Five-year Distribution and Patterns of Maternal Child Health Indicators after Institution of PEPFAR and Global HIV/AIDS Initiatives in Uganda

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Abstract

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As the HIV/AIDS epidemic escalated worldwide, the global community responded by a large increase in international aid to countries with high HIV/AIDS prevalence such as Uganda. This funding mainly came from PEPFAR and other Global Health Initiatives. Of interest is the impact of such large funding on non-HIV health services and the associated health outcomes. This thesis project focuses on the analysis of a subset of maternal child health data collected from multiple health centres and hospitals from 112 districts in Uganda during 2006-2010.

After the institution of PEPFAR and other Global Health Initiatives in Uganda, non-HIV child health and family planning services have seen annual improvement during 2006-2010. However, non-HIV maternal health services as measured in this study, are declining. There is a

decreasing trend in pregnant women attending all four antenatal care visits. An associated increase in maternal deaths in the same time period is also observed. Continued resources should be allocated towards non-HIV child and family planning services. However, additional allocation of resources should be targeted towards non-HIV maternal health services.

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LIST OF ACRONYMS & ABBREVIATIONS

ANC	Antenatal Care
AIDS	Acquired Immunodeficiency Syndrome
CDC	Centers for Disease Control
DFID	Department for International Development
DPT3	Diphtheria with whole cell pertussis, tetanus toxoid, hepatitis B, and *Haemophilus influenzae type* b, third dose
GFATM	Global Fund to Fight AIDS, Tuberculosis, and Malaria
GHI	Global Health Initiative
GoU	Government of Uganda
HC	Health Centre
HIV	Human Immunodeficiency Virus
HMIS123	Health Management Information System 123
IPT2	Intermittent Preventive Treatment, second dose
MAP	Multi-country HIV/AIDS Program
MDG	Millennium Development Goal
MoH	Ministry of Health
PEPFAR	The President's Emergency Plan for AIDS Relief
TB	Tuberculosis
UHSSS	Uganda Health Systems Strengthening Study
UNGASS	United Nations General Assembly Special Session
UNICEF	The United Nations Children's Fund
WHO	World Health Organization
YO	Year(s)-old

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Deepest appreciation to the patients, village health team members, and medical staff, especially Samuel Kirunda, in Uganda that I met in 2009. It is because of these life-changing experiences and conversations in Kiboga and Kampala that I decided to pursue a Master in Public Health in Global Health degree in addition to my medical degree in order to learn how to best effect good overall health in limited-resource settings globally. In 2013, I returned to Uganda and would like to provide sincere gratitude to the course directors, Michael Westerhaus and Amy Finnegan, and lecturers of the Social Medicine course in Gulu, and the Ugandan medical students who provided me with further inspiration and excitement for pursuing a career as a global physician and public health professional. Finally, wholehearted thanks to my family who provide incessant support and understanding throughout my studies in medical and graduate school and time abroad. Thank you.

DEDICATION

I dedicate this Master's Thesis to the people of Uganda, especially the patients and health care workers who shared their life experiences and stories with me. It is my sincere hope that this research will contribute to the ending of suffering from preventable diseases and that resources from developed countries will be more equally distributed towards those in need in the developing world.

INTRODUCTION

As the global HIV/AIDS epidemic dramatically increased over the past decade, so did the international community's commitment to ending this global epidemic. In 1996, funding for Global Health Initiatives (GHI) in the developing world was about US$300 million annually. In just over a decade funding increased to US$10 billion in 2007.[1] The major players of the GHI are The President's Emergency Plan for AIDS Relief (PEPFAR), the World Bank's Multi-country HIV/AIDS program (MAP), and the Global Fund to Fight AIDS, Tuberculosis, and Malaria (GFATM).[2] As a result of the worldwide commitment to the HIV/AIDS battle, there has been a large scale up of HIV prevention, care, and treatment services in those countries most afflicted by the disease.

PEPFAR is an American initiative to aid the global HIV/AIDS humanitarian crisis. Since its birth in 2003, PEPFAR has been successful in establishment and expansion of access to HIV prevention, treatment, and care services in multiple countries worldwide with high HIV burden including Uganda. In 2011, these include prevention of mother-to-child transmission services for 55,400 HIV-positive pregnant mothers, allowing 16,742 babies of HIV-positive mothers to be born HIV-free;[3] treatment to 257,000 individuals; and care to 834,700 individuals, including 282,300 orphans and vulnerable children in Uganda.[4] PEPFAR has a current target to increase the proportion of HIV-infected infants and children who receive anti-retroviral therapy to meet coverage levels of 65%. Since the initiation of PEPFAR, Uganda has received nearly US$2 billion for comprehensive HIV/AIDS prevention, treatment, and care programs. The United States government PEPFAR funds comprise 80% of the Uganda resources for HIV services.[5]

What are the impacts of programs such as PEPFAR on overall health in Uganda?

Uganda: An Overview

Country Background

Uganda, "the Pearl of Africa," is a small landlocked East African country on the shores of Lake Victoria. Uganda has a population of around 33 million, divided into over 50 different language and ethnic groups. Over half of the population is under age 15, and over 70% of the population lives in rural areas.[6] The highest population density is in the southern "fertile crescent" near Lake Victoria, which includes Kampala, the capital city. Shortly after achieving independence from the British in 1962, Uganda experienced a series of political catastrophes that turned it into one of the poorest nations in Africa. It was also one of the earliest African nations to be hit hard by the HIV/AIDS epidemic.

Health and Development

Life expectancy in Uganda is estimated to be 57 years for men and 48 years for women (Table 1).[7] This is a decrease from previous life expectancy, and is largely due to the HIV/AIDS epidemic in the country. The fertility rate in Uganda is one of the highest in the world at 6.2 children per woman, leading to a population growth of 3.26% per year.[5] The under-five mortality rate is estimated at 99 deaths per 1,000 live births. This is better than the regional average of 119 deaths per 1,000 live births but is worse than the global average of 57 deaths per 1,000 live births. The maternal mortality ratio appears similar with an estimated 310 deaths per 100,000 live births compared to a regional and global average of 480 and 210 per 100,000 live births, respectively (Table 1).[7]

Table 1: Comparison of key health indicators in Uganda to other African countries and globally, 2012

Health indicator		Uganda	Regional average	Global average
Life expectancy at birth (years)	Male	48	52	66
	Female	57	56	71
	Both sexes	52	54	68
Under-five mortality rate (per 1000 live births)	Both sexes	99	119	57
Maternal mortality ratio (per 100 000 live births)		310	480	210

Child Health

Child health has improved in the last century and public health interventions are an important part of that process. In particular, immunizations have resulted in eradication of certain diseases in the developed world. For example, with universal vaccination and herd immunity, measles is no longer seen in many countries of the developed world. The measles and diphtheria with whole cell pertussis, tetanus toxoid, hepatitis B, and *Haemophilus influenzae type* b, third dose (DPT3) immunization rates are good measures of child health and access to pediatric care services.

Childhood is a time of rapid development and is also the time period when an individual is the most vulnerable to health ailments. In Uganda, most childhood deaths occur under the age of five.[8] Outpatient visits during childhood are an opportunity to treat illness and prevent death and long-term health complications during this period of vulnerability. It is also a good time for health education and preventative health services.

For children less than five years of age, the main causes of morbidity and mortality are neonatal causes, including diarrhea during the neonatal period (24%), malaria (23%), and pneumonia (21%).[5] Nearly 40% of Ugandan children under the age of five are stunted. The

DPT3 immunization rate is just over 60%, lower than the regional average of 70%.[7] The percentage of children under the age of five sleeping under insecticide-treated nets is 33%.[8]

Childhood Immunizations

Measles is a serious infectious disease caused by a virus. Although a safe and cost-effective vaccine is available, measles remains one of the world's leading causes of death among children under the age of five.[9] In 2011, there were 157,000 measles deaths worldwide.[8] Greater than 90% of these deaths occurred in developing countries. However, the situation has been improving in the past decade. Through routine immunizations, 83% of infants in 2011 received the measles vaccine globally. This represents an increase from 73% of infants in 2000 worldwide.[9] Prior to global universal measles vaccination in 1980, the measles virus caused 2.7 million childhood deaths annually.[10]

Routine measles vaccination for children is a key public health strategy to reduce global measles deaths. The developed world has been administering the measles vaccine for over 40 years now. The measles vaccine is one of the safest and cost-effective immunizations available. Less than one US dollar will vaccinate a child against measles.[8]

The United Nations aim to end extreme world poverty by a set of Millennium Development Goals (MDGs). MDG 4 states that they will reduce the under-five mortality rate by two-thirds between 1990 and 2015. Measles vaccine administration is an indicator of access to child health services, and is therefore a marker of progress towards achieving MDG 4. In Uganda, the World Health Organization (WHO) recommends measles vaccine administration to all children at 9 months of age.[11] Children may receive the vaccine at later ages with catch-up

immunization schedules, or whenever they access health care. However, they are at continued risk for measles until they receive the measles vaccine.

Diphtheria, pertussis, tetanus, and *Haemophilus influenzae type* b are serious diseases caused by bacteria. Hepatitis B is a serious disease caused by a virus. Diphtheria, pertussis, and *Haemophilus influenzae type* b are transmitted via respiratory secretions. Hepatitis B is transmitted via bodily fluids. Tetanus enters the body through an open wound. Diphtheria can cause respiratory distress, heart failure, paralysis, and even death. Pertussis, or whooping cough, can cause severe coughing resulting in difficulty eating and breathing for multiple weeks. Tetanus, commonly called lockjaw, can cause painful muscle tightening of the entire body. Once a newborn has tetanus, 70% of these cases result in death.[10] *Haemophilus influenzae type* b can cause severe pneumonia and meningitis. The vast majority of infections occur in children under 5 years of age. Hepatitis B infects the liver and can cause death from liver cirrhosis and liver cancer. Prevention by vaccination is the best way to prevent death and severe health complications from these five serious diseases.

For Uganda, the WHO recommends diphtheria with whole cell pertussis, tetanus toxoid, hepatitis B, and *Haemophilus influenzae type* b vaccination at 6, 10, and 14 weeks of age.[11] There are catch-up immunization schedules. However, children should be vaccinated as soon as possible per immunization schedule. It is also important to complete all doses of the vaccine for the most effective protection against the five diseases. Diphtheria, pertussis, tetanus, hepatitis B, and *Haemophilus influenzae type* b vaccination, and receiving of the third final dose of the series, is another measure of access to child health services.

HIV

In 2011, the HIV prevalence rate in Uganda was 7.3%. Women are the dominantly affected gender with an HIV prevalence of 8.3% compared to men with a rate of 6.1%. In 2008, approximately 42% of HIV-infected individuals needing treatment had access to anti-retroviral therapy.[3] This worldwide commitment to combating the HIV/AIDS epidemic helped dramatically increase services towards the prevention, care, and treatment of HIV in the developing world. However, such disease-specific initiatives can amount to over half of sub-Saharan African countries' total health budgets.[2] The international community has recognized and celebrated these successes but is now pushing for continued scale up of HIV services in hopes of eventual universal access. Such disease-specific initiatives have led to growing concern regarding the impact on the health systems in these countries for other non-HIV services.

Health Care

Uganda has a structured health care service delivery system that provides access to health care services to the rural population.[12] Various health care services are provided depending on the surrounding population (Table 2).[13] For example, Village Health Team members are community health workers that volunteer at the Health Centre I level and provide basic care to populations in rural areas.

Table 2: Levels of health service delivery in Uganda

Infrastructure level	Administrative level	Target population	Services provided
Health Centre I	Village	1000	Community-based preventive and promotive health services. Village Health Team Members or similar status.
Health Centre II	Parish	5000	Preventive, promotive, and outpatient curative health services. Outreach care.
Health Centre III	Subcounty	20 000	Preventive, promotive, outpatient, curative, maternity, inpatient services, and laboratory services.
Health Centre IV	County	100 000	Preventive, promotive, outpatient, curative, maternity, inpatient services, laboratory services, emergency surgery, and blood transfusion services.
District	General hospital	500 000	HC IV capability as well as in-service training, consultation, and research for community-based health care programs.
Regional	Regional referral hospital	2 000 000	General hospital capabilities as well as specialist services. Such specialties include psychiatry, otolaryngology, ophthalmology, dentistry, intensive care units, radiology, and pathology.

Although medical care is technically free to see a government physician in Uganda, fees for medications and diagnostic tests are common. As a result, poorer people often wait until their diseases are advanced to seek medical attention. Uganda has a high burden of infectious diseases, including HIV/AIDS, TB, and malaria, along with many of the neglected tropical diseases. One of the major challenges the Ugandan health sector faces is a severe shortage of health care workers, especially in rural areas. Currently, 70% of all doctors in the country practice in urban areas, despite the fact that these areas are home to only 27% of the population.[3]

One study of six general clinics in urban Kampala found that the institution of HIV/AIDS Initiatives has positive effects not only on HIV/AIDS services, but also on many other essential child health services. In particular, immunization, child skin disease, and child malaria rates improved.[14] The WHO states that in Uganda, there is an overall trend towards better child health indicators in most areas but they still remain lower than both the regional and global averages.[7]

Maternal Health

The antenatal care (ANC) visit is comprised of tetanus toxoid vaccination, screening and treatment for infections, and identification of warning signs during pregnancy.[11] On a global scale, the WHO states that from 2000-2008, less than half of pregnant women received four antenatal care visits although 78% had at least one visit.[15] In Uganda, only 47% of pregnant women received four ANC visits during this same time period.[14]

Antenatal care visits with trained health providers are considered a good way to prevent, detect, and treat maternal and newborn health problems. In Uganda, four ANC visits are expected during a woman's pregnancy.[5] Calculating the attendance of the fourth ANC visit is a good measure of how many pregnant women are seeking the full spectrum of ANC services from trained health providers. This in turn measures how healthy pregnant mothers and newborns are. Maternal deaths measure maternal mortality during delivery.

During pregnancy, women have a weakened immune system and are more susceptible to malaria. Malaria parasites are also prone to infecting the placenta. If a pregnant woman becomes infected with malaria, the ability of the placenta to deliver nutrients to the fetus is compromised. Malaria affects both the mother and fetus. Malaria in pregnancy can cause maternal anemia, premature delivery, fetal demise, intrauterine growth retardation, and delivery of a low birth-weight infant, a risk factor for death.[16]

In Uganda, malaria is a leading cause of morbidity and mortality. It mainly affects children under the age of five years and pregnant women.[7] In select African countries such as Uganda with a high burden of disease from malaria, intermittent preventive treatment has been scaled up in recent years.[16] Intermittent preventive treatment, second dose (IPT2) is the empirical administration of a complete course of the anti-malarial medication sulfadoxine-pyrimethamine

during ANC visits to prevent malaria in pregnancy. IPT2 is a marker of access to ANC services and maternal child health.

Family Planning

Family planning is an important measure of access to maternal health services and of the general well-being of families. Many Ugandan women prefer greater birth spacing intervals or would like to delay their first pregnancy.[17] For poor families, the more children that are born, the more resources such as food, money, and maternal time, are divided amongst all the children. Ugandan men are often the primary wage earners or only source of income for the family unit. There are multiple family planning methods available in Uganda such as condoms, oral contraceptives, intrauterine devices, and injectables.[5] Injectables are an effective and often popular form of family planning in developing countries because they can be administered every three months and do not function on a per sex act or daily basis.

Research Objectives and Questions

This quantitative study examines the distribution and patterns of maternal child health indicators after the institution of PEPFAR and other GHI in Uganda over the time period of 2006-2010.

The specific objectives of this study are: (i) to study the distribution of maternal child illness among women and children in Uganda at the national level from 2006-2010; (ii) to study the patterns of maternal child illness among women and children in Uganda at the national level during the time period 2006-2010.

To this end, this study researches the following questions during 2006-2010:

(1) How has the number of antenatal care fourth visits and maternal deaths changed?

(2) How has the number of intermittent preventive treatment, second dose administration changed?

(3) How has the number of pediatric outpatient visits changed?

(4) How has the number of measles and diphtheria with whole cell pertussis, tetanus toxoid, hepatitis B, and *Haemophilus influenzae type* b, third dose vaccinations changed?

(5) How has the number of total and injectable family planning methods in new and repeat users changed? How has the percentage of injectables in new and repeat users changed?

METHODS

Study Design

The data source in this study was the monthly Health Management Information System 123 (HMIS123) data forms from 112 Uganda districts (Figure 1).[14] The data was collected from district health offices by the Uganda Health Systems Strengthening Study (UHSSS) which is a collaboration between the University of Washington, Makerere University, Ministry of Health, and CDC. The UHSSS collected the data to assess the impact of PEPFAR on non-HIV health system services. Data was abstracted by individuals with previous exposure to the health sector in Uganda and who were trained and deployed as abstractors. At the district level, data was

collected by sending teams to each district. The teams then identified the paper forms, copied, and double-entered the data into a computer. The electronic data was cleaned by a biostatistician. This researcher then used the data variables related to maternal child health for analysis.

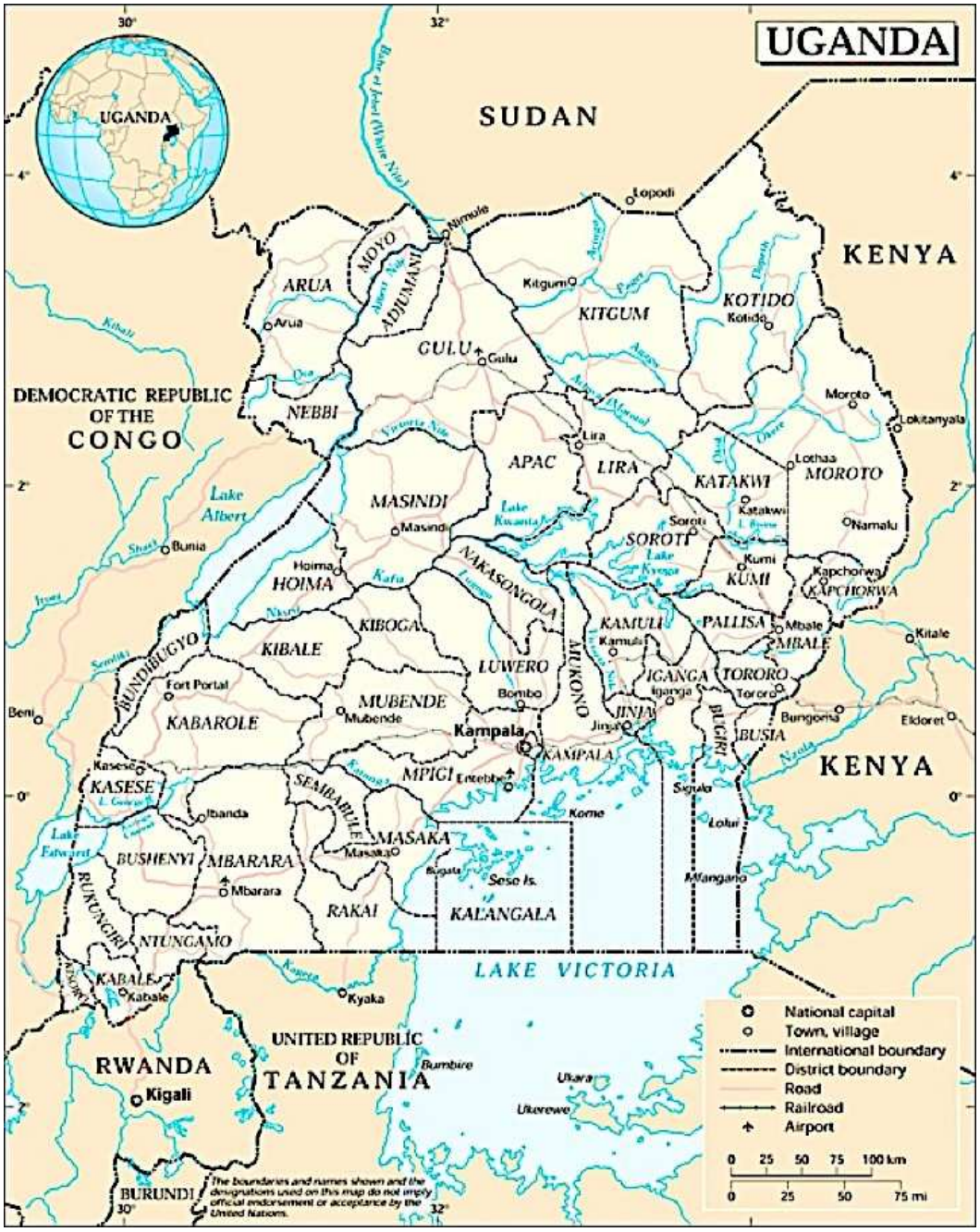
The Uganda Ministry of Health collects the HMIS data for its own administrative purposes. The existing national HMIS database includes most government and some private not-for-profit clinical facilities. This study design therefore excludes non-reporting clinics and private for-profit facilities not traditionally known to report through the HMIS. Included in this analysis are data from January 2006 to December 2010. The level of analysis is at the national level. Utilizing a data source that already exists allows for better quality and feasibility of data collection.

The output measures focus on easily quantifiable and important indicators of primary health care services. Pediatric outpatient visits are measured as the number of outpatient client visits reported to HMIS monthly between January 2006 to December 2010. Antenatal care is measured by the number of pregnant women attending their fourth ANC visit and number of intra-partum malaria prophylaxis second doses given. Child health is measured by the number of measles immunizations given to children under age one year and number of DPT3 immunizations given to children under age one year. Family planning service utilization is measured by the total number of family planning visits, including new and revisits.

Data Analysis

Data was compiled onto an Excel spreadsheet (Microsoft Excel, Microsoft Corporation, Redmond, WA). Analyses were conducted using Stata software (StataIC 12, Stata Corporation,

Figure 1: Map of Uganda showing district divisions[14]



College Station, TX). The data used in this thesis includes information related to maternal child health. In particular, maternal health data include the number of ANC fourth visits, maternal deaths, and IPT2 administrations. Child health markers include the number of pediatric outpatient visits and measles and DPT3 vaccinations. Family planning indicators include the number of total and injectable contraceptive use in new and repeat users of family planning methods.

With a large study involving numerous facilities over multiple years, missing data is inevitable. Instead of eliminating the districts with missing monthly data from all study analyses, the missing monthly data were imputed by the original researchers using a maximum likelihood algorithm. The maximum likelihood algorithm is built on the assumption that the observed annual data contain information that can be used to infer probable values for the missing monthly data. SPSS software: Missing Values add-on module (SPSS, IBM, Armonk, NY) was used to compute the missing data.[18]

Ethical concerns include research on human subjects, informed consent, and possible adverse events for research participants. As a large research project that is observing data distribution and patterns from a pre-existing government database, human subjects are not harmed and do not experience adverse events caused by this research project. Institutional Review Board approval was obtained by the original researchers but not by this researcher since this project involves secondary data analysis. The researchers have received permission from the Uganda Ministry of Health for the University of Washington and CDC to use this data for the research purposes previously agreed upon.

RESULTS

Maternal Health

Table 3 displays the ANC 4th visits and maternal deaths from 2006 to 2010. Trends of both are graphed in Figures 2a and 2b showing a decrease in the ANC 4th visit and an increase in number of maternal deaths.

Table 3: Number of antenatal care fourth visits and maternal deaths in Uganda, 2006-2010

Year	ANC 4th visits	Maternal deaths
2006	625 623	1020
2007	606 387	1018
2008	586 773	1269
2009	497 623	1212
2010	481 957	1181

Figure 2a: Annual trend of antenatal care fourth visits in Uganda, 2006-2010

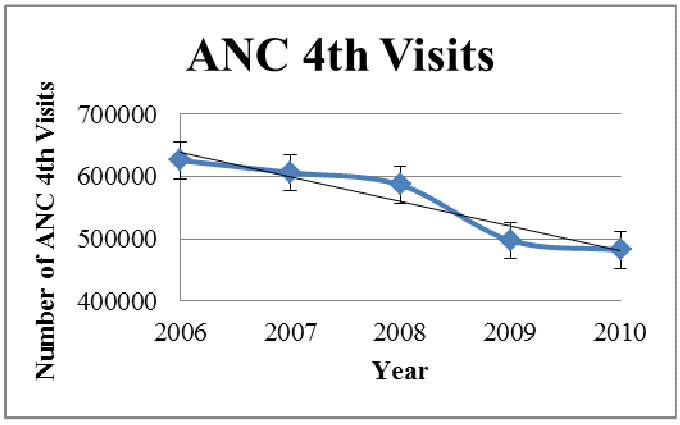
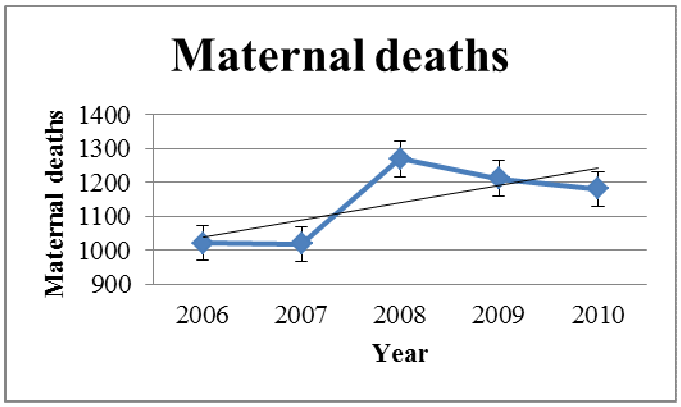


Figure 2b: Annual trend of maternal deaths in Uganda, 2006-2010



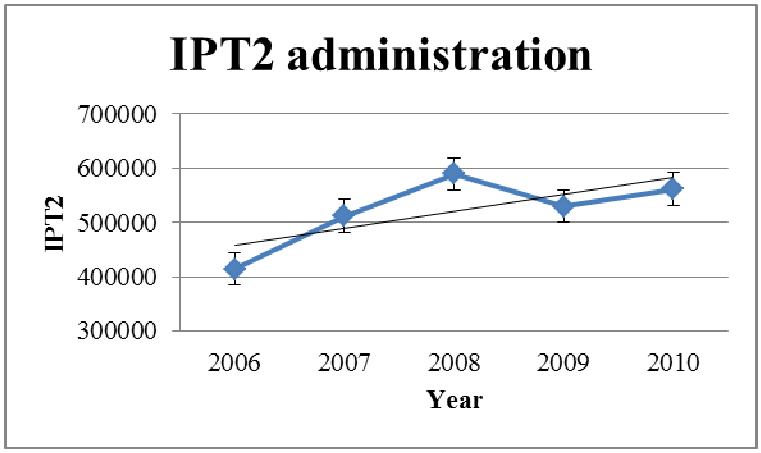
Malaria Intermittent Preventive Treatment in Pregnancy

Table 4 and Figure 3 show an increase in intermittent preventive treatment for malaria in pregnancy in Uganda from 2006 to 2010.

Table 4: Intermittent preventive treatment for malaria in pregnancy in Uganda, 2006-2010

Year	IPT2 administration
2006	413 990
2007	512 005
2008	588 828
2009	529 275
2010	561 466

Figure 3: Annual trend in intermittent preventive treatment for malaria in pregnancy in Uganda, 2006-2010



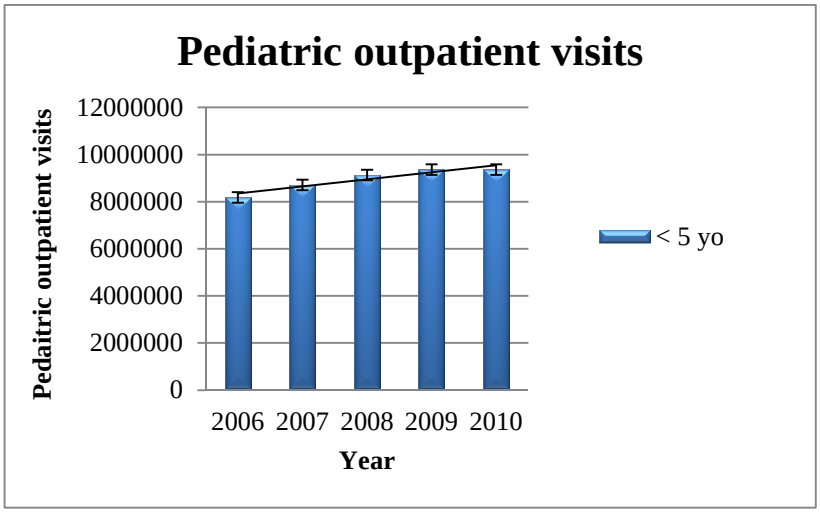
Pediatric Outpatient Visits

Table 5 and Figure 4 show an increase in pediatric outpatient visits during the same time period.

Table 5: Number of pediatric outpatient visits in Uganda, 2006-2010

Year	Age
	< 5 yo
2006	8 188 309
2007	8 709 920
2008	9 137 353
2009	9 363 831
2010	9 370 105

Figure 4: Annual trend of pediatric outpatient visits for children ages less than five in Uganda, 2006-2010



Childhood Immunizations

Table 6 and Figures 5a and 5b show an increase in the number of pediatric immunizations from 2006 to 2010.

Table 6: Measles and DPT3 vaccine administration in infants and 1 to 4 year old children in Uganda, 2006-2010

Year	Measles vaccine		DPT3 vaccine	
	< 1 yo	*1 to 4 yo*	*< 1 yo*	*1 to 4 yo*
2006	917 170	154 532	856 039	60 786
2007	999 088	133 937	980 650	57 976
2008	1 044 891	97 022	1 062 148	55 393
2009	1 004 438	83 980	1 042 701	46 534
2010	1 071 267	75 790	1 135 567	51 809

Figure 5a: Measles vaccine administration in infants and 1 to 4 year old children in Uganda, 2006-2010

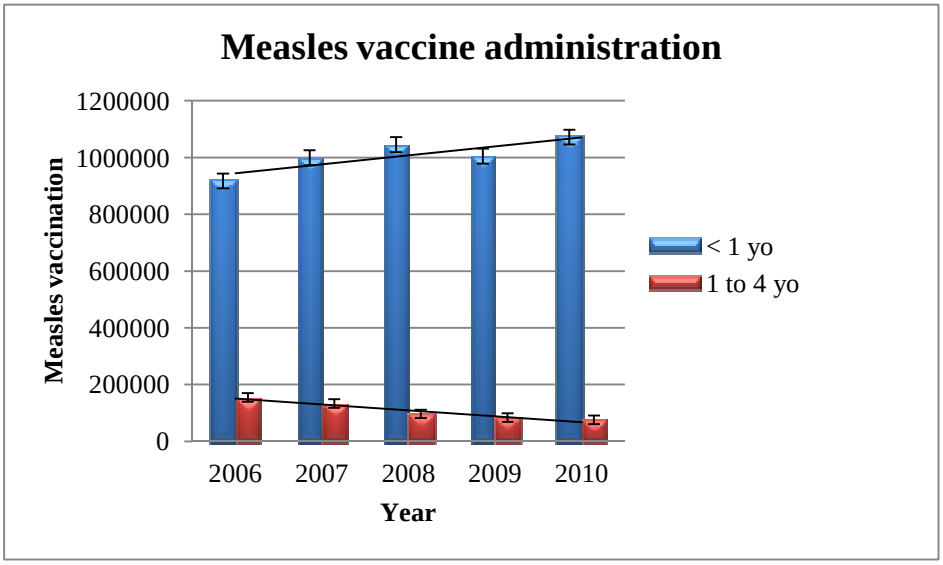
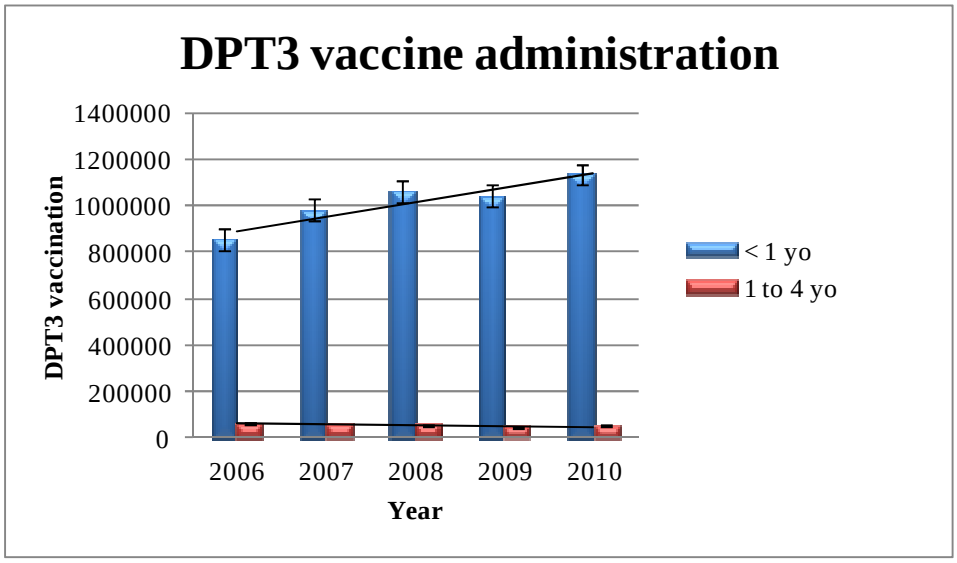


Figure 5b: DPT3 vaccine administration in infants and 1 to 4 year old children in Uganda, 2006-2010



Family Planning

Table 7 and Figures 6a and 6b show the changes in users of family planning methods over the period 2006 to 2010. As shown in Table 7 and Figure 6a, for both new and repeat users, there is an increase in family planning methods overall and in injectables. Figure 6b shows a slight decrease in percent injectables for new and repeat users.

Table 7: Family planning total and injectable methods for new and repeat users in Ugandan women, 2006-2010

Year	Family planning total methods		Family planning injectables		% Injectable family planning	
	New users	*Repeat users*	*New users*	*Repeat users*	*New users*	*Repeat users*
2006	444 634	431 349	156 072	205 934	35.10%	47.74%
2007	808 362	555 544	196 358	239 471	24.29%	43.11%
2008	795 769	666 282	210 808	266 429	26.49%	39.99%
2009	726 775	527 115	211 576	262 648	29.11%	49.83%
2010	673 584	616 339	212 712	247 468	31.58%	40.15%

Figure 6a: Annual trend for family planning total and injectable methods for new users and repeat users in Ugandan women, 2006-2010

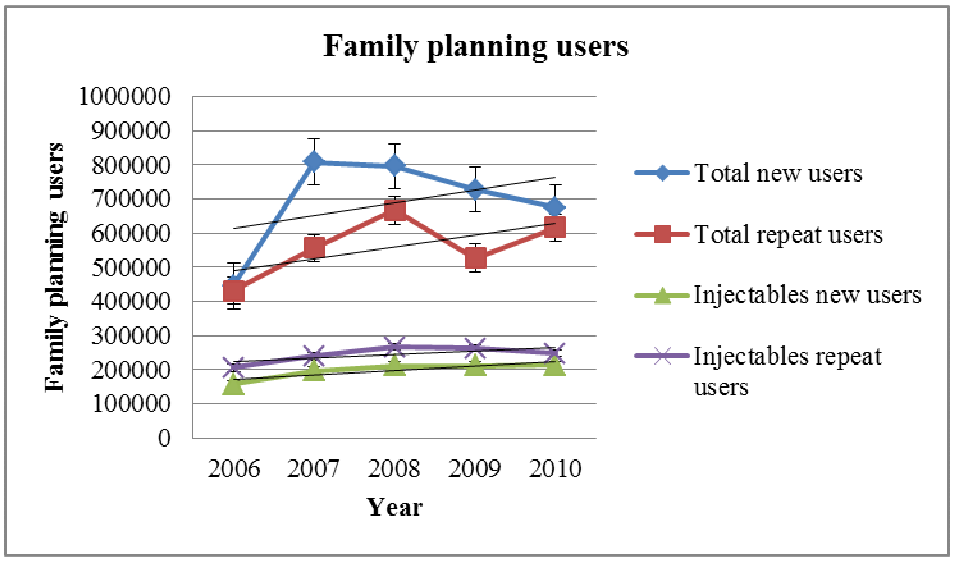
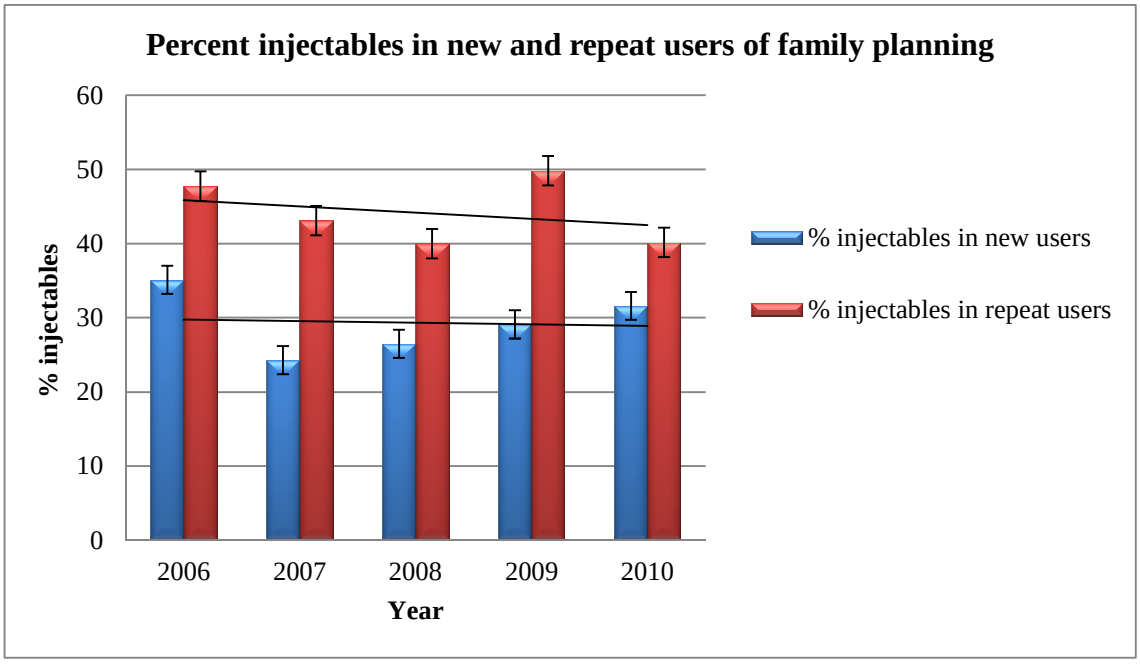


Figure 6b: Family planning percent injectables of total new and repeat users in Ugandan women, 2006-2010



DISCUSSION

This study looked at Ugandan women on a national scale who received ANC services from 2006-2010 (Table 3). There has been a decrease in fourth ANC visits in 2009 and a rise in maternal deaths in 2008 (Figures 2a and 2b). ANC services can be associated with better maternal and newborn health outcomes.

In Uganda, the pediatric outpatient visit includes a well-child examination, immunizations, and preventative health services.[11] Regular outpatient visits help prevent inpatient or emergency department visits. There is an increasing trend in pediatric outpatient visits in children under five years of age (Table 5). This data shows that pediatric outpatient services are steadily increasing on a national scale in Uganda.

Trends in childhood diseases such as measles, diphtheria, pertussis, tetanus, hepatitis B, and *Haemophilus influenzae type* b help delineate access to child health services. Both measles and DPT3 vaccine administration are increasing in Ugandan infants (Table 6). There is a significant decrease in measles vaccination in the one to four years of age group (Figure 5a). This may be due to the increase in measles vaccination in infants, the WHO recommended age group. DPT3 vaccine administration is increasing significantly in the infant age group (Figure 5b). More infants are therefore protected against diphtheria, pertussis, tetanus, hepatitis B, and *Haemophilus influenzae type* b during the WHO recommended age group of infants. Access to child health services during the most vulnerable time period, those under the age of five, is increasing on a national scale in Uganda.

A popular and effective form of family planning in sub-Saharan Africa is the injectable progestin-only contraceptive depot medroxyprogesterone acetate (DMPA, Depo Provera). In Uganda injectables can be administered at all levels of health service delivery, including the Health Centre I level with Village Health Team Members (Table 1). The popularity stems from the simple re-injection schedule every three months and their suitability for discreet use.[10] From 2006-2010, there is an increase in family planning methods overall and in injectables for both new and repeat users (Table 7, Figure 6a). However, the percent injectables for both new and repeat users are slightly decreased after the five years of the study overall (Figure 6b).

Limitations

The data used in this project is based on secondary data analysis. This project was chosen for thesis analysis because the original project contains a vast amount of data collected over a five year time period. The data used for this project includes maternal child health indicators.

However, secondary data analysis is limited by what available data exists from the large original dataset for subset analysis. This researcher had no control over the quality of the data as this researcher did not design, collect, or aggregate the original data. However, secondary data analysis allows the task of original design for more experienced researchers. The student can then focus their efforts on analyzing and constructing the thesis using a subset of data of interest from the original data source.

Missing data is another limitation of a large study with data collected from multiple facilities and over many years. A reputable software module was used to infer missing data values. This is a limitation since some of the data are inferences. However, instead of eliminating data from an entire district with some missing data, including some inferred data allows for more useful overall analyses. Another limitation is adjustment for confounders such as socioeconomic status, population growth, economic changes, social disruption, or education. The absence of robust data on confounders limits this evaluation.

Although the data collectors and abstractors were trained to be objective in conducting their data collection and abstraction, there might have been a tendency to observe desired results. Data reporters might have preferred to see better health outcomes and might therefore have been more likely to report positive data. This would affect the results and conclusions of the study. However, with multiple facilities and personnel involved over multiple years, there is higher likelihood of collection of more objective data overall.

As a follow-up to this thesis project, more maternal child health indicators in Uganda could be analyzed. The WHO recommends using eleven indicators of maternal child health. Other maternal health indicators include measuring the number of skilled attendants at birth and the number of mothers who exclusively breastfeed for six months. Important child health

indicators include measuring the number of children under five who are stunted and number of children who receive antibiotic treatment for suspected pneumonia.[19]

CONCLUSION

Since antenatal care is associated with better maternal and newborn health outcomes, more effort towards four antenatal care visits for pregnant women needs to be made to decrease maternal mortality. The observed decrease in ANC fourth visits and increase in maternal deaths, suggests that there needs to be more effort and resources placed towards ensuring pregnant women are attending all four ANC visits.

The trend in pediatric outpatient visits is positive annually and should continue to ensure children in Uganda have access to basic medical and preventative health services. Routine vaccinations are an incredibly effective public health measure for children. The increase in measles and DPT3 vaccination in their respective age groups shows continued improvement in child health services and protection from these vaccine-preventable diseases. In regards to family planning, the overall increase in contraceptive usage in Uganda is promising, however, more scale up of injectables in proportion to total contraceptive usage in new and repeat users needs to be operationalized.

In the realm of non-HIV maternal and child health services in Uganda after the institution of PEPFAR and other GHI, child health and family planning services have seen improvement. Maternal health, in particular, the number of pregnant women attending all four ANC visits is declining. This may be related to the observed increase in maternal deaths as well. Women have the highest prevalence of HIV in Uganda and are the foundation of Ugandan society as they are

the primary caretakers of children. Both HIV and non-HIV health services should always allocate adequate resources for maternal health.

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