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Prevention of HIV Mother-To-Child-Transmission in Africa

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Fieldwork Summary Report

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Abstract

The transmission of HIV infection from an HIV-positive mother to her child during labor, pregnancy, breastfeeding or delivery is termed as mother-to-child HIV transmission (WHO, 2013 report on HIV). A range of 15-45% infection transmissions are possible when no intervention strategies are put into place. Globally, goals and initiatives have been set to combat this issue as well as speeding up the interventions and achieve possible transmission rates of levels less than 5% and total elimination of new infant HIV infections by 2015 (WHO, 2013 report on HIV). In 2011, 57% of pregnant women living with HIV in low and middle-income countries received effective antiretroviral drugs for prevention of mother to child transmission (PMTCT), a substantial increase from 48% in 2010 (UNAIDS, 2011 data).

Despite the availability of many interventions and massive investments to prevent MTCT, this pandemic situation still lingers in Africa. An estimated 390,000 children globally acquired HIV from their mothers in 2010 with over 90% of these new infections occurring in sub-Saharan Africa (UNICEF, 2011 Global HIV/AIDS Response report). This paper summarizes the current observation made after internship with the Office for Policy in Clinical Research Operations that falls under the Division of AIDS (DAIDS) with the National Institute of Health (NIH) in Bethesda, MD. The paper highlights the importance of the current recommendations used for the prevention of mother-to-child HIV transmission in sub-Saharan Africa. The World Health Organization (WHO) recommendation for the prevention of mother-to-child HIV transmission in Africa is the main focus of this report. The report also reflects on the core competencies of the masters in public health program learnt with the University of San Francisco and its association with the project. Different learning objectives of the project were also

addressed in this report. Lastly, the overall quality of the project and the need of such projects for public health were addressed in the report.

Introduction

According to a (WHO, 2013 report on HIV) mother to child transmission of HIV/AIDS occurs between a mother who is HIV positive and her infant during the process of delivery, when breastfeeding, in labor or even during the pregnancy itself. The transmission rate of HIV infection increases by 15% to 45% in the absence of a medical intervention. On the other hand, the rate of infection can be reduced substantially by implementing medical interventions (WHO, 2013 report on HIV). HIV infection and mortality rates in African children are astoundingly high. At the end of 2010, an estimated 3.4 million children were living with HIV in the world, of whom 3.1 million in Africa (UNAIDS, 2011 report on the global AIDS epidemic). It is important to understand the burden of HIV on the pediatric population. An estimated 260,000 children became infected with HIV in sub-Saharan Africa in 2012. The vast majority of these children (over 90 percent), contracted HIV during pregnancy, childbirth or breast-feeding as a result of their mother being HIV positive (Aizire et al. 2013).

In the past decade, many recommendations have been made to reduce the rate of mother-to-child HIV infection. Most of the recommendations consisted of therapeutic drugs to prevent HIV transmission. These recommendations played an important role in the reduction of mother-to-child HIV transmission to a significant extent. However, some of the recommendations had major conflicts in regard to medication, safety and efficacy of interventions, and the risk associated with such interventions. To prevent the transmission of HIV from mother to baby in Africa, the World Health Organization (WHO) promotes a comprehensive approach which includes primary prevention of HIV infection among women of childbearing age; preventing

unintended pregnancies among women living with HIV; Preventing HIV transmission from a woman living with HIV to her infant; and providing appropriate treatment, care and support to mothers living with HIV and their children and families. Prevention is good but the WHO is looking beyond that and has also recommended the use of antiretroviral therapy (ART) as a potential mean towards elimination and cure.

This paper gives an in-depth review on the importance and success of the recommendation. This research report also summarizes the present observation made in the Office for Policy in Clinical Research Operations that falls under the Division of AIDS (DAIDS) with the National Institute of Health (NIH) in Bethesda, MD. The paper delves into the evolution of the recommendations and the practical implications on the ground for HIV positive mothers and their children. HIV transmission from mother-to-child is preventable (Marcos et al. 2012) and this report provides an in-depth review of the current status on HIV transmission from mother-to-child in sub-Saharan Africa.

Background

a) Description of the public health problem(s)

i. Summary statistics of the problem

The total number of people infected with HIV in the world is around 2.1 million in 2013 (WHO, 2013 report on HIV). The number of HIV infected people is said to increase if medical interventions and guidelines are not implemented immediately. Pediatric HIV is a large contributor to the high rates, the largest in sub-Saharan Africa, of infant and child mortality in the region. Most countries in the world not excluding developed nations such as the United States and Japan suffer from the burden of this problem. But these nations on a large scale have brought the situation under control. On the other hand, of the ten countries worldwide in 2010

with the greatest numbers of HIV positive women, the top nine are all in sub-Saharan Africa; these range from Nigeria in the first position with an estimated 200,000 HIV positive pregnant women, through South Africa with 210, 000, Mozambique, Kenya, Tanzania, Uganda, Zambia, Malawi, to Zimbabwe with 53,000 and India, the only non-African country to occupy the tenth position with the greatest numbers of HIV positive women (WHO report on PMTCT strategic vision, 2010) .

The majority of children living with HIV were infected via MTCT, during pregnancy, labor, delivery or breastfeeding. According to the UNAIDS, 90% of children who acquired HIV in 2011 live in sub-Saharan Africa and in South Africa alone 35.1% of all death of children under-5-years was caused by HIV/AIDS. While the impact of HIV/AIDS on people has been well documented, it has been much more difficult to observe the pandemic's effects on the African economy as a whole or to assess how it might affect Africa's future development if this under-age death is not prevented. In fact, The Joint United Nations Program on HIV/AIDS (UNAIDS) estimates that the ratio of African children to North American children who died from HIV disease in 2002 was 10,000 to 1. The statistics is worrying and attention needs to be paid to this problem.

ii. Literature review on the aspect of the problem

Mother-to-child transmission is the predominant way children become infected with HIV worldwide (Barron et al. 2013). Among pregnant women who are HIV positive, the likelihood of transmission of HIV in the absence of prevention of mother-to-child transmission (PMTCT) is quite high. There are three ways in which a HIV positive woman may transmit the virus to her child: in utero, during childbirth, and through breastfeeding. Current studies indicate that mixed

feeding (breastfeeding with other oral foods and liquids) is associated with the greatest risk of transmission among African children.

In 2010 WHO guidelines recommended that women with higher CD4 counts receive either zidovudine after 14 weeks gestation with additional peripartum drugs and if breastfeeding, infant nevirapine prophylaxis through cessation of breastfeeding (termed by WHO as “Option A”) or a triple ARV drug regimen after 14 weeks gestation through cessation of breastfeeding (termed by WHO as "Option B"). The revised World Health Organization (WHO) 2013 guidelines recommends that all countries follow option B+ and in countries where this is not feasible, option B. Option A is now only cited as a last resort. Option B+ has already been adopted successfully in African countries like Malawi and Rwanda. This option offers all pregnant or breastfeeding women who are HIV positive a lifetime on antiretroviral drugs to protect their own health and that of future pregnancies. It also brings down the chances of transmitting the virus to a sexual partner to nearly zero.

WHO recommended that a triple-drug antiretroviral regimen should be taken throughout pregnancy, delivery and breastfeeding - continuing for life, regardless of CD4 count or clinical stage? When this recommendation was adopted in Africa the majority of Malawian women spoke positively about Option B+. The women in this part of the world were pleased that Option B+ protects babies born to mothers living with HIV from vertical transmission and that it provides women with lifelong treatment (WHO, 2013 report on HIV). Continual expansion of Option B+ to other African countries may be a more effective PMTCT strategy, as it can help overcome some of the individual, organizational and societal barriers associated with achieving high coverage levels of prophylaxis and treatment, and will ensure that most HIV infected

pregnant women are placed on treatment immediately following diagnosis leading to further reduction of MTCT (Schouten et al., 2011).

b) Description of the agency's response to the health problem

i. Agency's mission

The National Institutes of Health (NIH), a part of the U.S. Department of Health and Human Services is the largest biomedical research facility in the world. NIH is made up of 27 Institutes and Centers, each with a specific research agenda, often focusing on particular diseases or body systems. The organization is the largest single entity providing funding for biomedical research and invests nearly \$30.1 billion annually in medical research. More than 80% of the NIH's funding is awarded through almost 50,000 competitive grants to more than 300,000 researchers at more than 2,500 universities, medical schools, and other research institutions in every state and around the world.

The National Institute of Allergy and Infectious Diseases (NIAID) is one of the 27 institutes of the NIH. The mission of the NIAID is to conduct basic and applied research to better understand, treat, and prevent infectious, immunologic, and allergic diseases. The Division of Acquired Immunodeficiency Syndrome (DAIDS) is a division of the National Institute of Allergy and Infectious Diseases which was formed in 1986 to address the national research needs created by the advent and spread of the HIV/AIDS epidemic. The mission of DAIDS is to help ensure an end to the HIV/AIDS epidemic by increasing basic knowledge of the pathogenesis and transmission of HIV, supporting the development of therapies for HIV infection and its complications and co-infections, and supporting the development of vaccines and other prevention strategies.

DAIDS has funded research conducted by six networks towards the cure of HIV/AIDS. The International Maternal Pediatric Adolescent AIDS Clinical Trials Group (IMPAACT) is one of the networks that DAIDS fund to reduce the rate of MTCT of HIV. The Office for Policy in Clinical Research Operations (OPCRO) that is under the DAIDS of the NIH is concerned with prevention of mother-to-child HIV transmission. OPCRO mission is to manage and support the DAIDS clinical research and helps ensure compliance with applicable regulations, standards, and good clinical practice guidelines; study participant safety and welfare; and study quality and integrity.

ii. Educational efforts

It is important to understand the needs of the target population and address specific educational materials to them. The agency engages community participation towards a family approach as a national PMTCT strategy. The DAIDS within the NIH has established a group called Community Partners (CP) which promote effective representation of and timely communication among the many communities, in the U.S. and internationally, that work with and participate in the NIH-funded HIV/AIDS Clinical Trials Networks. Community Partners are comprised of representatives from each of the NIH-funded networks' community groups, including the AIDS Clinical Trials Group (ACTG), the HIV Vaccine Trials Network (HVTN), the HIV Prevention Trials Network (HPTN), the International Maternal Pediatric Adolescent AIDS Clinical Trials group (IMPAACT), and the Microbicide Trials Network (MTN). There is also the Strategic Working Group (SWG) which provides expert advice on the scientific priorities and facilitates communication among all stakeholders relevant to the NIAID-sponsored HIV/AIDS Clinical Trials Networks.

The International Maternal Pediatric Adolescent AIDS Clinical Trials group (IMPAACT) is tasked to significantly decrease incident HIV and HIV-associated infections and to decrease mortality and morbidity due to HIV and HIV-associated infections and co-morbidities among infants, children, adolescents and pregnant/postpartum women. This network is actively involved in the sub-Saharan Africa for the PMTCT of HIV. The IMPAACT Community Advisory Board (ICAB) includes representatives from Africa that assists site CABS and regional CABs with capacity building, training, and development that will positively impact the formulation and implementation of research by community representation at the network and cross-network levels.

iii. Services, products and research efforts

DAIDS is concerned with the eradication of HIV MTCT and so provides services such as grants for HIV research. The agency has collaborated with top pharmaceutical and clinical research organizations (CROs) to facilitate the research and development of novel drugs to combat mother-to-child HIV transmission. Moreover, the agency has also provides financial support through grants to research organizations, universities, and research laboratories that are involved in the development of immunotherapies and antiretroviral (ART) drugs to prevent HIV transmission in sub-Saharan Africa and the world as a whole. DAIDS has also partnered with IMPAACT to conduct the PROMISE study. Through a variety of grants and contracts, the Division sponsors basic, pre-clinical and clinical research, including Phase I, II, III and IV clinical trials to evaluate the safety and efficacy of therapeutics, vaccines and other preventive modalities. NIAID/DAIDS currently funds more than 300 clinical trials in over 50 countries at more than 1,000 domestic and international clinical research sites.

iv. Advocacy and measuring the success of the agency efforts

DAIDS aims to reduce MTCT of HIV in Africa to the lowest levels by the end of 2015.

MTCT of HIV is preventable and DAIDS is in support of the WHO recommendation of Option B+ for the PMTCT. The program is aimed to create awareness among HIV infected women and children. The MTCT program also advocates primary prevention and family planning. Health-related outcomes were evaluated to measure the success of the MTCT prevention plan. NIAID in collaboration with the President's Emergency Plan for AIDS Relief (PEPFAR) supports safe medical male circumcision (MC) for HIV/AIDS prevention based on requests from host governments and in keeping with their national policies, guidelines and cultural norms.

In 2008, PEPFAR allocated approximately \$26 million to support male circumcision in Botswana, Ethiopia, Kenya, Lesotho, Malawi, Mozambique, Namibia, Rwanda, South Africa, Swaziland, Tanzania, Uganda, and Zambia. Male circumcision is the surgical removal of all or part of the foreskin (the tissue that covers the head of the penis). Two randomized controlled trials in Kenya and Uganda showed, respectively, 53% and 48% reductions in HIV acquisition among circumcised men than uncircumcised men in the trial (NIAID, NIH).

These results suggest that male circumcision could play an important role in the struggle against the continued rise in new HIV infections. The reduction in the number of mortality rates associated with HIV infection of children due to MTCT would indicate the success of the program. It was reported that between 2009 and 2011, the number of children newly infected with HIV fell in sub-Saharan Africa by 24% (UNAIDS Regional Fact Sheet, 2012). It is important to harness the fact that male circumcision does not completely protect against HIV but instead, it should be offered as part of comprehensive preventive mechanism for PMTCT of HIV.

c) Description of evidence to justify the project and/or intervention

Approximately one-third of children born to mothers living with HIV will acquire HIV infection in the absence of preventive measures with majority of these cases in Africa. However, progress has been made to combat this problem. Per the recommendation of WHO Ghana has been able to reduce by 76% the number of new HIV infections among children due to increased coverage of anti-retroviral prophylaxis for pregnant women living with HIV in 2009. The proportion of children born in the country with HIV to positive mothers declined to 9% in 2012 (UNAIDS, 2013 Progress Report on the Global Plan). In the same report South Africa also recorded 17,000 fewer children acquired HIV in 2012 than in 2009, a decline of 46%.

This has led to rapid decline in the number of AIDS cases among children under 5 years of age throughout the continent since recommendations made to prevent mother-to-child transmission of HIV was first introduced. Voluntary testing for HIV by pregnant women in Africa is constantly growing from 15% turn out in 2005 to 47% in 2010. More so, 64% of those who tested positive accepted to receive the prophylaxis to prevent infant transmissions, a rise from 19% in 2005. Some countries like South Africa have actually achieved 80% coverage (WHO, 2011). The fight against MTCT of HIV is yet to be won. From the studies it is clear that some countries in Africa are still far behind with the battle but it is imperative to affirm the efforts achieved to date.

c) Current and relevant public health literature as it relates to the topic and project

Van Roosmalen, J. (2010) highlighted that current PMTCT programs need to be improved because of their verticality. Simba et al. (2010) found that scaling-up prevention of mother-to-child transmission (PMTCT) of HIV infection helped in the reduction of the burden of HIV infection. Kouanda S, et al. (2010) also reported that the HAART program for HIV positive

mothers reduced the risk of infant HIV infection. It is important to note that the success of PMTCT programmes (Options A and B) together with clinical trial data on antiretroviral (ARV) treatment as prophylaxis, has emboldened UN agencies to aggressively promote lifelong ARVs for PMTCT (Option B+). In a peer-reviewed journal article published in the AIDS (London, England) in 2014 Tenthani et al. noted that Option B+ is considered a cost-effective strategy for ensuring universal access to ART for PMTCT in Malawi and has led to substantial increases in women initiating ART during pregnancy.

Implementation of the project/methods used

a) Describe the fieldwork experience project and plan, including learning objectives

The recommendation for the PMTCT of HIV helped countries in sub-Saharan Africa to understand the burden of MTCT of HIV. The main learning outcome of the project was that MTCT of HIV is preventable and if more resources are allocated to the regions in Africa to fight the disease the burden of this problem can be minimized. Increasing national and regional investment in these areas is central to ensure sustainability of the program beyond the 2015 target. The plan of the entire project was based on a community outreach coupled with extensive research design and implementation. The inclusion of educational and rehabilitation program are known to have reduced the rates of MTCT HIV-related mortality. This will eventually help healthcare workers and public health professionals to improve the lives for HIV positive pregnant women and children and potentially eliminate HIV MTCT in sub-Saharan Africa.

b) Describe the theoretical background and foundations of the public health problem and potential interventions

Antiretroviral (ART) drugs are considered as one of the most promising medical interventions to prevent MTCT of HIV (Wiegert et al, 2014). The foundation of MTCT of HIV has revolutionized the healthcare industry for HIV/AIDS treatment. There are fewer deaths of HIV infected children due to the implementation of MTCT of HIV programs in Africa (Chi et al, 2013). Furthermore, because breastfeeding transmission of HIV does occur, and because complete avoidance of breastfeeding is mostly impossible in the sub-Saharan African region, identification of risk factors for MTCT of HIV through breastfeeding has been important in order to design interventions to prevent such transmission.

According to a study, mother to child transmission (MTCT) rates among breastfed infants in low income nations is as high as 45% in the absence of interventions to reduce such transmission (Cohn, 2001). Some of the potential interventions recommended by the WHO to prevent breastfeeding transmission of HIV include decreasing the duration of exposure to breast milk (e.g., complete avoidance of breastfeeding, early cessation of breastfeeding), decreasing maternal infectivity (e.g., lowering viral load in breast milk through chemical or heat treatment of breast milk, or through ARV prophylaxis to the mother while breastfeeding), addressing factors affecting the transfer of virus from mother-to-child (e.g., mixed feeding, infant thrush, maternal nipple bleeding), and improving infant's defenses against HIV (e.g., through passive or active immunization). If feasible, replacement feeding for the first month is best as opposed to exclusively breastfeeding the child. These MTCT interventions for HIV positive women and their children have given them a new lease of life with positive impacts on families in Africa.

c) Types of methods/process of interventions was used to in this project

The plan for the recommendation for the prevention of HIV MTCT is based on different methods. The initial project began on a population survey to understand the burden of the

disease. The plan also included extensive research and evaluation on current drug and alternative therapies to reduce neonatal HIV transmission. Moreover, the WHO also recommends the inclusion of educational development and community outreach sessions. Furthermore, the 2010 WHO guidelines recommended that women with higher CD4 counts receive either zidovudine after 14 weeks gestation with additional peripartum drugs and if breastfeeding, infant nevirapine prophylaxis through cessation of breastfeeding (termed by WHO as “Option A”) or a triple ARV drug regimen after 14 weeks gestation through cessation of breastfeeding (termed by WHO as "Option B"). Active and passive vaccination trials have showed promising results in pediatric populations in the prevention of HIV transmission (Hicar, 2013). Many clinical trials have provided evidence that the combined use of antiretroviral drugs and immunotherapies reduce the rates of mother-to-child HIV infection (Newell, 2003).

Results/Findings

a) Efficiency: Positive and negative aspects

The WHO recommendation for the PMTCT of HIV is known to be one of the most successful programs till date. (Pilotto et al, 2011). The program design and health-related outcomes were criticized by some researchers but UNICEF argue that Option B+ can be expected to lower HIV transmission to male partners of HIV-positive women, since being on antiretroviral therapy will make women less infectious. The report also went on to suggest that ongoing antiretroviral therapy should reduce the risk of mother-to-child transmission of HIV in subsequent pregnancies. On the other hand, the business case for Option B+ assumes that it is too costly, owing to the need for additional drugs, laboratory tests, human resources and other health-system expenditures. Opponents also argue that Option B+ will stretch the resources of the public health service and weaken the ability of health workers to identify the group at high

risk of transmission and maternal morbidity and mortality. However, the positive aspects of the program outweigh the negative aspects with a focus on reduced mortality rates associated with MTCT of HIV among women and children in Africa.

b) Success of the Project

As mentioned earlier, the recommendation for PMTCT of HIV is considered to be the best plan to reduce the rates of mother-to-child HIV transmission. Many clinical trials, randomized studies, prospective and observational studies have provided evidence that the program is the best modern-day intervention for MTCT of HIV (Chi et al, 2013). Experienced clinicians have confirmed that MTCT of HIV is most common when women do not attend antenatal clinics, do not adhere to ART, or develop resistance to the drugs.

c) Sustainability of the project and intervention

The recommendation for the PMTCT is known for its sustainability and quality (Chi et al, 2013). The interventions used in the project were evaluated in a lot of scientific studies. The agency also uses behavioral interventions as one of its key components in research and the interventions may be focused on men, women, and adolescents at high risk of acquiring HIV. Another intervention method that the agency utilizes is male circumcision. NIH-supported researchers in Kenya and Uganda demonstrated that medically supervised adult male circumcision reduced by more than 50 percent the risk of heterosexual African men becoming infected with HIV. This finding has led to the decision by DAIDS to recommend circumcision as an important new element of the PMTCT.

d) Partners utilized in the project & the effect of the organizational structure outcomes

The US government, through the President's Emergency Plan for AIDS Relief (PEPFAR), has been supporting the global strategy by providing technical and financial assistance to countries with a high burden of HIV infection in Africa. In collaboration with NIH and PEPFAR various institutions in this world are awarded with grants which seek to improve program effectiveness and optimize efficiency, including the effective transfer of PMTCT interventions from one setting to another. The collaboration is an essential part for the entire project. The organizational structure of the entire project is well-designed and served the target population (HIV+ pregnant women and children) efficiently. The overall health-related outcome of HIV positive pregnant women was positive and there were reduced rates of MTCT of HIV after the implementation of the program (Wiegert et al, 2012).

Application of results/public health significance

a) Lessons learnt from the project (Field experience) implications for future public health interventions

The most important lessons learnt from this project are that advancements in science research have enabled man to prevent, treat, and cure incurable diseases such as HIV MTCT to some extent in sub-Saharan Africa. Drug development for this epidemic has been limited by a lack of understanding of the underlying mechanisms of the disease and sometimes the relative unavailability of subjects for clinical trials, as well as the prohibitive cost of investing in pharmaceutical agent with proper market potential. However we should not pretend as if progress has not been made for the elimination of MTCT in Africa. I have understood from this project that it is possible to learn and harness the biological aspects of viruses involved in

infectious diseases. I have understood from this project that increasing access to treatment among pregnant women has several advantages. From a therapeutic point of view, it would reduce morbidity and mortality among HIV infected women and their children in Africa.

The field experience from this project also helped me in understanding the importance of preventing and treating an infectious and incurable disease like HIV. Many researchers are developing new strategies and innovations to combat infectious and incurable diseases like HIV/AIDS. The recommendations as mentioned earlier can be set as an example for other researchers and scientific studies to develop new strategies to treat HIV and AIDS victims. Projects like these would also address other MTCT programs to eliminate the health issue not only in Africa but the world as a whole.

a) Recommendations that might improve the program for the future generation

Apart from the WHO's recommendation, the program should also include other novel strategies or pharmacological interventions to promote the prevention of mother-to-child HIV transmission. The educational and rehabilitation programs need necessary amendments to provide quality service to the target population. Engaging communities in preventing mother-to-child transmission is particularly challenging because of the complexity of the HIV transmission process and the stigma associated with HIV/AIDS. Overcoming negative community perceptions about people living with HIV/AIDS and educating community members about HIV transmission are necessary to increase women's willingness to be tested for HIV, a prerequisite for participating in interventions to prevent mother-to-child transmission. The fear of stigma and discrimination, particularly if a woman is economically dependent on her partner may prevent her from getting tested, from disclosing her status to a partner or healthcare provider, or from accessing antiretroviral treatment for her own health and for PMTCT. Fear of disclosure is a

common reason why women are reluctant to return to their HIV clinic in Africa. Therefore more resources should be channeled to HIV/AIDS education to allow for community members to engage in meaningful dialogue in order sub-vert the stigma associated with people living with HIV/AIDS in sub-Saharan Africa.

Competencies addressed

a) Achievement of learning objectives

The project enabled students to learn different concepts of public health management. Different healthcare policies, programs and politics were learnt during the course of the field experience. The main learning objectives of epidemiology and healthcare organizations and management were fulfilled at the end of the project. Maternal and pediatric care management was one of the main learning objectives achieved during the course of the project. After this project students understood that success of any HIV/AIDS clinical trial or research is to a great extent dependent on effective community sensitization, education, involvement and participation. Without these, there will be negative speculation, myths, misconceptions, reduced or community apathy in HIV/AIDS trials. This may also lead to non-adherence to HIV/AIDS and T.B treatment which causes further complications that come with drug resistance and impacting negatively on the fight against the MTCT in Africa.

b) University of San Francisco Master's in Public Health Program competencies addressed during the implementation of this fieldwork experience

Basically, almost all the courses students take with the USF master's in public health program were addressed during the implementation of the fieldwork experience. But it will just be fair to say that more emphasis were placed on Epidemiology studies, Community Health Behavior and Social Change, Social Justice, Health Policies and Ethics, Public Health Program

Management and Evaluation, Sexual Health in Public Health and Global Health competencies of the Master's in public health program were addressed during the implementation of this field experience. Social science and bio-statistical competencies of Public health program were also addressed to some extent in this project. The field experience placed students in real-life scenarios of the work of a typical public health professional.

c) Core knowledge areas addressed in this field experience

The core knowledge areas addressed in the field experience were epidemiology, biostatistics, budgeting, healthcare organization management, and health communication. The principles of epidemiology such as causal inference, populations, epidemiologic study design, public available databases, types of measures of disease frequency and association, effect measure modification, assessment and control of confounding and other biases, and qualities of a diagnostic test were addressed in this field experience. The concept of perceived barriers was used a core knowledge in this work. This may be defined as barriers are defined as a cost-benefit analysis that the individual will make, influencing her decisions. In this case do women in sub-Saharan Africa believe that the benefit of adhering to PMTCT outweighs the costs and barriers? Established barriers in the literature for PMTCT adherence include fear of knowing one's own HIV status; stigma and discrimination of HIV status being disclosed to partner, family, or the community and opposition of the male intimate partner.

d) Application of cross-cutting interdisciplinary values during the course of this project

Systems setting, program planning, professionalism, public health biology, diversity and culture, communication and informatics were key cross-cutting interdisciplinary values that were applied during the course of this project. Program planning included design, development,

evaluation, implementation, and improvement for the prevention of mother-to-child HIV transmission.

e) Application of concepts and interventions from coursework in the University of San Francisco Masters in Public Health Program

The concepts of Public Health Management and Evaluation, professionalism, and Health Policy were applied for this project. Moreover students learnt new healthcare competencies such as community engagement in health outcome during the course of the field experience. The Masters in Public health program also involves communication and inter-culture communications skills as one of the core competencies. This field experience helped students apply such core competencies efficiently.

Conclusion

The overall quality of the project was good with possible improvements for the future. Some of the major strengths of the project were that it included the target population as a whole without ethnic, age, or socio-economic discrepancies. The project also involved the best medical interventions to treat the target population. To some extent, the project was successful in implementing high-quality treatment interventions to prevent mother-to-child HIV transmission. The field experience helped students gain insight into the real-life scenario of a public healthcare worker. The entire project was based on most of the coursework in the Masters of public health program. Cross-cutting interdisciplinary values were learnt throughout the project that helped most students. The project was complex and involved a lot of data collection and interpretation. On a personal level, the project was lengthy but helped in improving core competencies in public health program. Different skills such as communication, cross-culture interaction, professionalism, and leadership were learnt during the course of this field experience. To

conclude, the learning experience of this filed project was wonderful with a brief insight into professional healthcare implementation, planning, development, management, and evaluation.

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