

**A 12-month retrospective, descriptive study of Hout Bay Volunteer
Emergency Medical Service, Cape Town, South Africa**

By

Jürgen Werner Kahle

Student, University of Cape Town

Student Number KHLJUR001

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Supervisors: Charmaine Cunningham, Julian Fleming, Peter Hodgkinson

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i. Abstract

Background

There is a growing need for Emergency Medical Services (EMS) globally and in Africa, as health services develop. The establishment and continued operation of volunteer ambulance services might assist with this need. This study provides a comprehensive overview of the operational activities of a volunteer ambulance service and forms a first step for further studies of this and other volunteer ambulance services.

Objectives

This study describes and quantifies the operational activities of Hout Bay Volunteer Emergency Medical Service (Hout Bay EMS) a volunteer ambulance service in Cape Town, South Africa for a one year period from 1 January to 31 December 2016.

Methods

This retrospective study describes call-outs, shifts and service demographics of Hout Bay EMS for 2016, using Provincial EMS dispatch data and shift records from Hout Bay EMS. Performance comparisons are drawn between Hout Bay EMS and Provincial EMS.

Outcomes

In the study period, there were 682 call-outs involving Hout Bay EMS, a total mission time of 951 hours worked over 119 shifts by 31 active members in 2016. Assault was the leading call-out type (18.40%); 58.24% of call-outs were Priority 2 (less urgent), and 39.30% of call-outs ended in no patient transport. Response times to Priority 1 call-outs were generally shorter for Hout Bay EMS than those of Provincial EMS within the Hout Bay area. Members largely preferred night shift to day shift by a factor of 4:1; the majority of shifts were worked by Basic Life Support (28.57%) and Intermediate Life Support (57.98%) qualified members compared to the relatively few shifts (13.44%) worked by Advanced Life Support members.

This study shows that a small volunteer ambulance service mostly active on weekends can successfully complement the efforts of the larger, full-time provincial ambulance service it is dispatched by. This model could be replicated elsewhere to meet the growing need for emergency medical services.

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v. List of Abbreviations

ACO	Ambulance Community Officer
ALS	Advanced Life Support
ANA / AEA	Ambulans Nood Assistent / Ambulance Emergency Assistant
BASICS	British Association of Immediate Care Schemes
BLS	Basic Life Support
CAD	Computer Aided Dispatch
CCA	Critical Care Assistant
CEO	Chief Executive Officer
CERT	Community Emergency Response Team(s)
CEU	Continuous Education Units
CLO	Chief Liaison Officer
COJEMS	City of Johannesburg Emergency Management Services
COO	Chief Operations Officer
CPD	Continuous Professional Development
CUEMS	Columbia University Emergency Medical Service
DoH	Department of Health
DRK	Deutsches Rotes Kreuz (Germany)
ECP	Emergency Care Practitioner
ECT	Emergency Care Technician
EMS	Emergency Medical Service(s)
Exco	Executive Committee
HBNW	Hout Bay Neighbourhood Watch
HFSVAS	Harpur's Ferry Student Volunteer Ambulance Service
HPCSA	Health Professions Council of South Africa
ILS	Intermediate Life Support
MDA	Magen David Adom
NGO	Non-governmental Organisation
NHS	National Health Service
NPO	Non-profit Organisation
NSRI	National Sea Rescue Institute
OECO	Operational Emergency Care Orderly
ÖRK	Österreichisches Rotes Kreuz (Austria)
P1	Priority 1: Life-threatening illness / injury
P2	Priority 2: Non-life-threatening illness / injury
PBEC	Professional Board for Emergency Care
PrDP	Professional Driving Permit
SA	South Africa
SIMCAS	South East Coast Immediate Care Scheme
SLA	Service Level Agreement
UCT	University of Cape Town
UK	United Kingdom
USA	United States of America
VEMA	Voluntary Emergency Medical Assistance

1. CHAPTER 1: Introduction and Background

1.1 Introduction

Although the importance of the contribution of volunteer organisations is widely recognised (1–3), there are few published reports or accessible studies covering the operational activities of volunteer ambulance or volunteer emergency medical services (EMS) in South Africa (SA). Volunteering is not new to EMS in the Western Cape, with doctors volunteering their time and expertise, staffing mobile accident units on Cape Town roads as early as 1974 (4) but records are sparse. To contribute towards knowledge in this under-reported field, this study describes and quantifies the operational activities of Hout Bay Volunteer Emergency Medical Service (Hout Bay EMS) a volunteer ambulance service in Cape Town for the period of the twelve months from 1 January to 31 December 2016.

The role of EMS is to respond to cases of severe injuries and illness, and then rapidly assess, provide appropriate emergency pre-hospital interventions and transport patients as quickly as is appropriate to definitive care (5). The service can include medical rescue of patients. Medical rescue involves skills and equipment for providing access to or extrication of patients from difficult scenarios, for example vehicle wrecks, steep slopes, trenches or confined spaces. EMS in SA may be provided by state, commercial, non-profit and volunteer organisations (6).

Hout Bay EMS has been operational, based in its suburban area in Cape Town, since 1994. It therefore provides a focus of study from which lessons can be learnt and applied in the volunteer EMS field. Describing one year of Hout Bay EMS operational activities creates a baseline of research that can be built on for both this service and other volunteer ambulance services. Increased knowledge of the volunteer sector of EMS may assist in creating assessment tools for existing services and planning and development of new volunteer ambulance services.

It is known that various volunteer EMS groups exist or used to exist in South Africa, but little is published about individual services (7–9). It is also not known why some have ceased to exist and whether others continue to operate. The Background section gives a detailed description of the history and organisational structure of Hout Bay EMS, founded in 1994 as a not-for-profit organisation.

In Chapter 2 the literature review gives a general background to volunteering and volunteer ambulance services. The Methodology is detailed in Chapter 3, Results of the study are described in Chapter 4 and implications of the study's findings are covered in Discussion in Chapter 5.

This retrospective, descriptive study begins to fill a void in data available on and understanding of the actual operational activities of volunteer ambulance services. The study aims and objectives are:

1. To describe Hout Bay EMS's operational activities between 1 January 2016 and 31 December 2016 (including call-out data);
2. To describe staffing of the Hout Bay EMS ambulance over the same twelve-month period (including shift rostering and personnel profiling in respect of gender and qualifications).

Mission (call-out), shift and membership data have been described to quantify the on-duty activities of Hout Bay EMS. This provides a comprehensive overview of the operational activities of this volunteer ambulance service in Cape Town during 2016, at the same time completely assuring confidentiality of patient and service personnel information.

Background information on the organisation's structure, its executive committee and the system used for booking shifts is also provided to give an overview of how the service operates. Where possible, comparisons are drawn with other services.

Only Hout Bay EMS is considered in detail in this study and the findings are not directly applicable to other volunteer ambulance services, primarily because the suburb of Hout Bay is uniquely situated facing the sea and otherwise surrounded on three sides by mountains.

1.2 Background

1.2.1 Geography, demographics and population numbers of Hout Bay

Hout Bay, including Hangberg and Imizamo Yethu, is an area of almost 30 square kilometres enclosed on three sides by mountains, and by the coastline on the fourth, in Cape Town, South Africa. The suburb of Hout Bay is a mix of relatively affluent areas with a low population density, as well as the Hangberg and Imizamo Yethu areas which are lower income groups with a high population density (10–12). Census data from 2011 suggests a total population of 33 000 in this area now likely much higher (13,14). A 2016 survey suggests a population increase of 7.5% in South Africa between 2011 and 2016, which could be extrapolated to Hout Bay and would loosely place its population at 35 000 (15). This too might be an underestimation of actual numbers.

Hout Bay has a police station, a National Sea Rescue Institute (NSRI) station, and a fire station which opened in February 2006 (16). Aside from a local forestry station, fire services previously had to respond from outside the area before the station opened. Key support services in the area include the Hout Bay Neighbourhood

Watch (HBNW) with a local control room and a community two-way radio network. The area has two clinics, the Hout Bay Harbour Community Health Clinic in Hangberg and the Hout Bay Main Road Clinic at Imizamo Yethu (18). Both are primary healthcare clinics, both operate during office hours Monday to Friday and both have a limited capacity to deal with emergencies (19). The suburb is served by various hospitals (public and private), all outside of the suburb (closest being Victoria Hospital some 10km away over a mountain pass. Discussions are on-going about a new healthcare facility to be built in the area to provide the growing community with adequate access to healthcare (20–22). Various emergency services respond to the area from outside Hout Bay.

1.2.2 History of Hout Bay EMS

Hout Bay EMS is thought to be the oldest volunteer ambulance service organisation in Cape Town. It was started in 1994 by a group of residents concerned with the response times to medical emergencies in their area. Some were members of the NSRI Station 8 in Hout Bay (23). Due to the geographical situation of Hout Bay, access to the area is only possible by one of three mountain passes, slowing the emergency response of resources from outside the area. Response is further hampered at peak traffic times and during adverse weather conditions. At the time Provincial EMS ambulances were normally stationed in Retreat or Pinelands approximately 15km and 25km respectively outside of Hout Bay. A reasonable response time under the circumstances could take 45 minutes.

Initially, members fulfilled a first responder role by responding to emergencies in their own vehicles. After members completed BLS training and registration with HPCSA, Provincial EMS would allocate an available ambulance to the volunteers for working shifts on weekends.. An ambulance base was built on municipal grounds at the Hout Bay Main Road Clinic in 1998 (23). Fundraising allowed the service to buy an ambulance in 2001 which was used until it incurred total damage in a collision in 2003. Provincial EMS provided an ambulance until funding through sponsorship became available in 2007 to purchase and equip a new dedicated ambulance. This vehicle is still in service but ageing, and Hout Bay EMS is raising funds for a replacement in due course (23).

1.2.3 Organisational structure

Hout Bay EMS was formalised as a non-profit organisation (NPO) and a number of guidelines and documents were developed to satisfy legal requirements for the organisation, and guide the on-going operations and management of the volunteer ambulance service. The documentation includes the Constitution, Standard Operating Procedures, Minimum Standard Service Requirements, Code of Conduct,

and Disciplinary Code, Induction and Indemnity forms and the Service Level Agreement (SLA) with Provincial EMS.

The latter is the agreement between Hout Bay EMS and Provincial EMS, which stipulates among other things: the minimum number of shifts Hout Bay EMS should work per month, availability during major incidents, supply of medical consumables by Provincial EMS, Hout Bay EMS' ownership of the vehicle and ambulance base, and operational directives including the volunteers working within the Provincial EMS dispatch system while on duty.

The service is funded exclusively through donations and sponsorship from community members and organisations in and outside Hout Bay. The Executive Committee (Exco) is made up of Hout Bay EMS members and is elected at the Annual General Meeting in March each year. Nine portfolios outlining different management aspects are shared between five to eight Exco members plus a Volunteer Medical Officer. Exco members may co-opt additional members to delegate specific management tasks and projects. Monthly meetings ensure that the service continues to operate smoothly. The organogram below shows the management structure as laid out in the Constitution.

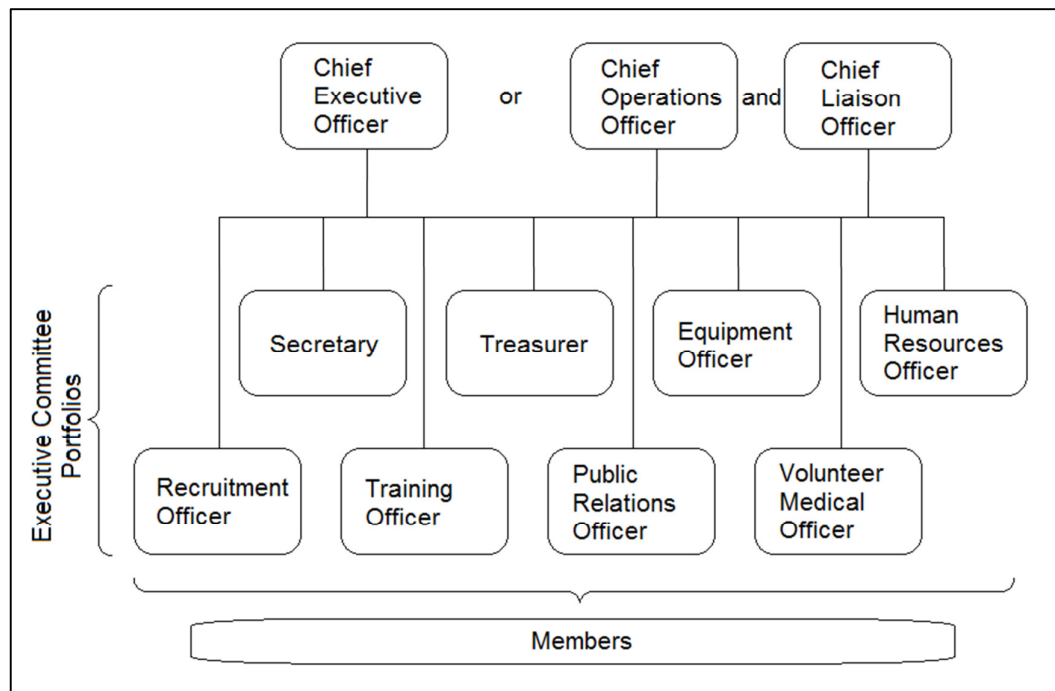


Figure 1: Hout Bay EMS Organogram

For the 2015/2016 year the Exco was led by a CEO and 5 Exco members. The same structure was kept for the 2016/2017 year and the CEO was re-elected (M. Rosenberg. Personal communication, 15 April 2018).

The Western Cape Ambulance Services Act (Act 3, 2010) was developed to ensure a minimum standard for all ambulance services (24). Hout Bay EMS was licensed

when compliance and licensing became compulsory in 2012. The legislation changed from provincial to national in 2014 (25). Annual inspections of the ambulance, equipment, base and documentation are carried out by the relevant authorities and compliance is recognised with a license disk displayed in each service vehicle.

1.2.4 Members

New members join the service as trainees and start working through the medical induction process, followed by the driving induction process until they are promoted to First Persons / Senior Crew members. Figure 2 outlines the induction sequence.

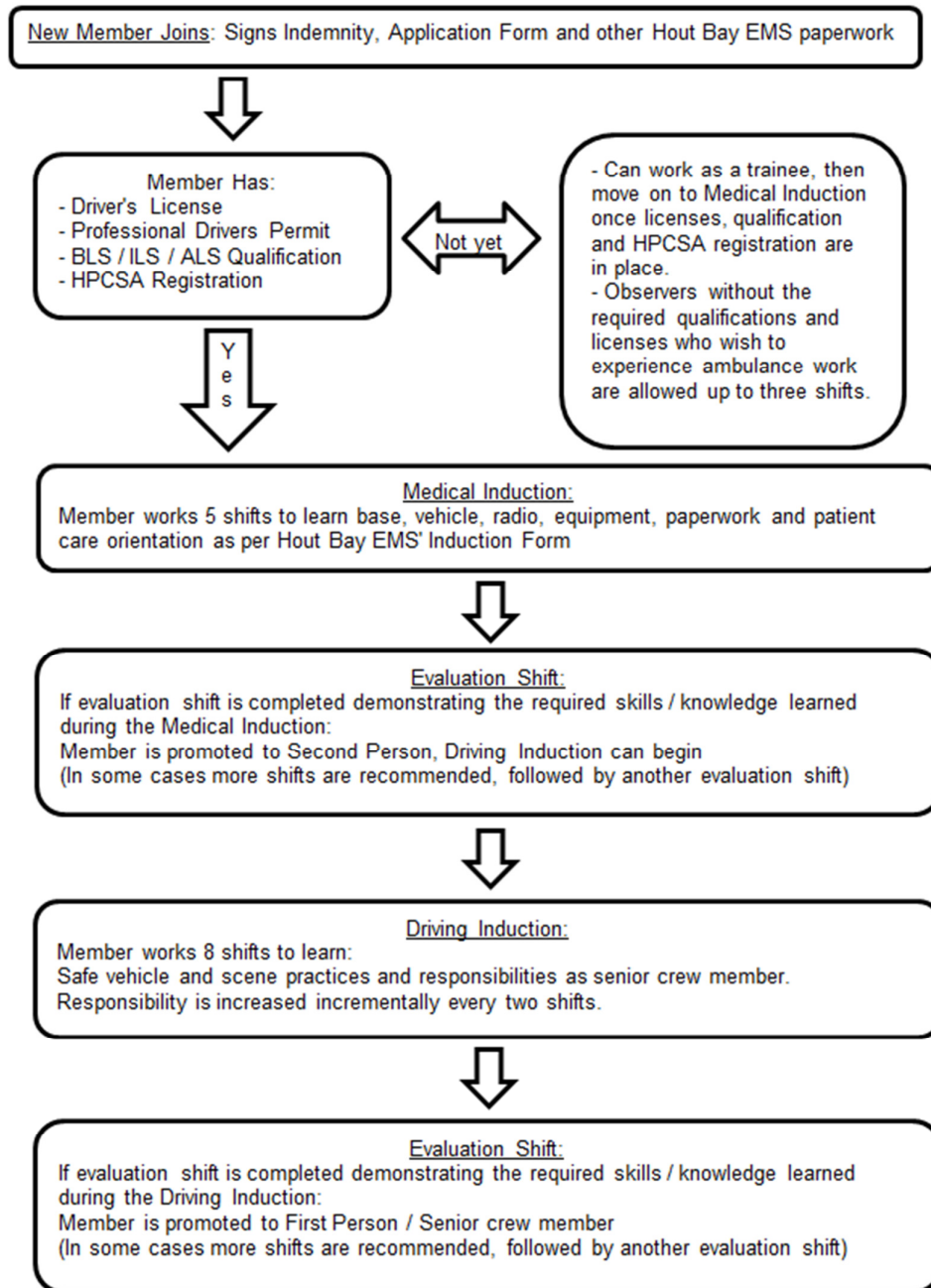


Figure 2: Membership Induction Flow Chart

Evaluation shifts are assessed by an Exco or a senior crew member to ensure that the member is competent and confident to take on the role as Second or First Person. Membership numbers at Hout Bay EMS have fluctuated between 20 and 40 active members throughout the history of the service (23).

1.2.5 Call-outs

When the Hout Bay EMS ambulance begins a shift, the crew communicates with the Provincial EMS control room by radio to call in service and make themselves available for call-outs. They therefore slot into the system of available Provincial EMS ambulances as an additional resource. Most call-outs Hout Bay EMS attends to are dispatched by Provincial EMS. When members of the public require an ambulance for any injury or illness they phone 10177 from a landline or 112 from a mobile phone and reach the Provincial EMS call centre. Once the emergency is logged on the system and Hout Bay EMS is deemed the closest or most appropriate resource available, the control room calls Hout Bay EMS on the radio and dispatches them to the call-out. Hout Bay EMS acknowledges receipt of the call-out and responds to the address. They update the control room on progress by advising them when they are on scene, when they depart the scene with the patient (and which hospital they intend to go to), when they arrive at the receiving hospital and once they have completed the call-out. Occasionally the patient will immediately be referred to another facility and the ambulance will continue to the new destination with the patient. Occasionally call-outs are received from the HBNW control room or other services, in which case Provincial EMS are alerted of the call-outs Hout Bay EMS responds to. This ensures that Provincial EMS is aware of Hout Bay EMS's availability and avoids sending unnecessary resources to a call-out.

Some call-outs end at the scene with no patient being transported to hospital. Reasons for this include situations where the patient refuses treatment or transport; where the patient has left the scene before the ambulance arrived, either by a different ambulance service or if a member of the community has taken them to hospital in a private vehicle; if the patient cannot be located at the given address; or if the call-out is cancelled while the ambulance is en route.

Inter-facility transfers occur when a patient already in a hospital has been treated and has to go for further assessment or treatment at another facility. The transfer is logged with the Provincial EMS call centre by hospital staff and an ambulance will be dispatched to collect the patient and take them to the receiving facility. Occasionally Hout Bay EMS is the closest or most appropriate resource and will be dispatched to attend to the transfer.

Priority 1 (P1) call-outs are life-threatening illnesses or injuries or situations where the information provided suggests that a life-threatening emergency is likely. Examples of this are motor vehicle collisions, unconscious patients, heart attacks, near drowning incidents and complications from serious medical conditions. Currently the target for P1 call-outs is to have an ambulance on scene within 15 minutes in 80% of cases (26). The priority of a call-out is determined by the information collected by the call-takers from the initial phone call for help. Once classed as P1, resources are dispatched urgently to attend to the call-out. The use of warning lights and siren is warranted in these cases to allow resources to reach the scene and patient as quickly, yet as safely as possible.

Priority 2 (P2) call-outs are non-life-threatening incidents where an ambulance was requested. While the patient is ill or injured and should receive medical care, less urgency exists, as they are not expected to deteriorate quickly. P2 examples include chronic illnesses where no urgent complications have currently occurred; a cut on a limb where the bleeding can be controlled or a sprained ankle. P2 call-outs will have an ambulance dispatched as soon as no P1 call-outs are waiting in the area, but the waiting time may be somewhat longer than for P1 call-outs.

1.2.6 Shifts

Hout Bay EMS members provide their time free-of-charge to the volunteer ambulance service and the community. Members are employed elsewhere or are students in a variety of fields and are usually not available during the week. Hout Bay EMS thus operates mostly on weekends, public holidays, and during the festive season. Members do make themselves available at short notice when a major incident has occurred. Unlike the founding members who were residents of Hout Bay, membership now includes people living outside Hout Bay (23). This limits the response to call-outs outside of scheduled shifts. The ordinary shift roster on weekends includes Friday night shift, Saturday day shift, Saturday night shift and Sunday day shift. Night shifts are generally from 19h00 to 03h00 and day shifts span 07h00 to 19h00. This is in accordance with the SLA in place between Hout Bay EMS and Provincial EMS. If P1 calls are pending, the crew will sometimes work beyond shift times to assist with these call-outs.

Members are expected to work at least one shift per three week rotation or an average of four shifts every three months, as stipulated in the service's Minimum Standard Service Requirements. Shift bookings have been managed with Doodle, an online scheduling system, since 2008 (27). The shift coordinator sends out an invite to all members, who can select a number of shifts they are available for. The coordinator then selects the best combinations of members to fill as many shifts as possible for the upcoming rotation. Once finalised, the roster is sent to members, Provincial EMS management and HBNW.

1.2.7 Training

Training sessions for members are held on the last Tuesday of each month at the Hout Bay EMS base. Relevant topics are presented by peers and external knowledge experts to update knowledge and remind members of the approach and treatment of specific illnesses or injuries. Specific training courses like the American Heart Association – Basic Life Support for Healthcare Providers are arranged on occasion.

2. CHAPTER 2: Literature Review

Volunteering has been widely described as yielding valuable benefits to communities, and volunteer organisations are regarded as active contributors to the efforts of uplifting those in need (1–3,28). Some authors further agree that research about volunteer organisations and their structures and characteristics is inadequate and not well described. They suggest such organisations should receive more attention (1,3). This literature review sought to describe the operational activities of volunteer ambulance services, especially in South Africa.

This chapter starts with an overview of ambulance services / emergency medical services globally by offering a definition and a short history. This is followed by a definition of volunteers in the context of volunteer emergency medical services and describing different volunteer ambulance structures. A variety of international volunteer ambulance services are described in comparison to Hout Bay EMS. The focus then shifts to South Africa with an explanation of how EMS in South Africa operates, with a breakdown of practitioner qualifications and registration. After this Hout Bay EMS is described in detail, including setting, history and how call-outs and shifts work in the service.

The online search for this literature review was conducted using Google and Google Scholar. Sources included were dictionary entries, web pages of relevant organisations, magazine and newspaper articles as well as scholarly / academic / journal articles. The search primarily included material published between 2005 and September 2018, however specific relevant material from older sources was also included to give context. To avoid unnecessary duplication some services with similar structures to those focused on were excluded. Services and organisations not suitable for the focus of this study were also excluded. For example, a number of volunteer ambulance services of similar structure to each other exist in the State of New York, United States of America (USA). Only a few key services of these were selected to illustrate the type of services researched.

The following list of keywords was used in online searches to establish context and assist with sections in the literature review. From these keywords further searches were conducted for each topic.

- i. Definition of Emergency Medical Service; definition of Ambulance Service
- ii. History of ambulance; history of ambulance service; history of emergency medical service (with a focus on international organizations); history of emergency medical care; history of patient transport

- iii. Definition of volunteer; volunteering; definition of volunteer ambulance; definition of volunteer ambulance service; definition of volunteer EMS; definition of volunteer Emergency Medical Service
- iv. History of ambulance in South Africa; history of EMS in South Africa; South African history of emergency services; emergency services history South Africa
- v. Volunteer ambulance South Africa; volunteer EMS South Africa; volunteer service South Africa; ambulance volunteers South Africa; emergency medical services volunteer South Africa
- vi. Health Professions Council of South Africa; HPCSA; HPCSA Professional Board for Emergency Care; HPCSA PBEC Registration; HPCSA Regulation; HPCSA CPD; HPCSA Continuous Professional Development
- vii. Ambulance Act South Africa; Western Cape Ambulance Act; Emergency Medical Services Regulations South Africa; National Health Act South Africa;
- viii. Additional searches were conducted where specific information was needed. An example is the building and opening of the Fire Station in Hout Bay.
- ix. In addition various unpublished organisational documents made available by Hout Bay EMS were used for the section focusing on the service.

2.1 Ambulance Services / Emergency Medical Services

The definition of Emergency Medical Services

EMS respond to cases of severe injuries and illness, rapidly assess, provide appropriate emergency interventions and transport the patient as quickly as is safe to definitive care. The goal of EMS is to provide emergency medical treatment to any person who needs it (5). The South African National Health Act of 2003, as revised in 2014, defines EMS as the pre-hospital treatment and transportation of sick and injured people including the medical rescue of such patients by state or private ambulance organisations (25).

EMS provides early access to the healthcare system especially in life-threatening illness or injury situations and those where disability and deterioration of the patient's condition can be prevented. Early access and treatment means minimising the effects of a critical injury or illness, a faster recovery and a lower burden on the healthcare system long term (29,30).

2.1.2 The history of EMS

Emergency treatment and transportation of patients to medical care in various forms has been recorded as early as the 11th century, mostly in military or war settings (31). Dominique-Jean Larrey is credited with the concept of an organised transport and treatment system for wounded soldiers from the battlefield to a safe place of care. He did this in the Napoleonic Wars at the end of the 18th century and his system formed

the basis of the modern ambulance service and triage (32,33). Later in the 19th century various formalised ambulance structures started to appear in Europe, for example St Johns Ambulance Brigade which had essentially evolved from the Knights of St John (31,34). Two predominant systems appeared, namely the primarily doctor-based Franco-German system and the primarily paramedic-based Anglo-American system, on either of which many countries base their EMS System (35).

De Villiers makes reference to the ambulance volunteers from England, active in the South African War of 1899-1902 under the Order of St John (36). These were members of the St John Ambulance Brigade established in 1887, which formed the basis for ambulance services in South Africa (36). Today South Africa's EMS structure is largely based on the Anglo-American system, using different levels of paramedics in the pre-hospital arena (37).

2.2 Volunteer Ambulance Services

2.2.1 The definition of volunteering

Although the definitions of volunteering differ depending on context, volunteering in the true sense of the word can be defined as follows: To give of one's own time, by one's own choice and without coercion, for no financial reward, for the benefit of others (38–40). In the context of Hout Bay EMS and volunteer ambulance services, volunteering is best described as formal or organised volunteering. The formal volunteer is a member of an organisation while participating in their voluntary activity, compared to informal volunteers who spend time assisting others outside a formal organisation (38,41,42). Within a formal structure and especially in the context of volunteer ambulance services it is reasonable for volunteers to be issued uniforms and some basic equipment to be able to fulfil their duties on the ambulance. Within the formal structure volunteers are expected to work a certain number of hours per week or month. These structures are required to allow a volunteer ambulance service to function properly, without conflicting with the definition of unpaid volunteering.

The concept of volunteering has been described as a valuable focus of activity to be encouraged and promoted especially among the youth in South Africa and volunteering in Southern Africa in various fields has enjoyed a new focus (1). Taking into account the difficulties volunteer organisations face, which include finding funding to continue their work, those organisations which have lasted longer than 11 years are described as resilient (1,2). Volunteer organisations' greatest resource is their volunteer members. Therefore increasing membership numbers or productivity of their existing membership increases the output that a volunteer organisation can achieve (28).

2.2.2 Types of volunteer ambulance structures

Autonomous volunteer ambulance services

This type of ambulance service is affiliated to other organisations and works alongside various entities but is constituted as an autonomous organisation. Hout Bay EMS is a prime example of this. Specifically this type of service is staffed and managed entirely by volunteers, and transports patients in ambulances to definitive hospital care. This is in contrast to volunteers working directly under the management of a parent structure or permanently employed, paid staff and those structures providing response-only services described below. Autonomous volunteer ambulance services especially in Southern Africa are relatively rarely described in literature, whereas the other types of services are well represented. In contrast, a large number of autonomous volunteer ambulance services in the state of New York, USA are well described. Some examples are outlined in the International Context section below.

Volunteer divisions within organisations

Many ambulance services internationally and in South Africa have volunteer divisions or a structure to allow volunteers to work alongside permanently employed, paid staff. The parent structures vary and include government / state services, paid / for profit ambulance companies and NGOs / NPOs. These volunteers assist at public events, at major incidents or disasters, with patient transport and in some cases are qualified to work as ambulance staff, supervised or unsupervised by permanent / paid colleagues. Some organisations offer financial stipends, hourly rates or stand-by allowance, departing from the definition of true volunteering.

First responder systems

Numerous examples exist of community based, volunteer first responder systems. First responders in this context are not employed by an ambulance service but respond from home or their place of work when an emergency arises in their immediate vicinity. First responder systems are sometimes operated in parallel to a formal EMS structure and dispatched to provide assistance to and as a source of reliable feedback from a scene. In other countries where formal EMS structures are less developed or access to an area is difficult, first responders may be the only response to a medical emergency. In general, community members trained as first responders focus on their area's burden of disease and are dispatched to assist patients before the arrival of an ambulance or suitable transport to hospital. In some cases the responders also provide transport, although not in ambulances, either to a hospital or to a point where EMS can meet them. While first responder systems yield

valuable results, their organisational and operational structure is dissimilar to Hout Bay EMS and will therefore not be discussed in more detail.

2.2.3 International context of volunteer ambulance services

The organisational structure and some operational characteristics of Hout Bay EMS were partly based on Harpur's Ferry Student Volunteer Ambulance Service (HFSVAS) in Broome County, New York (23,43). This occurred after a visit to the service by Bruce Bodmer in the mid 1990's. Mr Bodmer was later one of the founders of Hout Bay EMS and the insights he gained in America played an influential role in the development of Hout Bay EMS (23). HFSVAS is an autonomous volunteer organisation that was founded in 1973 as a result of a perceived need to add to existing emergency care and transportation resources in a specific geographical area. HFSVAS has operated continuously since its inception and is managed by an elected management team who look after administrative and operational tasks. The service relies on sponsorship and donations for its on-going operation and operates on 100% volunteer membership. Members are required to be trained and certified as pre-hospital healthcare professionals. HFSVAS do not charge patients for their service and are available to attend to call-outs beyond their immediate geographical area. They operate ambulances and are able to respond to emergencies and transport patients to the most appropriate facility (43). Hout Bay EMS shares all these characteristics with HFSVAS showing the similarity between the two services despite operating on different continents. There are also clear differences between the two services. HFSVAS operates 24 hours a day throughout the week and draws only on Binghamton University students as their source for members, where Hout Bay EMS operates primarily over weekends and does not have a specific source for recruitment of members. HFSVAS are able to assist with funding towards training of their members, whereas Hout Bay EMS members fund their own training courses.

HFSVAS respond to around 1000 call-outs annually. They operate 24 hours a day throughout the year and have 73 volunteers working on 3 ambulances and 2 response vehicles. They have additional equipment specifically for medical support at events.

In 1949, Chili Volunteer Ambulance started in Rochester, New York, USA with 21 members after an ambulance was made available through funds provided by the War Memorial organisation in the area. They are now called Chili-Henrietta-Scottsville (CHS) Mobile Integrated Healthcare after a merger with two nearby units (Henrietta and Scottsville). The organisation is run primarily with volunteer staff and a few full-time, paid staff members (44).

Salisbury Volunteer Ambulance Service in Connecticut in USA was established in 1971 by 14 members. The service is available 24/7 and is 100% volunteer based,

funded by the community and businesses in the area, much like Hout Bay EMS. They respond to 400 calls per annum on average (45).

Numerous other volunteer ambulance services in USA are based on similar structures as the two outlined above, especially in the state of New York.

Also in the USA, the Columbia University Emergency Medical Service (CUEMS) operates similarly to HFSVAS (46). This service is operated by students attending the university. They accept applications twice a year and provide the necessary training and certification for their members on site. Sponsorship for certification is available. The service started in 1968 under the name Columbia Area Volunteer Ambulance. Their service to the university campus and surrounding areas is available 24 hours a day, 7 days a week and is free of charge to patients. Approximately 40 active basic life support members respond to around 1100 call-outs per annum.

The St Johns Ambulance Service in the United Kingdom (UK) uses volunteers in a number of different capacities, including as personnel on their ambulances. They provide training for their event first aiders and on-going support and training as well as uniforms to first aid and ambulance volunteers. Volunteers form part of the bigger structure of the organisation and do not create a separate or autonomous organisation. (47)

The British Association of Immediate Care Schemes (BASICS) and Southcoast Immediate Medical Care Scheme (SIMCAS) in the UK are voluntary organisations coordinating highly trained, specialist first responders. Doctors, nurses, paramedics and military medics are activated by pager and respond in their own vehicles, primarily to motor vehicle collisions and major incidents in their respective areas. With its origins in the 1960s, BASICS was formalised into an organisation in 1977 and SIMCAS (now under the BASICS umbrella) was formed in 1978. Neither of these groups are funded by the National Health Service (NHS) and funding for these charities comes exclusively from donations (48,49).

Austria has around 50,000 volunteers active in the ambulance service across the country, either as first responders, as ambulance personnel or those doing their voluntary social year which usually happens soon after completing school. Ambulance volunteers form part of the Austrian Red Cross (Österreichisches Rotes Kreuz - ÖRK) ambulance service structures across the nine regions in Austria and assist in the staffing of approximately 2500 road ambulances. There are no reported autonomous volunteer ambulance services in Austria. The basis for such a vast pool of volunteers in the ÖRK stems from a history of more than 135 years of ambulance volunteerism in Austria (50–52). It is not clear from the sources whether volunteers receive a stipend or are otherwise financially compensated in the ÖRK.

Since the discontinuation of compulsory military or civil service in Germany in 2011, a voluntary system of social responsibility (Bundesfreiwilligendienst) has been developed. People are encouraged to spend between 6 and 18 months working in a social service field of their choice. Volunteering at one of the ambulance services is an option (53). Most large ambulance services like the German Red Cross (Deutsches Rotes Kreuz) and the Arbeiter-Samariter-Bund have a structure where applicants are trained and then become active members for the period to which they have committed. This social responsibility work can be used as a stepping stone into a career in the ambulance service (54,55). This structure (and that of Austria discussed above, which is similar) is quite different from most other types of volunteer ambulance services listed here.

The Magen David Adom (MDA) is the state of Israel's national organisation providing pre-hospital care and is the equivalent of a national Red Cross or Red Crescent structure. Apart from full-time pre-hospital work and volunteers incorporated under the parent structure, they specialise in a form of educational tourism focused on pre-hospital care. Participants travel to Israel from other countries and pay to be part of the MDA volunteer programme. They do a ten day training course, regardless of prior medical experience or qualification, followed by five weeks of ambulance work alongside Israeli volunteers. This structure is quite different from other organisations or programs and placement is possible in a number of cities in Israel. The programme aims to provide a meaningful travel experience with a focus on real day-to-day society and interaction with communities in Israel (56,57). The Red Cross in Puerto Vallarta, a popular tourist destination in Mexico has a similar program (58).

Ambulance Victoria operates in the state of Victoria in Australia (59). Volunteer Community Emergency Response Teams (CERTs) and casually employed Ambulance Community Officers (ACOs) add to the pool of resources of full-time employed staff, especially in outlying and rural areas in Australia. ACOs and CERTs are dispatched as soon as emergencies arise, respond to the scene and perform basic medical interventions to treat patients and prepare them for transport until the ambulance arrives. This assists Ambulance Victoria to improve response times to medical emergencies and in over 80% of cases where CERTs were dispatched in 2014-2015, they arrived before the ambulance. Note that these volunteers operate directly under Ambulance Victoria and do not form separate / autonomous organisations, unlike Hout Bay EMS. In 2015, Ambulance Victoria had approximately 670 ACOs and 404 CERTs active in the service.

The South Australia Ambulance Service has over 1400 volunteers spread across the state who work alongside their permanent staff members (60). These volunteers are active on ambulances and attend to emergencies and patient transfers. Once their application is accepted and they have been interviewed, applicants are subjected to

a medical fitness test and criminal background check. Training is free and accredited for all Australian states and territories. Volunteers are expected to commit to around 30 hours plus two training sessions per month.

Thailand's oldest volunteer ambulance corps was founded in 1937 by the Pohtecktung Foundation, followed by Ruam Katanyu Foundation in 1970. Both are private (non-government) not-for-profit organisations. Volunteers with very little medical training responded to emergencies to transport patients to hospital, usually in unequipped private passenger vehicles. No formal dispatch system existed, nor was there formal coordination between the organisations and receiving facilities. More recently volunteers across Thailand have benefitted from the development of more organised guidelines, focused training and better equipment and ambulances (61,62).

The Addis Ababa Red Cross in Ethiopia (Ethiopian Red Cross Society) has been using volunteers to staff their ambulances since 1960. Their training comprised only 72 hours of First Aid and the equipment on the ambulance is basic, however this system was one of the more formal ambulance arrangements in the East African region. Upgrades in recent years have resulted in improved training as well as coordination and collaboration between public and private ambulance service providers, often assisted by the international emergency medicine community (63,64). In July 2017 50 ambulances were distributed to various regions of Ethiopia, also supported by volunteers (65).

2.3 EMS in South Africa

South Africa's healthcare system is split into public and private healthcare, with around 16% of the population able to afford private healthcare insurance, normally in the form of medical aid scheme subscriptions. Public healthcare caters for the remaining 84%, of which around 25% are paying for at least some private healthcare. Of the almost ZAR 250 billion annual expenditure on healthcare in South Africa, around half is spent in public and half in private healthcare. Non-governmental organisations (NGOs) add around 2% to annual funding through donors (66,67).

The state ambulance service in South Africa is managed at provincial level with each province tailoring the service to their area's specific needs. Each province has multiple ambulance bases and call-centres to attend to the need for emergency medical care in their urban and rural catchment areas.

Netcare 911 (operating since 1998) and ER24 (operating since 2000) are two of the largest nationally operating private for-profit ambulance service providers in South Africa. They respectively have 200 and 300 emergency vehicles stationed at various branches across the country. Their fleets are made up of response vehicles, ambulances and specialist vehicles. Each has their own emergency contact number,

separate from the provincial ambulance emergency numbers. Both organisations have strategic partnerships with other organisations to extend their reach across the country and add to the range of products and services they provide to clients (68,69). A large number of smaller private for-profit ambulance services exist in all provinces of South Africa.

Air ambulance services and helicopter emergency medical services are additional response and transport resources that will not be discussed in further detail.

EMS in South Africa are governed by legislation, including the Constitution of the Republic of South Africa, 1996 (Act 108 of 1996), National Health Act, 2003 (Act 61 of 2003), Medicines and Related Substances Act, 1965 (Act 101 of 1965), Mental Health Care Act, 2002 (Act 17 of 2002), Health Professions Act, 1974 (Act 56 of 1974) and Children's Act, 2005 (Act 38 of 2005).

In addition, specific regulations for ambulance services were developed at provincial level either as Ambulance Acts or as part of the Provincial Health Act. Examples include Free State in 1999, Gauteng in 2002 and Western Cape in 2003. These were later reviewed and finalised at national level for implementation across South Africa. Under the National Health Act (No. 61 of 2003), the Emergency Medical Services Regulations were released in July 2014 (25). These regulations apply to all ambulance services operating in South Africa. They are designed to create a minimum standard in terms of equipment levels, management structures and record keeping, amongst others. Compliance is required to receive an annual license to be permitted to operate an ambulance service (25,70).

2.4 Qualifications and practitioner registration

The Health Professions Council of South Africa (HPCSA) Professional Board for Emergency Care (PBEC) currently registers the following qualifications (71):

- Basic Ambulance Assistants (BAA) – Basic Life Support (BLS)
- Ambulance Emergency Assistants (AEA) – Intermediate Life Support (ILS)
- Operational Emergency Care Orderly (OECO)
- Paramedics (Critical Care Assistant (CCA) and National Diploma (N Dip)) – Advanced Life Support (ALS)
- Emergency Care Technicians (ECT) - ALS
- Emergency Care Practitioners (ECP) - ALS

The HPCSA lists the following providers as Advanced Life Support (ALS): ECP, ECT, N Dip, Paramedic CCA (72). This study uses the HPCSA categories to distinguish between the levels of care on the ambulance. At the time of the study Hout Bay EMS had BLS, ILS and ALS members, however no OECOs.

HPCSA registration is possible after successful completion of one of the training courses presented by HPCSA accredited institutions. Practitioners can only work on ambulances and treat patients in South Africa once registered with the HPCSA. This manifests the HPCSA's vision to "protect the public and guide the professions" (71). Registration is renewable annually at a fee determined by the HPCSA. Continuous Professional Development (CPD) is mandatory and includes accredited activities and training regarding latest industry developments and skill updates. Each CPD activity is credited with a number of Continuing Education Units (CEUs) that are issued to attending practitioners. Practitioners have to accumulate 30 CEUs per annum (15 CEUs for BAA) and points are valid for 24 months. CPD compliance is tested by random audits done by the HPCSA on individual registered practitioners (73,74). Operational Hout Bay EMS volunteers are compliant with all of the above requirements.

South Africa had over 65000 HPCSA registered emergency care personnel as of March 2017. Around 80% are BLS, 15% ILS and 5% ALS. Of the registered personnel, only around 18000 are employed as operational pre-hospital personnel in the country with a 75/25 percentage public / private sector split. On a provincial level in the public sector, KwaZulu-Natal employs the most personnel at almost 15%, while the North West province employs the least at around 3.5%. The Western Cape employs 8.5%. A total of around 3200 ambulances are operational in the country with a 70/30 percentage public / private sector split recorded (75). The employment statistics are not clear about inclusion or exclusion of volunteer personnel in South Africa, however operational volunteers are included in the total number of HPCSA registered emergency care personnel statistics.

2.5 Burden of Disease in the Western Cape

The burden of disease in the Western Cape, South Africa is complex. While sources differ on the split between burden categories, the contributors can be grouped into communicable diseases like Tuberculosis or HIV / AIDS and maternal, perinatal and nutritional conditions; non-communicable diseases like heart disease, respiratory diseases, diabetes or cancer; injuries from inter-personal violence and motor vehicle collisions. Although not quantified, mental health disorders also feature as a burden on the healthcare system including drug and alcohol related conditions (76,77).

Inter-personal violence in the Western Cape exceeds injury and death by motor vehicle collisions, the latter normally being the largest contributor to death and morbidity by injury in other parts of the world. In one study, the victims of inter-personal violence were mostly males (75%) and incidents occurred largely at night and over weekends. Alcohol use was often recorded where violence occurred (78).

3. CHAPTER 3: Methodology

3.1 Study design

This study is a descriptive, retrospective study describing the operational activities of Hout Bay EMS, a volunteer ambulance service in Cape Town, South Africa. The call-out data and shift data of the service is described over one calendar year (2016). Comparisons were drawn to Provincial EMS data where available, especially where Provincial EMS was dispatched within the Hout Bay area. Membership demographic data made available by Hout Bay EMS were used to describe gender and qualifications of members without the need for member identifiable information.

The study received ethical approval from UCT Human Research Ethics Committee, and Provincial EMS and Hout Bay EMS agreed to the use of their data for this study. These approvals are attached in the Appendices.

3.2 Inclusion criteria

The study included all call-outs to which the Hout Bay EMS ambulance was dispatched in 2016, based on Provincial EMS Computer Aided Dispatch (CAD) data. All shifts for which the Hout Bay EMS ambulance was staffed in 2016 were described from shift information made available by the Hout Bay EMS shift coordinator. Hout Bay EMS membership demographics were described from information provided by their Human Resources Officer.

Comparison was made to relevant Provincial EMS data in the Hout Bay area in 2016 to establish a context for the work done by Hout Bay EMS.

3.3 Exclusion criteria

Any call-outs where the Hout Bay EMS ambulance was not officially dispatched were excluded. Therefore, call-outs attended to by off-duty Hout Bay EMS volunteers where the ambulance was not dispatched were excluded. Similarly, call-outs attended to by any other emergency service in Hout Bay where the Hout Bay EMS ambulance was not dispatched were excluded.

3.4 Measurements and analyses

Table 1 lists the measurements performed for this study. Measurements were selected for the study that would quantify and therefore highlight the operational activities of this service. Call-out and shift data were selected as these formed a data

set that could be repeated for past and future years of the same service and would also form a common framework that other services in other settings may find useful, even if those services are not similar in organisational structure to Hout Bay EMS. The assessment of this data over one year also adds a timeframe that may be useful for other studies to aid in meaningful future comparison of services. The measurements selected include call-out dispatch data from Provincial EMS who dispatch and record all call-outs for Hout Bay EMS. Shift roster information provided from Hout Bay EMS records was used to describe the staffing of the ambulance for rostered and ad-hoc shifts worked. Additional information from Hout Bay EMS provided data for a demographic description of the active members in the service. The call-out and shift data was used to create a quantifiable overview of what this volunteer ambulance service did in a year. Additional analyses were made to Provincial EMS call-out data within the Hout Bay area where possible.

Table 1: Study measurements and analyses

	Variables collected	Calculations and analyses
1	Total number of call-outs Hout Bay EMS was dispatched to in a 12 month period	Addition of all call-outs to give total for the year Mean number of call-outs per month, showing lowest and highest value
2	Percentage of Hout Bay EMS call-outs within Hout Bay compared to the percentage outside Hout Bay of the total described in point 1 above	Percentage of Hout Bay EMS call-outs within Hout Bay for the year Percentage of Hout Bay EMS call-outs outside Hout Bay for the year
3	Percentage of call-outs that were Priority 1 (P1) compared to Priority 2 (P2)	Percentage of P1 call-outs for the year Percentage of P2 call-outs for the year
4	Percentage of call-outs where no patient was transported	Percentage of call-outs where a dispatch did not result in a patient transport Breakdown of reasons / categories for call-outs ending in no patient transport Quantities for each reason / category for call-outs ending in no transport

5	Mission times for all call-outs	<p>Calculation of response time, i.e. Dispatch to Arrival on Scene for all P1 call-outs</p> <p>Mean response times for P1 call-outs inside and outside the geographical area of Hout Bay</p> <p>Total time spent on missions for the year was calculated</p>
6	Total number of shifts Hout Bay EMS worked in a period of 12 months	<p>Addition of all shifts worked to give total number of shifts for the year</p> <p>Differentiate between booked / rostered shifts and additional ad-hoc shifts</p> <p>Mean number of shifts per month</p> <p>Identification of highest and lowest shift numbers per month</p>
7	Monthly totals examined against the number expected in the SLA with Provincial EMS	Actual monthly shift numbers as a percentage of expected shifts as per the SLA with Provincial EMS
8	Percentage of day shifts and night shifts	<p>Percentage of day shifts for rostered shifts in 2016</p> <p>Percentage of night shifts for rostered shifts in 2016</p> <p>Percentage of day shifts for ad-hoc shifts in 2016</p> <p>Percentage of night shifts for ad-hoc shifts in 2016</p>
9	Highest qualification / level of care, with percentages of Basic Life Support (BLS), Intermediate Life Support (ILS) and Advanced Life Support (ALS) shifts worked in a period of 12 months	<p>Percentage of Basic Life Support shifts for the year</p> <p>Percentage of Intermediate Life Support shifts for the year</p> <p>Percentage of Advanced Life Support shifts for the year</p> <p>Differentiate between highest qualifications on rostered and ad-hoc shifts</p> <p>Note: The levels of Life Support used in this study will be as determined by the (HPCSA) for the period the study describes</p>
10	Volunteer demographics	<p>Total number of volunteers in 2016</p> <p>Number of female vs. male volunteers</p> <p>Number of BLS, ILS & ALS volunteers</p> <p>Described gender vs. qualification of volunteers</p>

3.5 Data management

Data for this study was received from two sources, Provincial EMS and Hout Bay EMS.

CAD data from Provincial EMS was received in a password-protected Excel spreadsheet with all recorded call-outs for the year for Hout Bay EMS including all relevant data. This list was stripped of all person identifiable data by copying relevant information for the study out to a new spread-sheet.

Hout Bay EMS shift data was received in a password protected Excel spread sheet format. From this a new spread-sheet was developed by extracting only relevant shift data for the study. No person identifiable data was required for the study. Similarly, a single table in Excel format was received from Hout Bay EMS, listing volunteer gender and qualification only with no further identifiable data. From this the service volunteer demographics were described.

Various checksums were built into the spread-sheet used to extract measurements from raw data to ensure no call-out or shift information was lost or duplicated.

Raw data and all records will be kept safe for the time span required by the university after submission of the study.

3.6 Ethical considerations

The main ethical concern in this study was for the safety of information which could identify patients, Hout Bay EMS personnel or Provincial EMS personnel. Raw call-out CAD data received from Provincial EMS were first stripped of all patient identifiable information such as exact scene location before the data were used. The CAD data received contained no Provincial EMS personnel identifiable information. Similarly, all shift data received from Hout Bay EMS were stripped of personnel identifiable information before use. All volunteer demographics data received from Hout Bay EMS were stripped of person identifiable data by the service. Access to the raw data was restricted to the investigator alone, all data were received in password protected format and all data were stored on the investigator's password-protected computer. No person identifiable data were used in the analysis of this study and no such information was shared with any other party.

This study was not designed to directly influence patient treatment strategies and no risk to future patients has been identified. Similarly, the study is retrospective and does not recommend any change to the operational activities of Hout Bay EMS that could increase risk to personnel in future.

Consent

Patient and personnel consent were not applicable in this study as no person identifiable data were used, no patient records were accessed and no interviews were conducted. Permission for access to and use of data was obtained from Provincial EMS management and Hout Bay EMS management before commencement of the study. UCT permission and Ethics Approval were received before commencement of the study.

Privacy and confidentiality

Privacy and confidentiality were upheld throughout the study by avoiding the use of any patient and personnel identifiable data and stripping any such information from the data before use in the study. All data were kept on a password-protected computer with access restricted to the investigator only. All notes on paper pertaining to the study were restricted for the investigator's use only, regardless of content.

3.7 Bias

The principal investigator was a member of Hout Bay EMS for 16 years (1999 to 2015), an Exco member over numerous of those years and CEO in 2013, but was no longer a member in 2016. There is therefore no conflict or bias in terms of the data described for 2016 in this study.

3.8 Data dissemination

No raw data has been or will be disseminated. No data containing any patient or personnel identifiable data has been or will be disseminated. A summary of results will be sent to Provincial EMS management as per request in the approval letter, once the study is complete and submitted to UCT. A summary of results will also be sent to Hout Bay EMS management. These results will be sent to the above organisations by email.

3.9 Source of funding

This study was self-funded by the investigator. No additional funding was applied for or received.

4. CHAPTER 4: Results of the Study

The results of the study are described in this chapter, with details of the call-outs Hout Bay EMS responded to in 2016, followed by details of the shifts the service members worked in the same year. Results for Provincial EMS call-outs responded to in Hout Bay over the same period are shown and compared to Hout Bay EMS results.

Missing data

57 call-outs were excluded from mission time calculations only, due to no recorded scene or completion times. These 57 call-outs were however included for calculations of call-outs ending in no patient transport, as that data was complete.

No missing shift data was found, therefore 101 rostered and 18 ad-hoc shifts were included.

Conflicting data

One recorded call-out was removed from the data as it was allocated to Hout Bay EMS in error. One further call-out was removed due to a conflicting timeline. Therefore 682 call-outs were included.

No conflicting shift data was found, therefore 101 rostered and 18 ad-hoc shifts were included.

4.1 Analysis of call-outs

4.1.1 Number of call-outs

An important measurement collected in this study to highlight the operational activities of Hout Bay EMS was the number of times the service responded to call-outs in 2016. This data was collected from the Provincial EMS CAD database for call-outs logged by the control room operators, where Hout Bay EMS was dispatched. The total number of call-outs on record for the year was 684. Only two call-outs (0.29%) were completely removed from the data collection as the data for the call-outs conflicted. One of these incidents was allocated to Hout Bay EMS in error; the other demonstrated a conflicting timeline. For the purposes of calculating response times and mission times, a further 57 call-outs were removed from time calculations (8.36%). These call-outs were initially allocated to the Hout Bay EMS ambulance but cancelled en route. They could not be included in these calculations and response statistics as no scene times or call-out completion times were recorded for them. There were no records available for major incidents that Hout Bay EMS was

dispatched to or required for in 2016. The total number of call-outs that were therefore dispatched and completed was 625, with the monthly breakdown as shown in Table 2.

Table 2: Monthly call-outs for Hout Bay EMS

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Call-outs	107	45	66	46	54	68	60	44	30	34	22	49

4.1.2 Call-out types

The call-out type categories are set by the Provincial EMS CAD system and allocated by the personnel receiving and logging the call-out when the public first requests an ambulance. These categories are based on information available from the person making the phone call, guided by detailed questions from the call-taker. Figure 3 shows a comparison of percentages per call-out type attended by Hout Bay EMS and Provincial EMS.

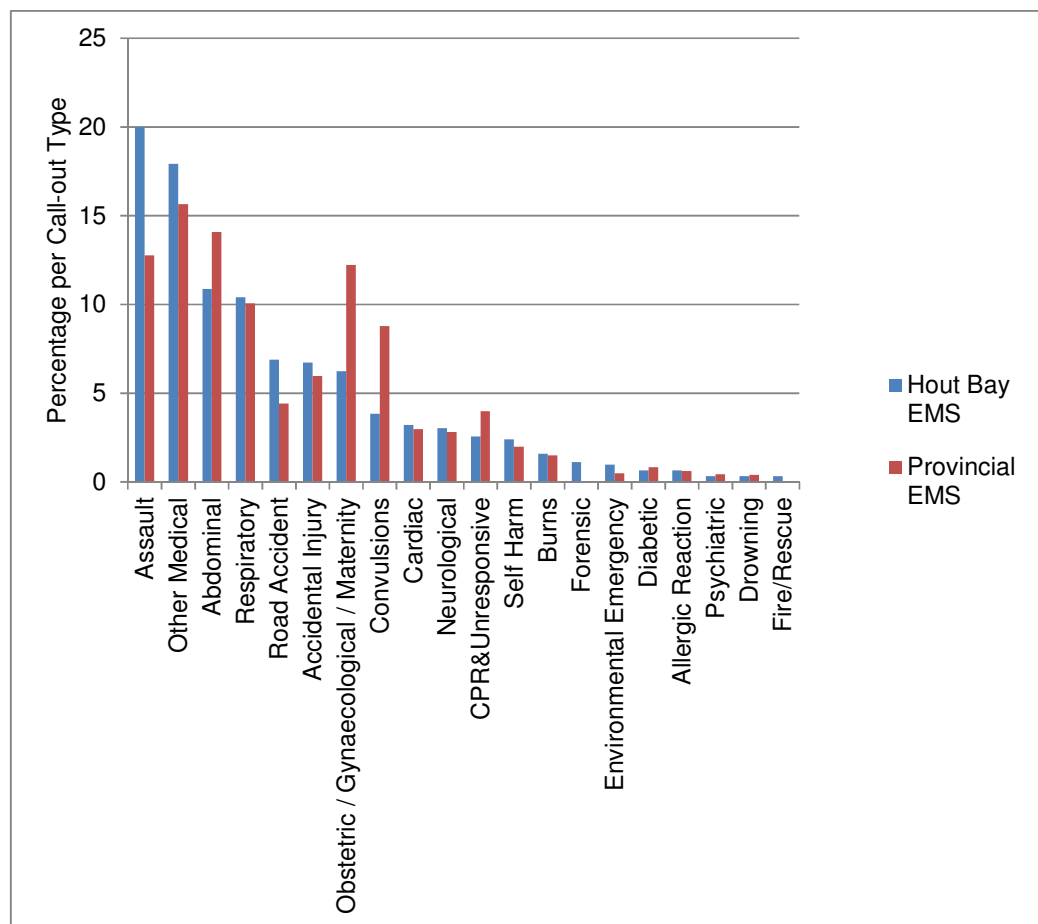


Figure 3: Number of incidents per call-out type

4.1.3 Call-outs within and outside Hout Bay

The percentage of call-outs responded to within Hout Bay compared to the percentage outside of the geographical area of Hout Bay, is broken down into monthly totals in Table 3. Hout Bay EMS attended to call-outs within Hout Bay 73.12% of the time. Only 26.88% of call-outs attended to were outside Hout Bay.

Table 3: Number of Hout Bay EMS call-outs inside and outside Hout Bay

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
Inside	77	31	37	33	36	50	45	36	21	28	19	44	457
Outside	30	14	29	13	18	18	15	8	9	6	3	5	168

Table 4 shows the monthly call-out totals for Hout Bay EMS within the Hout Bay area compared to Provincial EMS call-out numbers over the same period within the same geographical area. Provincial EMS totals do not include Hout Bay EMS call-outs. Hout Bay EMS therefore responded to 20.16% of all call-outs in Hout Bay, for the year. The average number of call-outs per month inside the Hout Bay area was 38.08 for Hout Bay EMS and 150.83 for Provincial EMS.

Table 4: Comparison of number of call-outs by Hout Bay EMS and Provincial EMS in the Hout Bay area

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
Provincial	150	137	153	122	122	130	149	148	162	151	154	232	1810
Hout Bay EMS	77	31	37	33	36	50	45	36	21	28	19	44	457
Total	227	168	190	155	158	180	194	184	183	179	173	276	2267

4.1.4 Call-outs with no patient transport

Of the 682 call-outs on record for Hout Bay EMS in 2016, 268 ended in no transport, which is 39.3%. This number includes all call-outs dispatched but cancelled en route or where the ambulance arrived on scene but no patient was transported to hospital. Provincial EMS recorded 38.84% in Hout Bay over the same period. Figure 4 shows the monthly percentages of all call-outs ending in no patient transport for Provincial EMS and Hout Bay EMS for 2016.

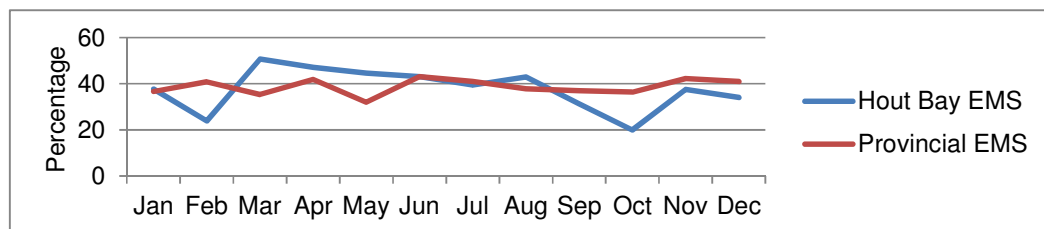


Figure 4: Monthly percentage of call-outs ending in no patient transport

For Hout Bay EMS in 2016, the largest category of call outs ending in no patient transport (25%) was categorised as “Other” since the data showed no specific category for these call-outs. Hout Bay EMS was dispatched to these call-outs and arrived on scene / attended to the call-out but did not transport patients from scene. The remaining 75% were split into 11 categories. Figure 5 shows the break-down of all categories. The categories are taken from the CAD data provided by Provincial EMS.

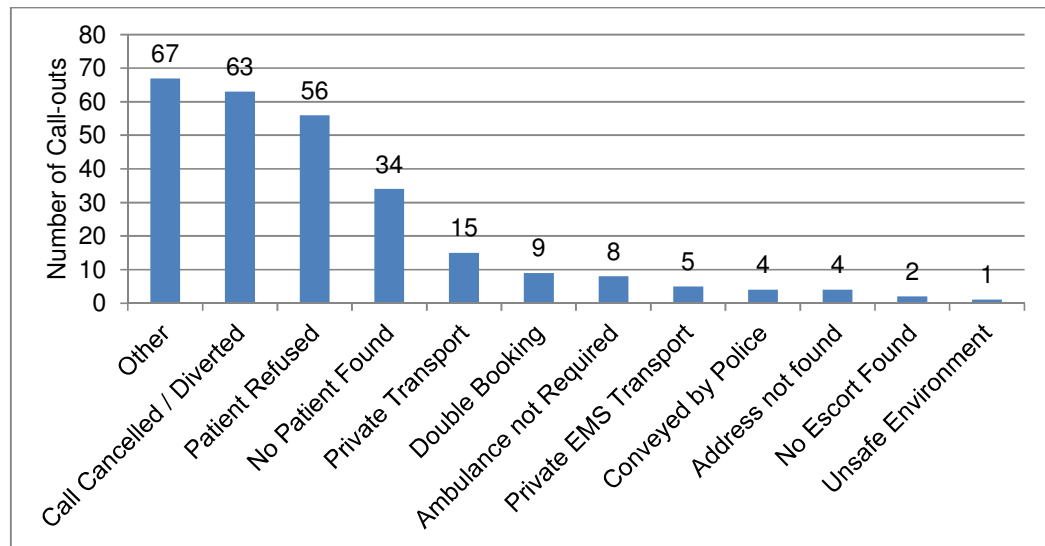


Figure 5: Categories of no patient transport

4.2 Prioritization and timing of responses

4.2.1 Priority 1 and Priority 2 call-outs

P1 call-outs are potentially life-threatening situations where the use of lights and siren are warranted and an urban response time of 15 minutes is aimed for. P2 call-outs are all other call-outs where no life-threatening emergency is suspected and response times can be longer without adversely affecting the patient.

Table 5 shows a break-down of call-out priorities for Hout Bay EMS call-outs in and outside the Hout Bay area and Provincial EMS call-out priorities in Hout Bay for 2016. The total number of call-outs for Hout Bay EMS for this calculation was 625 since the time of arrival on scene was required. Call-outs cancelled en route did not record scene times and had to be removed.

Table 5: Comparison of the number of Priority 1 and Priority 2 call-outs

	Total per category	Priority	Number per category	Percentage per category
Hout Bay EMS in Hout Bay	457	P1	126	27.57%
		P2	331	72.43%
Hout Bay EMS outside Hout Bay	168	P1	135	80.36%
		P2	33	19.64%
Hout Bay EMS Total	625	P1	261	41.76%
		P2	364	58.24%
Provincial EMS in Hout Bay	1810	P1	792	43.76%
		P2	1018	56.24%

The desired response time for P1 call-outs is within 15 minutes. This is calculated from the time the incident reaches the call centre to the time a resource arrives on scene. Figure 6 shows the comparison between monthly average response times of P1 call-outs between Provincial EMS call-outs in Hout Bay, Hout Bay EMS call-outs in Hout Bay and Hout Bay EMS call-outs outside Hout Bay.

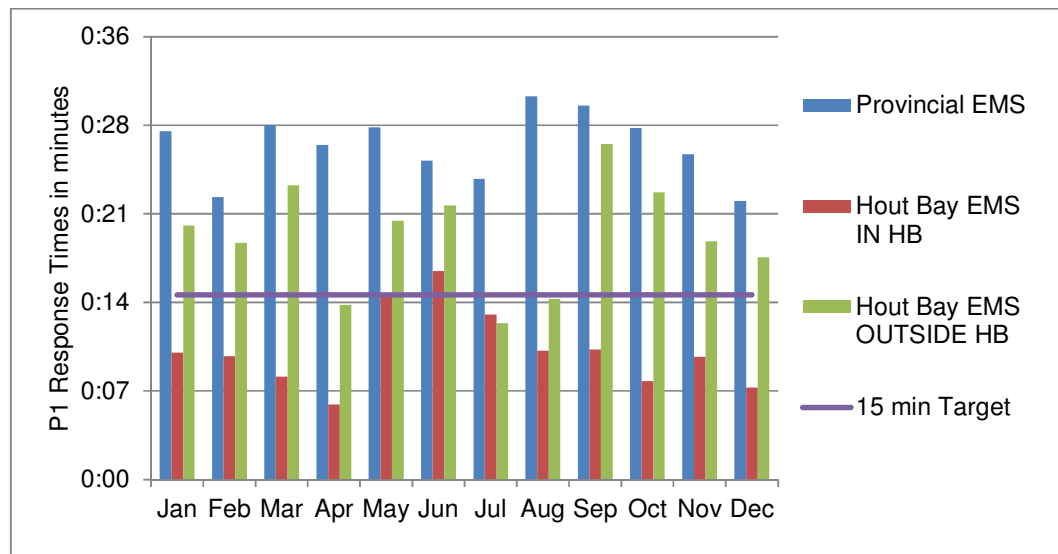


Figure 6: Comparison of Priority 1 response times

The average response times to P1 call-outs for 2016 are 27:09 minutes for Provincial EMS in Hout Bay, 10:33 minutes for Hout Bay EMS call-outs in Hout Bay and 19:44 minutes for Hout Bay EMS call-outs outside the suburb of Hout Bay.

Figure 7 shows the average monthly percentage of P1 call-outs responded to within 15 minutes, for Provincial EMS in the area of Hout Bay and for Hout Bay EMS inside and outside the area of Hout Bay. The annual average for Provincial EMS was 42.05%, where Hout Bay EMS achieved 78.57% inside Hout Bay and 47.41% outside Hout Bay. Note that the performance of Hout Bay EMS outside the Hout Bay area in October was caused by 5 P1 responses, none of which achieved a response time within 15 minutes.

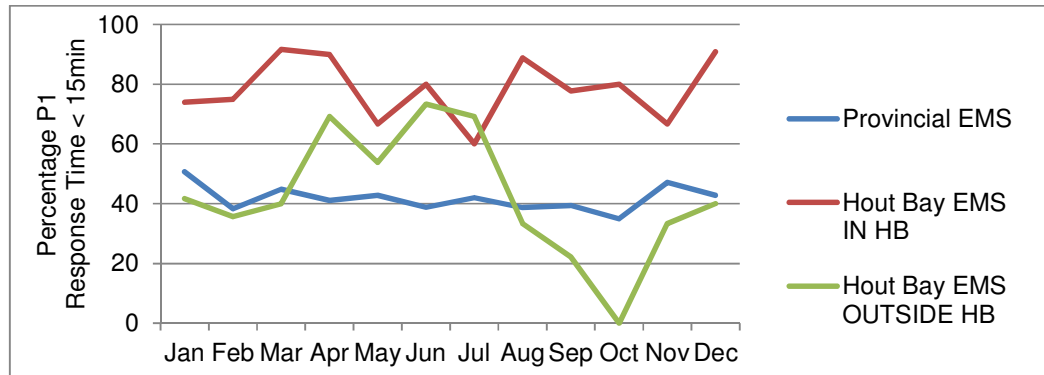


Figure 7: Monthly average percentage of P1 responses within 15 minutes

Closer investigation of the top seven call-out categories reveals that these categories make up 79.04% of total call-outs that Hout Bay EMS attended to in 2016. Figure 8 shows the P1 to P2 distribution of these categories.

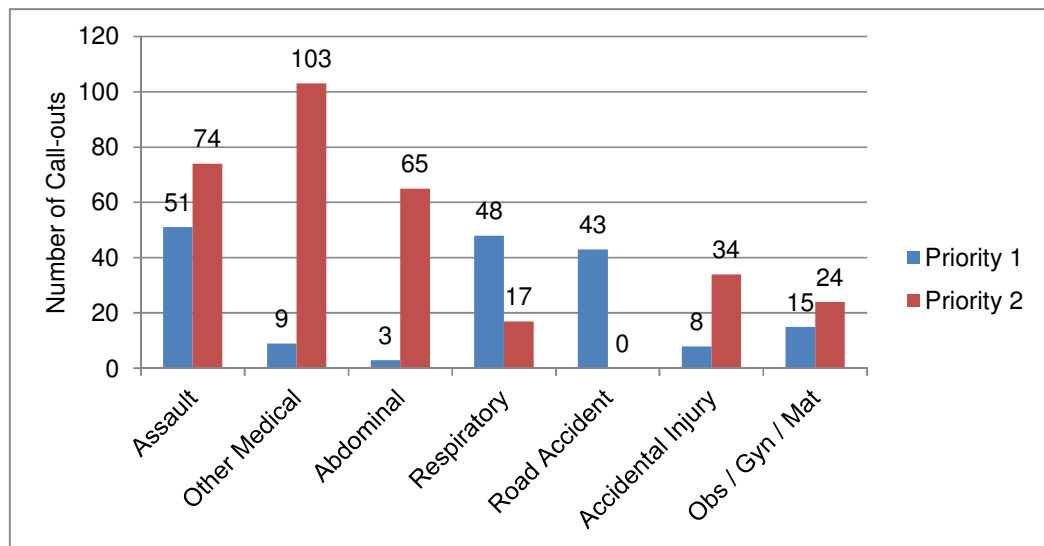


Figure 8: P1 / P2 distribution of top 7 call-out types

P2 call-outs in these categories amounted to 64.17% while P1 call-outs made up 35.83% for 2016.

4.2.2 Mission times

The mission times were collected from Provincial EMS CAD data and calculated as the time period from the time the call centre received the call-out to completion of each of the 625 call-outs that Hout Bay EMS responded to. This total time includes the time taken from receiving the call-out at the call centre, call-out logging on the system, the subsequent dispatch of the ambulance, plus the call-out as attended to by the ambulance. The average mission time per call-out was 1 hour 31 minutes. The total accumulated mission time of all Hout Bay EMS call-outs in 2016 is 951 hours (951:01:21). That is an average accumulated mission time of 79 hours 15 minutes per month. The shortest recorded mission was under one minute and the longest mission lasted 7 hours 10 minutes. The active time the Hout Bay EMS ambulance spent on call-outs in 2016 is calculated from dispatch time to time of completion of each of the 625 call-outs. This total amounts to 656 hours (656:41:03).

4.3 Hout Bay EMS volunteer shift allocations

4.3.1 Shift times

The SLA between Hout Bay EMS and Provincial EMS dictates a 12 hour day shift time (07h00 to 19h00) and a night shift time of 8 hours (19h00 to 03h00) on duty. Based on this and the shift data of 26 day shifts and 93 night shifts worked in 2016, the time Hout Bay EMS was on duty can be calculated. The Hout Bay EMS ambulance was therefore on duty for 312 hours for day shifts and 744 hours for night shifts. This totals 1056 shift hours for the year.

Using this data and the mission times recorded above, Hout Bay EMS spent approximately 62% of their on duty time on call-outs. The remainder of the time is normally spent on stand-by in Hout Bay, ready to respond to the next call-out. This calculation is based on the 625 completed call-outs as the time spent on dispatches cancelled en route cannot be quantified.

4.3.2 Rostered shifts

Hout Bay EMS structures their shifts on a three-week roster. Members book in advance to fill shifts and the shift coordinator works out a suitable roster to fill the most shifts. Once complete, the three-week roster is sent to Provincial EMS and the Hout Bay Neighbourhood Watch to inform them of when Hout Bay EMS will be on duty. Since Hout Bay EMS primarily operates on weekends, the possible shifts for the year are worked out according to the calendar. Shifts are available for every Friday night, Saturday day, Saturday night and Sunday day. This means that for 2016 a total of 211 weekend shifts were possible. Hout Bay EMS filled 47.8% of the

total available weekend shifts. 52.13% of possible weekend shifts had no crew for 2016.

The number of rostered day shifts for 2016 was 20.8% and rostered night shifts worked comprised 79.19%. Available weekend shifts are two day shifts and two night shifts making it theoretically possible for an even day / night shift distribution. The factor of 1 to 4 day to night shift distribution shows that Hout Bay EMS volunteers far preferred night shifts to day shifts in 2016.

The rostered shifts statistics split into day shifts and night shifts per month are shown in Table 6.

Table 6: Day / night split of rostered shifts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
Day	4	2	3	1	3	4	2	1	0	2	1	3	26
Night	13	8	8	9	6	7	10	7	6	8	4	7	93

4.3.3 Highest qualification per shift

The highest level of qualification on the ambulance determines the level of medical care available for patients treated by the crew during that shift. Each shift is categorised as BLS, ILS or ALS based on the highest qualified person working. A crew is made up of at least two qualified members and often a third person, who is a qualified or a trainee member, will join the shift. Backup resources can always be requested from Provincial EMS if the crew requires assistance. When requested, Provincial EMS will dispatch available resources or request resources of other services like METRO Rescue, Fire Services or Police. Backup might be requested because the patient's condition is more serious than the resources on scene can effectively stabilize, or where an incident has multiple patients, or to assist gaining access to a patient or removing them from the scene safely. Examples of the latter situation include narrow or blocked passage ways, bariatric patients, extrication from damaged structures or vehicles and access to and egress from unsafe environments.

Figure 9 shows the distribution of rostered BLS, ILS and ALS shifts per month for 2016.

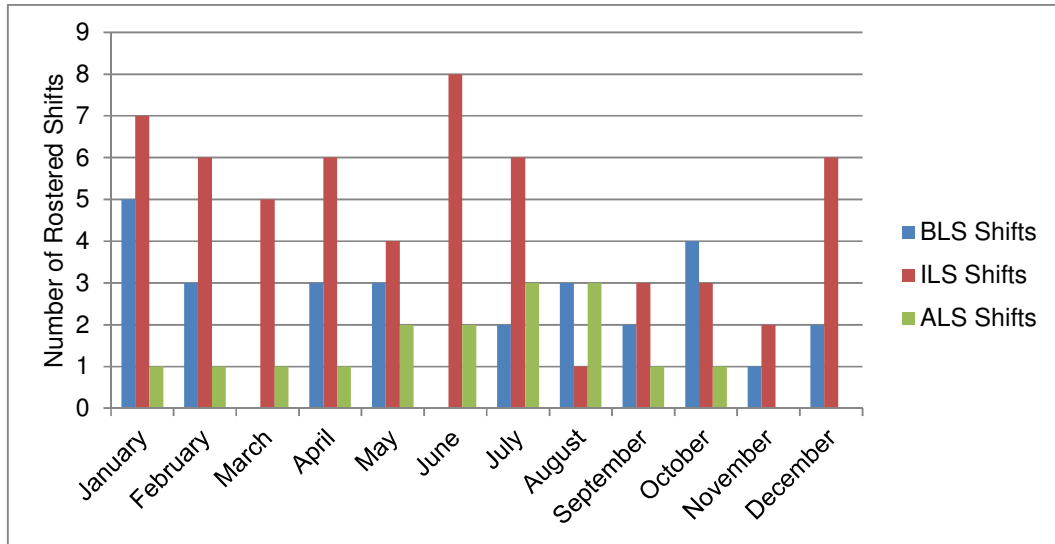


Figure 9: Number of rostered shifts per qualification

4.3.4 Service demographics

The Hout Bay EMS volunteer member demographics were taken as a snap-shot of 2016 since members occasionally resign and new members join throughout the year.

Hout Bay EMS had 31 active volunteers in 2016. Of these members 19 held BLS, 9 ILS and 3 ALS qualifications at the time. Membership was made up of 11 females and 20 males. A detailed breakdown of female and male distribution across BLS, ILS and ALS qualifications is shown below in Figure 10. The female to male ratio is 1:2 across ILS and ALS with only BLS having slightly more than half females to males (58.33%, 7 females vs. 12 males).

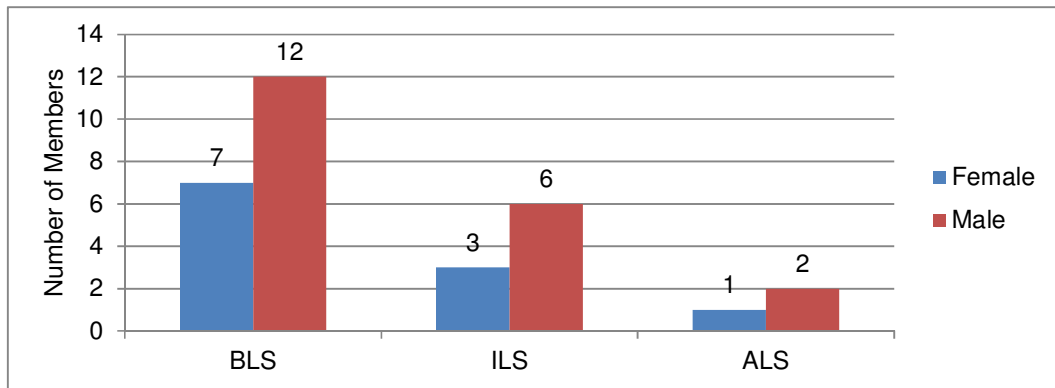


Figure 10: Gender vs. qualification distribution

4.3.5 Ad-hoc shifts

Ad-hoc shifts are those scheduled in addition to the booked / rostered shifts discussed above. Members choose to work shifts at short notice either when a shift is

open over a weekend or any time during the week. Members will advise the shift coordinator of their intention to work, who in turn informs Provincial EMS management of the additional shift.

During 2016 18 ad-hoc shifts were worked. The day / night shift distribution was very similar to the 1:4 day / night shift distribution of rostered shifts. Day shifts made up 22.22% while 77.78% were night-shifts. This confirms the strong preference of members to work night shifts. Of the ad-hoc shifts 33.33% were BLS shifts, while 66.67% shifts were ILS. No ALS ad-hoc shifts were worked in 2016.

4.3.6 Total shifts for 2016

Taking rostered and ad-hoc shifts into account, Hout Bay EMS worked a total of 119 shifts (101 rostered plus 18 ad-hoc shifts). Table 7 shows the overview of rostered and ad-hoc shifts Hout Bay EMS worked in 2016.

Table 7: Shifts worked in 2016

Shifts:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
Rostered	13	10	6	10	9	10	11	7	6	8	3	8	101
Ad-hoc	4	0	5	0	0	1	1	1	0	2	2	2	18

For 2016, the total number of BLS shifts worked comprised 28.57%. 57.98% of shifts were ILS, showing the highest percentage. Only 13.44% ALS shifts were worked, which is a reflection of the service having only three ALS members in 2016.

Table 8 shows the combined rostered and ad-hoc shifts monthly statistics by highest qualification on shift.

Table 8: Highest qualification on shift, per month

Qual.:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
BLS	5	3	1	3	3	1	2	4	2	4	2	4	34
ILS	11	6	9	6	4	8	7	1	3	5	3	6	69
ALS	1	1	1	1	2	2	3	3	1	1	0	0	16

Combining shift and call-out data for Hout Bay EMS for 2016, it is possible to show a monthly average call-out per shift rate. Figure 11 shows this, with the annual average of 5.25 call-outs per shift.

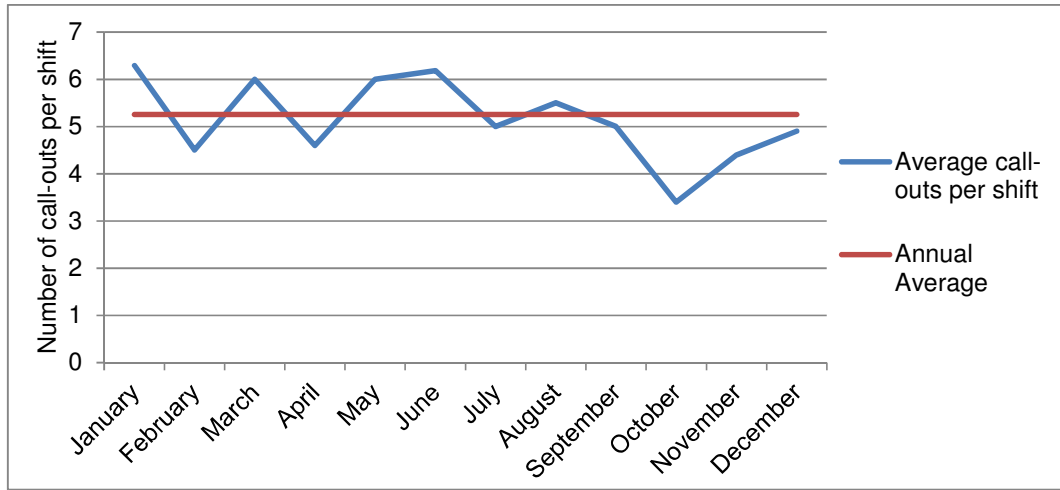


Figure 11: Average number of call-outs per shift

4.3.7 Service Level Agreement

According to their SLA with Provincial EMS, Hout Bay EMS is committed to working at least 5 shifts per calendar month; a minimum total of 60 shifts per year. In terms of this, Hout Bay EMS worked 198.3%, almost twice the number minimum shifts agreed to in the SLA. Figure 12 shows Hout Bay EMS exceeding the SLA requirements throughout the year except in November where the requirement was matched. At no time was the minimum required number of 5 shifts per month not achieved in 2016.

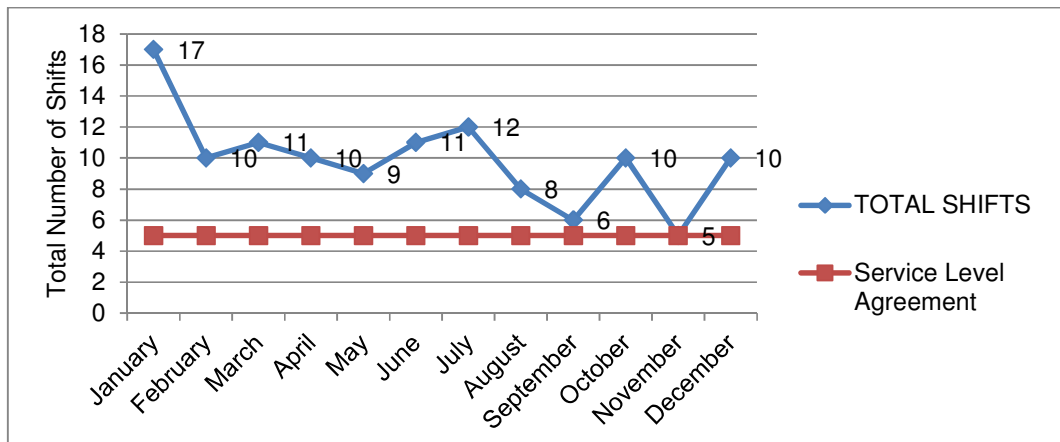


Figure 12: Shift performance in terms of SLA

5. CHAPTER 5: Discussion

This study provides insights into the operational activities of Hout Bay EMS. For a volunteer service that operates almost exclusively on weekends, the results show an active service with a strong presence in their primary response area and fast response times to call-outs especially when compared to the activities of Provincial EMS within the Hout Bay area. The findings are discussed in more detail in this chapter.

5.1 Analysis of most important findings

5.1.1 Call-outs

The primary operational difference between Provincial EMS resources and Hout Bay EMS is that Provincial EMS is operational 24 hours a day throughout the week whereas Hout Bay EMS almost exclusively operates on weekends. This might explain some of the findings where Provincial EMS and Hout Bay EMS results vary.

Hout Bay EMS spent 1056 hours on duty in 2016, which is 12.05% of total hours in the year. In the same year, Hout Bay EMS responded to 20.16% of all call-outs recorded in the Hout Bay area. This is an important finding, considering the different times that the two services are active in the Hout Bay area. The volunteer service therefore responded to one fifth of all call-outs in Hout Bay, while they were on duty for only one eighth of the available hours in 2016. A possible reason for the relatively high rate of call-outs compared to Provincial EMS might be that more call-outs occur in Hout Bay over weekends than during the rest of the week. In this scenario Hout Bay EMS would therefore be relatively busier in the area than Provincial EMS, especially as Provincial EMS normally moves their resources out of the area when Hout Bay EMS is on duty. This study is however not able to confirm this reasoning.

The majority of volunteer shifts were worked on Friday and Saturday nights, further restricting the window of operation of Hout Bay EMS in 2016. The difference in call-out types between the two services is therefore largely attributable to the operational period and Provincial EMS call-out types are likely to be more representative of the area's overall spectrum of illnesses and injuries. For example, Hout Bay EMS responded to a higher percentage of assaults than Provincial EMS, most likely explained by the higher alcohol use on Friday and Saturday nights than the rest of the week, leading to more cases of inter-personal conflict and violence during periods when Hout Bay EMS was primarily on duty (78). Similarly, the higher percentage of road traffic accidents responded to by Hout Bay EMS compared to Provincial EMS might be attributed to higher alcohol use on weekends.

As an exercise in extrapolation to estimate call-out numbers if more shifts were worked; it is possible to estimate an increase of 52.5 additional call-outs for every ten additional shifts worked. This is not an exact estimate as Figure 11 shows some fluctuations in call-outs per month and the fact that some shifts have no call-outs while others are far busier than the average.

Provincial EMS responded to a greater proportion of call-outs in the categories of Obstetric / Gynaecological / Maternity, Convulsions and Abdominal complaints compared to Hout Bay EMS. From the available data it can be surmised that the cause for the difference is the week-end operational times of Hout Bay EMS since there are no key differences in the resources responding to these call-outs, between Hout Bay EMS and Provincial EMS. This study has however not found any specific cause or reason for this difference.

5.1.2 P1 performance and response times

Hout Bay EMS performance as measured in P1 responses showed a consistently better performance compared to Provincial EMS within Hout Bay. This is most likely attributable to the volunteers being stationed in Hout Bay, in close proximity to the P1 call-outs much of the time. Good knowledge by volunteers of roads, landmarks and addresses in the area may also have contributed to shorter response times and increased P1 performance (79). P1 call-outs by Hout Bay EMS outside the Hout Bay area also generally achieved a faster response. Provincial EMS may not have had resources stationed in the area at all times, prolonging response times when resources had to respond from further afield. This suggests that the assessment of the founding members of Hout Bay EMS of the longer response distances to Hout Bay from outside the area may be justified.

5.1.3 No patient transport

The study found that Hout Bay EMS and Provincial EMS had similarly high percentages of call-outs ending in no patient transport (39.3% and 38.84% respectively). These results were an unexpected finding which may need further investigation. Results showed that the percentage of these call-outs per month remained constant throughout 2016, barring a few minor fluctuations. The high proportion of the "Other" category might be due to the ease of logging this category on the CAD system rather than matching the correct reason to each event. It is also conceivable that the exact reason is perceived less important to the dispatcher compared to closing the call-out and dispatching the resource to the next call-out or that obtaining the exact cause of the emergency from the public making the phone call might be difficult in some cases.

Time and resources were still required to respond to call-outs and assess the patient, even if the patient was subsequently not transported. This suggests that call-outs

ending in no patient transport may represent wasted ambulance resources and efforts should perhaps be made to reduce these numbers. The study was not designed to analyse the deeper background of this category of call-outs, however the high rate suggests that further research into this is warranted.

5.2 Other findings

5.2.1 International perspective

Hout Bay EMS' performance in 2016, based on the results in this study can be put into perspective by comparing findings to information available from other volunteer ambulance services discussed in the literature review. Relevant information was not available for any volunteer ambulance services in South Africa, however call-out and membership information from three services in USA could be found.

Table 9: Comparison of other volunteer ambulance services to Hout Bay EMS

Organisation	Location	Membership	Availability	Call-outs per annum
Hout Bay EMS, since 1994	Cape Town, South Africa	31 members, 100% volunteers	Weekends	625 (2016)
HFSVAS(43), since 1973	New York, USA	73 members, 100% volunteers from Binghamton University	Full Time	1000 (On average)
CUEMS(46), since 1968	New York, USA	40 members, 100% volunteers from Columbia University	Full Time	1100 (On average)
SVAS(45), since 1971	Connecticut, USA	No current membership numbers, 100% volunteer	Full Time	500 (On average)

HFSVAS: Harpur's Ferry Student Volunteer Ambulance Service

CUEMS: Columbia University Emergency Medical Services

SVAS: Salisbury Volunteer Ambulance Service

USA: United States of America

Hout Bay EMS is available on weekends only compared to the 24/7 availability of the other services listed. All services in this comparison have 100% volunteer membership and have been continually operational for decades (23,43,45,46). Calculating activity levels based on number of call-outs during operational shift hours for comparison, Hout Bay EMS did relatively more call-outs than the other three

services. Theoretical call-out rates for Hout Bay EMS, if they had been operational 24 hours a day throughout the year, can be extrapolated to 5184.66 call outs per annum to illustrate the difference. Membership numbers were not available for SVAS, however Hout Bay EMS had fewer members than reported for the other two services (45). It is interesting to note that HFSVAS operated three ambulances and two response vehicles while Hout bay EMS operated only one ambulance (43). This direct comparison might be flawed considering that the three services operate in a different context and setting to Hout Bay EMS and serve different operational purposes. Annual call-out rates are accurate for Hout Bay EMS, but only an estimated average for the other services listed. In the absence of available data on volunteer ambulance services in South Africa, this comparison serves to illustrate comparable activity levels in an international setting.

5.2.2 Priority 1 and Priority 2 call-out breakdown for Hout Bay EMS

The proportions of call-outs show that the majority of call-outs were in Hout Bay and the majority of those outside the area were P1. This is in line with the vision of the founding members, who wanted to provide improved access to emergency care and transportation to patients primarily in Hout Bay. Occasional assistance for P1 call-outs and rare responses to P2 call-outs outside the area was agreed to with Provincial EMS. In terms of the vision and agreement, Hout Bay EMS was dispatched appropriately in 2016.

5.2.3 Mission time vs. active time

Mission time is the recorded time from when the call-out first enters the emergency system at the call-centre until the call-out is completed. The active time of the ambulance is from dispatch to completion of the call-out. The difference between these measurements is the time the call-out exists on the system before a resource is dispatched to it. The total accumulated difference for the 625 call-outs which Hout Bay EMS was dispatched to in 2016 (inside and outside the Hout Bay area) was 294 hours (294:20:18). P1 call-outs are allocated to available ambulances as quickly as possible due to their urgency, often at the expense of P2 call-outs. This delay therefore largely represents the P2 call-outs pending on the system until an ambulance can be dispatched to it. A possible improvement in P2 response times might be achieved by using the approximately 38% stand-by time of Hout Bay EMS to be dispatched to P2 call-outs sooner even if they are outside the area of Hout Bay. If the P2 call-outs are chosen to be geographically close to Hout Bay, this might only have a minimal effect on the volunteers' availability for P1 and P2 call-outs within Hout Bay.

The Hout Bay area is enclosed by mountains on three sides and faces the sea. Road access is via one of three passes over the mountains, all of which are winding, dual-

lane roads with narrow stretches. This affects response times to emergencies in the area.

5.2.4 Shifts

Analysis of rostered shift data in the study found that Hout Bay EMS members had a strong preference for night shifts to day shifts by a factor of 4 to 1. Ad-hoc shifts booked at short notice showed similar results. There were no indications in the Standard Operating Procedures that Hout Bay EMS volunteers intentionally booked more night shifts than day shifts and personal communication (Rosenberg M. Personal communication, 30 March 2018) revealed that while discussions at executive level had touched on the possibility of putting a larger emphasis on night shifts, this had never been formalised or implemented. Work, study and family commitments during the day might be the reason for volunteers to prefer night shift, or possibly a perception that night shifts are busier.

Fluctuations in shift numbers per month and call-outs per shift calculations show no specific pattern in the shifts Hout Bay EMS worked in 2016. Provincial EMS requested additional shifts from Hout Bay EMS sporadically, especially when they anticipated a shortage in their own resources (Rosenberg M. Personal communication, 30 March 2018). In general Hout Bay EMS shift bookings were determined by the availability of enough volunteers to crew the vehicle. January showed the highest number of shifts for the year, confirming that volunteers were available more often to work shifts, possibly due to the greater availability of volunteers during the holiday season. Call-out rates were also higher in January resulting in the highest average rate of call-outs per shift for the year and the highest number of call-outs per month. This is likely attributable to the festive season and the related influx of visitors.

The service demographics in terms of member qualifications show that the highest numbers of members are qualified as BLS, some ILS and only a few ALS. This is in line with South Africa's distribution across these qualifications. The shift numbers show that most shifts were marked as ILS. Shifts are labelled according to the highest qualification on duty; therefore shift numbers are not a direct reflection of which qualifications worked the most during 2016. For example, ILS shifts generally have BLS members on board too and ALS shifts have ILS and / or BLS members working. This study did not focus on assessing duty hours per qualification. Almost twice as many men as women were active members in 2016 and the female / male split is consistent across the qualifications. There is no documented reason for fewer women volunteering in the service and it is possible that these numbers fluctuate if viewed over a longer time span of Hout Bay EMS' existence.

5.2.5 Shifts worked and the Service Level Agreement

Hout Bay EMS worked almost twice as many shifts as the minimum required by the SLA agreed to with Provincial EMS, thus fulfilling the agreement and more. Yet the volunteer service rostered under half of the possible shifts as per the 2016 calendar and there may be room for expansion to meet the clearly demonstrated need for emergency care in Hout Bay. An increase in shifts could be achieved by existing members working more shifts or through recruiting more members (1,28). Since volunteer organisations are dependent on the motivation of their members to give of their time and skill for no remuneration it might not be feasible for Hout Bay EMS to demand that existing members work more shifts (1,2,23,28). Alternatively, increased time and effort would be needed to recruit more members (23).

Membership numbers for 2016 were within the range of 20 to 40 members seen historically (23). An increase in membership in an effort to increase operational productivity would require additional funding and fund-raising efforts to afford additional resources like uniforms, fuel and vehicle maintenance. It might therefore not be feasible for Hout Bay EMS to attempt to double operational productivity and current activity and membership levels appear to be at a stable equilibrium.

5.3 Limitations of the study

It was not possible in this study to report long term operational trends, as only one year was examined. Further studies of Hout Bay EMS' operational activities incorporating a longer time frame might be beneficial to determine performance levels and sustainability of the service.

The accuracy and completeness of data from the Provincial EMS electronic database were dependent on individuals at various levels entering information at the time of each call-out and quality assurance protocols confirming the data. From this brief study, it is clear the database has much potential for this type of research, and this study should serve not only as a baseline for the Hout Bay area, but also for future comparison to other areas.

The study only examined one volunteer service in a specific setting in a geographically isolated area in Cape Town and direct comparison to other services is not possible with only this study.

The large proportion of the call-outs that resulted in no patient transport could not be analysed in much depth and future studies could attempt to establish further insight into this category, especially the largest sub-category labelled "Other".

The available data did not allow for differentiation between patient age groups. Future studies may investigate differentiation of age groups, to establish when different patient groups were most prevalent.

6. CHAPTER 6: Conclusion and Recommendations

6.1 Conclusion

This study has described the background and operational activities of Hout Bay EMS over one calendar year. In the process of focusing on the operational activities the volunteers achieved, the study has demonstrated how a volunteer ambulance service can operate alongside a large Provincial EMS structure and complement the efforts and resources of the full-time service in a setting where a growing need for emergency medical care exists. Despite working almost exclusively on weekends, Hout Bay EMS attended to one fifth of the call-outs in the Hout Bay area over the study period, and undoubtedly contributed to reducing response times to emergencies in the suburb. It demonstrates an effective volunteer service that has served its community since 1994.

6.2 Recommendations

Further in-depth research into the call-outs that ended in no patient transport is suggested, including the large number of unclassified (“Other”) call-outs. The high proportion of these call-outs for both Hout Bay EMS and Provincial EMS warrants investigation. It appears that many resources were spent on possibly fruitless call-outs.

The preferential dispatching of resources to P1 call-outs may have led to greater response times to P2 call-outs. Shortening of P2 response times could form an area for future research.

It was outside the scope of this study to explore the reasons behind the difference in proportions of call-out types between Hout Bay EMS and Provincial EMS in detail. It would be interesting to research this on a bigger scale and compare Hout Bay to other areas in Cape Town.

Similar studies about other volunteer ambulance services might be conducted to add to the pool of data available about these types of organisations, especially in Southern Africa. Comparisons between different services and areas might add perspective on common strengths and key differences of volunteer ambulance services.

7. REFERENCES

1. Perold H. Volunteering as a strategy to foster civic participation among youth in southern Africa. Presented at XIX IAVE World Volunteer Conference, Delhi, 10-13 November 2006: Volunteering for Peace in Multicultural Societies. 2006;
2. Volunteer Services Overseas, RAISA. Volunteer Management Needs Assessment Among South African Civil Society Organisations : Final research report. Distributed at Southern African Conference on Volunteer Action for Development 17-19 October 2011, Johannesburg, South Africa. 2011;(October).
3. Hodgkinson VA. Chapter 3 - Volunteering in global perspective. In: The Values of Volunteering. Springer, Boston, MA; 2003. p. 35–53.
4. MacMahon AG. Four years' experience with South Africa's first mobile accident unit. South African Medical Journal. 1978;53(9):333–7.
5. Kobusingye OC, Hyder AA, Bishai D, Joshipura M, Hicks ER, Mock C. Chapter 68 - Emergency Medical Services. In: Disease Control Priorities in Developing Countries. 2003. p. 1261–80.
6. Republic of South Africa. Act No. 61 of 2003: National Health Act, 2004. South African Government; 2004 p. 15–20.
7. Voluntary Emergency Medical Assistance. Voluntary Emergency Medical Assistance [Internet]. 2011 [cited 2018 May 8]. Available from: <http://vema-paramedics.com/>
8. False Bay Volunteer Emergency Medical Service. False Bay Volunteer Emergency Medical Service [Internet]. 2008 [cited 2018 Jan 27]. Available from: <http://www.falsebayems.co.za/>
9. Station 15. Volunteer Emergency Services - Station 15 [Internet]. [cited 2017 Oct 12]. Available from: <http://www.station15.org.za/>
10. Toussaint H. Anchoring - Imizamo Yethu, Hout Bay. [Master's Thesis] University of Cape Town. 2010;(October).
11. Fieuw WVP. Informal settlement upgrading in Cape Town's Hangberg : local government, urban governance and the "Right to the City." Development. 2011;(December).
12. Moradi A. Fire spreading in South African low-cost settlements. [Master's Thesis] University of Stellenbosch. 2016;(March).
13. Strategic Development Information and GIS Department - City of Cape Town. City of Cape Town – 2011 Census for Suburb Hout Bay. Information: Strategic

- Development Cape Town. 2013;(July):1–7.
14. Strategic Development Information and GIS Department - City of Cape Town. City of Cape Town – 2011 Census for Suburb Imizamo Yethu. Information: Strategic Development Cape Town. 2013;(July):1–7.
 15. South Africa. Statistics South Africa. Community Survey 2016, Statistical release P0301. 2016.
 16. Royine C. Emergency Services SA - Hout Bay joy : fire-stations. Emergency Services SA. 2006;27(2):17.
 17. Stanford J. Contract soon for Hout Bay fire station. Engineering News. 2005;25(January).
 18. Western Cape Government (South Africa). Western Cape Government Clinics Directory [Internet]. 2017 [cited 2018 Jan 18]. Available from: <https://www.westerncape.gov.za/directories/facilities/944>
 19. Info4africa. Info4Africa [Internet]. School of Applied Human Sciences, College of Humanities, Howard College Campus, University of KwaZulu-Natal. 2014 [cited 2018 Jan 18]. Available from: <https://search.info4africa.org.za/>
 20. People's Post. Imizamo Yethu on the fence about new clinic. People's Post. 2015 May 6;
 21. Swimmer L. Proposed Polyclinic On The Hout Bay Commonage [Internet]. Hout Bay Residents and Ratepayers Association. 2014 [cited 2017 Oct 15]. Available from: <http://www.hbrra.co.za/node/76>
 22. Quintas R. City & Province Re-Exploring Site For New Hout Bay Community Day Centre. Hout Bay Partnership. 2016 Nov 30;
 23. Cunningham C, Watson A. Sustainability of a Nonprofit Ambulance Service in Cape Town South Africa. [Master's Thesis] University of Sunderland. 2013;(September).
 24. Western Cape Government (South Africa). Act No. 3, 2010: Western Cape Ambulance Services Act. 2010.
 25. South Africa. Department of Health. Government Gazette, 24 July 2014 No.37869 EMERGENCY MEDICAL SERVICES REGULATIONS. Government Gazette. 2014;585(37869):3–36.
 26. Western Cape Government (South Africa). Emergency Medical Care [Internet]. 2016 [cited 2017 Aug 26]. Available from: <https://www.westerncape.gov.za/general-publication/emergency-medical-care>
 27. Lindblom M. Doodle [Internet]. 2017 [cited 2017 Oct 8]. Available from:

<https://help.doodle.com/hc/en-us/articles/360012150113>

28. Chinman MJ, Wandersman A. The benefits and costs of volunteering in community organizations: Review and practical implications. *Nonprofit and Voluntary Sector Quarterly*. 1999;28(1):46–64.
29. Razzak J, Kellermann A. Emergency medical care in developing countries: is it worthwhile? *Bulletin of the World Health Organization*. 2002;80(11):900–5.
30. Sasser S, Varghese M, Kellermann A, Lormand J. Prehospital trauma care systems. World Health Organization, Geneva. 2005;
31. Emt-resources.com. A History of Ambulances [Internet]. 2016 [cited 2017 Sep 17]. Available from: <http://www.emt-resources.com/History-of-Ambulances.html>
32. Haller Jr JS. *Battlefield Medicine - A History of the Military Ambulance from the Napoleonic Wars through World War 1*. 14th ed. Southern Illinois University Press; 2011.
33. Grundmann RT. Dominique-Jean Larrey “revolutionärer” Chirurg in Napoleons Diensten. *Chirurgische Allgemeine Zeitung*. 2011;12(3):187–92.
34. Fletcher I. Aid, first and foremost: a brief outline history of the St John Ambulance Association and Brigade. *Injury*. 1980;11:104–9.
35. Al-Shaqsi S. Models of International Emergency Medical Service (EMS) Systems. *Oman Medical Journal*. 2010;25(4):320–3.
36. De Villiers W. From Africa and India to Blackpool: Military history and ambulance services. *South African Medical Journal*. 2016;106(6):19–20.
37. Pelzer JL, Penn PC, Watermeyer J. “We’re kind of screwed”: Perspectives of Emergency Medical Workers on the Western Cape EMS system. [Master’s Thesis] University of the Witwatersrand. 2014;(April).
38. Volunteering Australia. *Definitions and Principles of Volunteering*. Information: Volunteering Australia. 2009;
39. Cambridge Dictionary. *Dictionary.cambridge.org* [Internet]. 2018 [cited 2018 Oct 14]. Available from: <https://dictionary.cambridge.org/dictionary/english/volunteer>
40. Merriam-Webster [Internet]. 2017 [cited 2017 Oct 14]. Available from: <https://www.merriam-webster.com/dictionary/volunteer>
41. Carsons ED. On Defining and Measuring Volunteering in the United States and Abroad. *Law and Contemporary Problems*. 1999;62(4):67–71.
42. Pospíšilová T. *Grassroots Volunteering : Definitions, Concepts and Themes*.

Grassroots Europe for Local Wellbeing Report. 2011.

43. Harpur's Ferry Student Volunteer Ambulance Service. Harpur's Ferry Student Volunteer Ambulance Service [Internet]. 2017 [cited 2017 Oct 15]. Available from: <http://www.harpursferry.org/founding>
44. Chili Ambulance Service. Chili Ambulance - Rochester New York [Internet]. 2017 [cited 2017 Aug 24]. Available from: <https://www.chiliambulance.org/history.php>
45. Salisbury Volunteer Ambulance Service. Salisbury Volunteer Ambulance Service [Internet]. 2017 [cited 2017 Aug 24]. Available from: <https://www.salisburyambulance.org/home/history/>
46. Columbia University Emergency Medical Service. Columbia University Emergency Medical Service [Internet]. 2017 [cited 2017 Aug 26]. Available from: <http://cuems.columbia.edu/>
47. St Johns Ambulance Service UK. Find your volunteer role [Internet]. 2015 [cited 2017 Sep 30]. Available from: <http://www.sja.org.uk/sja/volunteer/find-your-volunteer-role.aspx>
48. British Association for Immediate Care. British Association for Immediate Care [Internet]. 2017 [cited 2017 Sep 30]. Available from: <https://www.basics.org.uk/>
49. South East Coast Immediate Care Scheme. SIMCAS Immediate Medical Care [Internet]. 2012 [cited 2017 Sep 30]. Available from: <http://www.simcas.org.uk/>
50. Reisinger A. Rettungsdienst in Österreich. [Master's Thesis] Body&Health Academy Austria. 2012;(November).
51. Österreichisches Rotes Kreuz. Österreichisches Rotes Kreuz - Rettungsdienst [Internet]. 2017 [cited 2017 Sep 30]. Available from: <http://www.rotekreuz.at/rettungsdienst/>
52. Hoogeveen M. Ambulance care in Europe [Report]. Ambulancezorg Nederland. 2010;1–36.
53. Bundesamt für Familie und zivilgesellschaftliche Aufgaben. Der Bundesfreiwilligendienst [Internet]. 2017 [cited 2017 Oct 1]. Available from: <https://www.bundesfreiwilligendienst.de/der-bundesfreiwilligendienst/ueber-den-bfd.html>
54. Deutsches Rotes Kreuz. Die Freiwilligendienste in DRK [Internet]. 2017 [cited 2017 Oct 1]. Available from: <http://www.freiwilligendienste.drk.de/bundesfreiwilligendienst/angebote-des-drk/rettungsdienst/>

55. Arbeiter-Samariter-Bund. Die Einsatzbereiche für Freiwillige im ASB [Internet]. 2017 [cited 2017 Aug 28]. Available from: <https://www.asb.de/de/mitmachen-helfen/fsj-und-bfd/einsatzbereiche-fuer-fsj-und-bfd>
56. Magen David Adom Israel. Magen David Adom [Internet]. 2017. Available from: <https://www.mdais.org/en/about/mda-israel>
57. Magen David Adom Israel. MDA Volunteers [Internet]. 2017. Available from: <https://www.mdavolunteers.org/>
58. Gap Year Sport Ltd. Global Medical Projects - The Red Cross in Puerto Vallarta [Internet]. 2017 [cited 2017 Oct 1]. Available from: <http://www.globalmedicalprojects.co.uk/projects/paramedic-emergency-medicine-placements/mexico/>
59. Ambulance Victoria. Ambulance Victoria - Volunteers [Internet]. 2016 [cited 2017 Aug 26]. Available from: <https://www.ambulance.vic.gov.au/community-education/volunteers/>
60. SA Ambulance Service. SA Ambulance Service [Internet]. 2017 [cited 2017 Aug 26]. Available from: <http://www.saambulance.com.au/Volunteering.aspx>
61. National Institute for Emergency Medicine Thailand. National Institute for Emergency Medicine (Thailand) - History [Internet]. 2010 [cited 2017 Oct 1]. Available from: <http://www.niems.go.th/en/View/Page.aspx?PagelD=25551114035939822>
62. Lamsanpang S, Sangcharaswichai A. Emergency Medicine. The Bangkok Medical Journal. 2011;35:68–70.
63. Germa F, Bayleyegn T, Kebede T, Ducharme J, Bartolomeos K. Emergency medicine development in Ethiopia: Challenges, progress and possibilities. African Journal of Emergency Medicine. 2013;3(1):3–9.
64. Quijada C. Tebita Ambulance and Pre-Hospital Emergency Medical Services. USAID - UKAID - SHOPS Project. 2015.
65. Ethiopian Red Cross Society. Society Distributes 50 Ambulances [Internet]. 2017 [cited 2017 Sep 14]. Available from: <http://www.redcrosseth.org/news-and-media/news/item/112-society-distributes-50-ambulances>
66. Mayosi BM, Benatar SR. Health and Health Care in South Africa — 20 Years after Mandela. New England Journal of Medicine. 2014;371(14):1344–53.
67. Jobson M. Structure of the health system in South Africa. Khulumani Support Group Report. 2015;(October).
68. Netcare911. Netcare 911 Private Ambulance Service [Internet]. 2016 [cited

2017 Oct 6]. Available from: <http://www.netcare911.co.za/Products-Services/Road-operations>

69. ER24. ER24 Private Ambulance Service [Internet]. 2017 [cited 2017 Oct 6]. Available from: <https://www.er24.co.za/company-information/>
70. Van Huyssteen N. A Legal Analysis of the Emergency Medical Services in South Africa. [LLM Thesis] University of Pretoria. 2016;
71. Health Professions Council of South Africa Professional Board for Emergency Care. Professional Board of Emergency Care [Internet]. 2015 [cited 2017 Aug 23]. Available from: <http://www.hpcs.co.za/PBEmergencyCare>
72. Health Professions Council of South Africa Professional Board for Emergency Care. Form 169A: Guidelines for the completion of the portfolio for education and training centres wishing to offer short courses. 2015.
73. Health Professions Council of South Africa. Continuing Professional Development Guidelines for the Health Care Professionals. 2011.
74. Health Professions Council of South Africa. Continuous Professional Development [Internet]. 2017 [cited 2017 Aug 27]. Available from: <http://www.hpcs.co.za/CPD>
75. National Department of Health South Africa. National Emergency Care Education and Training Policy Report 2017. 2017.
76. Myers J, Naledi T, Corrigan J, Pienaar D, Matzopoulos R, Bourne D, et al. Report: Western Cape Burden of Disease Reduction Project. Vols. 1–7, Western Cape Burden of Disease Reduction Project. 2007.
77. Househam KC. Africa's burden of disease: The University of Cape Town Sub-Saharan Africa Centre for Chronic Disease. *South African Medical Journal*. 2010;100(2):94–5.
78. Schuurman N, Cinnamon J, Walker BB, Nicol A, Hameed SM, Matzopoulos R. Intentional injury and violence in Cape Town, South Africa: an epidemiological analysis of trauma admissions data. *Global Health Action*. 2015;8(1).
79. French ML, Fan Y, Stading GL. An exploratory study of factors influencing emergency response performance. *Management Research Review*. 2015 May 18;38(5):559–76.

8. APPENDICES

- 8.1 Ethics Approval
- 8.2 Provincial EMS Approval
- 8.3 Hout Bay EMS Approval

8.1 Ethics approval



UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee



Room E53-46 Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone (021) 406 6492
Email: sumayah.arietdien@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/forms

07 August 2017

HREC REF:556/2017

Ms C Cunningham
c/o Ms A Maas
Division of Emergency Medicine
E52.27 OMB

Dear Ms Cunningham

PROJECT TITLE: A 12 MONTH RETROSPECTIVE, DESCRIPTIVE STUDY OF HOUT BAY VOLUNTEER EMERGENCY MEDICAL SERVICE, CAPE TOWN, SOUTH AFRICA (MPhil-candidate-J Kahle)

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee (HREC) for review.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year until the 30 August 2018.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.

(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

We acknowledge that the student: - J Kahle will also be involved in this study.

Please quote the HREC REF in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval before the research may occur.

Yours sincerely

Signature Removed

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE

Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB00001938

HREC 556/2017

8.2 Provincial EMS approval



DIRECTORATE: EMERGENCY MEDICAL SERVICES
ENQUIRIES: Dr Shaheem de Vries
• shaheem.devries@pgwc.gov.za
☎: +27 21 508 4523

Attention: Mr J KAHLE

RE: REQUEST FOR PERMISSION TO CONDUCT RESEARCH – A 12-MONTH RETROSPECTIVE DESCRIPTIVE STUDY OF HOUTBAY VOLUNTEER EMERGENCY MEDICAL SERVICES

Dear Mr Kahle,

Your request on the above matter refers.

Thank you for the request to conduct research within the Western Cape Government Emergency Medical Services. Your proposal has been evaluated by the Emergency Medicine Division Research Committee and has been recommended for approval by this office.

I am therefore pleased to inform you that such approval is hereby granted.

I wish you well in your endeavor and trust that you will keep this office and its department informed of your findings when these become available. I am so looking forward to the insights that your research will afford us.

Yours sincerely

Signature Removed

Dr Shaheem de Vries
Head: Emergency Medical Services
Western Cape Government Health

Date: 23rd August 2017



WCG Health: EMS – Office of Director, 11 Alexandra Road, Pinelands, 7405
Private Bag X24; Bellville ☎ (+27) 21 508 4523 • (+27) 21 931 8490
www.capegateway.gov.za

8.3 Hout Bay EMS approval



EMERGENCY: 10177

PO Box 26722
Hout Bay, 7872
Cape Town
South Africa

facebook.com/hbvems
www.houtbayems.org.za
info@houtbayems.org.za
NPO: 036-258

Monday, 17 July 2017

The Chairperson
Human Research Ethics Committee
Faculty of Health Sciences
University of Cape Town

RE: PRELIMINARY APPROVAL OF RESEARCH STUDY CONDUCTED IN COLLABORATION WITH HOUT BAY VOLUNTEER EMERGENCY MEDICAL SERVICE

Dear Professor Marc Blockman

With regard to the study, "*A 12-month retrospective, descriptive study of Hout Bay Volunteer Emergency Medical Service, Cape Town, South Africa*", our executive committee is supportive of Mr Kahle in this study which will be conducted in collaboration with our organisation, pending ethical approval from the Human Research Ethics Committee of the University of Cape Town.

Please don't hesitate to contact us should you have concerns or questions.

Signature Removed

Matthew Rosenberg
HBVEMS Chief Liaison Officer
info@houtbayems.org.za

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