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HEALTH NEEDS ASSESSMENT FOR MEKELLE CITY, ETHIOPIA

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NB: This needs assessment was initially researched and prepared by Genessa Giorgi and Kripa Krishnan. It was reviewed by MCI Co-Director Susan Blaustein and former UNDP consultant Brian Lutz, who initially developed the health needs assessment model for the UNDP. Section III (“Results from the UNDP Costing Model”), the Conclusion and Recommendations were written by MCI Social Sector Research Manager Mourié Maoulidi, who also revised and updated the report, together with MCI summer intern, Anna Chang, MCI Coordinator, Paulo Cunha and Ms. Aberash Abay, MCI Social Sector Specialist in Ethiopia. Mr. Tesfu Weldegerima, of the Geographic and Information System Department at the Tigray Bureau of Finance and Economic Development (BoFED), assisted with mapping. Finally, MCI would like to thank the Center for National Health Development in Ethiopia (CNHDE), our invaluable partner in Mekelle, and Dr. Awash Teklehaimanot, the Country Director for all of our work in Ethiopia.

Map 1. Map of Ethiopia showing Mekelle



Source: Courtesy of Macalester Geography, Addis Ababa 2006.

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List of Acronyms and Abbreviations

ADCS	Adirat District Catholic Service
ADD	Acute Diarrheal Disease
AIDS	Acquired Immune Deficiency Syndrome
ANC	Antenatal Clinic(s)
ARI	Acute Respiratory Infection
ART	Antiretroviral Therapy
BoFED	Tigray Bureau of Finance and Economic Development
CBHRA	Community-based Reproductive Health Agents
CBO	Community-Based Organization
CBR	Crude Birth Rate
CCE	Community Conversation Enhancers
CDR	Crude Death Rate
CFS	Child Friendly Schools
CHA	Community Health Agents
DERG	The Coordinating Committee of the Armed Forces, Police, and Territorial Army
DOTS	Directly Observed Treatment, Short-course
DPT	Diphtheria-Pertussis-Tetanus (vaccine)
EARC	Ethiopian AIDS Resource Centre
ECD	Early childhood development
EMIS	Education Management Information Systems
EPRDF	The Ethiopian People's Revolutionary Democratic Front
ETB	Ethiopian Birr
FDI	Foreign Direct Investment
FGAE	Family Guidance Association of Ethiopia
FGM/C	Female Genital Mutilation/Cutting
FMOH	Federal Ministry of Health
GDP	Gross Domestic Product
GER	Gross Enrollment Rate
HAPCO	HIV/AIDS Prevention and Control Office
HBC	Home-based Care
HBS	Household Budget Survey
HC	Health Center
HEP	Health Extension Program
HEW	Health Extension Worker
HIV	Human Immunodeficiency Virus
HMIS	Health Management Information System
HSDP	Health Sector Development Programme
HSDP III	Health Sector Development Department Head, III
HSEP	Health Service Extension Program
ILO	International Labour Organization
IMR	Infant Mortality Rate
ITNs	Insecticide-Treated [bed] Nets (not necessarily long-lasting)
LGAs	Local Government Authorities
MBB	Marginal Budgeting for Bottlenecks
MCI	Millennium Cities Initiative

MDGs	Millennium Development Goals
MdM	Medecins du Monde
MMR	Maternal Mortality Rate
MOE	Ministry of Education
MOH	Ministry of Health
MVP	Millennium Villages Project
MZHO	Mekelle Zonal Health Office
NFE	Non-Formal Education
NFS	Non-Formal Schools
NGOs	Non-Government Organizations
NHA	National Health Account
NHC	Nucleus Health Center
ORS	Oral Rehydration Therapy
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
OVC	Orphans and Vulnerable Children
PEPFAR	U.S. President's Emergency Plan for AIDS Relief
PLWHA	People Living with HIV/AIDS
PHCU	Primary Health Care Unit
REST	Relief Society of Tigray
RHB	Regional Health Bureau
TB	Tuberculosis
TPLF	Tigrayan People's Liberation Front
TRHB/THB	Tigray Regional Health Bureau
TT+	Tetanus Toxoid vaccination
TTBA	Trained Traditional Health Birth Attendants
U5s	Under Five Years Old
U5MR	Under Five Mortality Rate
UHEP	Urban Health Extension Program
UN	The United Nations
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
UN-HABITAT	United Nations Human Settlements Programme
VCT	Voluntary Community Testing
WHO	World Health Organization

Executive Summary

In 2008, the Earth Institute designated Mekelle, Ethiopia, as a Millennium City. The Millennium Cities Initiative (MCI) is working in collaboration with the municipal government of Mekelle, the regional government of Tigray, the Ethiopian federal government and numerous non-governmental and community-based organizations to support an Integrated City Development Strategy aimed at achieving the Millennium Development Goals (MDGs) by the universally embraced target date of 2015. In health, these include: reducing by two-thirds the mortality rate of children under five (MDG4); reducing by three-quarters the maternal mortality rate, or MMR (MDG 5), and reversing the spread of HIV/AIDS, tuberculosis (TB), malaria and other major infectious diseases (MDG 6).

To best capture Mekelle's progress and trends in meeting the city's needs for health infrastructure, human resources, drugs and equipment and those support systems aimed directly at achieving these three MDGs, the MCI has carried out this needs assessment and costing exercise, using a model initially developed by the United Nations Millennium Project, now administered by the United Nations Development Programme (UNDP), and applied here for the first time in a municipal context.¹

The City of Mekelle, like the region of Tigray and Ethiopia as a whole, has extraordinary leadership in the field of public health. Within the city of Mekelle, there are public hospitals, public health centers, clinics and a number of private health facilities. Recent improvements in both facility and service provision have included the construction of Mekelle's new referral hospital and the introduction of a new health program through which nurses and community health workers are able to conduct home visits, as part of an effort to reduce infant and maternal mortality.

However, there are still substantial deficiencies in Mekelle's municipal health system that challenge the city's ability to meet the MDGs in health. These include: a lack of skilled professionals at primary health facilities; an inadequate budget for emergency obstetric equipment, as well as the most basic health care supplies (e.g., antibiotics, gloves, soap), and a lack of coordination between non-governmental organizations (NGOs), community-based organizations (CBOs) and those government entities working on health issues.

In recent years, tremendous progress has been made in Ethiopia and in Tigray towards attaining the health-related MDGs. With a united focus, the health professionals, governmental workers, non-governmental actors and community members can work together to make Mekelle a healthier city. HIV/AIDS, TB, upper respiratory infections and malnutrition are the city's major health challenges; the prime causes of child morbidity and mortality are pneumonia, diarrhea and malnutrition. To accelerate the reduction in maternal mortality, improved access to antenatal care and health facilities staffed with skilled birth attendants are essential.

Yet these challenges are in no way insurmountable. Indeed, through the research undertaken for this needs assessment, MCI has found that MDGs 4, 5 and 6 can be accomplished in Mekelle, at relatively low cost -- particularly when compared to the heavy financial burden of treating those suffering from the grave and debilitating diseases mentioned above.² The total estimated annual

¹ A costing model that accompanies this narrative report is available at <http://www.earth.columbia.edu/mci/?page=news>

² Not to mention the opportunity cost created by the inability of those stricken to participate fully in the work force.

cost to achieve the MDGs in health during the period between 2010 and 2015 is approximately USD 30 per capita. An additional estimated one-time expenditure of USD 353,684 is needed during this five-year period, to purchase ambulances and build latrines in hospitals and health centers.

A five-year, USD 30 annual per-capita investment in the health of the population of Mekelle would result in a multifold return, in significantly increased productivity, heightened ability to learn, enhanced family life and diminished health care costs, with the ability to focus instead of furthering economic development. Such momentous results, anticipated by numerous economists and health care finance experts, could make the modest city of Mekelle a model of how to rapidly improve public health and the quality of life in similarly under-resourced urban settings; the return would seem well worth the risk.

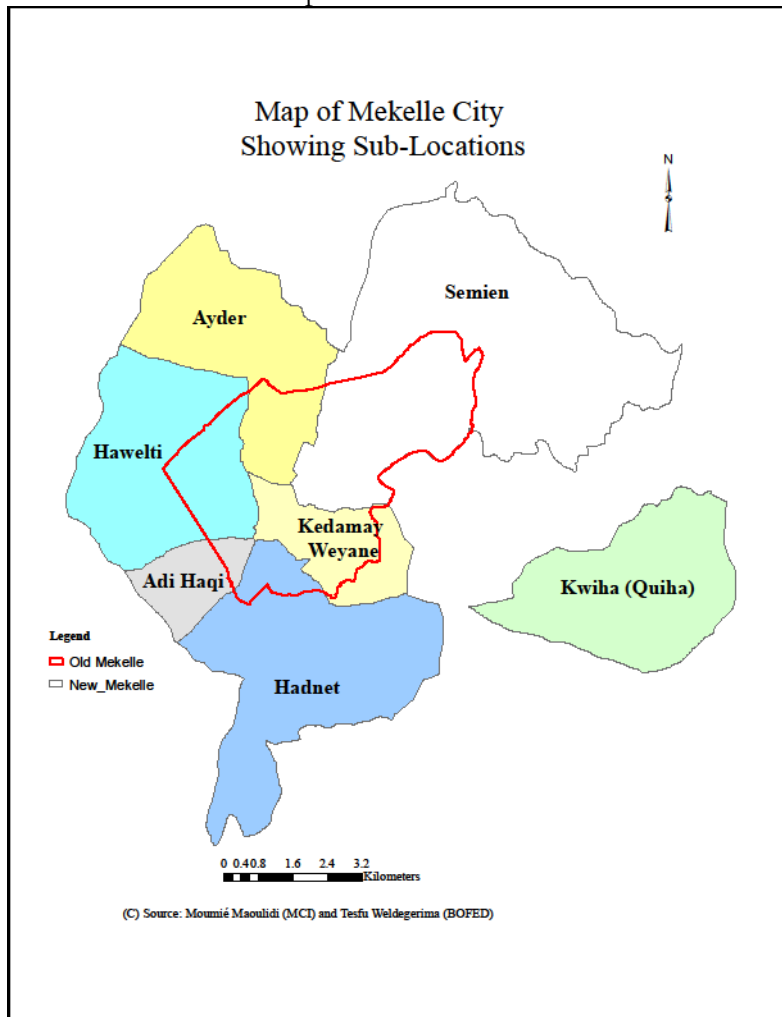
This needs assessment is divided into three sections. Part I presents general information about Mekelle and outlines the health assessment methodology and limitations; Part II describes Mekelle's health facilities and services, as well as current capacities in the local health sector and analyzes specific issues that need to be addressed. Part III identifies budgetary needs, presents results from the costing model and offers some recommendations.

I. Introduction

The densely populated, ethnically rich East African country of Ethiopia faces a number of complex health challenges. These include high maternal and child mortality rates, a high HIV prevalence rate (13.3 percent in 2005³), infectious and communicable diseases and ill-equipped health facilities. In recent years, the maternal and under-five mortality rates have declined but are still among the highest in developing countries. Mekelle is a mid-sized city in northern Ethiopia.⁴ As the capital of Tigray region, Mekelle is a politically important city, containing most of the region's major health facilities and hosting many international health-related programs. Many people from nearby villages travel to Mekelle to utilize its health facilities; thus, Mekelle's health facilities serve a population larger than Mekelle's municipal population.

In 2008, the city consisted of seven local administrative areas. Map 2 shows these areas followed by Map 3 which shows Tigray Regional State Administrative Division by a) Zone, b) Woreda (district)

Map 2. Mekelle Administrative Map



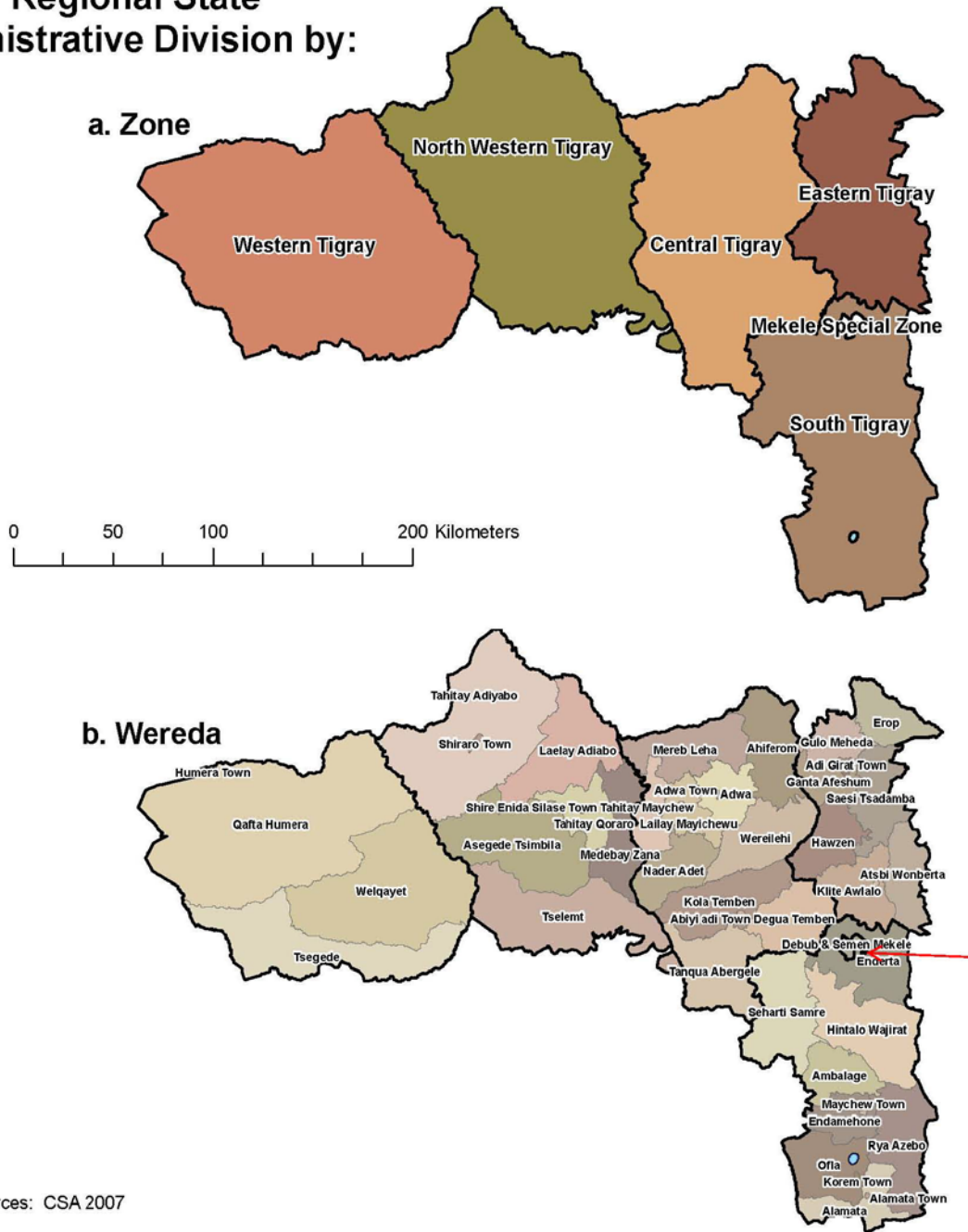
(C) Source: Moumié Maoulidi (MCI) and Tesfu Weldegerima (BOFED).

³ According to UNAIDS projections, the HIV prevalence in urban areas of Tigray region in 2008 was 10.7 percent.

⁴ Mekelle can also be spelled as Me'kelle, Mekele, and Meqelle.

Map 3. Map of Tigray Regional State Administrative Division by a) Zone, b) Woreda

Tigray Regional State Administrative Division by:



Data sources: CSA 2007

Source: Central Statistical Agency (CSA), 2007.

1.1. Objectives

This needs assessment examines the state of Mekelle’s public health system. The objective is to determine what is needed to achieve the three health-related MDGs: the reduction of child mortality (MDG 4), improvements in maternal health (MDG 5) and the reduction in rates of infection for HIV/AIDS, malaria, tuberculosis (TB) and other diseases (MDG 6). Each MDG is associated with a number of targets so as to provide a consistent method of measuring progress. Table 1 lists the health-specific MDGs and their relevant indicators.

Table 1. Health-specific MDGs and their indicators

Goal	Indicator
4. Reduce child mortality	4.1. Under-five mortality rate
	4.2. Infant mortality rate
	4.3. Percentage of 1-year-old children immunized against measles
5. Improve maternal health	5.1. Maternal mortality ratio
	5.2. Percentage of births attended by skilled health personnel
6. Combat HIV/AIDS, malaria and other diseases	6.1. Percentage of current users of contraception who are using condoms
	6.2.A. Condom use at last high-risk sex
	6.2.B. Percentage of population aged 15-24 years with comprehensive correct knowledge of HIV/AIDS
	6.2.C. Contraceptive prevalence rate
	6.3.A. Percentage of population in malaria-risk areas using effective malaria prevention and treatment measures
	6.3.B. Percentage of children under five sleeping under ITNs ⁵
	6.3.C. Percentage of children under five who are appropriately treated

It needs to be noted that, since 1998 (1990 E.C.⁶), Ethiopia has been implementing Health Sector Development Programmes (HSDP). The third phase (HSDP III), currently being implemented, will end in 2010 (2003 E.C.). One of the major policies of HSDP III is the decentralization of health services and health policy. Local administration and officials are responsible for implementing public health services, whereas the federal government is responsible for setting health standards, conducting policy analysis, producing guidelines, translating how laws and rules are implemented and supporting the regional health bureaus and *woreda* health offices.

1.2. Methodology

In order to examine Mekelle’s health system, qualitative and quantitative data were collected from all organizations working on health issues in Mekelle. Interviews, questionnaires and a costing tool developed by UNDP were employed in this process. The costing model uses demographic, epidemiological and health services data to determine the total costs of meeting the health-related MDGs.

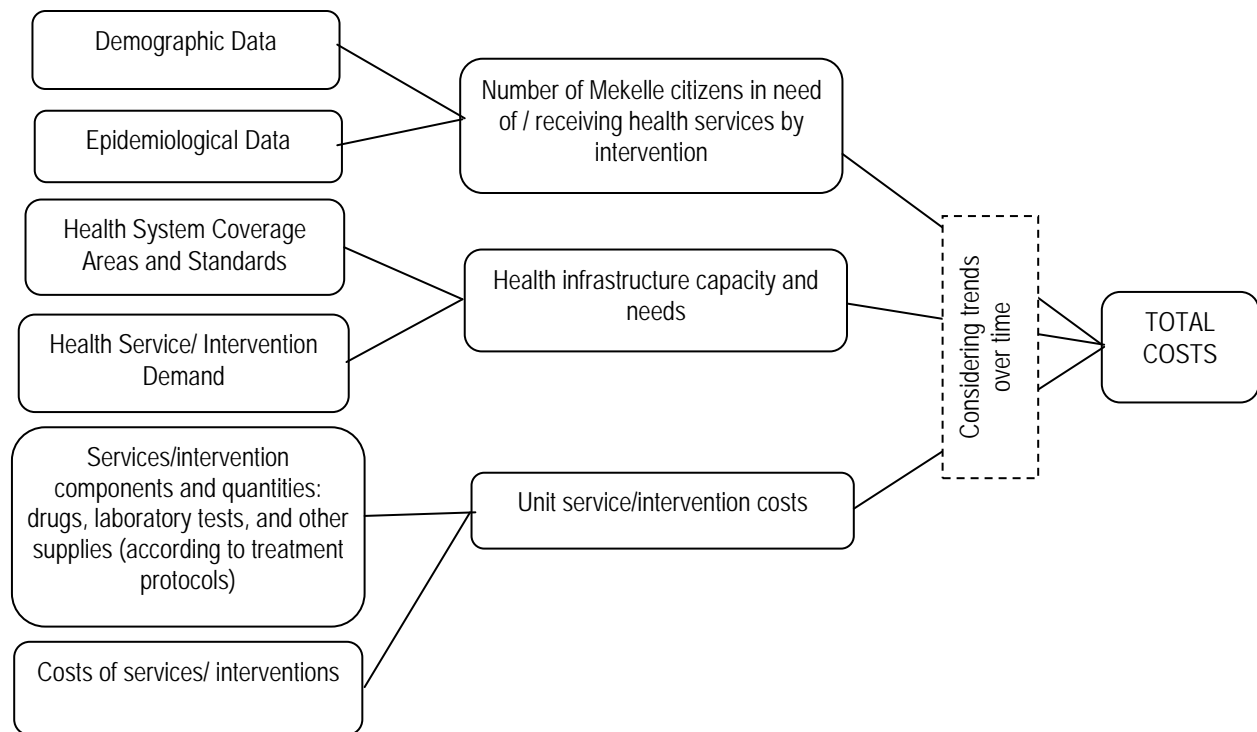
To acquire information about the cost of health goods and services in Mekelle, costs were tracked back to the purchasing source wherever possible. Finding the cost of goods and services proved

⁵ ITNs= Insecticide-treated bed nets.

⁶ E.C. stands for Ethiopian Calendar, which is set approximately eight years behind the Roman calendar. For additional details on the conversion between the Gregorian and Ethiopian calendar, see Annex 6. Throughout this report, if both dates are not given, the relevant operative calendar for a given date has been identified.

challenging, as higher levels of government (e.g., the Regional Health Bureau and even the Mekelle City Health Office) no longer keep cost records at the facility level, due to decentralization. In lieu of these records, budgets and accounting books at individual health clinics were utilized and averaged to approximate some of the costs for all the facilities. Additionally, the Federal Ministry of Health (FMOH) produced a “costing guide” that assisted with aggregate costs of many services (e.g., the cost of fully immunizing one child). All costs were verified through price checks at in-house pharmacies of the major health centers in the city. Finally, where cost information did not exist for some procedures, the cost of the service was calculated based on professional time and the costs of supplies used. Figure 1 is a schematic representation of the UNDP needs assessment methodology.

Figure 1. Health Needs Assessment Methodology
 Source: MDG Support Group, Integrated Health Model User’s Guide.



1.3. Limitations

The major limitations of this assessment are due to the completeness, accuracy and quality of the data collected, which, in turn, are limited by the reporting structure throughout Ethiopia regarding health data. The national government aggregates information from the regional health bureaus, which in turn collect data from the *woredas* (districts). The *woredas* rely on individual facilities to report data that is subject to vast gaps and variation. At the facilities, data collection is not always a high priority, and compliance varies greatly. Diagnoses themselves are not consistent, and the ICD-9⁷ diagnostic codes have not been updated to reflect the current disease burden. Some of the data called for in the model are not collected at any level of government facility.

⁷ ICD-9 coding is a numerical way of identifying medical conditions for billing and statistical purposes.

Additionally, costing data are inconsistent across facilities. Currently, supplies, treatment protocols and human resource costs vary widely between facilities, even at the same level of service. For example, diarrhea cases may be treated by a health officer, clinical nurse or junior clinical nurse, depending on the day and the facility. Such variations can result in significant human resources cost differentials.

This assessment is also limited in its degree of accuracy by the fact that the decentralization process has made financial information hard to track. Health facilities often report to many government agencies as well as to funding NGOs and CBOs. Each government agency and organization has various reporting requirements and data collection mechanisms, often resulting in confusion and duplication of services. In part because of these reporting challenges, the higher levels of government may have incomplete practical knowledge of the realities on the ground.

The government would benefit from capturing data gathered by NGOs about their activities. However, there is currently no centralized data collection process to share data collected by NGOs. The exception in this case is HIV/AIDS, which uses the HIV/AIDS Prevention and Control Office (HAPCO) as the central clearing house for organizing activities dealing with the disease.

Another limitation relates to the interviews, which were conducted in English whenever possible, always with Tigrinya and Amharic translators present, and with considerable effort taken by MCI to check and re-check the information given. It is nevertheless possible that some of the translations are incomplete and/or not completely accurate.

1.4. Demographics

Table 2. Population statistics projected for 2008

Category	2007 census	2008 projection
total population	215,546	227,505
female population	110,788	116,935
male population	104,758	110,570
under 5 child population	26,536	28,008
women in reproductive age (15-49 years)	60,998	64,382
total number of estimated pregnancies/births	10,221*	10,650*
<15 years age group	78,770	83,140

Source: Population statistics projections based on 2007 A.D. (1999/2000 E.C.) Ethiopian Census data.

* *Statistics from the Mekelle City Woreda Based Planning Tool, 2008 (2000 E.C.)*

Based on the 2007 (1999/2000 E.C.) Ethiopian Census and a growth rate of 5.4 percent, the projected total population of Mekelle in 2008 was 227,505.

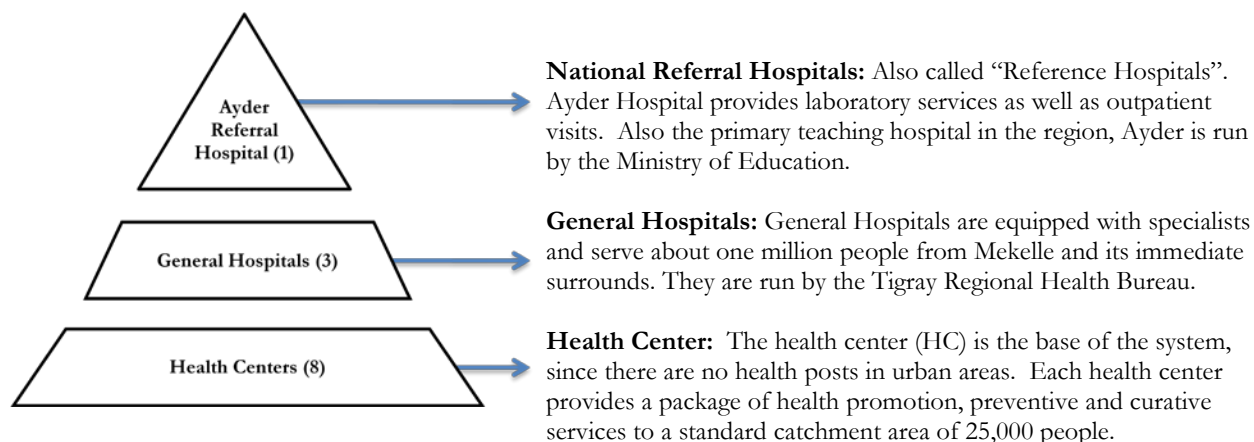
II. Data Analysis

2. Health Facilities and Services in Mekelle

The health services system in Mekelle is typical of a growing city, consisting of both public and private health care providers. In the private sector, there are for-profit clinics (low, medium, higher and specialty), as well as for-profit hospitals. A number of NGOs also run private, not-for-profit clinics that serve the general public free of cost. The majority of the city's population, however, is served by the government-owned and -operated health facilities. The Primary Health Care Units (PHCUs) are under the jurisdiction of the Mekelle Zonal Health Office (MZHO). As Mekelle is an urban center, the MZHO presently has no plans to build any satellite health posts.

Mekelle, like the rest of Ethiopia, is in the process of realigning existing health facilities to match the new Health Facilities Infrastructure Plan set out by the national government in the HSDP III. To accomplish this, and to meet demand, Mekelle plans to upgrade, as well as build, additional health Centers (HCs). These plans are constrained largely by budgetary approval from the regional health bureau. Consequently, the MZHO is using the budget allocated for a health post to construct the basic infrastructure of a health center.

Figure 2. Structure of Health System



Source: Social Sector Review/Per III, Volume 2: Main Report: Education, Health and Generic Issues, A report prepared for MOF by the Center for the Study of African Economies, Oxford University, Addis Ababa, March 1997.

2.1. Health Facilities

Overcrowding is the foremost issue at all health centers and at Mekelle Hospital. All health centers serve catchment populations much larger than the intended population of 25,000 people; this is compounded by the fact that none of the facilities is sufficiently staffed to serve even the intended population. Mekelle Hospital is supposed to serve about one million people from Mekelle and its immediate surrounds. In reality, Mekelle Hospital patients come from throughout Tigray and even from the neighboring regions of Afar and Humera, because it is one of the only hospitals with certain areas of specialization. It has long been hoped that the opening of Ayder Referral Hospital will ease some of this demand. Now a decade old, Ayder has recently begun to launch some of its services, including laboratory services and outpatient visits.

Table 3. Available Health Facilities in Mekelle City as of 2008 (2000 E.C.)

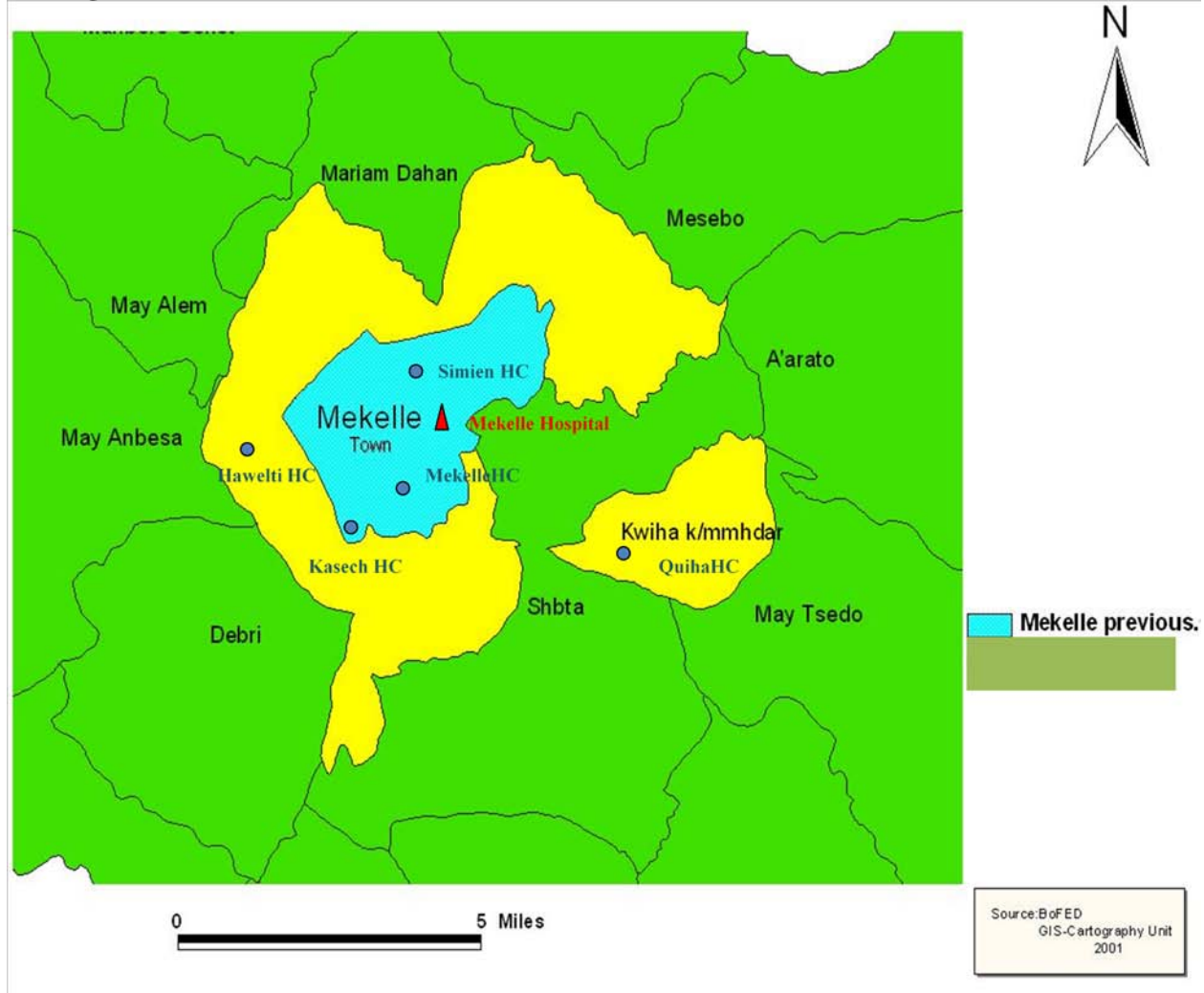
	Government	Private	Total
Health Center	8	0	8
Referral Hospital	1	0	1
General Hospital	3	2	5
Clinic	0	32	32
Dental clinics		3	3
Diagnostic Laboratories		5	5
Pharmacies		35	35
Physiotherapy center		3	3

Source: Mekelle City Administration, 2008.

The hospitals in the city fall under the jurisdiction of various governmental bodies. The Tigray Regional Health Bureau runs most hospitals, including Quiha District Hospital and Mekelle Hospital; Ayder Referral Hospital is the primary teaching hospital in the region and is run by the Ministry of Education.⁸ There is one government hospital, the Military Hospital, which is reserved for military personnel and their families and is run by the Ministry of Defense. Map 4 shows the location of some health facilities within Mekelle. The General Hospitals are Mekelle, Quiha, and Adi Shum Dhun. The health centers are Mekelle, Simien, Kasech, Quiha, Aynalem, Halwelti, Felegado and Adha.

⁸ In Table 3, “Referral Hospital” refers to Ayder.

Map 3. Distribution of Select Public Health Facilities in Mekelle



Source: Tesfu Weldegerima (BOFED) and Moumié Maoulidi (MCI).

Access to these facilities is constrained mostly by lack of transportation, though this is of course more acute for those residing outside of Mekelle. Currently the city does not charge for its health care services but will begin doing so soon, at which point, access will be further constrained by cost. It is estimated that in 2000, 32.2 percent of Mekelle residents lived below the poverty line of 92.95 ETB (USD 9.78) per month (Gebremedhin and Whelan, 2007). The combination of poverty, high levels of migration and the large informal employment sector contribute to the challenges facing Mekelle officials in their ongoing efforts to provide adequate public services.

2.2. Health Services

Primary care services are provided at health clinics and hospitals. However, many people choose to get their primary care at hospitals instead of at health clinics, leading to the underutilization of health services at the primary level and an over-utilization at the tertiary level.

Government-initiated health education and promotion activities are carried out largely by health centers. Outreach is conducted at schools, the local prison and under the auspices of various community organizations and associations (women's, youth, farmers'). Certain health activities are carried out by the Mekelle Zonal Health Office (MZHO) and health centers through campaigns such as Voluntary Community Testing for HIV (HIV-VCT) and immunizations against childhood diseases.

NGOs and CBOs also carry out a large part of the health education in Mekelle. For example, the youth associations have formed HIV/AIDS prevention clubs that promote condom usage and educate other youth about how the virus is transmitted. However, health promotion and education efforts in Mekelle are not fully documented by any one organization. Programs and campaigns carried out by NGOs and CBOs are not reported to the MZHO, so it is difficult to estimate coverage. Consequently, some services are duplicated across organizations, when collaboration would be more productive. Communication is somewhat more effective among organizations working on HIV/AIDS. The Tigray Regional HIV/AIDS Prevention and Control Office (HAPCO) acts as the secretariat for federal funding and is also attempting to coordinate the efforts of all relevant stakeholders. To this end, they organize quarterly meetings with NGOs, CBOs and government, to review progress and address challenges as they arise.

2.3. Human Resources

The government introduced a national Health Extension Program (HEP) in 2006 (1998 E.C.). The program aims to tackle major health problems and provide services in the following areas: maternal and child health, sanitation, nutrition, malaria, HIV/AIDS and TB. According to the Ministry of Finance and Economic Development, the government has also introduced a Health Extension Worker Program (HEWP) which aims to increase the number of nurses and other staff. In April 2008, 50 nurses completed a one-month training course on the health extension package, of which 10 have been deployed to Mekelle. The MZHO will first employ the UHEP workers to conduct a baseline household survey of the city.

Community health workers are also involved in rendering health services, particularly antenatal and postnatal care, and in providing health information and education to the community. The major categories of community health workers (CHWs) are Community Based Reproductive Health Agents (CBHRAs), Trained Traditional Health Birth Attendants (TTBAs), and Community Health Agents (CHAs). There is a need for a Health Management Information System specialist, as well as someone to conduct a basic survey of maternal mortality.

Table 4. Total Stock of Human Resources Based on Initial Stock and Projected Capacity

Staff	2006	2007	2008
Doctor, other specialists	1	1	1
Gynecologist/Obstetrician	2	2	2
Internal Medicine Specialist	3	3	3
Pediatrician	3	3	3
Anesthesist	0	0	0
Surgeon	5	5	5
Radiologist	1	1	1
Doctor, General Practitioner	22	21	20
Health Officer	13	12	12
Nurse, professional (BA)	14	13	13
Ophthalmic nurse	6	6	5
OR nurse	17	16	15
Anesthetic nurse	6	6	5
Nurse, clinical	139	132	125
Nurse, clinical junior (diploma)	25	24	23
Nurse, public health	0	0	0
Nurse, midwife (BA)	2	2	2
Nurse, midwife, junior	18	17	16
Health assistant	48	46	43
Health assistant, junior	14	13	13
Primary health worker	0	0	0
Primary midwife	0	0	0
Ophthalmic medical assistant	0	0	0
Laboratory technologist (BA)	9	9	8
Laboratory technician	15	14	14
Dentist	0	0	0
Dental technician (nurse and assistant)	2	2	2
Pharmacist	7	7	6
Pharmacy technician	21	20	19
Environmental health technician (BA)	1	1	1
Environmental health technician, junior	4	4	4
Radiology technician	7	7	6
Physiotherapist	0	0	0
Social worker	0	0	0
Statistician	0	0	0
Librarian	0	0	0
Administrator	4	4	4
Support Staff	159	151	143
*Supervisors	0	0	0
*Supply Loaders	0	0	0
*Drivers	0	0	0
*District Level Managers	0	0	0
Other Nurse	17	16	15

Source: Health Services and Training Department. Standards. MOH 2006 (1998 E.C.).

3. Child Health

It is estimated that as of 2008, there were 83,140 children under the age of 15 and 28,008 children under the age of five living in Mekelle (based on 1999 E.C. census data). As with the general population, children in Mekelle face significant health challenges. Once born, infants are vulnerable to infectious disease (mainly pneumonia and diarrhea) and malnutrition. Additionally, many youth do not have access to reproductive services and family planning, and therefore many start families before they would like to and are at higher risk for contracting HIV/AIDS. Finally, lack of transportation and prohibitive costs limit access to health care.

Due to the HIV/AIDS epidemic and the years of violence along the Eritrean border, it is estimated that in 2002, there were 3,000 orphans and 2,000 street children in Mekelle (Central Statistical Agency, 1994 E.C.). Orphans and street children are susceptible to nutritional deficiencies, physical, sexual and psychological abuse and intellectual stunting. In an effort to promote comprehensive child wellbeing, the Mekelle Health Office, the Tigray Health Bureau and many NGOs and CBOs have developed programs focused on child health. Some NGOs and CBOs concentrate primarily on food, education and life skills for vulnerable children, such as orphans and street children. The Mekelle Health Office also provides annual child health screenings for malnutrition, stunting, immunizations and vitamin A coverage through health outreach campaigns,⁹ which afford nurses and health officers regular opportunities to provide immunization and vitamins directly to the children in need and to refer those requiring specialty care to the health centers.

3.1. Morbidity and Mortality

As in most developing countries, the highest percentage of deaths in Ethiopia occurs before children's first birthdays. There has been a considerable effort to reduce infant and under-five mortality over the past five decades. In 1960, Ethiopia's under-five mortality rate (U5MR) was 269 per 1000 live births; in 2003 data, the U5MR had been reduced to 169 per 1000 live births (THB, 2006b). Historically, Tigray has had a higher infant mortality rate (IMR) than the national average, but in 2005 Tigray had a lower-than-average IMR, and Mekelle has had a significantly lower average than both larger groups. A possible explanation for the differential lies in the different collection techniques. The national and regional level data are collected through surveys, while the Mekelle information is based on hospital and health center data at the time of birth. If the difference is *not* due to a collection bias, then it is possible that Mekelle's IMR is lower because most women in Mekelle, as distinct from most of those in the countryside, have relatively ready access to health services and are able to give birth at hospitals. Additionally, women in Mekelle tend to bear children later in life than in the rural areas of Tigray and therefore are less likely to suffer from obstetric fistula and other birth-related complications.

The main causes of death among children under age five are pneumonia, dysentery and malnutrition. The IMR and under-five mortality rate (U5MR) are lower in Mekelle than in both the Tigray region and the nation as a whole.

⁹ Interview, Hayelon Tafere, Acting Team Leader of Environment Health at the Mekelle Health Office (2008). Profile of Hygiene and Environmental Sanitation Team.

3.2. Inoculations

Mekelle has higher immunization rates than both Tigray and the national average; however, the tentative results for 2008 (2000 E.C.) show a big drop in immunization coverage within Mekelle. Table 5 shows the immunization rates in Mekelle, Tigray and Ethiopia in 2005. For Mekelle, the immunization rates in 2008 are also shown. In 2009 (2001 E.C.), 17,279 children under five years of age were de-wormed.¹⁰

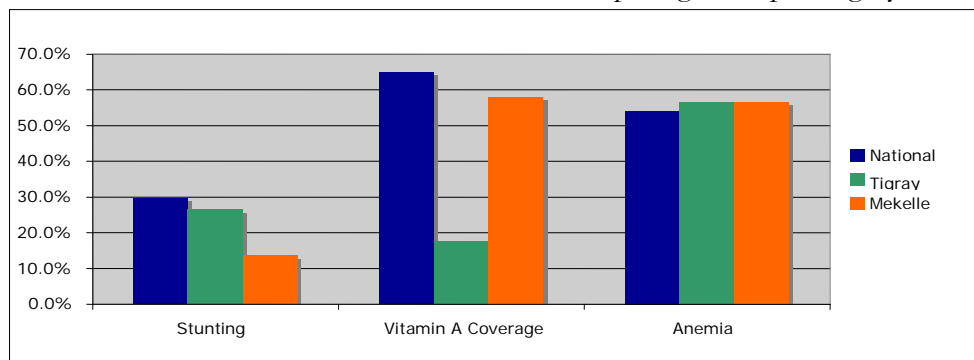
Table 5. Mekelle Immunization Rates

	National	Tigray	Mekelle	
	2005	2005	2005	2008
BCG	57.4%	77.4%	78.0%	64.0%
DPT	29.0%	51.6%	83.0%	56.0%
Polio	41.0%	56.6%	83.0%	56.0%
Measles	28.5%	63.3%	70.0%	57.0%
All	16.7%	32.9%	49.0%	n/a
Source	DHS, 2005	DHS, 2005	THB, 2004	MZHO, 2008

3.3. Nutrition

Child nutrition is measured in Ethiopia by three indicators: prevalence of stunted children; prevalence of anemic children, and the vitamin A supplementation coverage for children under five. Between 2005 and 2008 (1997 to 2000 E.C.), Mekelle had lower percentages of stunting than Tigray and the nation as a whole (see Chart 1). However, during the same period, Mekelle had lower vitamin A coverage than the national average (at 58 compared to 65 percent), but much higher coverage than that in all of Tigray (at roughly 18 percent). For 2009 (2001 E.C.), the vitamin A coverage for children under five in the city is estimated at 22,330, or 80.8 percent of the target population. The city, region and country as a whole have recorded similar rates of anemia in children, ranging from 52 to roughly 57 percent. As all of these measures showcase, Ethiopia, Tigray and Mekelle have severe problems with malnutrition.

Chart 1. Nutritional Assessment of Children Comparing Ethiopia, Tigray and Mekelle



Source: DHS (2005); THB (2007).

¹⁰ Ms. Aberash Abay, MCI Social Sector Specialist. The de-worming initiative was carried out in Mekelle schools by Professor Zvi Bentwich and his team from Ben Gurion University, made possible by the Office of International Cooperation of the Israeli Ministry of Foreign Affairs (Mashav) and facilitated by the MCI. Dr. Bentwich is repeating and expanding his intervention in the Mekelle schools, training Mekelle doctors, as well, in October, 2009.

4. Maternal and Reproductive Health

Ethiopia has one of the highest adjusted maternal mortality ratios in the world, at 850/100,000 in 2006 (2nd 5-Year Strategic Plan for Tigray, 1998 E.C.). The city of Mekelle does not currently track maternal mortality, live births or infant deaths in a comprehensive way, so estimates are to be taken cautiously. Access and ability to utilize maternal health resources, as with many other areas of health, is limited by the economic realities faced by women in the city. Access to food at all, let alone to healthy food, is scarce, due to environmental, seasonal and job-related factors. As a result, women's nutrition in general and during pregnancy in particular suffers tremendously.

Table 6. Relevant National, Regional, Municipal Data for Maternal/Reproductive Health

	National	Tigray	Mekelle
	<i>2005</i>	<i>2005</i>	<i>2005</i>
C-Section	1.0%	0.9%	10.3%
Postnatal Care	6.3%	8.7%	26.2%
Anemia	26.5%	29.3%	
Fistula	1.0%	1.6%	
<i>Sources</i>	<i>DHS, 2005</i>	<i>DHS, 2005</i>	<i>THB EFY 1998 E.C. (2006)</i>

4.1. Pregnancy and Delivery

In Mekelle, coverage for antenatal care is slightly higher than for Tigray and for Ethiopia as a whole. Between 2006 (1998 E.C.) and 2008 (2000 E.C.), coverage in Mekelle slipped to approximately eight percent, perhaps because of Mekelle's rapidly growing population and limited health sector staff and facilities. This is an area where thoughtful deployment of the Urban Health Extension Workers (UHEWs) might help increase access to antenatal health services for the urban population. UHEP workers are prepared to address a broad range of issues; however, they have specifically been trained in women's reproductive and obstetric health. UHEP workers have limited expertise in emergency obstetric care. To address this issue, the international NGO Medicins du Monde (Mdm) plans to train three to five hospital teams in emergency obstetrics and surgery, to deal with complications during pregnancy and delivery.¹¹

Because Tetanus Toxoid vaccination (TT+) of expectant mothers is a major directive of the Mekelle Zonal Health Office and the Tigray Health Bureau (THB), vaccination rates are well tracked. Mekelle appeared to have done well in 2005, compared to national and regional vaccination rates, but coverage has since dropped more than 15 percent. Vaccinations are usually carried out through targeted health campaigns; given that the MZHO is preparing for future such outreach and mobilization efforts, coverage is expected to rise.

Many women in Mekelle still deliver at home. One of the reasons cited is that they feel health care professionals do not offer the same level of service that they can receive at home. There is a need to train, and to persuade, TBAs and other health professionals to encourage expectant mothers to deliver at hospitals and to more effectively shepherd expectant mothers to health centers, where they are more likely to experience normal deliveries, or to hospitals, for cases with complications. This can be accomplished through a coordinated, UHEP-led health education campaign, coupled with an integrated referral system and the furnishing of emergency obstetric equipment to all such facilities.

¹¹ Interview, Ato Kinfe Abersh, Medicins du Monde, 2000 E.C.

4.2. Fistula, FGM and Other Gender-based Issues

Throughout Ethiopia there is a high prevalence of obstetric fistula. In response, the Fistula Foundation established a clean and modern satellite hospital facility in Mekelle in 2006. A majority of women treated at the fistula hospital come from the rural areas of Tigray and even from as far away as Afar and Humera. Mekelle is less affected by harmful traditional practices, such as FGM and other gender-based health issues, than many of the rural areas of Tigray. Indeed, fistula hospital staff noted that few, if any, women treated there are from Mekelle. However, these issues do exist within Mekelle, and in some cases they might be even more effectively masked by the urban setting. To reduce further incidence of this debilitation condition, education, maternal nutrition and societal awareness are needed within Mekelle as well as in the surrounding rural areas.

5. HIV/AIDS, Malaria, Tuberculosis and Other Diseases

HIV/AIDS, TB, upper respiratory infections and malnutrition are particularly prevalent in Mekelle, with deleterious effects on both the economy and society. For example, the high rate of HIV/AIDS in the city severely limits work productivity, increases the costs of medical intervention and disproportionately imposes the burden of care at home on women and girls.

5.1. HIV/AIDS

As of 2005, the estimated prevalence of HIV in the urban areas of Tigray was 13.3 percent, compared to the national urban prevalence of 10.5 percent (FMOH and HAPCO, 2006). Table 7 shows UNAIDS projections of various HIV indicators based on ANC data from 2005 and earlier. HIV/AIDS is the second highest cause of death in Mekelle,¹² with over 25 people dying from HIV/AIDS every year (THB, EFY 1998 E.C.). In 2006, of the estimated 689,000 people living with HIV/AIDS (PLWHA) in urban areas of Ethiopia, roughly eight percent were found in urban Tigray (FMOH and HAPCO, 2006).

Table 7. UNAIDS Projections of HIV/AIDS Indicators (2008)

HIV/AIDS	National	National Urban	Tigray	Tigray Urban
Prevalence	2.2	7.7	2.8	10.7
PLWHA	1,037,267	643,395	75,120	54,197
Incidence	0.27	1.78	0.35	2.81
# AIDS orphans	886,820	396,055	46,064	27,336
# of HIV+ pregnant women	612,815		6,184	
Annual HIV positive births	79,183		1,096	
Adults in Need of ART as % of Total Number of PLWHA	27.93%		25.56%	
Children in Need of ART as % of Total Number of PLWHA	25.34%		27.77%	

Source: UNAIDS Report (2006).

The Mekelle Municipal Health Office has 25 core objectives for reducing HIV/AIDS prevalence in the city. These objectives include improving prevention and surveillance of the disease and increasing treatment, care and support services for PLWHA (MOH, guidelines for costing, 1999 E.C.). Within Mekelle, numerous organizations and groups are working on HIV/AIDS-related

¹² After pneumonia; see Table 12 for Mekelle's top 10 causes of death.

issues; in 1994 E.C., the THB created the HIV/AIDS Prevention and Control Office (HAPCO), to help coordinate HIV/AIDS prevention and service delivery. The following table provides a summary of the public, private and non-profit groups working on HIV/AIDS-related activities in Mekelle. Additionally, a more complete breakdown of the services and their costs is presented in the Mekelle Integrated Health Model.

Table 8. Mekelle's HIV/AIDS service profile

ACTIVITY	ORGANIZATIONS INVOLVED
<i>Prevention</i>	
Education	OSSA, YAT, WAT, REST, Tsefu Women's Association Living with HIV/AIDS, FGAE, hospitals, Bright Africa, Vision, Red Cross
Condom Distribution	DKT, OSSA, YAT, WAT, Pathfinder, HCs, pharmacies
VCT	Health Center and Hospitals provide services along with OSSA, Family Health International and many religious and church-based programs
PMCT & Screening of Pregnant Women	Hospitals and Health Center distribute information and services, funded by PEPFAR; Guidance and training provided by MDM; Bana, The Global Fund and UNFPA provide other support services.
<i>Treatment</i>	
ART	Hospitals and Health Center distribute, funded by PEPFAR.
<i>Care/Support</i>	
Orphans and Vulnerable Children	Pathfinder, OSSA, WAT, Mums for MUMs, Pathfinder International, UNICEF, WHO
Nutritional Support	Concern, World Food Programme, ADCS
Economic Opportunities	Micro Credit Lenders Association, Mekelle

Source: Authors and Mekelle Zonal Health Office.

Prevention

After decades of health education and promotion of condom use and other methods of safe sex, surveys report that 95 percent of Ethiopian respondents claim to have knowledge of HIV/AIDS, and 94 percent of respondents from Tigray report using methods to protect themselves (THB, EFY 1998 E.C.)

Treatment

Data about ART treatment are comprehensive and readily available via the online Ethiopian AIDS Resource Center. However, it is estimated that only 17 percent of PLWHA ever started antiretroviral treatment (FMOH, 2005 and MZHO, 2008). In Mekelle, all three Type A health centers and Mekelle Hospital serve as ART treatment sites. Mekelle Hospital serves the largest number of people and is currently the only site treating HIV-positive children. The most recent figure, for 2007, indicates that 142 children have been enrolled in ART treatment in Mekelle (MZHO, 2008).

Table 9. List of ART drugs distributed in Mekelle

Drug	Target Population	Treatment Level
ABC-ddl-LPV/R	Adult & Child	Second line
ABC-ddl-NFV	Adult & Child	Second line
AZT-3TC-EFV	Adult & Child	First line
AZT-3TC-NVP	Adult & Child	First line
d4t(30)-3TC-EFV	Adult	First line
d4t(30)-3TC-NVP	Adult	First line
d4t(40)-3TC-EFV	Adult	First line
d4t(40)-3TC-NVP	Adult	First line
d4T-3TC-EFV	Child	First line
d4T-3TC-NVP	Child	First line
TDF-ddl-LPV/R	Adult & Child	Second line
TDF-ddl-NFV	Adult & Child	Second line

Source: Data provided by THB, 2008.

ART is free for all Ethiopians, eliminating the cost barrier.¹³ As part of the concerted national effort to halt the spread of this disease, local *woredas* are being asked to aggressively increase treatment coverage for those who need it. Accordingly, the MZHO plans to increase the number of people receiving ART by 11 percent next year (MZHO, 2008).

5.2. Malaria

Mekelle is not a malaria endemic area, due to the high elevation. The few cases of malaria every year occur mainly among Mekelle residents who work outside of the city, and those who live outside the city but come to seek medical care in Mekelle.¹⁴ During the summer months or particularly wet rainy seasons, though, numerous cases can develop within Mekelle itself. In 2004 (1996 E.C.), there was a malaria epidemic in Tigray, and over 193 cases were reported out of the hospital and health centers in Mekelle inside six months.¹⁵

The Mekelle Health Office occasionally participates in community malaria awareness and plant clearing activities and evaluates the health clinics to ensure that they are administering fever and malaria rapid diagnostic tests during malaria season.¹⁶ *Woredas* outside the city and health extension workers in rural areas often distribute bed nets, but none have yet been distributed within the city of Mekelle.

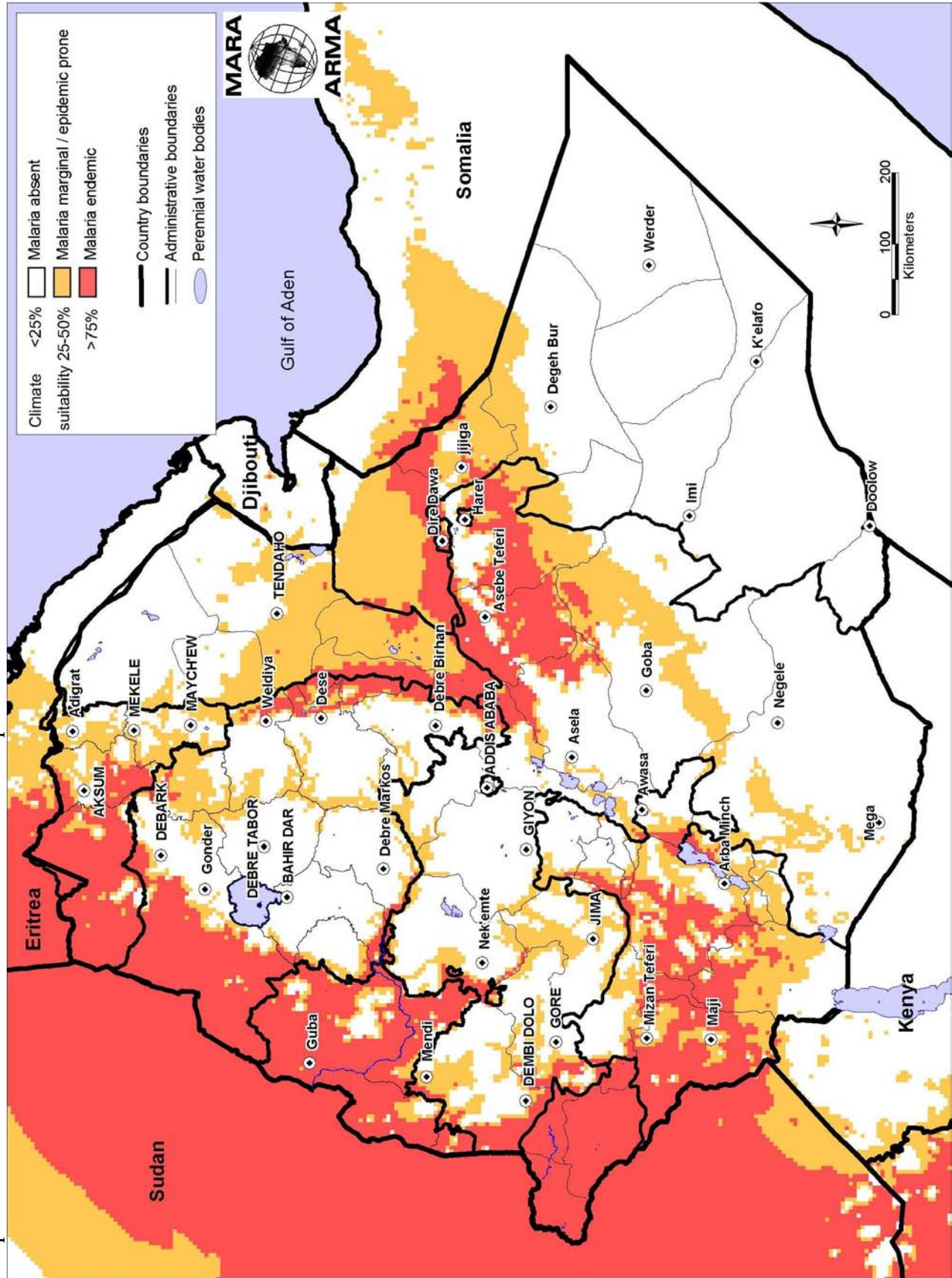
¹³ The Ministry of Health covers the cost of ART.

¹⁴ Interview, Wto Allum (2008), Chief Malaria Expert, Mekelle Zonal Health Office.

¹⁵ Ibid.

¹⁶ Ibid.

Map 5. Distribution of Endemic Malaria in Ethiopia



This map is a product of the MARA/ARMA collaboration (<http://www.mara.org.za>), July 2005, Medical Research Council, PO Box 70380, Overport, 4067, Durban, South Africa; CORE FUNDERS of MARA/ARMA: International Development Research Centre, Canada (IDRC); The Wellcome Trust UK; South African Medical Research Council (MRC); Swiss Tropical Institute, Multilateral Initiative on Malaria (MIIM) / Special Programme for Research & Training in Tropical Diseases (ITDR), Roll Back Malaria (RBM). Malaria distribution model: Craig, M.H. et al. 1999. Parasitology Today 15: 105-111. Topographical data: African Data Sampler, WRI, http://www.igc.org/wri/sdis/maps/ads/ads_idx.htm.

5.3. Tuberculosis

Tuberculosis (TB) is a major health concern for Mekelle, partly due to its hazardous symbiosis with HIV/AIDS. According to (Mesfin et al, 2005) low detection of smear positive pulmonary TB (PTB) has posed major challenges to tuberculosis control over the years. As Table 10 shows, since 2004, TB cure and treatment success rates have increased in Tigray, but the detection rate has dropped significantly.¹⁷ Moreover, when comparing Tigray's performance in detecting TB with the national average, it is evident that during the 2003-2007 period, the TB detection rate has been consistently below the national average.¹⁸ On the other hand, since 2005, Tigray has exceeded national averages, in terms of cure and treatment success rates. Preliminary results for 2009 indicate that Tigray is still below the WHO detection rate target of 70 percent but has almost met the TB cure target of 80 percent and the treatment success target of 85 percent.

Table 10. Tuberculosis Indicators for Tigray and Ethiopia 1995-1999 E.C. (2003-2007)¹⁹

Tigray	1995 E.C. (2003)	1996 E.C. (2004)	1997 E.C. (2005)	1998 E.C. (2006)	1999 E.C. (2007)
TB Case Detection rate (%)	31	51	29	26	27
TB Cure Rate (%)	64	68	82	78	70
TB Treatment Success Rate (%)	81	80	87	84	128
Ethiopia					
TB Case Detection rate (%)	44	45	34	30	32
TB Cure Rate (%)	66	63	65	61	68
TB Treatment Success Rate (%)	81	82	81	74	85

Source: MOH Health and Health Related Indicators (1995-1999 E.C.).

The city of Mekelle has a high rate of testing those with TB for HIV (78 percent), but a low treatment success rate (22 percent) (MZHO, 2008). The city has set ambitious goals for itself for 2009 as it aims to triple its treatment success rate and double its treatment cure rate.

Table 11. Tuberculosis Baseline & Target Data for City of Mekelle

	2008 Baseline	2009 Target
% of health centers that provide TB care services (Microscopic diagnosis and DOTS therapy)	40%	70%
TB Case Detection Rate	79%	89%
Treatment Success Rate	23%	62%
Treatment Cure Rate	22%	41%
Proportion of registered TB patients tested for HIV	78%	89%

Source: MZHO 2000 E.C. (2008).

Knowledge and awareness about TB and its transmission among both women and men in the Tigray region are reportedly higher than the national average; however, there is still room for improvement. The THB plans to address this through more public health education (THB EFY, 1998 E.C.).

¹⁷ Detection of Pulmonary Tuberculosis (PTB) cases in Ethiopia is done using sputum-smear microscopy (SSM), a simple laboratory test for the detection of a certain type of bacteria.

¹⁸ The only exception was in 2004 when the detection rate in Tigray was 51% and the national average was 45%.

¹⁹ Due to insufficient resources, these numbers have not been collected for the city itself.

5.4. Other Contributors to Mekelle’s Illness Burden

While HIV/AIDS, Malaria and TB are specifically targeted among the MDGs as health priority areas, other debilitating causes are also increasing the illness burden in Mekelle, including waterborne diseases, road traffic incidents, respiratory infections, disabilities, aging and mental illnesses.

Water, Sanitation and Waterborne Diseases

At multiple citywide meetings, Mekelle citizens agreed that their biggest health concern was water and sanitation issues. They expressed deep concern about the level of contamination in river water; accumulation of garbage in the streets; the availability of soap; the shortage and condition of school latrines, and new houses being built without proper toilets or wash facilities. Indeed, it is true that the city of Mekelle lacks a comprehensive water and sanitation system. Though detailed information regarding this vital sector is primarily covered in the MCI Water and Sanitation Integrated Model and Mekelle report, its vast implications on the health of Mekelle’s population necessitates mention here, as well.

Within Mekelle, water is supplied to residents through public taps and pipelines, pumped in from reservoirs and collected from any available source, including rivers, streams, pools and drainage canals. It is estimated that between 50-60 percent of families have access to tap or in-house plumbing; other families obtain their water through any sources available.²⁰ Each year Mekelle has an estimated 133,000 episodes of diarrhea in children aged two months to five years, as depicted below in Table 12.

Table 12. Estimation of Annual Diarrhea Cases in Mekelle, Ethiopia.
Breakdown by severity for children from 2 months to 5 years of age

Primary Care Cases	
No Dehydration	100,284
Some Dehydration	31,061
Severe Dehydration	1,775
Persistent Diarrhea (>14 days)	-
Dysentery (blood in stool)	50,951
Referral Cases	
Severe Dehydration	532
Severe Persistent Diarrhea	710
Severe Dysentery	532
Total Number of Diarrhea cases	133,120

Source: Authors

Common waterborne disease agents include *Vibrio cholerae*, *Campylobacter*, *Salmonella*, *Shigella* and the diarrheogenic *Escherichia coli* (CDC, 2008). Inadequate sanitation and access to sources of potable water account for the majority of these diarrhea cases. Additionally, many dehydration and malnutrition deaths among infants and young children are due to, or compounded by, complications from waterborne bacterial infections. Contaminated surface water sources and poorly functioning

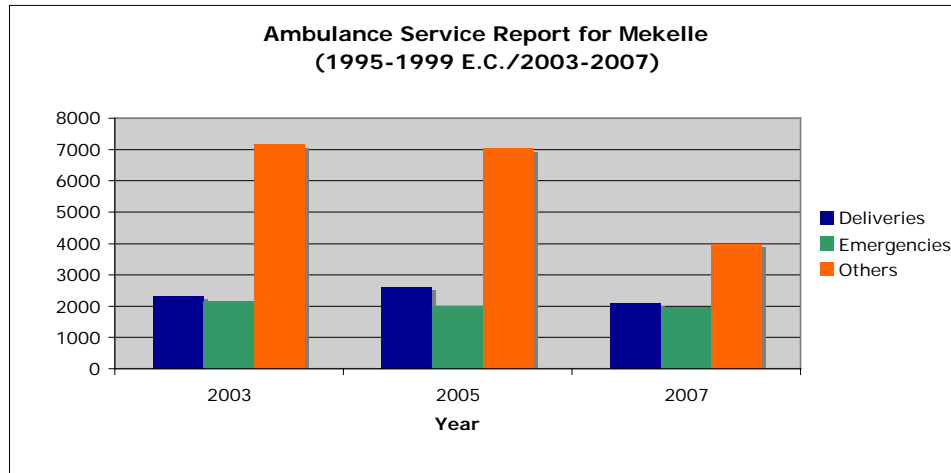
²⁰ Hayelon Tafere Interview, 2008.

municipal water distribution systems contribute to the transmission of waterborne bacterial diseases, which risk can be substantially diminished with chlorination and improved water handling.

Road Traffic Injuries

Road traffic accidents are a major cause of mortality and morbidity in Mekelle. Currently, Mekelle has fewer than 20 paved roads within the city limits. Over the last 10 years, the number of cars in the city has increased greatly, but car ownership is still very rare, and most residents of Mekelle use bikes or buses or walk to get around town. However, a major municipal public works project is underway to increase the number of paved roads.

Chart 2. Ambulance Service Report for Mekelle (1995-1999 E.C.) 2003-2007



Source: Ethiopian Red Cross of Society Tigray Branch, 2008.

Currently, the Tigray Red Cross owns the only functioning ambulances in the city. Tigray has bought 30 ambulances through the Red Cross, but the vehicles remain in Addis Ababa; thus, Mekelle’s hospitals and government have no method of responding to health emergencies. The Tigray Red Cross reports that it responds to around 2,000 accidents every year and that those emergencies account for approximately 20.2 percent of their total service calls (Tigray Red Cross, 1999 E.C.). The Tigray Red Cross also responds to deliveries and other emergencies and sometimes transfers patients from a primary health care facility to the tertiary care facility. The average annual expense for the Red Cross to pick up patients in Mekelle is 171,864 ETB a year (USD 18,090.95), which averages to a cost per patient of 16.51 ETB (USD 1.74) (Tigray Red Cross, 1999 E.C.).

Respiratory Infections

Cooking with coal, firewood and biomass in enclosed spaces is extremely common in Mekelle. Most traditional stoves for *injera* and *wats* use coal or organic and biomass materials. Cooking with those materials increases the risk of maternal, neonatal and childhood respiratory problems. Indeed, bronchopneumonia is the number one cause of death in Mekelle and all forms of pneumonia contribute to over 60 deaths a year (THB, EFY 2000 E.C.). Currently, few organizations within Mekelle are examining this issue; however, the Mekelle Health Office and the Tigray Health Bureau are very interested in environmental contributors to respiratory problems and are measuring related indicators in the Baseline Household Survey conducted by the UHEP in late 2000 E.C. (2008).

Respiratory infections and pneumonia are the third and 10th top reasons for admission to Mekelle hospitals, accounting for over 500 admissions every year (THB, EFY 2000 E.C.).

Table 13. Top Causes of Death in Mekelle (2006)

Top Causes of Death in Mekelle		
Pneumonia	60	41%
AIDS	26	18%
Unkown (non-specific)	21	14%
TB	20	14%
Dysentery	19	13%
Total	146	100%

Source: THB, EFY 2000 E.C., p.106.

6. Cost and Financing of Public Health Care

According to a survey completed by the National Health Account of Ethiopia in 2001 (1993 E.C.), the major financial contributors to health care in Ethiopia are households (36 percent), government (33 percent), and bilateral and multilateral donors (16 percent) (HSDP-III, 2006 E.C., p. 25). In Mekelle, the municipal health office is allocated funds via the Regional Health Bureau. This annual distribution of funds is based on major health costs, including salary, facility and construction costs. Similarly, the municipal health office distributes portions of its annual budget as lump sums to the health centers to use as they see fit. This highly decentralized structure gives significant autonomy to individual health centers, but decreases the ability of the health office and higher levels of government to track where and how the money is being spent. A sample of the Mekelle Zonal Health Office budget is included in Annex 6.

As recently as February 2008 (mid-2000 E.C.), all citizens became eligible to receive certain health care services free of charge at government health facilities. These services included HIV/AIDS care and treatment; child and maternal health maintenance visits; prenatal and delivery care; TB treatment and laboratory testing, and malaria treatment and care. However, patients are required to bring or purchase the materials used during their visit, including, for example, the latex gloves worn by the health provider during prenatal care. Any revenue generated by the health facility through materials fees or the pharmacy stores are given back to the Regional Health Bureau, in this case, the THB. Under the new health care financing scheme, all services will have a fee set by the Regional Bureau of Finance and Economic Development and the Regional Health Bureau. Revenues generated by each facility will be retained by that facility for its own use. Each health center and hospital will have a Board of Directors made up of health care professionals and community representatives who will direct and approve decisions regarding revenue expenditures.

Mekelle has a system of waiver cards enabling extremely poor residents to obtain all services for free at the public health facilities. Those unable to pay for services are issued waiver cards from the local *kebele* court; however, no governmental body documents or regulates the issuance of waiver cards, so the exact number distributed is unknown. Interviews revealed reports of widespread corruption and favoritism in the distribution of the waiver cards. Under the new finance scheme, the local *woreda* administrations will be responsible for issuing fee waiver cards, as well as for paying the cost of care for those patients to the health facilities. The THB and the municipal health office hope these changes will curb corruption and increase the program's effectiveness.

III. Results from UNDP Costing Model

To estimate costs to achieve the health-related MDGs and to project financial, human resources and infrastructure requirements, this needs assessment has used UNDP's Integrated Health model.²¹ The results derived from this model depend on a set of assumptions; for instance, the Mekelle health model assumes that the population will grow at same rate between 2007 and 2015.

Based on available data, Table 14 shows estimates of per capita costs needed to attain child health, maternal health, malaria, tuberculosis, staffing and health facilities goals, for each year between 2009 and 2015, in order for the health MDGs to be achieved by 2015.

Table 14. Health Sector Costs Per Capita (2010-2015, in USD)

	2010	2011	2012	2013	2014	2015	Average
Child Health	0.27	0.22	0.21	0.20	0.19	0.17	0.21
Maternal Health	1.57	1.34	1.28	1.22	1.16	1.11	1.28
HIV/AIDS, Malaria and other diseases (Total)	9.78	10.28	10.96	11.60	12.19	12.51	11.22
HIV/AIDS	9.57	10.07	10.75	11.39	11.98	12.30	11.01
Malaria Prevention and Treatment	0.02	0.01	0.01	0.01	0.01	0.01	0.01
Tuberculosis (TB)	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Facilities, Human Resources, Health Systems	16.91	17.19	16.66	16.49	16.26	14.45	16.33
Commodity Supply Systems	1.50	1.46	1.44	1.34	1.31	1.07	1.35
Supplementary Intervention (EMOC)	0.157	0	0	0	0	0	0.03
Total Per Capita Costs (\$)	30	30	31	31	31	29	30

In addition to the above results derived from the Mekelle health model, local health authorities have informed MCI of the urgent need at local hospitals for ambulances, a program of latrine construction and reliable access to clean water.²²

Table 15. Costs for Ambulances and Latrine Construction

Item	Unit Cost (ETB)	Unit Cost (USD)	Number	Total Cost (ETB)	Unit Cost (USD)
Purchase of 6 ambulance cars	500,000	52,632	6	3,000,000	315,789
Construction of latrine in the hospitals	72000	7,579	2	144,000	15,158
Construction of latrine in health centers	72000	7,579	3	216,000	22,737
Total				3,360,000	353,684

²¹ This model is a product of the UN Millennium Project, now administered by the MDG Support Group in UNDP.

²² In particular, officials at Quiha and Mekelle hospitals have expressed the pressing need for new latrines and for adequate, sustainable access to safe water.

7. Conclusions and Recommendations

Significant progress is being made toward meeting the health-related MDGs in Mekelle; yet, more work remains to be done. To improve the quality of health services in general, it will be critical to expand the training of health care professionals; fully equip health centers with the necessary equipment, and ensure a continuous and ample supply of essential drugs. This section briefly reviews recent achievements in each MDG-related area and presents some recommendations for the city of Mekelle.

Child Health

According to a recent Ministry of Health document on *woreda*-based health sector planning, more and more children are being immunized against TB, DPT 1, DPT3 and measles, and child mortality rates have indeed gone down (MOH, 2008). However, there remains a need to further reduce infant and under-five mortality rates in Mekelle. Interventions the city can pursue to promote child health include:

1. Encouraging mothers to breastfeed exclusively for the first six months of the infant's life;
2. Treating and monitoring severely malnourished children;
3. Providing antibiotics for pneumonia and dysentery;
4. Providing oral rehydration therapy for diarrheal diseases;
5. Supplementing with micronutrients, including iron, folic acid and vitamin A.

More work also needs to be done to ensure that pregnant mothers are immunized for Tetanus Toxoid, a significant cause of neonatal and maternal deaths.

Maternal Health

Another maternity ward was recently built in Mekelle, and several teams have since been trained in emergency surgery and obstetrics. It is critical to safe and timely deliveries that uncomplicated pregnancies are referred to health centers or clinics and that only high-risk pregnancies are referred to Mekelle Hospital. Nevertheless, emergency obstetric kits need to be made available at all health facilities. The recent opening of the 20-bed Hamlin Fistula Hospital in Mekelle in 2007 (1999 E.C.) is expected to improve the health of many women suffering from obstetric fistula; it is also important, given the widespread practice of unsafe abortion, to strengthen post-abortion care.

Interventions Mekelle can pursue to improve women's health include:

1. Improving basic and emergency obstetric care competency at public health sites;²³
2. Building a referral system for expectant mothers;
3. Expanding the administration of nutritional supplements to pregnant women;
4. Increasing and broadening safe blood supplies at health facilities, so that transfusions are available when needed;
5. Encouraging the use of vacuum extractors, rather than forceps, for assisted vaginal deliveries;
6. Training health workers in emergency post-abortion care;
7. Increasing the supply of neonatal resuscitation materials (e.g., warming lamps, bag valve masks).²⁴

²³ The list of contents for the recommended emergency obstetric package is available upon request from MCI or the Tigray Regional Bureau of Health.

HIV/AIDS, Malaria, and Other Diseases

With regard to HIV/AIDS, the initiation of a program by the Ethiopian government to provide antiretroviral treatment (ART) to HIV-positive patients in 2003 is improving the lives of those living with HIV/AIDS (PLWHA).²⁵ Moreover, HIV/AIDS awareness campaigns are resulting in an increasing demand for voluntary counseling and testing (VCT). Malaria morbidity rates are also declining in Mekelle and Tigray, mainly because the insecticide-treated bed nets (ITN) program has been successfully rolled out with nets distributed free of charge, and with the wider utilization of the anti-malarial drug Coartem.

Interventions Mekelle can pursue to reduce the disease burden include:

1. Increasing the number of hospitals and health centers providing VCT, and PMTCT and ART;
2. Reducing morbidity attributed to malaria by increasing ITN coverage (at least two per household);
3. Improving TB detection and treatment success rates.

In addition to the aforementioned recommendations, there is a need for emergency ambulance services. The Mekelle City Administration estimates that the city needs to raise 3,000,000 ETB (USD 315,789) to buy six ambulances.²⁶

With continued support from the Ethiopian government, the donor community and non-government organizations, the City of Mekelle is well positioned to continue making significant progress in improving health services for its inhabitants. Assuming that careful, sufficient and sustained attention is paid to the issues highlighted here, given the investment recommended in this needs assessment of USD 33 per capita per annum, the city will likely achieve the health-related MDGs by the target date of 2015.

This progress can be greatly accelerated, however, with increased support from international partners, who, as recent experience in Mekelle has shown, are eager to help with in-kind contributions and interventions, as well as with direct financing. As examples, University of Utah ophthalmologist Dr. Geoffrey Tabin and his Himalayan Cataract Project team have led multiple missions to Mekelle over the last two years, in the course of which they have carried out hundreds of screenings and cataract repair surgeries and have also trained Mekelle ophthalmologists. As mentioned above, Dr. Zvi Bentwich and his team from Ben Gurion University have also conducted a comprehensive de-worming and hygiene education program for Mekelle that has unearthed unexpected findings regarding the types of waterborne diseases carried and *not* carried by Mekelle schoolchildren, with implications for treatment and for follow-on studies.²⁷

²⁴ Ibid.

²⁵ The ART program has benefitted from the U.S. President's Emergency Plan for AIDS Relief (PEPFAR), launched in 2003. In 2007, Ethiopia received USD 241.8 million to support comprehensive HIV/AIDS prevention, treatment and care programs (<http://www.pepfar.gov/press/countries/profiles/116132.htm>)

²⁶ Information obtained and confirmed by MCI Social Sector Specialist, Aberash Abay. According to Regional Bureau of Health Director Dr. Gebreab Barnabas, the Tigray Health Bureau has purchased 30 ambulances via the Red Cross, but they have not yet been delivered to Tigray. In 2007 (1999 E.C), Ethiopia Red Cross Society spent 7,917 birr to repair and maintain ambulances.

²⁷ This intervention was carried out with the support of the Office of International Cooperation (Mashav), Ministry of Foreign Affairs, Government of Israel.

The boundless opportunities for many such partnerships, in the areas of training, research, health management information systems, hospital administration and clinical treatment in a broad array of medical sub-specialties, are both welcomed and actively sought by both the Tigray Regional Bureau of Health and the federal health authorities, and should continue to be pursued as well by municipal officials. By virtue of such energetic efforts at every level of government, the people of Mekelle stand to benefit from implementation of each recommendation proposed here, hopefully, to be supported by the expertise and capacity of official development partners and NGOs alike.

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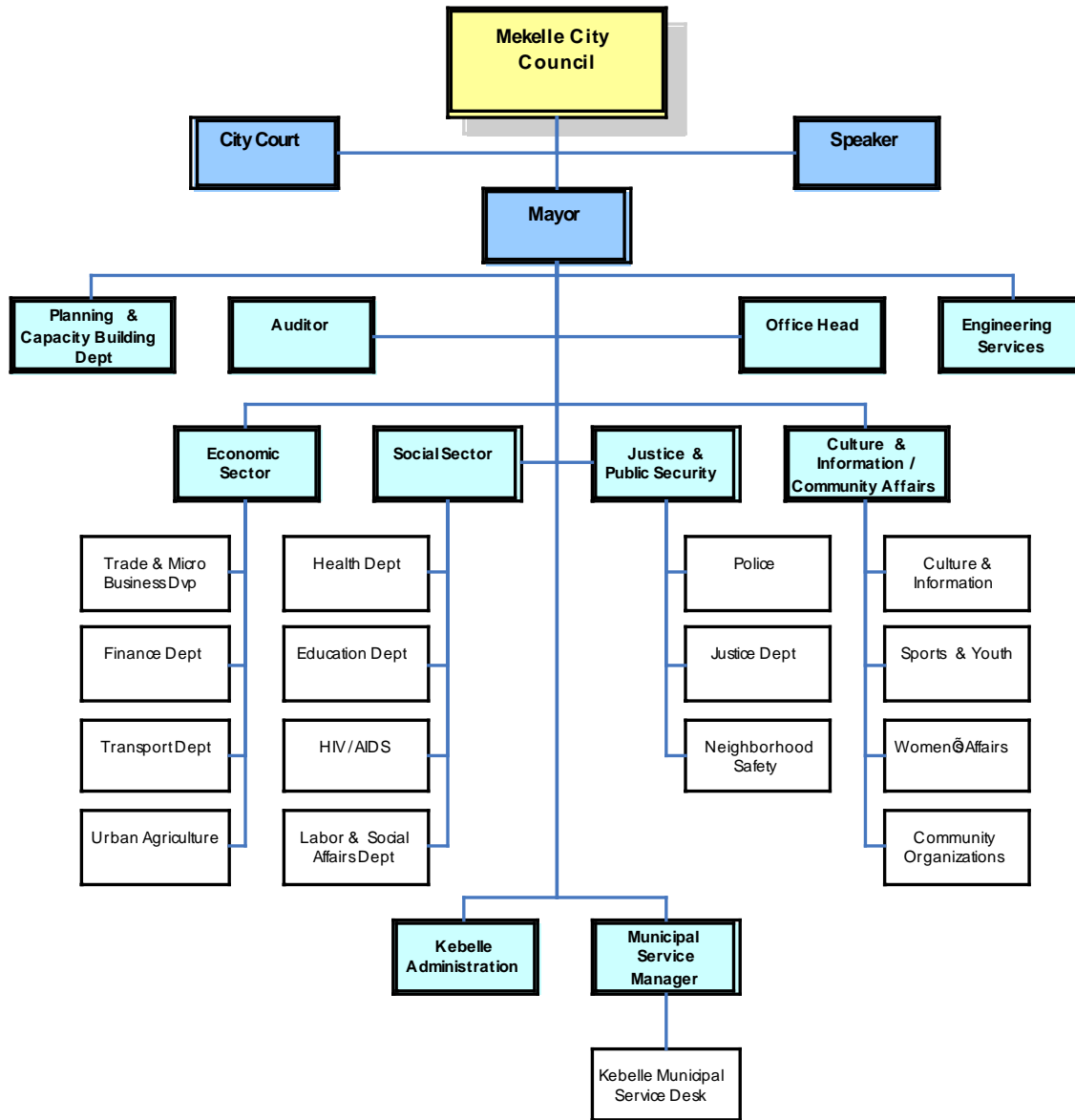
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Annex 1. Mekelle City Administration Diagram

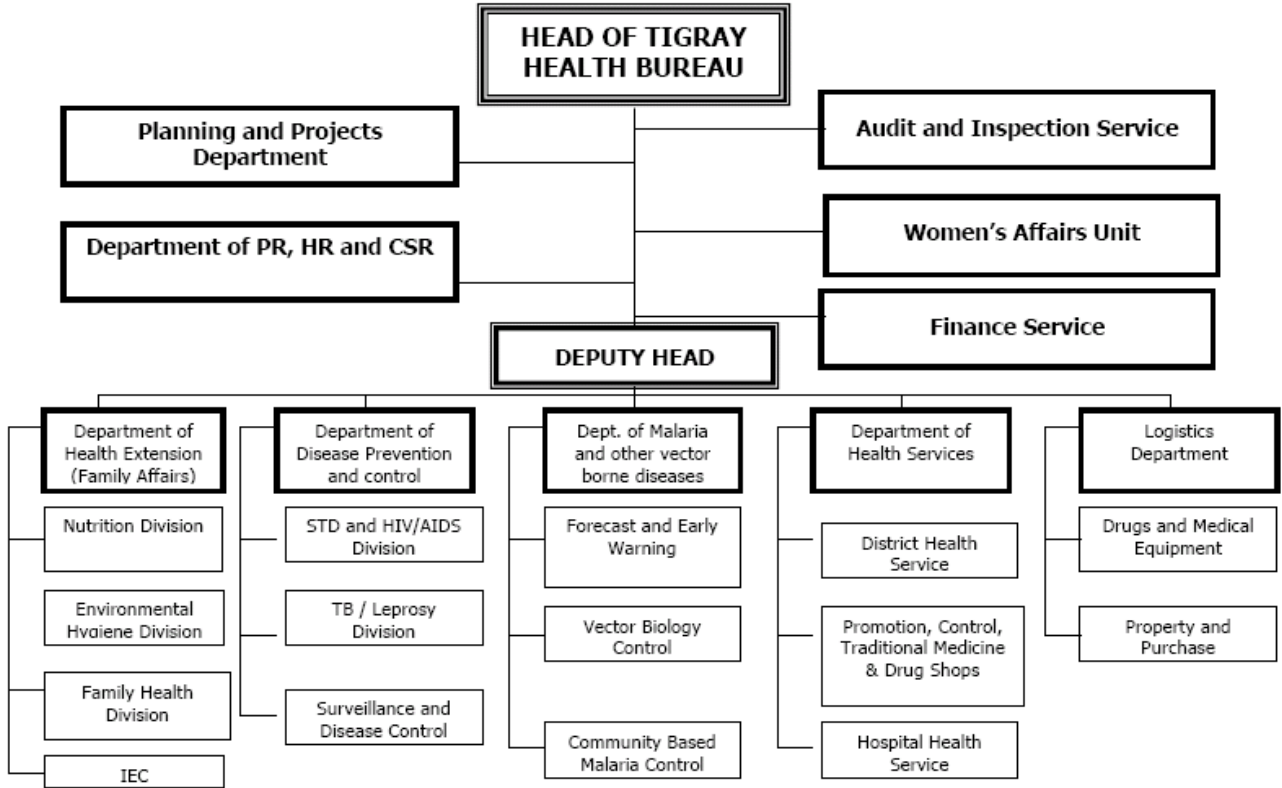
Mekelle City Administration



Source: Mekelle City Administration.

Annex 2. Organizational Structure of the Tigray Health Bureau

ORGANIZATIONAL STRUCTURE, TIGRAY HEALTH BUREAU



Source: THB EFY 1998 E.C. (2006).

Annex 3. Mekelle Zonal Health Office Budget

Tigray National Regional State - Mekelle City of Finance and Economic Development
 Fiscal year 2000, period: 6 *Tabsas*, Report Date: Wednesday, January 23, 2008
 Recurrent and Capital Budget vs. Expenditure

Code	Description	Approved Budget (ETB)	Adjusted Budget (ETB)	Expenditure (ETB)	Over/Under (ETB)
02/000/341/01/01	Administration and General service				
6000-6999	Items of expenditure	288074	288074	146684.39	141389.61
6100	Personnel services	220896	220896	118698.8	102197.2
6110	Emoluments	298392	298392	111980	96412
6111	Salaries to permanent staff	208392	208392	111980	96412
6130	Pension contributions	12504	12504	6718.8	5785.2
6131	Government contribution to permanent staff pensions	12504	12504	6718.8	5785.2
6200	Goods and services	67178	67178	27985.59	39192.41
6210-6229	Goods and supplies	36622	36622	16297.27	20324.73
6211	Uniforms, clothing, bedding	4109	4109	0	4109
6212	Office supplies	8700	8700	8395.97	304.03
6213	Printing	467	467	0	467
6217	Fuel and lubricants	22246	22246	7901.3	14344.7
6218	Other material and supplies	1100	1100	0	1100
6230	Traveling and official entertainment services	950	950	411	539
6233	Official entertainment	950	950	411	539
6240	Maintenance and repair services	20649	20649	6582.72	14066.28
6241	Maintenance and repair of vehicles and other transport	18649	18649	6582.72	12066.28
6243	Maintenance and repair of plant, machinery and equipment	2000	2000	0	2000
6250	Contracted services	8957	8957	4694.6	4262.4
6255	Freight	1800	1800	240	1560
6256	Fees and charges	1260	1260	0	1260
6257	Electricity charges	1300	1300	959.12	340.88
6258	Telecommunication charges	3757	3757	3495.48	261.52
6259	Water and other utilities	840	840	0	840
02/000/341/02/02	Transmitted Resources				
6000-6999	Items of expenditure	141051	141051	64026.35	77024.65
6100	Personnel services	122240	122240	63294.72	58945.28
6110	Emoluments	115320	115320	59712	55608
6111	Salaries to permanent staff	115320	115320	59712	55608
6130	Pension contribution	6920	6920	3582.72	3337.28
6131	Government contribution to permanent staff pensions	6920	6920	3582.72	3337.28

6200	Goods and services	18811	18811	731.63	18079.37
6210-6229	Good and supplies	12311	12311	0	12311
6212	Office supplies	7331	7331	0	7331
6217	Fuel and lubricants	4980	4980	0	4980
6230	Traveling and official entertainment services	300	300	0	300
6233	Official entertainment	300	300	0	300
6240	Maintenance and repair services	5000	5000	0	5000
6241	Maintenance and repair of vehicles and other transport	3800	3800	0	3800
6243	Maintenance and repair of plant, machinery and equipment	1200	1200	0	1200
6250	Contracted services	1200	1200	731.63	468.37
6258	Telecommunication charges	1200	1200	731.63	468.37
02/000/341/05/01	HIV/AIDS prevention and control				
6000-6999	Items of expenditure	54519	54519	26555.57	27963.43
6100	Personnel services	39814	39814	23544.72	16269.28
6110	Emoluments	37560	37560	22212	15348
6111	Salaries to permanent staff	37560	37560	22212	15348
6130	Pension contribution	2254	2254	1332.72	921.28
6131	Government contribution to permanent staff pensions	2254	2254	1332.72	921.28
6200	Goods and services	14705	14705	3010.85	11694.15
6210-6229	Good and supplies	10118	10118	2302.73	7815.27
6212	Office supplies	7000	7000	2302.73	4697.27
6217	Fuel and lubricants	3118	3118	0	3118
6230	Traveling and official entertainment services	300	300	0	300
6233	Official entertainment	300	300	0	300
6240	Maintenance and repair services	2200	2200	0	2200
6241	Maintenance and repair of vehicles and other transport	2200	2200	0	2200
6250	Contracted services	2087	2087	708.12	1378.88
6258	Telecommunication charges	2087	2087	708.12	1378.88
02/000/341/06/01	Malaria and Vector Diseases				
6000-6999	Items of expenditure	111670	111670	58989.93	52680.07
6100	Personnel services	105068	105068	58861.8	46206.2
6110	Emoluments	99120	99120	55530	43590
6111	Salaries to permanent staff	99120	99120	55530	43590
6130	Pension contribution	5948	5948	3331.8	2616.2
6131	Government contribution to permanent staff pensions	5948	5948	3331.8	2616.2
6200	Goods and services	6602	6602	128.13	6473.87
6210-6229	Good and supplies	4888	4888	0	4888
6212	Office supplies	3400	3400	0	3400

6213	Printing	250	250	0	250
6217	Fuel and lubricants	1238	1238	0	1238
6230	Traveling and official entertainment services	120	120	0	120
6233	Official entertainment	120	120	0	120
6240	Maintenance and repair services	550	550	0	550
6241	Maintenance and repair of vehicles and other transport	500	500	0	500
6243	Maintenance and repair of plant, machinery and equipment	50	50	0	50
6250	Contracted services	1044	1044	128.13	915.87
6258	Telecommunication charges	1044	1044	128.13	915.87

Annex 4. Conversion Between Ethiopian Calendar and Roman Calendar

Ethiopian Month	Start Date (Roman calendar)	Start Date (leap year)
Meskerem (1)	11-Sep	12-Sep
Tikemet (2)	11-Oct	12-Oct
Hidar (3)	10-Nov	11-Nov
Tahesas (4)	10-Dec	11-Dec
Tir (5)	9-Jan	10-Jan
Yekatit (6)	8-Feb	9-Feb
Megabit (7)	10-Mar	-
Miyaza (8)	9-Apr	-
Ginbot (9)	9-May	-
Sene (10)	8-Jun	-
Hamle (11)	8-Jul	-
Nehase (12)	7-Aug	-
Pagume (13)	6-Sep	-

Source: <http://www.funaba.org/en/calendar-conversion.cgi>.