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Women's reproductive health in ongoing humanitarian emergency
A case study of the Democratic Republic of the Congo

By

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Master of Public Health

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By
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Bachelors of Science, University of Maryland College Park 2016

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An abstract of a
thesis submitted to the faculty of the
Rollins School of Public Health of Emory University
in partial fulfillment of the requirements for the degree of Master of Public Health
in the Hubert Department of Global Health

2020

Abstract

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Background
Developing nations, such as the Democratic Republic of the Congo, struggle with maternal mortality reduction and "by the end of 2015, about 99% of the world's maternal deaths…with countries affected by a humanitarian crisis or fragile conditions accounting for almost 2/3 cases"(UNFPA, 2015). The combination of post-colonial political instability, corruption, and resource mismanagement all work in the disservice of DRC health infrastructure. Women, who traditionally have worse health outcomes then men, feel the brunt of this unfortunate combination. The DRC's inadequate healthcare system is largely substantiated by its dearth in qualified and accredited health providers. Healthcare systems are stagnated by inadequate resources to properly train health care providers and the lack of basic medical equipment.

Objective
By examining the potential relationships between the amount of eligible providers per health facility and health indicators including types services provided, advanced educational training, we aim to evaluate whether increasing number of authorized health providers will positively impact women's health outcomes.

Methods
We will conduct a multivariate linear regression analysis of the number of eligible providers against survey categorical and continuous variables using SAS and Excel.

Results Providers with training in the past 2 years [95%CI 1.18-1.29] or supervision in the last 6 months [95%CI 1.06-1.33] were strongly associated with the number of overall eligible providers at the FOSA. Significant relationships exist with facilities offering cesarean delivery [95%CI 3.04-4.16].

Discussion
Overall, our findings indicate the number of eligible providers in a DRC facility correlates strongly with the types of services provided, variety of service providers, and recent education on medical care.

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Acknowledgements

I would like express my gratitude to my thesis advisor, Dr. Roger Rochat, for sharing his time and expertise with me as we pursued our research. I am extremely grateful for Demographic and Health Surveys for granting me permission to use their dataset in this thesis. I would also like to thank my academic advisor, Ms. Theresa Nash, for always encouraging me to remain determined. Finally, I must thank God for guiding me throughout my MPH journey.

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Chapter 1: Introduction

Project overview

There is a need to prioritize women's reproductive health in areas of ongoing conflict to prevent avoidable maternal death. This is evidenced by the shortage of qualified providers in areas of reproductive health including pre and antenatal care and family planning. A workforce of medical providers is the backbone of a developed healthcare system. We chose the Democratic Republic of the Congo (DRC) to provide the framework for our research mainly because of its extensively documented societal and political unrest and correspondingly unsatisfactory health indicators. The Democratic Republic of the Congo's frequent periods of humanitarian turbulence both during and after colonialism has caused a lack of prioritization of women's health.

By examining the potential relationships between the amount of eligible providers per health facility and health indicators, including types services provided, advanced educational training, we aim to prove that increasing number of authorized health providers will positively impact women's health outcomes. This study will identify and evaluate numbers of eligible providers against maternal health related indicator variables during ongoing humanitarian crisis in the DRC.

Significance of MM in DRC

Maternal mortality is defined by UNICEF as the number of "deaths due to complications from pregnancy or childbirth"(UNICEF, 2019). These deaths can be attributed to systematic inequalities that exist in gender and religious classes and further prevent healthcare access due to poverty. In 2017, "MMR in low income countries was 462 per 100 000 live births versus 11 per 100 000 live births in high income countries"(Abebe, Negash, Bogale, Beru, & Molla, 2019).

Pregnancy can pose a myriad of health challenges for already impoverished women. These challenges present themselves while conceiving, carrying, and birthing a child and continue post-childbirth. In the absence of quality and timely care, complications before, during and after pregnancy can be exacerbated despite otherwise being preventable or treatable. The World Health Organization (WHO) states that the "risk of maternal mortality is highest for adolescent girls under 15 years old and complications in pregnancy and childbirth are higher among adolescent girls age 10-19 (compared to women aged 20-24)"(Abebe, Negash, Bogale, Beru, & Molla, 2019). The WHO designated the reduction of MM by 75% by 2015 as its goal #5 in its global Sustainable Development Goals (UNFPA, 2015). With this MDG in mind, global communities have committed to reducing MMR by 2030. Specifically, SDG 3 designates "reducing the global MMR to less than 70 per 100 000 births, with no country having a maternal mortality rate of more than twice the global average" as a main objective ((Dube-Moyo, 2019).

Developing nations, such as the DRC, struggle with MM reduction and bear the vast majority of maternal deaths. The United Nations Population Fund (UNFPA) states that "by the end of 2015, about 99 per cent of the world's maternal deaths will have occurred in developing regions, with countries affected by a humanitarian crisis or fragile conditions accounting for almost 2 in 3 cases"(UNFPA, 2015). The combination of post-colonial development, political instability, corruption, and poor resource mismanagement all work in the disservice of DRC health infrastructure. Women, who traditionally have worse health outcomes then men, feel the brunt of this unfortunate combination. Maternal mortality in low income and developing countries like the DRC, "is 1.9 times the world average, and the number of maternal deaths in these countries represent 61 per cent of the total number of maternal deaths worldwide"(UNFPA, 2015).

The DRC and similar developing are often referred to as areas of CHE or complex humanitarian emergency. Their volatile social and governmental infrastructure reflect "breakdowns in governance, rule of law, and support systems" and are "are characterized by destruction of public infrastructure including health facilities, massive population displacement, insecurity, and a collapse of the social contract"(Zeid et al, 2015). A study by the UNFPA found that "more than 80% of the 25 and 44 countries classified as making either "no progress" or "insufficient progress" towards MDG 5 were those that "have suffered a recent conflict, recurring natural disasters, or both"(Zeid et al, 2015). With regards to maternal mortality, the report found that "at any given time 4% of disaster affected populations are pregnant, about 15% of whom will experience an obstetric complication"(Zeid et al, 2015). Additionally, areas of CHE present the need for risky or unsafe practices, such as delivering children in the absence of a skilled health professional, unregulated abortion and unwanted (transactional) sex.

MMR reduction is complicated in that it necessitates not simply policy reform and regulation to allow for improved health access and outcomes for reproductive age women but also to some degree, behavioral change. Social beliefs, norms, and customs must also be transformed to favor women empowerment and essential value to society. Health education and interventions targeted towards women and men must influence their gender structure, sexual health practices, and trust in their healthcare providers. The non-profit organization CARE addresses this as "even in crisis, people continue to have sex and bear children, which increases their risk of sexually transmitted infection , pregnancy, and pregnancy-related complications that can lead to illness and death for mother and child" (Sexual and Reproductive Health in Emergencies, 2018). As the DRC's population continues to grow, the sexual health and reproductive rights of women must be highlighted to improve the overall health outcomes of the population.

Country economic overview

The DRC is a former Belgian colony located in central Africa. It is bordered by Rwanda, Central African Republic, Uganda, Burundi, Angola, Tanzania, and South Sudan. The "largest Francophone country in Africa", its position includes some of the mineral and resource rich terrain in the world, making it an extremely desirable area for economic trade of goods including "diamonds, gold, copper, cobalt and zinc"(BBC, 2012). Most notably, the DRC "also has supplies of coltan, which is used in mobile phones and other electronic gadgets, and cassiterite, used in food packaging"(BBC, 2012). The DRC's natural resources is estimated at $24 trillion U.S. dollars (Nuttall & Halle). Despite the DRC's rich supply of natural resources, "the most recent World Bank estimates put the extreme poverty rate in the DRC at 73% in 2018, one of the highest in sub-Saharan Africa, placing it ahead of only Nigeria" (The World Bank in DRC, 2019). The DRC's geographic wealth is frequently lamented as a curse as it is cited as a main contributor for decade long international and civil wars, particularly in the eastern region.

Extended periods of corruption, conflict and instability have spurred the "decline of public institutions and cost-cutting by industries across the country, the standard of life has plunged to a level unparalleled in the majority of African countries" (International Crimes: Women in the DRC Demand Justice, 2017). As well, "the social service sector reflects some of the worst indicators in the world for infant and maternal mortality, education access, and employment"(Maternal mortality, 2019). In 2012, 77% of the population was living in extreme poverty on less than $1.90 a day (No Poverty, 2017). It is clear that the DRC's reduced capacity to provide general economic stability for its populations directly cripples its capacity to provide a sound healthcare system. With the longstanding debt, mismanagement of resources, and intrinsic political corruption, the

DRC has severe economic strongholds that prevent its concentration on improving its health indicators.

Chapter 2: Review of the Literature

Conflict and war

The ongoing humanitarian crisis and political instability can be traced back to the DRC's independence from Belgium in 1960. As an African colonial power, Belgium maintained a system of brutal forced labor and slavery, enacting a policy of 60-day compulsory forced labor for all Congolese in 1935 (Johnson, 2014). This was eventually increased to 120 as mining of diamonds became progressively lucrative (Johnson, 2014). The DRC's African population lacked education or vocational training, which stunted future Congolese leaders from making sound economic and political policies (Johnson, 2014). Fed up with imperialist regime, the Congolese people rioted against its colonial oppressor, eventually gaining independence. However, before exiting the country and relinquishing its control, Belgian leaders plundered the DRC "treasury and transfers the debt to the new Congolese government"("DR Congo: Chronology", 2009). The following 40 years saw a constant fluctuation of power between rebel groups vying for political and ethnic power. The decades old debt has been tackled through debt relief programs like the Multilateral Debt Relief Initiative (MDRI), external financing via foreign direct investment (FDI), and sale of valuable mining rights to foreign nations like China (International Monetary Fund, 2015).

Political assassinations, military coups, inconceivable violence and shifting ethnic alliances created a volatile environment for the Congolese people. Ethnic wars with Rwanda's Hutu and Tutsi tribes only exacerbated matters as "Tutsi rebels took control of Rwanda, over a million Hutu - including many of the leaders who directed the genocide - take refuge in camps across the border in Zaire [DRC]"("DR Congo: Chronology", 2009). Waves of mass genocide

persisted and by 1996 “the Rwandan government sent its troops into the Congo, asserting the need to impede preparations for attacks on Rwanda as well as any obligation to protect the Banyamulenge, Congolese of the Tutsi ethnic group, who were being threatened by local and national Congolese political authorities” (“Democratic Republic of Congo: Civilians attacked in North Kivu”, 2005). Rwandan soldiers along with the Allied Democratic Forces for the Liberation of Congo attacked the camps and killed tens of thousands of Rwandans, many of them unarmed civilian refugees (Csete & Kippenberg, 2002). In July 1999, the main foreign contenders signed a cease-fire accord at Lusaka (“Peacekeeping Missions Security Council”, 2020).

A United Nations peacekeeping force, the U.N. Observation Mission in the Congo (MONUC), was deployed to supervise the ceasefire and the demobilization of combatants Lusaka (“Peacekeeping Missions Security Council”, 2020). Unfortunately, this organization was later found to have committed sexual atrocities of its own while supposedly working to maintain the cease-fire Lusaka (“Peacekeeping Missions Security Council”, 2020). In 2003, the International Rescue Committee conducted a mortality survey that reported “the death toll of Congolese civilians since 1998 had risen to 3.3 million, the largest civilian death toll of any war since World War II”(“DR Congo: Chronology”, 2009). The first democratic elections in 2006 notwithstanding, portions the Congo remains centers of human rights violations, a fact adamantly denied by its current president who “rejects the charges as "lies" but later announces a new policy of "zero tolerance" for abuses and rape committed by its soldiers”(“DR Congo: Chronology”, 2009). Most recently, life in the DRC is still fraught with more localizes armed conflicts and civil unrest. Ebola prevention, response, and treatment efforts have consumed the much of the public health emergency funding and media attention. As of 2019, the “Ebola outbreak in northeastern DRC is the second-largest ever, surpassed only by the West Africa outbreak that killed 11,000 people from

2014 to 2016" (Reid, 2019). These socioeconomic and political conditions leave approximately 13 million, of which 1.3 million are children, subject to extensive malnutrition as families cannot afford adequate dietary provisions (Reid, 2019). As the DRC moves toward ending its frequent internal conflicts, combating the Ebola public health emergency, and affording basic nutrition to its citizens, it must also concern itself with women's maternal and reproductive health to meet the urgent needs of this population segment.

Rape as a weapon

Notable tactics employed in the ongoing wars in the DRC are rape and sexual violence. These strategies were not limited to Congolese or Rwandan militia, but frequently included "non-state armed groups, using sexual violence to enforce control over illicit economic activities, including the exploitation of natural resources"(*Democratic Republic of the Congo*, 2019). According to a 2019 UN Security Council report, "in 2018, MONUSCO documented 1,049 cases of conflict related sexual violence against 605 women, 436 girls, 4 men and 4 boys" (*Democratic Republic of the Congo*, 2019). In many incidents, women and "girls were targeted while walking to school or collecting firewood or water" (*Democratic Republic of the Congo,* 2019). A quarter of the cases attributed to the Congolese police "were committed while victims were detained in temporary holding cells"(*Democratic Republic of the Congo*, 2019). The Global Fund For Women, an international women's humans rights group, asserts that "armed groups that used rape as weapon of war are not brought to justice, but instead given amnesty and integrated into the national army or let into general society, where they rape once more" (International Crimes: Women in the DRC Demand Justice, 2017).

In addition to armed forces, women and girls are repeatedly violated "at the hands of ordinary civilians – teachers, neighbors, and other men who have never been in the military or have been discharged"(International Crimes: Women in the DRC Demand Justice, 2017). In fear of social rejection and lack of faith in the DRC legal system, many women do not seek justice for their rapists. Peace treaties, both in 2003 and eventually 2013, have not yielded consistent or reliable protection for susceptible women and girls. In November 2012, "hundreds of women and girls were raped in a single horrific day in Minova when Congolese soldiers– who had just been defeated by rebel fighters in Goma – retreated there"(International Crimes: Women in the DRC Demand Justice, 2017). Women in DRC are made increasingly vulnerable to persistence of weaponized sexual violence by "ineffective justice system, poor governance, and women's inferior social position, the sexual violence against women that characterized the conflict has infiltrated daily life in eastern Congo, including classrooms and public spaces"(International Crimes: Women in the DRC Demand Justice, 2017). While institutionalized rape and sexual violence are directly and indirectly upheld in DRC society, sustainable efforts to progress women's health outcomes will not be viable.

Cultural beliefs regarding sexual reproductive health

Women's sexual and reproductive health is to some degree unmentionable or even taboo in many cultures. A study containing interviews of a DRC marketing specialists revealed that "the category of 'contraception' is underdeveloped or non-existent in pharmacies in the DRC" and that "products are hidden behind counters, except for condoms, and clients 'whisper' about contraception if they come to purchase it"(Kwete, et al., 2018). Additionally, DRC society looks favorably upon large families and therefore has been slow to adapt to modern contraceptive

techniques and programs. Husbands also retain great authority over their household "health and financial decisions" which "can be an obstacle to women's access to SRH services" (Steven, et al., 2019). Similar studies have shown that "both husbands and community members played a significant role in reinforcing unequal gender norms and influencing women's individual SRH choices"(Steven, et al., 2019).

The social structure of the DRC gives immense power and influence to highly regarded local community leaders. These persons are "often perceived as the stewards of local traditions" and are influential in supporting or denouncing women's reproductive health rights (Steven, et al., 2019). Due to the country's "conservative attitudes expressed by community members and partners dissuaded women from utilizing contraception", DRC women remain overwhelmingly disempowered in taking control of their own health (Steven, et al., 2019). The above sentiments underscore the importance that community leaders and male heads of households must play in uplifting women in the DRC. Their favorable support of sexual and reproductive health policies and programs is essential to women's health and directly corresponds with improving their health status.

Shortage of eligible providers

The DRC's inadequate healthcare system is largely substantiated by its dearth in qualified and accredited health providers. Inconsistencies in healthcare infrastructure by its 52 health zones impact the equal provision of health services, particularly with regard women's health. Insufficient human and financial resources to properly train and supervise health care providers, lack of equipment, and the deterioration of physical infrastructure, some of which dates from the colonial era, are all difficulties encountered by those working in family planning (Kwete, et al., 2018).

Mafuta et al. investigated the specific service deployment and utilization of the DRC health facilities and found that “skilled providers, appropriate equipment and services are important but there is no guarantee for responsive services”(Mafuta, et al., 2015). The severe health workforce shortage, as a direct consequence of decades long political and social conflict, contributes to the lack of service utilization, low administrative capacity, quality service delivery for women countrywide. Health providers do not have an enforced payment schedule for their workers who are often unsalaried (Mafuta, et al., 2015).

The Final Report Summary of the 2017-2018 SPA survey provided by the Demographic and Health Surveys in the Democratic Republic of the Congo further highlights the need for qualified healthcare providers. Based on information about training and supervision from 6650 CPN provider, researchers found that “3/10 providers had received training in the field of prenatal care during the 24 months preceding the survey, but nearly 8 in 10 (78%) had received supportive supervision during the six months preceding the survey”(“Evaluation of the Performance of Health Care Service”).

Furthermore, with specific regard to women’s health, only 10% had received training advice to pregnant women and 10% for screening for complications of pregnancy (“Evaluation of the Performance of Health Care Service”). Similarly, out to the 7,188 providers surveyed regarding neonatal and childbirth care, only “16 percent of providers had received training in the field of childbirth and neonatal care in the 24 months preceding the survey, but…(76%) had received supportive supervision during the six months preceding the survey”(“Evaluation of the Performance of Health Care Service”). These figures demonstrate the abundant need for healthcare providers with adequate training and education in order to provide DRC women with quality of service they deserve.

A quality of care investigation published by the WHO determined that "the aim of many strategies to improve health-care quality has been to ensure that essential inputs – e.g. technology, operational facilities, pharmaceutical supplies and trained health workers – are in place"((Hanefeld, Powell-Jackson, & Balabanova, 2017). The authors assert that "quality improvement approaches should be applied within patient-centred [sic] models of care is relatively recent" (Hanefeld, Powell-Jackson, & Balabanova, 2017). With regards to maternal health, "these patient-centered models of care" should undoubtedly encompass initiating or increasing current staffing levels of effectively educated or trained service providers specific to areas of SRH (Hanefeld, Powell-Jackson, & Balabanova, 2017).

Key health indicators for women

In stark contrast to the universal sexual reproductive healthcare (SRH) systems of the developed world, those of the developing world lack adequate women's health framework. The UN cites "lack of education and inadequate maternal care are major factors related to poor pregnancy outcomes and high maternal and antenatal mortality"(Mariani, et al., 2017). Comparably, 15% of maternal deaths worldwide are due to adolescent pregnancy however in Africa, the rate is 26% (Mariani, et al., 2017). MMR is largely attributed to "unsafe abortion, severe bleeding, infections, eclampsia/pre-eclampsia, complications from delivery and, above all, lack of access to healthcare facilities" (Mariani, et al., 2017).

Previous research has established that the "leading factors for maternal mortality include unsafe abortion, severe bleeding, infections, eclampsia/pre-eclampsia, complications from delivery and, above all, lack of access to healthcare facilities"(Mariani, et al., 2017). The WHO also recommends that women attend no fewer than four ANC visits (Mariani, et al., 2017).

Furthermore, “providing universal access to reproductive healthcare has been recognized by the UN as a priority global health area, included in the MDGs” another key indicator of acceptable women’s health is (Mariani, et al., 2017). In the DRC and general developing world, “women’s health services, particularly sexual and reproductive health services, are often not provided at a level of quality that meets human rights standards”(Temmerman, Khosla, Laski, Matthews & Say, 2015). Finally, a facility or provider’s ability to appropriately conduct “clinical history, medical examination, laboratory tests and diagnostic imaging all play a significant role in improving the delivery of sexual and reproductive health” and support the edification of women’s healthcare delivery (Mariani, et al., 2017).

Unmet demand for family planning

Within the context of reproductive health, family planning (FP) is a key indicator of the strength of a health network. Several studies have echoed the fact that “family planning prevalence is strongly correlated with quality of life as measured by income, life expectancy, and education, with family planning and quality of life tending to improve simultaneously and coherently”(Trias, 1992). Women serve essential roles in society and therefore “accessibility of family planning is another indicator of women's status” (Trias, 1992). With FP, women are able to prevent unwanted pregnancy, adequately time pregnancy, and terminated pregnancy as needed. Specifically, “the potential health benefits of avoiding births before age 20 and after 35 (high parity births) and closely spaced births are well known” as well as “proper spacing would also combat infant mortality (Trias, 1992).

There is an interconnectivity between “human rights, gender equity and empowerment, and maternal and child health” (Starbird, Norton, and Marcus, 2016). Much of the developing world

lacks the fundamental resources to enact policies and programs that support FP. In many cases, FP has uninterrupted influence on "creating human capital, in that women with more access to family planning are more likely to have more schooling, work in the formal sector, and achieve larger economic gains" (Assaf & Wang, 2019). FP methods including spacing of pregnancies, contraception, abortion, overall fertility management "has a direct impact on her [women's] health and well-being as well as on the outcome of each pregnancy" (Shaw, 2013). A 2017 report from the Guttmacher Institute found that in the DRC capital of Kinshasa "72% of married women reported in 2017 that they wanted to delay or prevent having a child"(Induced Abortion and Postabortion Care in Kinshasa, Democratic Republic of Congo, 2018). Thus, illustrating a clear unmet demand for delay or prevention of pregnancy by women.

According to a 2019 article investigating contraception and abortion in the DRC, found that despite constitutional provisions for SRH and contemporary criminalization of sexual assault, abortion is nevertheless illegal and enforcement of women's rights centered legislation is minimal (Swanson, Hennink & Rochat, 2019). The authors found that rural areas had decreased access to FP, "only 4% of rural areas compared with 15% of urban areas"(Swanson, Hennink & Rochat, 2019). This finding is echoed in the Figure 1 map as less densely populated rural provinces lack general health infrastructure. Furthermore, the authors linked pervasive sexual brutality inflicted on Congolese women to widespread unintended pregnancy therefore creating an unmet demand for modern contraception methods (Swanson, Hennink & Rochat, 2019).

Facility infrastructure distribution

Figure 1 shows the spatial distribution of health facilities in the DRC as it correlates with the overall 2019 population density in each province. This map utilizes the country's current provincial boundaries. Only health facilities that could potentially be of use for

reproductive/maternal health purposes were included in the visualization although other classifications exist in the dataset. This map is intended to help visualize the distribution of healthcare facilities that may offer specific SRH services against provincial population density. Based on this geographic coordinate data provided by volunteers within the regions, much of the northern and central regions of the country, do not appear to have many facility that would specifically cater to SRH care. It should be noted that much of the central and northern regions contain the largest tropical rainforest in Africa, and second largest in the world, second to that of the Amazon in South America (Turkewitz, 2019). As this data source relied on coordinate collection and recording by volunteers, areas may be underrepresented as they are marked by extremely thick vegetation and unmarked terrain.

The eastern border of the DRC joins with Rwanda and Burundi. Rwanda in particular has been constant source high immigration and refugees to the DRC. This contributes not only to this regions elevated population density but also the increased presence of humanitarian aid and intervention efforts, leading to greater prevalence of healthcare facilities. Likewise, the capital city-state of Kinshasa, along the southwestern border, has both a high population density and concentration of healthcare facilities. This map demonstrates the lack of access to potential SRH providers and facilities for the majority of the DRC. Increased facility locations are not consistently correlated with population density, leaving millions, particularly women, inaccessible to feasible provider care.

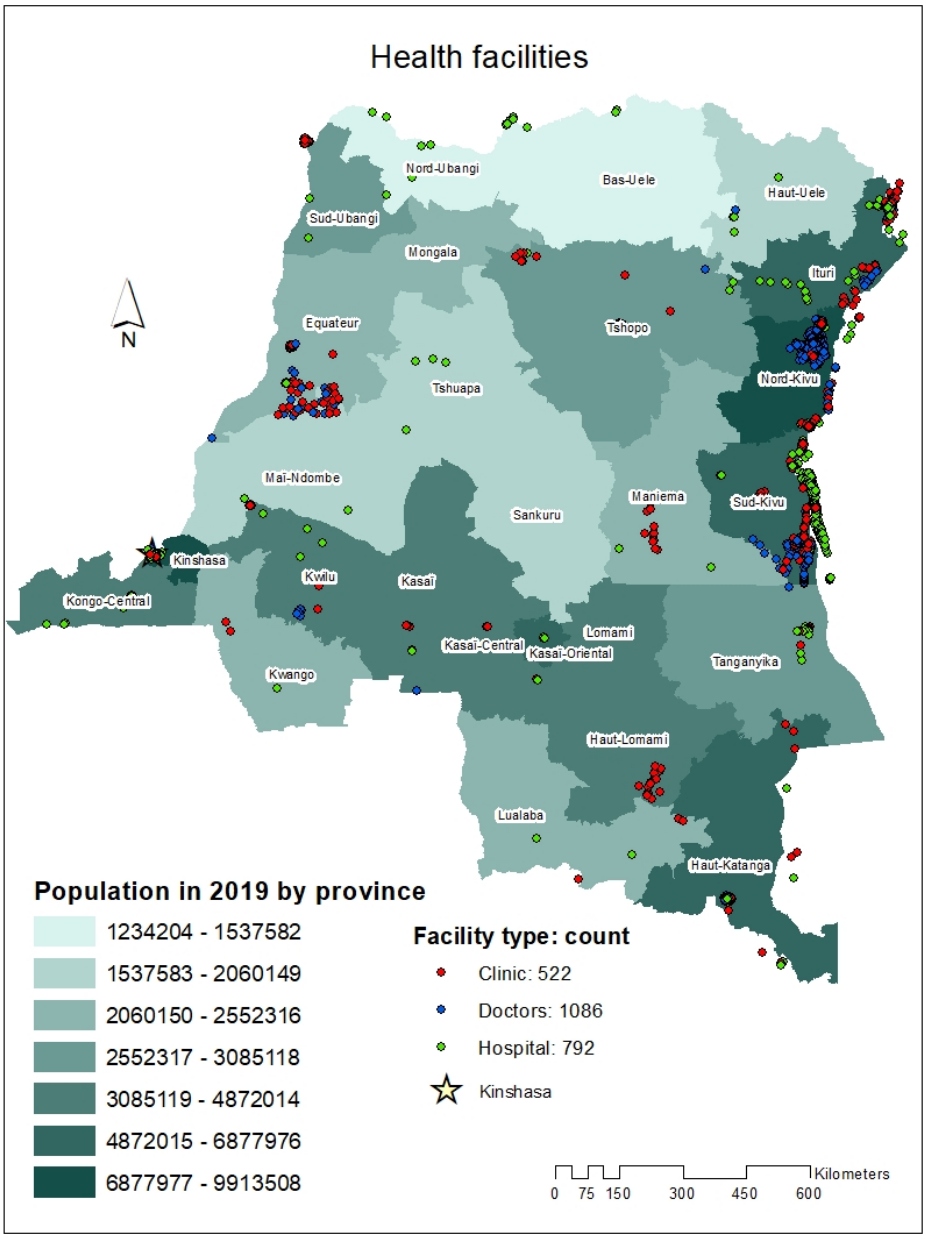

Figure 1 Location of health facilities by type in the DRC correlating with underlying province population density. Data obtained from hotosm_cod_health_facilities_points_shp.zip OpenStreetMap via volunteered geographic information collection. Map created by Taylor Worsley.

Chapter 3: Methods

Data source overview

We selected Demographic and Health Surveys as our data source due to its thorough and reputable data collection procedures as well as vast scope topical range. DHS conducts “nationally representative population-based surveys with large sample sizes (usually between 5,000 and 30,000 households)” ("The DHS Program"). Women (15-49) as well as men (15-54) participate. Although there is a standard core or model questionnaire used in data collection, each country is able to modify the format to their needs. That is, some questions may be added or omitted as seen fit. Our study applied specifically the SPA (Service Provision Assessment) questionnaire which are “conducted in health facilities and communities to obtain information about the health and family planning services available in a country” ("The DHS Program"). Included in this form of survey is a “nationally representative sample of over 400 facilities and covers all types of health services sites from hospitals to health posts. Public, private, and faith-based institutions are all represented”("The DHS Program").

Procedures

We conducted our research in Atlanta, Georgia. We submitted an abstract of our proposed research with accompanying contact information to DHS via their website. After approval, we downloaded the compressed zip files containing the survey datasets of the most recent questionnaire (2017-2018). The survey of interest, the Evaluation of Services of Health Care Services in the Democratic Republic of Congo 2017-2018 (EPSS DRC 2017-2018), “aims to collect information on the provision of health services in the DRC to assess the capacity of training sanitary (FOSA) and their readiness to provide quality health care”(“Evaluation of the

Performance of Health Care Service"). Types of questionnaires included inventory questionnaire FOSA, questionnaire for interviewing the care provider, and a questionnaire for observations during consultations("Evaluation of the Performance of Health Care Service"). The overall survey contained separate sub-datasets for each topic. In accordance with our stated research interests, only the provider dataset was considered. We analyzed this dataset using both SAS and Excel. The initial portion of the EPSS document presented DHS's overall findings, summary of survey methodology, and country specific context for the entire survey program of that year. The second portion of the document contained the survey transcript used in the study. Because the document was written in French, we used the Google translator online tool to translate it to English. The translated questionnaire was required when analyzing the data in the aforementioned software systems as it revealed the context, specific question, and answer choices that are not able to be deduced from viewing the data tables alone. We consulted the supplementary DHS Word document "Notes for users of the Congo Democratic Republic SPA 2017-18 data files" for vital information regarding established weights, variable name structures, and sub-table arrays.

Data analysis

The survey dataset incorporated categorical and continuous data. For data formatted in arrays, dummy variables were constructed for analysis. DHS defines that missing values "as a variable that should have a response, but does not have a response — either because the question was not asked (due to interviewer error) or the respondent did not want to answer" ("The DHS Program"). Although questions may allow and code for responses such as "don't know", a respondent may have chosen not to answer or the interviewer did not ask the question. Those coded as "don't know" were included in analysis as they had an assigned value; however, blank or

"NULL" responses were not. This occurrence was somewhat frequent within large sections of the datasets; therefore, those particular questions were omitted from analysis. This may indicate respondent sensitivities or reluctance toward certain topics of interest. DHS assigned each respondent a weight of 1 in order to be accurate. Incomplete rows that did not meet this stipulation were excluded as they indicated deficient observation and exit interview completion.

We chose to conduct a mixture of simple and multivariate linear regression to identify possible associations between independent and dependent selected variables. Simple linear regression involve one independent and one dependent variable where multivariate involved several explanatory variables. Our independent variable, number of eligible providers at the FOSA, was used in each test. Dependent variables included a mix of categorical and continuous. The p value was set to <.05 with a 95% confidence interval.

Explanation of output tables

Although many components are produced from the linear regression output, we are primarily focused on the following sections and corresponding values. R Squared indicates how well our data adheres to our linear regression model. Adjusted R square is essentially the same as R square except this is used with multivariate analysis. Values close to or equal to 1 denote a strong fit; if it is close to or equal to 0, there is a weak or poor fit of the variables for this model. The F statistical significance illustrates the overall statistical significance of the model. For this study, a value p<.05 denotes a significant model and consequently reliable results. P-value refers to the statistical significance of each dependent variable. The threshold was also assigned as p<.05.The columns labeled Upper and Lower 95% signify the confidence intervals for each dependent

variables. Finally, the coefficients listed alongside each variable indicate the amount the independent variable will increase (+) or decrease (-) by the associated number.

Ethical considerations

Our project did not require Emory Institutional Review Board (IRB) as it was not considered human subject research.

Chapter 4: Results

Table 1

Table 1 uses the number of eligible providers indicated by the respondent at their current FOSA as the independent variable. The dependent variables of interest were whether the FOSA possessed the medical tools, storage, and waste practices listed on the questionnaire. The adjusted R square was 0.45 and the overall F significance was 3.665E-167, nearly 0. Significant relationship between the number of eligible providers and whether the facility offers sterilization [95%CI 1.76-2.52] , ART [95%CI 1.14-2.04], has test tubes [95%CI 1.93-2.72], and has a functional incubator [95%CI 1.39-2.55].

Table 2

Table 2 uses the number of eligible providers indicated by the respondent at their current FOSA as the independent variable. The dependent variables of interest were whether the FOSA were binary yes/no responses to the survey question “does your FOSA provide the following health services” (“Evaluation of the Performance of Health Care Service”). The adjusted R square was

.48 with an F significance of 2.892E-184, nearly 0. A significant relationship was identified only in the row regarding cesarean delivery [95%CI 3.04-4.16].

Table 3

Table 3 uses the number of eligible providers indicated by the respondent at their current FOSA as the independent variable. The dependent variables of interest were respondent numerical responses of the number of eligible providers with any training in the last two years, supervised in last 6 months, and a combination of both of the previous variables at their FOSA. The R square was .89501878 with and F significance of 0. All three variables had a $p<.05$. Providers with training in the past 2 years [95%CI 1.18-1.29] or supervision in the last 6 months [95%CI 1.06-1.33] were strongly associated with the number of overall eligible providers at the FOSA. Providers with both training in the last 2 years and supervision in the last 6 months [95%CI -1.43-(-)1.27] were strongly negatively associated. With increased numbers of eligible providers, there was a positive correlation with the number of eligible providers with any training within the last two years, and providers supervised within the last six months. Providers who had both any training and supervision decreased with an increase in overall number of eligible providers.

Table 4

Table 4 uses the number of eligible providers indicated by the respondent at their current FOSA as the independent variable. The dependent variables of interest were the number of assigned staff in the questionnaire listed categories in the respondent's FOSA. The R square was .74160304 and the F significance was 0. Fifteen out of the sixteen categories were significant with $p<.05$. The only insignificant relationship was with the technician dental category. The categories

of kinesitherapists [95%CI-0.55-(-)0.36], license in physical medicine[95%CI-1.79-(-)0.89], technician dental [95%CI -0.18-0.03], without qualification [95%CI -0.02-(-)0.01] and other [95%CI -0.02-(-)0.01] had a negative relationship with the overall number of eligible providers a that FOSA. All others were positive. The number of eligible providers had positive relationships with facilities that provided any family planning service (including methods modern, natural methods, female surgical sterilization or masculine), services for the prevention of mother-to-child transmission of HIV (PMTCT) either with the ANCs or with the delivery services, blood group analysis services, cesarean delivery, management of malnutrition. Strongest relationship was with cesarean delivery. The positive coefficients for each category indicate that for every 1 eligible provider, there is the coefficient% more of that category.

Table 5

Table 5 uses the number of eligible providers indicated by the respondent at their current FOSA as the independent variable. The dependent variables of interest was a combination of the variables of Table 3 with new variables of the respective totals of provider selected for interview, ANC selected for observation, FP selected for observation, ANC clients visits, and FP clients visits. The R square was .99674152 with an F significance of 0. As before, providers with training in the past 2 years [95%CI 0.02-0.05] or supervision in the last 6 months [95%CI 0.03-0.05] were positively associated, although weakly, with the number of overall eligible providers at the FOSA. Providers with both training in the last 2 years and supervision in the last 6 months [95%CI -0.06-(-)-0.02] were weakly negatively associated. Only the total number of providers selected for the interview [95%CI 0.95-0.97] and the total family planning providers selected for interview [95%CI -0.003-0.05] had a $p<.05$ and were strongly associated with the number of eligible

providers. The number of eligible providers was again positively related to the number of providers with any training last 2 years, providers supervised in last 6 months, total providers selected for interview, and total FP selected for observation.

Chapter 5: Discussion

Findings

Overall, our findings indicate the number of eligible providers in a DRC facility correlates strongly with the types of services provided, variety of service providers, recent education on medical care, and medical tools or practices available. Facilities with a greater number of eligible providers were more likely to have staff with recent medical training, supervision, and family planning staff. Similarly, with increased amount of eligible providers, there was an increase in a facility offering sterilization, antiretroviral therapy (ART), and possessing test tubes and an incubator. The aforementioned services and tools are essential in addressing maternal and reproductive health needs of women. Facilities in the DRC should retain vital instruments related to general safety as well as labor and delivery in order to provide quality care to their female patients.

Moreover, the increased number of eligible providers positively increased whether the facility offered cesarean delivery. Cesarean delivery is an essential aspect of reducing maternal mortality as it allows for women to make decisions regarding their childbirth experience. Increasing numbers of women opt for this delivery, when medically feasible; however, in emergency obstetric situations, this method avoid the many risks associated with vaginal delivery (Konlan, Baku, Japiong, Konlan, & Amoah, 2019). Increasing the number of eligible providers

may also increase the amount of providers qualified to perform a cesarean delivery, thereby expanding DRC women's birth options and strengthening overall SRH healthcare.

As previously introduced, family planning and associated ANC are essential for maternal health, particularly in CHE developing countries like the DRC. For example, due to the fact that "60% of preventable maternal deaths take place in settings of conflict, displacement,…", it is critical that adequate staffing geared toward maternal health is prioritized ("WHO says address protracted emergencies to achieve Sustainable Development Goals", 2016). Women's opportunities for appropriate SRH and maternal health resources "including family planning, emergency obstetric and neonatal care, and gender-based violence services" are further reduced during times of CHE which is unfortunately the times they are most needed (Sexual and Reproductive Health in Emergencies, 2018).

In contrast with the above expected results, some of our findings were unanticipated. For instance, we estimated seeing significant relationship between the number of eligible providers and the total number of ANC and FP clients visits, however this was not the case. Similarly, there was not a significant relationship between the number of eligible providers and facilities providing ANC services, diagnosis or management services for non-disease or communicable diseases, minor surgery services, or laboratory services for diagnosis, including any testing 1 rapid diagnosis. Although unforeseen to us, these findings are supported by those of the article "A Resource Planning Analysis of District Hospital Surgical Services in the Democratic Republic of the Congo"(Sion, et al., 2015). After completing analysis of "DRC district hospitals using the World Health Organization's Emergency and Essential Surgical Care Situation Analysis Tool", the authors determined "only 2 of the 12 hospitals provided all essential services" and that "on average, 21% of lifesaving surgical interventions were absent from the facilities, compared with

the model normative hospital"(Sion, et al., 2015). From the 32 interventions surveyed on the situational analysis tool, only 2 hospitals…were found to provide all the essential services. Finally, with regards to life saving medical procedures such as resuscitation, obstetric fistula, urethral stricture dilation, only 2/12 hospitals provided all 32 essential service "interventions surveyed on the situational analysis tool provide"(Sion, et al., 2015). We were unable to prove a statistical relationship between these variables with our model, however, that does not definitively mean one does not exist.

Lastly, our study found that the positive correlation between the number of pharmacists, nurses, birth attendants, wise women, laboratory technicians / medical biologist, radiology technicians, nutritionists, sanitation technicians, other healthcare professionals, and administrative (all professions) with the overall number of eligible providers underscores the importance that having sufficiently skilled and trained healthcare providers has on maternal health. Girum and Wasie's study on the correlate effects of maternal mortality in developing countries, including the DRC, found that "the number of physicians and nurses available for every 1000 population has negatively associated with magnitude of MMR"(Girum & Wasie, 2017). Unsurprisingly, the authors concluded that "this could be due to the fact that availability of health professional increase availability of maternal care service and improve the quality of existing service and further reduce maternal mortality and the utilization of antenatal care and skilled delivery service" (Girum & Wasie, 2017). A larger presence of qualified essential medical personnel during critical times of labor or delivery, ANC visits, FP consultations, of treatment of STIs has been proven to enhance the health outcomes of pregnant or recently pregnant women seeking care. Staffing facilities with properly educated and supervised medical providers will have a significant positive effect on women's health and contribute to development of a satisfactory healthcare framework in the DRC.

Limitations

Our research constrained by several limitations. Primarily, due to the nature of DHS data, our data represents surveys conducted over the course of the previous 3-4 years; therefore, our data included in the 2017-2018 dataset actually is indicative of participant responses of 2013-2017 year range. Although, much of the ongoing CHE and conflict presently occurring in the DRC was also occurring in the former year range, the data from this year range may not be "real-time" or the most representative of the present health and political climate in the DRC.

Additionally, our linear regression model was helpful in identifying and confirming potential relationships between independent and dependent variables; however, it does not explain the entire reasoning for their occurrence. Linear regression does an excellent job of illuminating the existence of a significant/insignificant and positive/ negative relationships between variables though may not be optimal in explaining the underlying causes such relationships.

With interview based survey data, there exists a chance for several types of bias. Response or social desirability bias by participants may cause them to deliberately underreport or misreport unfavorable indicators, such as most recent training or number of legally eligible providers, to avoid negative reporting of their facility or organization. As well, because the sampling methods and rationale for those participants selected to partake in the DHS survey, there is potential for under coverage bias, where a comprehensive and accurate representation of providers in the DRC is unachieved.

Finally, DHS did not record actual usage data, rather focusing on subjective availability of services, tools, staff, and protocols. Including information of how many women are actually able to utilize the services of eligible providers would enhance our understanding of the reproductive

healthcare system in the DRC. Similarly, the term "eligible provider" is not clearly defined by DHS for this survey and could lead to misrepresentation of positive relationships with increased numbers of eligible providers in this context.

Chapter 6: Conclusions and Recommendations

Conclusions and implications

Our research reveals the impact larger numbers of eligible staffing has on health outcomes related to maternal and reproductive health. Researchers who seek to further investigate relationships between facility staffing levels and variety, tools, waste protocols, and services provided can use our findings as a guide point as to where current successes and failures exists with the healthcare system in the DRC. Moreover, our results can be of service to existing humanitarian initiatives such as the Reproductive Health Access, Information, and Services in Emergencies Initiative (RAISE), to improve crisis related healthcare decision making and workforce development. Specifically, RAISE works to "catalyse [sic] change in the ways in which comprehensive reproductive health is addressed in field services, relief organisations [sic] and global decision- making" and "to ensure that good quality comprehensive reproductive health services are routinely provided to those in emergency situations (Austin, Guy, Lee-Jones, Mcginn, & Schlecht, 2008). This and other organizations can base their policy and economic initiatives in the DRC on our findings of the importance of the number of eligible providers on several aspects of maternal health.

We acknowledge that the DRC is one of many countries currently embroiled in CHE and therefore recommend applying and augmenting our research and findings to nations in similar

situations. Uganda, South Sudan, Pakistan, and Columbia collectively experience ongoing natural or man-made crisis and have ensuing poor SRH systems and high MMR. Each country fits the definition of having "a serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses that exceed the ability of the affected community or society to cope using its own resources…" as presented by authors of the systematic review "Evaluating the effectiveness of sexual and reproductive health services during humanitarian crises" (Singh, et al., 2018). Countries with similar development status and insufficient healthcare systems can base their allocation of resources or humanitarian aid to the edification of their medical workforce, prioritizing education, medical equipment, and modernization of services provided. These alterations should be purposely aimed at augmenting women's SRH as it has been continuously proven to be disregarded.

Recommendations for future research

We recommend further research in the areas of healthcare personnel training, employment, and supervision in areas of CHE such as the DRC based on our study's findings on the overall significance of increased eligible provider staffing. Although, many studies have explored a plethora of other health indicators contributing to MMR, such as socio-economic status of women or political implications of ongoing conflict, much still needs to learned regarding the significance of the quality of care that is currently available to women in these countries. While it has been said that "socio-economic development increases reproductive health" and "improvement in social development is likely to decrease the intensity of conflict", conflict laden countries like the DRC may not see sustained political, social, and economic stability for many years to come (Swatzyna & Pillai, 2013). Fortunately, as the DRC continues to evolve politically and socially, studies show

that health infrastructures will inevitably develop as well. As women assume more permanent roles outside of the home due to improved education opportunities and career prospects, they will no longer rely on marriage and having children as a means of financial security and social acceptability. This shift "improves women's control over her well-being including reproductive health" (Swatzyna & Pillai, 2013).

Nevertheless, young girls and women deserve quality care now, "as helpless victims of war and conflict, women bear the short term as well long term ill effects of conflict"(Swatzyna & Pillai, 2013) . We advise humanitarian agencies to allocate appropriate funding for research and data collection on the quality of care women receive in areas of CHE to better understand and support women's health outcomes and reduce the gap in health equity between those in the developed and the developing world.

Appendix

Appendix I

TABLE 1

Regression Statistics	
Multiple R	0.67188356
R Square	0.45142752
Adjusted R Square	0.4465729
Standard Error	2.95072524
Observations	1369

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	12	9715.63631	809.636359	92.9891891	3.665E-167
Residual	1356	11806.3929	8.70677943		
Total	1368	21522.0292			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	2.20423063	0.27823247	7.92226228	4.8253E-15	1.65841782	2.75004344
MODTMPFP	0.18926672	0.26954158	0.70218006	0.48268739	-0.339497	0.71803047
STERFP	2.14189654	0.19311407	11.0913543	2.0059E-27	1.76306179	2.5207313
PAFP	0.06747554	0.23281323	0.28982691	0.77199297	-0.3892377	0.52418873
FACPMTCT	-0.0606723	0.24329555	-0.2493771	0.80310684	-0.5379489	0.41660419
FACART	1.58926871	0.23063163	6.89094008	8.4634E-12	1.1368352	2.04170223
FACMICROSC	1.09682365	0.24640687	4.45127058	9.2363E-06	0.6134436	1.58020369
FACTUBES	2.32795866	0.20093346	11.5857195	1.1529E-29	1.93378449	2.72213283
FACINCUB	1.97204236	0.2953584	6.67677754	3.5523E-11	1.39263335	2.55145136
SHARPWASTE	0.45857916	0.27347081	1.67688526	0.09379541	-0.0778926	0.99505094
MEDWASTE	-0.0879266	0.27185945	-0.3234266	0.74642206	-0.6212373	0.44538417
SHARPSTORE	-0.2142049	0.16396228	-1.3064281	0.19162856	-0.5358522	0.10744234
MEDSTORE	0.76579998	0.37637134	2.03469262	0.04207602	0.02746669	1.50413328

Data source: Demographic and Health Survey, Evaluation of Services of Health Care Services in the Democratic Republic of Congo 2017-2018 (EPSS DRC 2017-2018)

TABLE 2

Regression Statistics	
Multiple R	0.69339271
R Square	0.48079346
Adjusted R Square	0.47658471

Standard Error	2.86960264
Observations	1369

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	11	10347.6508	940.695527	114.236675	2.892E-184
Residual	1357	11174.3784	8.23461932		
Total	1368	21522.0292			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	3.31180212	1.81613804	1.82354097	0.06844138	-0.2509407	6.87454499
102_4	0.79627665	0.19914797	3.99841705	6.7202E-05	0.40560535	1.18694796
102_5	-0.0488707	0.33750768	-0.1447989	0.88489118	-0.7109642	0.6132227
102_6	0.71931441	0.1936731	3.71406455	0.00021223	0.33938323	1.09924558
102_7	-1.1793918	0.66207911	-1.7813457	0.0750796	-2.4782014	0.11941788
102_14	-0.1292317	0.27064166	-0.4775011	0.63308222	-0.6601532	0.40168976
102_15	-0.2254539	1.66702556	-0.1352432	0.89243963	-3.4956808	3.04477297
102_16	3.59854925	0.28507086	12.62335	1.2744E-34	3.03932184	4.15777666
102_17	0.15189243	0.33569813	0.45246731	0.65100469	-0.5066512	0.81043605
102_18	1.3506878	0.39811896	3.39267389	0.00071207	0.56969238	2.13168321
102_19	0.34518166	0.43955773	0.78529312	0.43241881	-0.5171048	1.20746808
102_20	0.7564821	0.16326439	4.63347888	3.9412E-06	0.43620411	1.07676009

Data source: Demographic and Health Survey, Evaluation of Services of Health Care Services in the Democratic Republic of Congo 2017-2018 (EPSS DRC 2017-2018)

TABLE 3

Regression Statistics	
Multiple R	0.94617502
R Square	0.89524717
Adjusted R Square	0.89501878
Standard Error	1.28639877
Observations	1380

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	19460.1797	6486.72657	3919.89436	0
Residual	1376	2277.03477	1.65482178		
Total	1379	21737.2145			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0.69447256	0.06577405	10.5584576	4.114E-25	0.56544429	0.82350084
ELIGTRAIN	1.23242481	0.02817187	43.746646	1.022E-262	1.17716035	1.28768927
ELIGSUPERV	1.09226212	0.02116453	51.6081512	0	1.05074389	1.13378036
ELIGBOTH	-1.3519633	0.04202026	-32.174083	8.171E-170	-1.434394	-1.2695326

Data source: Demographic and Health Survey, Evaluation of Services of Health Care Services in the Democratic Republic of Congo 2017-2018 (EPSS DRC 2017-2018)

TABLE 4

Regression Statistics	
Multiple R	0.86290273
R Square	0.74460112
Adjusted R Square	0.74160304
Standard Error	1.03597095
Observations	1380

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	16	4264.77089	266.548181	248.35938	0
Residual	1363	1462.82041	1.07323581		
Total	1379	5727.5913			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0.15796941	0.03507486	4.50377836	7.2459E-06	0.08916284	0.22677598
Q400A_05	0.10467049	0.03930442	2.66307164	0.00783428	0.02756677	0.18177422
Q400A_06	0.01843967	0.0025181	7.32286406	4.1368E-13	0.01349991	0.02337944
Q400A_07	0.0691706	0.01611465	4.2924058	1.8924E-05	0.0375584	0.1007828
Q400A_08	-0.4562107	0.05068723	-9.0005047	7.3613E-19	-0.5556441	-0.3567772
Q400A_09	0.09110678	0.01588488	5.73543987	1.1964E-08	0.05994531	0.12226824
Q400A_10	0.19688432	0.01736726	11.3365185	1.5668E-28	0.16281485	0.23095379
Q400A_11	0.17439243	0.06471191	2.69490455	0.00712741	0.04744668	0.30133818
Q400A_12	0.25266461	0.06720947	3.75936005	0.00017755	0.12081939	0.38450984
Q400A_13	-1.3410016	0.22748417	-5.8949227	4.7191E-09	-1.7872586	-0.8947445
Q400A_14	-0.156708	0.04981537	-3.1457769	0.00169228	-0.2544312	-0.0589849
Q400A_15	0.07153512	0.01875072	3.81505916	0.00014224	0.03475171	0.10831853
Q400A_16	-0.0711537	0.05331571	-1.3345724	0.18223923	-0.1757434	0.03343607
Q400A_17	0.03438936	0.00589544	5.83321034	6.7823E-09	0.02282424	0.04595449
Q400A_18	0.02026452	0.00242833	8.34505766	1.7248E-16	0.01550086	0.02502819
Q400A_19	-0.0134728	0.00337876	-3.9874968	7.0317E-05	-0.020101	-0.0068447
Q400A_20	-0.0184983	0.00271201	-6.82087	1.3565E-11	-0.0238184	-0.0131781

Data source: Demographic and Health Survey, Evaluation of Services of Health Care Services in the Democratic Republic of Congo 2017-2018 (EPSS DRC 2017-2018)

TABLE 5

Regression Statistics	
Multiple R	0.99836943
R Square	0.99674152
Adjusted R Square	0.9967225
Standard Error	0.22729552
Observations	1380

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	8	21666.3842	2708.29802	52422.1324	0
Residual	1371	70.8303233	0.05166326		
Total	1379	21737.2145			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0.03703911	0.01263519	2.93142439	0.00343006	0.01225271	0.06182552
ELIGTRAIN	0.03307032	0.0076544	4.32043031	1.6695E-05	0.01805471	0.04808593
ELIGSUPERV	0.03932854	0.00633001	6.21303495	6.8796E-10	0.026911	0.05174609
ELIGBOTH	-0.0396979	0.00977639	-4.0605906	5.1718E-05	-0.0588762	-0.0205196
PROVDERS	0.9577828	0.00467077	205.058978	0	0.94862017	0.96694542
ANCF	0.00361878	0.00256815	1.4090981	0.15903293	-0.0014192	0.00865671
FPF	-0.0469375	0.01851692	-2.5348414	0.01136026	-0.083262	-0.0106129
ANCT	-0.0009113	0.00095737	-0.9518393	0.34134627	-0.0027893	0.00096681
FPT	0.02265906	0.01331871	1.70129562	0.08911424	-0.0034682	0.04878631

Data source: Demographic and Health Survey, Evaluation of Services of Health Care Services in the Democratic Republic of Congo 2017-2018 (EPSS DRC 2017-2018)

Appendix II

Table 1 Variables

Variable	**Description**
MODTMPFP	Facility offers any modern temporary FP
STERFP	Facility offers sterilization
PAFP	Facility offers PA temporary FP
FACPMTCT	Facility offers PMTCT
FACART	Facility offers ART
FACMICROSC	Facility has functional microscope
FACTUBES	Facility has test tubes
FACINCUB	Facility has functional incubator
SHARPWASTE	Facility has good sharps waste disposal
MEDWASTE	Facility has good medical waste disposal
SHARPSTORE	Facility has good sharps waste storage
MEDSTORE	Facility has good medical waste storage

Table 2 Variables

Variable	**Description**
102_4	Any family planning service, including methods modern, natural methods, female surgical sterilization or masculine.
102_5	Prenatal Consultation Services (ANC)

102_6	Services for the prevention of mother-to-child transmission of HIV (PMTCT) either with the ANCs or with the delivery services.
102_7	Services for normal delivery and / or newborn care
102_14	Diagnosis or management services for non-disease or communicable diseases
102_15	Minor surgery services
102_16	Cesarean delivery
102_17	Laboratory services for diagnosis, including any testing 1 rapid diagnosis.
102_18	Blood group analysis services
102_19	Blood transfusion services
102_20	Management of malnutrition

Table 3 Variables

Variable	**Description**
ELIGPROV	Number of eligible providers
ELGTRAIN	Providers with any training last 2 years
ELGSUPERV	Providers supervised in last 6 months
ELBOTH	Providers with supervision and any training within last 2 years

Table 4 Variables

Variable	**Description**
Q400A_5	Pharmacists
Q400A_6	Nurses
Q400A_7	Birth attendants
Q400A_8	Kinesitherapists
Q400A_9	Wise women
Q400A_10	Laboratory technicians / medical biologist
Q400A_11	Radiology technicians
Q400A_12	Nutritionists
Q400A_13	License in physical medicine
Q400A_14	Pharmacy assistants
Q400A_15	Sanitation technicians
Q400A_16	Technician dental

Q400A_17	Other healthcare professionals
Q400A_18	Administrative (All professions)
Q400A_19	Without qualification
Q400A_20	Other

Table 5 Variables

Variable	Description
ELGTRAIN	Providers with any training last 2 years
ELGSUPERV	Providers supervised in last 6 months
ELBOTH	Providers with supervision an any training within last 2 years
PROVDERS	Total provider selected for interview
ANCF	Total ANC selected for observation
FPF	Total FP selected for observation
ANCT	Total ANC clients visits
FPT	Total FP clients visits

Appendix III

Term	Definition
Antenatal Care	Antenatal care (ANC) can be defined as the care provided by skilled health-care professionals to pregnant women and adolescent girls in order to ensure the best health conditions for both mother and baby during pregnancy (Chaurasiya, Pravana, Khanal, & Giri, 2019).
CHE	The United Nations (UN) defines a complex humanitarian emergency (CHE) as “a humanitarian crisis in a country, region, or society where there is total or considerable breakdown of authority resulting from internal or external conflict and which requires an international response that goes beyond the mandate or capacity of any single and/or ongoing UN country program”(Brown, et al., 2008).
Family Planning	Family planning allows individuals and couples to anticipate and attain their desired number of children and the spacing and timing of their births. It is achieved through use of contraceptive methods and the treatment of involuntary infertility. A woman’s ability to space and limit her pregnancies has a direct impact on her health and well-being as well as on the outcome of each pregnancy ("The Journal of Reproductive health and Contraception").

Health Indicator	Synonym for "indicator of the population's health," rather than "indicator of individual health." It therefore uses information on groups or places generated by aggregate measurements of health. These are commonly based on an event of interest, a reference population, and inclusion/exclusion criteria (Leite, 2018).
Maternal Mortality	Maternal death (mortality) is the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes (Patwardhan, et al., 2016).
Reproductive Age	women age 15–49 years

Appendix IV

Abbreviation	**Phrase**
ANC	Antenatal care
ART	Antiretroviral therapy
CHE	Complex Humanitarian Emergency
DHS	Demographic and Health Survey
DRC	Democratic Republic of the Congo
EPSS	Évaluation des Prestations des Services de soins de Santé
FC	Facility
FOSA	Formation Sanitaire (French) or health facility
FP	Family planning
IR	Individual record
MDG	Millennium Development Goal
MMR	Maternal Mortality Ratio
(MONUSCO)	United Nations Organization Stabilization Mission in the Democratic Republic of the Congo
NGO	Non-governmental organization
PMTCT	Prevention of mother-to-child transmission
PV	Provider
RAISE	Reproductive Health Access, Information, and Services in Emergencies Initiative
SRH	Sexual and reproductive health

UN	United Nations
UNICEF	United Nations Children's Fund
USAID	U.S. Aid for International Development
WHO	World Health Organization

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