisfied	1 - very dissatisfied

9. Whom can you really count on to help you feel better when you are feeling generally down-in-the dumps?

No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

10. How satisfied?

6 - very satisfied	5 - fairly satisfied	4 - a little satisfied	3 - a little dissatisfied	2 - fairly dissatisfied	1 - very dissatisfied

11. Whom can you count on to console you when you are very upset?

No one	1)	4)	7)
	2)	5)	8)
	3)	6)	9)

12. How satisfied?

6 - very satisfied	5 - fairly satisfied	4 - a little satisfied	3 - a little dissatisfied	2 - fairly dissatisfied	1 - very dissatisfied

---

TO SCORE SSQSR:

1. Count the total number of people for each of the odd-numbered items. Add the totals together (Max. = 54). Divide by 6 for per item SSQ Number Score, or SSQN.
2. Add the total Satisfaction scores for the 6 even-numbered items (Max. = 36). Divide by 6 for per item SSQ Satisfaction score or SSQS.
3. You can also compute a Family score and a Non-Family score by using the method in #1 for all people described as family members, or not described as family members respectively.

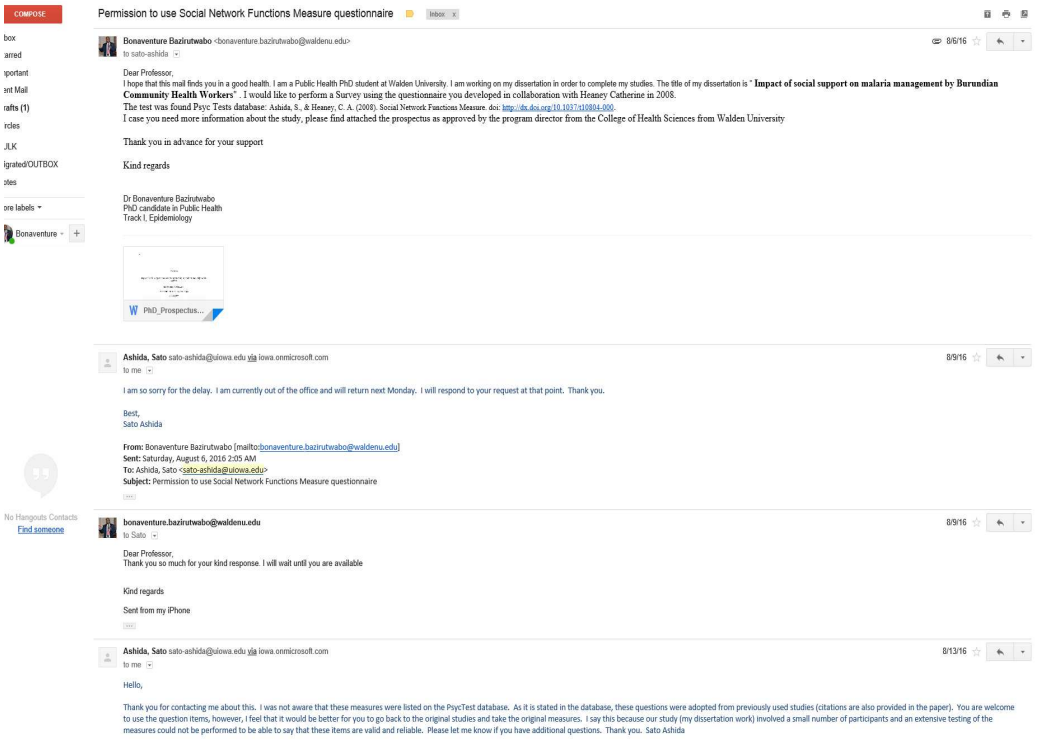

Table A1

Durban – Watson statistic for the model 1

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.529a	.280	.215	5.472	1.734

Appendix C: Kruskal Wallis Tests

Table A2

Who Provides Informational Support

	Who provides informational support	N	Mean Rank

How many patients do you receive per week?	Health staff	17	49.00
	Community member	2	19.75
	Colleague	3	20.67
	Health staff and community member	6	51.42
	Health staff and family member	2	43.00
	Health staff and colleague	25	43.90
	Community member and colleague	3	38.17
	community member and family member	1	15.50
	Family member and colleague	8	33.38
	Both	14	45.18
	None	1	79.00

Health officials, community members and family members	4	51.50
Total	86	

Table A3

Statistical Significance of the Test

Statistical significance of the test	How many patients do you receive per week?
Chi-Square	11.085
Df	11
Asymp. Sig.	.436

a. Kruskal Wallis Test

b. Grouping Variable: Who provides informational support

Table A4

Who Provides Appraisal Support

	Who provides appraisal support	N	Mean Rank
How many patients do you receive per week?	Health staff	3	50.33
	Community member	19	41.61
	Health staff and community member	15	43.40
	Health staff and colleague	4	31.88
	Community member and family member	3	69.00
	Community member and colleague	9	39.11
	Family member and colleague	3	32.83
	Both	31	49.48
	None	1	4.50

	Total	88

Table A5

Significance of the Test

Test Statisticsa,b

	How many patients do you receive per week?
Chi-Square	8.928
df	8
Asymp. Sig.	.348

a. Kruskal Wallis Test

b. Grouping Variable: Who provides appraisal support