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Does osteoarthritis of the first carpometacarpal joint limit function of the hand?

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Does osteoarthritis of the first carpometacarpal joint limit function of the hand?

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in partial fulfillment of the requirements for the degree of Master of Medicine

Declaration

I, Este Knipe, declare that this research report is my own original research and work.

It is being submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in partial fulfillment of the requirements for the degree of Master of Medicine, in the branch of Orthopaedic Surgery.

It was also submitted to the Colleges of Medicine of South Africa in partial fulfillment of the requirements for the qualification of the Fellowship of the College of Orthopaedic Surgery.

This research report has not been submitted in part or in whole for any other degree or examination at the University of the Witwatersrand or at any other university.

Signature..Knipe.....

.....26th.....day of ...september.....2018

Abstract

Background: Arthritis is the most common cause of disability, and osteoarthritits is the most common form of arthritis affecting the older population. This disease commonly affects the first carpometacarpal joint of the hand and is often debilitating due to pain. The effect on general hand function, however, has not been clearly described. Research on the effects of first carpometacarpal (CMC) joint osteoarthritis (OA), and its limitation on thumb function, is also very limited.

Aim: The aim of the proposed study was to determine whether OA of the first CMC joint limits function of the hand. The specific objective was to document limitation in hand function in patients with OA of the first CMC joint.

Methods: A prospective review of patients presenting with OA of the first CMC joint was done. All male and female patients age 18 years and older were included in the study. Exclusion criteria included patients unwilling to participate, patients with carpal tunnel syndrome and trigger finger, pre-existing ipsilateral elbow or shoulder pathology, and patients with ipsilateral peripheral nerve or brachial plexus injuries. Descriptive statistics were obtained using the Cochin hand function scale as a questionnaire.

Results: Forty (40) patients (66 hands) were included in the study, 33 were females and 7 males. The mean age was 70.38 years (SD = 10,058) with the minimum age 53 and the maximum 93. Thirty-six (36) of the patients were right hand dominant and 4 were left hand dominant. The most common difficulties experienced in the activities of daily living were to unscrew the lid from a jar, to button a shirt, to squeeze a new tube of toothpaste, to write a letter with an ordinary pen and to pick up coins from a table top.

Conclusion: OA of the first CMC joint has a greater influence on grip strength, but not as much on function of the hand.

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Table of Contents

	Page
Declaration	i
Abstract	ii
Acknowledgements	iv
Table of Contents	v
List of Figures	viii
List of Tables	ix
Nomenclature	xi
Chapter 1	**1**
1.1 Introduction	**1**
1.1.1 Epidemiology	1
1.1.2 Anatomy	1
1.1.3 Biomechanics	2
1.1.4 Etiology	2
1.1.5 Pathophysiology	3
1.1.6 Diagnosis	3
1.1.7 Differential Diagnosis	3
1.1.8 Classification	4
1.1.9 Treatment	5
1.2 Literature Review	**6**
1.3 Problem Statement	**9**

1.4 Study Aim 9
1.4.1 Hypothesis 9
1.4.2 Specific Objective 9

Chapter 2 10

2.1 Methodology 10
2.1.1 Study design 10
2.1.2 Population 10
2.1.3 Procedure 10

2.2 Statistics 11

2.3 Funding 11

2.4 Consent 11

2.5 Ethics 12

Chapter 3: Results 13

3.1 Demographics of patients 13
3.1.1 Gender of study population 13
3.1.2 Age of study population 14
3.1.3 Hand dominance 14
3.1.4 Affected hand 15

3.2 Limitation of function 15
3.2.1 Cochin hand function scale 15

Chapter 4: Discussion 26
4.1 General 26
4.2 Strengths 28
4.3 Limitations 28
4.4 Recommendations 29
4.5 Conclusion 29
Appendix 30
A: Information document and consent form 30
B: Cochin Hand Function Scale 33
C: Data Capture Sheet 34
D: Ethics Certificate 35
E: Letter of Permission from Hospital CEO 36
F: Age of Study Population 37
References 38

List of Figures

Figure 3.1: Age of study population

Figure 3.2: Activities of daily living – in the kitchen

Figure 3.3: Activities of daily living – dressing

Figure 3.4: Activities of daily living – hygiene

Figure 3.5: Activities of daily living – at the office

Figure 3.6: Activities of daily living – other

List of Tables

Table 1.1: Burton Classification

Table 1.2: Eaton Classification

Table 3.1: Gender of study population

Table 3.2: Hand dominance of study population

Table 3.3: Affected hand

Table 3.4: Ability to hold a bowl

Table 3.5: Ability to grasp a full bottle and raise it

Table 3.6: Ability to hold a plate full of food

Table 3.7: Ability to pour liquid from a bottle

Table 3.8: Ability to unscrew the lid from a jar

Table 3.9: Ability to cut meat with a knife

Table 3.10: Ability to prick things well with a fork

Table 3.11: Ability to peel fruit

Table 3.12: Ability to button your shirt

Table 3.13: Ability to open and close a zip

Table 3.14: Ability to squeeze a new tube of toothpaste

Table 3.15: Ability to hold a toothbrush efficiently

Table 3.16: Ability to write a short sentence with an ordinary pen

Table 3.17: Ability to write a letter with an ordinary pen

Table 3.18: Ability to turn a round door knob

Table 3.19: Ability to cut a piece of paper with a scissor

Table 3.20: Ability to pick up coins from a table top

Table 3.21: Ability to turn a key in a lock

Nomenclature

AP	antero-posterior
Auscan	Australian/Canadian
CMC	carpometacarpal
DASH	Disabilities of the arm, shoulder and hand
KG	kilogram
MCP	metacarpophalangeal
n	mean
OA	osteoarthritis
PA	postero-anterior
SD	standard deviation
TMC	trapeziometacarpal

Chapter 1

1.1 Introduction

1.1.1 Epidemiology

Osteoarthritis (OA) commonly affects the first carpometacarpal (CMC) joint. In the hand it is the second most common site of OA. It will affect one in twelve men and one in four women in their lifetime.[1] Twenty-five percent of men and fourty percent of women older than 75 years will have radiographic degeneration of the first CMC joint.[2]

1.1.2 Anatomy

Ligamentous Stability

Ligamentous anatomy plays an important role in the stabilisation of the first CMC joint. The dorsoradial ligament is the thickest and strongest ligament present, it stabilises radial and dorsal translation of the thumb metacarpal on the trapezium, therefore preventing dorsal dislocation. The palmar ligament (or the beak/oblique ligament) is an intracapsular ligament, and its main purpose is to provide static restraint. It resists abduction, extension and pronation. The intermetacarpal ligament acts by resisting radial translation of the base of the first metacarpal.

Secondary stability is provided by the dorsoradial and posterior oblique ligaments.[2]

Muscular Stability

Dynamic stabilisation is just as important in creating a balance for positioning of the thumb. Dorsal muscles are the abductor pollicis longus, extensor pollicis brevis, extensor pollicis longus and the first dorsal interosseous muscle. Volar muscles are the abductor pollicis brevis, flexor pollicis brevis, opponens pollicis, flexor pollicis longus and the adductor pollicis.[2]

Bony Anatomy

The first CMC joint was described as a complex joint, appropriately named the "saddle joint" by Fick in 1854.[2] This configuration consists of two saddles opposite each other, with the axes perpendicular to one another. There is increased range of motion due to the bony configuration and this enables opposition of the thumb.[2,3,4]

1.1.3 Biomechanics

The thumb can perform basic and also more complex movements. Due to the unique configuration of this universal joint, movement occurs in three planes. Basic movements include adduction, abduction, extension and flexion. Combining these allows for the more complex palmar and radial abduction and adduction and also opposition. The more complex the movement, the more significant the axial load while performing them, especially pinch and gripping.[1,2,5]

1.1.4 Etiology

There is currently no evidence to suggest a clear etiology for the development of OA of the first CMC joint. Some literature suggested inherent and acquired risk factors. Inherent factors include age, female gender, genetic predisposition, the inherent mobility of the thumb, ligament laxity due to hormonal factors and congenital joint malformation. Acquired (environmental) factors mainly involve posttraumatic degeneration, medical conditions and possibly occupational risk factors.[6]

1.1.5 Pathophysiology

Abnormal translation of the thumb metacarpal on the trapezium leads to shear forces and subsequent wear on the volar compartment of the CMC joint. This is especially the case in the presence of previous trauma to the anterior oblique ligament. Subsequently the radial quadrant of the metacarpal will be affected, and thereafter it spreads to the volar quadrants. Wear on the trapezium starts on the dorsoradial surface and then progresses to the volar quadrants.[2]

1.1.6 Diagnosis

Symptoms depend on the stage of the disease. Patients typically present with intermittent radial-side hand pain or pain localised to the base of the thumb, which might later progress to disability. There is rarely a specific time of onset. Pain is exacerbated by writing, turning keys or doorknobs, using scissors and holding heavy objects. Patients may report this as weakness. Pain might be reported as radiating up the radial aspect of the forearm. Symptoms are often relieved by rest and analgesia.[7]

Clinical signs of first CMC joint OA include a dorsoradial prominence of the base of the thumb metacarpal. Local swelling might be present over the base of the thumb. Local warmth, and tenderness over the base of the thumb on palpation. Crepitus may be felt, associated with pain on the grind test. In advanced stages, patients have an adduction deformity with hyperextension of the metacarpophalangeal joint of the thumb.

Standard antero-posterior (AP), lateral and oblique views usually confirm the diagnosis of OA. A 30° postero-anterior (PA) view (or stress view) can be used to assess the subluxation of the trapeziometacarpal joint and the joint space loss.[8]

1.1.7 Differential Diagnosis

The following should be excluded as differential diagnoses: rheumatoid arthritis, tenosynovitis, septic arthritis, autoimmune diseases, gout or pseudogout, gamekeeper's thumb, carpal tunnel syndrome, de Quervain disease and trigger thumb.[8]

1.1.8 Classification

The Burton classification[8] (Table 1.1) relies on patient symptoms, clinical signs and PA radiographs.

TABLE 1.1: BURTON CLASSIFICATION	
STAGING	**CHARACTERISTICS**
STAGE 1	Pain Positive grind test Ligamentous laxity Dorsoradial subluxation of the trapeziometacarpal (TMC) joint
STAGE 2	Instability Chronic subluxation Radiographic degenerative changes
STAGE 3	Involvement of the scaphotrapezial joint or less commonly the trapeziotrapezoid or TMC joint to the index finger
STAGE 4	Stage 2 or 3 with degenerative changes at the metacarpophalangeal (MCP) joint

The Eaton classification[8] (Table 1.2) uses PA radiographic changes, and is therefore a radiographic staging system to guide possible surgical intervention.

TABLE 1.2: EATON CLASSIFICATION	
STAGING	**CHARACTERISTICS**
STAGE 1	Normal articular cartilage Widened joint space
STAGE 2	Narrowing of joint space (<2mm) Maintained joint contours Minimal sclerosis and joint debris
STAGE 3	Significant narrowing of joint space Sclerosis present Cyst formation Joint subluxation Osteophytes longer than 2mm
STAGE 4	Significant narrowing of joint space Concomitant scaphotrapezial joint degeneration

1.1.9 Treatment

Treatment should be individualised. Treatment goals include improvement of pain, prevention of disability and secondary deformity. Nonsurgical treatment includes splinting of the thumb, stretching and strengthening physical therapy and steroid injections into the first CMC joint. Many different surgical strategies have been described to ensure a painless and functional thumb. Surgical treatment therefore varies from joint preserving to joint salvage procedures. Procedures include resection or replacement of the CMC joint, with repair of the palmar oblique ligament. There is still controversy regarding the preferred treatment.[1,8]

1.2 Literature Review

In 1989, Pattrick *et al.*[13] studied 67 patients with established OA of the hands, comparing nodal generalised OA (57 patients) and erosive OA (ten patients) with a normal control group of 52 patients. These patients had more than three rays affected on each hand. They evaluated hand function by testing activities of daily living. Tasks performed were light and heavy pinch, tripod pinch and lateral grip (of only the right hand), dexterity and power grip. The outcome measures were pain and functional impairment of daily activities. On the same day these patients underwent plain AP radiographs of the hands, which were then examined. Significant differences between the controls and patient groups were noted during the individual tasks ($p < 0.04$). A correlation between hand function and the extent of changes on radiographs were proven to be inconsistent. In the elderly age group, a less pronounced correlation was found when comparing results between the patient group and the control group. Erosive arthritis causes more prominent inflammation which may cause more severe limitation in hand function, however, this study included a small number of this subset of patients. The study suggests that nodal generalised OA of the hand does not contribute much to the limitation of function in the elderly. No differentiation was made with regards to which rays were affected.

In a cross-sectional study carried out in 2011 by Jones *et al.*[14], an association between OA of the hand, disability and pain was confirmed. Furthermore, it was confirmed that OA of the distal interphalangeal joints and the first CMC joint contributed to loss of hand function and grip strength. The authors demonstrated that there is strong evidence of a dose response associated with the severity of OA. The study did not demonstrate that OA of the CMC joint of the thumb alone had any greater significant effect on hand function compared to distal interphalangeal OA. A consistent association was only found with OA and grip strength. No significant association was found between OA of the CMC joint of the thumb and limitation of other hand functions.

Zhang *et al.*[15] performed a population-based study in 2002. In this study, it was reported that in patients over the age of 70, 13.2 percent of men and 26.2 percent of women had at least one symptomatic joint. In this population, the base of the thumb was the third most commonly affected joint. It was confirmed that symptomatic hand OA is associated with

limitations in achieving daily activities, as well as a weaker grip strength. Only 8.9 percent of men and 17 percent of women with radiographic changes had clinical symptoms. The authors also assessed several functional activities of the hand and found that patients with OA had difficulty writing, and using and holding small objects that weighed more than 4.5 kilograms (kg). These findings suggested that it was mainly the pinch grip of the thumb that was affected.

In a case-control study by Bagis *et al.* (2003)[16], it was found that postmenopausal female patients with grade three or four OA had lower grip and pinch strengths compared to normal patients. Pinch strength was lowest in patients with interphalangeal and CMC joint OA. Pain and nodules were also found to affect hand function. A functional index was used to assess hand function however, specific activities were not tested. Patients with interphalangeal involvement were reported to have less grip strength and patients with CMC joint OA had less pinch strength. The authors suggested that muscle strength adjacent to the affected joint is reduced which is an additional risk factor for disability.

In a large study carried out by Haara *et al.*[17] in 2004, the authors found that thumb CMC joint OA was a common disease that occured more frequently in women than in men. Despite this finding, the authors did not observe any frequent disability. These results contradicted those reported in previous studies and may be attributed to differences in the study populations.

Spacek *et al.* (2004)[18] compared the disability between patients with OA of the interphalangeal joints and OA of the base of thumb. They used the Cochin Hand Function Scale to assess patients, which revealed no significant differences between these two groups. They did however observe that activities requiring grip strength caused greater disability in the base of thumb OA group. There was no difference in pinch strength between the two groups. This correlates with the findings reported in most of the literature that OA of the thumb CMC joint mainly affects grip strength.

Eighty-seven women with hand OA were studied in 2005 by Kjeken *et al.*[19] These patients completed an examination involving hand impairment measures and health status measures. The Australian/Canadian (AUSCAN) Osteoarthritis Hand Index was used to determine activity limitations. The Canadian Occupational Performance Measure was used to measure subjective participation restrictions. This study confirmed that OA has a

measurable effect on function. The results showed that these patients had reduced mobility and grip force, and experienced pain with resisted motion. Occupational measures revealed that the most common problems experienced by patients with OA of the hand are related to personal care, household activities and mobility. Therefore, activities requiring grip strength poses a problem.

Özkan *et al.*[20] in 2007 wanted to determine the effect of OA on hand function in elderly patients. One hundred patients were included in this study. These patients had radiological hand OA, grade two and more, defined by Kellgren-Lawrence. Grip strength, and tip, lateral, and three-fingered pinches were determined. Dreiser's functional index was used to assess hand function. The assessment of subjective hand disability was used. Functional limitation tests such as handling small objects or carrying a bundle were much worse in patients with radiographic hand OA. Hand function was also negatively affected by tenderness, pain and Herberden's and Bouchard's nodules.

In a study by Ceceli *et al.* (2012)[21], sixty patients with OA of the hand were compared with 40 control patients. Hand pain, nodules and tenderness of the hand were documented. A Jamar dynamometer and a pinch meter were used to determine grip and pinch strengths. Disabilities of the arm, shoulder and hand (DASH) test was used to determine upper extremity function. They determined that the mean pinch and grip measurements were lower in the patient study group. DASH scores were higher in patients with OA of the hand, but this was not shown to be statistically significant. This was the first study that evaluated fine hand skills in patients with hand OA. The results showed that fine hand skills might be negatively affected by OA.

1.3 Problem Statement

In the United States, arthritis is the most common cause of disability, and OA is the most common form of arthritis affecting the older population. The effect on general hand function, however, has not been clearly described.[9] Thus, research on the effects of CMC joint OA, and its limitation on thumb function, is limited. Limited studies have been found specifically looking at the hand function scales, clearly defining the scores in these patients.

There are very few, if any, studies that have systematically assessed what the effect of symptomatic hand OA is on the function of the hand. Most epidemiologic studies look at grip strength alone.[23]

Furthermore, studies that have assessed the effect of symptomatic hand OA in relation to functional limitation in the South African population are limited.[10,11] The general notion is that first CMC joint OA negatively affects hand function, but does not cause any significant disability.[12]

1.4 Study Aim

The aim of the proposed study is to determine whether OA of the first CMC joint limits function of the hand.

1.4.1 Hypothesis

OA of the first CMC joint negatively affects hand function, and therefore cause significant disability.

1.4.2 Specific Objective

To document the limitation in hand function in patients with OA of the first CMC joint.

Chapter 2

2.1 Methodology

2.1.1 Study design

This study was a prospective review of patients presenting with OA of the first CMC joint at Chris Hani Baragwanath Academic Hospital and Helen Joseph Hospital in Johannesburg, South Africa. These Orthopaedic Units are Academic Units and are part of the Faculty of Health Sciences, University of the Witwatersrand. They are strictly referral units accepting referrals from local primary health care clinics and general practitioners in the greater Johannesburg Metropolitan area.

2.1.2 Population

The sample included all male and female patients aged 18 years and older presenting with any stage of OA of the first CMC joint between 01/10/2016 to 30/04/2017. Exclusion criteria included patients with carpal tunnel syndrome and trigger finger, pre-existing ipsilateral elbow or shoulder pathology, and patients with ipsilateral peripheral nerve or brachial plexus injuries.

2.1.3 Procedure

Screening was done by taking an appropriate history or PA radiographs of the involved hand/s. An information document and a consent form (see Appendix A) for participation in the study was obtained by the attending doctor, during which time the study and its purpose were fully explained. Patients were assessed using the Cochin hand function scale[22,23] (see Appendix B), the questionnaires were filled out by the attending doctor, and functional outcomes were documented. Patients were expected to compare

their hand function subjectively prior to disease onset. Confidentiality was maintained by not revealing the names of the patients involved in the study. Each patient was assigned a study number.

2.2 Statistics

The data were collected and entered into a Microsoft Excel Software spreadsheet (see Appendix C). Descriptive statistics were preformed and statements of frequency with percentages and mean with standard deviations, or medians with ranges were found.

To achieve statistical significance for this difference at a *p*-value of 0.05 and with a power of 80%, a minimum of 30 patient files had to be reviewed.

2.3 Funding

PA radiographs of the hand is a routine procedure done in patients presenting with symptoms and signs of OA of the first CMC joint. There were no extra costs or special services needed. The study was self-funded.

2.4 Consent

An information document and a consent form (see Appendix A) for participation in the study was obtained by the attending doctor, during which time the study and its purpose was fully explained.

2.5 Ethics

Ethics permission was obtained from the Human Research Ethics Committee (Medical) of the University of the Witwatersrand (clearance certificate number: M161131; see Appendix D).

Hospital permission was obtained from the Chief Executive Officer of Chris Hani Baragwanath Academic Hospital and Helen Joseph Hospital (see Appendix E).

Chapter 3

Forty patients were included in the study. The patients were screened based on their presenting symptoms, signs and/or previous radiographs presented.

3.1 Demographics of Patients

3.1.1 Gender of study population

Of these 40 patients, 33 were female and seven were male.

Table 3.1: Gender of study population ((n) = 40)

Gender	Frequency (n)	Percent (%)
Female	33	82,5
Male	7	17,5
TOTAL	40	100

3.1.2 Age of study population

The mean age of patients included in the study was 70,38 years (SD = 10,058) with a minimum age of 53 and a maximum age of 93. (see Appendix F)

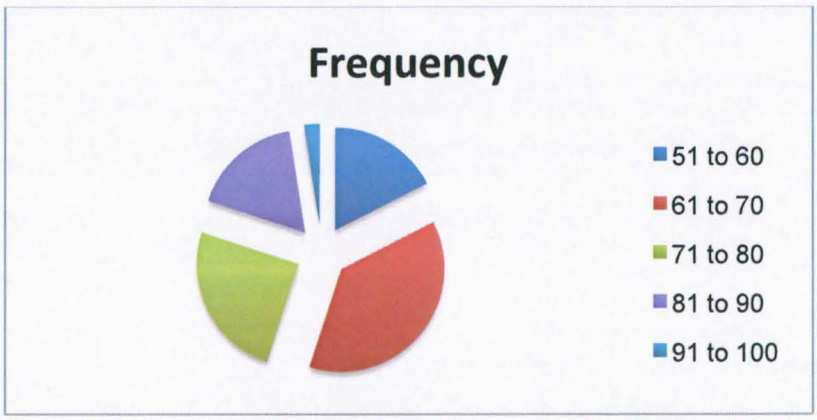

Figure 3.1: Age of study population (n = 40)

3.1.3 Hand Dominance

Thirty-six patients were right hand dominant and only four were left hand dominant.

Table 3.2: Hand dominance of study population (n = 40)

Hand dominance	Frequency (n)	Percent (%)
Right	36	90
Left	4	10
TOTAL	40	100

3.1.4 Affected Hand

Sixty-six hands were affected by OA, 36 of which were the right hand and 30 the left hand. Twenty-six patients had bilateral hand OA.

Table 3.3: Affected hand ((n) = 66)

Affected Hand	Frequency (n)	Percent (%)
Right	36	54,4
Left	30	45,5
Right and Left	26	15,6
TOTAL	66	100

3.2 Limitation of Function

3.2.1 Cochin Hand Function Scale

Hand function was evaluated by assessing the ability of the patient to perform 18 activities of daily living.

Table 3.4: Ability to hold a bowl

Scale of difficulty	Frequency (n)	Percent (%)
Without difficulty	6	9,1
With a little difficulty	7	10,6
With some difficulty	13	19,7
With much difficulty	18	27,3
Nearly impossible to do	12	18,2
Impossible to do	10	15,2
TOTAL	**66**	**100**

Table 3.5: **Ability to grasp a full bottle and raise it**

Scale of difficulty	Frequency (n)	Percent (%)
Without difficulty	4	6,1
With a little difficulty	8	12,1
With some difficulty	13	19,7
With much difficulty	22	33,3
Nearly impossible to do	13	19,7
Impossible to do	6	9,1
TOTAL	**66**	**100**

Table 3.6: **Ability to hold a plate full of food**

Scale of difficulty	Frequency (n)	Percent (%)
Without difficulty	5	7,6
With a little difficulty	10	15,2
With some difficulty	13	19,7
With much difficulty	17	25,8
Nearly impossible to do	17	25,8
Impossible to do	4	6,1
TOTAL	**66**	**100**

Table 3.7: **Ability to pour liquid from a bottle**

Scale of difficulty	Frequency (n)	Percent (%)
Without difficulty	3	4,5
With a little difficulty	6	9,1
With some difficulty	15	22,7
With much difficulty	21	31,8
Nearly impossible to do	15	22,7
Impossible to do	6	9,1
TOTAL	**66**	**100**

Table 3.8: **Ability to unscrew the lid from a jar**

Scale of difficulty	Frequency (n)	Percent (%)
Without difficulty	1	1,5
With a little difficulty	1	1,5
With some difficulty	8	12,2
With much difficulty	9	13,6
Nearly impossible to do	28	42,4
Impossible to do	19	28,8
TOTAL	**66**	**100**

Table 3.9: **Ability to cut meat with a knife**

Scale of difficulty	Frequency (n)	Percent (%)
Without difficulty	9	13,6
With a little difficulty	13	19,7
With some difficulty	14	21,2
With much difficulty	15	22,7
Nearly impossible to do	9	13,6
Impossible to do	6	9,1
TOTAL	**66**	**100**

Table 3.10: **Ability to prick things well with a fork**

Scale of difficulty	Frequency (n)	Percent (%)
Without difficulty	15	22,7
With a little difficulty	14	21,2
With some difficulty	13	19,7
With much difficulty	13	19,7
Nearly impossible to do	7	10,6
Impossible to do	4	6,1
TOTAL	**66**	**100**

Table 3.11: Ability to peel fruit

Scale of difficulty	Frequency (n)	Percent (%)
Without difficulty	10	15,2
With a little difficulty	13	19,7
With some difficulty	15	22,7
With much difficulty	8	12,1
Nearly impossible to do	15	22,7
Impossible to do	5	7,6
TOTAL	**66**	**100**

Table 3.12: Ability to button your shirt

Scale of difficulty	Frequency (n)	Percent (%)
Without difficulty	10	15,2
With a little difficulty	8	12,1
With some difficulty	5	7,6
With much difficulty	21	31,8
Nearly impossible to do	12	18,2
Impossible to do	10	15,2
TOTAL	**66**	**100**

Table 3.13: Ability to open and close a zip

Scale of difficulty	Frequency (n)	Percent (%)
Without difficulty	16	24,2
With a little difficulty	6	9,1
With some difficulty	13	19,7
With much difficulty	12	18,2
Nearly impossible to do	12	18,2
Impossible to do	7	10,6
TOTAL	**66**	**100**

Table 3.14: Ability to squeeze a new tube of toothpaste

Scale of difficulty	Frequency (n)	Percent (%)
Without difficulty	13	19,7
With a little difficulty	7	10,6
With some difficulty	21	31,8
With much difficulty	18	27,3
Nearly impossible to do	5	7,6
Impossible to do	2	3,0
TOTAL	**66**	**100**

Table 3.15: Ability to hold a toothbrush efficiently

Scale of difficulty	Frequency (n)	Percent (%)
Without difficulty	19	28,8
With a little difficulty	7	10,6
With some difficulty	19	28,8
With much difficulty	12	18,2
Nearly impossible to do	6	9,1
Impossible to do	3	4,5
TOTAL	**66**	**100**

Table 3.16: Ability to write a short sentence with an ordinary pen

Scale of difficulty	Frequency (n)	Percent (%)
Without difficulty	36	54,5
With a little difficulty	7	10,6
With some difficulty	9	13,6
With much difficulty	4	6,1
Nearly impossible to do	8	12,1
Impossible to do	2	3,0
TOTAL	**66**	**100**

Table 3.17: Ability to write a letter with an ordinary pen

Scale of difficulty	Frequency (n)	Percent (%)
Without difficulty	33	50,0
With a little difficulty	6	9,1
With some difficulty	8	12,1
With much difficulty	6	9,1
Nearly impossible to do	6	9,1
Impossible to do	7	10,6
TOTAL	**66**	**100**

Table 3.18: Ability to turn a round door knob

Scale of difficulty	Frequency (n)	Percent (%)
Without difficulty	7	10,6
With a little difficulty	8	12,1
With some difficulty	10	15,2
With much difficulty	17	25,8
Nearly impossible to do	12	18,2
Impossible to do	12	18,2
TOTAL	**66**	**100**

Table 3.19: Ability to cut a piece of paper with a scissor

Scale of difficulty	Frequency (n)	Percent (%)
Without difficulty	12	18,2
With a little difficulty	4	6,1
With some difficulty	18	27,3
With much difficulty	18	27,3
Nearly impossible to do	7	10,6
Impossible to do	7	10,6
TOTAL	**66**	**100**

Table 3.20: **Ability to pick up coins from a table top**

Scale of difficulty	Frequency (n)	Percent (%)
Without difficulty	10	15,2
With a little difficulty	5	7,6
With some difficulty	12	18,2
With much difficulty	11	16,7
Nearly impossible to do	14	21,2
Impossible to do	14	21,2
TOTAL	**66**	**100**

Table 3.21: **Ability to turn a key in a lock**

Scale of difficulty	Frequency (n)	Percent (%)
Without difficulty	8	12,1
With a little difficulty	8	12,1
With some difficulty	15	22,7
With much difficulty	18	27,3
Nearly impossible to do	13	19,7
Impossible to do	4	6,1
TOTAL	**66**	**100**

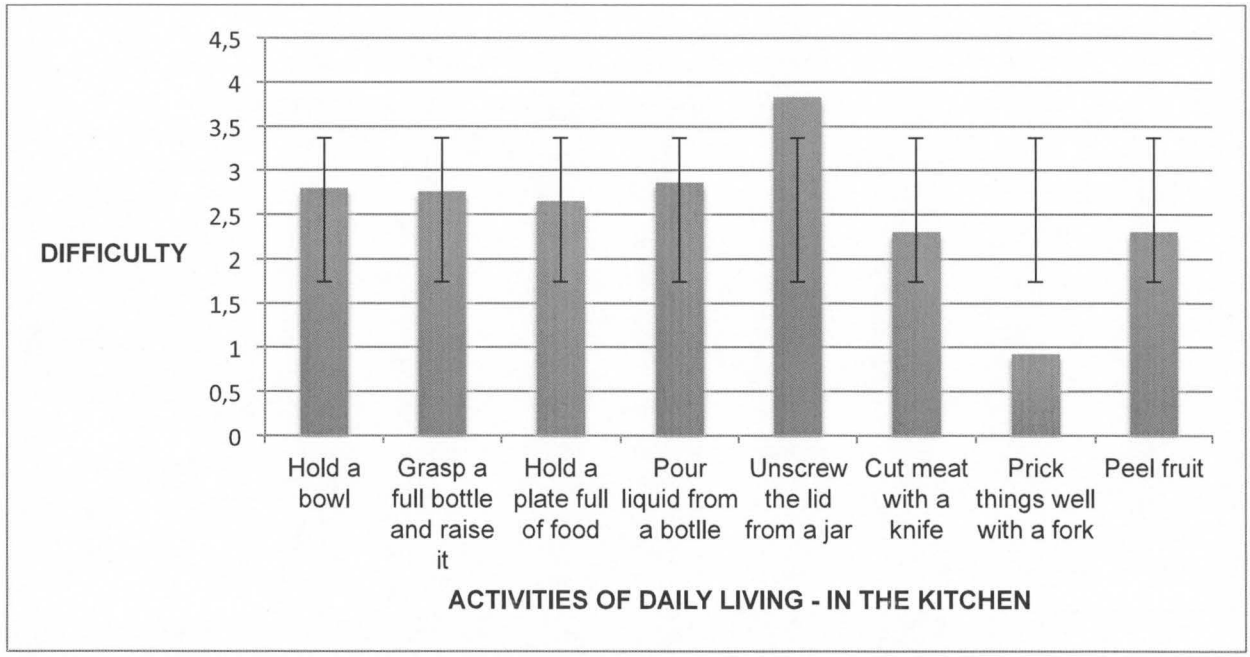

Figure 3.2: Activities of daily living – in the kitchen

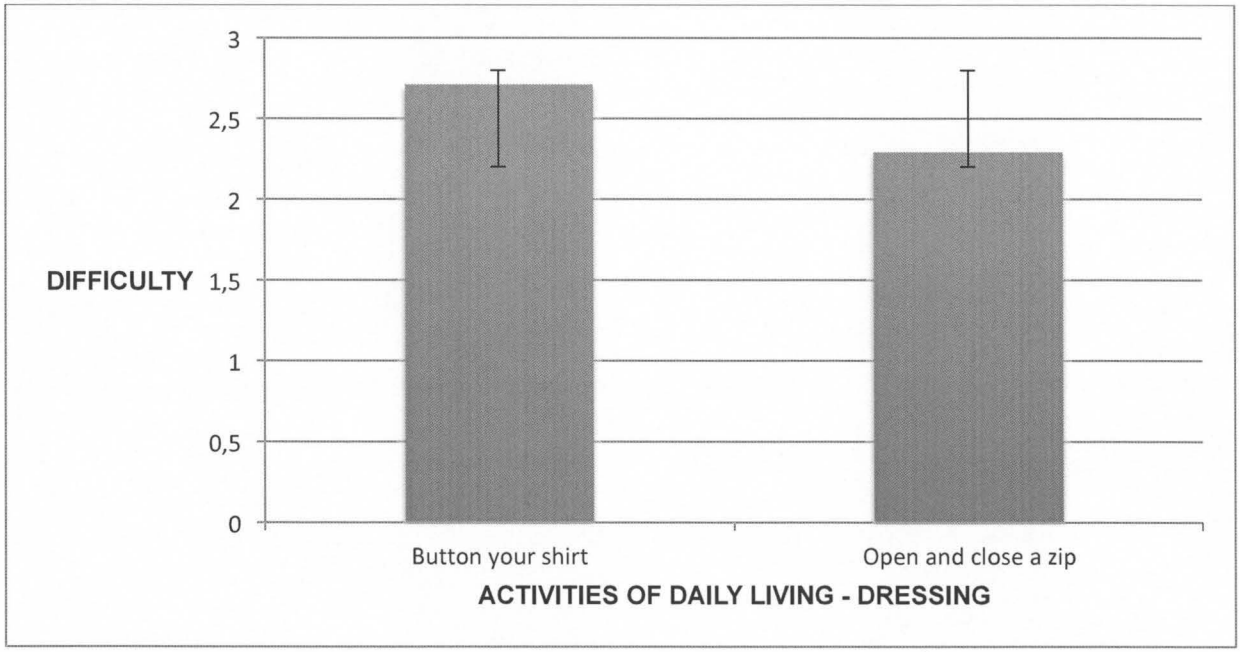

Figure 3.3: Activities of daily living – dressing

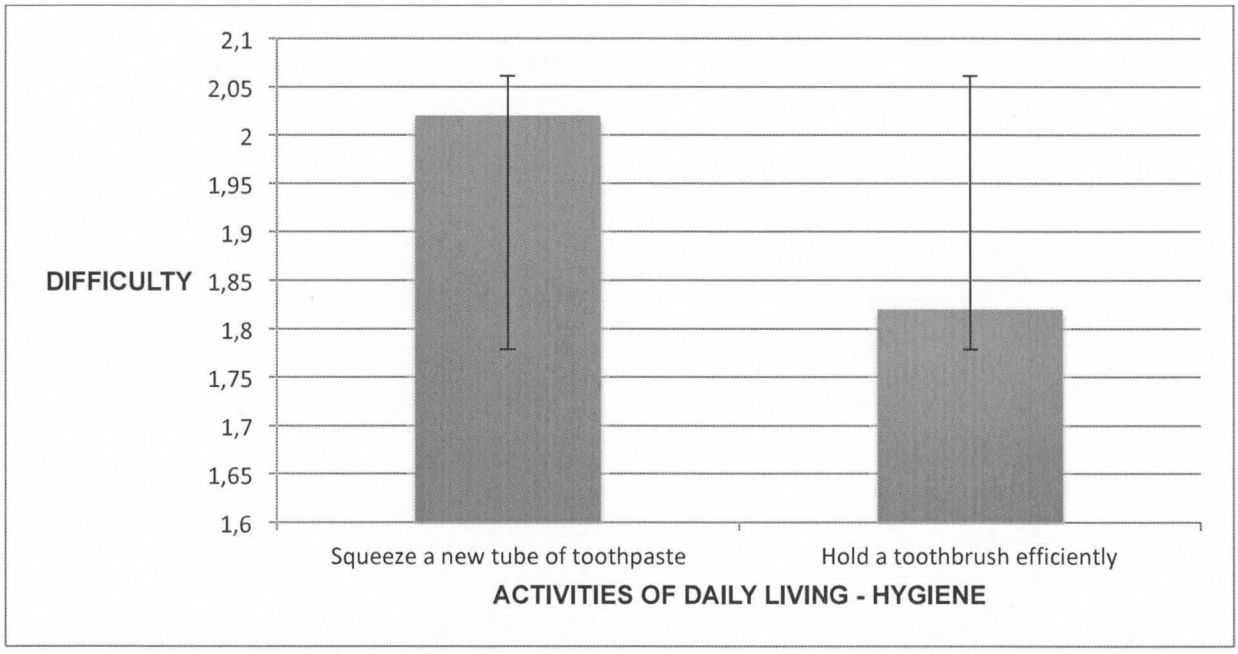

Figure 3.4: Activities of daily living – hygiene

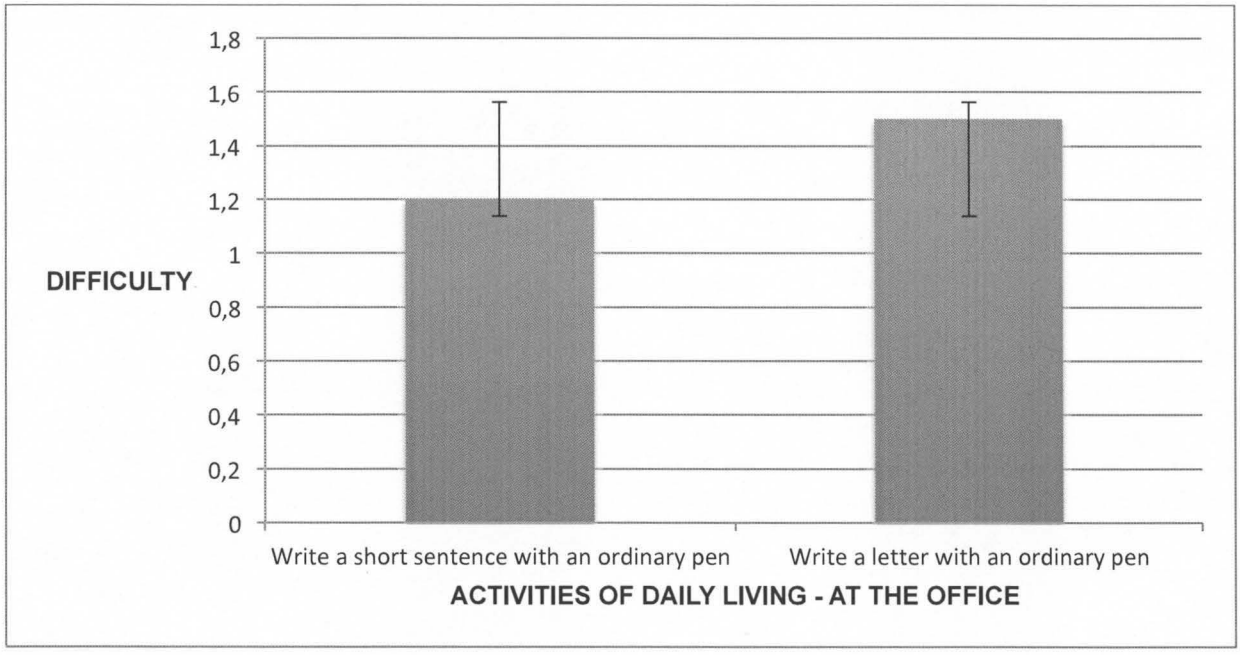

Figure 3.5: Activities of daily living – at the office

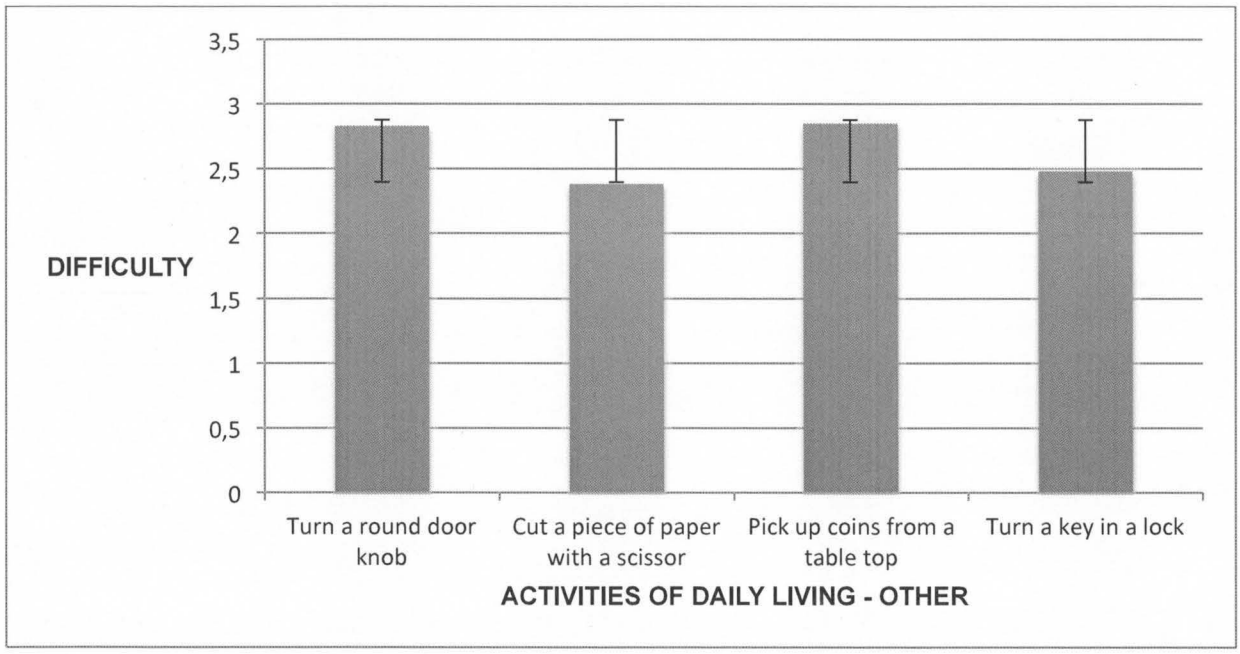

Figure 3.6: Activities of daily living – other

In the kitchen

The most common difficulty experienced in the activities of daily living in the kitchen was to unscrew the lid from a jar, with the mean calculated at 3,83 (SD = 1,046). Most patients answered that they found it nearly impossible to do.

The least difficult task was to prick things well with a fork, the mean calculated at 1,92 (SD = 1,522).

Dressing

The least difficult activity of daily living with regards to dressing was to open and close a zip, the mean calculated at 2,29 (SD = 1,699).

The most common difficulty experienced was to button a shirt, with the mean calculated at 2,71 (SD = 1,634).

Hygiene

The least difficult activity of daily living with regards to maintaining oneself's hygiene was to hold a toothbrush efficiently, the mean calculated at 1,82 (SD = 1,487).

The most common difficulty experienced was to squeeze a new tube of toothpaste, with the mean calculated at 2,02 (SD = 1,330).

At the office

The least difficult activity of daily living in the office was to write a short sentence with an ordinary pen, the mean calculated at 1,20 (SD = 1,581). 54,5 percent of the patients reported that this was done without difficulty.

The most common difficulty experienced was to write a letter with an ordinary pen, with the mean calculated at 1,50 (SD = 1,817).

Other

The least difficult activity of daily living in the random category was to cut a piece of paper with a scissor, the mean calculated at 2,38 (SD = 1,527).

The most common difficulty experienced was to pick up coins from a table top, with the mean calculated at 2,85 (SD = 1,712). 42,4 percent of the patients reported that this was either impossible, or nearly impossible to do.

This was closely followed by the limitation of turning a round door knob, with the mean calculated at 2,83 (SD = 1,584).

Chapter 4

4.1 Discussion

4.1.1 Demographics of study population

Gender of study population

Out of the 40 patients included in the study, 33 were female (82,5%). Only seven of the patients presenting with OA of the first CMC joint were men. According to our literature review this is typical in the presentation of OA of the first CMC joint.[8] The reason for this gender predominance is still unclear. A postulated hypothesis is hormonal factors. Hypermobility has been postulated as a cause for CMC joint arthritis. Joint laxity has been found more often in females, linked to hormones prolactin, relaxin and estrogen. This might be the cause of subtle geometrical differences of the CMC joint when comparing males and females.[2,6]

In the cross-sectional study by Jones *et al.* (year)[14] the hand function scores, pain and grip strength were all significantly worse in women. Our study also found this with regard to the hand function scores.

In other studies[15] the prevalence of symptomatic OA in women was higher than that in men.

Age of study population

The mean age on our study population was 70,38 (SD = 10,058) with a minimum age of 53 and a maximum age of 93. This correlates with the reported literature as OA of the first CMC joint is most common between the ages of 50 and 70 years.[8] Fifty-five percent of our patients were indeed between the ages of 50 and 70.

4.1.2 Limitation of function

Symptomatic hand OA is especially associated with difficulty performing daily tasks such as eating, dressing and carrying objects. As has been suggested by the results from other studies, they were able to qualify carrying weight of 4.5kg or more.[9]

Pain and functional impairment are the most important factors to the patient. Literature review suggests that patients with erosive OA present with more pain and therefore more difficulty performing activities of daily living. We were able to produce the same results even though we did not specify between the different types of OA.[13]

First CMC joint OA has a greater influence on grip strength, but not as much on function of the hand. These studies did not use the Cochin Hand Function Scale, making it difficult to compare results in detail. Grip strength was reduced in our study.[14]

The Framingham study demonstrated difficulty in writing, using and holding small objects, difficulty carrying weight of 4.5kg, and decreased grip strength. In this study there was no effect on dressing, eating, using the telephone, taking medication or pouring liquid into a glass. This suggests that CMC joint OA mainly limits grip strength and pincer grip and does not result in significant disability.[15,16] In our study we found that it does affect dressing, eating and pouring liquid as well.

Haara *et al.* (2004)[17] found that thumb CMC joint OA was not associated with overall disability. It is difficult to compare their disability findings to the current study as different measures were used.

The most frequent reported problems[19] were wringing out wash cloths, opening jars and opening bottles which suggests a reduced grip strength. This is consistent with our results.

4.2 Strengths

Our study confirmed the hypothesis that OA of the first CMC joint limits function of the hand.

4.3 Limitations

A small number of patients was included in the study as the majority of patients with early stages of OA are treated conservatively in smaller centers around Johannesburg. Our results are possibly skewed towards the more severe cases of OA of the first CMC joint. No correlation of results with the Burton classification was done which may have demonstrated that.

Possible inconsistency due to multiple doctors, with different levels of expertise, completing the questionnaire.

It could be argued that the Cochin hand function scale is not valid in our population. A majority of our patients might not necessarily be writing letters or cutting with scissors. An alternative to use would be the DASH score.

4.4 Recommendations

This study did not include the measurement of limitation of specific functions of the thumb, which could be investigated in the future. Furthermore, the number of patients included in the study could be increased.

4.5 Conclusion

OA commonly affects the first CMC joint of the hand. Females, between the ages of 50 and 70 years, are more often affected than males.[8] Patients present with pain and functional impairment. The influence of OA on the first CMC joint in terms of decreased grip strength[8] is greater, than on function of the hand. Measurement of decrease in grip strength could be quantified in further studies.

APPENDIX A

INFORMATION DOCUMENT AND CONSENT FORM

This Informed Consent Form is for men and women who attend the Orthopaedic Clinic at Helen Joseph Hospital and Chris Hani Baragwanath Hospital.

Title of the Study: Does osteoarthritis of the thumb carpometacarpal joint limit function of the hand?

Principal Investigator: Dr. Este Knipe (Registrar)

University of the Witwatersrand

Division of Orthopaedic Surgery

This Informed Consent Form has two parts:

Information Sheet (to share information about the research with you)

Certificate of Consent (for signatures if you agree to take part)

PART I: INFORMATION SHEET

Introduction:

I am Dr. Este Knipe, working for the Orthopaedic Surgery department. We are doing research on patients at the Orthopaedic Outpatient Departments of Helen Joseph Hospital and Chris Hani Baragwanath Hospital with osteoarthritis of the base of thumb.

Invitation to participate:

I am inviting you to participate in our research study. If there is anything you do not understand, please stop me and I will take time to explain.

Purpose of the study:

Osteoarthritis is a common disease and research is necessary to learn answers to any

unanswered questions. We want to see if osteoarthritis of the base of the thumb has any effect on the function of the hand.

Type of intervention:

Your participation would only involve asking you 18 questions, using a standardized questionnaire. The questions will all be regarding your hand function. It will take about 10 minutes. I will have to send you for one x-ray of your hand, if you do not already have one. After the x-ray was done, you will come straight back to me, and will therefore not have to sit in the queue again. You won't need any extra visits to the clinic after completing this questionnaire.

Participant selection:

We are inviting all adult patients with osteoarthritis to be a part of this study.

Voluntary Participation:

Your participation is entirely voluntary and refusal will not result in any penalty or loss of benefits. It is your choice to take part or not to. Participation can be withdrawn at any stage of the study.

Risks:

There are no risks involved.

Benefits:

There may not be any physical or therapeutic benefit, but you will help us learn more about a common disease.

Confidentiality:

Effort will be made to keep your personal information confidential. For this reason your questionnaire will not contain any personal details.

Who to contact:

If you have any concerns or questions later, you may contact me:

Principal Investigator: Este Knipe 0711077220

PART II: CERTIFICATE OF CONSENT

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I consent voluntarily to participate as a participant in this research.

Print Name of Participant: _____

Signature of Participant: _____

Date: _____

If illiterate:

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Print Name of Witness: _____

Date: _____ AND

Thumb print of Participant: _____

Statement by the researcher/person taking consent

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands. I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this consent form has been provided to the participant.

Print Name of researcher/person taking consent: _____

Signature of researcher/person taking consent: _____

Date: _____

APPENDIX B

COCHIN HAND FUNCTION SCALE						
	0*	1**	2***	3****	4*****	5******
IN THE KITCHEN Can you:						
Hold a bowl						
Grasp a full bottle and raise it						
Hold a plate full of food						
Pour liquid from a bottle						
Unscrew the lid from a jar						
Cut meat with a knife						
Prick things well with a fork						
Peel fruit						
DRESSING Can you:						
Button your shirt						
Open and close a zip						
HYGIENE Can you:						
Squeeze a new tube of toothpaste						
Hold a toothbrush efficiently						
AT THE OFFICE Can you:						
Write a short sentence with an ordinary pen						
Write a letter with an ordinary pen						
OTHER Can you:						
Turn a round door knob						
Cut a piece of paper with scissors						
Pick up coins from a table top						
Turn a key in a lock						

* Without difficulty

** With a little difficulty

*** With some difficulty

**** With much difficulty

***** Nearly impossible to do

****** Impossible to do so

APPENDIX C

DATA COLLECTION SHEET						
Study number:						
Gender	Male			Female		
Age						
Hand dominance	Left		Right		Both	
Affected hand/s	Left			Right		
OA of the first CMC joint	Yes			No		
Exclusion criteria present	Yes			No		
Hold a bowl	0	1	2	3	4	5
Grasp a full bottle and raise it	0	1	2	3	4	5
Hold a plate full of food	0	1	2	3	4	5
Pour liquid from a bottle	0	1	2	3	4	5
Unscrew the lid from a jar	0	1	2	3	4	5
Cut meat with a knife	0	1	2	3	4	5
Prick things well with a fork	0	1	2	3	4	5
Peel fruit	0	1	2	3	4	5
Button your shirt	0	1	2	3	4	5
Open and close a zip	0	1	2	3	4	5
Squeeze a new tube of toothpaste	0	1	2	3	4	5
Hold a toothbrush efficiently	0	1	2	3	4	5
Write a short sentence with an ordinary pen	0	1	2	3	4	5
Write a letter with an ordinary pen	0	1	2	3	4	5
Turn a round door knob	0	1	2	3	4	5
Cut a piece of paper with scissors	0	1	2	3	4	5
Pick up coins from a table top	0	1	2	3	4	5
Turn a key in a lock	0	1	2	3	4	5

APPENDIX D

Ethics Certificate

R14/49 Dr Este Knipe et al

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M161131

NAME: (Principal Investigator)	Dr Este Knipe et al
DEPARTMENT:	Orthopaedic Surgery Chris Hani Baragwanath Academic Hospital Helen Joseph Hospital
PROJECT TITLE:	Does Osteoarthritis of the Thumb Carpometacarpal Joint Limit Function of the Hand?
DATE CONSIDERED:	25/11/2016
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Prof A. Aden
APPROVED BY:	Professor P. Cleaton-Jones,Chairperson, HREC (Medical)
DATE OF APPROVAL:	05/04/2017

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary in Room 10004,10th floor, Senate House/2nd floor, Phillip Tobias Building, Parktown, University of the Witwatersrand. I/We fully understand the the conditions under which I am/we are authorised to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated,from the research protocol as approved, I/we undertake to resubmit to the Committee. **I agree to submit a yearly progress report**. The date for annual re-certification will be one year after the date of convened meeting where the study was initially reviewed. in this case, the study was initially review November and will therefore be due in the month of November each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Knipe — Principal Investigator Signature

Date: 29/2018

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

APPENDIX E

Letter of permission from Hospital CEO

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

MEDICAL ADVISORY COMMITTEE
CHRIS HANI BARAGWANATH ACADEMIC HOSPITAL

PERMISSION TO CONDUCT RESEARCH

Date: 4 Nov 2016

TITLE OF PROJECT: Does osteoarthritis of the thumb metacarpal joint limit function of the hand

UNIVERSITY: Witwatersrand

Principal Investigator: E Knipe

Department: Orthopaedics

Supervisor (If relevant): A Aden, T Sefeane

Permission Head Department (where research conducted): No

Date of start of proposed study: Nov 2016
Date of completion of data collection: De 2018

The Medical Advisory Committee recommends that the said research be conducted at Chris Hani Baragwanath Hospital. The CEO /management of Chris Hani Baragwanath Hospital is accordingly informed and the study is subject to:-

- Permission having been granted by the Human Research Ethics Committee of the University of the Witwatersrand.
- the Hospital will not incur extra costs as a result of the research being conducted on its patients within the hospital
- the MAC will be informed of any serious adverse events as soon as they occur
- permission is granted for the duration of the Ethics Committee approval.

.....
Recommended
(On behalf of the MAC)
Date: 04 November 2016

.....
Approved/Not Approved
Hospital Management
Date:

APPENDIX F

Table F.1: Age of study population (n = 40)

Age	Frequency (n)	Percent (%)
53	2	5,0
55	1	2,5
58	1	2,5
59	2	5,0
60	1	2,5
61	1	2,5
62	2	5,0
63	2	5,0
65	1	2,5
66	2	5,0
68	2	5,0
69	4	10,0
70	1	2,5
71	3	7,5
72	1	2,5
74	1	2,5
76	2	5,0
78	3	7,5
82	2	5,0
83	2	5,0
84	1	2,5
88	2	5,0
93	1	2,5
TOTAL	**40**	**100**

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EXPLORING ORGANISATIONAL FACTORS THAT INFLUENCE HEALTH FACILITY MANAGERS' DATA UTILISATION IN A METROPOLITAN HEALTH DISTRICT

Tshegofatso C.R. Maimela

A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, in partial fulfilment of the requirement for the degree Master of Medicine (MMED) in the speciality of Community Health, in the field of Public Health Medicine.

Date: September 2018

DECLARATION

I, Tshegofatso Carol Ramatsimele Maimela, declare that:

i. The research reported in this dissertation, except where otherwise indicated, is my original research.

ii. This dissertation has not been submitted for any degree or examination at any other university.

iii. This dissertation does not contain other persons' data, picture, graphs or other information, unless specifically acknowledged as being sourced from other persons.

iv. This dissertation does not contain text, graphics, or tables copied and pasted from the Internet, unless specifically acknowledged, and the source being detailed in the dissertation and in the References section.

Student: Dr Tshegofatso C.R. Maimela (0104440Y)

Signature: 

Date: September 2018

DEDICATION

To all my reasons, Owohlukileyo and Boikhutjo Nkonzo…and to my solid ground:
I am. I am.. I am…

PRESENTATIONS ARISING FROM REPORT

1. *Maimela TCR; Kawonga M, Armstrong S.* "Exploring organisational factors that influence health facility managers' data utilisation in a metropolitan health district." Oral Presentation; Parallel Session 2C - Health Systems: Governance, Leadership, Management.
Public Health Association of South Africa (PHASA) 13th Annual 2017. Conference theme "A Global Charter for the Public's Health": Implications for Public Health Practice in South Africa.
Date: 5th September 2017;
Venue: Indaba Hotel and Conference Centre, Sandton, Johannesburg, 2068

2. *Maimela TCR; Armstrong S, Kawonga M.* "Exploring organisational factors that influence health facility managers' data utilisation in a metropolitan health district." Poster Presentation; Parallel Session 4B – Employee Wellness:
Gauteng Department of Health Research Summit.
Date: 16th February 2018
Venue: Birchwood Hotel & Conference Centre, Boksburg, Johannesburg, 1456

3. *Maimela TCR; Armstrong S, Kawonga M.* "Exploring organisational factors that influence health facility managers' data utilisation in a metropolitan health district." Oral Presentation;
LESEDI workshop: Utilisation of data for decision-making at the district level
Date: 22nd February 2018
Venue: WITS School of Public Health, Parktown, Johannesburg, 2193

ABSTRACT

INTRODUCTION: Information use for decision making is an important factor for improving health system performance. The District Health Management Information System (DHMIS) was established to strengthen the generation and use of information by health managers for planning, monitoring and evaluation of health services. However, evidence demonstrates sub-optimal use of DHMIS information, especially by primary health care (PHC) facility managers.

AIM: Using concepts from the PRISM framework, we explore facility managers' perceptions regarding whether and how organisational factors may influence their use of data for health service improvement in a metropolitan health district.

METHODS: This exploratory qualitative study was conducted in the Johannesburg metropolitan health district in 2017. Ten PHC facility managers were randomly selected for semi-structured interviews, which explored the organisational management functions, resource availability and culture of information. Nine interviews were transcribed and analysed using a directed theoretical approach to thematic content analysis.

RESULTS: An enabling DHMIS policy and available data generating tools facilitated data use. Gaps in training, Health Information System (HIS) staff and supervision; and an information culture that emphasised reporting, were constraining factors of data use. Poor quality data, delayed feedback and data disseminated in cumbersome formats reduced the usefulness and use of data.

CONCLUSION: An effective HIS training strategy nurtured in a culture of information supportive of data use could improve the potential of DHMIS performance. DHMIS standard operating procedures should define data use for facility managers more clearly to support empirical data use practices. The organisation should capacitate facilities in a manner that increases DHMIS data ownership and use by PHC facility managers.

ACKNOWLEDGEMENTS

I would like to acknowledge the following individuals without whom this research project and dissertation would not have been possible:

- The participants in the study who received my curious questions warmly despite time constrains. Thank you for obliging my team and I with such valuable data.
- The Johannesburg Metropolitan Health District Research Committee, PHC directorate and the Gauteng Department of Health for granting access for this research for this research to be conducted.
- The University of the Witwatersrand Human Research Ethics Committee for granting ethical clearance for this study to be conducted.
- The Department of Community Health, School of Public Health, University of the Witwatersrand, for the continued academic support and opportunity for professional and personal growth.
- The study was part of the LESEDI project funded by the Atlantic Philanthropies (Grant ID: 21408). The views expressed in this study are those of the authors and not of the funder.
- Finally, and most importantly, to my two astute supervisors, Dr Mary Kawonga and Dr Sue Armstrong, for their dedicated and patient guidance. Your reassurance and expertise is deeply valued and has made this research journey unquestionably fulfilling.

Table of Contents

DECLARATION ii
DEDICATION iii
PRESENTATIONS ARISING FROM REPORT iv
ABSTRACT v
ACKNOWLEDGEMENTS vi
LIST OF ACRONYMS AND ABBREVIATIONS ix
CHAPTER 1 1
1. INTRODUCTION 1
1.1. **Background** 1
1.2. **Literature Review** 2
1.3. **Problem Statement** 6
1.4. **Justification for the Study** 7
1.5. **Aims and Objectives** 8
CHAPTER 2 9
2. STUDY METHODS 9
2.1. Study Design 9
2.2. Study Setting 9
2.3. Study Population and Sampling 10
2.4. Data Collection and Measurement 10
2.5. Pre-Test 12
2.6. Data Management and Analysis 13
2.7. Data Authentication 15
2.8. Ethics 16
CHAPTER 3 18
3. RESULTS: 18
3.1. Facility Managers Use of Data for Service Improvements 22
3.1.1. Planning and monitoring of health services 22
3.2. Organisational Factors Influencing Data Use 25
3.2.1. Critical management functions 26
3.2.2. Resource availability for DHMIS functioning 29
3.2.3. Culture of information use 32
3.3. Other Emerging Factors Influencing DHMIS Data Use 34
CHAPTER 4 40
4. DISCUSSION 40
4.1. PHC's Facility Managers' Uses of DHMIS Data for Service Improvement Decision-Making 40
4.2. Organisational and other Facilitators of PHC Facility Managers' Use of Data for Service Improvement at Facility Level 42
4.3. Organisational and other Factors Constraining PHC Facility Managers' Data Use for Service Improvement 44
4.4. Public Health Implications of the Study 48
4.5. Bias and Limitations 49

CHAPTER 5 51
5.1. Conclusions 51
5.2. Recommendations 51
APPENDICES 55
APPENDIX A: ORGANISATIONAL FACTORS AND DATA USE INTERVIEW GUIDE 55
ANNEXURE B2: INFORMATION SHEET – JOHANNESBURG SUB-DISTRICT DISTRICT PHC MANAGERS AND HEALTHCARE FACILITY MANAGERS 59
ANNEXURE C1: INFORMED CONSENT SHEET – JOHANNESBURG SUB-DISTRICT DISTRICT PHC HEALTHCARE FACILITY MANAGERS 64
ANNEXURE C2: CONSENT TO RECORD THE INTERVIEW – JOHANNESBURG SUB-DISTRICT DISTRICT PHC HEALTHCARE FACILITY MANAGERS 65
APPENDIX ONE: SIGNED PLAGIARISM DECLARATION 66

LIST OF ACRONYMS AND ABBREVIATIONS

CHC	Community Health Centre
DHS	District Health System
DHIS/DHMIS	District Health (Management) Information System(s)
HIS/HMIS	Health (Management) Information System(s)
LMIC	Low- and Middle-Income Countries
RHIS	Routine Health Information Systems
RHMIS	Routine Health Management Information System
M&E	Monitoring and Evaluation
NDOH	National Department of Health
PHC	Primary Healthcare Clinic
PRISM	Performance of Routine Information System Management
SOP	Standard Operating Procedure
WHO	World Health Organisation

CHAPTER 1

1. INTRODUCTION

1.1. Background

The utilisation of health management information systems (HMIS) by health managers, is an essential outcome of HMIS, in order to support data informed decision-making that addresses population health issues. (1,2) Data use (i.e. the reading, analysis and interpretation of health information) for decision making is an important indicator of an organisation's HMIS performance. This is because the goal of HMIS is to generate data to inform and guide responsive decision making by health service managers on community and population health related problems. (3)

The utilisation of data is described as a health systems strengthen mechanism which can ultimately improve population health outcomes. (1,4,5) AbouZar et al. (5) outlined the foundation that good health information systems provide for any health system. The World Health organization (WHO), recognised the impact that health information and health-related data for decision making has in strengthening health system responsiveness and improving service delivery for better population health outcomes. (1)

The South African National Department of Health (NDOH) has invested a considerable amount of resources into strengthening and modernising its national routine health information system (RHIS), known as the district health management information system (DHMIS). (4,6) As delineated within the organisation's 2011 policy, the main aim of the DHMIS is to strengthen monitoring, evaluation and the use of information at national, provincial, district and facility-level, in policy and programme planning. In light of the various resource constraints encountered by the South African health sector, strategies aimed at optimising the use of health information (to be referred to as data from here on), for decision making, must thus yield maximum return on investments in HMIS. (7) Similarly, the need to examine the factors that influence the use of RHIS generated data by health service and

health program managers within this health organisation, must be known and understood, in order to practically achieve its DMHIS policy aim. (4,5,8)

1.2. **Literature Review**

This literature review considers the evidence on RHIS data use within health systems and the varying factors contributing to data use by health system managers. It additionally outlines the purpose and rationale for understanding factors associated with the increased use of data by PHC facility managers for improved service delivery and identifies gaps in the literature related to understanding these factors .

USE OF DATA

RHIS data use is argued by Hotchkiss et al. (9) as an equally valuable measure of RHIS performance as good quality data, stating that the use of RHIS data to inform decision making by health service managers is what leads to a more responsive health system that improves health outcomes. Authors such as Nutley et al. (10,11) and Kawonga et al. (12) among others, have broadened the description of data use to include actions such as the following: (i) reading or discussing data reports; (ii) interpreting and reviewing data in terms of targets set for health programs or health facilities; (iii) deriving implications for program and service delivery performance based on interpreted data; and (iv) taking action or making decisions on health service and health program management especially in the light of data trends and interpreted meanings of identified trends. Nutley et al. (11) further emphasised the importance of organisations understanding data utilisation as an outcome of health system managers' data demands (i.e. how , when and why data are used) together with the data needs required for decision making responsibilities (10). As a result, the authors argue that an organisation's ability to understand the data needs and data demands of its intended users (e.g. PHC facility managers) is a vital step in designing supportive RHIS that will ensure maximum uptake of RHIS outputs, in particular reference to data utilisation for decision making (10).

As Davies et al. (13) suggest, different levels of management within a health organisation should use data differently as relevant to their leadership roles. Wilson et al. (14) and Garrib et al. (15) have shown that the availability of RHIS data reports

for use by intended users within the health organisation at the lowest levels of health service delivery is limited in South Africa. (14–16) The lack of such follow-through in RHIS feedback mechanisms to lower levels, creates a scenario where there is no RHIS data reflecting facility-specific health service performance, and targets to support and guide facility level health service management in order to improve service delivery outputs and meet set targets. (12,17,18) In the South African context, Wilson et al. (14) and Rohde et al., (18) continue to reflect upon the widespread sub-optimal use of RHIS data especially by health managers at levels closest to service delivery. This description of RHIS use, provides possible insights into understanding why timely use of health-related data for decision making is often poorly demonstrated in many regions of the country. And can similarly provide insight into how this lack of organisational responsiveness ultimately offsets the purpose of the DHMIS for the district health system (DHS) as a whole. (13,14)

DETERMINANTS OF DATA USE

Understanding the factors that influence data use within an organisation assists in instituting justifiable mechanisms that lead to the increased use of heath data within that defined organisation. HMIS performance described by authors such as Littlejohns et al. (19) and Heeks et al., (20) link information and communication technology (ICT) infrastructure as the main determinant of RHIS performance and good quality data outputs. ICT infrastructure and support in this description includes resources such as computers with updated software, uninterrupted internet connectivity and availability as well as staff trained in ICT processes and competent in using ICT systems. In addition to ICT system reliability factors, a systematic review undertaken by Gagnon et al. (21), identified the other key ICT related factors (i.e. system design and system function) that had an influence on the adoption and use of ICT technologies by healthcare professionals. These authors determined that among such issues, the users' perceived ease of use of the ICT systems and the users' perceived usefulness of the ICT systems as relevance to their work and impact on productivity, were considerable ICT determinants.

Aqil et al., (22) however propose a framework they name the Performance of Routine Information System Management (PRISM). This framework postulates and takes into consideration how HMIS performance (both data quality *and* data use) are

not only determined by technical factors (i.e. ICT and infrastructure, software etc.), but also by the system's behavioural (i.e. related to the people engaging with the rHIS) and organisational factors (i.e. mechanisms designed to support the generation and use of good quality data outputs). (22) The relationships between these three sets of factors are illustrated in Figure 1 below.

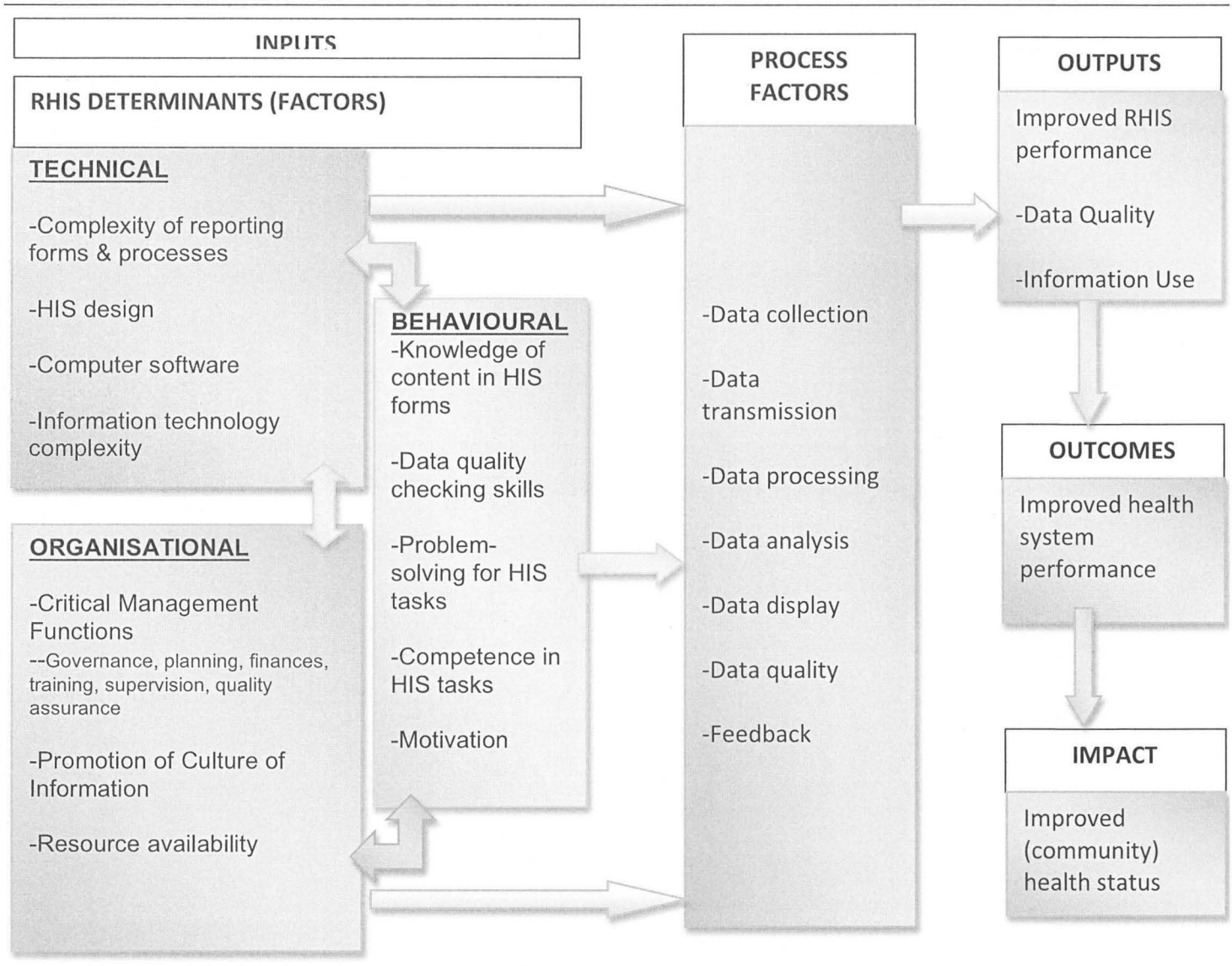

Figure 1: Framework on determinants of RHIS performance (22).

Within this PRISM framework, Aqil et al. (22) argue that any RHIS performs within a defined environment or organisation. The manner in which an organisation plans for, capacitates and supports its human and technical resources to produce and use good quality data, significantly contributes to the two key HMIS performance

indicators of data quality and data use. Furthermore, the authors postulate that an organisation needs excellent knowledge of its information needs, in order to create functional RHIS governance structures, ensure adequate financing, resource allocation and sufficient planning for RHIS activities. Such organisational knowledge, supported by appropriate training, supervision, quality assurance mechanisms, information dissemination systems and a culture which values and promotes information use, comprehensively create an environment which optimises RHIS performance. (22)

Behavioural factors which influence RHIS performance are summarily described in this framework, in terms of the knowledge of HIS processes and data collection tools, the competence levels, skills and degree of motivation in performing various RHIS tasks for those involved in data production. (12,23) Other behavioural factors described include the motivation and skills of managers in interpreting RHIS data for problem solving. (23) An organisation which therefore demonstrates appropriate RHIS support for data producers and managers in the performance of HIS related tasks and HIS data-interpretation, can thereby improve behavioural factors of data user and in so doing, improve overall RHIS data use outputs. Other authors argue that value-based operational mechanisms that promote a culture of data demand and sustained data use within the organisation, contribute to the organisational factors which improve overall data production and data use. (11,12,21,22) Such organisational factors can encompass the various ways in which an organisation creates strategic and operational platforms where RHIS data outputs are routinely interrogated and reflected upon by health service managers to make sense of healthcare facility or health program performance. (8) Other examples of how an organisation can promote a culture of data use by health service managers is in ensuring that their health service managers periodically demonstrate evidence that supports data-based decision-making, or data-informed resource requests where data are used to advocate for resources in healthcare facilities or health programs (24,25)

Interestingly, other studies contend that behaviours related to RHIS data use are also influenced by the reliability of the technical resources and processes involved in generating and disseminating accurate and timely data outputs. (12,17,26) As such,

an organisation should appreciate how good quality data - in and of itself - can increase the trust that health service managers might have in the RHIS outputs to inform their management duties. (17) This trust can then translate into an increased likelihood of health service managers in using data and assimilating their interpretations into service management decision making. (15,27)

In gathering the collective description of RHIS performance in developing countries, available studies describe to a reasonable extent, organisational factors and their direct impact on RHIS performance (i.e. data quality and/or data use,). (26,28) However, few are able to describe the relationship between data utilisation for data informed decision making and an organisations' understanding of described information needs, governance mechanism, resource planning, resource availability, training, supervision as well as the nature of the organisation's current culture of data use. As such, there is a dearth of evidence expounding on how these well considered organisational elements foster environments that directly contribute to the performance of its RHIS in terms of data (non)-use by its intended end-users. By the same token, there is seemingly a dearth of evidence that explores and refines how and most importantly *why* organisational factors of RHIS data quality and data-use outputs directly or indirectly interacts with RHIS behavioural factors as described within the PRISM framework.

1.3. **Problem Statement**

In South Africa, primary healthcare facilities (clinics and community health centres) are the main platform through which services are delivered within the district health system (DHS) through primary healthcare service providers. For the DHS in South Africa to perform optimally and its service targets to be reasonably attained, PHC facility managers need to identify problems and to take action to improve health-service related activities, based on data generated by the DMHIS. (4,15) The utilisation of these DHMIS reports for decision making are described as sub-optimal at all levels of health service management, and particularly so at facility level. (14,15,23,27) Currently, there are limited empirical descriptions on how and why the current district organisational environment (in terms of the PRISM organisational

factors,) either promotes or prevents data informed health-service management decisions by healthcare facility managers.

In the same vein, there are seemingly limited studies that probe the experiences of facility managers' perceived data use expectations and needs, in the backdrop of analysing their generally described sub-optimal use of data for health service management duties. And unless we can explore, understand and describe these experiences, the district (within its DHS organisational context,) will be somewhat unable to appropriately remedy the extent to which such experiences result in the under-utilisation of data by PHC facility managers. In order to improve upon current PHC facility manager's use of data for health service improvements, and thereby, the ultimate performance of the DHMIS, the DHS organisational context wherein this RHIS performs, and in which PHC facility managers operate should be examined, to establish if this context allows the support of their data use expectations outlined in the DHMIS policy. The translation of improved DHMIS performance, in terms of its intended impact on primary healthcare service provision, is better quality health services to meet community needs and district/ sub-district health program targets through efficient facility health service outputs and outcomes.

Finally, in order to advise upon policy revisions that aim to reform, strengthen or evaluate the DHMIS for this ultimate impact on health services and health outcomes in South Africa, perceptions on the RHIS's organisational factors towards this end, - as experienced by intended end-users - could provide useful insights in designing and outlining future implementation strategies for improved health information management systems.

1.4. **Justification for the Study**

This study focused on one district to explore whether the organisational factors that might influence DHMIS performance in terms of data use exists, from the perspectives of PHC facility managers. The study uses the Johannesburg Metropolitan District in Gauteng province, South Africa as a case study.

Since data use is the final outcome of routine HIS performance, this study will provide empirical insight into district level organisational factors contributing to data use by facility managers. As such, the study findings may inform current and future district level DHIS data output improvements, together with organizational-level interventions for optimal implementation of current e-Health and DHMIS data utilisation strategies.

This proposed study was nested under a larger study using mixed quantitative and qualitative methodology to describe the organisational context for data use by health facility managers in the district, using the PRISM framework. This present study's findings will contribute to the larger study by providing data on the organisational factors from the PHC facility managers' perspective, and will guide the interpretation of the subsequent study on understanding the behavioural determinants of RHIS data utilisation in PHC facility managers within this unique DHS organisational context. The findings on the organisational factors influencing the use of RHIS data from the facility managers' perspective will be used to firstly adapt the PRISM data collection tool on behavioural factors as informed by the district's organisational factors. Secondly the findings will be used to help explain the findings of the behavioural factors (within the PRISM framework) of PHC facility managers' use of data within the understanding of the organisational context of the Johannesburg Metropolitan District.

1.5. **Aims and Objectives**

The overall aim of the study was to examine PHC facility managers' perceptions of the organisational factors that influenced their data utilisation for service improvement in the Johannesburg Metropolitan health district in 2017.

The specific objectives of the study are:

1.5.1 To describe PHC facility manager's experiences of using RHIS data for service improvement decision-making;

1.5.2 To explore PHC facility mangers' perceptions of the organisational factors (critical management functions, culture of information use, and availability of resources) influencing RHIS data use.

CHAPTER 2

2. STUDY METHODS

2.1. Study Design

The study adopted an exploratory descriptive design using qualitative methods. Semi-structured interviews were conducted using an interview guide, which drew essential themes from the organisational factors of the PRISM theoretical framework. (22)

2.2. Study Setting

The study took place within the Johannesburg Metropolitan health district in the Gauteng province of South Africa. This metropolitan health district is one of five health districts in the province. It is divided into seven sub-districts which are called regions and named alphabetically from Region A to Region G. Primary healthcare (PHC) facilities within these sub-districts are either under the authority of the local government (LG) or provincial government (PG) health department. Both these authorities provide operational leadership and governance oversight over their respective facilities. Each PHC facility is managed by a facility manager, supported by PHC program managers at both sub-district and district management levels. Health information system (HIS) managers under both provincial and local government authorities are responsible for the oversight of DHMIS functions at sub-district and at district management levels.

This study setting was chosen due to the fact that this MMeD research was nested in a larger project examining data-utilisation in the Johannesburg Metropolitan district at healthcare facility level. The study setting for this MMeD was also chosen because of the availability of different types of primary healthcare facilities (i.e. clinics and community health centres), with a considerable scope of comprehensive PHC services provided at each service delivery platform.

2.3. Study Population and Sampling

The study population comprised of primary health care (PHC) facility managers in the Johannesburg Health district in 2017.

Selection of a sample of participants was done to ensure representation from each of the seven sub-districts. Firstly, PHC facilities were grouped according to their respective sub-districts from region A to G. Two facilities were selected within each sub-district by simple random sampling (one facility under local government and one facility under provincial government authority). One sub-district had no provincial PHC facilities. The PHC facility manager of each selected facility was identified for recruitment into this study and contacted as a prospective study participant, upon which the date and time for the interview was secured.

From May – July 2017, thirteen facility managers were contacted, but ten PHC facility managers eventually participated. Although there were recurrent cancellations by one participant and logistical challenges encountered in the field in reaching the other two recruited participants, the final sample of participants consisted of ten facility managers recruited for semi-structured interviews, as data saturation was achieved after nine interviews. Since data saturation was reached after nine interviews, following the tenth interview the remaining three participants were not further pursued. The sample population therefore comprised of five PHC facility managers from local government (three clinics and two CHCs) and five PHC facility managers from provincial government facilities (three clinics and two CHCs).

Data Collection Tools and Procedure

Data collection occurred onsite at the selected primary health care facilities. Qualitative data were collected principally using an interview guide (see Appendix A). Interviews took 30 minutes to 1 hour to conduct. The semi-structured interviews were recorded on an audio-recording device, once consent for audio-recording had been granted by participants. No audio-recording was undertaken in one instance where informed consent to record was expressly declined. In that instance, written

field notes were taken during the interview instead. One participant requested to conduct the interview in Setswana, while the other nine were conducted in English.

The interviews explored participants' experiences of using DHMIS data at facility level. The interview guide (Appendix A) also asked questions related to the key PRISM organisational factors. The guide specifically explored the following issues:

1. PHC facility managers' description and experiences of using health data including DHMIS data at facility level for service improvement decision-making.

2. Facility managers' perceptions of the PRISM organisational determinants of data use and of how these factors influence their use of DHMIS data at facility level. The organisational factors explored include:
    a. Critical management functions related to the DHMIS. These include: HIS governance, HIS policies, financing, planning, logistics, training and supervision.

    b. Resource availability for DHMIS functioning. These HIS resources include: the current human resource availability (i.e. people) and technological (i.e. ICT systems) infrastructure.

    c. The culture of information use within the district. This includes: facility managers' perceptions of the current ways that DHMIS functions are applied in practice.
        i. The organisational culture of information as it related to the data management processes.
        ii. The organisational culture of information data use applications.

The interviews were supplemented with field notes based on the researcher's observations of the facility's size, operating hours, perceived busyness and efficiency in attending the patient queues. While there was no objective tool used to collect this information prospectively, operating times were observed from clinic signage, busyness was observed based on how full the waiting area/reception areas were prior to the interviews and finally, efficiency was observed based on the estimated

number of people still seated at the end of each interview. The researcher noted these observations intuitively for the first two interviews, as she had to wait in these clinics for a considerable time before the interviews took place. From the third interview forward, these observations were consciously observed and captured as part of the interview field notes. The written field notes taken during the interviews as well as researcher audio-recorded voice notes which were captured after each interview.

The audio-recorded voice notes outlined the overall impression of the interview conducted, reflective notes on observations, and the electronic or telephonic interactions that took place between the researcher and the participants leading up to and following the interviews, in particular reference to the establishment of rapport with the interviewee. Introductory discussions which facilitated rapport in the interview outlined the researcher's own experience and current participation in the health system. The researcher's comments on the high patient loads seen at PHC facilities similar to those visited in the study, allowed participants to share their experiences in PHC service. Information on their current position at the facility, the unique community characteristics and the duration that they have been in the position as a PHC facility manager were later included as unique characteristic data of the sample population. These additional data from observations and introductory conversations were annotated as field notes and recorded on an audio-journal after each interview.

2.4. Pre-Test

The interview guide was pre-tested in the Ekurhuleni health district by interviewing one facility manager and one sub-district PHC manager for content and face validity as well as to improve the researcher's interviewing skills prior to data collection. Only one adjustment to the tool was made based on pre-test findings and upon discussion with both supervisors. The critical management functions question on DHMIS policy was modified into a more open question to allow PHC facility managers to include their views on any other policies (other than the DHMIS policy) that influence how they routinely use DHMIS data for service improvements.

2.5. Data Management and Analysis

The eight interviews conducted in English were captured via audio-recording and were then transcribed verbatim through a transcription service into Microsoft Word document formats. The transcripts were then reviewed by the researcher for completeness and accuracy in capturing the interview data. The interview conducted in Setswana was transcribed in Setswana by the researcher, then translated into English by the researcher, who is proficient in both the written and spoken forms of these two specific official South African languages. For the interview where consent for audio-recording was declined, the written interview notes were annotated on word documents following the interview. The data from additional field notes, post-interview memo's and audio-recorded observations were used to contextualize the data produced through the interview process, though they were not included in the analysis of the interview data collected.

Six phases of thematic analysis described by Braun & Clarke, (29) were undertaken in approaching the analysis of the data in an iterative and recursive manner. The thematic analysis phases were conducted as follows.

Familiarisation with the data:

Data immersion was achieved through an iterative process of listening to interviews, reading and re-reading the transcripts while initial analytic observations were noted in the initial phase of analysis.

Coding:

Using the directed content analysis approach described by Hsieh & Shannon (30), data were analysed into broad codes e.g. organizational factor themes or emerging themes. The transcripts were coded to identify themes regarding the reported uses of DHMIS data by PHC facility managers. To explore perceptions of the organisational factors, all transcribed data were coded firstly using the deductive approach guided by the organisational factors influencing DHMIS data use as defined in the PRISM framework. The data were further coded into the organisational factors that facilitate and those that constrain data use. Under organisational factor themes data were coded as "governance/policy", "training",

"supervision", "resource availability" and "culture of information use". An inductive approach was also applied to identify any emerging themes not contained within the organisational factors of the PRISM conceptual framework.

To increase the study's dependability, the researcher undertook a code-recode procedure, by coding the same segment of transcribed data one or two weeks apart and comparing the two sets of coding results. In order to ensure data accuracy and credibility, definitions of both fine and broad codes emerging from the data were documented in a codebook. The coding and codebook were reviewed through the inter-coder agreement conducted telephonically with a research peer – a Master of Public Health (MPH) postgraduate student, based on three randomly selected transcripts. The MPH researcher has a background as a social worker, who was - at the time of this study - involved in the NGO non-profit health sector. The revised codebook was additionally reviewed by the researcher's supervisors. All data management processes and changes to the coding were documented in order to update and authenticate the researcher's audit trail.

Searching for themes:

Coded data were analysed to identify repetitive ideas and organise the themes into main categories and sub-themes., e.g. teasing out "resource availability" and "resource constraints" and placing them as sub-themes "ICT and material resource availability" and "HIS personnel constraints". This was done for the organisational and emerging themes

Reviewing themes:

Themes were reviewed to assess whether they accurately and convincingly reflected what the body of data were showing. Relationships between themes were identified in order to consolidate themes which can be grouped together, e.g. "Communication", "data dissemination" and "feedback" were grouped into one overall emerging theme.

Defining and naming themes:

Data were defined according to analysed codes for routine uses of DHMIS data, organisational themes (as outlined in the framework) influencing data use, and emerging themes influencing data use. Once these definitions had been established, the data were coded into organisational and emerging themes facilitating data use and organisational and emerging themes constraining data use.

Writing up:

Thematic analysis in this phase involved weaving together the analytic narrative of data extracts in providing the reader with a coherent and persuasive story about the data. This phase is undertaken within the contextual analysis of existing literature in relation to the narrative.

2.6. Data Validation

Data validity was strengthened through two stages. Firstly, data credibility was achieved by conducting an audio-recorded telephonic interview with a PHC facility manager who was not part of the sample population. This particular facility manager is a permanent manager working in this study setting. At the time of this research field work, this manager was undertaking post-graduate studies focused on health systems and policy. The interview was conducted two weeks following the completion of data collection and prior to the inter-coder agreement with the MPH peer researcher. The purpose of this initial data validation process was to determine if the overall scope of interview data were credibly reflective of true observations in the field at the onset of data analysis, in the eyes of the PHC facility manager, similar to those interviewed. The scope of this interview outlined the study aims, methodology and provisional impressions provided through the data, according to the broader organisational factors contributing to overall DHMIS performance as guided by the PRISM framework. This PHC facility manager's views were subsequently included in the analysis of the primary data collected from interviews, as these views confirmed and tied the reflected perceptions together. These views additionally aided with confirming the interpretation of technical abbreviations or commonly used phrases used by the PHC facility managers. This PHC facility manager is referred to as PHC_Manager_11 in the report.

The second phase of data validation was conducted six months after data collection had completed, through presenting the provisional study findings to HIS strategic and operational stakeholders working in the district. Their comments on the presentation increased both the credibility and the confirmability of the research findings and thereby strengthened study results. Additional strategies adopted to increase the confirmability of the study involved the documentation of the processes and steps of data capturing, data transferring and data consolidation from both interviews and field notes.

2.7. Ethics

Ethics approval was obtained from the Human Research Ethics Committee (HREC) of the University of the Witwatersrand, South Africa, reference no: M170132.

In order to ensure autonomy, participants gave informed consent. Details of the study were explained briefly upon telephonic recruitment and then in more detail on an information sheet (see Appendix B). Participants were provided with information sheets, and two consent forms which they were asked to sign to consent for participation to be interviewed (see Appendix C1) and for the interview to be audio-recorded (see Appendix C2), respectively. Participant information sheets and consent forms were sent to prospective participants via email prior to the date of the interview (where this electronic platform was available) alternatively the documents were brought to the interview by the researcher. Once the information sheet had been read and any or all arising questions about the purpose, scope and methods of the research were satisfactorily answered, verbal and written consent were established. A signed copy of the consent forms for both participation and audio-recording of interviews were kept by the researcher while the original remained with the facility manager participant for her record keeping. Participants were at liberty to decline participation at the point of telephonic or electronic recruitment and to decline audio-recording or stop the interview at any point in the interview process, without being apprehensive that such a decision could result in any negative professional or research-related outcomes

Confidentiality was ensured by using unique participant identity codes, and removing any district, sub-district, facility or personal identifiers from transcripts. Transcripts were stored in a lockable drawer away from signed consent forms that could otherwise be used to link the content of the interview data to the evidence of the consent obtained from participants. Transcripts were additionally (and will continue to be) stored in the researcher's password and finger-print protected laptop in a hard drive and cloud account. The data will be archived for up to July 2022, 5 years after the study has been conducted.

CHAPTER 3

3. **RESULTS**:

The semi-structured interview findings relay facility managers' views on the use of data within their organisational health district and sub-district context, as well as the perceived organisational factors that may influence their use of data.

The findings additionally describe the organisational factors that may influence respondents' use of data. This chapter presents these findings in three sections – first, the ways in which managers use data; second, their perceptions of PRISM's organisational factors and how these may influence their data use; and third, the emerging themes that participants raised as important factors, which are not in the organisational determinants section of the PRISM framework, but are part of the broader conceptual framework for RHMIS performance. The organisational factors and emerging themes are presented as facilitators and barriers to data use. Figure 2, illustrates the summary of themes identified from the findings in line with the three main themes (outlined above) of data use for service improvements; organisational factors influencing data use; and other emerging factors influencing data use.

Table 3.1. below, summarizes the overall characteristics of the ten interviewees and the PHC facility context in which they work. All participants were female PHC facility managers.

Table 3.1.: Characteristics of the participants and PHC facilities

INTERVIEW CODE	PARTICIPANT CHARACTERISTICS	FACILITY CHARACTERISTICS
SSI_1_LG_CHC	Facility manager, in permanent position for seven years.	Local government CHC located in an urban township, has many departments and is very busy. Provides 24-hour services.
SSI_2_PG_PHC	Facility manager in permanent position, was previously acting manager for eighteen months.	Provincial government clinic located in an urban township. Small clinic, that provides 8-hour services.
SSI3_LG_PHC	Facility manager in permanent position for one year. She is also an operational manager for mother and child health services.	Local government CHC located in an urban township. Small clinic. Provides 8-hour services.
SSI4_LG_CHC	Manager, in permanent position for one year.	Local government CHC located in urban township. *Very* busy facility providing 24-hour services.
SSI5_LG_PHC	Manager in permanent position for one year.	Local government clinic located in the inner-city. Provides 8-hour services. Small but busy clinic.
SSI6_PG_CHC	Manager in permanent position, for twenty-six years.	Provincial government CHC in an urban suburb. Very large facility providing 24-hour services. It is very busy as three surrounding clinics have shut down and so patients now access this CHC.

SSI7_LG_PHC	Manager in permanent position for twelve years.	Local government clinic in the inner-city. Busy clinic, provides 8-hour services
SSI8_PG_CHC	CHC manager in permanent position for more than five years.	Provincial government CHC in the inner-city serving a very mobile community. Busy CHC provides 24-hour services.
SSI9_PG_PHC	Manager who has been acting for one year.	Provincial government clinic located in an urban township. Very busy facility serving mostly foreign nationals and a very mobile population.
SSI10_PG_PHC	Manager in permanent position for two years as the facility manager.	Provincial government clinic located in an urban township. Small clinic in containers. Provides 8-hour services. Not very busy.

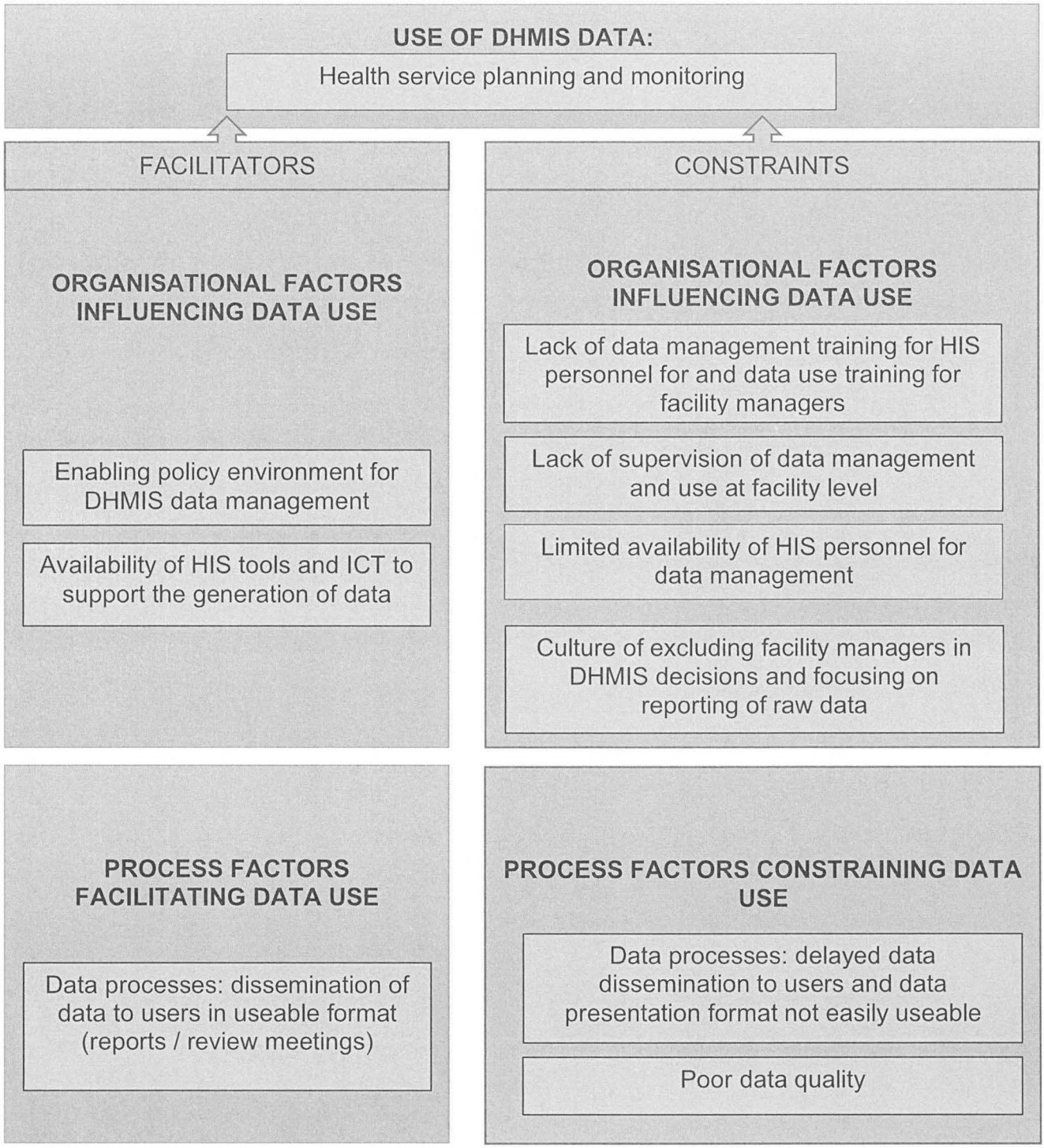

Figure 3: Figure illustrating the themes for factors influencing DHMIS data use by PHC facility managers

3.1. PHC Facility Managers' Experiences of Data Use for Service Improvements

All facility managers were able to clearly outline the data process from the point of data being captured at facilities to the point where the data are reported back to them. The process begins with clinicians ticking on the data tool registers followed by data capturers compiling summative daily statistics. The facility is required to collate the daily into weekly summative reports which then become monthly reports sent to the sub-district HIS offices once managers have verified that the data are indeed correct. Sub-district HIS offices then analyse these facility data and compile monthly reports on the sub-district, which present indicators on the sub-district's overall performance. Sub-district HIS offices are then required to provide monthly reports which detail each facility's' analysed data (indicators) back to facility managers. In the absence of these reports being routinely furnished to the facilities, respondents indicate that analysed DHMIS data can additionally be requested by facility managers as required.

The main uses of DHMIS data described by facility managers were to plan for routine and unplanned health services and to monitor health service performance. Respondents then highlighted ways in which they take decisions based on the data indicators to improve service coverage. Several facility managers commonly described conducting focused health promotion and screening activities in the community as a result of monitoring data to improve the clinic's response to the community's health profile and patterns in service utilisation.

3.1.1. Planning and monitoring of health services

In terms of planning, data were reportedly used for estimating resource needs for both routine services as well as unplanned activities such as measles vaccination mop-up campaigns in the event of outbreaks. Interviewees emphasized that they use data through observing patterns of service utilisation and community population statistics, and that this information was then used to determine how and where resources were to be best allocated to support routine or unplanned activities.

My job is to monitor those indicators, see how we perform because we work according to targets given by national so we have targets that we need to reach... if I have maybe 44 children this month for 6 weeks [vaccination], I would love to [reach] 44 throughout the immunisation process. The same with any other program... If you have those 44 [but] you see you have 23 in 10 weeks where you're supposed to have 44, you know so many defaulted. So, you trace those. **SSI5_LG_PHC**

Similar to the uses of data on planning activities, for the purpose of monitoring service trends, the indicators received by managers through the DHMIS platform, were reportedly used by facility managers to identify quality improvement strategies to address underperforming indicators. Facility managers also reviewed the data to identify underperforming indicators and used these insights for the development of operational plans which were required annually for submission to the district to guide routine service provision.

We do our QIP (Quality improvement plan), we do our operational plans according to that [the data], so we need to update our performances per quarter. **SSI5_LG_PHC**

In addition to the above uses of data, participants described how they used DHMIS data to monitor service utilisation rates for specific key services such as antenatal, family planning or chronic disease services. Several respondents reported taking these observed utilisation trends to the facility staff for further discussions in order to identify areas where service utilisation did not reach projected monthly or quarterly targets and to try to understand possible factors that may contribute to reduced service utilisation.

Before we submit the [data], we sit down to see where are the gaps? Where are we lacking? Why is this indicator so low this month as compared to the previous month? What could it have been? Was it a shortage of staff or things like that, or people never turned out for that service? Or is it because people are defaulting and how best can we get them back on track because we actually, on some other indicators we are in the red. **SSI10_PG_PHC**

Such discussions in some facilities took place on a weekly basis, and in other facilities on a monthly basis. A number of managers mentioned using these meetings with their staff as a platform to discuss commonly observed data gaps in their facility's data collection process. An example would be if the data are incorrectly captured onto the tick registers and to assist clinicians and HIS personnel in understanding how such gaps in data collection may affect the facility's data quality.

Upon observing low utilisation trends, managers reportedly then made decisions to improve service utilisation through awareness campaigns often-times conducted through the ward-based outreach teams (WBOTS) conducting routine household visits within the community. An example of this is reflected in one manager's observation of their facility's "below 20 weeks" indicator which was consistently underperforming. T his indicator measures the proportion of pregnant women being seen for the first time for antenatal service at a gestational age less than 20 weeks, out of the population of pregnant women accessing ANC services. The facility manager describes the way in which – based on the data showing poor performance on that indicator – they use the data to inform the WBOTs to raise additional awareness to facilitate earlier ANC visits by pregnant women residing in their communities.

> *But at least the WBOTs are there. At least they go and they spread our gospel. If they find a pregnant woman in the household, they say 'Let's go to the clinic. You're pregnant, let's go to the clinic to book.' We know that we have to see what to do to improve early [ANC] bookings. What we can do is to conduct health education.* **SSI9_PG_PHC**

A handful of interviewees were able to identify, through reviewing the indicators, the need to upscale their health promotion activities, and took a decision to intervene appropriately. For example, one facility manager noticed that there was a high demand for chronic services at their clinic. In order to reduce the number of stable chronic patients visiting the facility, the manager decided to form exercise groups which now meet on a monthly basis. The respondent described that all stable chronic patients were booked for the same monthly date. They meet at the stadium where the patients would have an opportunity to participate in healthy exercise

routines and lifestyle advice to support their medical treatment for hypertension or diabetes. The manager and their health promoter would conduct health promotion talks each month on various conditions soon after the exercise session was complete, then dispense the chronic medication to the stable patients while also screening those in the group who had joined it to improve their physical activity.

> *You know I have started the groups. Because there are a lot of patients who are not supposed to be here. So, I went to the stadium to start the groups. I took my health promoter, packed medication [for the stable chronic patients], put it in the car, went to the stadium to exercise. We give education why we are here. [We] go with stethoscopes to the stadiums for those who need to check BP's and do them there. And then we tick their cards.* **SSI2_LG_PHC**

3.2. Organisational Factors Influencing Data Use

The organisational theme is analysed according to the reported facilitators and constraints. There are three contributory sub-themes in this analysis. In Table 3.2. below, the overall sub-theme analysis findings are outlined.

Table 3.2. Table summary of the sub-theme analysis

Sub-theme	Facilitators	Constraints
Critical management functions	▪ Enabling policy governing the production and use of DHMIS data ▪ Health system strengthening policies for service improvement ▪ HIS training support from non-governmental implementing partners	▪ Lack of data use training for facility managers ▪ Inconsistent or inadequate supervision of data management and data use at facility level
Resource availability for DHMIS functioning	▪ Availability of HIS tools and technology for data generation	▪ Insufficient HIS personnel at facility level for data management functions
Culture of information use		▪ Excluding facility managers from decisions on DHMIS

		functions
		▪ Emphasis on raw data rather than useful analysed information

3.2.1. Critical management functions

Facilitators

Enabling policy governing the production and use of DHMIS data

The district health management information system (DHMIS) policy is the policy framework that governs the district health management information system. The overall view of participants was that this policy is comprehensive in outlining the roles and responsibilities of various clinical, administration, management and HIS personnel in the production and use of DHMIS data. All the facility managers described the policy and its intended implementation clearly. Their views were that while there are no gaps in the policy, there continues to be a need to optimize accountability of all stakeholders involved in the production and use of DHMIS data.

> *We have the DHIMS policy, it's right in front of me although it's covered. I guess if we just follow the DHIMS as it is stipulated here then that does assist. For me, the DHIMS policy is clear. It just needs the role players to do what they're supposed to be doing.* **SSI4_LG_CHC**

The DHMIS policy states that sub-districts and districts should conduct quarterly review meetings where service data are presented and discussed for monitoring district performance. The majority of facility managers under the management of the PG health department reported that they relied on the sub-district quarterly review meetings to get a sense of their facility's performance on service indicators and analysed reports on health service performance.

Health system strengthening policies for service improvement

While all interviewees referenced the DHMIS policy as the guiding framework for how they used their data for service improvements, several participants mentioned

other policies which they observed made a contribution to improving the way in which data are generated and used at the health facility level. Notably, managers highlighted the Ideal Clinic Initiative and the National Core Standards (NCS) (two recent national policies aimed at strengthening health service delivery and quality) which they felt facilitated the more practical use and discussion of data at their respective facilities.

During the data collection phase, interviews took place as Ideal Clinic initiative and National Core Standards assessment were being conducted throughout. Respondents viewed the NCS quality assessments as supportive of data use in their facilities, as each facility was required to display their facility data in visible areas as well as demonstrate that all facility members had an understanding of what the displayed data meant.

> *I think they [the district] are supporting us because as it is when they [the district] are visiting our facilities, these graphs must be on. Everybody must know what is happening. It is not the work of only the facility manager [to] know what this graph means...for instance last week Friday we were having inspections on our core standards. If they found you in an area near these graphs they will ask you...they [the facility staff] must know it.* **SSI2_PG_PHC**

HIS training support from non-governmental implementing partners

Participants noted that various non-governmental organization (NGO) implementing partners who are involved with assisting districts on various service delivery activities were helpful in supporting in-service training efforts to improve the data management within their respective facilities. The respondent below describes how their application of the data management practices demonstrated through the support of NGO partners assisted in improving their TB indicator performance. The training allowed the facility manager to have a clearer view of the clinic's activities as shown by the data in TB screening as well as to share words of appreciation and encouragement to clinicians on their efforts in conducting their screening within clinical consultations.

I have asked the partners to in-service [train] them [the clinicians]. Well, it was for a particular element...we were not performing [well]. And ever since the partners got engaged there was an improvement . It was about TB screening that we were standing at 52%, and last week when I checked it, we were at 77%. **SSI4_LG_CHC**

Constraints

Lack of data use training for facility managers

Training of facility managers for data in the district was reported as not being available. Some mentioned that they received inputs on data collection tools whenever changes to these took place, however training on how to apply or use the data generated at their facilities is not received.

Let me tell you. Training is needed! I attended training once and I could understand here and there, and even had an interest in data. But then I left to go to patients. Then you start to forget. Me, I haven't seen training done since I've arrived. I think it's been a long time since it was done. It should be available. Then people will be able to have insight into data. **SSI9_PG_PHC**

Participants highlighted that in this district training on data use is still not sufficient for facility managers, and that the current training platforms were reportedly available largely for data capturers for improving data generation.

There is no active training where this happens for the facility managers. The training is only for the data capturers, so those are the people who are basically being trained for data management. That is still in the pipeline to say maybe they can make a specific module of some sort for the facility managers that this is this and all that. **SSI10_PG_PHC**

Some respondents noted that they had made efforts to request training in order to better interpret and use the data presented in reports they receive from the sub-district. However, they still had not obtained the requested training.

It is difficult, data is a problem. Data is the problem because even myself as the manager, like I am telling you the elements, I can't even interpret these

data elements truly, because even us managers, we are not trained on it. **SSI1_LG_CHC**

Inconsistent or inadequate supervision of data management and data use at facility level

Onsite supervisory visits aimed at supporting data management and data use functions at facilities were reportedly an uncommon practice. The absence of supervision by sub-district and district offices in supporting data management functions and data use at facilities was contrasted with how non-governmental organizations (NGOs) supported data functions by establishing their own supervisory mechanisms to help facilities meet data performance goals.

Yes, truly the supervision, we're lacking supervision because of the shortages of staff...but, now where are our people from the districts coming down to check…? You don't see them. That is why I say they don't take data serious truly, yes, because now you'll only find the [NGO] partners, they are constantly here in the clinic assisting us...But [our] very own people from the districts, you don't see them, so they don't take it seriously. **SSI1_LG_CHC**

While some participants did see sub-district managers visiting the facility, the view below outlines this participant's wish to see more regular visits by managers so that data related issues could be actively engaged with.

I think they need to get more and more people that are coming on a regular basis. Well, maybe let me not say they should get…maybe they should be coming on a regular basis to the facilities where we are able to talk about data, review data and if there are any issues where we can address. So, I guess more and more of their support, more of what they are doing if they can intensify on what they are doing, currently. ***SSI4_LG_CHC***

3.2.2. Resource availability for DHMIS functioning

In order for managers to use data, that data has to be first generated (collected, processed, and analysed) and available at facility level. Various resources essential for data generation include hard copy data collection and collation tools (e.g. tick

sheets which staff use to record data, collation sheets for summary data) or electronic information and communication technology (ICT). Human resources are also required to generate and use the data. The HIS resource-related facilitators and constraints identified in this study are presented below.

Facilitators

Availability of HIS tools and technology for data generation

Respondents highlighted the ease of access to materials such as tick sheets for data collection. The availability of, and accessibility to, data collection and collation materials such as tick registers and headcount booklets, issued by LG and PG authorities, was thought by participants to be overall satisfactory. Respondents reflected that the availability of materials for collating data into monthly summaries facilitated weekly and monthly data consolidation, which presented an opportunity for facility managers to discuss the provisional service data with their staff at facility level prior to submission to the sub-district.

Participants reported that with district efforts slowly reflecting the ongoing implementation of the e-Health strategy, information and communication technology (ICT) resources have become more visible and accessible across multiple facilities, albeit to varying extents. Out of the ten respondents interviewed, two had fully implemented ICT systems at their facilities (i.e. Computers with electronic registers for daily visits, email access and the ability to sms notification reminders for upcoming visits to patients.) One of the facility managers with ICT functionality highlighted the ease of drawing clinic statistics from the electronic system and the reduced burden of the data management demands as a result of the ICT, which improved timely availability of health information at facility level. Both participants with ICT resources onsite noted the value of the eHealth strategy when fully implemented, as ICT was viewed as a means for greater automation and improved data management efficiencies at facility level.

> *It will be so good once we're on eHealth so, that eHealth will help us a lot because at the end of the month we won't have to count how many head-counts did I see for the month. It will automatically count and give you that, and that will be lovely.* ***SSI5_LG_PHC***

Participants also outlined that such automated processes may facilitate improved access to their facility's data or for real-time monitoring of submitted sub-district and district data. This automation, in line with the e-Health strategy, would – according to their views - support decision-making as data were extracted from the HIS software in real-time for facility operations. Currently, managers wait for higher HIS offices to disseminate the data to the various facilities.

> *It's beautiful and we can actually draw some stats from here, data from here. I'm telling you, when [the patients] come in they just say I'm in the system, I take out the appointment system, they don't even come and sit in the queue, because already they know they're in the system. It's beautiful.* **SSI7_LG_PHC**

Constraints

Insufficient HIS personnel at facility level for data management functions

Under this theme, respondents highlighted the insufficient numbers of dedicated HIS personnel at facility level to carry the majority of data management functions. These functions include daily data capturing, compiling weekly and monthly summary reports and checking data received from the clinicians. For example, some managers specifically noted that the DHMIS Standard Operating Procedures for facility-level data management (31) require every facility to have the support of an HIS officer or chief data coordinator. However, participants confirmed that these HIS personnel did not exist in the majority of PHC facilities in practice. This gap, in the participants' view, resulted in the compilation of reports from facilities being done in a rushed manner by facility managers.

> *[Data] needs a dedicated person on its own so that they concentrate on it. They mustn't have other things because now this one person, the reports, they must do the monthly reports, they must do this and this and this. At the same time, they must still do data management…It is not on. We must have people employed only for data you know, on a daily basis.* **SSI1_LG_CHC**

There was also a general observation by respondents that there was an inappropriately high turnover of data capturers, which undermines the availability of

quality data. Data capturers are appointed under the expanded public works program (EPWP) for a fixed period to assist with various facility functions, including data management. Once these contracted data-capturers have fulfilled their annual- or biannual contracts they ultimately leave the facility. In-service support to the new contracted data-capturers is then required to begin afresh, which disrupts data quality gains.

> *Yes, but we have EPWP contracts that starts or that works every year so, now in June they've finished their contracts and we have new ones. Just when they know the program…it's time for another one to come…I think that makes it difficult for her [the permanent data capturer] because how long does it take to teach whereas she could have captured 20 files but she captured 2 because she's giving in-service to others. I think that's a challenge. It would be nice if there's 2 data capturers kept permanently and not every year somebody changes.* **SSI5_LG_PHC**

> *You just will take these intern people, you will train her and when now you can see that she loves what she is doing, the contract would be finished. After three months, somebody else comes in. You will train that person, so there is no consistency and we really don't have dedicated people for the data management. I really think the district needs to employ people specifically for data management.* **SSI1_LG_CHC**

3.2.3. Culture of information use

The DHMIS policy outlines mechanism that aim to facilitate data use at district, sub-district and facility level. These include monthly dissemination of analysed data to facilities (from sub-districts), discussions of analysed data at quarterly review meetings (at district and sub-district level) with quarterly reports sent to facilities, together with training and supervision for data management and data use efforts at facilities. Participants from both LG and PG facilities reported varying application of these systems in practice and that in reality there was a culture of excluding facility managers from data use platforms, and focussing more on data management (the generation of data) than data use, and on raw data rather than the analysed useful

information (indicators). These constraints related to the culture of information use are presented below.

Excluding facility managers from decisions on DHMIS functions

As required by the DHMIS policy, sub-district and district quarterly review meetings are held in this district. However, one manager expressed her concern about these DHIS governance platforms mostly being attended by sub-district and district HIS managers or sub-district and district PHC managers, with the details of the discussions not being disseminated to the PHC facility managers themselves. Some participants highlighted that this gap resulted in disconnected communication of data-related expectations between the district and the facilities themselves. These respondents additionally reflected that the impact of this lack of engagement was that they were not involved in decisions about setting indicator targets for service monitoring, and so the targets remained at levels the participants viewed as unattainable for the context in which health services were being provided at facility level.

Participants noted that it was usual practice for facility managers to be excluded from decisions about changes to the health indicators that they were expected to use. For example, a participant noted that changes made by higher levels of management to the indicator data sets lacked the inclusive participation of facility managers, and that insight into the higher management's rationale for the inclusion or removal of certain indicators was oftentimes inadequately communicated by district management to health facilities.

> *The thing is we don't have an input in terms of what indicators they are putting on, or what they're taking off. What we are just given is, 'These are the changes and this is the new books [registers] starting from when and when.' So, what made them to say this [data] element we are taking it out because it's not important or it's [not?] relevant or it's not what we want? We don't know...what is the cause of changing from this version to the next version with different indicators and all of that. We are just not part of that and we are not even involved. It's at a different level and for us it is just to implement.* **SSI10_PG_PHC**

Some respondents noted that whenever there are changes to the data elements on the tick sheets and registers, as determined by higher levels of management, this often resulted in logistical difficulties in receiving new data collection materials timeously. These changes impacted the quality of the data generated by the facility, thereby reducing their ability to use the facility DHMIS data.

Emphasis on raw data rather than useful analysed information

It was articulated that within the district there is a practice of not applying data-based decision making, as part of a culture of information use within the organisation. This manager's comments below noted that as they continue to submit their facility data (crude numbers) to higher levels of management for analysis and interpretation, their expectation was to see the analysed data reflected in the district's decision-making process for resource allocation. However, this did not happen. The participant was of the view that resource-allocation and decision-making should not only take into consideration the crude numbers of patients seen daily at the various healthcare establishments, but should use more meaningful analysed information (indicators) and also demonstrate an appreciation of the population and facility context wherein those data are generated.

> *Decision-making especially regarding resource allocation, I think is based on numbers and not data...top management is more focused on the numbers than in what the numbers are saying...they use aggregated numbers and don't take into consideration the activities involved behind the numbers.* **PHC_manager_11**

3.3. Process Factors Influencing DHMIS Data Use

Participants highlighted several factors that they felt constrained the use of data by facility managers for service improvement. These constraints are presented below. Notably, these emerging themes reflect constraints regarding the other determinants of RHIS performance (technical and behavioural), challenges with data processes (feedback and dissemination of information to users), and concerns regarding the quality of data that are generated by the DHMIS.

Facilitators and constraints related to DHMIS data dissemination

According to the PRISM framework, dissemination of information to potential users is essential to data use. The manner in which DHMIS data were reportedly disseminated to facility managers ranged diversely between healthcare facilities, according to data from the interviews. Participants reflected on mainly two aspects of data dissemination which they felt influence their use of data for service improvements at facilities. These are presented below.

Timeliness of dissemination of health information to facilities

One aspect was the predictability and timeliness in receiving analysed monthly summary reports from the district HIS office. Some respondents received their reports monthly while others received them two or three months after submitting their data. While those who received monthly reports were overall satisfied with this time-frame, some felt that receiving reports on a monthly basis was not frequent enough. They felt that this impacted the value and therefore the usefulness of the data for day-to-day facility management because resource re-allocation decisions and data-related facility discussions took place more frequently than the rate at which analysed data were received, which in the PG facilities was on a quarterly basis. LG facility managers reported that they received their reports on a monthly basis. Nonetheless, the unpredictability and extended time-frame for dissemination of summary data reports therefore made data less useful for service-delivery decision making.

> *We were receiving the graphs, only that they were producing them quarterly. So now the problem is that that information on those graphs is old.*
>
> **SSI9_PG_PHC**

Participants' views however showed that there was a notable distinction between how regularly local and provincial sub-district HIS offices were able to furnish reports to facility managers. The monthly reports disseminated to LG managers included data demonstrating the facility's service performance alongside other facilities within the sub-district. Receiving such summary reports on a monthly basis was thought to be somewhat more useful for monitoring progress at facilities than waiting for the data on performance to be disseminated at quarterly review meetings, as is the case

with PG facilities. The quotes below demonstrate the differences in the respondents' experience of receiving analysed data for their needs as managers.

> *We give our data to the district. Before it took long for us to get back but now recently we get our reports monthly. As I'm sitting here I received May's report…What our director said is that every month if we compile our stats the month before, it must be returned to the facility so that the facility also sees their progress. [Instead of] waiting 3 months, (for) a performance meeting.* **SSI5_LG_PHC**

Format and presentation of disseminated data

The second aspect under this theme outlines participants' views on how the data were presented (both in print and electronic form). Some managers mentioned reports being sent as raw figures in the form of spreadsheets and not adapted into more visually appealing formats such as graphs with percentages. This kind of data presentation made the interpretation of clinic performance difficult for practical use within the clinic setting.

> *It depends what the data is on. It depends on what the data is like. If you give me [raw?] data on pages they don't make sense to me. Then if you are there, all the way up there [at district level] and you email me data – without explaining – I will delete, it doesn't make sense to me. But if you give me something that you want me to use come to my office and say, "[says own name], these are stats for such and such." I think the people that handle data should know what they are doing. If I say I'd like to request data for 1, 2, 3, 4 don't give me raw data…the very same data that I gave to you. Turn it around so that it makes sense to me. So that it is able to show me as it is displayed there on the wall, it can show me that you're in the red.* ***SSI7_LG_PHC***

> *Definitely [receiving graphs] would be [useful] because I would see where am I lacking, or how best can I improve on this, and what have you. If it's also in a percentage form it also helps you to know exactly where I am. If you give me a number like 700 – but it doesn't give me [out] of what.* **SSI10_PG_PHC**

No, graphs. Unless you ask them from the partners. The graphs we've just recently received because we asked for them because ideally that is what is needed. But for them to give it to us on a monthly basis or quarterly it won't happen. **SSI10_PG_PHC**

The LG facility managers reported that in the summary reports that were disseminated to them, the data on facility performance were clearly displayed in graphs and pie charts, which allowed easier interpretation of data and facilitated simpler discussions of the data with their facility staff members. The respondents whose establishments were under provincial government authority however reported on the data being displayed in graphs which were not easy to interpret, rendering the data difficult to engage with. The PG managers reported additional difficulty in discerning performance between clinics in the graphs received because the graphs were printed in black and white rather than colour-coded.

They say they don't have printers and all those things so, even if they give you the black and white graphs, of which they won't give you a clear indication of what is what so, you need to work out yourself what this or that can be. Unlike in other institutions, like your local authority where their graphs are very nice and colourful. They are able to see at a glance what is it for and what it is. **SSI10_PG_PHC**

Data reports not being presented in a user-friendly format therefore led to managers not being able to know which facility manager or peer to reach out to, in order to discuss and learn about how the better performing facility is managing to meet targets. Participants were therefore unable to use insights or experiences of peers to implement similar strategies to improve clinic performance related to an indicator of interest.

Constraints related to DHMIS data quality at facility level

Managers described DHMIS data quality gaps ranging from discrepancies in the raw numbers found in the tick registers and those collated in weekly or monthly facility statistics to an overall observation of clinicians either under-reporting or over-reporting their clinical activities, while clinical notes and collated numbers did not present the same evidence of clinical events. This caused the data to be an unreliable source for demonstrating the ongoing service challenges experienced by the facilities. The poor, inconsistent quality of data produced by facilities created challenges because managers felt they could not use their very own data to establish if quality improvement projects implemented in the facility departments were yielding projected outputs or to motivate for additional human and material resources to support overall clinical services, as they felt the data were not credible.

> *Yes, like for example, I had to tell [my staff] about staffing. They are complaining that we are short staffed and indeed, we are short staffed and I said to [my staff], "If you are not collecting data [on] how many patients you are seeing, when you've seen 50 patients, [but] you only put in 10 patients that is the picture that you are painting. Nobody is able to see how much work you have put in so, how do they add extra staff?" Even when I try to motivate [for management] to endorse and agree, [they don't] because [the data is] not there. Nobody sees that we really need this equipment and we really need this treatment, this much of the treatment. It's because if you are not doing the correct data then we are just not going to win in anything. I'm not giving a true reflection of what is happening and how much work am I doing, so I won't get assistance.* ***SSI4_LG_CHC***

Every single interviewee commented on data quality gaps identified in their own facilities. Those facility managers who reported having a system such as pooling staff members (the admin clerks and data capturers) onsite to form the facility's data team were often able to address quality gaps prior to their monthly submission to the sub-district HIS offices. Those who were not able to identify and address quality gaps would commonly send the data as is, without verifying them, mostly due to other competing demands in the clinic. However, some managers highlighted the positive impact that proactive and responsive communication from HIS officers at

sub-district management made in facilitating their ability to attend to data quality gaps while the issues were still fresh, and improvements on data management practices could be made.

> *Sometimes you become so busy you fail to verify the data and just submit. But fortunately, the sub-district HIS officer does call where gaps are identified. Then we discuss the data and make corrections.* **SSI9_PG_PHC**

> *Like if there's a discrepancy in data or whatever they [the sub-district HIS manager] actually phones the facility immediately and then you go through back to your doctors where you've collected the information from, and you check where the gaps [are], where did you miss it, and all those things.* **SSI10_PG_PHC**

CHAPTER 4

4. DISCUSSION

This study set out to describe how PHC facility managers' use routine DHMIS data for service improvement decision making, to explore the organisational factors that may influence their use of data and how these organisational factors influence their data use for service improvement decision-making. The study demonstrates that data are being used by PHC facility managers for service improvement decision-making in line with management functions of planning, monitoring and evaluating health services provided by the various facilities. An enabling policy environment and the availability of materials and ICT tools for generating routine data were facilitative of data use. Conversely, the described constraints for data use for service improvement were related to poor capacity for data management functions at the facilities and an organisational culture of information which does not intentionally promote data use. Further factors perceived to constrain data use were: the limited usefulness of the data reports disseminated to facilities through the DHMIS, and poor-quality data which facility managers felt they could not use. This chapter interprets these findings, discusses them in the light of the literature, highlights the policy and practice implications, and makes recommendations for strengthening data use at facility level for service delivery decision-making which is responsive to community health needs.

4.1. PHC's Facility Managers' Uses of DHMIS Data for Service Improvement Decision-Making

This research demonstrates that PHC facility managers commonly use DHMIS data for the planning and monitoring of healthcare services, and for making decisions about clinic resource re-allocations and the kinds of outreach or health promotion and disease preventative measures to implement for the purpose of increasing service coverage and utilization. These reported uses of data at PHC level are indeed in accordance with South Africa's DHMIS policy objective of data to be used for the monitoring and evaluation of health service and programmes. (31) The respondents' described uses of data are seemingly consistent with definitions of data

use in literature. These descriptions include (i) reading or discussing data reports; (ii) interpreting and reviewing data in terms of targets set for health programs or health facilities; (iii) deriving implications for program and service delivery performance based on interpreted data; and (iv) taking action or making decisions on health service and health program management especially in the light of data trends and interpreted meanings of identified trends. (10,17,28) In this study some facility managers used, for example, data on increasing numbers of stable patients accessing chronic services to implement outreach activities in order to reduce the clinic load experienced by growing volumes of patients coming from their community.

However, in the South African context, authors such as Nicol et al, have highlighted that there is sub-optimal use of data by PHC facility managers for service improvement decision- making. (32) In fact, those authors in their study in SA describe that while 98% of the facility managers they surveyed had quarterly DHMIS reports available, only 53% of facility managers across two health districts had verifiable evidence of discussions and decisions being based on DHMIS data reports available to them. Likewise, all respondents in our study reported on their various uses of data for service improvements, though only three LG respondents used quantitative figures (from previous month's report) in demonstrating specific targets they were actively aiming for, based on their facility's DHMIS data. Perhaps access to recent reports allowed these managers to reference recent numbers from specific DHMIS reports, making their approach in reaching their targets, seem more empirically in nature. Alternatively, this could also reflect that in some facility managers, the decisions for service improvements are guided by the overall trends in target performance (i.e. upward or downward trend), versus decisions guided by observing the point at which an under-performing target reaches a specific value. Whichever the case, there is still a measure of variability in how facility managers specifically describe their uses of data, and how that use of data is drawn directly from DHMIS data.

The lack of an organisation objectively monitoring information which shows how facility managers' use DHMIS reports for decision-making, may continue to create the perception that data are not being used by facility managers, when indeed they are. Admittedly, this aspect of how data are used was beyond the scope of this

study. And perhaps there is value in further exploring whether facility managers' decision-making processes for service improvements, take place in intuitive ways (i.e. based on overall trends), versus whether they are grounded on empirical values (i.e. once a particular target value is reached/ not reached), regardless of the accessibility of reports.

4.2. Organisational and other Facilitators of PHC Facility Managers' Use of Data for Service Improvement at Facility Level

This study's findings demonstrate that the use of DHMIS data by facility managers is facilitated by an enabling policy and the availability of HIS resources for generating data. An enabling policy – the DHMIS policy – provides for the generation of data at PHC facilities. The enabling policy environment is further created by health systems strengthening (HSS) strategies, namely the National Core Standards assessment (33) and Ideal Clinic Initiative audits, (34) which intentionally monitor specific quality indicators at PHC facilities. Health information management is a sub-domain of the NCS assessment, with specific quality scores linked to the DHMIS data generated at the facility level. These HSS strategies therefore force facility managers to use their DHMIS data through data discussions and data display, in order to achieve and maintain a particular quality standard. The combined effect of these strategies illustrates a reasonably positive outcome of HIS performance in terms of PHC level data use in this current organisational context.

The DHMIS policy is considered enabling principally because the standard operating procedure (SOP) drawn from the DHMIS policy provides specified roles and responsibilities for the data management processes required to generate data at facility levels. (31) With regards to data use specifically, the DHMIS policy itself states that, "Data shall be used at the point of collection, prior to it being sent to the next level of the health system." (35) For facility managers the defined responsibility in the policy is that they "ensure that data collected by their respective facilities are reviewed during their monthly management meetings, and that remedial interventions are implemented to improve service delivery, where the data shows

inadequate performance." (31) However, while the SOP provides a clear idea of what data management processes facility managers are to meet, as well as how these data are to be captured and reported on, the same clarity is not demonstrated in the same document for their data use responsibilities. Interestingly, the frequency and manner in which the National Core Standards assessments and Ideal Clinic audits are conducted seem to provide managers with a clear idea of how to use their data and how managers can document and demonstrate their use of data. This could perhaps be the reason that these quality assurance strategies are perceived as facilitating managers' use of data in service improvement decision-making.

In a study in the Democratic Republic of Congo (DRC), a report examining factors influencing the use of Malaria program data across seven provinces illustrated similar policy gaps observed in the facility DHMIS SOP. (26) The respondents in that descriptive study (also adopting its assessment of data use through PRISM's framework), (22) noted that guidance on data management and collection was more explicitly described in policy and procedures, than guidance on data use is. Their additional reflections were that how data use was often verbally communicated instead of being written in a document for ease of reference. (26) Some respondents were altogether unable to distinguish between data management and data use due to this policy gap.

This study also shows that HIS resources (paper-based and electronic data recording materials and tools) were widely available for generating the DHMIS data that PHC facility managers are expected to use and this availability of material and the technological tools were viewed as facilitators of data use at facility level. According to the PRISM framework, (22) the lack of availability of data generating materials is often reported as a barrier to data use. In the South African setting research from Nicol et al., (32) demonstrated that the lack of resources and equipment for data recording was a barrier to facility managers' data use. The lack of data recording equipment resulted in inaccurate data recording which lead to the production of poor quality data. While these authors examined the corollary of this study, which demonstrate a reasonable relationship of resource availability to data use performance.

In the Nigerian setting, Afe et al.,(36) report on the perceived motivators for using routine health information for Family Planning services within the health system. Though respondents in that cross-sectional study were not mainly facility managers, the data reflected that respondents would be more motivated to use data if resources were available

In a report describing how HIS in developing countries can be implemented, Bhattarai (28) denotes organisational factors that contribute to successful HIS performance as those with i) available and well-performing human and other resources; ii) clearly defined roles and responsibilities for all personnel involved in the HIS process, iii) sound reporting structures; iv) a supportive information culture; and v) leadership and management efforts aimed at optimising HIS performance. This study findings regarding the organisational facilitators of data use, reflect that the organisation is seemingly achieving some measure of HIS success with a DHMIS policy (supported by other enabling strategies) that outline clearly defined roles and responsibilities for PHC facility managers and by providing material resources for data management, which impact their use of data.

However, this study notes organisational barriers which counterbalance potential HIS success based on perceptions of gaps in the information culture as well as the lack of HIS capacity (especially in data-capturer and HIS officer categories), insufficient training and inconsistent or lack of supervision for data use activities at the facilities.

4.3. Organisational and other Factors Constraining PHC Facility Managers' Data Use for Service Improvement

The study findings highlight several organisational factors that were perceived to constrain DHMIS data use by PHC facility managers. Insufficient mechanisms to ensure the training of HIS personnel on data generation tasks (i.e. analysis and re-presentation of data to graph formats) and specifically of facility managers on the use of data (interpretation of data) was noted as a constraint. The lack of training was compounded by insufficient dedicated data capturers and/or HIS officers, for data management functions at PHC facilities. Another perceived organisational

constraint is the inconsistent or lack of supervision, by higher levels, of data management and data use activities at facility level. This barrier, together with a lack of training and dedicated HIS personnel at facilities contributes to a significant capacity gap for both data management and data use at PHC facilities.

According to the DHMIS policy, routinely supporting data management and data use practices at PHC facilities in, is the responsibility of the HIS officer appointed progressively at fixed healthcare facilities. (4,31) This is the very human resource that, according to facility managers' perceptions, is essentially non-existent at facility level, and yet a felt need in all facilities within the study sample. The role of the facility manager as far as training is concerned, is to ensure that training is available and conducted at the facility. However, the organisation (district) has not put in place the sufficient systems, mechanisms, activities and resources for the training and supervision of data use activities at facility level. This may explain why in the absence of training available through the district, managers request HIS training through the partners and NGO's operating within the health district.

Currently, DHMIS training within the district focuses on improving data management skills (especially for onsite data capturers), while data use training for facility managers is lacking. While capacity building for improving data management in this form is appropriate, (28,37) this narrow approach to DHMIS strengthening means facility managers may not be able to use the data that the up-skilled data capturers will generate. This study suggests that an overall lack of training for PHC facility managers on how to use data contributes to the minimal use of DHMIS data at facility level. Other studies in the South African context consistently demonstrate a lack of HIS training as a key barrier of data use by PHC facility managers, (32,38) especially in their ability to interpret data indicators and targets. (32) Nicol et al., link the observed numeracy gaps as part of the reasons for the limitation in skills needed to adequately interpret indicators for monitoring. A gap that could possibly be minimized if onsite HIS officers in facilities, responsible for ensuring local use of data, were readily accessible to support data use. Their onsite presence could allow them to routinely analyse raw data, which would make the data instantly available to facilitate PHC managers to use. However, the HIS officer as this essential data

management and data use link, could provide substantial support for onsite in-service teaching to support district training platforms which currently exist. (39)

Nevertheless, the perceived absence of facility HIS officers may compound the perceived need for onsite supervision by the district to be more demonstrable. While the DHMIS supervisory function is also defined in the DHMIS policy, through routine onsite inspections by sub-district HIS officers, (4) the current practice reported in this study seems inadequate for end-users' expressed needs. Nicol et al., (32) allude to limitations of supervisory visits/monthly audits as a cause for poor quality data. The authors additionally link the lack of validation skills at facility level to the increased burden of validation experienced by HIS officers at higher levels, even describing the extent of validating and coordinating information at sub-district and district levels as overwhelming. This could perhaps explain why the snowball effect of non-validation at facilities, (32) causes the sub-district (and district) offices to focus their efforts more on ensuring the verification of data quality (i.e. validity and reliability) instead of facilitating mechanism that support facility level data use.

The study findings also show that, according to respondents, the culture of information in the organisation (district) heavily emphasizes PHC managers' data reporting above that of their use of DHMIS data. In a baseline assessment of South Africa's HIS, Measure Evaluation reported that data reporting was erroneously thought of as data use. (39) This observation may reflect why there is such a disproportionate focus on data reporting observed in this study. Or this may once again be highlighting the lack of training and clear description of what data use is and what data use isn't within the DHMIS process. Two studies in the South African context comment specifically on the culture of information use, and highlight one reason for facility managers' lack of motivation in using DHMIS data being linked to their lack of ownership of the DHMIS process, (32) as well as ownership of facility data. (38) This study similarly suggests that there is a culture of decision-making which excludes facility-based (end-users) from discussions regarding DHMIS data changes, and as a result facility managers reported feeling like they are merely reporters of data rather than key stakeholders in the DHMIS. This study also highlights a practice of district resource allocations which is not entirely reflective of DHMIS data (i.e. not informed decision-making), and this may be part of the reason

there is limited ownership by facility managers in the DHMIS process or in the use of data generated by their facilities.

Participants in this study highlighted other factors that may constrain their use of data at facility level. These factors relate to poor data quality, availability of non-useable data, and the delayed dissemination of data to facilities. In research elsewhere, Nutley et al., demonstrated – by using the PRISM tool as an intervention for monitoring HIS performance at each health system level in Cote d'Ivoire – that poor data quality and limited data availability reduced data use by health managers in decision-making. (11) That study along with others examining data use through PRISM's framework determine that data presented in formats that are visually appealing and interpretable for use to end-users, (40) improved responsive data feedback in support of operational data demands (36) and that dependable, accessible and good quality data facilitated data use for decision making. (26) These descriptions support South African studies using the same framework to assess HMIS performance in the local context. (32,38) This simply makes this study's findings an additional voice to this body of data use literature.

Bhattarai, (28) found capacity gaps in data use skills and data management resources, as a consistent feature of LMIC HIS. The author suggests adopting more innovative ways in ensuring continuous HIS training without necessarily dedicating staff to HIS tasks only but through health information teams (HITs) (28). The author proposes identifying staff members (from facilities to higher HIS offices) with HIS skills, competence and an interest in HIS tasks to be the knowledge hub that supports HIS data management (data collection and data analysis) and training for staff members at every level of the health system. In the case of supporting facility managers' use of DHMIS data, these team members would assist managers with the training and data analysis needs they require to transform facility raw data into meaningful information. This would address the constraints of having to wait long for data reports / graphs to be disseminated to them. Similarly, the facility-level analysis of data generated may be presented in easily interpretable formats for facility managers to readily access, for day-to-day decision-making.

This research therefore suggests that in order for data use practices to show meaningful improvement, the district management must pay attention to

strengthening data processes in order to improve data quality outputs, data dissemination formats and the frequency of data feedback. This may indeed improve perceptions on the usefulness of DHMIS data in supporting routine monthly, weekly or even daily operational decision-making at facility level.

4.4. Public Health Implications of the Study

In South Africa's resource-limited setting, it is important that we view these findings along with other literature to inform the organisation's application of current DHMIS and HSS policy efforts. While the DHMIS policy initially intended to implement measures that capacitate and facilitate the generation and use of data for local decision making, there are however, organisational constraints and DHMIS data process barriers that offset the progress facilitated through the implementation of the DHMIS policy framework.

The sub-optimal use of data by PHC facility managers, is a reflection of a DHMIS which is not performing optimally and hinders the potential for applying data-based and responsive service improvement decisions within facilities. Multiple, interrelated factors impact the perceived usefulness of DHMIS data by PHC facility managers, and the extent to which managers own and use these data for monitoring health services. This, coupled together with the perceived culture that excludes facility managers in decision making and a capacity shortage, hinder information use within the organisation. The less useful the data (due to poor quality, delayed reporting feedback and a culture of information reporting etc.), the less likely these data will be used for routine service-improvement decision-making. HIS are an essential element for the realisation of quality, responsive and accessible health services through coordinated and coherent decision making by health managers. (3) In the absence of this iterative data-informed decision-making process for service improvement, the quality, responsiveness and ultimately the effectiveness of remedial interventions may not be sufficient in meeting community health needs, at all levels of decision making. (41)

The findings suggest that managers are excluded from decisions that relate to DHMIS processes, such as how and why data elements are revised or prioritized in

the organisation. Districts which therefore demonstrate transparent decision-making and foster inclusive consultations in proposed changes to DHMIS processes, may cultivate a sense of ownership of the changes collectively made within the organisation. Excluding lower-level health managers in such decisions, has been shown in South Africa to result in their lack of ownership of data or lack of responsibility for using data in managing health services. (42) Indeed in South Africa's current organisational context, limited delegations and devolution of centralized authority - particularly financial, material and human resources - are challenges for ensuring autonomous, transparent and accountable decision-making in districts and healthcare facilities. (43–46) Consequently, the perceived limited decision-space and minimal delegations of authority in which PHC facility managers undertake their data management functions, continue to constrain data ownership and data management outcomes at PHC facilities and within the district. Ultimately, the implementation of facility-generated, data-driven decision making for service improvements may prove to be slow and difficult to realize in real time, without the appropriate delegations of authority being given, to support PHC facility managers' ability to autonomously provide their facilities with resources to close data-informed service gaps.

4.5. Bias and Limitations

The study had limitations in the following areas:

- *Transferability*: The study setting was conducted in one health district, which is a metropolitan health district in urban parts of Gauteng province. The findings of this context may therefore not be reproducible and transferable to study setting with a more rural context as there may be additional or differing organisational factors at play, which either support or hinder data use by facility managers.
- *Social desirability bias*: The study took place in the context of quality assurance assessments taking place throughout the district. The researcher (interviewer) introduced themselves as a university student who concurrently works for the Gauteng Department of Health in order to establish rapport. As such, the element of a response bias from participants could be related to

their understanding of the researcher's background and by the knowledge of the district's attempts of improving quality assurance in PHC facilities. The respondents could therefore have provided answers that may be viewed as favourable to the researcher and/or possible managers who may be presented with the research findings upon dissemination.

- The research findings are based only on reported views of data use in PHC facilities and do not include additional objective assessments to measure the actual use or the processes involved in the handling of data within clinics.

CHAPTER 5

5.1. Conclusions

This study provides findings on some organisational factors that the management in the Johannesburg health district should consider if they are to support PHC facility managers' use of data for service improvement at facility level. Adaptations to the DHMIS policy (especially the facility SOP's) may be valuable in providing concrete descriptions and demonstrations of how empirical data use can be practiced and monitored by facility managers. Or how empirical data use monitoring can result in achieving defined quality standards for service delivery (in a similar fashion that the quality assurance strategies do). The study additionally demonstrates a basis for using innovative capacity building measures (specifically for onsite data management and data use training) to address the perceived training gap for data use in facility managers. Lastly, the study suggests that including facility managers in decision making on DHMIS processes, and a that more explicit demonstration of how the data generated by PHC facility managers is applied in district resource allocation, could facilitate an improved culture of information supportive of managers' data use and data needs at facility level.

5.2. Recommendations

The following recommendations are made in order to assist the organisation (Johannesburg Metropolitan Health District) in optimising current facilitators and minimizing constraints of data use by PHC facility managers. These recommendations are additionally made in consideration of the significant resource-constraints currently experienced within the Province and the broader health system in South Africa.

<u>For Improving Critical Management Functions (Governance)</u>

- The district HIS and M&E offices should optimize the enabling policy environment for data use by outlining specific and measureable roles and responsibilities for data use practices for PHC facility managers.
- The district HIS and M&E offices, with support from the provincial M&E directorate, should design a clear and comprehensive DHMIS data use SOP

(with algorithmic infographics) at facilities. These SOP's should describe how to use DHMIS data generated by facilities for various operational decision-making needs. For example, how service utilisation data are to be used to investigate why certain services have better uptake than others. And how to use that data to implement remedial interventions that increase service access based on the findings from such investigations. These SOP's should be used as readily discernible tools for inclusion in the continuous onsite training platform.

For Improving the Training of DHMIS facility data for use by PHC facility managers.

- The district HIS and M&E offices should design and implement a training strategy which aims to support facility data use objectives without requiring a heavy reliance on sub-districts and districts in providing facility managers with meaningful, accessible and accurate data reports for use at facility level. Instead, the strategy should aim to build capacity and ownership of the DHMIS data generated at PHC facilities for their specified data needs in service-improvement decision-making, as they generate data for the overall health system.

For Improving the Usefulness of DHMIS facility data for use by PHC facility managers

- The district HIS and M&E offices should strengthen the available data management training, so that the training improves data quality, and also increases local capacity skills to analyse raw data such that facility managers have meaningful data;
- The district and sub-district HIS offices should identify a handful of personnel within facilities with an interest in and with competencies for ICT and data-management tasks to be the focal knowledge point of data management at the facility. These individuals could assist managers by transforming DHMIS facility data into meaningful formats for facility managers to use for decision-making. This team could additionally be the mechanism used to capacitate (train and supervise) all other members involved in the data generating process within the facility. The district could intentionally support these teams

with continuous online training modules to troubleshoot common data management and data use gaps noted through weekly and monthly data submission from the facility or during supervisory visits conducted by HIS officers in the sub-district or the district.

- The district HIS offices should additionally introduce within the training strategy, specific training that targets facility managers on how to interpret the data that are available to them and to use them for various management functions.

For Improving a Culture of Information Use

- The district HIS and M&E offices should foster a culture of data use which is demonstrated as district and sub-district management transparently show their use of DHMIS data in budgeting and resource allocation decisions. This may help managers see how their data is valued and used at higher levels of decision-making. And provide insight into how their data impacts district decisions. Additionally, this may inculcate ownership of facility data, improving its quality and use.
- The district management team should advocate for, and facilitate increased delegations to be provided to PHC facility managers in order to support their decision-making autonomy related to service improvements at their facilities. Similar mechanisms to increase delegations of authority, should be provided for sub-district and district PHC programme managers, in line with service performance targets and programme responsibility. This would provide a fair environment to implement performance based reviews that assess the extent to which facilities and programme managers have based and implemented their service improvement decisions on locally (i.e. facility) generated and analysed data.
- District PHC program managers should align PHC facility managers' data use practices to the current Performance Management Development Systems (PMDS) and link key performance indicators to their roles and responsibilities for data use at facility levels. The impact of holding managers responsible for the performance of their facility, including their performance in using facility data in decision-making, may reduce the practice of only collecting data for

the purpose of reporting it to higher levels, but perhaps incentivise local use. Using the same mechanism, district management teams should align HIS and M&E managers' performance (PMDS appraisals) to how well their sub-district offices ensured the provision of tangible support for data management and data use practices at facilities as prescribed by the DHMIS policy.

- The district HIS, M&E and PHC program managers should create more inclusive platforms for facility managers to voice their views on why they feel certain data elements should remain, as they may find them valuable for their decision-making data needs. This may facilitate ownership of facility-level DHMIS processes and improve insight into how these processes impact the overall DHMIS performance. This may also improve ownership and use of facility DHMIS data as they view themselves as part of discussions that take place on DHMIS processes in the organisation.

For Further Study

- Further areas of research that are required in exploring these and other ideas, may perhaps be in demonstrating how PHC facility managers' individual characteristics and behavioural factors together with the technical factors contribute to their data use. This study alluded to aspects of PRISM's behavioural factors (knowledge and skills deficiencies) and technical factors (ICT design, internet connectivity, email access etc.), but was not part of the research question for this study. These factors however, do tie into how the organisation can respond to upskill and capacitate HIS staff and PHC facility managers while optimising the ICT infrastructure for improved data use performance. There may be room to assess perhaps through an intervention study, whether and how data which is transformed into meaningful and more useable data formats at facility level results increases data demand, data uptake and data use for operational (day-to-day) decision-making by PHC facility managers. This would require a more in-depth definition across PHC facility managers on what additional factors (besides data quality, data presentation and timely access to reports) make DHMIS data meaningful, for routine use in service improvement decision-making.

APPENDICES

APPENDIX A: ORGANISATIONAL FACTORS AND DATA USE INTERVIEW GUIDE

(PHC facility managers)

Interviewer: Tshegofatso Maimela

Respondent Code: _____

Date of Interview: _____

Time of Interview: _____

Place of Interview: Facility/ Sub-District Offices/ District Offices

Information Sheet on study read by Participant:

- Yes (Observed) Yes (Reported) No (Verbally Explained)

Informed Consent Form for Interview signed:

- Yes (Observed) Yes (Reported) Copy attached Verbal consent No (refused):

comment - _____

Informed Consent Form for Audio-Recoding signed:

- Yes (Observed) Yes(Reported) Copy attached Verbal Consent No (Refused):

Comment - _____

Audio-Recorder Tested Flight-Mode (cell-phone)

Time Interview started: _____

QUESTIONS: (FOR FACILITY MANAGERS)

As my information sheet has highlighted, I have an interest in understanding how the current environment within the district influences the way health facility managers interact with and use DHMIS data in order to assist them in performing their routine duties for health service improvements. The purpose of the questions that follow, is to explore your views and experiences of the district health context and how it influences facility managers' use of DHMIS of data in general.

INTRODUCTORY QUESTION ON RHIS PERFORMANCE:

(OVERARCHING IMPRESSION ON DATA MANAGEMENT AT HEALTHCARE FACILITY)

As you know, the district has a DHMIS that collects and analyses routine health data. Please could you tell me your thoughts on whether and how the health data collected through the DHMIS are used at healthcare facilities in this district?

PROMPT Q's: What kinds of health data are used at PHC facilities? How would you describe your experience in using various health data? Why do you think that is the case?

PERSONAL DATA-USE QUESTIONS:
THEMES EXPLORED – PERCEIVED DATA DEMANDS, DATA NEEDS AND EXPECTATIONS OF DATA USE.

What current policies can you think of, that you think influence the way data are used by you in the healthcare facility?

PROMPT Q's: In what ways do you think these policies influence your use of data? Why do you think these policies influence your use of data in this way?

DISTRICT (ORGANISATIONAL) DATA-USE QUESTIONS:
THEMES EXPLORED – HOW DECISIONS REGARDING PLANNING, RESOURCE ALLOCATION AND HEALTH SERVICE/PROGRAM MONITORING ARE MADE:

Could you tell me about mechanisms which you think are in place for disseminating DHMIS information within the district?

PROMPT Q's: How would you describe the way they work? Why? In what ways, if any, could these mechanisms be improved? In what ways do you think the existing information dissemination mechanisms might support data use by PHC facility managers? Might hinder data use?

ORGANISATIONAL CULTURE AND ENVIRONMENT FOR DATA:

THEMES EXPLORED INDIRECTLY (SUPERVISION, TRAINING AND PROMOTION OF CULTURE IN DATA UTILISATION, RESOURCE AVAILABILITY)

How are people trained for using data in this facility?

PROMPT Q's: What are your thoughts around the way in which training is conducted or planned in supporting how you use data in the facility? Why?

Tell me a bit about how your supervisor assists you in using data in your facility?

PROMPT Q's: What are your thoughts regarding the way in which supervision happens within the district for supporting data use at facilities? How and why? How would you describe the (sub-)district's supervisory support?

Could you tell me your thoughts about the current human (i.e. people) and technological (i.e. ICT systems) infrastructure, in influencing the use of data at healthcare facilities?

PROMPT Q's: Why do you think this is the case? Are there ways in which you think these resources should be used differently for data use support at healthcare facilities?

FINAL/ EXIT QUESTION:
For both facility manager and PHC supervising managers:
Are there any other thoughts that you would like to share regarding your overall experience and/or observations on how the organisation could best facilitate data use amongst healthcare facility managers that I may have missed which you'd like to reflect upon?

Time Interview ended: _____

APPENDIX B1: ETHCIS CERTIFICATE FROM HUMAN ETHICS RESEARCH COMMITTEE

R14/49 Dr Tshegofatso Nkonzo

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M170132

NAME: (Principal Investigator)	Dr Tshegofatso Nkonzo
DEPARTMENT:	Community Health School of Public Health PHC, Subdistrict Offices, JHB Metropolitan Health District, Gauteng
PROJECT TITLE:	Exploring Organisational Factors that Influence Health Facility Managers' Data Utilisation in a Metropolitan Health District
DATE CONSIDERED:	27/01/2017
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Mary Kawonga and Sue Armstrong
APPROVED BY:	Prof P Cleaton-Jones, Chairperson, HREC (Medical)
DATE OF APPROVAL:	10/02/2017

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary in Room 301, Third floor, Faculty of Health Sciences, Phillip Tobias Building, 29 Princess of Wales Terrace, Parktown, 2193, University of the Witwatersrand. I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report**. The date for annual re-certification will be one year after the date of convened meeting where the study was initially reviewed. In this case, the study was initially reviewed in January and will therefore be due in the month of January each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature

1 March 2017
Date

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

ANNEXURE B2: INFORMATION SHEET – JOHANNESBURG SUB-DISTRICT DISTRICT PHC FACILITY MANAGERS

Study title: Exploring organisational factors that influence health facility managers' data utilisation in a metropolitan health district.

Wits Human Research Ethics Committee (HREC) protocol no: M170132
Ref: R14/49
Date Granted: 10 February 2017

Researcher -
Dr Tshegofatso Maimela (MBBCH)
Public Health Medicine Registrar
University of the Witwatersrand,
Department of Community Health
School of Public Health

Introduction:
My name is Dr Tshegofatso Maimela. I am a public health medicine registrar studying through WITS University. I am currently in the process of conducting research on exploring the organisational factors that influence health facility managers' data utilisation in a metropolitan health district. I am going to provide you with information about the research and invite you to be part of this research. You do not have to commit to participating in the research immediately. Kindly look through the details of this information sheet in order for you to make an informed decision on your potential participation to this regard.
At any point in your examination of this information sheet, feel free to get clarity on the content and/ or process of the proposed research.

What is this study about?
Data use for decision making is an important indicator for an organisation to understand the functioning of its health information system (HIS). The main objective of routine health information systems such as South Africa's District Health

Management Information System is to strengthen monitoring, evaluation and the use of information in policy and programme planning.

Health Management Information Systems (HMIS) perform within the context or environment of an organization. As such, the factors within that environment which contribute to the information system's performance should be understood before mechanisms to improve health information system outputs are instituted. Using the PRISM theoretical framework proposed by Aqil et al.,(22), the factors which determine HMIS performance are Organisational, Behavioural and Technical.

In this study, the organizational factors which influence data utilization (an indicator for HMIS performance) will be examined. Since Primary Healthcare (PHC) is the mechanism through which the South African National Department of Health aims at delivering services, the study will examine how the perceived organizational factors supporting data use by healthcare facility managers influence data utilization of the DHMIS data by facility managers in the Johannesburg Metropolitan health district in 2017. The reason for this proposed study is to use the insights of facility managers' current perceptions and experiences to inform current and future strategies aimed at strengthening and/or reforming data utilization mechanisms and HMIS performance measures within the district health system.

How we will find this out?

The study will use semi-structured interviews to collect data on PHC managers' perceptions of Organisational factors which might influence the use of data in the Johannesburg Metropolitan District. Interviews will be conducted by myself, the researcher and data will be captured using an audio-recording device. A separate informed consent sheet will be issued to participants prior to data collection to ensure autonomy. An additional consent form will also be issued for audio-recording. This research is not about evaluating the performance of PHC facility managers and other departmental managers and their respective competencies. Our role is to listen and to understand your viewpoints on your perceived experiences of the current district health management information system within the organisational context of the Johannesburg health district. Our intention is certainly not to pass any judgment on these viewpoints.

Will my confidentiality be compromised by this study?

No. The information that will be obtained from you will be kept confidential. Only members of the research team will know who has been interviewed. All interviewees will be assigned a code and these codes will only be known by members of the research team for the purpose of the study. Consent forms will be issued prior to conducting the interviews. Data captured through the audio-recording will be transcribed into word documents and kept by the researcher. No names will be revealed in any written data or report resulting from the study. The responses given by participants will be combined and analysed to look for common themes and experiences. The combined information will be written up in the form of an executive report and a Masters research thesis dissertation.

Where did we get permission to carry out the study?

Permission to carry out this project was obtained from the WITS Human Research Ethics Committee. Your participation in assisting us with this research would be appreciated and we will ask you to sign an informed consent form the interview to ensure that you are well informed about the study, should you decide to be a participant.

Will there be any harm from participating?

No. Your participation is entirely voluntary. Your responses will be treated as confidential, and we will ensure that any statements or comments you make cannot be linked either to you as an individual or to your healthcare facility or sub-district. There will be no negative consequences for individuals who do not want to be interviewed. However, we would really appreciate it if you do share your thoughts and feelings about the issues we will be asking you about. We hope that the information we will get from you will be used to inform or advocate for more insightful HIS organisational mechanism to support data utilisation within the Johannesburg district.

Will there be any benefits from participating?

Participation is voluntary this means you have the right to refuse to answer any questions, to be recorded during the interview or to participate in the research

altogether. There will be no direct benefits to anyone individual who participates in the interviews, however it is anticipated that the results of the study will strengthen district initiatives to empower facility managers in using health information.

Who is carrying out this project?

This project is being carried out by myself, Dr Tshegofatso Maimela under the supervision of my supervisors, Dr Mary Kawonga and Dr Sue Armstrong from the WITS School of Public Health. The study constitutes part of a larger study (project) on the overall utilisation of data in the Johannesburg Metro Health District.

Who do I contact if I want to ask more questions?

I will be happy to answer any questions you have about this study. I, Tshegofatso Maimela can be contacted on any of the forms of contact details below:

Phone: +27 11-717 2316 (w) / 072 562 0606 (c)

Email: tshegofatso.maimela@wits.ac.za/ tshego.nkonzo@gmail.com/ tshego.maimela@gmail.com

Should your questions include any implications on your rights as a study participant, or should you have questions or concerns about any aspect of the study, you may contact the ethics office.

WITS Human Research Committee contact details:

HREC (medical) contact details:

Prof P. Cleaton-Jones,

Tel (011)717 2301,

Email: peter.cleaton-jones1@wits.ac.za.

Ms Z. Ndlovu/ Mr Rhulani Mkansi/ Mr Lebo Moeng

Administrative Officers

(011)7172700/2656/1234/1252

zanele.ndlovu@wits.ac.za;

Rhulani.mkansi@wits.ac.za and

Lebo.moeng@wits.ac.za.

If you have questions about the research, you may also contact me Tshegofatso Maimela, on the below details:

Phone: +27 11-717 3612

Email: tshegofatso.nkonzo@wits.ac.za/

tshego.nkonzo@gmail.com/

tshego.maimela@gmail.com

ANNEXURE C1: INFORMED CONSENT SHEET – JOHANNESBURG SUB-DISTRICT DISTRICT PHC FACILITY MANAGERS

Study title: Exploring organisational factors that influence health facility managers' data utilisation in a metropolitan health district.

I have been given the information sheet on the project entitled:
"Exploring organisational factors that influence health facility managers' data utilisation in a Metropolitan health district."
I have read and understood the information sheet and all my questions have been answered satisfactorily.

I understand that my participation in the interview is entirely voluntary and that there will be no negative consequences should I decide not to participate. I also understand that I do not have to answer any questions that I am uncomfortable with and that I can stop the process at any point in time.

I understand that the researchers involved in this project will make every effort to ensure my confidentiality and that my name will not be used in the study reports. The comments that I make will not be reported back to anybody else. I consent voluntarily to participate in the interview for this study. I have been given appropriate contact names and telephone numbers that I may call if I have any questions or concerns about the research.

Participant's signature: _____

Date: _____

Interviewer's signature: _____

Date: _____

ANNEXURE C2: CONSENT TO RECORD THE INTERVIEW – JOHANNESBURG SUB-DISTRICT DISTRICT PHC FACILITY MANAGERS

Study title: Exploring organisational factors that influence health facility managers' data utilisation in a metropolitan health district.

I consent voluntarily to the interview being audio-recorded.

Participant's signature: _____ Date: _____

Interviewer's signature: _____ Date:_____

APPENDIX ONE: SIGNED PLAGIARISM DECLARATION

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

FACULTY OF HEALTH SCIENCES

PLAGIARISM DECLARATION TO BE SIGNED BY ALL HIGHER DEGREE STUDENTS

SENATE PLAGIARISM POLICY:

I Tshegofatso C.R. Maimela, (Student number: 0104440y) am a student registered for the degree of Master of Medicine (MMed) in the specialty of Community Health, in the field of Public Health Medicine, in the academic year 4th.

I hereby declare the following:

- I am aware that plagiarism (the use of someone else's work without their permission and/or without acknowledging the original source) is wrong.
- I confirm that the work submitted for assessment for the above degree is my own unaided work except where I have explicitly indicated otherwise.
- I have followed the required conventions in referencing the thoughts and ideas of others.
- I understand that the University of the Witwatersrand may take disciplinary action against me if there is a belief that this is not my own unaided work or that I have failed to acknowledge the source of the ideas or words in my writing.

Signature: _____ Date: 17 September 2018

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