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Tools and Methods for Zika Prevention in Cachoeira, Bahia

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Tools and Methods for Zika Prevention in Cachoeira, Bahia

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Abstract

Zika virus, which is mainly transmitted by *Aedes aegypti* and *Aedes albopictus* mosquitoes, has become a major health threat in Brazil and other Latin American countries. Brazil is the country that is being most impacted with zika virus in addition to the existing mosquito-borne diseases of dengue and chikungunya. With the increase in zika virus infections, there have also been increasing numbers of infant brain abnormalities such as microcephaly associated to zika. International and local health institutions are working together to control and prevent zika transmission. This project aimed to investigate the various tools and methods employed by the Center for Endemic Diseases health institution and USF Justiniano de Jesus clinic in Alecrim - North Eastern part of Brazil, to control and prevent zika in the community. Data was collected through observation, informal interviews and questionnaires. The results show that education and house visits by community health workers are the main tools used by these health centers and education was ranked to be the most effective tool. Most healthcare workers perceive zika to be very dangerous and more efforts need to be made by the government to fight against the infection. Rural health centers are also not as equipped as urban centers in the fight against zika and as the virus evolves genetically and habitually, rural areas are at a high stake of future outbreaks.

Keywords: zika, prevention methods, perceptions, health care workers, Brazil

Resumo

Vírus Zika, que é transmitida principalmente pelo *Aedes aegypti* e *Aedes albopictus*, tornou-se uma grande ameaça à saúde no Brasil e em outros países latino-americanos. Brasil é o país que está a ser mais afetados com o vírus zika além das doenças transmitidas por mosquitos existentes da dengue e chikungunya. Com o aumento de infecções Vírus Zika, também tem havido número de anormalidades cerebrais infantis tais como microcefalia associada a Zika crescente. As instituições internacionais e locais de saúde estão trabalhando juntos para controlar e prevenir a transmissão zika. Este projecto teve como objetivo investigar as várias ferramentas e métodos empregados pelo Centro de instituição de saúde as doenças endémicas e USF Justiniano de Jesus clínica em Alecrim - zona nordeste do Brasil, para controlar e prevenir zika na comunidade. Os dados foram coletados através de observação, entrevistas informais e questionários. Os resultados mostram que educação e de visitas domiciliares por agentes comunitários de saúde são as principais ferramentas utilizadas por esses centros de saúde e educação foi classificada para ser a ferramenta mais eficaz. A maioria dos profissionais de saúde percebem zika ser muito perigoso e mais esforços devem ser feitos pelo governo para lutar contra a infecção. centros de saúde rurais também não são tão equipado como centros urbanos na luta contra zika e como o vírus evolui geneticamente e habitualmente, as zonas rurais estão em uma alta participação de futuros surtos.

Table of Contents

Tools and Methods for Zika Prevention in Cachoeira, Bahia	i
Abstract	ii
Resumo	iii
Acknowledgements	v
List of Figures	vi
Introduction	1
Main Objective	3
Primary Objectives	3
Literature Review	5
Zika origin and transmission	5
Association of Zika virus infection with infant brain abnormalities	5
Challenges facing Brazil’s public health sector in controlling zika	5
Measures to control Zika in Brazil	6
Methodology	9
Location of the study	9
Participants and Selection Process	10
Limitations of the study	10
Data Collection and Analysis	11
Results and Discussion	12
Knowledge of Zika	12
Zika training among health care workers	13
Zika Perceptions among the health care workers	15
Zika and Microcephaly	15
Zika Prevention Methods and Tools	16
Methods and Tools Applied	16
Perception of health care workers on the effectiveness of the tools and methods used by their health centers	18
Challenges faced by the health centers in prevention of zika	19
Perception of health care workers on efforts made by the Brazilian government to control and prevent zika	20
Other tools and methods used to control and prevent zika	21
Conclusion	23
References	25
Appendices	27
Appendix A: CSP Monograph Appendix Questions	27
Appendix B: Informed Consent Form	30
Appendix C: Questionnaire Sample	32

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List of Figures

Figure 1. A chart showing the number of zika reported cases in Cachoeira from April 2015 to March 2016

Figure 2. A drawing of a child with microcephaly associated with zika virus

Figure 3. A pie chart showing the tools and methods used by health centers to prevent and control zika in Cachoeira

Figure 4. Pictures showing a student and a community health agent applying Pyriproxyfen powder in areas with standing water

Figure 5. A bar graph showing the perception of health care workers on the efforts by the Brazilian government to prevent zika

Figure 6. A bar chart showing the other tools used to control and prevent zika infections

Introduction

The aim of this community study project is to investigate the tools and methods employed by the Alecrim health care center and Center for Endemic Diseases in Cachoeira, to prevent and control zika. This project also aims to investigate the perception of health care workers on the interventions used by their health centers and the government of Brazil against zika.

Zika virus (ZIKV) is an emerging mosquito-borne flavivirus that was initially isolated from a rhesus monkey in the Zika forest in Uganda in 1947 (Bell 2016; 589). The main mode of transmission for the zika virus is the *Aedes aegypti* and *Aedes albopictus* mosquitoes. In 2015, there was a significant outbreak of zika in most parts of Latin America and Brazil is the most affected country. In December 2015, Brazil reported preliminary estimates of 440,000 to 1.3 million cases of zika infections (Mlakar, 2016: 1). Although zika can affect anyone, the most affected group is pregnant women and women planning to get pregnant because there are scientific assumptions that zika could be the causative of microcephaly and brain anomalies in newborns. According to the 2016 World Health Organization (WHO) report on the zika virus situation in Brazil, between October 2015 and February 2016, there have been 5640 reported cases of microcephaly including 120 deaths. 583 out of 5640 cases of microcephaly are related to zika virus (ZIKA 2016; 9). In addition, recent reports from the Ministry of Health of Brazil suggest that cases of microcephaly have increased by a factor of approximately 20 among newborns in the northeast region of the country where there are more cases of Zika virus infections, hence indicating a possible association between

ZIKV infection in pregnancy and fetal brain malformations (Mlakar, 2016: 2).

Microcephaly is a birth defect whereby a baby is born with a small head or the head stops growing after birth. Microcephaly can develop developmental disabilities due to poor brain growth of the baby (Facts 2016). Severe microcephaly can be life threatening; however, milder forms of microcephaly can lead to a child developing seizures, vision problems and intellectual disability. The major concern about microcephaly is that there is no vaccine or treatment, and the problems associated with it are often life long (Zika 2016). In spite of the fact that babies can have microcephaly due to changes in their genes and/or a woman being close to or touching toxins during pregnancy, the current increasing rates of microcephaly in Brazil are linked to the ZIKV infection. Additionally, the other problems detected among fetuses and infants infected with Zika virus before birth are absent or poorly developed brain structures, defects of the eye, hearing deficits and impaired growth (Questions 2016).

The outbreaks of mosquito-borne infectious diseases in Brazil such as dengue, chikungunya and zika have demanded critical and holistic interventions to prevent and control the spread of the diseases. The Ministry of Health of Brazil is making efforts to enforce education and understanding of these diseases among the populations through television campaigns, flyers, advertisements and community focused programs. Some churches in Brazil have also responded to the zika outbreak through lent campaign. The Episcopal Anglican Church of Brazil has joined forces with other churches in the country to raise awareness of the zika virus and promote preventative measures through the lent campaign of “Care for our Common Home” for a healthy environment. The National Council of

Christian Churches in Brazil (CONIC's) also aims to enforce availability of clean water and sanitation services to all populations in Brazil, and to fight the injustices in provision of these services. Furthermore, the campaign is used in churches to educate people on ways they can protect themselves from zika through taking care of their environment (ACNS 2016). All the health centers in Brazil are also given responsibility to educate and help the community to prevent and deal with the zika outbreak as well as other related diseases such as dengue and chikungunya.

Main Objective

The main objective of this community study project is to investigate the various tools and methods used to prevent and control zika virus infections in the community by the Center for Endemic Diseases (Centro de Endemias) also known as Policlínica in Cachoeira town and a rural health center in Alecrim named USF Justiniano de Jesus. Both health centers are funded and operated by SUS (Sistema Único de Saúde)¹.

Primary Objectives

- To explore the various ways that the urban and rural health care centers in Cachoeira work with the community to provide education of preventative measures of zika, dengue and chikungunya.

¹ Sistema Único de Saúde (Unified Health System) is Brazil's publicly funded health care system created in 1990, but still undergoing revisions and reorganizations. SUS provides free health care services for any person including foreigners.

- To examine the perception of the health workers on the effectiveness of the methods and tools used by their health centers and the government to control and prevent zika, dengue and chikungunya.
- To investigate whether there is an increase in the number of women seeking contraceptives after the outbreak of zika due to the scientific assumptions that it may be related to microcephaly and brain anomalies in newborns.

Literature Review

Zika origin and transmission

Zika virus, which is a mosquito-borne flavivirus, was initially isolated from a rhesus monkey in the Zika forest in Uganda in 1947 and started circulating in other parts of Africa and Southeast Asia for decades but it had no serious adverse outcomes or reports of outbreaks. Zika virus outbreak in Brazil began early 2015 and the vast majority of outbreaks are happening in the areas affected with dengue and chikungunya (Bell 2016; 590). The transmission of zika has crossed borders and is now reported in other territories in Latin Americas, Cape Verde and the Pacific Islands (Bell 2016; 589).

Association of Zika virus infection with infant brain abnormalities

Although zika affects people of all ages and gender, attention is focused in preventing zika virus infections in pregnant women because growing evidence shows an association between maternal zika virus infection and infant brain abnormalities such as microcephaly (Bell 2016; 588).

Challenges facing Brazil's public health sector in controlling zika

I. Institutional Challenges

Until April of 2016, there is still a lack of a complete understanding of zika and its effects. This is due to lack of large epidemiological studies and research. In addition, the definition of zika is not standardized and consistently applied among various institutions hence leading to complexities in controlling its spread and setting priorities. Diagnostic testing of zika is also very complex and thus laboratory-testing capacity is limited primarily to public

health and research institutions. There are currently no commercially available diagnostic tests for the infection (Bell 2016; 587).

II. Environmental Challenges

Similar to dengue and chikungunya, zika virus is also transmitted by Aedes mosquitoes, with Aedes aegypti known as the most efficient vector (Bell 2016; 588). The problem is that the A-aegypti mosquito easily adapts to human environments and has the ability to breed in very small amounts of standing water. It thrives in largely densely populated cities with poor environmental conditions, hence making it very difficult to control (Rodrigues 2016; 582)

Measures to control Zika in Brazil

Zika, dengue and chikungunya require aggressive scale-up vector control efforts aimed at reducing A-aegypti populations. Reports indicate that the Ministry of Health in Brazil is intensifying control measures against the mosquito Aedes aegypti and implemented intensive surveillance actions (Heukelbach 2016; 118). Although this seems promising, persistent past failed efforts of the Brazilian government to control dengue has raised red flags on whether or not the control of zika will be successful (Horton 2016; 633). In addition, the current political instability of Brazil causes disruption in the established health priorities and a lack of strong and stable leadership may lead to more disastrous health outcomes.

It is critical to continue supporting ongoing research to optimize existing and develop new vector control methods, as well as develop vaccines and therapeutics to prevent future outbreaks. Innovative market oriented

strategies of vector control will also help to spur further development and lower the cost (Bell 2016; 589). However, some scholars argue that vector control strategies must be directed at all potential vectors because there are areas in which *A-aegypti* and other mosquito species coexist thus it is naive to assume that the main vector is *A-aegypti* (Ayres 2016; 277). If the other mosquito species plays a role in zika virus transmission, then controlling the population of *A-aegypti* would only have solved part of the problem.

Efforts to prevent zika need to go beyond vector control and include education and widespread awareness of protection methods such as insect repellants, bed nets and window screens, as well associated risks of infection especially for pregnant women in affected areas (Bell 2016; 590). Pregnant women are also being advised to apply a U.S. Environmental Protection Agency (EPA)-approved insect repellent (Petersen 2016; 12). Some women are advised to avoid pregnancy at all, which is not a choice that every woman has due to existing gender roles and dynamics. Due to this, there have been surging demands on reopening the debate for a legal right for women to choose the course of their pregnancy in Latin America (Rodrigues 2016; 582). Maria Teixeira also argues that in light of the severity of the malformations being identified in association with zika, the affected families will likely face extreme negative consequences raising and taking care of these children, and thus it would be sensible to reopen the legalization of abortions debate to offer women choice over the decision of continuing or interrupting such pregnancies with adequate medical care and legal protection (Teixeira 2016; 18).

It is also extremely important to improve global capacity to detect emerging threats and ensure preparedness and rapid response in affected areas, which is one of the goals of the Global Health Security Agenda. The control of zika will require international commitments and co-operation (Bell 2016; 590).

Brazil's National Technical Commission for Biosafety (CTNBio) approved commercial release of 'Friendly Aedes aegypti' or OX513A, which precisely target the disease-transmitting vector Aedes aegypti and provide a safe approach to prevent infections with no adverse impact to the environment. The 'Friendly Aedes aegypti' are produced by Oxitec, which is a UK based subsidiary of Intrexon Corporation (NYSE: XON), a leader in synthetic biology. Oxitec's self-limiting mosquitoes compete to breed with the female wild A. aegypti but the offspring's do not survive and thus the numbers of the wild A.aegypti decrease over time. Oxitec's solution is to be supplied to all the regions that are heavily impacted by zika in Brazil (ZIKA 2016; 7).

Methodology

Location of the study

This study was conducted in Cachoeira, an inland town of Bahia- Brazil, on the Paraguaçu River. The town of Cachoeira is a growing commercial and industrial center. The majority of the population in Cachoeira is young people between the ages of 18 to 45 and there are more women than men. 51% of the area is considered the urban area and 49% is the rural area. The urban area is more densely populated than the rural area. In 2010, the life expectancy of Cachoeira was approximately 70.7 years (Souza, Andréa; lecture March 2016). Cachoeira provides all primary and basic health services for everyone through the Family Unit Program. Families with a poor/low income receive support from the program of Bolsa Família² as long as they fulfill the required conditions. One of the health conditions required under Bolsa Família includes getting vaccination.

Cachoeira is one among the many places in Brazil affected by zika infections with a few cases of microcephaly. I specifically chose to do this project in Cachoeira because it is less populated compared to big cities like Salvador, and thus there are more opportunities to interact with the health care workers since the hospitals are not always busy or full of people. The SIT, Salvador program's relationship with the Alecrim health center also helped me to establish initial contact with the clinic and thus I had great support from the health care

² Bolsa Família is a social welfare program of the Brazilian government, which provides financial aid to poor Brazilian families.

workers. Through the same network of people, I was introduced to the Centre of Endemic Diseases in Cachoeira, which became my second point of contact.

Participants and Selection Process

The main participants of this project were health care workers because they are the one's responsible for organizing and/or conducting and implementing any events/training/programs of infectious disease prevention in the community. One of the secondary goals of this project is to evaluate the workers knowledge and perception of zika and the current zika related programs.

The Alecrim health center and the Center for Endemic Diseases in Cachoeira serve a large number of people and thus the health workers have accumulated experience with community related programs. In addition, most of these workers have been working with the community to control and prevent dengue and chikungunya, which are also spread by *Aedes aegypti*.

All the participants were selected randomly through the connections of the people I knew and had established contact with. Some of the questionnaires stayed with the clinic's receptionist and any health worker who wanted to participate in the project could take a questionnaire and return it to the receptionist. I collected the filled in questionnaires from the receptionist and individuals, depending on what they preferred.

Limitations of the study

Language: Language barrier was one of the main limitations of this study. My level of Portuguese is still at beginners level and thus it was hard to fully understand people when in the field, and it was also difficult to fully participate in

related conversations. Due to this, I think there is some important and useful information that I missed during these interactions. This challenge can be overcome by having the ability to speak and understand Portuguese at an intermediate or advanced level. Another way is by having a translator who is fluent in both Portuguese and English.

Time: Four weeks is a short time to fully engage in a new community and community study project. It takes time to get accustomed to a place's new culture and way of living as well as establish contacts. Thus, although I was able to reach the goals of the project, I was able to do so in a small scale.

Data Collection and Analysis

All the data in this project was collected through questionnaires and informal interviews in order to minimize the problem of language barrier. The questionnaires were all written in Portuguese and they all had a brief introduction of the project and its goals at the beginning. This introduction summary was to assist the participants to understand the project they were participating in and be able to make an informed decision of whether they wanted to participate or not. A total of 30 questionnaires was distributed, 10 in Alecrim and 20 in Cachoeira. All the questionnaires were returned except 1 in Alecrim, and thus a total of 29 questionnaires were returned.

According to the data records of zika at the office of Secretary of Health in Cachoeira, zika cases peaked around the months of June to July 2015, but have been decreasing significantly ever since.

There was a high peak of zika reported cases during the months of May to July 2015, and then a significant drop from July to August 2015. After the month

of August 2015, the drop was steady. However, the cases reported have started to increase in the month of March 2016. The significant decrease in the number of zika cases from the months of July to August 2015 could be due to a lot of factors such as weather changes, which affects the natural habitats of the mosquitoes; intense and aggressive preventative measures that began to be implemented and/or changes in people's behavior in trash management and proper maintenance of the environment. If the main factor for the decrease was weather patterns, then the number of zika cases reported is expected to rise significantly beginning April 2016 to July, despite the preventative measures in place. If the number of zika cases continues to drop or rises slightly, then the sharp decrease would suggest successful implementation of the preventative measures against zika infections.

Results and Discussion

The total number of health care workers who responded to the questionnaires was 29, 24 females and 5 males. 78% of the respondents were between the ages of 30 to 49 years. Only 9% were between the age of 18 to 39 years and 13% were above 49 years old. Among the 29 participants, 18 had worked in their current position for more than 5 years, while 11 had experience of less than 5 years.

Knowledge of Zika

The health care workers are one of the primary sources of information for the community about zika and other related infections/diseases. The community relies on the knowledge and information that the health care workers have about

the diseases. In order to evaluate the knowledge of the health care workers in the two clinics, the following question was used in the questionnaire.

- On a scale of 1 – 10, how would you rate your knowledge of Zika disease, its history and cause, effects and prevention methods?

(10 = fully knowledgeable, 1 – little/no knowledge)

The responses from the health care workers was as follows:

1	2	3	4	5	6	7	8	9	10
				21		2	4	1	1

According to the results of the question, less than 50% of the health care workers had knowledge of zika above the scale of 5. This means that more than half of the health care workers do not fully understand zika; it's history, cause, effects and prevention methods. The zika outbreak in Brazil began in 2014, and thus one of the reasons for the lack of sufficient knowledge may be because there are currently no established training programs for health professionals in all areas of the country.

Zika training among health care workers

51% of the health care workers received some form of training or informational session on zika organized by the Municipal Secretary of Health and conducted by medical doctors and nurses. All the 29 respondents said that they would like to receive training and/or educational sessions about zika, dengue and chikungunya. This shows that there is demand for training from the health care workers.

Among those that had received training, 78% rated the usefulness of the training they received a 5 on a scale of 1 to 10, 1 being not useful at all and 10 being very useful. This means that although most of the health care workers received some form of training or educational session about zika, it was not very informative and effective in preparing them to take the front line in its prevention in the communities. This section also explains the reasons for low knowledge rates among health care workers as evaluated on the question about zika knowledge.

I think that the education and training of health care workers should be made a priority along the lines of prevention. This is because in order to ensure successful prevention programs, the health care workers need to be fully knowledgeable on the subject so that they can be great informants to the community. About 83% of the respondents said that a lot of people ask them about zika in the community, as can be seen in the responses of the question below:

- Do people ask you about zika? If yes, in approximation, how many people per week?

0 – 4 people	5 – 9 people	10 – 14 people	15 < people
		11	13

It is the health care workers that are in the front lines of zika prevention in the communities and thus investing in their education and training will result in better-prepared task forces for prevention and control of these infectious diseases.

Zika Perceptions among the health care workers

Since the outbreak of zika in Brazil, there have been a lot of perceptions and assumptions about the disease. Zika is a new outbreak in Latin America and thus there is still a lot of research being done on the subject. Most of the things said about zika are not yet facts but assumptions that are yet to be proven. Although there is a lot of research to be done concerning zika, preventative measure have already been established and implemented. Interestingly, one of the factors that affect prevention efforts is the perception of danger or negative effects caused otherwise. Thus, in order to evaluate how serious the preventative measures are being taken; one has to evaluate the perception of zika's effects. Health care workers were asked the following question, "On a scale of 1 – 10, how dangerous do you perceive zika to be?" (*10 = very dangerous, 1 = not dangerous at all*). 95% of the health care workers believed zika is a dangerous disease. I think these results may suggest that preventative measures are being taken as recommended because of their perception of zika as a very dangerous disease. It is also important to evaluate the perceptions of zika by the community members and see whether there are differences or similarities compared to the perceptions of health workers.

Zika and Microcephaly

After the outbreak of zika in Brazil, there has also been an increase in microcephaly cases in newborn babies. In most of these cases, the mothers test positive for zika and zika virus is also detected in the amniotic fluid of the baby. Microcephaly is the condition whereby a baby is born with a smaller head

circumference because the brain is not fully matured, and in other cases, the head stops growing after birth.

Microcephaly can develop developmental disabilities due to poor brain growth of the baby and thus children born with microcephaly will need special attention and care throughout their lives (Facts 2016). Nonetheless, abortion is illegal in Brazil. Thus, there have been reports that after the outbreak of zika, there has been an increase in demand for contraception by women. 90% of the health care workers agreed that there has been an increase in the number of women seeking contraception's due to the perceived association of zika to microcephaly. 3% said that they do not know and 7% said there hasn't been any major difference.

Zika Prevention Methods and Tools

Methods and Tools Applied

The main objective of this project was to evaluate the tools and methods used by health centers in Cachoeira to prevent and control zika. The respondents were asked to list these tools and rank them in the order of the most useful to the least useful based on their own perceptions.

Education was ranked as the most effective tool in the prevention and control of zika, dengue and chikungunya. I also think that education is one of the most effective tool in prevention of infectious diseases because when people are knowledgeable about the diseases, their causes, and effects and how to protect themselves from infections, they become capable to make informed decisions on their actions and behavior. For example, children can learn from a young age about proper trash management and thus they will develop this habit as they grow up. According to an article of *Preventing Zika Virus Infections in Pregnant*

Women by Dr. Bell, efforts to control zika need to go beyond vector control and include education of protection methods such as insect repellants, bed nets, window screens and proper maintenance of the environment (Bell 2016: 531). The work done by community health agents to visit houses and apply the Pyriproxyfen powder, a powder that prevents mosquito breeding in standing water areas, ranked second among the other methods. This shows that the community recognizes the work done by the community health workers and they have seen the positive effects of this work.

Figure 4. Participating in applying Pyriproxyfen powder in areas with standing water



During one of the house visits in Cachoeira town, a woman said that whenever she sees the community health workers, she is reminded about zika, dengue and chikungunya and this makes her become more conscious about taking care of her surroundings to prevent the mosquito breeding areas. The woman said the community health workers served as reminders about the fight against these infectious diseases, and also showed them that the government cared about their health, and this meant that they also had a responsibility to ensure they play their part in the fight. Such comments may indicate that the community is satisfied with the care and efforts made by the health centers and

the government in the fight against zika, dengue and chikungunya. However, further research and survey is required to evaluate and analyze the community perceptions on the employed tools and methods for zika prevention.

Perception of health care workers on the effectiveness of the tools and methods used by their health centers

On the other hand, the health care workers had differing opinions about the effectiveness of the tools and methods used by their health centers and the government in the fight against zika, dengue and chikungunya. The results showed that about 93% of the health workers in Alecrim are not satisfied with the tools and methods employed by their health center in the fight against the infectious diseases. On the other hand, about 89% of the health workers at the Center for Endemic Diseases rated the effectiveness of the tools and methods employed by their health center a 5 and above. The Alecrim health center is located in a rural part of Cachoeira, while the Center of Endemic Diseases is in the urban part. There are more cases of zika, dengue and chikungunya in the urban areas than in the rural areas so a lot of efforts have been concentrated in the urban areas. For example, health centers in rural areas like Alecrim do not receive Pyriproxyfen powder to prevent mosquito breeding and thus the community health workers only rely on flyers and other educational materials to spread awareness in the community and in schools.

The concentrated efforts to prevent and control zika and other related infectious diseases in the urban areas may have proven to be fruitful as the number of zika cases has decreased significantly since the month of August 2015 to date. However, there is no absolute proof that the decrease has been

due to the preventative methods in place. Other factors such as climate and weather conditions may play a major role in the habitats and breeding patterns of the mosquitoes, which transmit the diseases. Thus, I think that rural areas such as Alecrim also need to be given more attention and the necessary tools for prevention like the urban areas. This is because, there is also a high chance that as more preventative measures are being kept in place in the urban areas, the mosquito may start moving farther into the rural areas, and without being prepared, the outbreak would be disastrous. In addition, research shows that the *Aedes aegypti* mosquito adapts easily to human environments and like other species, the mosquito is evolving and forming new strains and these new strains are more resistant and may reach rural areas, which are now considered more safer than urban areas (Schinring 2016). Efforts to fight infectious diseases like zika and dengue will need diagonal approaches whereby both the rural and urban areas are well equipped and protected from further outbreaks. As of now, the rural areas are at high risk of an outbreak and this will probably be much harder to control because there are few health centers and health resources in the rural areas.

Challenges faced by the health centers in prevention of zika

More than 50% of the health worker respondents listed delay of test results as one of the major challenges facing the health centers in the fight against zika. Once a person arrives at the health center with symptoms, he or she has to first be tested for both dengue and chikungunya. Once they rule out both diseases, then the person is confirmed to have zika. The problem is that the molecular testing of dengue, which detects the genetic material of the dengue

virus in the blood, takes up to 5 days after symptom onset (fever). Antibody tests, which detect two different types of antibodies produced by the body in response to a dengue fever infection, may take 2 to 4 weeks. The tests for chikungunya are normally available 4 to 14 days after the specimen is collected. Unfortunately, in hot weather climates like Brazil, the reporting times for the test results may take longer because the arbovirus activity increases and thus takes longer to detect. Thus, it may take weeks for a person to be confirmed to have zika, which also affects reporting and planning of control measures.

Perception of health care workers on efforts made by the Brazilian government to control and prevent zika

Many news reports indicate that the Ministry of Health in Brazil has intensified control measures against the mosquito *Aedes aegypti* and implemented intensive surveillance actions to prevent and control infectious diseases (Heukelbach 2016; 118). Nevertheless, persistent past failed efforts of the Brazilian government to control dengue, which is also transmitted by *Aedes aegypti* (one of the main vectors of zika) has raised red flags on whether or not the control of zika will be successful (Horton 2016; 633). In this project, the health care workers were asked to rate the efforts made by the Brazilian government to control and prevent zika

The results showed that about 79% of the respondents rated the government's efforts to control and prevent zika a 5 and below. However, none of the respondents rated it below a 3, which means they all perceive the government to be making some form of efforts. Among the 29 respondents, only 1 perceived the government to be making all the necessary efforts for zika

prevention. This question was aimed to roughly show the perception of people working in the health force on the efforts made by the Brazilian government to prevent and control zika. However, the question was a bit vague because the wording used such as “great efforts” may have been translated and understood differently by different people. Future research may focus in further exploring the perceptions and reasons for such a rating, as well as explore the perceptions of the community members.

Other tools and methods used to control and prevent zika

In Cachoeira, an urban area, the main means of information for people is television. In Alecrim, people use radio more than television to be informed. It is important to know how people receive news and information because it helps to strategize effective means and ways to reach out to various communities. For example, it is more effective to use radio programs in Alecrim than in Cachoeira town because more people listen to radio in Alecrim. The flyers and posters available in hospitals and other institutions such as offices have also been a source of information for some people. There was a deficit of flyers in the Alecrim health center and this is probably the reason that it was ranked as high as it was in Cachoeira. The health care workers through the questionnaires and informal interviews mentioned all the above tools.

Since I arrived in Brazil on February 2016, I have also seen a lot of advertisements on television and on the road about zika and ways to prevent mosquito-breeding areas. In addition, most of the public buses in Brazil have television, which also broadcast zika advertisements, and thus as people commute from one area to another, they come across the preventative methods

of zika in one way or another. I also think social media is a great tool to promote awareness in the community. However, social media can also be a source of panic and misinformation if not carefully monitored.

Conclusion

The outbreak of zika in Brazil as well as the increase in the number of microcephaly in newborns has been an ongoing discussion among health experts, political leaders and economists. In 2015, the World Health Organization declared zika among the health threats and demanded that countries in Latin America employ the necessary preventative measures. On the other hand, the zika outbreak has been a challenge to political leaders about the health policies in their countries. Before the outbreak of zika, Brazil already had the problem of dengue and chikungunya in the population. The same mosquito as dengue causes zika, and thus the outbreak of zika could suggest that the policies that were in place to fight dengue were not effective and successful. In this case, zika has definitely been a wake up call. Brazil's political system has been unstable with ongoing strikes and protests. Efforts to fight zika will largely depend on leadership, and with the current political instability, a lot is at stake. The economy of the country has also been largely affected after the zika outbreak and with the increased numbers of babies with microcephaly, a lot of money will have to be invested in providing them with the necessary health needs as well as special education.

Due to the increase of congenital anomalies after the outbreak of zika in Brazil and neighboring countries, all member states should establish and maintain heightened awareness and capacity to detect and confirm zika cases, have healthcare facilities prepared to respond to a possible increased demand for specialized care for microcephaly and neurological syndromes, strengthen

antenatal care, and introduce public health measures to reduce risk of zika spread and infection.

It is important to ensure that health care providers are well knowledgeable and up to date with the latest findings on zika, dengue and chikungunya because they play the primary role of care provision to the communities. Similarly up-to-date information should be well shared among public health, political and religious leaders in order to ensure appropriate measure and actions are taken when necessary.

References

- Anglican News Service. (2016, February 12). Retrieved April 12, 2016, from <http://www.anglicannews.org/news/2016/02/brazils-churches-respond-to-zika-virus-through-lent-campaign.aspx>
- Ayres, C. F. (2016). Identification of Zika virus vectors and implications for control. *The Lancet Infectious Diseases*, 16(3), 278-279.
doi:10.1016/s1473-3099(16)00073-6
- Bell, B. P., Boyle, C. A., & Petersen, L. R. (2016). Preventing Zika Virus Infections in Pregnant Women: An Urgent Public Health Priority. *Am J Public Health American Journal of Public Health*, 106(4), 589-590.
doi:10.2105/ajph.2016.303124
- Facts about Microcephaly. (2016). Retrieved April 18, 2016, from <http://www.cdc.gov/ncbddd/birthdefects/microcephaly.html>
- Heukelbach, J. (2016). Zika virus outbreak in Brazil. *Journal of Infection in Developing Countries*, 10(2), 116-120. Retrieved April, 2016.
- Horan, E. (2016, January 29). Q&A: Mosquito-borne Zika virus linked with microcephaly in Brazil. Retrieved May 23, 2016, from <http://thriving.childrenshospital.org/qa-zika-virus-mothers-linked-microcephaly-babies-brazil/>
- Questions and answers. Zika virus and complications:(n.d.). Retrieved April 18, 2016, from <http://www.who.int/features/qa/zika/en/>
- Questions-Answers. (2016). Retrieved April 18, 2016, from <http://www.cdc.gov/zika/pregnancy/question-answers.html>

Rodrigues, L. C. (2016). Zika: The Tragedy and the Opportunities. *Am J Public Health American Journal of Public Health*, 106(4), 582-582.
doi:10.2105/ajph.2016.303114

Schinring, L. (2016, May 20). Cape Verde Zika virus matches Americas' strain, threatening Africa. Retrieved May 23, 2016, from
<http://www.cidrap.umn.edu/>

Zika Virus Associated with Microcephaly — NEJM. (n.d.). Retrieved April 18, 2016, from
<http://www.nejm.org/doi/full/10.1056/NEJMoa1600651#t=article>

Zika virus microcephaly and guillain-barré syndrome (pp. 1-12, Rep.). (2016).
World Health Organization.

Appendices

Appendix A: CSP Monograph Appendix Questions

- 1. Could you have done this project in the USA? What data or sources were unique to the culture in which you did the project?**

This project could not have been done in the USA because all the primary sources of information were the health care workers who work in the clinics in Cachoeira Brazil.

- 2. Could you have done any part of it in the USA? Would the results have been different? How?**

I could have done the literature review in the USA, and I would not have any results because I couldn't collect raw data from the health workers.

- 3. Did the process of doing the CSP modify your learning style? How was this different from your previous style and approaches to learning?**

The CSP helped me to improve my research skills by fully engaging in the field from the beginning to the end. Initially, I used to participate in research projects where the data was already collected or the objectives were already set and I just had to collect the required data. However, having the opportunity to create my own research question, the objectives, collect data and analyze it was a new experience and I learnt a lot of skills such as organization, time management and goal settings.

- 4. How much of the final monograph is primary data? How much is from secondary sources?**

The final monograph is about 85% of primary data and only 15% from secondary sources for reference in making arguments.

- 5. What criteria did you use to evaluate your data for inclusion in the final monograph? Or how did you decide to exclude certain data?**

I included most of the data I collected in the field; only the data that carried identifiers was removed in the final monograph. In addition, most of the informal interviews or conversations were unrelated to the main objective

of the project and thus although discussed in some parts of the project, it was not highlighted.

6. How did the “drop-offs”, community projects, and/or field activities contribute to the process and completion of the CSP?

I think the drop-offs helped me to prepare meeting people who spoke Portuguese fluently with little/no English, thus I was able to practice my listening skills and taking cues from the way the people spoke or expressed themselves. Most people in the fieldwork did not speak any English and thus having practiced listening became really useful.

7. What part of the FME course most significantly influenced the CSP process?

The FME course helped to give me a general idea of how to prepare and conduct my fieldwork. I do not think there was any part that had the most significant influence.

8. What were the principal problems you encountered while doing the CSP? Were you able to resolve these and how?

The principal problem I encountered was language barrier and as my Portuguese improved over time, the problem became lesser and lesser than it was at the beginning.

9. Did you experience any time constraints? How could these have been resolved?

Fortunately, I did not experience any time constraints.

10. Did your original topic change and evolve as you discovered or did not discover new and different resources? Did the resources available modify or determine the topic?

My original topic did not change in the field, however, I got more insight of possible future research topics to explore on zika in Brazil

11. How did you go about finding resources: institutions, interviewees, publications, etc?

I was able to find the two health centers I worked with through the connections of people at SIT and Alecrim. My advisor helped me to find

some publications on zika, but I also used the Duke public health library resources to find recent articles on zika and its prevention.

12. What method(s) did you use? How did you decide to use such method(s)?

I used questionnaires and informal interviews because I wanted to minimize the problem of language barrier and save costs of hiring translators, as well as avoid time constraints in the transcribing process.

13. Comment on your relations with your advisor: indispensable? Occasionally helpful? Not very helpful? At what point was he/she most helpful? Were there cultural differences, which influenced your relationship? A different understanding of educational processes and goals? Was working with the advisor instructional?

My advisor was very helpful and understanding. She was also very approachable and knowledgeable and we had great informative discussions on zika and other related diseases.

14. Did you reach any dead ends? Hypotheses, which turned out to be not useful? Interviews or visits that had no application?

I did not reach any dead ends and most of the conversations, visits and informal interviews were useful in one way or another in reaching my primary and secondary objectives of the CSP.

15. What insights did you gain into the culture as a result of doing the CSP, which you might not otherwise have gained?

The Brazilian culture is very similar to the culture of people back in Tanzania, my home country. Thus, I was able to fully engage myself and form friendships with the people I worked with and met, which was really helpful in collecting data.

16. Did the CSP process assist your adjustment to the culture? Integration?

The CSP process definitely assisted me to integrate into the Brazilian culture, which as mentioned above, felt very familiar to me.

17. What were the principal lessons you learned from the CSP process?

Organization is key and important to ensure good track of progress, flexibility is always a bonus because things tend to change sometimes, connections and networking will always be the key to finding more places, resources and people, and time management. These are the key lessons I learnt during the CSP.

18. If you met a future student who wanted to do this same project, what would be your recommendations to him/her?

I would recommend them to prepare to adjust and also to make proper use of the connections they have during the CSP, as they always turn out to be fruitful.

19. Given what you know now, would you undertake this, or a similar project again?

Yes, I want to be able to explore the other questions and areas that I wasn't able to explore during this CSP period, and thus I plan to continue with this zika project in the near future.

Appendix B: Informed Consent Form

Termo de Consentimento Livre e Esclarecido

Prezado(a) Senhor(a)

Gostaríamos de convidá-lo(a) a participar de nosso estudo: **Ferramentas e métodos utilizados por instituições de saúde para controlar o zika vírus**, que tem como objetivo: **Entender as ferramentas e métodos utilizados por instituições de saúde para prevenir infecções do zika vírus e controlar a transmissão na comunidade.**

O estudo, consistirá na realização de entrevistas, observações e/ou participações junto aos participantes do estudo e posteriormente haverá a análise do conteúdo destas entrevistas e/ou observações. Será conduzida dessa forma, pois pretendemos trabalhar com a experiência de vida dos(as) participantes do estudo.

Trata-se de um estudo, desenvolvido por **Florence Ezron Tesha** orientada pela **dra. Rita Maluf**.

Garantimos que, a qualquer momento da realização desse estudo, qualquer participante e/ou estabelecimento envolvido, poderá receber esclarecimentos adicionais que julgar necessários. Qualquer participante selecionado(a) tem o direito de recusar-se a participar ou retirar-se do estudo em qualquer fase do mesmo, sem nenhum tipo de penalidade, constrangimento ou prejuízo. O sigilo das informações pessoais dos participantes será preservado, especificamente, quanto ao nome, à identificação de pessoas ou de locais. Todos os registros efetuados no decorrer desta investigação científica serão usados para fins acadêmicos e serão inutilizados após a fase de análise dos dados e de apresentação dos resultados finais na forma de monografia ou artigo científico.

Em caso de concordância com as considerações expostas, solicitamos que assine este “Termo de Consentimento Livre e Esclarecido” no local indicado abaixo. Desde já agradecemos sua colaboração e fica aqui o compromisso de notificação do andamento e envio dos resultados deste estudo.

Qualquer dúvida ou maiores esclarecimentos, entrar em contato com a responsável pelo estudo:

e-mail: gabriela.ventura@sit.edu **Telefone:** (71) 99719.6010 (do SIT Study Abroad: Brasil-Saúde Pública, Raça e Direitos Humanos).

Aluno:

Orientador(a) : Gabriela Ventura

Estudante no Programa do SIT
Study Abroad: Brasil-Saúde
Pública, Raça e Direitos Humanos

Orientador(a): Rita Maluf

_____, _____ de
_____ de 2016.

(cidade)

Eu, _____,
assino o termo de consentimento, após o esclarecimento e da concordância com
os objetivos e condições da realização do estudo “**Ferramentas e métodos
utilizados por instituições de saúde para controlar o zika vírus**”, permitindo,
também, que os resultados gerais deste estudo sejam divulgados sem a menção
dos nomes dos pesquisados.

_____, _____ de
_____ de 2016.

(cidade)

Assinatura do Pesquisado(a)

Appendix C: Questionnaire Sample

Interview Questions for the health workers

As perguntas da entrevista para os trabalhadores de saúde

Interviewee ID Number:.....

Entrevistado Número ID:

Interviewee Gender:.....

Sexo Entrevistado:.....

1. How old are you?

Quantos anos você tem?

2. How many days a week do you work?

Quantos dias por semana você trabalha?

3. How long have you worked here? (days/months/years)

Quanto tempo você trabalha aqui? (dias / meses / anos)

4. On a scale of 1 – 10, how would you rate your knowledge of Zika disease, its
history and cause, effects and prevention methods?

(10 = fully knowledgeable, 1 – little/no knowledge)

Em uma escala de 1 - 10, como você classificaria o seu conhecimento da doença Zika, a sua história e causar, efeitos e métodos de prevenção?

(10 = totalmente compreensível, 1 - pouco / nenhum conhecimento)

5. On a scale of 1 – 10, how dangerous do you perceive Zika to be?

(10 = very dangerous, 1 = not dangerous at all)

Em uma escala de 1-10, o quão perigoso você percebe Zika ser?

(10 = muito perigoso, 1 = não é perigoso em tudo)

6. Have you ever got any Zika training? If yes, please answer the questions below:

- i. Who organized the training?.....
- ii. Who conducted the training?.....
- iii. How many times have you received this training?.....
- iv. If no, do you expect to receive any training in the future? Yes/No.....

Você já tem alguma formação Zika? Se sim, por favor, responda às perguntas

abaixo:

- I. *Quem organizou o treinamento?*
 - *Doctors, Ministry of Health*
- II. *Que conduziu o treinamento?*
 - *Nurses, doctors*
- III. *Quantas vezes você recebeu esta formação?*
 - *A lot of times, once*
- IV. *Se não, você espera para receber qualquer tipo de formação no futuro? Sim ou Não.....*

7. If you answered yes on the above question, on a scale of 1- 10, how would you rate the training you received?

(10 = very useful and effective, 1 = not useful at all)

Se você respondeu sim à pergunta acima, em uma escala de 1 a 10, como você classificaria o treinamento que você recebeu? (10 = muito úteis e eficazes, 1 = não é útil em tudo)

8. Have you ever been infected by Zika? If yes, when? (month.....& year.....), where did you get tested?
Alguma vez você já foi infectado por Zika? Se sim, quando? (Mês & ano), onde você fazer o teste?
9. Does this health center test for Zika? Yes/No.....
Será que este teste de centro de saúde para Zika? Sim/ Não.....
10. In what ways is this clinic/health center involved in the control and prevention of Zika in this community? Please list them
De que forma é este centro clínica / saúde envolvidos no controle e prevenção de Zika nesta comunidade? Por favor, liste-os
11. Which among the above-mentioned methods do you perceive as the most effective? (Mention one only)
*Entre os métodos acima mencionados fazer você percebe como o mais eficaz?
(Mencionar apenas uma)*
12. Do people ask you about Zika? If yes, in approximation, how many people per week?
Será que as pessoas perguntar-lhe sobre Zika? Se sim, de aproximação, quantas pessoas por semana?
13. After the outbreak of Zika in Brazil, is there an increase in the number of women seeking contraception's because of the perceived association of Zika to microcephaly? a). Yes b). No c). I do not know
Após a infecção da Zika no Brasil, há um aumento no número de mulheres que procuram contracepção de por causa da associação percebida de Zika a microcefalia? a) Sim b) Não c) Não saber

14. Pregnant women are the most affected group when it comes to Zika infection because of the perceived association of mother's Zika infection with infant's microcephaly. In what ways does this clinic support pregnant women in terms of counseling and education?

As mulheres grávidas são o grupo mais afetado quando se trata de infecção Zika por causa da associação percebida de infecção Zika da mãe com microcefalia da criança. De que forma este apoio clínica de mulheres grávidas em termos de aconselhamento e educação?

15. On a scale of 1 – 10, how do you perceive the effectiveness of the tools and methods used by this clinic/health center to prevent Zika (if any)?

(10= very effective, 1= not effective at all)

Em uma escala de 1 - 10, como você percebe a eficácia das ferramentas e métodos utilizados por este centro de saúde / clínica para evitar Zika (se houver)

(10 = muito eficaz, 1 = não é eficaz em tudo)

16. What are the challenges that this clinic/health center faces on controlling and preventing Zika? Please list them

Quais são os desafios que este centro de saúde / clínica enfrenta no controle e prevenção Zika? Por favor, liste-os

17. On a scale of 1 – 10, what is your perception of the efforts made by the Brazilian government to control and prevent Zika?

(10= the government makes great efforts to prevent Zika, 1= the government is not making any efforts to prevent Zika)

Em uma escala de 1 - 10, qual é a sua percepção dos esforços feitos pelo governo brasileiro para controlar e prevenir Zika?

(10 = o governo faz grandes esforços para prevenir Zika, 1 = o governo não está a fazer todos os esforços para prevenir Zika)

18. What other tools do people use to educate themselves on Zika. Select all that apply

Que outras ferramentas que as pessoas usam para se educar sobre Zika.

Selecione tudo que se aplica

19. What methods do you use to prevent yourself from getting infected with Zika?

Que métodos você usa para prevenir-se de ficar infectado com Zika?

20. What are your suggestions/thoughts on Zika?

Quais são as suas sugestões / pensamentos sobre Zika?

Thank you very much :-)

Muito obrigado :-)