



The Public Health Impact of
The Healing Hands and
Madieu Williams Foundations'
2011 Mission to Sierra Leone

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1.0 Executive Summary

Sierra Leone is one of the most impoverished nations in the world; its health and education infrastructure is practically non-existent and the country relies on non-profit organizations to provide quality care and resources. In June 2011, the Healing Hands (THHF) and Madieu Williams (MWF) Foundations collaborated to provide critical health and educational services to the people of Freetown, Sierra Leone. During the two-week mission the medical team examined 67 patients, and found there was a generally low level of health status among patients. The THHF/MWF teams performed 44 surgeries, saw 435 dental patients, and provided educational mentorship for a primary school with 220 students built by the MWF.

An evaluation of the mission's efficacy in reducing disease burden determined that over 500 years of death and/or disability were avoided by performing surgeries. This demonstrates that surgical procedures can have a positive impact on the health status of Sierra Leoneans, and this impact persists beyond the two-week mission itself. In addition, the medical supplies and mentorship THHF and MWF delivered to Freetown hospitals help improve hospitals' ability to care for their patients and enhance relationships between organizations and in-country staff.

Our findings support the notion that surgeries can be effective in reducing disease burden in developing countries such as Sierra Leone. Missions such as those conducted by THHF and MWF require specific resources and much skilled planning. Experience gained in Sierra Leone will be used to streamline efficiency and effectiveness of future THHF and MWF missions. We advocate for on-going support of these surgical missions to developing nations that lack the capability to meet surgery needs. We also advocate for ongoing educational and medical mentorship on-site, since these activities serve to improve the quality of life for future generations.

2.0 Acknowledgements

The authors would like to thank all the diligent volunteers from The Healing Hands Foundation (THHF) and the Madieu Williams Foundation (MWF), who professionally and collaboratively worked to provide support and mentorship to the Sierra Leone people. We thank Marco Avila and Madieu Williams for their hard work, leadership and logistical assistance making the mission - and this report - possible. Additional thanks to mission volunteers Jonathan Cohen, Rosanna Drake, Nicole Gonzaga, Mary King, Anne Gaddy, Marco Avila, and Stephanie McKew for providing valuable mission feedback and personal reflections that add a touching human perspective to the mission's story. Thank you to photographer Curtis Smith. We also deeply appreciate the hospitality and collaboration provided by staff at Connaught and Princess Christian hospitals, and the teachers and students at Abigail D. Butscher School.





“ I am grateful for all the volunteers that took the time out of their lives to travel to Sierra Leone... it was not an easy mission trip to take part of [and] I am pleased with the amount of services that we were able to provide to the people of Sierra Leone.” – Madieu Williams, MWF Founder

“We are very fortunate to have a group of volunteers that are very experienced, caring, and willing to donate their time, money and expertise to help others in need. On top of this, our volunteers work as a team. We are very proud of our volunteers and we applaud them and thank them for a JOB WELL DONE!!!! “ – Marco Avila, THHF Executive Director/Co-Founder

Most especially, we thank the citizens of Sierra Leone... they were our patients, pupils, mentees, and collaborators. They were also our teachers. Thank you.

3.0 Introduction

3.1 The Picture of Health in Sierra Leone



Sierra Leone is a small country on the West African coast with a population of approximately 6.4 million people, the majority living in the large financial center and capitol of Freetown. Sierra Leone’s past is marked by colonial rule, ethnic strife, and civil war, all of which have left the country the twelfth-lowest ranked on the United Nations’ Human Development Index (HDI) and eighth-lowest on the Human Poverty Index (HPI). The HDI is based among other factors, on a country’s life expectancy, per capita gross domestic product, and maternal and children under age 5 mortalities.¹ Sierra Leone’s most recent civil war from 1991 to 2002 killed more than 50,000 people² and destroyed much of the country’s already limited infrastructure. The current statistics are staggering across the board, with over 70% of the population living below poverty level and 26% that cannot meet basic food needs.³ Sierra Leone has one of the highest levels of child mortality in the world, and the maternal mortality rate is astounding: one in eight women risk dying during pregnancy or childbirth.³

“I thought that I understood poverty, but I quickly realized that I had no clue. Yet I was amazed by the resilience, resolve, energy and joy of the people. This was almost a contradiction.” – Mary King, Teacher

Sierra Leone struggles to provide adequate education and health care to its people. Education is required for all children at primary and secondary levels, but the civil war destroyed many of the schools and created a shortage of teachers, making implementation of the law nearly impossible.⁴ The national healthcare system is practically non-existent; government hospitals and other health care facilities are essentially non-functional because of severe lack of human and material resources,¹ including infrastructure, personnel, supplies and equipment to adequately provide emergency and essential surgical care.⁵ Ranking at the bottom globally with less than





three surgeons per 100,000 citizens, the population relies on the non-governmental organizations (NGOs) to provide health care.¹

3.2 The Foundations



The Healing Hands Foundation (THHF) is a non-profit organization founded in 2007 that provides medical services to children and adults around the world. The THHF mission is to provide high quality surgical care to children with complex congenital malformations in areas lacking resources and expertise. The medical staff of THHF has decades of combined experience, and its doctors, dentists, and nurses have practiced medicine in countries around the world, including Ecuador, Colombia, Guatemala, Philippines, and in Africa. The mission not only involves surgical and dental services, but also education of local surgeons and other health care providers to improve children's lives in these areas.



The Madiou William Foundation (MWF) is a non-profit organization that focuses on health, wellness, nutrition, fitness, and education for underprivileged youth.

3.3 Mission Objectives

The mission's overall objective was to have a positive health and educational impact in a country where needs are particularly great. To accomplish this, the team performed quality surgeries and provided dental services for patients at two hospitals in Freetown, Sierra Leone. They sought to gain understanding of key health issues and quantify the effectiveness of THHF services in reducing disease burden. Another goal was to provide educational support and mentorship at a primary school built by the MWF, located outside the city of Freetown in the village of Calaba Town. The Foundations sought to learn from the challenges they encountered and refine plans for future missions to Sierra Leone and other developing countries.

In this report, we describe the number and demographics of patients treated during the two week mission, and provide an overview of patients' health status and history at the time of treatment. We also evaluate the effectiveness of the mission in reducing disease burden, by quantifying the disability-adjusted life years (DALYs) averted by providing surgical services. The challenges, successes, and lessons learned during the Sierra Leone mission are also discussed to provide insight for future mission-planning strategies.





4.0 Methods

4.1 Resources

The medical and surgical teams were on-site from June 19 - June 30, 2011. Medical and surgical services were performed at two hospitals in Freetown, the Connaught Hospital ('C') and Princess Christian Maternity Hospital ('P'). The educational team was on-site from June 19 - July 5, 2011 at the Abigail D. Butscher primary school. Over four million dollars worth of medical and teaching supplies, mostly donated, were transported to Sierra Leone to complete this mission.

4.1.1 Mission Participants

Forty-five volunteers from all over the United States brought with them to Sierra Leone a wide range of expertise shown below in Table 4-1. The medical team of 31 trained staff included surgeons, nurses, anesthesiologists, dentists, gynecologists, and others. The seven member education team included professional teachers and their teaching assistants. In addition, there were five volunteers working in operations and/or providing additional support as needed, plus two professional photographers.

Table 4-1: Mission Participants

Specialty	No. Volunteers	Specialty	No. Volunteers
Cardiologist	1	OR Nurse	2
CRNA	3	OR Technician	2
DDS & Dentist	3	PA	1
Dental Assistant	3	Pediatric surgeon	1
Director/Operations	1	Pediatrician	1
Paramedic	1	Plastic Surgeon	1
Epidemiologist	1	RN	3
General Surgeon	1	Teacher	5
LMT	2	Teaching Assistant	2
Medical resident	1	Translator and PCT	1
OBGYN	3	Additional support	6
Total			45

* Acronyms: CRNA = Certified Registered Nurse Anesthetist; DDS = Doctor of Dental Surgery; LMT = Licensed Massage Therapist; OBGYN = Obstetrician/Gynecologist; OR = Operating Room; PA = Physician Assistant; RN = Registered Nurse; PCT = Patient Care Technician.

4.1.2 Hospital Resources

The medical team operated at two hospitals. Most surgeries were performed at Connaught hospital, a government civilian hospital for general medicine and surgeries. Obstetrics and gynecological surgeries and examinations were conducted at privately run





Princess Christian maternity hospital. Resources available at Ola During Children’s hospital were also collected. Although there was no mission work at this facility, it is physically connected to Princess Christian and its information is reported for comparison.

Table 4-2 lists the resources available at Connaught Hospital (C) for general medical and surgical cases, Princess Christian Maternity Hospital (P) for obstetrics and gynecological cases, and Ola During Children's Hospital (O) for pediatric cases

Table 4-2: Hospital Resources

CATEGORY	RESOURCE(S)	HOSPITAL			
		C	P	O	
Infrastructure	In-patient ward number of beds	273	146	175	
	Isolation ward	0	0	2	
	Outpatient facility	Yes	Yes	Yes	
	Emergency room	No	No	Yes	
	Operating rooms (OR)	4	4	0	
	Labor and delivery rooms	0	2	0	
	Recovery room or ICU	1	1	0	
	Blood bank	1	1	0	
	Pharmacy	1	1	1	
	Clinical Laboratory	sub-standard	sub-standard	sub-standard	
	Radiology	1	1	0	
	Ultrasonography	1	1	1	
	Equipment/ Supplies	Anesthetic machine	1	1	0
		Pulse oximetry	1	1	1
Blood pressure monitors		Yes	Yes	No	
Fully equipped OR		basic only	basic only	No	
Fully equipped delivery room		0	basic only	0	
Fully equipped recovery or ICU		basic only	basic only		
Respirators/ O2 supply		0	0	0	
Blood products		unreliable	unreliable	unreliable	
Microbiology equipment		sub-standard	sub-standard	sub-standard	
Pharmaceuticals		sub-standard	sub-standard	sub-standard	
Surgical supplies, gloves, consumables		sub-standard	sub-standard	sub-standard	
Human Resources		Permanent nursing staff	223	150	140
		Midwives	37	0	0
		Anesthetist	0	7	6
	House and medical officers	8	8	8	
	Obstetrician/gynecologists	0	3	0	
	General surgeons	4			
	Pharmacy assistants	10	6	6	
	Pharmacists	2-4	2-4	2-4	
	Radiology technicians	2-3	0	0	
	Radiologist	1	0	0	
	Physiotherapist	1	0	0	
ENT specialist	1	0	0		
Dentist	2	0	0		
Ophthalmologist	2	0	0		



4.2 Record Keeping

Age, sex, diagnosis, treatment, and outcome were recorded for each patient. Medical and health history (self-reported), and any significant observations from pre-procedure physical exam were also recorded. Drug treatments were noted when available. Medical record-keeping by hospital staff at Connaught was minimal and disorganized, and consistent information could not be obtained for all patients. Patients' health status had to be obtained from interviewing patients, relying on their memory, truthfulness and understanding of the questions. Record-keeping by staff at Princess Christian was more organized and complete; however, personal-reported health history still relied on patients' accurate recollections.



Education team activities were not recorded on-site, but efforts were made to obtain activity descriptions and personal reflections from the team after the mission was completed, so that activities and impressions could be chronicled.

4.3 Data Analysis

The mission's efficacy in reducing disease burden was determined by estimating disability adjusted life years (DALYs) that were averted due to THHF's medical services and surgeries. According to World Health Organization (WHO) guidelines, the DALY is a measure of disease burden that considers both premature death as well as non-fatal health consequences of disease or injury (disability).^{6,7} The DALYs is a commonly used methodology for cost-effectiveness analysis,⁸ and is calculated as

$$\text{DALY} = \text{YLL} + \text{YLD}$$

where YLL represents years of life lost due to the condition, and YLD the years lived with disability for non-fatal conditions. To calculate YLL, we used published standard values for discounted YLL due to death at select ages.⁹ Age was unknown for one female receiving a hysterectomy, so for this patient we assumed the most conservative YLL value calculated from other hysterectomy patients.

A scoring system defined severity of disease and efficacy of treatment (for either life or disability) following previously established methods.^{6,10} Disability weights for diseases and conditions were taken from average disability weights used by Murray,⁶ from values



reported in Table 3A.6 of the Global Burden of Disease Project⁹ or from other published condition-specific metrics.¹¹

5.0 Results

5.1 Medical Team Activities

A total of 67 patients were examined by the medical team, of which 44 received surgeries (Table 5-1). The most common surgery performed was inguinal hernia repair followed by myomectomy and hysterectomy. Hydroceles were very common, and were often extremely large. Some additional medical activities are not included in this report, such as assisting hospital staff with emergencies, examining walk-in patients, or treating other unplanned patients. Records for those patients were either not obtainable or it was not possible to quantify the amount of intervention attributable to THHF doctors.

Table 5-1: Total Procedures by Type

PROCEDURE	NO. OF PATIENTS
Burn scar contracture release	3
Exploratory laparotomy	1
Hernia repair (left and/or right inguinal) with possible hydrocele removal	22
Hydrocele removal only	4
Hysterectomy	4
Imperforate anus surgery	1
Incision and drainage of pyomyocitis	1
Open Myomectomy	5
Orchiectomy	1
Orchiopexy	1
Urethrocutaneous fistula excision	1
Total	44

5.1.1 Children

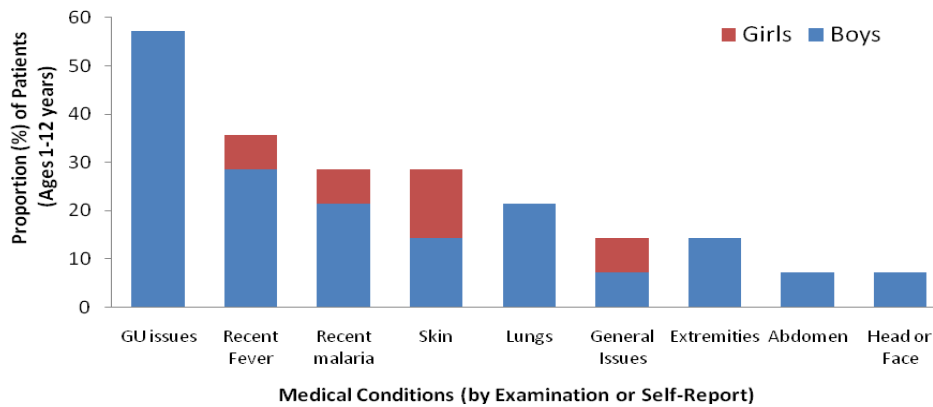
There were 15 pediatric patients examined between the ages of 1 (1 yr 8 mo) and 12 years, with a mean age of 6.2 years. Successful surgeries with no post-operative complications recorded were performed on 12 of these patients. One perioperative death



occurred from complications following surgery. Two patients were not cleared for surgery due to additional medical conditions discovered during pre-surgical exams.

The most common medical complaint among child patients were genitourinary (GU) issues (8 of 14, or 57%), mostly due to hydroceles. Skin and extremities issues followed close behind, mostly related to burn scar contractures. According to parental reports, almost 30% of children (4 of 14, or 28.6%) had malaria within the past 1 year, and 50% children not reporting malaria had recent fever (Figure 5-1).

Figure 5-1: Medical Complaints among Children Aged 1 to 12 years.



Among the 12 successful surgeries on children, burn scar contracture release and hydrocele removal were the most common (Refer below to Table 5-2). Girls over-represented among skin issues (burn scar contractures) and boys over-represented for GU issues (Refer above to Figure 5-1).

Table 5-2: Successful Surgeries on Minors

PROCEDURE	NO. OF PATIENTS
Burn scar contracture release	3
Hydrocele removal	3
Imperforate anus surgery	1
Urethrocutaneous fistula excision	1
Orchiopexy	1
Hernia Repair	2
Incision and drainage of pyomyocitis	1
TOTAL	12



5.1.2 Men

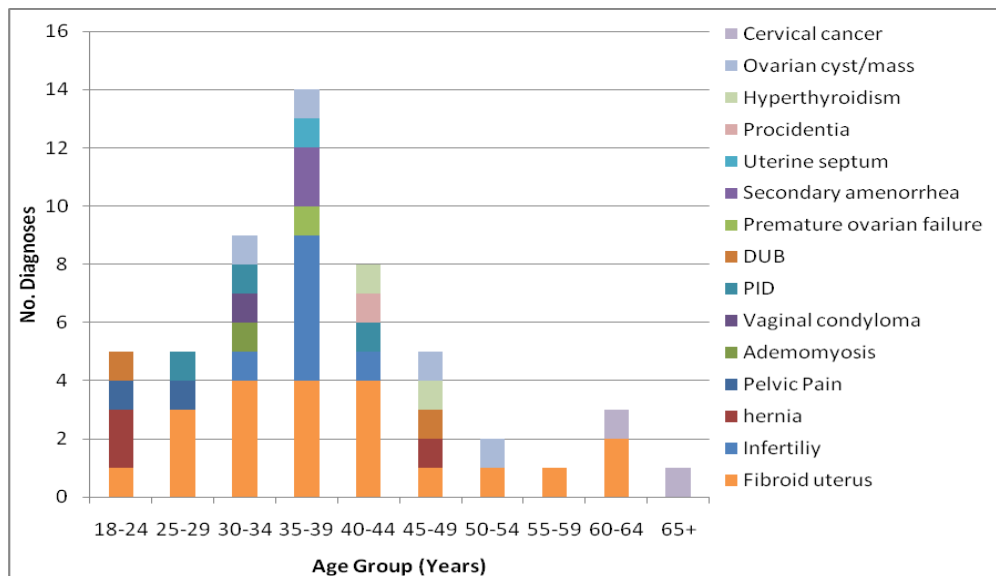
A total of 22 adult male patients were examined at Connaught hospital, with age range of 18 to 68+ years (two patients reported being at least 60 years old, but exact age was unknown). The median age was 39 years, with mean 37.7 years among patients who reported.

Overall, 19 patients received hernia repair (left, right, or bilateral inguinal), often with hydroelectomy. In addition, one hydroelectomy (but no hernia), and one orchiectomy were performed. No age-related patterns could be observed. One 22 year old male was not cleared for hernia surgery due to contrary medical condition.

5.1.3 Women

A total of 44 female patients were examined (2 at Connaught, 42 at Princess Christian), with ages ranging from 18 to 65 yrs (one patient had age unknown). From these 44 patients, 56 diagnoses were made, equivalent to 1.3 diagnoses per patient (Figure 5-2). Older women were no more likely than younger women to have >1 diagnosis (p=0.35, Student’s t-test). When confirmation tests were not available, diagnoses were considered “probable” and included in the diagnosis count.

Figure 5-2: Diagnoses among Women by Age Group



Acronyms: DUB= dysfunctional uterine bleeding; PID = Pelvic Inflammatory Disease.



The most common medical complaints were genitourinary problems (Table 5-3) and almost half of patients were diagnosed with at least one uterine fibroid (47.7%). Complaints of infertility were common; 9 of 43 (21.9%) women ages 18 to 41 reported a desire to become pregnant, but were having trouble conceiving. However, two women were pregnant at time of exam and could not undergo surgery. Three women passively reported having had malaria recently within the past one year (6.8%).

Table 5-3: Common Medical Complaints among Women

MAJOR SYSTEM	NO. OF PATIENTS	AGE RANGE (YRS)	MEAN AGE (YRS)
GU	41	18 - 65	30
Abdominal	20	18 - 62	39
General Condition	7	22 - 50	35
Eyes	3	38 - 49	43
Heart	2	41 - 42	41.5
Lungs	2	41, 62	52
Pregnancy	2	18, 31	25
Extremities	1	36	36
ENT	1	42	42
Neuro	0	n/a	n/a
Skin	0	n/a	n/a

The medical team performed 11 surgeries (25% of all surgeries) on women, 10 at Princess Christian and 1 at Connaught hospital. The age range of women who received surgery was 26 to 56 years (1 patient age unknown). Surgeries included 5 open myomectomies, 1 incisional hernia repair, 4 hysterectomies and 1 exploratory laparotomy.

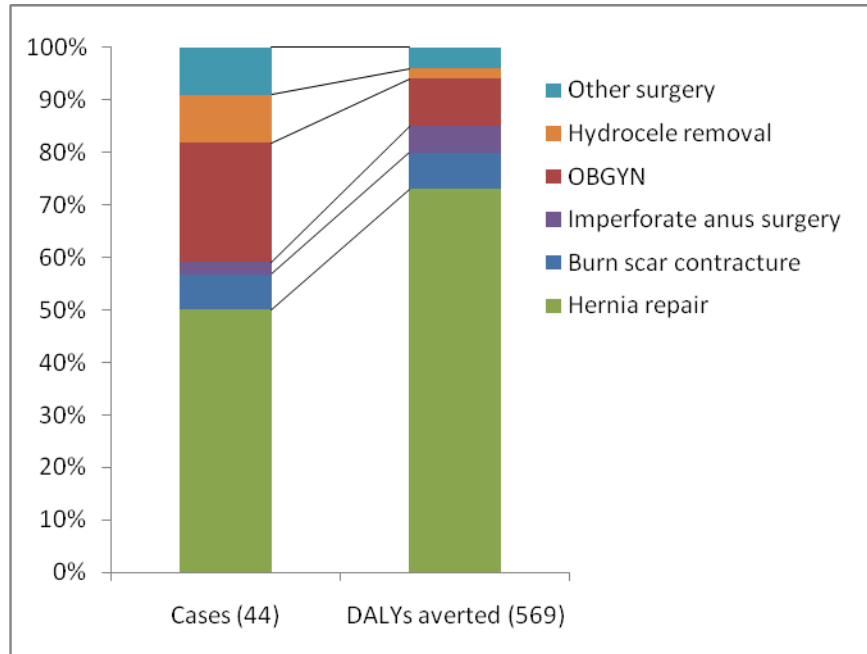
5.1.4 DALYs Averted

A total of 569 DALYs were averted by performing the 44 surgeries. Although child patients often contributed to more DALYs averted than older patients, the trend was not statistically significant ($r = -0.09$). Hernia removals were responsible for the largest proportion of DALYs averted, and this was larger than the proportion of hernia removal cases (Figure 5-3).

“We helped a large number of men who previously were very uncomfortable walking and working, had poor self-perception of their bodies, difficult or nonexistent sex lives, and a condition which could kill them if their bowel twisted and became entrapped... We provided life changing services to them.” – Anne Gaddy, Pediatrician

The years of life lived with disability prior to surgery were not included in calculations, providing a conservative estimate of the impact of the surgical mission. For example, hernias addressed during the same year as onset avert more DALYs than those addressed several years after onset. At least 4 of 20 hernia patients passively reported that they had lived with their hernias for 2 or more years.

Figure 5-3: Distribution of Cases and DALYs Averted



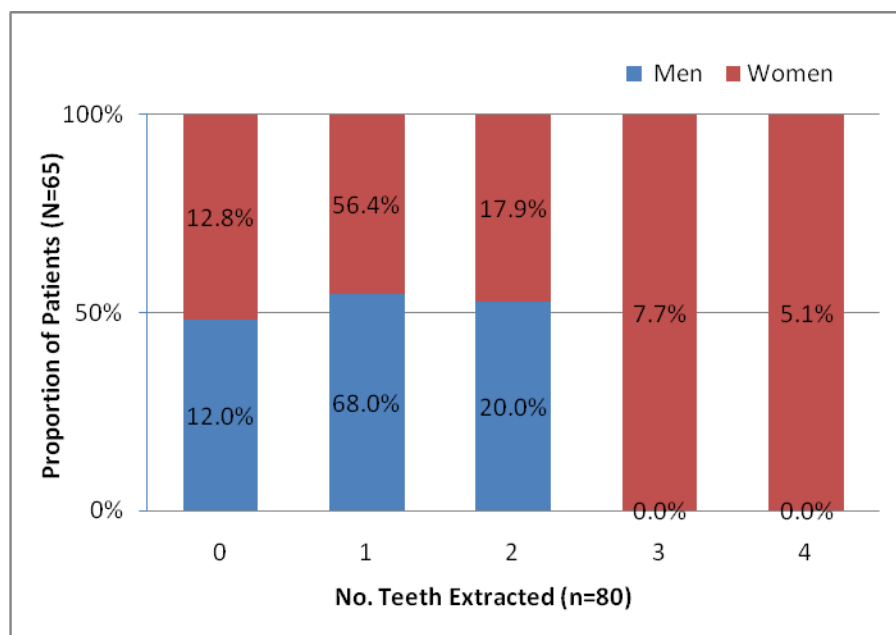
5.2 Dental Team Activities

The THHF dental team saw a total of 435 patients and performed a total of 287 tooth extractions plus 330 triage procedures. This resulted in an overall triage rate of 1.4 procedures per patient.

To provide insight into the level of patients’ dental health, specific data on tooth extractions and decay were collected for the first 65 dental patients. The age range of these patients was 16 to 64 years (mean = 35.2 years). There were a total of 80

extractions (mean 1.2, range 0-4 teeth per patient) plus 35 teeth with dental caries were identified (but not extracted) among these patients. The majority of patients required 2 extractions. Women were more likely to have 3 or 4 teeth pulled than men (Figure 5-4); however, the number of teeth extracted was not positively correlated with age. The difference in average age between male and female patients was very small (34.4 and 35.7 years, respectively). Although this suggests that Sierra Leonean women may be at higher risk for dental caries than men, more data is required for definitive findings.

Figure 5-4: Distribution of Tooth Extractions by Gender



5.3 Teaching Team Activities

There were approximately 220 students enrolled in six grades or “classes” at the Abigail D. Butcher School. The students and teachers at the school were receptive to the mission team. The THHF and MWF teachers noted both challenges and successes during the mission. The most notable challenges included over-crowding (up to 80 students in one class), a lack of instructional materials, minimum curriculum guidelines, and limited home support. The crowded class sizes hindered teachers’ ability to manage student behavior or to give needed attention to students with learning disabilities. Teachers often resorted to a reciting, copying and memorizing focus, with little concept learning. Finally, there was a general need for better health and nutrition conditions: improved latrines, providing running water, a designated and cleared playground area, cleaner classrooms, and snacks/food for children.



Despite these challenges the teachers were optimistic, identifying areas of opportunity for growth and improvement at the school. For example, a complete curriculum is taught at the school including reading/language, art, mathematics, science, and social studies. The children receive breaks for recess every day. The school’s teachers demonstrated an incredible work ethic and a commitment and deep concern for their students. With the school’s staff expressing a desire to grow professionally through best teaching practices, and the enthusiasm and respect given by students, the mission team was able to make much progress. The students were extremely eager to learn and enthusiastic to perform (sports, singing, or acting).

“This was evident especially on our last day when each class performed in a program that included much of the village in the audience.” – Mary King, Teacher.

A designated Professional Development Day at the beginning of the second week allowed teachers to collaborate and was considered a big success. THHF/MWF teachers presented effective teaching practices that had been modeled in the classroom during the first week of the mission. The day gave the opportunity for the teachers to expand and reflect on the previous week’s classroom work on curriculum and methods of instruction crucial to establishing concept development (as opposed to memorization).

Topics covered during Professional Development Day included phonetic instruction, setting high behavior expectation and establishing school rules, teaching math conceptually (and writing across grades and curriculum.



The education team was able to return to the classroom for the duration of the second week to mentor creative concept-based lessons and continue to assist teachers in classroom management, phonics/reading, mathematics, written language, and science.

“After teaching my initial phonics lessons, the students were proudly holding their chalkboard folders over their heads to show the words they were able to spell. But even more rewarding, was class teacher Ms. Thompson’s comment, ‘This is how I am going to teach them to read!’” – Stephanie McKew, Teacher.

The THHF/MWF education team donated many needed learning materials to the school (Table 5-4), as well as playground toys such as soccer balls, hula hoops, Frisbees, bubbles, and jump ropes.

Table 5-4: Educational Materials Donated to the School

DONATED MATERIALS	AMOUNT
Notebooks	300
Chalk Board Notebooks	500





Lined Paper (case)	1
Colored paper (case)	1
Pencils	5,000
Pens	300
Crayons (case)	1
Chalk (case)	2
Flash Cards, Addition (set)	30
Flash Cards, Subtraction (set)	30
Flash Cards, Multiplication (set)	40
Flash Cards, Division (set)	20
Flash Cards, Dolch site words (set)	100
Flash Cards, Counting (set)	30
Flash Cards, Fractions (set)	40
Phonics Cards (set)	60
Readers, Levels A-Z	960
Math Wheels	100
Numbered Sticks (set)	80
Storage shelves	5
Storage carriers	5

6.0 Discussion

6.1 Public Health Importance of THHF and MWF Missions

The overall level of health care quality and access in Sierra Leone is abysmal. Similar to previous observations in a 2009 Sierra Leone survey study,¹² there was a paucity of electricity, running water, and oxygen at Connaught Hospital. Both Connaught and Princess Christian hospitals regularly run out of basic medical supplies such as gloves, pharmaceuticals, and masks. In fact, only 20% of government hospitals in Sierra Leone have adequate stores of sterile gloves or eye protection and less than half have functioning sterilizers.¹²

The overall state of health is very poor. Patients often presented to THHF with a myriad of untreated medical conditions and many reported waiting a long time to receive surgery. As of 2010, there were only 0.2 government-appointed surgeons per 100,000 Sierra Leoneans.⁵ This shortage of trained medical surgeons creates a large back-log of surgical cases that continue to accumulate without treatment, placing patients at increased risk for mortality and reducing quality of life.





*"You see these kids that don't have a chance, and you give them a chance,"
"[After] the surgery, it changes their life completely." – Marco Avila, THHF Executive
Director/Co-Founder.*

The THHF medical team brought a complete stock of necessary supplies for performing surgeries and used appropriate sterile techniques. In Sierra Leone the non-profit organizations, such as THHF and MWF, provide critical support and mentorship for improving standards of care and reducing the burden of disease in high-risk populations.

*"We [want to] leave something long-lasting behind. It's developing relationships
with doctors in these countries and helping them develop their programs, instead of
thinking we can just come over and do it for them." – Dillon Stewart, Pediatric Surgeon*

6.2 Health Needs and Most Effective Procedures

Four procedures, hernia repair, mastectomy, hysterectomy, and burn scar contracture release comprised 77.27% of all surgeries performed by THHF during this mission and contributed highly toward total DALYs averted. These same four procedures comprised 41% of all surgical inpatient ward services (including both general and orthopedic surgery) reported by another Sierra Leone hospital.¹² Although patients were referred to THHF by the hospitals and do not represent a random sample of the Sierra Leone patient population, this provides strong evidence that these four procedures comprise a large fraction of total surgical needs for Sierra Leoneans.¹²

Findings by Nordberg¹³ indicate that NGO-supported hospitals have a capacity to perform health services at a significantly higher rate than government-operated hospitals not receiving assistance, particularly for surgeries such as hernia removals and Cesarean-sections.¹ Additional studies^{1,11} also support the notion that these surgical procedures are cost-effective in averting DALYs in Sierra Leone; costs per DALY averted for surgeries compared favorably with the costs of other interventions.¹

Among children, burns, traumatic injuries, and congenital anomalies are some of the areas where the presence of plastic surgical expertise can make a significant difference in patient outcomes and thereby decrease the years of life lost due to disability. In light of the severe shortage of plastic surgeons throughout the developing world, it falls to those in the developed world to harness their skills and address the vast unmet needs.¹⁴ The THHF mission successfully averted 142.77 DALYs (25.18% of total) from 12 successful pediatric surgeries.

6.3 Challenges Experienced and Future Missions

Pre-trip planning is critical for a successful mission. Making contact with government and hospital officials, researching the country's top health issues, gaining an understanding of the health culture and determining hospitals' resource needs are all important components to establish before planning and packing. In Sierra Leone, corruption and theft are particularly challenging issues. To handle this, directors from THHF and MWF





met with government officials on-site, to make sure supplies were distributed to several locations and received by the people who needed them.

Costs to work in Sierra Leone are expensive. A local coordinator that could get local business donations, corporate support, and in-kind donations would help reduce expenses for food, lodging, transportation, or security. Additional medicines and supplies are likely to be needed during medical/surgical missions in developing countries such as Sierra Leone, and a plan should be in place to obtain them if/when needed. To continue operations, THHF traded supplies with another organization, Mercy Ships; however, additional on-site partnerships would have been helpful. Additional viable partnerships are currently being sought out by THHF for future missions.

Care should be taken to select mission volunteers based on skill-sets, so that country-specific medical needs are addressed while conserving resources and costs. Selection can be completed during a pre-planning phase when mission goals are also defined. In addition, matching patients to the surgeon's skills (for example, match predicted difficulty of the specific procedure to surgeons with matching experience level) may increase quality of care and decrease operative and anesthesia time.

Sierra Leone hospital medical record-keeping was often incomplete and disorganized. This was especially challenging at Connaught Hospital, where doctors struggled to obtain accurate patient medical history information. Patients selected for surgery were prone to falsifying their self-reported health status in order to be cleared for surgery. These challenges impact both patient and doctor safety. Unfortunately, a young patient was lost due to anesthesia-related complications when his family medical history was omitted from the patient record. Because local officials cannot be relied upon, the THHF is assessing their safety protocols, equipment, and team roles to ensure the highest level of safety on future missions.

There is a need in Sierra Leone, as well as many other developing nations, for the foundation a comprehensive health statistics and/or patient medical history program. When patient records were available at Princess Christian, the information therein was very valuable. Future missions may also examine alternatives for technology to support simplified data collection and record-keeping that would improve patient health data quality.

Estimates for severity of disease used in this report (i.e., probability of death if left untreated) are believed to be conservative and compare well with reported ranges.^{1, 11} In some cases, it was difficult to obtain accurate measures of disability and mortality. In developed countries such as the USA, surgeons operate at diagnosis in most cases, making it hard to find an adequate population to compare with Sierra Leonean patients¹⁵ who often wait years before receiving surgery. Further research relating to whether the balance of advantages and disadvantages changes when hernias are recurrent, bilateral, or combined with hemocele removal is needed as current data are limited.



6.4 Towards meeting the United Nations' Development Goals

Despite some progress, Sierra Leone will not attain most of the UN's Millennium Development Goals (MGDs) by 2015,¹⁶ and the country relies heavily on mentorship and assistance from non-profit organizations. Successful collaboration between THHF and MWF provide much needed assistance to the people of Sierra Leone, and work toward meeting several key MDGs. First, THHF increased hospitals' abilities to function at an appropriate level of care and sterile technique. Surgeries performed by THHF averted hundreds of disability-adjusted life years in a country plagued by lack of health infrastructure and access to care. Teaching collaboration and mentorship at primary schools, such as Abigail D. Butscher School, help increase quality of education for the next generation of Sierra Leoneans.

"The mission [was] incredible that we were able to take such a large group of people, supplies and all, to a country where nothing seems too reliable and offer people a chance for a better, healthier life... this experience has given me a perspective on life unobtainable without experiencing what we did in Sierra Leone... I was able to connect with individuals I would have never had the opportunity to learn more about if it wasn't for this mission." – Rosanna Drake, medical student

The health and education needs in Sierra Leone are great. A lack of adequate infrastructure, healthcare and education, results in the country holding some of the world's worst health outcome statistics. Based on our findings, we support the argument that surgeries can be effective in reducing disease burden. Surgical missions do require resources and much planning, but organizations like THHF and MWF show there is a substantial positive, long-term impact on health burdens even when operating in-country for short periods of time.

"We were able to help a lot of Sierra Leoneans and we accomplished everything we planned to do. This year we were able to do four missions in one trip (medical, dental, educational, and humanitarian). We delivered nearly \$4 million in supplies. This in itself is a huge accomplishment and a milestone for THHF and MWF." -Marco Avila, THHF Executive Director/Co-Founder.



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