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A POCKET FULL OF POSIES: THE SPATIAL DISTRIBUTION OF CHILDREN'S DISEASES IN EARLY JOHANNESBURG FROM 1923–1925

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A Dissertation submitted to the Faculty of Science, University of the Witwatersrand, Johannesburg, in fulfillment of the requirements for the degree of Master of Science (Archaeology)

Completed on the 28th of February 2022 in Johannesburg, South Africa

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DECLARATION

I declare that this thesis is my own, unaided work. It is being submitted for the degree of Master of Science at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree of examination at any other university.



(Signature of Candidate)

Signed on the 28th of February 2022 at Wits University, Johannesburg.

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Project title: **A Pocket Full of Posies: The Spatial Distribution of Children's Diseases in Early Johannesburg from 1923-1925.**

Reason: An archival study in the Adler Museum archive. No human participants, or human tissues will be involved in the study.

CB Penny

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ABSTRACT

This study focuses on the medical and surgical records of the Transvaal Children's Memorial Hospital from its opening in 1923 until 1925. These archives allowed for the investigation of the spatial distribution of children's diseases in Johannesburg over a three-year period through a process of manual mapping. The results produced were off-set against public health perceptions and legislations of the period. These publications broadly created the impression that social and sexual diseases were race-based and that spatial and social segregation was necessary to create a healthy and hygienic white city. However, the study showed no clear spatial trends of disease and demographics which revealed that most diseases were prevalent both in poorer and wealthier socio-economic white suburbs. These results indicated a high degree of ethnic intermingling within the white population. This project is situated within Medical and Health Geography and provides a more nuanced understanding if health and well-being within the white population of Johannesburg as well as a better understanding of diseases in children.

KEYWORDS

Public Health in Johannesburg; Transvaal Children's Memorial Hospital; Medical Geography; Health Geography

“A person’s a person, no matter how small.”

-Dr. Seuss

This dissertation is dedicated to all those who made paediatrics possible in South Africa, and for all the children in history and antiquity whose voices are only being discovered now.

ACKNOWLEDGEMENTS

Professor Amanda Esterhuysen (Main Supervisor): thank you for all the guidance, you are the kind of archaeologist I only hope to be one day be. You have been and will always be, one of the greatest role model in my life.

Dr Alex Wafer (Co-Supervisor): Thank you for all your help and guidance through the tumultuous journey which was Masters.

Dr Catherine Burns and Mr David Sepeke Sekgwele: Where do I start? Firstly, thanks for putting up with me and my demanding hours at the museum! Without your help during the pandemic, this thesis would never have been possible. The two of you have helped me to discover a deep love for archival work that I never knew I possessed.

Mom and Dad: Thank you for your financial and emotional support during this process. You encouraged me to remember that my illness would never define me and that was more special than you will ever know. Thank you for fostering my love for history and archaeology from a young age. You taught me that art, castles, cathedrals and monuments were more important than Disneyland would ever be.

Bren and Ned: I love you both so much and you have always supported me and encouraged me to spread my academic wings, no matter the sacrifice you both had to make to make it all possible. I will forever be indebted to you both and hope I will one day make the Geoghegan name proud.

Sam Zlotnick: I love you and thank you for your support and for being here in the good and bad times. Thank you for believing in me when I didn't believe in myself. I am so happy you chose me to be your intellectual equal. Thank you for being the voice of reason to my madness, I would be lost without you.

Kayla Thomas: I love you and you are a source of light in the darkness. Thank you for making me laugh like no one else can and putting up with me as your best friend.

The Zlotnick Family (Jack, Arlene, Shira and Ash): Thank you for your constant support, love and acceptance. You are my second family through and through and that means the world to me.

Uncle Colin and Aunt Sue: You mean so much to all of us, thank you for your unwavering financial and emotional support to the whole family. This degree would not have been possible without you both and all the love you both have to give.

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CHAPTER 1: INTRODUCTION

The understanding of disease within a segregated setting is often based primarily on public health perceptions and legislations of the period which aimed to create a 'healthy' and 'hygienic' white utopia. This perception enforced the notion of race and class based segregated. However, disease mapping can lead to a more nuanced understanding of health and well-being of a population within the segregationist space.

This dissertation investigates the medical and surgical records from the Transvaal Children's Memorial Hospital (TCMH) from 1923-1925 in order to understand the spatial distribution of children's diseases in early Johannesburg. This project integrates history with geographical mapping to attain epidemiological information pertaining to the larger white population and therefore better understand the socio-political and economic climate of the era. Consequently, this research evaluates whether white upper class anxieties linking disease to race and economic class were no more than the machinations of those wishing to justify separation. This chapter provides a brief introduction to the project at hand and presents the aim and objectives; rationale; site background and the project structure.

1.1. Aim

To investigate the spatial distribution of white children's diseases recorded by the Transvaal Children's Memorial Hospital. Johannesburg from 1923 to 1925.

1.2. Objectives

This thesis has two primary objectives:

To investigate and map the spatial and social distribution of children's diseases during the 1920's in Johannesburg.

To link the spatial distribution of children's diseases to perceptions and legislation pertaining to public health of this period in Johannesburg and thus interrogating

socio-economic circumstances of social and sexual diseases amongst white people in the 1920's.

1.3. Rationale

The medical records from the TCMH have been left relatively unstudied and the use of this demographic group in order to establish the spatial distribution of disease in early Johannesburg has yet to be explored. This study intends to understand and unravel public health regimes of the period, which were often used to attribute disease to areas populated by African and Asian peoples. This notion justified a push by white city fathers[1] to segregate the urban space. The fact that children are the main focus of this study is also useful as children are particularly susceptible to disease due to their developing immune systems. Thus sample will thus act as a proxy for the larger population. As of yet, there has only been a few studies which investigate the spread of infectious diseases in children in early industrialized and urban setting both in South Africa and globally. Therefore, this project holds importance in understanding disease and its links to socio-political and economic factors in historic Johannesburg.

1.4. The Transvaal Children's Memorial Hospital (TCMH)

Literature focusing on the history of this hospital is sparse and thus there is a greater need to understand the importance of this medical facility. The TCMH was established on the 29th of October 1923 and saw the admittance of its first patient on the 3rd of November of that year (J.C. Council 1986; Heymann 1973). It was primarily funded by the National Council of Women to commemorate those fallen in the First World War (J.C. Council 1986; Heymann 1973). TCMH was the first hospital to be devoted solely to the healthcare and medical treatment if children in Johannesburg (J.C. Council 1986). However, it is important to acknowledge that this hospital dealt with exclusively children within the white population and not children of other racial groups. This is because segregationist

[1] The term 'white city fathers' refers to the white heteronormative men who were responsible for the administration of the city of Johannesburg and who often imposed segregationist regimes to serve their benefit.

policies of the period in South Africa prohibited the mixing of white and 'non-white' persons in any public space or institutions, including treatment in medical facilities.

The establishment of the hospital was considered somewhat of a '"pioneering move" for the province since paediatrics and healthcare devoted to the well-being of children was still an emerging field within Western medicine[2] during this time (Wade 2006:131). Dr E.P. Baumann was important in both the development of paediatrics in South Africa as well as the establishment of the hospital itself and worked as one of the main resident and teaching doctors at the hospital from 1923 until 1934 (Heymann 1973).

The hospital aimed to support 100 patients at a time and provide all available facilities needed in the treatment of sick children, as well as on-site accommodation for its staff (Heymann 1973). TCMH comprised one central block and two double-storied extension blocks which each contained two wards (Heymann 1973). The fifth ward was devoted to patients requiring observation and isolation (Heymann 1973). The hospital was fully equipped and provided a physiotherapy unit; a surgery room; multiple x-ray rooms and lecture theatres for teaching (Heymann 1973). The medical facilities at TCMH treated patients up to 14 years of age and focused especially on patients ranging from new-born to two years of age (Heymann 1973).

In 1978, the hospital relocated its services to the newly erected Johannesburg General Hospital (also known as 'The Joburg Gen' and recently renamed to the Charlotte Maxeke Johannesburg Academic Hospital (Heymann 1973). The building has since become a listed heritage monument used by community groups

[2] Throughout this thesis, the term 'Western medicine' will refer to what is also commonly known as 'Modern medicine'. This is a field of medical practice and treatment developed in the Western world based in Western scientific theory. Western medicine often disregards and refutes the use and efficacy of 'Alternative/Traditional' medical practice such as those used in Africa and Asia by indigenous peoples.

dedicated to the service of children (The Heritage Register 2021). The building is currently owned by the Gauteng Department of Infrastructure Development as well as the Gauteng Department of Health and is managed by the Children's Memorial Institute (The Heritage Register 2021).



Figure 1.1: Dr E.P. Baumann (Source: Wade 2006)



Figure 1.2: The Transvaal Children's Memorial Hospital (TCMH), Johannesburg (Source: Wade: 2006)



Figure 1.3: The Transvaal Children's Memorial Hospital (TCMH), Johannesburg (Source: DRISA 2016)

1.5. Project Structure

Chapter one provides a brief introduction to the research project at hand. It includes the study's aim, objectives, rationale as well as offers a brief background to the TCMH from which this project draws its Data. Chapter two provides the literature review for this study, and presents the necessary background to the theoretical, historical and methodological components of this research project. The literature review begins with literature pertaining to Medical and Health Geography which influenced and structured the methodology of this study and provided insight into the mapping and interpretation of the spatial distribution of diseases which were important in understanding the produced results.

The second part of chapter two roots this projects in both space and time. It illustrates the socio-political and economic climate of the period, focusing on the turn of the century to the early 1920's, recognising that no even in history is isolated. This part of the literature review also reflects on white upper class anxieties toward race, class and disease. Lastly, this chapter introduces diseases and afflictions, with specific focus on the diseases and afflictions deemed

'prevalent' within both the 'non-white'[3] population as well as amongst the white working class such as sexual diseases, respiratory related illnesses (such as those associated with mining like Tuberculosis) as well as those which stood as evidence for child neglect or abuse.

Chapter three provides the methodology employed by this study in order to collect the Data for this research project. It makes use of Medical and Health Geography in order to construct a scientifically sound methodology. It first presents the archives from which this project draws its Data, providing a brief explanation of the medical and surgical records of the TCMH and then outlines the analysis of the Data- from extraction to mapping and finally, to interpretation. This section also provides insight into the problems encountered during the digital mapping process which was solved through a manual mapping process. Lastly, chapter three introduces how trends may be identified in spatial Data.

Chapter four presents the results in two main categories. The first consists of patient demographic results which includes age; sex; mortality rates; economic status; religion and patient transfers. The second provides the results of the spatial distribution and frequency of diseases and afflictions of interest.

Chapter five is comprised of a discussion surrounding the produced results, exploring the disjuncture and divide between public health perceptions of the period; white upper class anxieties and scientific fact. This chapter reveals patterns observed in children's diseases and illnesses and links these to socio-economic circumstances and thus to a population at large. This is therefore able to establish whether disease is race-based and therefore suitable rationale for the push by white city fathers for urban segregation during this period.

[3] The term 'non-white' refers to any persons who were not classified as 'white' or 'Caucasian' under segregationist legislations. The term included peoples of color such as those of African or Asian descent; indigenous/aboriginal peoples or mixed race individuals. However, such classification systems were often fallacious and rooted in racist and stereotypical pseudo-scientific systems.

Lastly, chapter six presents a brief conclusion to this thesis and reiterates the use of public health as a tool of propaganda in order to segregate and divide the greater population of Johannesburg. It lastly presents the future avenues of research pertaining to this research.

CHAPTER 2: LITERATURE REVIEW

This chapter provides a literature review which evaluates the current knowledge available in the academic sphere relevant to this study and is divided into three sections. The first focuses on Medical and Health Geography and how diseases can and should be mapped. The second section draws attention to the social, political and economic climate of Johannesburg during the 1920's. Lastly, the third section introduces the types of diseases/afflictions present within the study sample and how these ailments interact not only with the populations which they affect but the environments in which they are present.

2.1. Medical and Health Geography

Medical and Health Geography each hold importance to this study as the project draws on these disciplines to structure and guide its methodology. In order to fully understand the usefulness of these disciplines for this research, it is first important to define these fields and the differences which exist between them. Both disciplines view the mapping of diseases as inherently important in the analysis of a disease's function within a given society (Kearns & Moon 2002; Moon 2009). Brown, *et al.* (2010) state that Health Geography was once a sub-field born from the more established Medical Geography and focuses mainly on the social dimensions with regards to health, and more specifically, the relationship which exists between people and their environment (Rosenberg 1998; Moon 2009). Although these terms are sometimes used interchangeably, it is important to note they are not one in the same (Brown, *et al.* 2010; Moon 2009; Cutchin 2007).

Health Geography has tended to focus more on the 'healthy' rather than the 'diseased'. In this way, the discipline focuses on well-being, which "implies a progression away from being ill or impaired" and thus an absence of ailments (Rosenberg 1998). The definition of such a term is however somewhat problematic (Brown, *et al.* 2010). This is because health is not the mere absence of disease but rather a positive notion as greater health is normally equated with "lower mortality and morbidity rates" (Meade & Emch 2010:18; Rosenberg 1998).

The problem, according to Meade & Emch (2010), lies in trying to define health without reference to disease. Meade and Emch (2010:18) make use of the World Health Organization's definition of health which is "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" which proves useful in implying that an individual may experience different levels of health without necessarily suffering from a disease. Furthering this idea, Brown, *et al.* (2010) state that there are two main traditions which draw on the notion of 'well-being'. The first being indicators used to establish quality of life, and the second, embracing the holistic ideas of health of the later 20th Century which "identify the dimensions of human experience" (Brown, *et al.* 2010: 20; Rosenberg 1998; Kearns & Moon 2002).

From these, it becomes clear that health is not a binary, but rather, exists on a spectrum in which health occurs as a "continuing property" (Meade & Emch 2010:28). It is not a characteristic that is either present nor absent at a particular time in a community but instead health exists in relation to multiple factors and may only be completely absent in the case of death (Meade & Emch 2010; Moon 2009). This definition of health is therefore important to understand in terms of this study as it combats the fallacies created by both the upper white population and the Public Health Department in Johannesburg during the 1920's who linked disease solely to poverty and race, believing wealthier Johannesburg residents would therefore be safe from serious illnesses.

The focus of Medical Geography is slightly different to that of Health Geography as it considers the effects of locale and climate on a population's health (Brown, *et al.* 2010; Moon 2009; Cutchin 2007). Medically Geography specifically focuses on diseases within society and how this links to public health, paying particular attention to the spatial analysis of disease (Brown, *et al.* 2010; Rosenberg 1998; Kearns & Moon 2002). It is thus useful to note that Medical Geography is no longer confined to Geography, but has proven useful in spatial analysis and identifying the spread of contagious diseases (Brown, *et al.* 2010; Rosenberg 1998). Meade & Emch (2010:340) further the ideas of benefits in

Medical Geography by stating that "the Medical Geographic tradition of disease ecology is not only spatial, but holistic; it includes the integration of many different types of variables responsible for disease. It is also useful in the fact that it accounts for and emphasizes the complex interactions between people and their environments making it beneficial in understanding the history of diseases of a certain area (Meade & Emch 2010).

As explored earlier, the mapping of diseases within the disciplines of Medical and Health Geography are important in order to understand the phenomena of health and disease within society (Rosenberg 1998). According to Meade & Emch (2010:28), Geography has a fundamental interest in variations over space which makes it possible "to map, at a variety of scales, every kind of insult (agents of disease)". Since the landscape that distinguishes a place is a complex expression of physical, biotic and cultural processes it is therefore possible to track and study disease and the complex processes behind them (Meade & Emch 2010; Rosenberg 1998).

Meade & Emch (2010:75) define a map as a "distillation of complex interrelationships that the map maker chooses as important to represent" therefore a map is an interpretation and graphic translation of "external real-world reality" (Brown, *et al.* 2010). This means that maps tend to produce biases since a single map is not able to represent all of reality, instead, it represents only that which the map maker views as important for their line of research (Meade & Emch 2010). Health maps have nevertheless become widespread and have proven useful for numerous reasons including determining certain disease risk and exposure sources; analysing disease prevalence and for governments to reach certain decisions pertaining to public health (Brown, *et al.* 2010; Rosenberg 1998; Moon 2009). Brown, *et al.* (2010) argues that maps fulfil two main functions: first they are a communicative tool and secondly, they are a tool for analysis. However, as argued by Meade & Emch (2010), Brown, *et al.* (2010) state that the limitations associated with maps tend to be the fact they do not necessarily health inequalities. In both Medical and Health Geography, the mapping of diseases

proves inherently important in the analysis of a disease's function within a given society and thus it is paramount in our understanding of disease within antiquity.

Although disease maps are mainly concerned with the spatial distribution of one disease, little research has addressed the idea of multiple diseases combining in one geographical space (Brown, *et al.* 2010). This is a significant question which this project intends to pursue. The maps created for the purpose of this study are termed by Brown, *et al.* (2010) as "investigative maps" which aim to locate spatial associations mostly linking socio-economic status to health. In this way, an investigative map is able to show the distribution of cases which may be unknown and identify possible concentrations, spatial continuities and discontinuities (Brown, *et al.* 2010). It is therefore possible to make sense of aggregation densities of patients in certain areas (Brown, *et al.* 2010). Mapped Data is able to supply information on the location of diagnosed health events and provide vital information about the distribution and spread of certain diseases (Brown, *et al.* 2010).

Meade & Emch (2010) state that there are two main modes of mapping diseases, the first being through cartography and the second being through the use of digital systems such as GIS (Geographic Information Systems). Meade & Emch (2010) state that GIS is an information system which was specifically created for mapping. It is vital in the manipulation of spatial Data in various ways and allows for the capture, storage, retrieval, analysis and display of spatial Data (Meade & Emch 2010:83).

This choice is highly dependent on the Data being utilized, as although mapping can be visually effective and authoritative, Meade & Emch (2010) also state that a map is no better than the Data which it presents. In the case of historical Data, cartography tends to be a more appropriate option (dependent on the availability of maps of the period) whereas modern Data may be more usefully mapped on satellite images (Meade & Emch 2010). In the case of this project, both have been

utilized to map the study sample in order to compile relevant Data and thus draw important conclusions pertaining to health in early Johannesburg.

Spatial dimensions are therefore important in understanding and determining health as well as risk and protective factors which occur at a community level (Meade & Emch 2010). Spatial variations in health are often caused by variations in the people who occupy certain spaces (Meade & Emch 2010). Brown, *et al.* (2010) explain how the mapping of health in small areas with a small population may raise statistical problems due to variances in the results produced, which are often unstable and cause random variation. However, small scale disease mapping has proven useful, as with Jon Snow's 1854 map of Soho London which tracked the Cholera outbreak (Brown, *et al.* 2010; Snow 1854). Snow was able to conclude that disease was able to spread through urban London through contaminated water sources (Brown, *et al.* 2010; Snow 1854). This was the first experiment which mapped the occurrence of a specific disease (Brown, *et al.* 2010; Snow 1854). Therefore, even though this study consists of a fairly small study sample, it is still important in our understanding of this era in Johannesburg as was Snow's Cholera mapping for London.

With maps on a small scale such as Snow's, the creators tend to employ what is known as 'point data' which corresponds to an individual suffering from a particular disease as a single point on a map (Meade & Emch 2010). These are most commonly employed in dot distribution maps which are the maps utilized in this thesis. These maps are useful as they are also able to track abnormal concentrations of cases across space when investigating infectious diseases (Brown, *et al.* 2010). This means that associations which may not be obvious through other mediums may have contributed to their prevalence and spread may become clearer (Brown, *et al.* 2010).

2.2. Social, Political and Economic Climate of Johannesburg

In order to understand the spread of infectious diseases and the occurrence of afflictions within the study sample, one must first understand the complex

interactions of social, political and economic phenomena which aided the establishment of Johannesburg as a 'white' city. Since no event in history exists in isolation, it should be acknowledged that important social, political and economic events which occurred prior to the 1920's in Johannesburg had far-reaching consequences into the later decades which emphasizes why earlier phases in the planning and history of Johannesburg need to be explored in this section of the literature review.

In 1886, gold was discovered through an exposed gold seam in Johannesburg by white settlers which quickly turned the Transvaal from a poor and struggling Boer Republic, into an economic powerhouse even though gold had long before been panned and mined further North in the Old Transvaal by Africans (Bonner & Segal 1998; Parnell 2003; Callinicos 1985; Parnell 1993). With the establishment of economic potential, the Rand was declared open for digging by Paul Kruger causing "modern Johannesburg" to come into fruition along with Johannesburg's first stock exchange which opened in 1887 and help significant power over South Africa's economy (Brodie 2008:44; Burns 2004). Gold mining therefore quickly became the most important industry in the country and by 1898 the Witwatersrand was producing 27% of the world's gold (Callinicos 1985; Parnell 1993; Van Onselen 2001). Gold mining activity meant that Johannesburg's periods of greatest economic growth coincided with prominent investments in the gold industry leading to a period of significant capitalist growth between 1886 and 1914 (Van Onselen 2001).

The prospect of gold drew the rich as well as the poor to Johannesburg like a magnet. Within a decade of gold being discovered, the mining population of the Rand grew from 3000 to 10 000 people (Brodie 2008). Mining became the main employment sector for the Transvaal and remained the dominant economic activity prior to the First World War, employed a quarter of the national workforce (Brodie 2008; Parnell 1993). Although Johannesburg's economic prospects initially appeared short term, laws allowing deeper level mining meant that the area became more appealing for longer term investments and secured a

future for some of Kimberley's richest diamond miners who invested in and moved to the Rand (Callinicos 1985). Many stayed majority owners of these mines and became known as the 'Randlords'. Randlords not only ensured the functioning of the economy through gold mining, but also held significant political power over the Transvaal (Callinicos 1985).

The Union of South Africa came into existence in 1910 when general Louis Botha unified the Cape, Natal, Transvaal and Orange Free State. The Union became a self-governing dominion of the British Empire (Barber 1999; Davenport 1991; Lacour-Gayet 1977; Muller 1975) until 1934 when it became a sovereign state (Barber 1999; Davenport 1991; Lacour-Gayet 1977; Muller 1975). This means that South Africa in the 1920's was not strictly under colonial rule which is why this period will be referred to as 'The Union Period' or 'The Segregation Era' (Barber 1999; Davenport 1991; Lacour-Gayet 1977; Muller 1975).

It should also be stated that the Prime ministers ruling over the Union of South Africa during the period of interest for this study were Jan Smuts (1919-1924) as well as Barry Hertzog (1924-1939) (Barber 1999; Davenport 1991; Lacour-Gayet 1977; Muller 1975). Even though these Prime ministers ruled over the Union of South Africa, the Randlords continued to hold both economic and political power over Johannesburg (Callinicos 1985).

The money promised by rich, white miners on the Rand meant that men desperate for work were easily recruited , both black and white. With a greater demand for labour on mines, migrant labour demand increased and taxes were imposed on rural South African families forcing men into the city and onto the mines, labour brokers also began to bring in African men from outside of South Africa; from Mozambique, Malowi and Lesotho (Kark 2003). Migrant labour was preferred since it provided cheap and seasonal labour to the mining industry and ensured that a black population would not settle in the Rand due to pass laws and low wages (Callinicos 1985; Kark 2003; Van Onselen 2001; Wolpe 1972; Harries 1994). Migrant labour was a legislated form of employment which meant that

African men often did not have a choice but to move to and work on the mines in South Africa (Callinicos 1985; Kark 2003; Harries 1994).

However, white male labourers, unlike their black counterparts, were mostly employed on longer-term contracts in order to encourage them to settle with their families on the Rand and did not have to commit to legislated employment (Bonner & Segal 1998; Kark 2003). The outbreak of the South African War (also known as the Anglo-Boer War). From 1899 until 1902, which abruptly caused the economy to halt, resulted in an influx of poor Afrikaans labourers who had lost their farms during the war and were in desperate search for work (Burns 2004; Van Onselen 2001). The devastation of the South African War thus caused a dramatic increase in the population of Johannesburg which pushed the Rand to become a more settled town (Van Onselen 2001; Bonner & Segal 1998; Wolpe 1972). The introduction of manual labourers into the Rand further increased the wealth gap present within the society creating a stark contrast between wealthier residents, such as the Randlords, and the poorer members of society, such as miners and domestic workers (Van Onselen 2001; Bonner & Segal 1998; Wolpe 1972).

As mines increased their demand for labour, rich Randlords and their newly settled families created a demand for domestic servants. By 1892, the Rand required white servants to work in private houses, hostels and boarding houses across Johannesburg (Brodie 2008; Van Onselen 2001). Although there was a greater call for white servants, the domestic workforce comprised of both black and white servants with majority made up of black men whose wages covered lodging, food and clothing (Brodie 2008). However, the major economic depression which took place from 1906-1908 meant that white servants were the first to be dismissed from the domestic workforce since a cheaper and better alternative supply of labour had arrived: black women (Brodie 2008; Van Onselen 2001). The arrival of a black female workforce to the Rand was something which was welcomed by employers (Van Onselen 2001). The presence of black women meant that black male domestic workers could be replaced due to hysterias

surrounding sexual relations between white women and black men with the most significant period of panic surrounding these relations termed ‘The Black Peril’ which took place from 1912-1913 (Van Onselen 2001:245).

The introduction of the working class to Johannesburg coupled with the economic recessions and collapses introduced by multiple problems by the ruling class in not only the form of criminality but racial mixing. Many English speaking white labourers left the mines due to economic problems within the mining industry which left older white generations vagrant whilst the younger turned to crime (Van Onselen 2001). Van Onselen (2001) argues that in 1906, Afrikaans labourers who entered the mining industry in the form of ‘scab labour’ struggled to compete with more skilled European immigrants within the industry. This left majority of the Afrikaans population in the Rand jobless leading them to seek alternative work since unskilled white labourers refused to participate in what they termed ‘kaffir work’ (Van Onselen 2001; Brodie 2008:126). Although much of the Afrikaans population turned to brick making or became transport riders, their work suffered with every economic recession (Van Onselen 2001; Brodie 2008).

Vagrancy and the absence of family life in Johannesburg meant an increase in criminal activity. In the early 1900’s, the illegal liquor and prostitution industries became extremely difficult to police and the government viewed both illicit activities as a “necessary evil” which could be utilized in order to control the working class and ensure that both the town and its economy functioned (Pirie & Da Silva 1986; Van Onselen 2001:136). This meant that drinking, gambling and prostitution soon became central to white working class life on the Rand, similarly to the black working class (Van Onselen 2001). This harboured fear in the white ruling class who felt a growing unity between race in the working population and they felt the need to protect their money (Van Onselen 2001).

Prostitution, in particular, was the main concern for the ruling class of the Rand. The arrival of both black and white women in Johannesburg meant that a complete restructuring of the urban ‘white’ and colonial space was necessary as

sexual promiscuity between the sexes and inter-racial sexual affairs were major fears of white governance (Legg 2007). Although industrialization in the Rand afforded women more freedom, many resorted to illegal prostitution and liquor brewing due to the shortages of opportunities available in the employment industry for women (Harries 1994).

In the early decades of the town's establishment, approximately ten percent of all women over the age of 15 were prostitutes, many white European immigrants who were willing to 'service' both white men and men of colour (Van Onselen 2001; Brodie 2008; Harries 1994). The government quickly introduced two laws to curtail the illicit sex industry. The first being the Immorality Act[4] and the second, the Transvaal Immigrants Restriction Act[5] (Van Onselen 2001; Brodie 2008). Although these laws were used to enforce "upper class why values" they did little to stop illegal activity (Van Onselen 2001; Brodie 2008).

The Immorality Act aimed to prosecute those involved in "unlawful carnal connection" but the law did more to punish prostitutes and brothel owners than those who frequented them. Brothels allowing sexual relations between races were often punished the most severely under this law. The Immigration Restriction Act of 1907 and 1908 ordered the deportation of many foreign pimps and prostitutes. However, Brodie (2008) argues that this caused the sex trade to disperse rather than to disappear.

Although prostitution on the Rand had increased the number of women in Johannesburg, sex ratios only began to equalize when rural poverty pressed greater numbers of women into the city meaning that "Johannesburg gradually evolved from a tin-and-tent city of men […] to a city of households and generations (Harries 1994; Burns 2004:171). The original population of the rand was predominantly male due to the fact that Johannesburg's future was

[4] Immorality Act no. 46 of 1903
[5] Immigration Restriction Act no. 15 of 1907, later amended to the Immigrants Restriction Act no. 35 of 1908

unpredictable and the costs of transporting families for settlement were high (Bonner & Segal 1998; Brodie 2008). However, settlement began to stabilize and people saw greater opportunities for family life and thus arrived Johannesburg's first generation of children (Bonner & Segal 1998; Brodie 2008).

Although family life in Johannesburg slowly came into existence, with white families from different socio-economic backgrounds making the town their home, Johannesburg remained racked with class conflict (Van Onselen 2001). According to Brodie (2008), white poverty remained an issue up until the 1930's creating a large economic divide within the white population which resulted in pertinent political tensions (Parnell 1993). Although a similar socio-economic gap remained between the white and black population of the Rand, the rift within the white population was more of a concern to the white ruling class (Van Onselen 2001; Harries 1994; Wolpe 1972).

One of the major factors causing anxiety within the white ruling class was the issue of racial mixing in poor residential areas where the working class and the vagrant occupied large, racially diverse slums in the inner city (Parnell 1993). Parnell (2003) argues that Johannesburg was initially characterised by its increasing levels of racial integration rather than segregation. The slum districts within the city centre were therefore not only known for their racially diverse residents but their criminal activity as well as the prevalence of infectious and often life threatening diseases such as Tuberculosis (TB), Plague and Smallpox (Parnell 2003; Grob 2002). The slum districts of Johannesburg were often described during this time as "some of the worst in the world" (Parnell 2003:619).

The upper class white anxieties focused on notions of 'degeneracy' within the media which were exacerbated by the presence of racially mixed slums in urban areas. Newspapers of this period in the Rand often included articles which focused mainly on "the poor white problem" as well as the fear of the consequences racial and class mixing would have on the Rand's wealthier

population. In *The Rand Daily Mail,* an article released in 1929[6] spoke of the need to address the poor white community as their 'isolation' and 'intermarriage' within their social class was leading to what was believed to be physical and moral degeneracy. A month later, the newspaper released a letter to the editor from a concerned citizen who spoke to the presence of "poor white children in towns"[7] and claimed that their presence should be of the government's immediate concern due to fears surrounding the creation of more poor white families as well as more generations of unskilled and vagrant white civilians in the future.

These articles exhibit the fear mongering nature of the media and the ruling class of Johannesburg leading up to the 1930's which was a problem needing an immediate solution. One of which being the immediate prohibition of racial mixing in urban slum areas as this was believed a solution to fix both the spread of disease within the white population as well as 'moral degeneracy'. Thus, the "poor white problem" focused on a solution for a perceived problem rather than improving the lives of sufferers.

The rich and comfortable white classes and their imitators followed English norms of respectability in upper class suburban areas and tended to avoid poorer white residents as often as possible (Chipkin 1993; Van Onselen 2001). The introduction of cheap public transport, available to whites, such as the tram systems meant that the population of the Rand could extend its footprint away from the city centre which further encouraged wealthier families to move away from both white and black poverty (Van Onselen 2001). The introduction of public transport therefore enabled richer white families to move out of the city centre and thus extend the Johannesburg urban sprawl (Brodie 2008). From 1890-1896 especially, more than half of Johannesburg's population resided in slum areas within the city's centre (Brodie 2008).

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[6] Isolation and Degeneracy: Research on the Poor White Problem (Published May 30th of 1929) in *The Rand Daily Mail* (Via Readex)
[7] Letter to the Editor: Poor White Children in Towns (Published April 23rd of 1929) in *The Rand Daily Mail* (via Readex)

The government grew increasingly concerned over the disconnect within the white population and the growing unity of the black and white working class. Parnell (1993) explains that the government saw the need to unite the white population as tensions between white English speakers and white Afrikaans speakers were so great after the South African War that leading up to the First World War "the race question" was more commonly centred around relations between English and Afrikaans speakers rather than between blacks and whites (Parnell 1993). The ruling class was most concerned about the belief that poor whites and blacks would unite and thus create a racially mixed and united working class which could potentially lead to communism (Parnell 1993). Therefore, white city fathers saw the need to create a unified white identity (Parnell 1993).

It is poorly understood why and how racially mixed slums developed in Johannesburg and why the Johannesburg municipality initially chose to ignore it (Parnell 2003). It is possible, as argued by Parnell (2003), that racial intermingling in poorer areas occurred due to the need for blue-collar workers to be placed close to points of production and thus the city council chose to ignore town planning during this time based on racial segregation. However, these areas began to draw in numerous complaints and although some pertained to racial mixing, the majority were firmly rooted in concerns surrounding health and environmental hazards which these settlements presented as well as crime (Parnell 2003; Brodie 2008). Thus, racial mixing became almost synonymous with issues of public health and the government felt that racial segregation was necessary in order of keeping a healthy and hygienic city (Parnell 2003; Brodie 2008).

The spread of infectious disease was and is most commonly associated with poverty and thus race due to the poor state of dwellings in which this sect of the population inhabits, this phenomenon is termed 'environmental racism' (Washington 2004). Washington (2004) argues environmental racism not only targeted black members of society but underprivileged which communities, such as is seen in America. In America, disenfranchised white communities mainly

comprised of immigrants, such as the Polish, Irish, Jewish, Italians and Appalachians, yet it is important to understand that although discriminatory practices towards these groups seemed evident these communities were never classified as black under the law (Washington 2004). Washington (2004) states that the primary difference that existed between these poorer white communities and the black population was that the black population had legislation governing their oppression, whereas the white underclass did not and thus their oppression is often less clear (Washington 2004).

Washington (2004) therefore argues that the issue of environmental racism was no longer based on the dichotomy of white and black but rather on dichotomies centred around socio-political and economic 'othering' as was present in the first of the 20th Century in Johannesburg. The belief that black bodies were 'diseased; was a driving force in planning policies restricting the geographical space of the individuals but there is little evidence that such struct planning was in place to restrict and control "the white other" so outwardly (Washington 2004). To date, there has been little literature which has addressed the role of environmental racism toward "the white other" within the Rand such as the work Washington (2004) has done in America.

One of the earliest plans to create a unified white identity and thus solve the complaints made by the white upper class was to segregate black labourers from their white counterparts thus isolating the blue-collar workforce. As early as 1903, Johannesburg began building municipal compounds for single African men which housed both miners and domestic servants (Brodie 2008). These compounds were located close to points of production but away from white settlements (Bonne & Segal 1998). These compounds were a form of social control which made African mobility in the Rand strictly controlled (Harries 1994). Although these compounds were equipped with so-called "ground-breaking innovations" they only consisted of the bare minimum in terms of shelter and sanitation which meant that both disease and criminality flourished (Janzen 2002; Harries 1994; Pirie & Da Silva 1986:176; Callinicos 1985; Bonner & Segal 1998). Often, harsh

conditions in compounds and other areas designated to African occupation, such as the later established townships, were used to justify institutionalized racism operating with society of this period (Callinicos 1985; Bonner & Segal 1998).

Therefore, although initial town planning regulations were not explicitly concerned with the regulation of African settlement, by 1910 the idea of segregation became part of an emerging racial framework which cast South Africa into a racial mould and aided in encouraging white settlement (Parnell 1993). The Natives (Urban Areas) Act[8], introduced in 1923, was the first law passed in Johannesburg which enforced racial segregation legally and in turn required the government to provide housing, no matter how poor the condition, to members of the African population in Johannesburg (Pirie & Da Silva 1986). However, residences provided to the poorer white population, including white immigrants, were not dissimilar to black compounds (Van Onselen 2001). The majority of the white working class resided in boarding houses which like black compounds, were located close to points of production such as in Jeppe and Fordsburg (Van Onselen 2001).

Prior to the enactment of the Natives (Urban Areas) Act, Parnell (2003) argues that no true blueprint existed to enforce urban segregation, except for the Housing Act[9] which stipulated only briefly that housing provisions be made for the poorer members of society, including those classified as 'non-white'. National segregationist policies were enforced on an urban scale by local authorities and aimed at excluding non-white races from the city altogether which further enhanced white nationalist identities through territorial segregation of privilege (Parnell 2003). The Natives Land Act of 1913[10] designated only eight percent of the entire country to legal black ownership and tenure (Callinicos 1985; Brodie 2008:145). The push for urban segregation meant that members of the white ruling class began to enjoy privileges which the rest of the white population had

[8] Natives (Urban Areas) Act no. 21 of 1923
[9] Housing Act no. 35 of 1920
[10] Natives Land Act no. 20 of 1913

(Parnell 1993). This started to create a divide between the races of the blue-collar workforce thus moving toward a unified white identity and fixing the tensions evident between the different white socio-economic classes (Parnell 1993).

Racial segregation was viewed as crucial to the control of public health (Parnell 1993; Parnell 2003). Due to these perceptions, many urban slum districts were cleared or destroyed in hopes of crushing and preventing the spread of certain deadly and infectious diseases, most notable the slum clearance of both the 'Coolie location' (a slum settlement set aside for Indian South Africans) and the Brickfields (located close to the 'Coolie location' and was an Afrikaans working class settlement) in 1904 due to the growing fear of bubonic plague (Brodie 2008). It is important to note that the control of infectious diseases was something extremely important to British dominions and colonies in order to keep control and obedience over its subjects which was a sentiment also enforced within the Union of South Africa by governing bodies (Legg 2006).

The dominion space within the British empire was somewhat of an experimental playground where "spatial divisions, time tables, bodily regulations and different forms of supervision were used to regulate and control the population" (Legg 2006; Legg 2007:8). Johannesburg's authorities were no exception. Space was a medium employed by the government to regulate its subjects and thus gain complete political, economic and social control through governmentality (Legg 2007). Dominion territories, especially under British rule, became heavily influenced by the notion of sovereignty where ideas of boundaries, hierarchies, zones and cultural imaginaries were used to assert power and dominance over dominions and colonies to create the binary of 'the norm' and 'the other' in which those who did not fit into this moult were viewed as societal misfits (Legg 2006; Legg 2007).

This binary became strictly tied to 'liberty' wherein 'true liberty' was only granted to those normalized by Western society, in particular, adult white heterosexual able-bodied men (Legg 2007). However, it is important to note that

these racialized ideologies which resulted in racial and ethnic categorization of the population often caused imprecision and variability, making laws based on these categories extremely difficult to control and police (Posel 2001).

The notion of governmentality and the control exerted on a society by a ruling white body has been extensively studied in British Colonial India which serves as an example of the ideologies enforced in Johannesburg by ruling white city fathers. In the case of New Delhi, it came to be seen as "Britain's most spectacular showcase of imperial modernity" and is described by Legg (2007:1) to be Britain's "vision of an empire and legitimacy and longevity in the 20th Century". Compared to Britain's other domains, India was seemingly 'more liberal' (Legg 2007). The colony marked two complimentary forms of hierarchy, that of space and that of society, and although they reinforced each other they were not mutually exclusive (Legg 2007).

The governing body of India found it necessary to exert their power not only upon India's population, but on individual bodies in order to establish Imperial and British 'hygiene standards' in an attempt to "colonize the body" (Legg 2009:450). Legg (2009) speculates that there was seldom differentiation made between prostitutes and normal Indian women which reveals the 'othering' of the indigenous population. When prostitutes were found to be carrying Sexually Transmitted Infections (STI's), they were forcibly cured in fear these infections would be passed onto British soldiers (Legg 2009). These ideologies were often imposed not only on the native population but on the white working class of Johannesburg in order to prevent not only disease but actions which the upper class population viewed as 'distasteful'.

Thus, there was a growing need for the enforcement of racial segregation which could easily be justified through the link between race and disease in Johannesburg. This link was often perpetuated in popular media of the period such as in the newspaper. As early as 1904, newspapers such as *The Rand Daily Mail* pushed the notion of deadly diseases such as Bubonic Plague being linked to

both black miners[11] as well the South African Indian population[12]. In 1912, *The Rand Daily Mail* released an article provided feedback from the Tuberculosis Commission[13] which directly tied the spread and occurrence of TB to black residents in urban areas. Later, the newspaper released an article in 1917 entitled "Syphilis among the Natives"[14] which linked the STI to the native population, stating that "persons most commonly affected [are] the k-----s themselves" furthering the discourse of the 'non-white' population being directly associated with ideas of 'degeneracy' and 'unhygienic habits'.

One of the most important events prompting the Public Health Act[15] was the outbreak of the Spanish Influenza (Flu), which Phillips (1984:189) argues was a "baptism of fire" for the newly established Health Department of Johannesburg. The outbreak of Spanish Flu forced authorities to become directly involved in social welfare which the Public Health Department was completely unprepared for (Phillips 1984). The deadly pandemic was the catalyst leading to the state's interest in living conditions and the development of the national system of public health which was desperately needed (Phillips 1984).

Prior to the Public Health Act, the only law which enforced some key aspects to the prevention of the spread of infectious diseases, was the Local Government Ordinance Bill[16]. This bill delegated the responsibility of establishing and maintaining sanitary services to ensure that public areas; streets and water sources were kept clean to the Town Council. It also made the Town Council responsible

[11] Chamber of Mines Monthly Meeting Yesterday. Plague on the Mining Areas: Only Twenty Actual Cases (Published April 22nd of 1904) in *The Rand Daily Mail* (Via Readex)
[12] The Plague Outbreak (Published March 21st of 1904) in *The Rand Daily Mail* (Via Readex)
[13] The Tuberculosis Commission (Published May 1st of 1912) in *The Rand Daily Mail* (Via Readex)
[14] Syphilis Among the Natives (Published October 10th of 1904) in *The Rand Daily Mail* (Via Readex)
[15] Public Health Act no. 36 of 1919
[16] Local Government Ordinance Bill no. 9 of 1912

for preventing the spread and outbreak of infectious diseases in both animals and people.

With the establishment of the Public Health Department, Dr Charles Porter became Johannesburg's first medical officer of health and proved to play a vital role in Town planning which not only enforced racial segregation but instilled upper class white British values (Parnell 1993). Porter's role in the Public Health Act as well as his previous involvement in the Housing Act was notable and whilst these laws did focus on the prevention of the spread of infectious diseases, they did more to entrench urban privileges for whites, particularly the English speaking population, above all else (Parnell 1993). Porter viewed racial segregation as key to public health control and targeted slum areas as the main hot spots for disease, most of which were inhabited by the poorer white population and black communities (Parnell 1993).

Porter's role in public health was also important in the establishment of strict racially segregated settlements which paved the way toward the Apartheid era philosophy (Parnell 1993). Porter justified segregation through the use of the Bubonic Plague outbreak and argued that the 'non-white' population of Johannesburg was "particularly susceptible`' to infectious diseases and that their bodies were "incapable" of handling them which identified the need for white isolation away from 'the diseased other' (Parnell 1993). Porter tried to further push his philosophies into mainstream societies with the Unhealthy Areas Bill which focused on the demolition of slum housing but this bill was rejected by parliament (Parnell 1993).

Porter and the Public Health Department aimed at producing a "sanitized" white city which would ultimately make Johannesburg a model white city (Parnell 1993). However, legislations passed focused more on anxieties exacerbated by white city fathers which alienated people of colour from the white race. In turn, laws also did little to benefit members of the white vagrant and working classes who still felt excluded from white upper class society and although the

government was able to instil racial segregation between blue-collar workers, many white labourers and their families still felt alienated form mainstream Johannesburg society and white ruling class values.

2.3. Types of Diseases Investigated

This project will broadly define 'disease' in terms of afflictions which resulted in the admittance of a patient to hospital. The study focuses mainly on the cause of diseases which leads to the understanding of their frequency in certain areas and within certain populations, as well as a greater understanding of societal perceptions of these diseases during this period. Firstly, it is important to note that there are two main lines of evidence within the archaeological and historical disciplines, the first comprises of primary evidence, which as defined by Roberts & Manchester (2005) constitutes the skeletal or mummified remains of an individual. The second is secondary evidence which is the documentary and iconographic Data which is contemporary with the time period being studied and which is the focus of this research (Roberts & Manchester 2005).

In order to understand the far-reaching consequences which diseases have over societies throughout history, it is important to understand morbidity, mortality and survival rates. Firstly, one must comprehend the difference between mortality and morbidity. According to Roberts & Manchester (2005), mortality refers to the cause of death of an individual whereas morbidity refers to the occurrence of a disease within a population. This is of particular importance to the study of early Johannesburg, especially due to the fact that "the process of adjusting to a new environment was inevitable fraught with dangers" (Grob 2002:56). In the past, areas which underwent extreme economic and population growth tended to suffer more harshly from high morbidity and mortality rates and even acute infections remained a major threat, particularly to young children and infants residing in urban or port areas (Grob 2002; Harari 2014; Larsen 2002).

Whilst bacteria and viruses accounted for most deaths in the past, fungi and parasites also caused lethal infections (Roberts & Manchester 2005). Meade &

Emch (2010) further these views, stating that diseases most newly transferred to a human host tend to be most virulent and dangerous. However, if the host does not survive long enough to pass it on both will die (Meade & Emch 2010). The host, as defined by Meade & Emch (2010) is the organism which becomes infected with a disease agent.

Within a given population, there are three subgroups which exist in relation to a certain disease or infection caused by bacteria, viruses, parasites or fungi as outlined by Brown, *et al.* (2010). The first is that of the "susceptibles" who are those who show no immunity to a given disease and are therefore susceptible to contracting it (Brown, *et al.* 2010:115). The second are the "infectives" who are individuals within a population who have been infected by a given disease and have the ability to infect others (Brown, *et al.* 2010:115). Lastly there are what are termed the "immunes" who have acquired immunity through either infection or a vaccine (Brown, *et al.* 2010:115). Brown, *et al.* (2010) states that it is the main goal to increase the number of immunes within a society and therefore decrease those susceptible, thus gaining permanent immunity. In order for a population of any species to survive a hostile invasion from a disease, herd immunity is necessary so that a population can gain what is termed: "permanent immunity" and therefore ensure higher survival rates for the individuals in a population (Brown, *et al.* 2010).

Herd immunity, according to Meade & Emch (2010:353), is the proportion of immunity present within a certain population to prevent "the infectious contact from finding a susceptible host, thereby ending a pandemic" and ensuring the survival of the host species. In early stages, most of a population tends to be susceptible where the numbers of those infected will peak and then begin to decline (Brown, *et al.* 2010). The number of infections will decline as people either die or recover (Brown, *et al.* 2010). However, it is important to note that for a pandemic or epidemic to burn out, the number of those susceptible to the illness does not necessarily have to be zero (Brown, *et al.* 2010).

The notion of 'disease ecology' is important in the investigation and understanding of diseases within a given population (Brown, *et al.* 2010). According to Brown, *et al.* (2010), disease ecology considers the environments as well as the population and cultures in the explanation of disease occurrence in certain geographical spaces. This means that the geographic distribution of disease is "neither random nor uniform" and instead, diseases vary spatially (Brown, *et al.* 2010:81). The disease ecology framework, in its most basic form, argues that any disease can be attributed to three main causal factors: environment; population/genetics and behaviour (Brown, *et al.* 2010:81; Meade & Emch 2010). The environment, also sometimes referred to as "the habitat", is the geographical space in which people live which directly affects them (Meade & Emch 2010). Population/Genetics accounts for humans as biological organisms who are potential hosts for disease and is related to factors such as demographics; genetic susceptibility or resistance; immunological or nutritional status and immediate physical status (Meade & Emch 2010:30). Lastly, behaviour is the observable aspect of human culture and is born from cultural perceptions; economic constraints; social norms and individual psychology (Meade & Emch 2010:30).

A disease agent is either able to produce immunity or kills its host and is thus an agent of evolution (Meade & Emch 2010). Disease agents are present within certain environments which prove beneficial to their survival (Meade & Emch 2010). As a result, the concept of 'neighbourhood health' is important as it shows the way in which people plan and build their immediate environment which has an influence over their health and demonstrates that living in certain areas may present hazards which endanger them (Meade & Emch 2010; Janzen 2002). However, Meade & Emch (2010:351) also argue that the movement of peoples, animals and their products is the more "usual" explanation for the prevalence of certain diseases in a specific location.

The diffusion of infectious disease thus moves both through populations and over geographical space (Meade & Emch 2010). Brown, *et al.* (2010) furthers this idea

by stating that the location and condition of one's immediate environment can also be considered another dimension of the social environment which determines disease risk in an individual. Spatial diffusion theory is therefore vital in understanding the mobility of disease. Spatial diffusion theory studies the movements of goods, peoples and innovations or ideas and when applied to disease it can help in describing how, where and when the spread of infectious diseases can or does occur (Brown, *et al.* 2010). Disease occurrence and distribution over geographical space can therefore be perceived in two ways, as argued by Brown, *et al.* (2010). They can either be where cases (or infected individuals) are found or the location where they occur, illustrating potential hazards which cause illness (Brown, *et al.* 2010).

The initial portrayal of British colonies and dominions was mainly that of a "health utopia" in order to encourage immigration within British power domains rather than without (Grob 2002:77). However, Britain failed to recognize the role of biocultural factors in the spread of diseases (Grob 2002). The biocultural perspectives of disease are outlined by Roberts & Manchester (2005) as being determining factors in disease prevalence in certain areas and include factors such as the movement of people; climate and weather (since some diseases tend to favour certain geographical locations such as the case with Malaria, it is also dependent on an individual's ability to adapt to these environments); diet and economy (such as population intensity and contact with animals); living environment; occupation and treatment accessibility. However, Meade & Emch (2010:137) refute the importance which Roberts & Manchester (2005) award to the role of movement, stating that the argument is limited as some diseases are still restricted to their 'realm of evolution', despite advances in human transport and mobility. Meade & Emch (2010:139) do however support the significance of diet and economy in their role of disease prevalence by arguing that "one of the most profound human influences on the earth has been ecological simplification" since closer contact with animals and a less varied diet in agricultural communities has increased the number of health risks which 'modern' societies are faced with.

Urbanization, as evident with Johannesburg, meant crowded housing, contaminated water supplies and unhygienic living conditions became significant in the spread and contraction of deadly infectious diseases (Grob 2002). Of these environmental factors, housing is normally the easiest to understand since the poor normally inhabit overcrowded; unhygienic; badly ventilated dwellings where disease often flourishes (Meade & Emch 2010). Thus, urbanized areas, particularly that of the poor became "nurseries of infection" where disease such as Plague, TB and Smallpox were only some of the life-threatening diseases to have originated in slum districts (Parnell 2003:631; Grob 2002). Grob (2002) argues that children and infants raised in urban environments, such as Johannesburg, were at greater risk if dying compared to their rural counterparts which resulted in low life expectancy for those raised in urban environments compared to those of the countryside.

Crowded and urban industrialized settlements such as those conducive to the Industrial Revolution (both in Europe and abroad) became one of the most dangerous environments for a child to grow up in (Grob 2002). Early industrialized Northern Europe saw frequent instances of nutritional and vitamin deficiencies such as Rickets and Scurvy caused by lack of food, overcrowding and air pollution (Lewis 2002). Parts of Northern Europe also saw high incidences of trauma and injury as well as poor physical development in children due to child labour where children came to work in hazardous environments such as in factories and mines (Kirby 2010). Apart from the immediate implications of childhood during the industrial revolution, polluted water sources and unsanitary work and living condition often lead to the spread of infectious diseases which children were most susceptible to and which included Typhoid Fever, Cholera and TB (Kirby 2013).

Infectious diseases, such as the above, are among the most problematic associated with an increase in population size and urbanization. Larsen (2002:123) as well as Callinicos (1985) argue "the origin of infectious diseases present in the world

today and in the recent human past can be traced to the time the population became large enough to sustain pathogenic organisms that are responsible for their spread" thus making infectious diseases commonly known as "crowd diseases". A pathogen is defined as an infectious disease which arises when a host organism is colonized by a foreign species which carries the diseases and thereafter seeks to utilize the host's resources to support itself (Brown, *et al.* 2010). A pathogen will thereafter result in the impaired functioning of the host organism (Brown, *et al.* 2010).

Diseases may also flourish in environments which they have been newly introduced to. Even though most diseases tend to be restricted to their realm of evolution, the introduction of diseases to similar environments with the mobility of peoples results in the greater spread of the pathogen as well as the introduction of these pathogens into new populations and environments (Brown, *et al.* 2010; Meade & Emch 2010). Infections thus spread with people, vectors (the agents or carriers of disease) and pathogens (Meade & Emch 2010; Brown, *et al.* 2010). Roberts & Manchester (2005) state that there have been three specific infections which have plagued populations throughout history of which include TB, Leprosy and Treponemal disease. Whilst this study shows no evidence of Leprosy cases, TB and Treponemal disease do occur in the study sample.

Like the given environment, age and sex are important in the contraction and maintenance of certain diseases and thus demographics (population/genetics) cannot be ignored (Roberts & Manchester 2005; Meade & Emch 2010; Brown, *et al.* 2010). This is due to the fact that age and sex may impact a person's susceptibility to a given disease or illness (Meade & Emch 2010; Brown, *et al.* 2010). For example, a child is more at risk of dying from Whooping Cough (Pertussis) than an adult and cervical cancer can only be life-threatening to those possessing female genitalia. In addition, race is a demographic factor which is relevant only to a certain degree. Meade & Emch (2010:292) argue that as a genetic classification system, race has a limited relevance to disease aetiology (the cause of disease) and is "not biologically accurate". However, this is not to say

that genetic lineages do not play a role in the prevalence of diseases as some diseases can be linked to specific geographically related groups and populations, as is the case with Sickle-Cell Anaemia (Meade & Emch 2010).

Due to the link present between economic status and disease in Johannesburg however, race play a pertinent role within this population. Rapid urbanization and a racially engineered wealth gap created in the midst of an industrial revolution created the perfect breeding ground for disease, from which the black population and white working class were therefore most vulnerable to.

Meade & Emch (2010) further this notion by arguing that many diseases seen to occur more frequently among the poor rather than the affluent due to numerous factors. This is mainly a result "a socio-pathological complex" consisting of stress; lifestyle; diet; housing; access to healthcare and education; pollution and sanitation (Meade & Emch 2010:289). Therefore, the behaviour aspect of the disease ecology framework is directly linked to both environment/habitat as well as genetics/population.

Therefore, an individual's risk and exposure to certain infectious diseases ultimately varies with social context (Brown, *et al.* 2010). According to Brown, *et al.* (2010), this includes sexual contact and other social behaviour, not only genetic factors. Power dynamics are mediators of health and disease and may be directly tied to factors of the social environment such as income, gender, culture and education (Brown, *et al.* 2010). Poverty is also most commonly linked to factors such as poor nutrition, pollution and lack of access to proper sanitation which accounts for the prevalence of infectious disease amongst the poor (Brown, *et al.* 2010).

Similarly to infectious disease prevalence, the behavioural aspects of disease ecology can be tied to the occurrence and prevalence of trauma and injury as well as abuse within a population (Lewis 2002; Brown, *et al.* 2010; Meade & Emch 2010). However, the ability to distinguish between accidental trauma and cases of

abuse can be difficult to identify in the historical and archaeological records (Lewis 2002). Lewis (2002) illustrates that cases of child abuse can often be complicated as child abuse results from a complex combination of socio-cultural factors such as poverty, social status, as well as substance abuse. She argues that urbanization and industrialization provide a great social divide within society, thus increasing the frequency of abuse cases toward children (Lewis 2002). She also stresses the importance of investigating cases of abuse in the archaeological record in order to better understand the past (Lewis 2002).

The history of disease in South Africa is complicated, given its inherent ties with the political history of the country. There are five main diseases throughout South Africa's history which have had the most devastating effect on its population. These diseases include: Small Pox (1713-1893); Plague (1901-1907); The Spanish Influenza (1917-1918); Polio (1918-1963) and finally, HIV/AIDS (1982-Current) (Phillips 2012a). The Act of Union in 1910 meant that each governing body was responsible for the health care of its population thus, each province operated independently which largely ignored the notion of public health (Phillips 2012a). As discussed prior, it was only until the outbreak of the Spanish flu that a Union Department of Public Health was established (Phillips 2012a).

Due to the fragility of the economy within the newly established Union of South Africa, early medical intervention in public health focused on the healthcare of male workers as they ensured the functioning of the country's economy which became most evident in the Rand (Digby 2008). However, this meant that public health attempted to find direct links of contagious diseases to the black population as many diseases found to be of concern were suffered by miners, majority of whom were black men (Digby 2008). Medical professionals began to investigate possible racial susceptibilities to diseases such as TB and Silicosis which were contracted mainly through work in mines but have no race-based prejudice genetically (Digby 2008). Medical Doctors thus seemed to serve the interest of politics rather than the wellbeing of their patients, which led to considerable

compromises in the treatment of patients in order to ensure the continuing functioning of the Rand's economy (Digby 2008).

Public medical interventions not only focused on industrial diseases such as those commonly suffered by miners but contagious diseases, of which STI's were of major concern (Digby 2008). Even before the official establishment of a public health department, the government had established the Contagious Disease Act[17] which enforced by law the treatment of black sufferers and sometimes even their imprisonment to contain the spread (Digby 2008). In this way, diseases such as Syphilis became a largely 'black disease' (Digby 2008).

Similarly, Western medicine was hostile and problematic toward sufferers of leprosy, it became a disease associated with poverty and 'blackness' which led to a social stigma surrounding white sufferers and thus often white leper victims would leave their illness untreated (Digby 2008). Mental illness also gained attention in the public domain and became heavily race-based (Digby 2008). Mainly white individuals were admitted to asylums which does not suggest the absence of mental illness in black individuals but rather, that medical professionals viewed mental illness in white patients as "treatable" where in black individuals, abnormal mental wellbeing was largely ignored (Digby 2008). The attitudes by medical doctors toward mental illness in the black community during this period were heavily seated in popular discourse of the time which dictated black African behaviour to be "violent" and "inherently problematic" (Digby 2008).

In a study of the health of people inhabiting the mining town of Kimberley in the Northern Cape in South Africa, it was found that infectious diseases flourished during the pre-antibiotic era, especially due to harsh living conditions (Van Der Merwe, *et al.* 2010). The pre-antibiotic era occurred in the early 1900's when there were no medicines available against common germs (Aminov 2010). Although Penicillin (the first antibiotic) was discovered in 1928 by Alexander

[17] Contagious Disease Act of 1885

Fleming, it was not until the early 1940's that Penicillin came into clinical use (Aminov 2010; Bryson 2019).

Van Der Merwe, *et al.* (2010) analysed the health status and diseases within the 19th Century mining community of Kimberley and whilst the study makes use of primary evidence and focuses more on young adults under the age of 30, strong parallels can be drawn with this project. Within a study sample of 86 males and 15 females, it was found that there was a high incidence of Treponemal disease, Scurvy, Osteomyelitis, dental disease as well as trauma and injury (Van Der Merwe, *et al.* 2010). Van Der Merwe, *et al.* (2010) was able to conclude that these diseases were mainly due to factors associated with the individuals socio-economic status which was categorized by poor diet; poor living conditions; little to no access to healthcare as well as high levels of interpersonal violence and occupational injuries which were associated with mining. The occurrences of interpersonal violence was also linked to leisure activities such as drinking, gambling and prostitution (Van Der Merwe, *et al.* 2010). This shows how conditions for disease diffusion within society thus has to do with complex ecological circumstances; human mobility and behaviour; socio-economic conditions; poverty; urbanization as well as climate and weather (Brown, *et al.* 2010:123).

Van Der Merwe, *et al.*'s (2010) study does however caution the use of historical documentation, stating that it is often imprecise in its description and characterization of certain diseases and explains that disease in antiquity may have presented differently to how it is observed today. It can be argued that due to taphonomic factors associated with burial however, similar biases may occur when analysing a skeleton by misdiagnosing a disease on skeletal remains.

In conclusion, this chapter has outlined integral events which took place in the 1920's which influenced the spread and prevalence of diseases in early Johannesburg. It also gives insight into the diseases which are present within the study sample and their role in developing urban and industrial centres. With the

review and assistance of Medical and Health Geography and how diseases can and should be mapped, the section to follow will provide the methodology employed in this study used to produce results.

CHAPTER 3: METHODS

Chapter two provided an analysis of literature relevant to this study, which included literature pertaining to Medical and Health Geography; the social, political and economic climate of early Johannesburg as well as the types of diseases which this project investigates. The following section provides an overview of the methods used in order to conduct the research for this project. This chapter is divided into six sections and includes an overview of the TCMH medical and surgical records; the raw Data recording process; an overview of the historical maps used for the mapping process; the mapping process; the identification of trends within spatial Data and the use of historical sources such as newspapers throughout this thesis. The chapter also briefly outlines the limitations associated with this study.

3.1. The Transvaal Children's Memorial Hospital's Medical and Surgical Records:

The archives from which this project draws its primary Data are the medical and surgical records of the TCMH. It is important to note that these archives from the hospital consist of the patient records from its opening in 1923 until 1925. The thesis focuses specifically on these three consecutive years because these are the only preserved records from TCMH that are known of. Apart from the records being left relatively unstudied, they are believed to be complete because a great deal of attention was given to binding the records together according to affliction and to preserving the date order. The archives are situated within the Adler Museum of Medicine located on the University of the Witwatersrand's medical campus and access was granted by head curator of the museum.

As seen below (Figure 3.1), the resident doctors of the TCMH were provided with a standard form in which they, or the nurses on call, recorded the important information pertaining to the patient's identity; their date of admittance; their date of discharge (or in this case death) as well as the diagnosis given by the doctor. The doctor also provided additional notes on the patient's family history as well

as their physical and mental state upon admission. All the provided information proved useful in the recording of Data for this project.

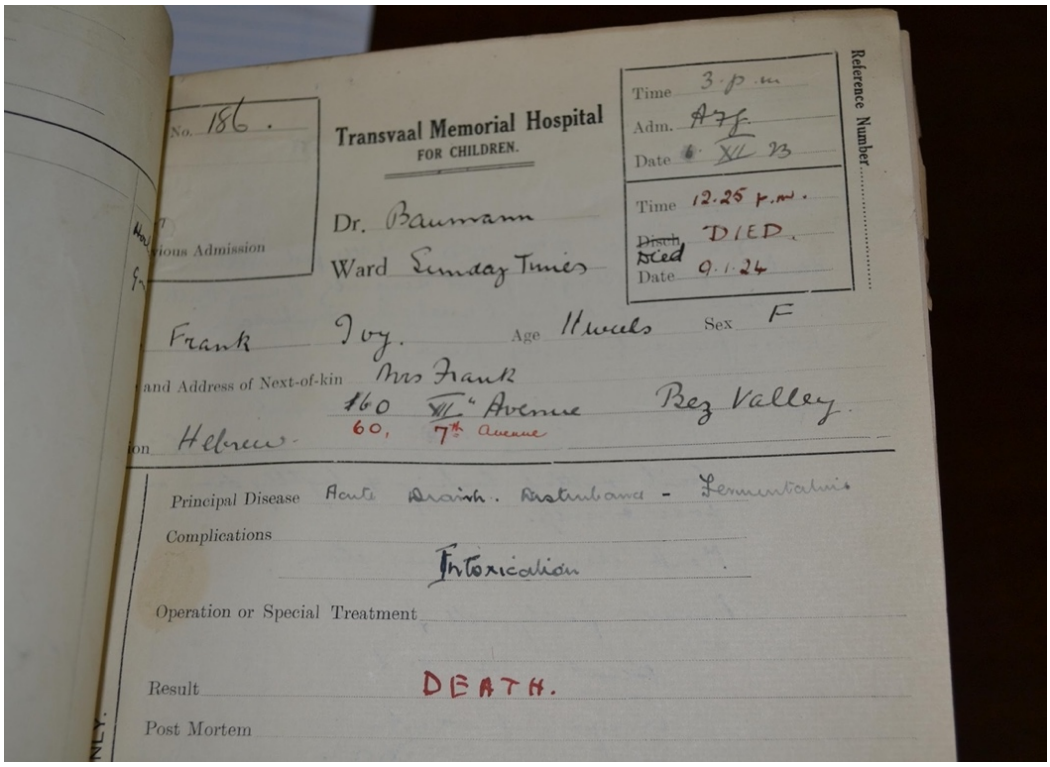


Figure 3.1: An example of the patient records found within the hospital's medical and surgery records

3.2. The Raw Data Recording Process:

I first conducted archival work by deciding what Data would be relevant to this study and recorded the information provided by the archives onto a Data spreadsheet in Excel[18]. All the patients within the archives who were admitted between 1923 and 1925 were recorded in order to provide a proxy of areas most affected by death as well as specific diseases and in order to determine the most significant or common afflictions (a total of 995 patients recorded). Table 3.1

[18] It should be noted that the names of patients and any other matters pertaining to their identity are not disclosed in this project and the recording of such Data was only done in order to attain demographic information vital to this study. Although ethics clearance did not provide a time frame in which this Data should be destroyed, the Data will be destroyed after the completion of this research.

provides insight into how the Data extracted from the archives was recorded in Excel. Excel was used as it provided an easy and accessible way to store Data and create multiple categories which enabled the manipulation of said Data. It is important to note that patients were only recorded as "free/non-paying patients" in Excel if documentation was provided in order to prove their inability to pay for their hospital bills. If this documentation was not provided, it was assumed that the patient was a paying patient.

It is important to draw attention to Appendix A and B as this Data was compiled during the time that the raw Data extraction from the archival records took place. Due to the spatial dimension of this project, Data was extracted according to area and thus a profile of Johannesburg's residential areas was created which proved crucial in the interpretation of results. Appendix A provides a comprehensive list and overview of the suburbs of Johannesburg from which patients of the records resided. The table includes the suburb's date of establishment; a brief historical and demographic background of each area as well as their approximate distance from the city centre and thus TCMH.

Diseases were also extracted from the archival records and a comprehensive list of diseases/ailments within the medical and surgical records was created and can be seen in Appendix B. Appendix B thus provides a detailed list of disease and ailments which this study focuses on. These afflictions have been given a general overview; a general list of symptoms as well as insight into their causal factors and vectors which allow for a better understanding of their contraction; spread and the susceptibility of their victims.

Table 3.1: Table showing the archival Data recorded on the Excel spreadsheet

Data Recorded:	Example:	Explanation:
Date of Admission	04/02/1924	Provides information pertaining to when an outbreak occurred in a certain area.
Date of Discharge	08/02/1924	Shows whether the patient was cured of their ailment and discharged from the hospital.

Transferred?	Yes, to Rietfontein Hospital	Shows whether a patient was transferred to a different hospital/institution for special treatment or recovery.
Died?	No	Provides information with regards to mortality rates within the hospital population.
Diagnosis	Broken Bone	Records the diagnosis of the patient as given by the resident doctor.
Detail of Diagnosis	Femur	Provides detail of injury or diseases location or severity.
Sex	F (Female)	Provides demographic information showing possible susceptibility to a disease by a certain sex.
Age (Years)	9	Provides demographic information showing possible susceptibility to a disease for a certain age group.
Name (Surname)	BOTHA	Provides demographic information to which white ethnic groups were living where.
Religion	Dutch Reformed Church	Provides demographic information of hospital population and indicates the intermingling in certain areas of different religious/ethnic groups.
Street Address	17 First Street	Provides information pertaining to where an outbreak occurred or where certain diseases were prevalent as well as the demographics of the area.
Residential Area/Suburb	Orange Grove	
Free Patient?	Yes, pauper	Provides demographic information pertaining to the patient's socio-economic background.
Family History?	Father has TB, siblings died from Malaria	Provides information of previous illnesses or deaths in the family which are medically relevant.
On Admission (physical or mental state of the patient)	Child Malnourished	Records comments made by resident doctor of patients' physical or mental state at time of admission.

Previous Illnesses	Measles, Chicken Pox	Records diseases which the patient has previously suffered from.
Complications?	Yes, TB	Provides information of any complications which occurred hindering the patient's healing or recovery.
Operations	Appendix Removed	Records operations which the patient has undergone during their admission or in the past.

3.3. The Historical Maps Used for the Mapping Process

It is important to understand that the absence of certain diseases, or patients from certain areas of settlement is of equal importance as the presence of these aspects within the Dataset. For example, the absence of patients from certain residential areas of the maps such as the Northern suburbs of Johannesburg is important. It is also significant to acknowledge the prevalence of certain diseases over others. There is a high prevalence of cases such as Typhoid/Enteric Fever throughout the city yet only one case of rape and few reported cases of STI's.

There is a distinct separation between the northern and Southern suburbs of the city due to the natural border created by the mining belt. Although mining properties are placed far away from upper class suburbs and congregated along the mining belt, settlements for miners are places within mining properties or within close proximity to them with transport routes meant that their place of work was easily accessible and often being fed water by the reservoirs which mines were using after securing the rights to them. However, many of the water sources flow through mining properties into the city centre and more populated areas, with only a few upper class white suburbs having access to their own water sources. This shows that most areas were therefore receiving water from the same limited supply of water reservoirs. Most of the land within Johannesburg during the town's early years were reserved for white settlement with only a few areas covering a small area set aside for 'native' settlement.

Figures 3.2. and 3.3. show the details of the historical maps used as overlays for this project when enlarged. Figure 3.2. shows not only water sources but

ownership claims of mining properties to both land and water. As can be seen on the map, forms of settlement have been established on mining land for mine labourers and although the map does show some suburbs it do so only of suburbs neighbouring or within mining territory and does not provide great detail of inner city suburbs. The map also shows the C.S.A. railway which gives insight into the movement of both goods and people.

Figure 3.3. shows not only settlements but major landmarks such as the Turffontein race course and Braamfontein cemetery which are still located in the same positions today and remain important historical landmarks. It also shows roads as well as the year in which each suburb was established. It shows the mining belt which separates the Northern and Southern suburbs and also illustrates the distance of these suburbs from the centre of Johannesburg. It also displays the locations of 'native' and 'non-white' settlements. Since each map does not provide all this information separately, the two maps were used in combination in order to ensure more information which could be utilized in the interpretation and analysis of the spatial distribution of diseases in this project.

It should be noted that the use of two historical maps was also necessary due to their differing dates. Due to the difficulty associated with finding maps contemporaneous of the time period of the archival records, the use of maps created both before and after this time could be used in order to establish what suburbs and amenities were accessible to the hospital's patients and families. The historical maps used were both accessed through the University of Witwatersrand's online historical archives.

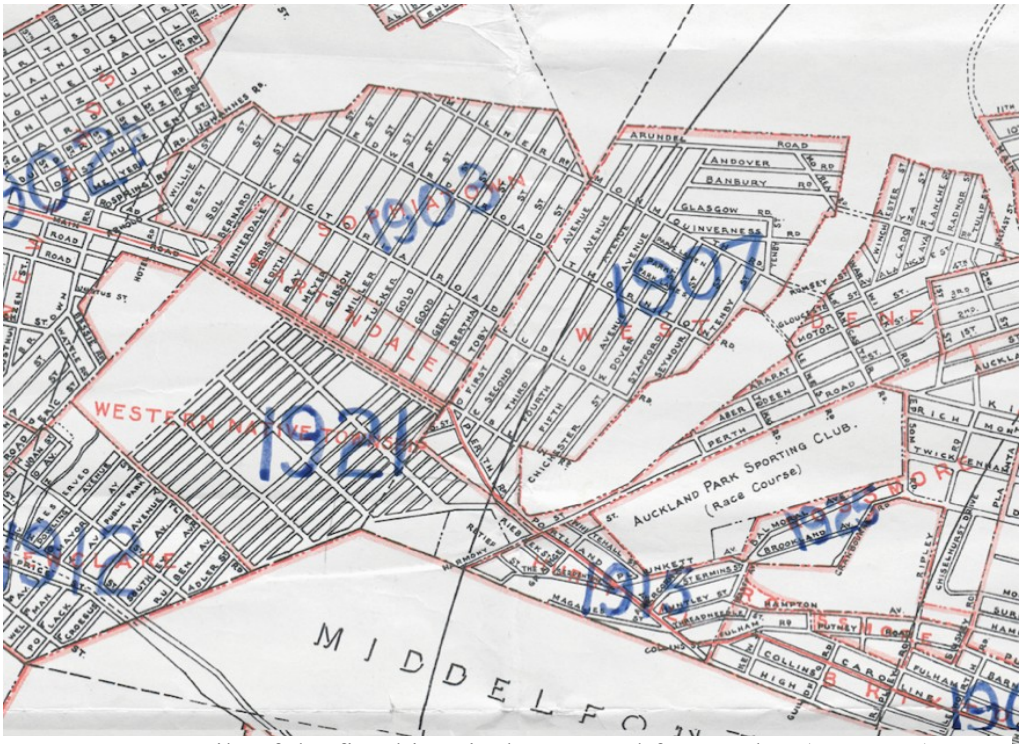


Figure 3.2: Details of the first historical map used for overlay (1:30 700) (Source: Consolidated Gold Field of South Africa, Ltd. 1903

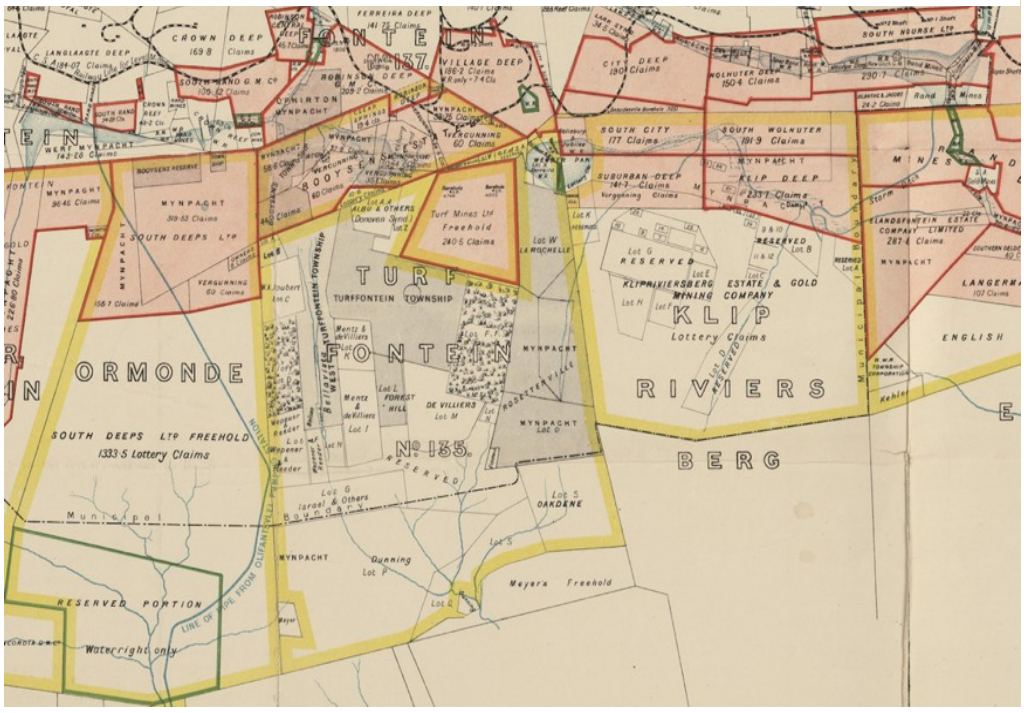


Figure 3.3: Details of the second historical map used for overlay (1:14 500) (Source: Waugh 1927)

3.4. The Mapping Process

Once all the information was recorded onto Excel, I was able to separate out and extract information useful for understanding the socio-economic circumstances of the white population of Johannesburg during this period as well as the spatial distribution of diseases/afflictions most prevalent in this demographic group through the assistance of literature on disease mapping associated with Medical and Health Geography. Five main categories were created in order to group afflictions and diseases and are as follows: Sexually Transmitted Infections (STI's); Diet Related Illnesses; Respiratory Related Illnesses; Cases of Improper Care/Neglect; Trauma/Injury.

Each category was then mapped on each of the two historical maps with a different symbol given to each disease/affliction type (see table 3.3. for the Master Key). The categorization process of different diseases/afflictions can be seen in table 3.2. It is important to acknowledge that the resident doctors may, in some case, have misdiagnosed patients such as can often be seen in cases such as with Typhoid/Enteric fever where patients can be misdiagnosed with a symptom, such as diarrhoea, rather than the principal illness. This is why the categorization process was important. I also chose to plot deaths and free patients on separate maps. I added pins for important locations, such as hospitals and orphanages which were added to every map. Mapping the patients spatially was important as it provided a representation of the Data collected and also allowed for spatial trends of diseases to be more apparent than if the Data was only provided on an Excel spreadsheet. A total of 548 patients were mapped.

Table 3.2: Table showing the categorization of diseases/afflictions mapped and the reason for their inclusion in the mapping process

Category	Diseases Included	Reason for Inclusion
Important Locations		Provides insight into the patient preference of health care facilities as well as outbreaks in certain orphanages/children's homes
Deaths		Provides informationinto which areas are experiencing the highest mortality rates.

Free Patients		Provides information into the socio-economic backgroundof certain areas.
Sexually Transmitted Infections (STI's)	Syphilis, Gonorrhea	Provides information regarding sexual healthas well as what socio- economic class is mostaffected by these diseases perceived to be associated with individuals of a lower social standing.
Diet Related Illnesses	Diarrheal Disturbance, Enteritis, Constipation, Dysentery, Tapeworm, Vomiting, Nutritional Disturbance, Typhoid/Enteric Fever	Provides informationfor areas receiving contaminated food orwater.
Respiratory RelatedIllnesses	Pneumonia, Bronchopneumonia, Bronchitis, Tuberculosis (TB), Whooping Cough, Rhinitis (Colds), Influenza,Chronic Obstructive Pulmonary Disease	Provides information pertaining to the spread of infectious diseases and indicatespolluted areas (from mine dumps or industrialized areas).
Cases of Neglect/ImproperCare	Chronic Malnutrition, SkinIrritations and Infections (Cellulitis, Dermatitis, Impetigo), Rotten Teeth (Caries), Neglect, Improper Care, Septicaemia, Poor Hygiene	Indicates the socio- economic backgroundof the patients as wellas possible cases of child abuse.
Trauma/Injury	Burns, Broken Bones, Injuries, Dislocations, Sprains, Poisoning, Rape,Contusions, Epiphyseal Separation, Foreign Bodies	May provide an indication of cases of possible child abuse ordangerous living environment.

The mapping process utilized point Data which allowed for the better understand of densities of particular diseases in certain areas such as that used by Snow (1855) to establish the frequency and occurrence of Cholera in the residential areas of London (Brown, *et al.* 2010; Meade & Emch 2010). One pin represented one patient and although the family history was recorded on Excel, this Data was

not plotted as the project aimed to show a snapshot in time rather than to track family or personal health trajectories.

Instead, this Data was used in order to understand the socio-economic background of certain residential areas and ethnic groups. If a patient received multiple diagnoses of relevance to this study, each diagnoses was mapped separately due to the fact that maps were separated out into different disease categories as discussed above. This means that if a patient with Typhoid/Enteric Fever also had a broken leg, they were mapped both on the Diet Related Illness map as well as the Trauma/Injury map as these illnesses do not fall into the same category.

I then plotted the disease onto Google Earth Pro by corresponding the patient's residential address or suburb (if a street address/residential area or their diagnosed disease was not provided they were excluded from the mapping process). Since most street names and areas have not had their names changes this was a relatively easy task to undertake. In the case of street names having changed, Google Earth Pro would often recognize old street names and still allow for accurate mapping. Google Earth Pro was chosen as a preferred GIS system due to the fact it was easy to use and provides the most extensive and comprehensive collection of geospatial Data readily available in the public domain. I aimed to keep the study area fairly small, within a radius of ±16km from the city centre. This is because some patients were from areas as distant as Pretoria and this project aimed to trach the occurrence of certain diseases in Johannesburg's immediate suburbs and surroundings.

However, because maps contain different Data, the choice to make use of a single map may have led to a biased interpretation when analysing spatially distributed Data (Meade & Emch 2010; Brown, *et al.* 2010). This is because maps are created in order to fulfil certain functions such as to show topography; river systems; services supplied to a certain area; etc. (Meade & Emch 2010; Brown, *et al.* 2010). It is rare that a single map will offer all the features that would be relevant to this study or that a modern map would remain identical to one of the period. As

a results, two maps of the period were overlayed onto Google Earth Pro, one which showed suburban settlement which provided insight into how certain illnesses may target different socio-economic classes (Town Council Map of Johannesburg) and the other which showed mining locations and water sources, specifically important for contagious disease spread through contaminated water supplies and respiratory diseases caused through contact in mines/air pollution (Plan of Central Section of the Witwatersrand). Both maps can be seen in Appendix D and E.

It is important to acknowledge that the maps used for the overlay aspect of this project may be limiting in the fact that both were made in order to fulfil certain functions which is why the overlay is important for this project and allowed for the combining of certain Data to lead to more reliable interpretations. Since the maps were not made during the time period of this particular study, these maps may not be completely accurate to the time frame of interest and thus may vary slightly to the landscape of the period in question.

Google Earth Pro presented difficulty in the generation of maps and images and lost its interactive aspects which did not allow for high resolution analysis and instead, generated maps which proved difficult to read. I then decided to print out the historical maps which were originally used for overlay and manually plot the points with reference and aid of the plotted points on Google Earth Pro. However, it should be noted that this process did result in a slight loss of accuracy as street names were not fully visible on the historical maps or were absent altogether. I was then able to scan the maps back into a digital format which allowed for higher resolution maps which made them easier to read and interpret.

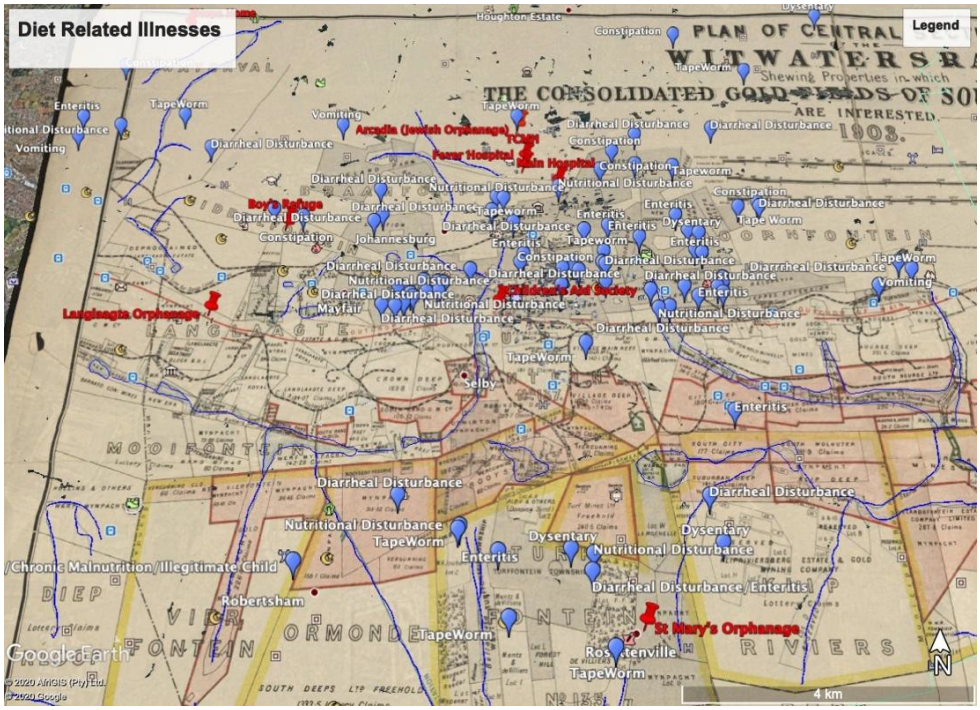


Figure 3.4: An example of an illegible map generated from Google Earth Pro

Table 3.3: The master key used to plot afflictions, diseases and other important Data on the historical maps manually (with one symbol= one patient)

Place of Interest:	Disease/Affliction:	Symbol:
Langlaagte Orphanage		1 ★
Johannesburg Main Hospital		2 ★
Transvaal Children's Memorial Hospital (TCMH)		3 ★
Fever Hospital		4 ★
Children's Aid Society		5 ★
Salvation Army Orphanage		6 ★
Rietfontein Hospital		7 ★
Boy's Refuge, Brixton		8 ★
Arcadia Jewish Orphanage		9 ★
St Mary's Orphanage		10 ★

Hope Home		11 
	Contusion	**C**
	Dislocation	**D**
	Epiphyseal Separation	**S**
	Foreign Body	**F**
	Head Injury	
	Eye Injury	**E**
	Rape	**R**
	Poisoning	
	Broken Bone	>
	Burn	
	Free Patient	
	Death	
	Nutritional Disturbance	
	Diarrhoea/Diarrheal Disturbance	
	Enteritis	
	Dysentery	
	Constipation/Chronic Constipation	
	Tape Worm	
	Vomiting/Cyclical Vomiting	

	Typhoid/Enteric Fever	
	Syphilis	
	Gonorrhoea	
	Child Adopted	**C.A.**
	Child Illegitimate	**C.I.**
	Influenza	
	Bronchitis	
	Chronic Obstructive Pulmonary Disease	
	Bronchopneumonia	
	Pneumonia	
	Tuberculosis (TB)	
	Whooping Cough/Pertussis	
	Bad Cold/Rhinitis	
	Dermatitis/Eczema	
	Cellulitis/Skin Infection	
	Impetigo	
	Chronic Malnutrition	
	Neglected/Improper Care	
	Septicaemia	
	Child Dirty/Poor Hygiene	
	Rotten/Infected Teeth (Dental Carries)	

3.5. Identifying Trends within Spatial Data

A trend, presented in either spatial, numerical or qualitative Data, may be identified through a recurring pattern evident in a Dataset. A trend may either be present within a specific time frame or over an extended period. Therefore, trend analysis involves a collection of Data in order to identify recurring patterns within the study sample and therefore make reliable observations of events. When trends are visually represented in terms of mapping, these trends are evident through the aggregation or sparseness of individual plots over a certain area of space and/or time and is therefore known as a spatial trend. The absence of spatial trends can be identified in mapping when there is no pattern occurring within individual plots and instead the mapped phenomenon appears to be spread randomly across the map.

Trend mapping in particular allows for the visual depiction of certain phenomena and the observation of systematic variations within a Dataset (Şen 2017; FSG 2017). It allows for the identification of possible shifts and changes which occur in the Data and for the identification of key factors involved in the frequency and occurrence of certain aggregations and dispersals of plot points on the map (Kjaer 2014). Trend mapping additionally allows for the researcher to place the phenomenon within context both in terms of the landscape and historically (FSG 2017). It allows for an understanding of connections and the relations of aspects of influence and helps in understanding why such patterns are occurring (FSG 2017). Situating the Data within a broader context allows for the avoidance of misinterpretation of Data and of trends (David 2019).

Trends within spatial Data occur due to factors present within a given environment which have an influence over the occurrence and prevalence of the Data which is being investigated in a certain area. In terms of disease mapping, environmental, political and social aspects play a role in the occurrence of trends over a spatial area (Washington 2004; Brown, *et al.* 2010; Meade & Emch 2010). In particular, disease trends may appear when a vector of said disease is present within a certain area (Washington 2004; Brown, *et al.* 2010; Meade & Emch

2010). This is often seen with Cholera where trends can appear on a map when areas sharing a single contaminated water source become infected with the disease which can be exacerbated in lower income areas where residents have little to no access to health care or education on the subject matter (Snow 1855; Meade & Emch 2010; Brown, *et al.* 2010; Washington 2004).

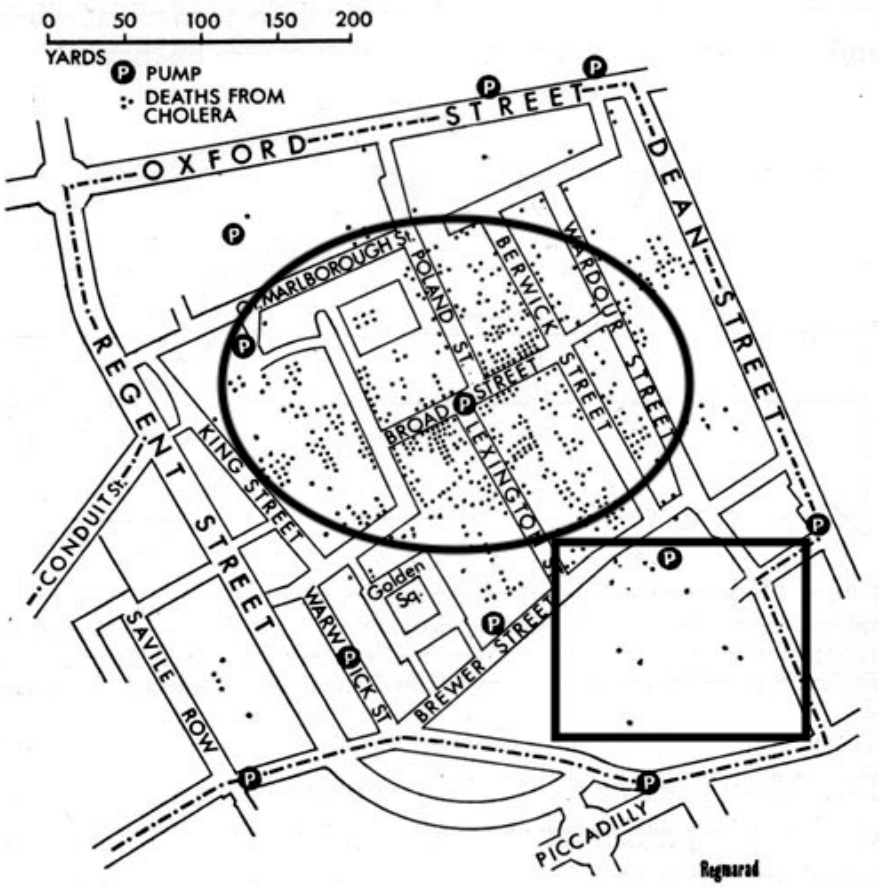


Figure 3.5: An example of spatial trends evident in mapping with the circled area representing aggregation of points within a certain region thus showing a spatial trend and the area within the square illustrating more dispersed points and therefore no clear evidence of a spatial trend (Source: Snow 1855)

3.6. The Use of Historical Newspaper Sources

In order to understand both the socio-political and economic climate of Johannesburg as well as the produced results, it was important to employ historical sources such as newspapers of the period. Newspapers written in the 1920s reflect the attitudes of sectors of the society. Although they may present

biases and present the views of the political elite which can make them an unreliable source. This was of interest to this project because it reflected common perceptions perpetuated by the white-owned media of this period. These perceptions included gender societal norms; links between race/class to disease; common medical perceptions, as well as information regarding town and city planning involved in the newly erected suburbs of Johannesburg.

The *The Rand Daily Mail* historical archive was researched for this project. Articles were accessed via online digital archives on Readex which has published each issue from the newspaper's establishment in 1902 until its controversial closing in 1985 as a result of the paper's outspoken stance on the Apartheid regime. Although other newspapers existed in Johannesburg during this time, this newspaper was chosen for its popularity during this period, and because it was accessible online and was a complete archive.

The years chosen for newspaper articles ranged from 1904 until 1930. While this study only focusses on the years 1923-1925, I felt it to be important to evaluate media over a longer period of time, acknowledging that no event in history is isolated. The events leading up to this period and directly proceeding it were therefore important in understanding the implications of the results, particularly with regards to the reported outbreak of disease, and how perceptions of disease over the period may not have been supported by the data. One most noteworthy example includes how the white ruling class pushed for 'scientific proof' linking disease with race.



10 RAND DAILY MAIL, JOHANNESBURG, SATURDAY, FEBRUARY 15, 1913.

A Lay Preacher

Brain Fag, Nervous Exhaustion—

Just a *change of opinion* was enough to give Mr. W. King his present prosperity, for he realised in the nick of time that air was not curing his brain fag and nervous exhaustion, so he tried the Fontenne way. Mr. King's method was to ignore his despondency and feeling of collapse, and persuade himself there was nothing unusual in the painful fatigue the lightest effort to work cost him, until, as he stedily *got worse*, he resolved to drop his own opinion and see what Phosferine could do. The result was to astonishingly beneficial, even after a *few* days, that the brain fag and nervous exhaustion ceased entirely, enabling him to do more work than before and yet not feel the strain. This remarkable advantage is seen in the extraordinary energy and vigour of Mr. King's public speaking, and so amazingly have his prospects improved since his

WHAT IS A RACE CARD?

"RAND DAILY MAIL" CASE

SUMMONS DISPUTED

INTERESTING ARGUMENTS

A matter of keen interest to the sporting public was discussed in "E" Court yesterday, when a test case was brought under the Betting Act, in which Mr. G. H. Kingswell, managing director of the Rand Daily Mails, Ltd., was the subject of the charge.

Mr. Lionel Gill was on the Bench; Mr. Whitelaw appeared for the Crown, and Dr. Anders was for Mr. Kingswell. The Court was crowded.

The summons was as follows:—

(1) That he (Mr. Kingswell) did contravene section 4, sub-section (b) of Act 37 of 1909, in that he then and there wrongfully and unlawfully in a place other than a racecourse, to wit, at or near Commissioner Street, Johannesburg, did sell or offer for sale or did circulate a race-card, the said race-card being contained in an issue of the "Rand Daily Mail" newspaper, dated January 2, 1913, in a column headed "Racing News," under the sub-heading "Turf Club."

(2) That on or about January 3, 1913, and at or near Johannesburg, in the district of Johannesburg, he did contravene section 4, sub-section (b) of Act 37 of 1909, in that he then and there wrongfully and unlawfully in a place other than a racecourse, to wit, at or

Mr. A. Duncan, chief publisher of the Central News Agency, gave evidence of the publication of the papers.

Major Henley, secretary of the South African Jockey Club, the controlling body of racing, stated that intimation was received by him of horses running, etc. Witness identified the "Notes and Comments" column in the "Rand Daily Mail," relating to racing matters. Under the sub-heading of "Goldfield: Handicap" there was a list of horses, weights and probable jockeys. Such a race was to be held on the date mentioned, and the information was correct. Some of the horses ran and all were entered to run. Several other races were mentioned and tips were given. Only in the Champion Stakes were the horses mentioned. Otherwise the sporting editor only gave the tips of the other races. All the races mentioned were held in Johannesburg. Witness also gave evidence of the publication on January 3, dealing with the Johannesburg Pony and Galloway meeting to be held the following day. He produced the official race card and checked it. All the races were mentioned except the Final Plate.

Dr. Anders objected to the Prosecutor contending that "Notes and Comments" were a "list."

The Prosecutor urged that the writer had very ingeniously mentioned every horse in his comments.

An examination of the list to check the names revealed the fact that one horse had not been mentioned.

The Prosecutor: It could be sufficient if I proved one race only.

The Magistrate: Quite.

NOTHING LIKE IT

Major Henley next produced a "Mail" of January 2, giving the horses and weights for the Eastern Districts Sporting Club. Mr. Whitelaw put it that this was equivalent to a race card.

Major Henley: Not the slightest resemblance to a race card.

The Prosecutor: It contains the horses and the weights?

Major Henley: Yes.

The Magistrate: Of a race to be run where?

Major Henley and the Prosecutor explained that it was at Benoni.

Major Henley: Oh, yes. The weights, etc., are supplied to owners and trainers, and any member of the public can see an owner or trainer to let him look at the lists.

The Prosecutor: Do you think that the public regard the information in the papers as incorrect?

Major Henley: I don't know what the public think.

The Prosecutor: Surely the public know that the papers get this information from the Jockey Club?

Major Henley: I daresay they do.

The Prosecutor: Have you seen the paper used for its collections in connection with the race-card?

Major Henley: Yes.

The Prosecutor intimated that he required a witness from the Supreme Court who had seen Mr. Kingswell in his office when the latter had made a statement to the effect that he was responsible. The Prosecutor asked Dr. Anders whether this was admitted.

Dr. Anders said he did not admit anything of the kind.

The Magistrate allowed an adjournment of ten minutes in which to get the witness.

"SUMMONS ME!"

On the resumption, Detective J. W. Peck was called by the Prosecutor.

Detective Peck said that he attended the "Daily Mail" office on instructions, saw Mr. Kingswell, and informed him that the Public Prosecutor intended to institute a prosecution for the publication of betting information in the "Mail."

"I asked him," witness continued, "to supply me with the name of the responsible person to be summoned the printer responsible for the publication. Mr. Kingswell said 'summons me; I am responsible.' Then he wrote his name and address on a piece of paper for me.

Dr. Anders: He told you that he was managing director of the Rand Daily Mails, Ltd.?

Witness: Yes.

He did not say anything about being responsible for the "Rand Daily Mail"?

"Yes, he did."

"Did you believe it?"

summons against him. He contended that the description of a person in a criminal summons was not essential. What ever custom might have developed England he knew of no such custom here Whenever they had sued a corporate they had sued the parties or one of the parties. In the cases of limited liability corporations one of the corporation has been proceeded against.

Dr. Anders said that in the course of his argument the Prosecutor had made an important admission. His friend had admitted that Mr. Kingswell was being sued in his personal capacity and not as managing director, and there was absolutely no evidence that in his personal capacity he had sold or circulated the paper. It could not be any stretch of imagination he said that Mr. Kingswell had contravened the Act. Proceeding, he again quoted authorities.

The Magistrate: I should like to look up some further authorities.

The Prosecutor: It is in his personal capacity, because he is managing director of the "Mail." He is sued because he is managing director of the "Mail." If he was not managing director of the "Mail" or he was managing director of the Goldfields, for instance—he would not have been sued.

Dr. Anders contended that that made matters worse still, and that the Prosecutor's remark was inconsistent with the other. There were two things that had to be done. If he was sued in his private capacity then they had to prove that in his private capacity he did certain things. If he was sued in his managerial capacity they had to prove that the corporation did certain things.

The Magistrate said that he would prefer to look up the authorities, and accordingly adjourned the case till ten o'clock today.

OSTRICH FARMING IN EAST AFRICA

The Reuter—S.A. Press Agency

Figure 3.6: An example of a newspaper on the online archive from *The Rand Daily Mail*

It should be noted that the project at hand presents numerous limitations which have all been taken into account and are addressed throughout this thesis but should be restated in the methodology. First, this research consists of a study sample which is made up solely of white children. Although this excludes the investigation of the larger Johannesburg population, the study of this subject group provides a proxy for the larger population, and shows how communicable diseases do not discriminate against race, class, or sex within an age group. Secondly, the investigation of the population of Johannesburg during this period instead of the whole country provides a more nuanced understanding of health and wellbeing of children within this city during its early years of establishment which literature has mostly neglected. The investigation into a vulnerable group such as children will undoubtedly enrich our knowledge of health and wellbeing of the period, not only in Johannesburg and South Africa but across the world with regards to the Industrial era.

This thesis has also chosen to focus only on certain diseases/afflictions rather than on all those present within the patient records. This is because these diseases were directly associated with an individual's race or class according to common perceptions of this era and thus are important to the research question at hand.

Furthermore, archival records, whether they are the patient records themselves; the maps utilized or other contemporaneous sources present inherent prejudices which cannot be considered fully reliable. Historical sources such as these can sometimes be manipulated by their creators whether consciously or subconsciously and thus carry underlying socio-political and economic agendas. However, being aware of these problematic biases has led to a more nuanced and critical evaluation of them and thus a more reliable critique and discussion surrounding them. Furthermore, it is important to acknowledge that as a researcher, my own biases may be present within the compilation and interpretation of this Data and thus the reader should be aware of this.

This section provided insight into how the research for this project was conducted in order to produce results, and provided insight into how Data was collected and mapped. Furthermore, it briefly highlighted the identification of spatial trends as well as how historical sources such as newspapers were utilized. Lastly, this chapter addressed some of the major limitations associated with this study. All aspects employed in the methodology were important in order to provide a more nuanced understanding and interpretation of the Data collected in order to produce reliable results. The chapter to follow provides these results, both from the Data in its raw form and in its mapping, leading to a thorough analysis of both demographic and epidemiological information and patterns.

CHAPTER 4: RESULTS

Thus far, this project has highlighted the academic significance of this project in the introductory chapter which focuses on the need to better understand diseases within the population of Johannesburg during the 1920's. Chapter two situated this thesis within a literary framework and provided a nuanced understanding of Medical and Health Geography and thus how diseases can and should be mapped. This information proved important in the methodology which not only recounted the mapping process but introduced the surgical and medical records form TCMH as well as explored the raw Data collected from the archives. The chapter also evaluated the identification of a spatial trend; other archival sources such as newspapers employed for the understanding of this time period as well as the limitations associated with this study.

This chapter introduces the results produced both from the Data collection process as well as the mapping process from the TCMH from 1923-1925 which will later be discussed. This chapter is divided into two main sections, the first which presents the patient demographic information and the second which is concerned with the diseases and afflictions which are of particular interest to this study.

4.1. The Patient Demographics

4.1.1. Sex

The female to male sex ratio of patients from the TCMH between 1923 and 1925 is fairly equal with a slight imbalance favouring male patients at a discrepancy of 14% (n=141). The leading cause of admission for male patients was Trauma/Injury (27.7% n=157) whereas the leading cause of admission for female patients was Typhoid/Enteric Fever (8.4% n=36).

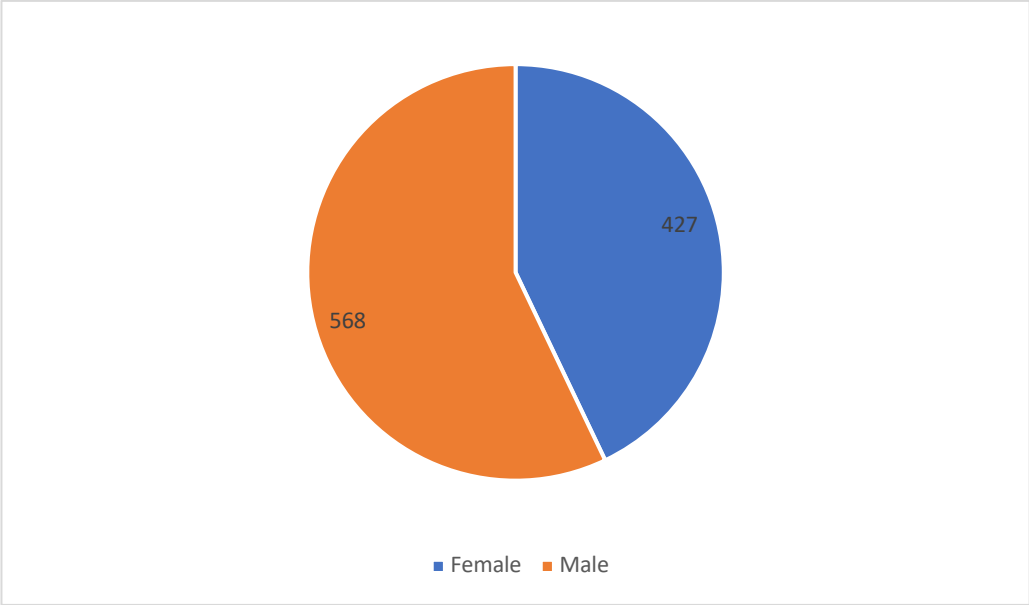


Figure 4.1: Pie chart showing the TCMH patient sex ratio

4.1.2. Age Range

The age range of patients range from new born, with the youngest patient three days old, to the oldest patients who were 14 years of age. The largest age group admitted to the hospital were those younger than two years of age, at 22% (n=226).

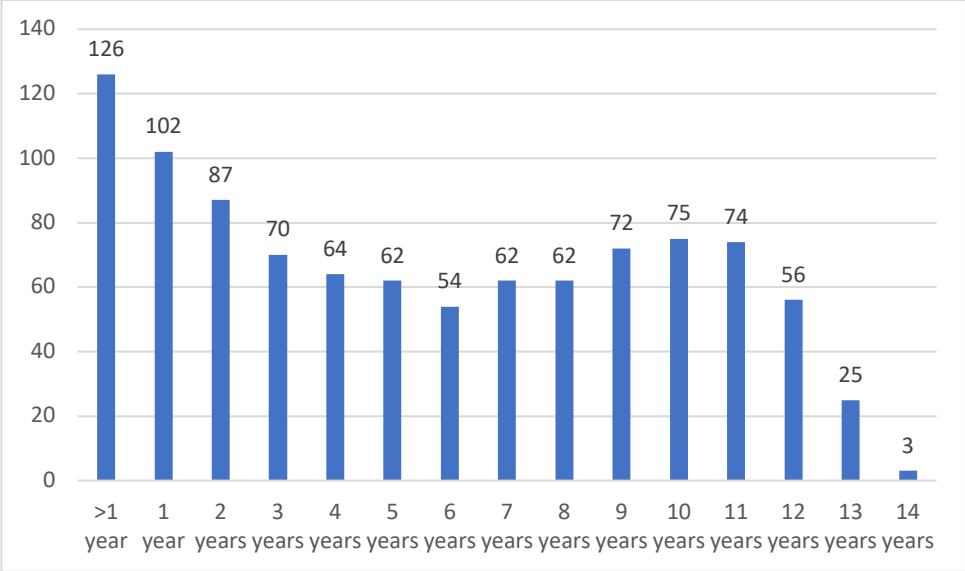


Figure 4.2: Bar graph showing the age and number of TCMH patients admitted from 1923-1925

4.1.3. Mortality Rates

The patient mortality rates at the hospital are fairly low at 8.2% (n=79). However roughly 0.3% (n=3) of patients died subsequently out of hospital as recorded by the doctors. Although there is no clear leading cause of death, a large amount or mortalities was the result of complications caused by Chronic Malnutrition (13.6% n=11); Enteritis (9.9% n=8); Meningitis (13.6% n=11) and TB (7.4% n=6).

Although the mortality rates of patients admitted to the hospital between 1923 and 1925 are spread fairly evenly across both maps, there is a slight aggregation of deaths in areas such as Mayfair, Fordsburg, Kensington and Turffontein mining property as well as the inner city suburbs of Braamfontein, Doornfontein and New Doornfontein showing a pattern of higher mortality rates within the three mile radius of the city centre (as can be seen in Figure 4.5). In contrast, some areas of the maps show either a low mortality rate or a complete absence of deaths such as on mining properties located in Elandsfontein, Vierfontein and Driefontein as well as richer Northern suburbs like Houghton, Waverley, Saxonwold and the Parktowns.

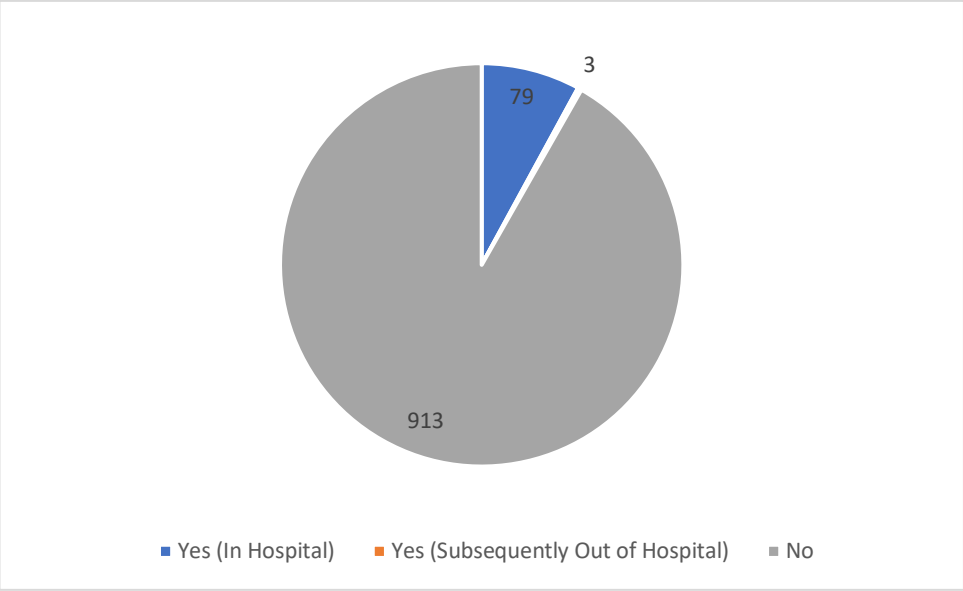


Figure 4.3: Pie chart showing the mortality rates of patients from TCMH

PLAN OF CENTRAL SECTION
OF THE
WITWATERSRAND
Shewing Properties in which
THE CONSOLIDATED GOLD FIELDS OF SOUTH AFRICA, LIMITED
ARE INTERESTED.
1903.

WATERVAL
BRAAMFONTEIN
MIDDELFONTEIN
JOHANNESBURG
DOORNFONTEIN
ELANDSFONTEIN No 142.
DRIEFONTEIN
LANGLAAGTE
MOOIFONTEIN
DIEP
KLOOF
VIERFONTEIN
ORMONDE
TURFFONTEIN
KLIP RIVIERS BERG
OLIFANTSVLEI
RIETVLEI
KLIPPOORTJE

REFERENCE.
Mining Properties in which the Consolidated Gold Fields of South Africa have interests } thus
Floated Mining Properties in which the Consolidated Gold Fields of South Africa have interests } "
Freehold Properties in which the Consolidated Gold Fields of South Africa have interests } "
Water-rights in which the Consolidated Gold Fields of South Africa have interests } "

Figures against Shafts denote depths in Feet at which Reefs were struck.
Railway distances are from Johannesburg, Braamfontein Station.

Compiled by the Survey Department Consolidated Gold Fields of South Africa, Ltd
Copyright.

C.596 (1)

Figure 4.4: Historical mine and water map showing the spatial distribution of deaths (1:30 700) (Source: Consolidated Gold Fields of South Africa, Ltd. 1903)

Key: (1 point=1 patient)

Langlaagte Orphanage- 1 ★ ; Johannesburg Main Hospital- 2 ★ ; Transvaal Children's Memorial Hospital (TCMH)- 3 ★
; Fever Hospital- 4 ★ ; Children's Aid Society- 5 ★ ; Salvation Army Orphanage- 6 ★ ;
Rietfontein Hospital- 7 ★ ; Boy's Refuge, Brixton- 8 ★ ; Arcadia Jewish Orphanage- 9 ★ ;
St Mary's Orphanage- 10 ★ ; Hope Home- 11 ★ ; Death- ✕

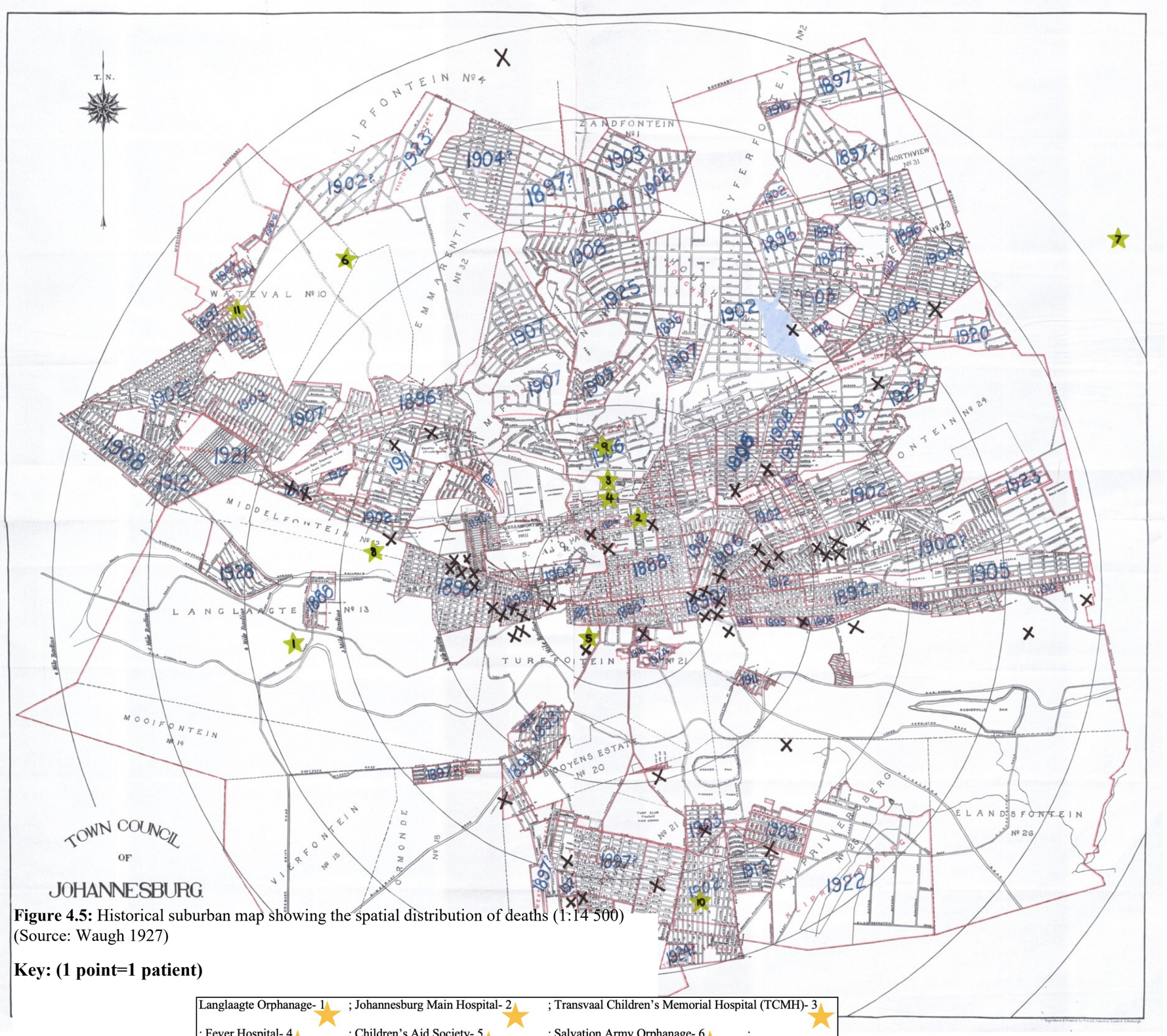


Figure 4.5: Historical suburban map showing the spatial distribution of deaths (1:14 500)
(Source: Waugh 1927)

Key: (1 point=1 patient)

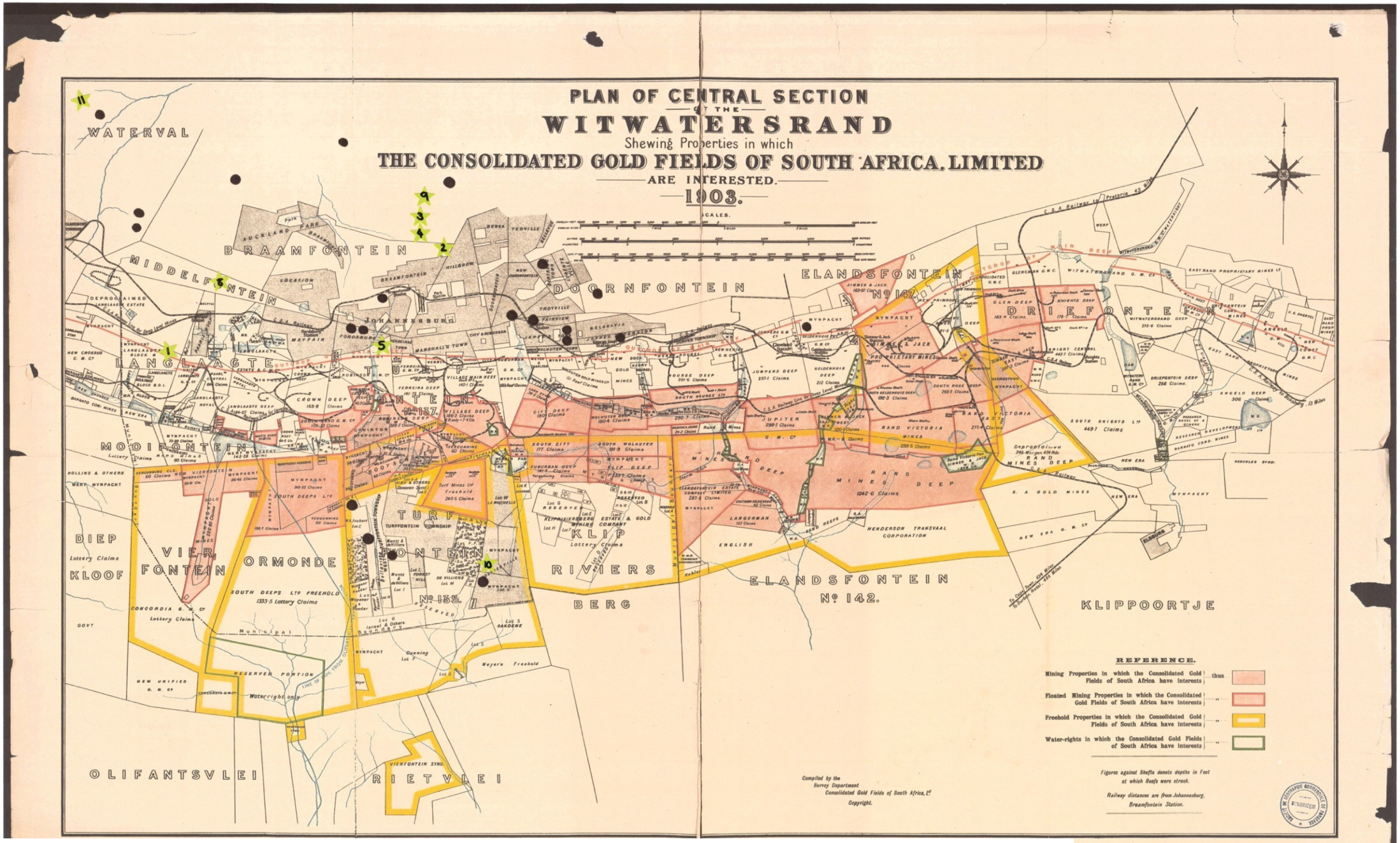
Langlaagte Orphanage- 1 ; Johannesburg Main Hospital- 2 ; Transvaal Children's Memorial Hospital (TCMH)- 3 ; Fever Hospital- 4 ; Children's Aid Society- 5 ; Salvation Army Orphanage- 6 ;

Rietfontein Hospital- 7 ; Boy's Refuge, Brixton- 8 ; Arcadia Jewish Orphanage- 9 ;

St Mary's Orphanage- 10 ; Hope Home- 11 ; Death- ×

4.1.4. Economic Status

The Data indicated that 5.3% of patients admitted to the hospital were paupers or free patients (n=59). There are no distinct trends in poorer patients being admitted for a specific disease. However, a slight majority were admitted for either Trauma/Injury (20.3% n=12) or TB (10.2% n=6). The poorer patients notably reside within mining territories such as Turffontein as well as in the inner city just North of the mining belt in the suburbs. Although there is no clear trend in the spatial distribution of free patients, these patients tend to live within close proximity of major transport routes such as the tramways, railways or main roads.


PLAN OF CENTRAL SECTION
OF THE
WITWATERSRAND
Shewing Properties in which
THE CONSOLIDATED GOLD FIELDS OF SOUTH AFRICA, LIMITED
ARE INTERESTED.
1903.
SCALES.
WATERVAL
BRAAMFONTEIN
MIDDELFONTEIN
DOORNFONTEIN
ELANDSFONTEIN
No 167
JOHANNESBURG
LANGLAAGTE
MOOIFONTEIN
TURFFONTEIN
No 137
DRIEFONTEIN
DIEP
KLOOF
VIER
FONTEIN
ORMONDE
No 135
RIVIERS
BERG
KLIP
ELANDSFONTEIN
No 142.
KLIPPOORTJE
OLIFANTSVLEI
RIETVLEI
RAND MINES DEEP
WITWATERSRAND DEEP
GLEN DEEP
KNIGHTS DEEP
DRIEFONTEIN DEEP
ANGELO DEEP
SOUTH KNIGHTS
RAND VICTORIA
JUPITER
CITY DEEP
SOUTH WOLHUTER
SOUTH ROSE DEEP
GELDENHUIS DEEP
JUMPERS DEEP
ROSSE DEEP
VILLAGE MAIN REEF
VILLAGE DEEP
CROWN DEEP
SOUTH DEEPS
SUBURBAN DEEP
KLIP DEEP
LANGLAAGTE ESTATE
LANGLAAGTE ROYAL
LANGLAAGTE DEEP
NEW CROESUS
DEPROCLAIMED
MYNPACHT
SIMMER & JACK PROPRIETARY MINES
EAST RAND PROPRIETARY MINES
WITWATERSRAND G. M. Co
GLENCAIRN G.M.C.
NEW CROESUS G. M. Co
NEW ERA
NEW COURT G.M.C.
ANGELO
HERCULES SYND.
BARRATO CONS. MINES
HOLLINS & OTHERS
WERK MYNPACHT
VIERFONTEIN
DIEP
KLOOF
VIER FONTEIN
ORMONDE
SOUTH DEEPS LTD FREEHOLD
1333·5 Lottery Claims
CONCORDIA G. M. Co
Lottery Claims
GOVT
Municipal
RESERVE PORTION
Waterright only
NEW UNIFIED G. M. Co
TURFFONTEIN TOWNSHIP
TURFFONTEIN
Turf Mines Ltd Freehold
240·5 Claims
W. A. Joubert Lot C
Wentz & de Villiers Lot I
De Villiers Lot M
Lot 9 Israel & Others
Lot 5 OAKDENE
Wayers Freehold
Dunning Lot P
Lot G RESERVE
Lot W LA ROCHELLE
KLIPRIVIERSBERG ESTATE & GOLD MINING COMPANY
Lottery Claims
Lot H
Lot C
Lot 8 RESERVED
Lot 7 RESERVED
Lot 6 RESERVED
Lot 5 RESERVED
Lot 4 RESERVED
Lot 3 RESERVED
Lot 2 RESERVED
Lot 1 RESERVED
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Lot W
Lot X
Lot Y
Lot Z
SUBURBAN DEEP 141·7 Claims
Prospecting Claims
KLIP DEEP 2337 Claims
SOUTH WOLHUTER 189·9 Claims
SOUTH CITY 177 Claims
CITY DEEP 190·1 Claims
WOLHUTER DEEP 150·6 Claims
JUPITER 299·1 Claims
230·7 Claims
ROSSE DEEP 201·6 Claims
JUMPERS G.M. Co
JUMPERS DEEP 251·1 Claims
GELDENHUIS DEEP 212 Claims
GELDENHUIS ESTATE & G. M. Co
SIMMER & JACK 163·8 Claims
SIMMER & JACK PROPRIETARY MINES
SOUTH ROSE DEEP 265·7 Claims
GEORGETOWN MYNPACHT
SOUTH GELDENHUIS DEEP 186·3 Claims
RAND VICTORIA MINES 233·5 Claims
RAND VICTORIA 271·4 Claims
RAND MINES DEEP 1242·6 Claims
ELANDSFONTEIN ESTATE COMPANY LIMITED 221·6 Claims
SOUTHERN HELDERKROOF 82 Claims
LANGERMAN 107 Claims
HENDERSON TRANSVAAL CORPORATION
S. A. GOLD MINES
NEW ERA G. M. Co
MYNPACHT
RAND LEASES
ENGLISH
Deproclaimed 345 Morgen 434 Rds
SOUTH KNIGHTS Ltd 449·7 Claims
KNIGHT CENTRAL 449·7 Claims
KNIGHTS 179·7 Claims
GLEN DEEP 183·4 Claims
WITWATERSRAND DEEP 213·6 Claims
DRIEFONTEIN DEEP 256 Claims
DRIEFONTEIN CONS. MINES
EAST RAND PROPRIETARY MINES
EAST RAND DEVELOPMENT & ESTATE
RESEARCH DEVELOPMENT
ANGELO DEEP 306 Claims
NEW COURT G.M.C.
NEW ERA
BARRATO CONS. MINES
HERCULES SYND.
MYNPACHT
C.S.A. Railway
C.S.A. Railway Line for Deep Level Mines
C.S.A. Railway Line for Deep Level Workings
Railway Line for Deep Level Workings
Railway Line to Deep Level Mines
Railway Line to Deep Level Workings
Railway Line to Deep Level Workings
Railway Line to Deep Level Workings

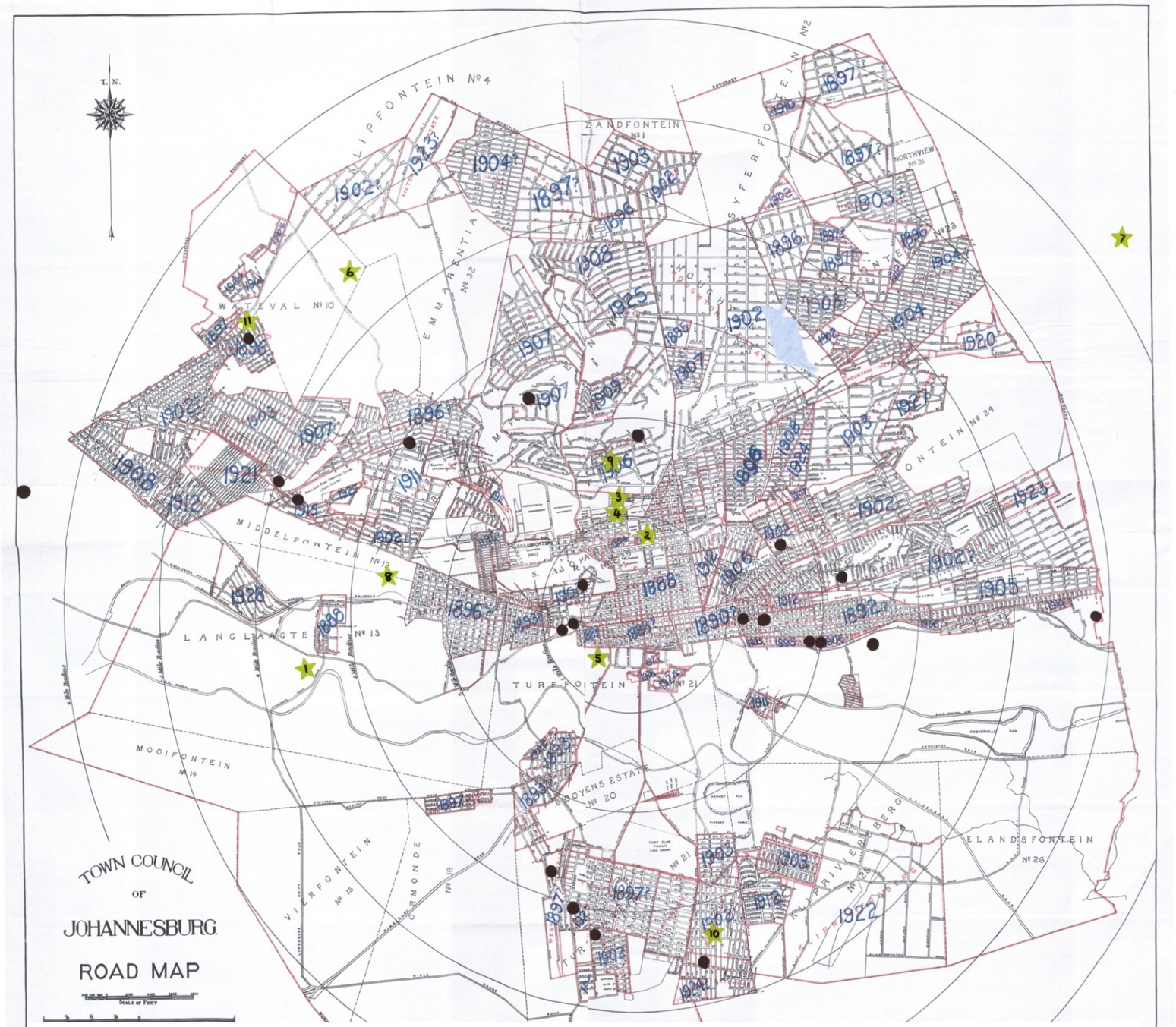


Figure 4.7: Historical suburban map showing the spatial distribution of free patients (1:14 500) (Source: Waugh 1927)

Key: (1 point=1 patient)

Langlaagte Orphanage- 1 ; Johannesburg Main Hospital- 2 ; Transvaal Children's Memorial Hospital (TCMH)- 3 ; Fever Hospital- 4 ; Children's Aid Society- 5 ; Salvation Army Orphanage- 6 ; Rietfontein Hospital- 7 ; Boy's Refuge, Brixton- 8 ; Arcadia Jewish Orphanage- 9 ; St Mary's Orphanage- 10 ; Hope Home- 11 ; Free Patient

4.1.5. Religion

Majority of patients did not specify their religion or were members of minority Christian groups such as Presbyterians, Mormons, Jehovah's Witnesses, etc. However, a large percentage of patients were members of either the Dutch Reformed Church or The Church of England. Only a small percentage of patients admitted were Jewish, 11% (n=52) of the total hospital population.

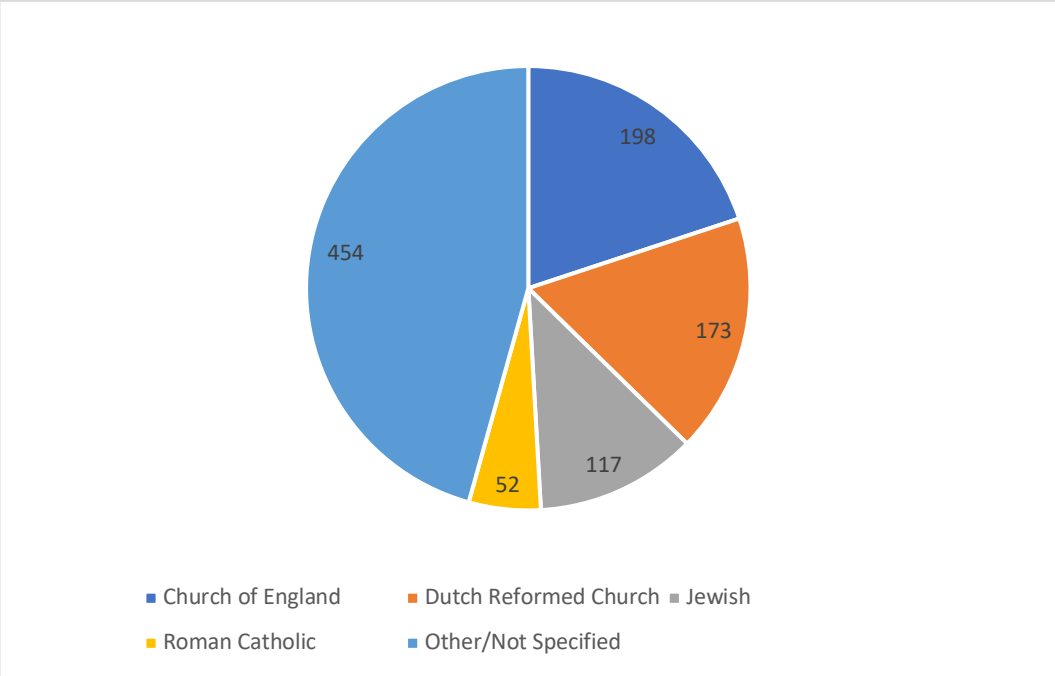


Figure 4.8: Pie chart showing the religion of TCMH patients

4.1.6. Patient Transfers

Out of 995 patients, approximately only 3% (n=30) were directly transferred to other health/child care facilities which included: The Fever Hospital; Johannesburg General Hospital; Rietfontein Hospital; Hope Home; The Children's Aid Society as well as other unspecified nursing homes. More than half of these patients (n=16) were transferred due to infectious diseases such as Meningitis; TB; Pneumonia; STI's as well as Typhoid/Enteric Fever which would have required specialized treatment or isolation in order to avoid outbreaks. Others were transferred to homes in cases of abuse as well as other health care

facilities if their ailment required surgery which the TCMH could not provide, such as one case of a severe contusion which required immediate surgery at the Johannesburg General Hospital.

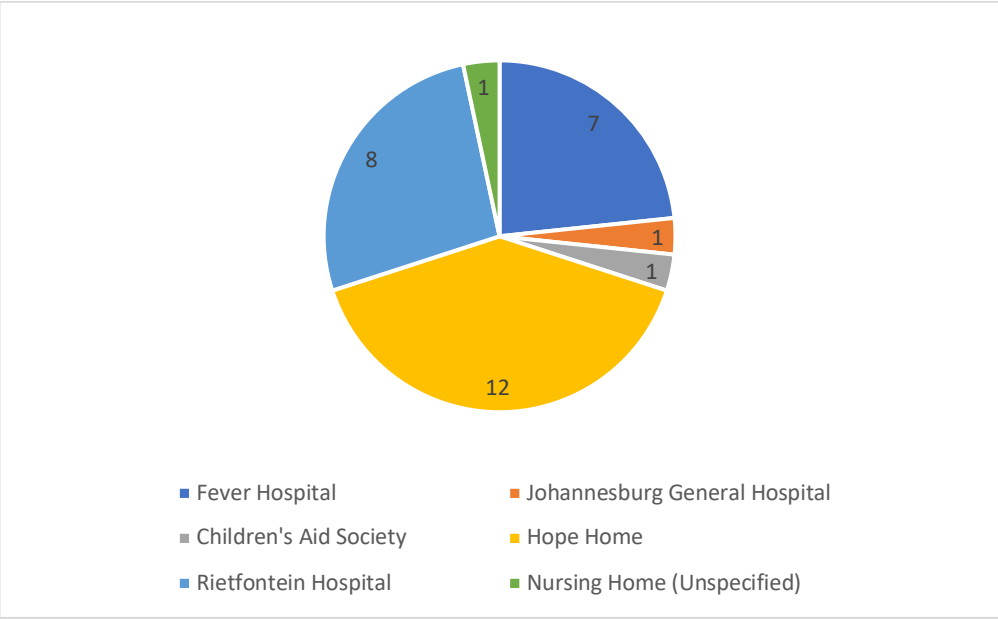


Figure 4.9: Pie chart showing TCMH patient transfers to other health/child care facilities

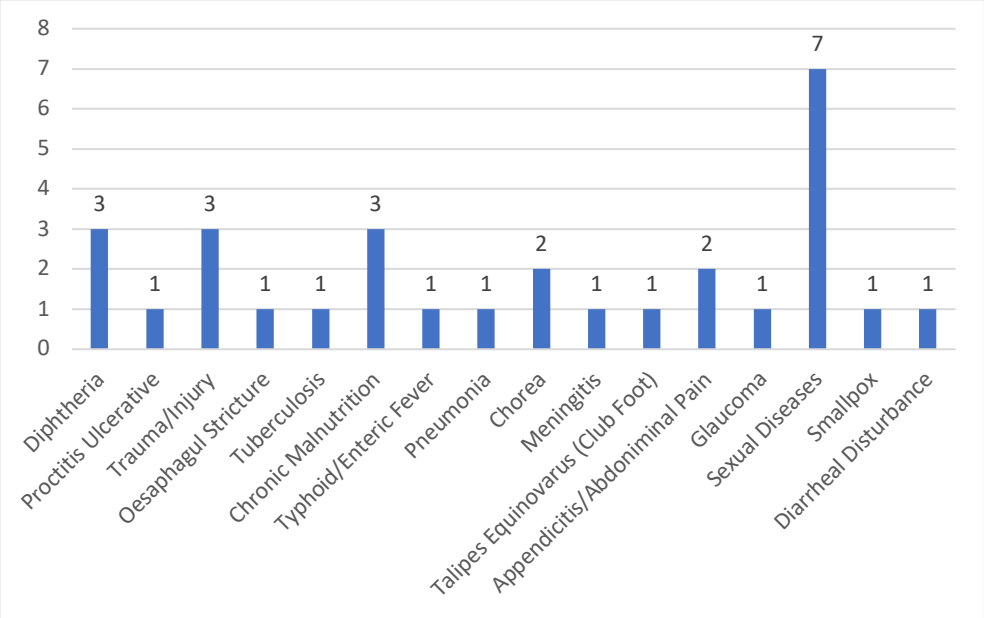


Figure 4.10: Bar graph showing ailments which resulted in TCMH patient transfers

4.2. Diseases and Afflictions of Interest

4.2.1. Diet Related Illnesses

Patients admitted for diet related illnesses (excluding Typhoid/Enteric Fever made up 11.7% of the hospital's population (n=116). It is important to note that these illnesses appear widespread with no clear trends. However, these patients tend to be within a two mile radius of the city centre and lessen in frequency thereafter. Areas such as Fordsburg, Mayfair, Jeppe and the inner city suburbs seem to be most readily affected as well as on Turf mine property. The Northern suburbs see only a few scattered cases of these diseases. Cases of Enteritis tend to be most prevalent within the city centre however.

Typhoid/Enteric Fever was the main contagious diseases which patients were admitted for, a total of 6.7% (n=67). Although the patients suffering from Typhoid/Enteric Fever are fairly dispersed, cases seem to concentrate within the city suburbs and Jeppe and their surrounding areas as well as Turf mine property whereas other areas of the map remain fairly unaffected.

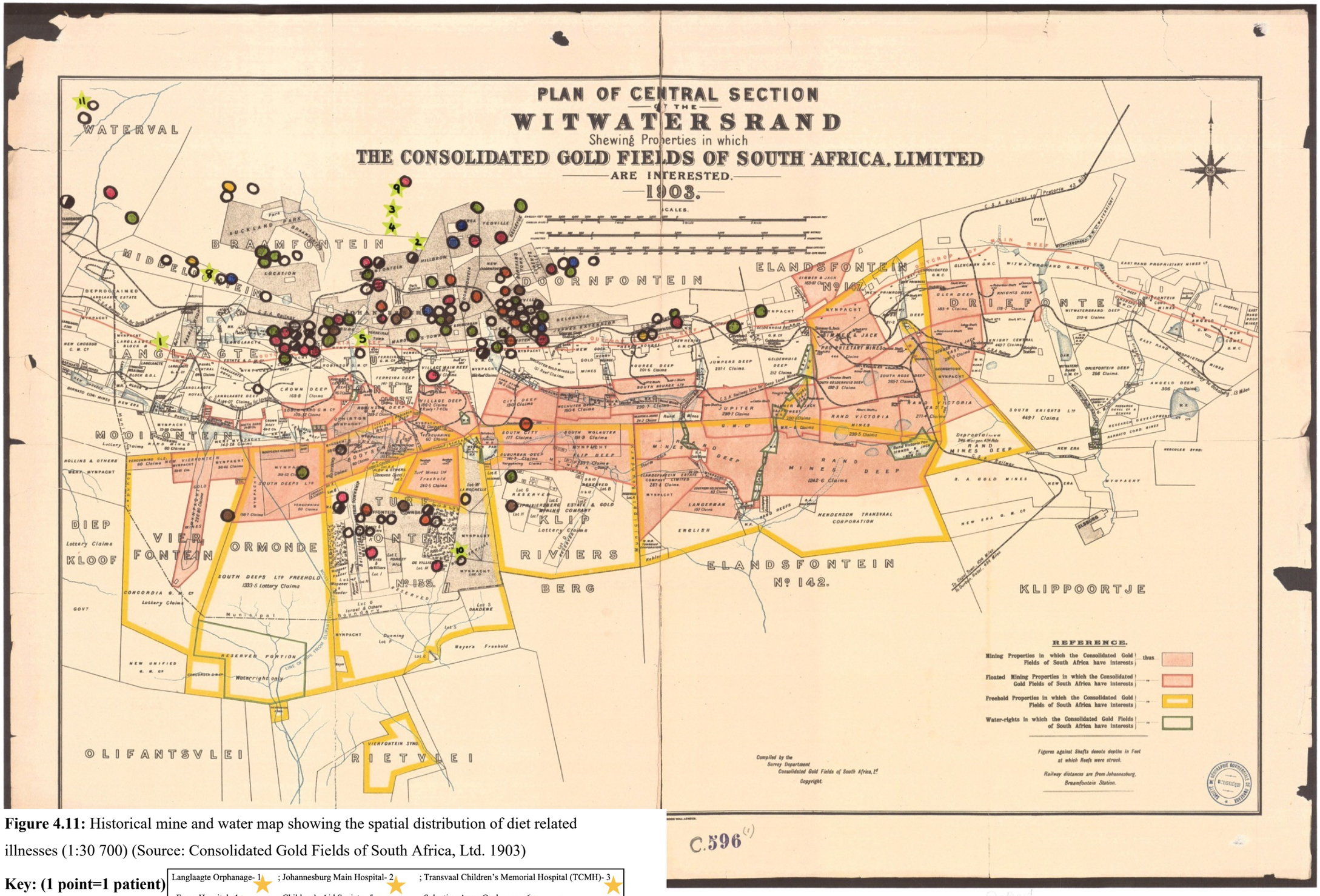
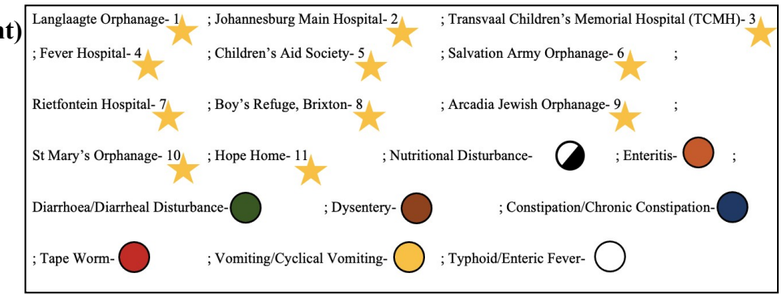


Figure 4.11: Historical mine and water map showing the spatial distribution of diet related illnesses (1:30 700) (Source: Consolidated Gold Fields of South Africa, Ltd. 1903)

Key: (1 point=1 patient)



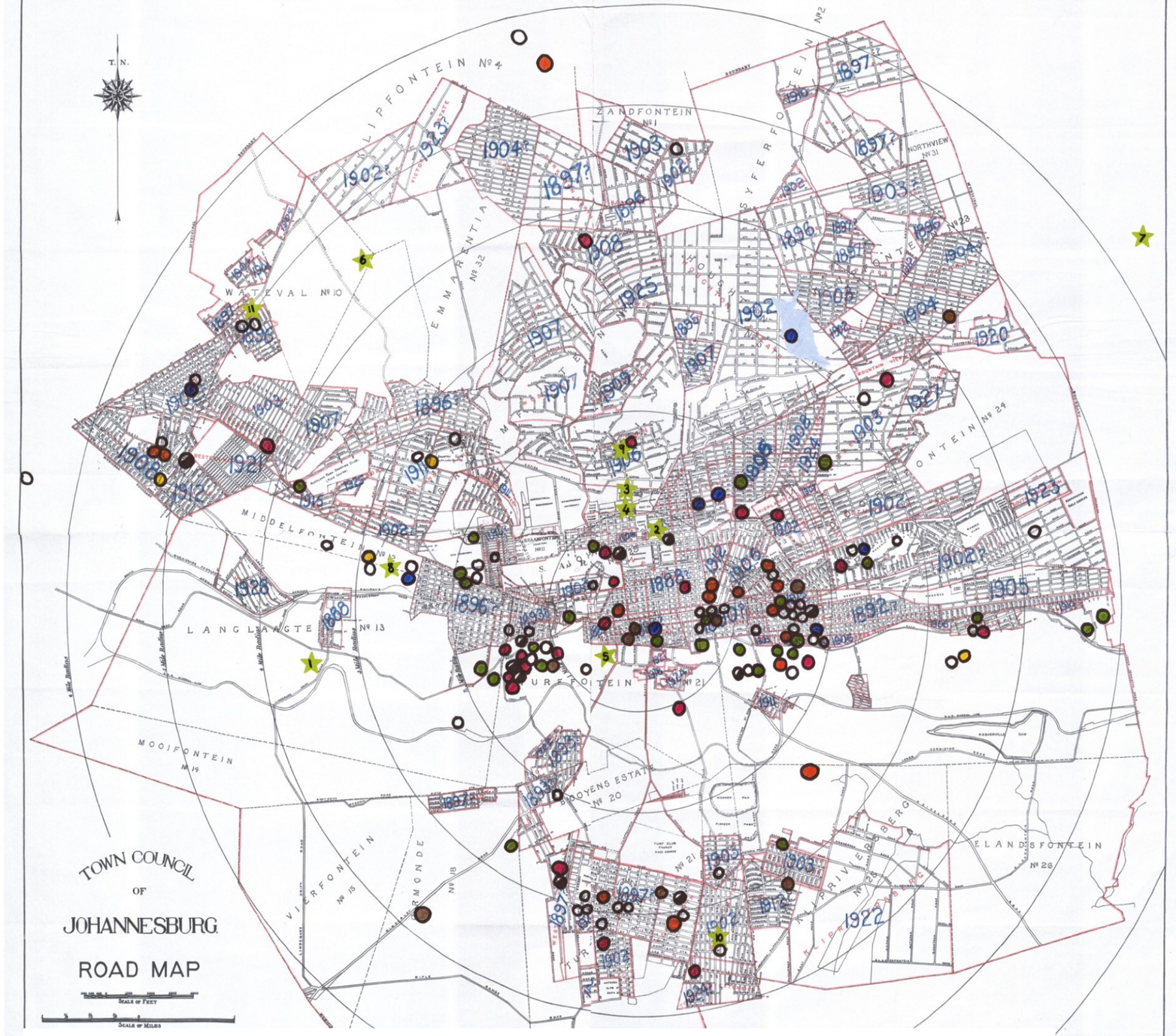


Figure 4.12: Historical suburban map showing the spatial distribution of diet related illnesses (1:14 500) (Source: Waugh 1927)
Key: (1 point=1 patient)

Langlaagte Orphanage- 1 ; Johannesburg Main Hospital- 2 ; Transvaal Children's Memorial Hospital (TCMH)- 3 ; Fever Hospital- 4 ; Children's Aid Society- 5 ; Salvation Army Orphanage- 6 ; Rietfontein Hospital- 7 ; Boy's Refuge, Brixton- 8 ; Arcadia Jewish Orphanage- 9 ; St Mary's Orphanage- 10 ; Hope Home- 11 ; Nutritional Disturbance- ; Enteritis- ; Diarrhoea/Diarrheal Disturbance- ; Dysentery- ; Constipation/Chronic Constipation- ; Tape Worm- ; Vomiting/Cyclical Vomiting- ; Typhoid/Enteric Fever-

4.2.2. Respiratory Diseases

TB was the second most common contagious disease within the hospital population, making up a total of 6.1% of admission (n=61). TB is highly prevalent in mining areas such as on Turf Mine property as well as suburbs running along the mining belt such as Jeppe, Mayfair and Fordsburg as well as the Eastern suburbs of Troyeville and Fordsburg. However, one major outlier is that found within Norwood/Orange Grove.

Other respiratory diseases are spread throughout the city but decrease significantly three miles away from the city centre. Whilst Northern suburbs remain relatively untouched, those closer to mining territory and the city centre appear to be the most affected with a large concentration of cases of Influenza within the city centre and Whooping Cough (Pertussis) being more prevalent in Easterly city suburbs.

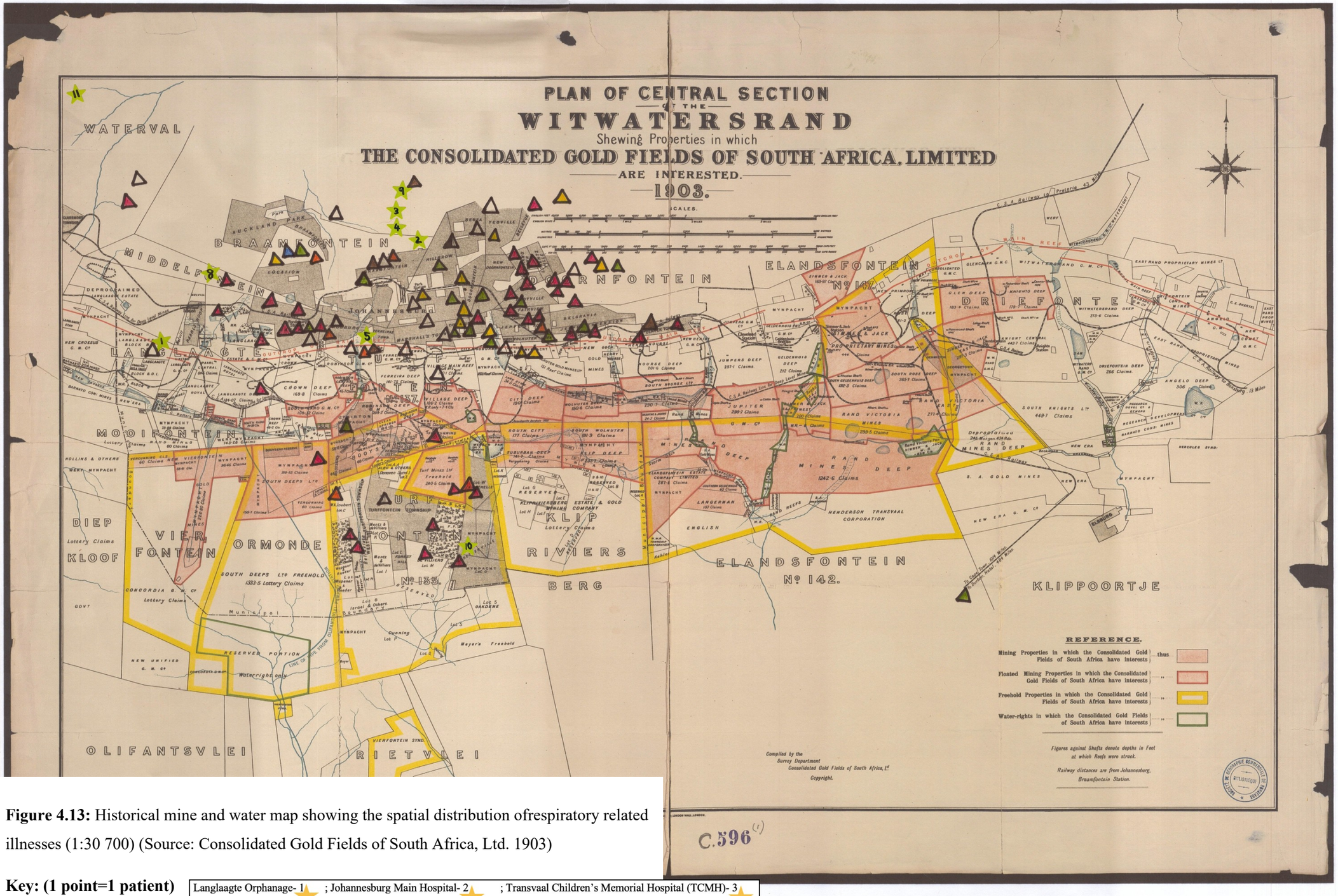


Figure 4.13: Historical mine and water map showing the spatial distribution ofrespiratory related illnesses (1:30 700) (Source: Consolidated Gold Fields of South Africa, Ltd. 1903)

Key: (1 point=1 patient)

Langlaagte Orphanage- 1 ; Johannesburg Main Hospital- 2 ; Transvaal Children's Memorial Hospital (TCMH)- 3 ; Fever Hospital- 4 ; Children's Aid Society- 5 ; Salvation Army Orphanage- 6 ;

Rietfontein Hospital- 7 ; Boy's Refuge, Brixton- 8 ; Arcadia Jewish Orphanage- 9 ;

St Mary's Orphanage- 10 ; Hope Home- 11 ; Influenza- ; Bronchitis- ;

Chronic Obstructive Pulmonary Disease- ; Bronchopneumonia- ; Pneumonia- ;

Tuberculosis (TB)- ; Whooping Cough/Pertussis- ; Bad Cold/Rhinitis-

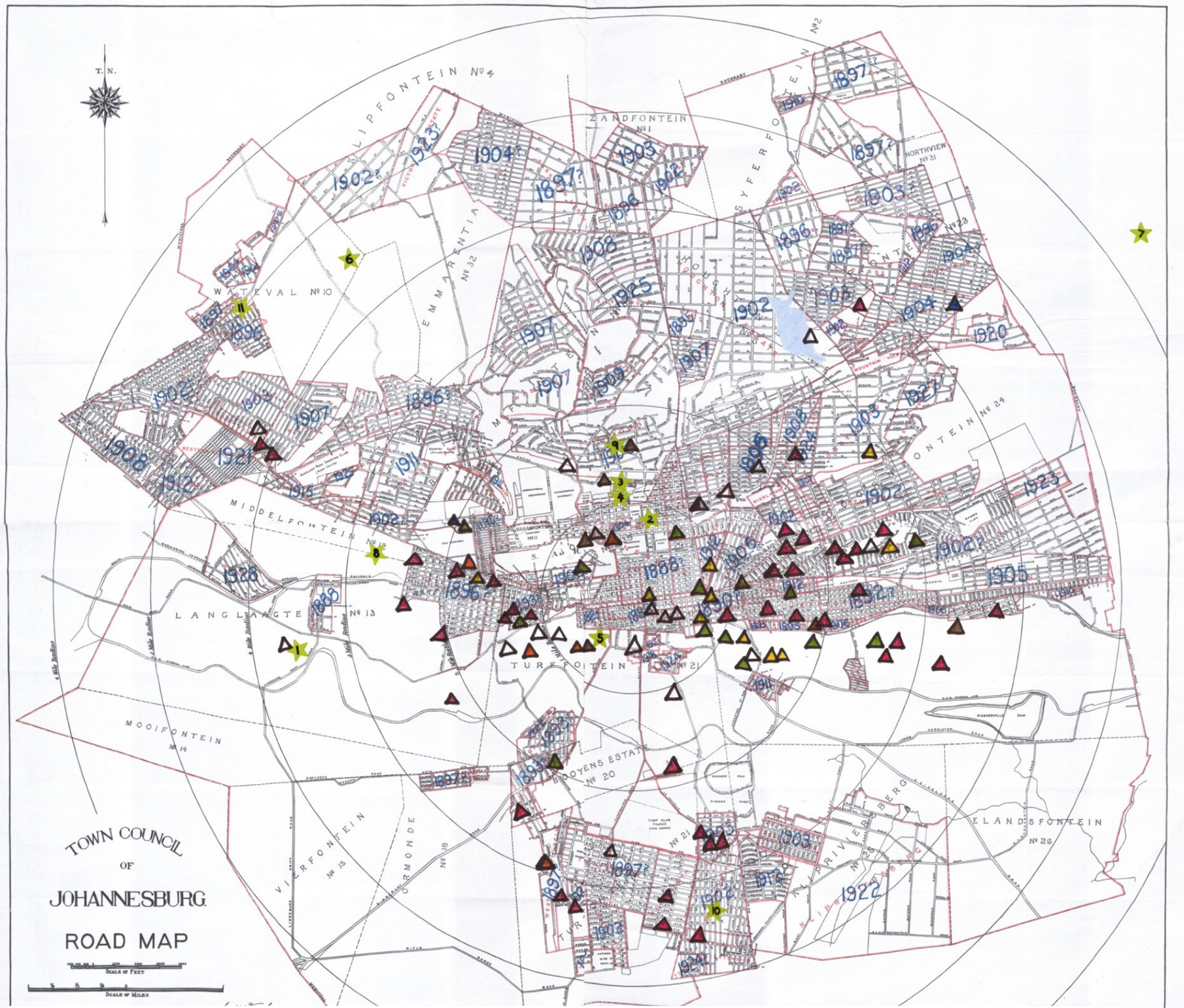


Figure 4.14: Historical suburban map showing the spatial distribution of respiratory related illnesses (1:14 500) (Source: Waugh 1927)
Key: (1 point= 1 patient)

Langlaagte Orphanage- 1 ; Johannesburg Main Hospital- 2 ; Transvaal Children's Memorial Hospital (TCMH)- 3 ; Fever Hospital- 4 ; Children's Aid Society- 5 ; Salvation Army Orphanage- 6 ; Rietfontein Hospital- 7 ; Boy's Refuge, Brixton- 8 ; Arcadia Jewish Orphanage- 9 ; St Mary's Orphanage- 10 ; Hope Home- 11 ; Influenza- ; Bronchitis- ; Chronic Obstructive Pulmonary Disease- ; Bronchopneumonia- ; Pneumonia- ; Tuberculosis (TB)- ; Whooping Cough/Pertussis- ; Bad Cold/Rhinitis-

4.2.3. Sexually Transmitted Infections (STI's)

The occurrence of STI's are low and infrequent, making up only 2% (n=20) of the hospital population. Due to the low frequency of patients within this group, cases appear widespread but there is a small concentration within the city centre as well as on Turf mine property. A case of an adopted child suffering from congenital syphilis in Claremont means that this child, although an outlier, likely did not originate from this area and thus cannot be considered in terms of spatial distribution of this disease since their origin is unknown. Another case of an illegitimate child with congenital syphilis in the Eastrand in Driefontein with no other recorded cases within this area may suggest the contraction by a parent who resides within a different area. Although these cases appear across the maps, there are areas within the Northern suburbs that do not seem to be affected such as the Parktowns, Highlands and Parkview with the exception of Linden.

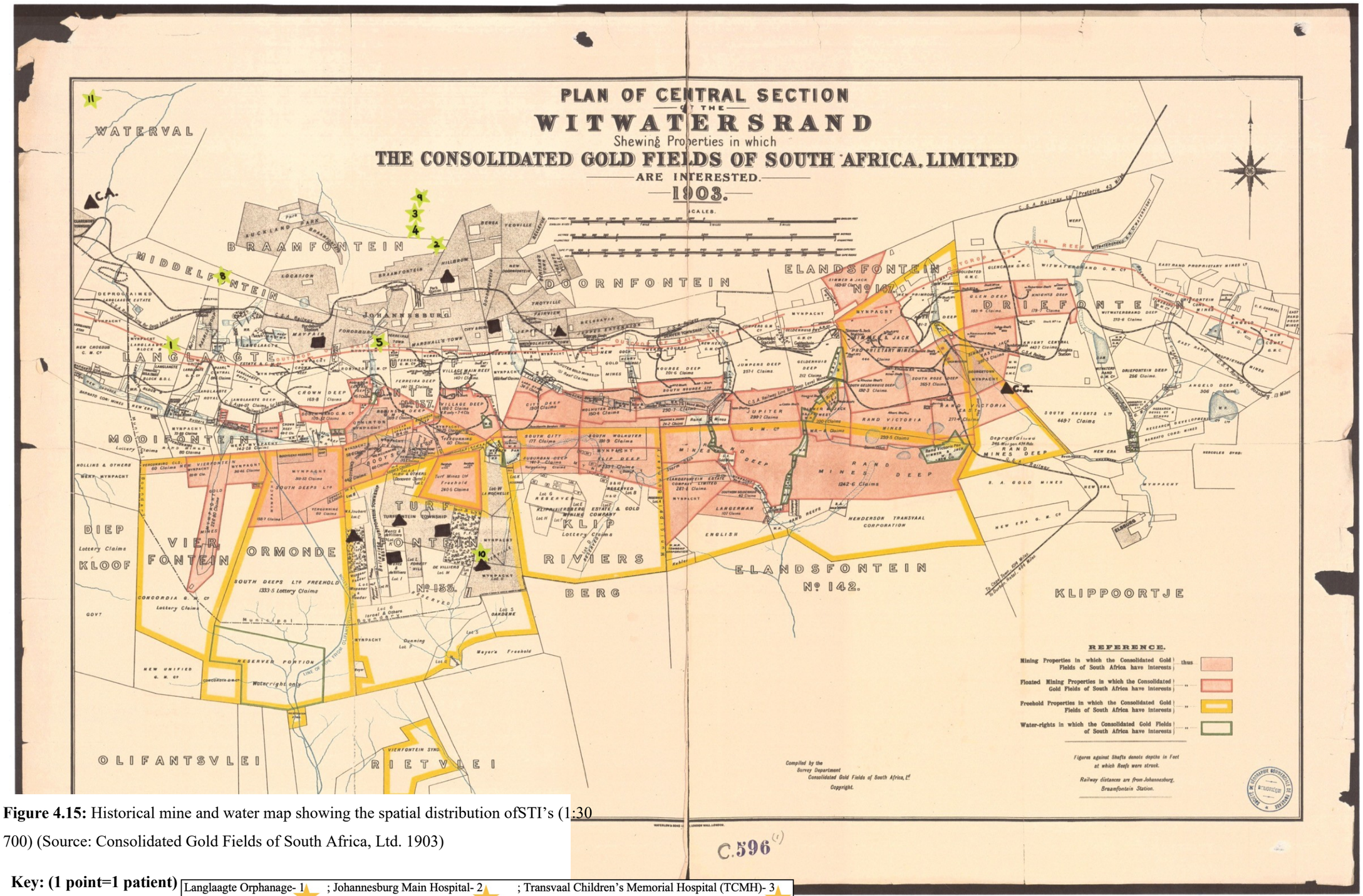


Figure 4.15: Historical mine and water map showing the spatial distribution ofSTI's (1:30 700) (Source: Consolidated Gold Fields of South Africa, Ltd. 1903)

Key: (1 point=1 patient)

Langlaagte Orphanage- 1 ; Johannesburg Main Hospital- 2 ; Transvaal Children's Memorial Hospital (TCMH)- 3 ; Fever Hospital- 4 ; Children's Aid Society- 5 ; Salvation Army Orphanage- 6 ;

Rietfontein Hospital- 7 ; Boy's Refuge, Brixton- 8 ; Arcadia Jewish Orphanage- 9 ;

St Mary's Orphanage- 10 ; Hope Home- 11 ; Syphilis- ▲ ; Gonorrhoea- ■

Child Adopted- **C.A.** ; Child Illegitimate- **C.I.**

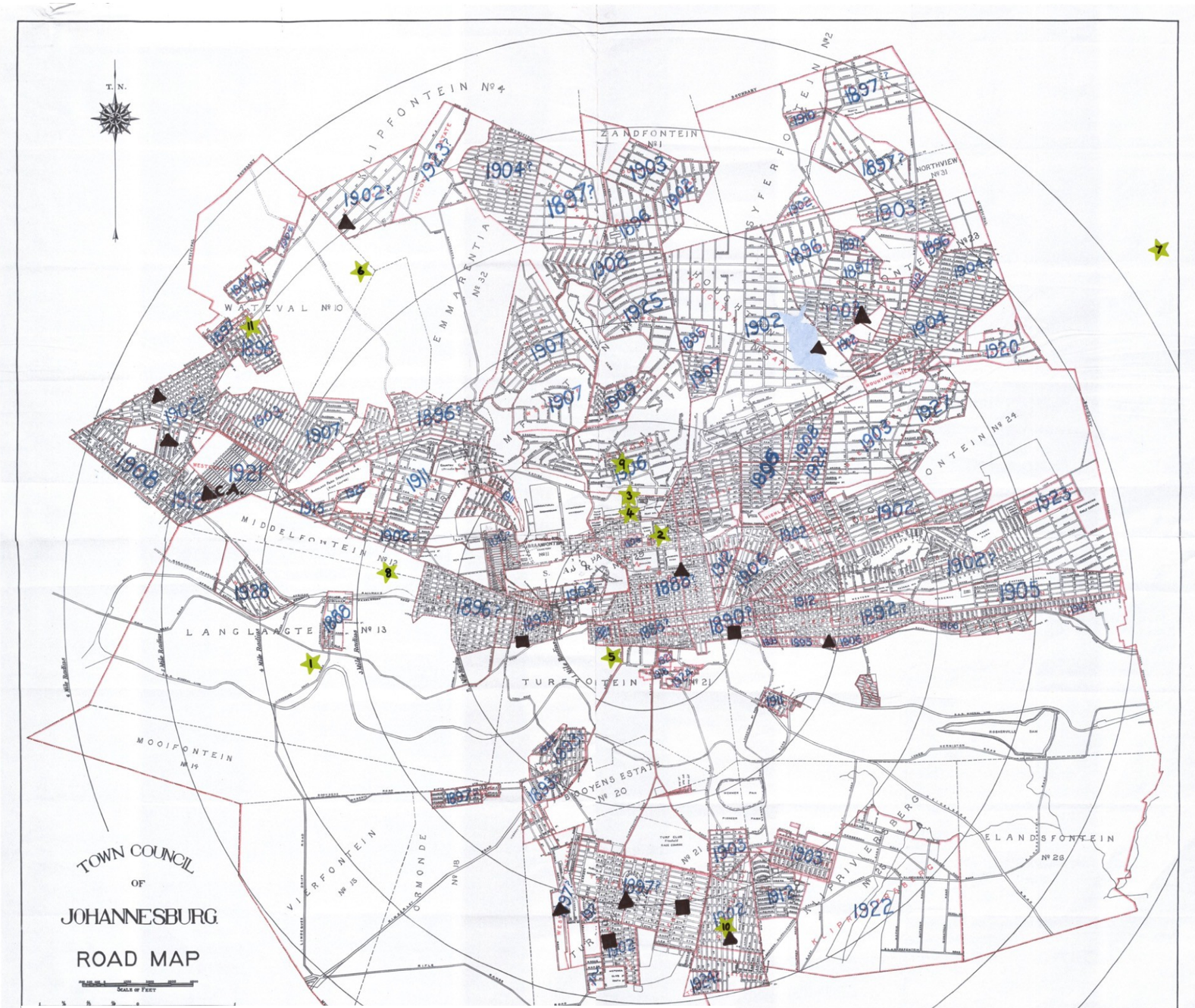


Figure 4.16: Historical suburban map showing the spatial distribution ofSTI's (1:14 500)

(Source: Waugh 1927)

Key: (1 point=1 patient)

Langlaagte Orphanage- 1 ; Johannesburg Main Hospital- 2 ; Transvaal Children's Memorial Hospital (TCMH)- 3 ; Fever Hospital- 4 ; Children's Aid Society- 5 ; Salvation Army Orphanage- 6 ; Rietfontein Hospital- 7 ; Boy's Refuge, Brixton- 8 ; Arcadia Jewish Orphanage- 9 ; St Mary's Orphanage- 10 ; Hope Home- 11 ; Syphilis- ▲ ; Gonorrhoea- ■

Child Adopted- **C.A.** ; Child Illegitimate- **C.I.**

4.2.4. Cases of Improper Care/Neglect

Under this category, the most common ailment was Chronic Malnutrition which made up 59% (n=45) of cases under this category and a total of 4,5% of the total hospital population. Cases of Improper Care and Neglect seem to be more prevalent in the inner city suburbs rather than on mining property. Cases of Chronic Malnutrition seem to be evenly distributed across the map with no clear spatial distribution trends. There is however a slight clustering of cases in Newtown, Mayfair and Fordsburg as well as one case of Chronic Malnutrition within the wealth suburb of Houghton Estate. Cases of unspecified Improper Care or Neglect are evident in Ormonde and Doornfontein and are absent elsewhere.

PLAN OF CENTRAL SECTION
OF THE
WITWATERSRAND
Shewing Properties in which
THE CONSOLIDATED GOLD FIELDS OF SOUTH AFRICA, LIMITED
ARE INTERESTED.
1903.

Figure 4.17: Historical mine and water map showing the spatial distribution of improper care/neglect cases (1:30 700) (Source: Consolidated Gold Fields of South African, Ltd. 1903)

Key: (1 point = 1 patient

Langlaagte Orphanage- 1 ; Johannesburg Main Hospital- 2 ; Transvaal Children's Memorial Hospital (TCMH)- 3 ; Fever Hospital- 4 ; Children's Aid Society- 5 ; Salvation Army Orphanage- 6 ;

Rietfontein Hospital- 7 ; Boy's Refuge, Brixton- 8 ; Arcadia Jewish Orphanage- 9 ;

St Mary's Orphanage- 10 ; Hope Home- 11 ; Child Adopted- **C.A.** ; Dermatitis/Eczema- ; Cellulitis/Skin Infection- ; Impetigo- ; Chronic Malnutrition- ; Septicaemia- ; Neglected/Improper Care- ; Child Dirty/Poor Hygiene- ; Rotten/Infected Teeth (Dental Carries)-

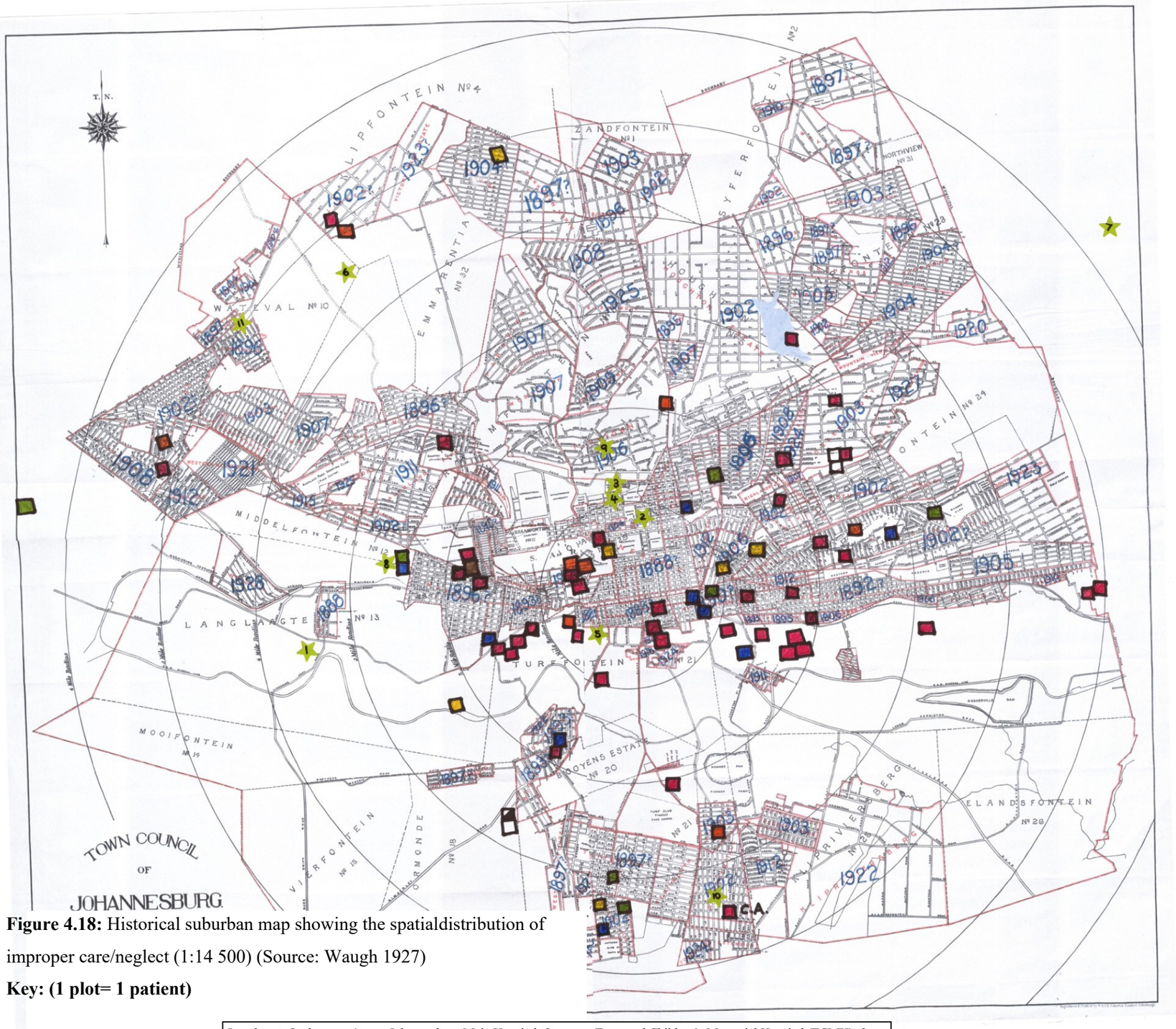


Figure 4.18: Historical suburban map showing the spatialdistribution of improper care/neglect (1:14 500) (Source: Waugh 1927)

Key: (1 plot= 1 patient)

Langlaagte Orphanage- 1 ; Johannesburg Main Hospital- 2 ; Transvaal Children's Memorial Hospital (TCMH)- 3 ; Fever Hospital- 4 ; Children's Aid Society- 5 ; Salvation Army Orphanage- 6 ; Rietfontein Hospital- 7 ; Boy's Refuge, Brixton- 8 ; Arcadia Jewish Orphanage- 9 ; St Mary's Orphanage- 10 ; Hope Home- 11 ; Child Adopted- **C.A.** ; Dermatitis/Eczema- ; Cellulitis/Skin Infection- ; Impetigo- ; Chronic Malnutrition- ; Septicaemia- ; Neglected/Improper Care- ; Child Dirty/Poor Hygiene- ; Rotten/Infected Teeth (Dental Carries)-

4.2.5. Trauma and Injury

There are many incidents associated with this category with a total of 22% (n=226) of patients admitted to the hospital suffering with Trauma or Injury which accounts for the main reason for patient admittance from 1923-1925. There is no distinct trend in patients admitted for these ailments within the city and there is an even distribution of patients across both maps. The main cause for these incidences are associated with locomotive accidents such as dangerous encounters with cars, carts, trams, motorbikes, bicycles and horses/donkeys.

With exception of Turffontein, there is a high frequency of cases within a two mile radius of the city centre which thereafter decreases with high concentrations especially in Mayfair and Fordsburg, showing that Southern inner city suburbs seem to be most affected and richer Northern suburbs less so. Other than one reported poisoning in Emmarentia and one broken bone in Linden, Northern Johannesburg is absent of reported cases. There is also only one recorded rape case within the hospital records, the survivor resided on Turf mine property.

PLAN OF CENTRAL SECTION
OF THE
WITWATERSRAND
Shewing Properties in which
THE CONSOLIDATED GOLD FIELDS OF SOUTH AFRICA, LIMITED
ARE INTERESTED.
1903.

WATERVAL
BRAAMFONTEIN
MIDDELFONTEIN
LANGLAAGTE
MOOIFONTEIN
DIEP
KLOOF
VIERFONTEIN
ORMONDE
TURFFONTEIN
KLIPRIVIERS
BERG
JOHANNESBURG
DORNFONTEIN
ELANDSFONTEIN
No 147.
ELANDSFONTEIN
No 142.
DRIEFONTEIN
KLIPPOORTJE
OLIFANTSVLEI

REFERENCE.

Mining Properties in which the Consolidated Gold Fields of South Africa have interests	thus
Floated Mining Properties in which the Consolidated Gold Fields of South Africa have interests	"
Freehold Properties in which the Consolidated Gold Fields of South Africa have interests	"
Water-rights in which the Consolidated Gold Fields of South Africa have interests	"

Figures against Shafts denote depths in Feet at which Reefs were struck.

Railway distances are from Johannesburg, Braamfontein Station.

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C.596(1)

Figure 4.19: Historical mine and water map showing the spatial distribution of cases of trauma/injury (1:30 700) (Source: consolidated Gold Fields of South Africa, Ltd. 1903)

Key: (1 point= 1 patient)

Langlaagte Orphanage- 1 ; Johannesburg Main Hospital- 2 ; Transvaal Children's Memorial Hospital (TCMH)- 3 ; Fever Hospital- 4 ; Children's Aid Society- 5 ; Salvation Army Orphanage- 6 ; Rietfontein Hospital- 7 ; Boy's Refuge, Brixton- 8 ; Arcadia Jewish Orphanage- 9 ; St Mary's Orphanage- 10 ; Hope Home- 11 ; Contusion- **C** ; Dislocation- **D** ; Epiphyseal Separation- **S** ; Foreign Body- **F** ; Head Injury- ; Eye Injury- **E** ; Rape- **R** ; Burn- ; Broken Bone- > ; Poisoning-

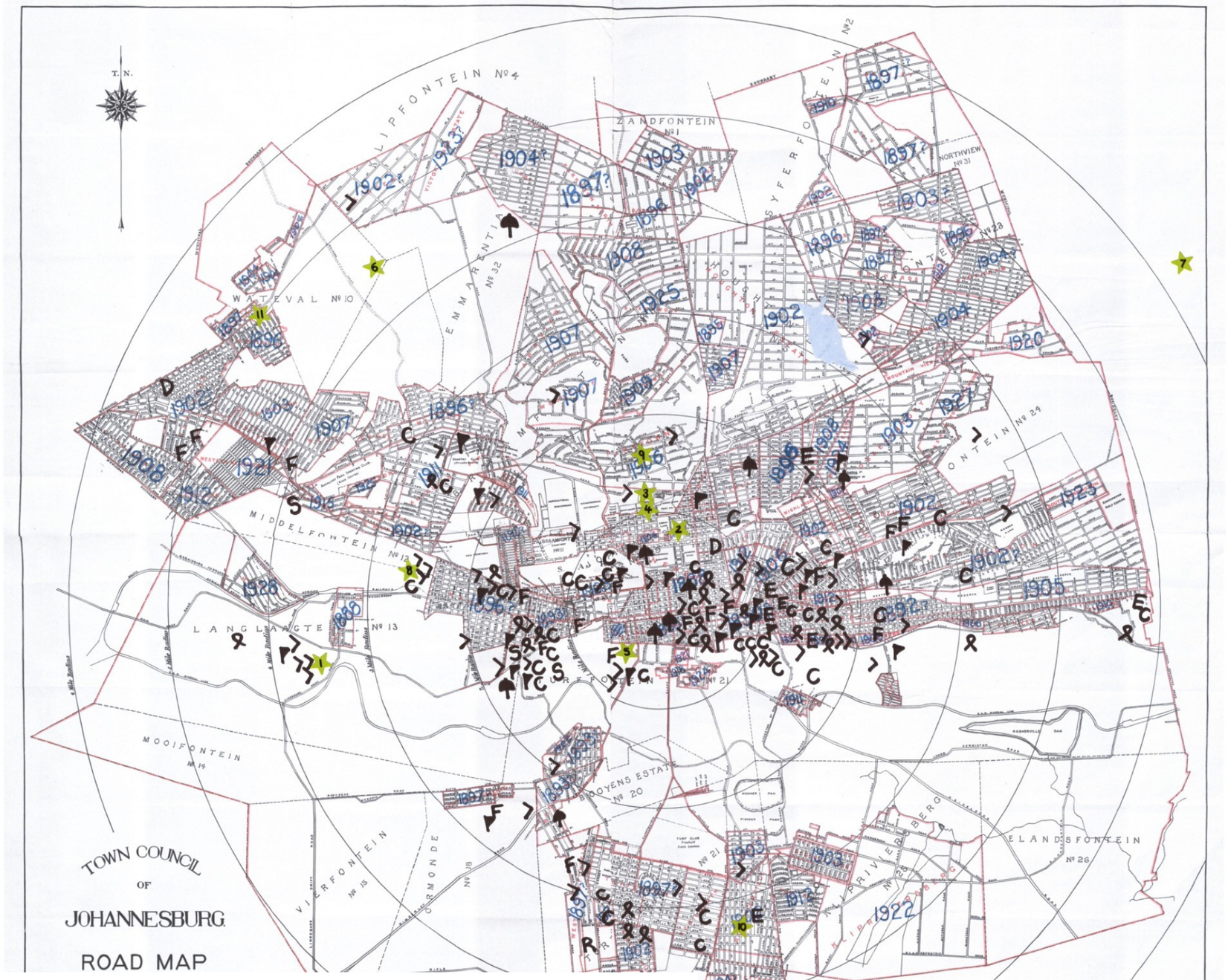


Figure 4.20: Historical suburban map showing the spatial distributionof cases of trauma/injury (1:14 500) (Source: Waugh 1927)

Key: (1 point=1 patient)

Langlaagte Orphanage- 1 ; Johannesburg Main Hospital- 2 ; Transvaal Children's Memorial Hospital (TCMH)- 3 ; Fever Hospital- 4 ; Children's Aid Society- 5 ; Salvation Army Orphanage- 6 ; Rietfontein Hospital- 7 ; Boy's Refuge, Brixton- 8 ; Arcadia Jewish Orphanage- 9 ; St Mary's Orphanage- 10 ; Hope Home- 11 ; Contusion- **C** ; Dislocation- **D** ; Epiphyseal Separation- **S** ; Foreign Body- **F** ; Head Injury- ⚑ ; Eye Injury- **E** ; Rape- **R** ; Burn- ; Broken Bone- > ; Poisoning-

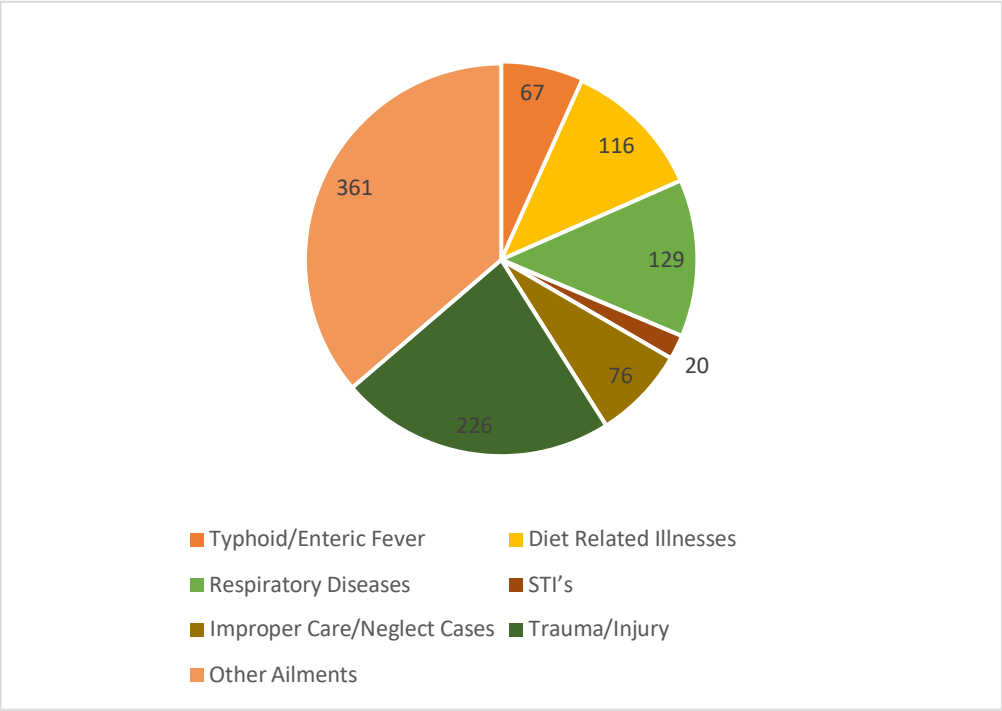


Figure 4.21: Pie chart showing the frequency of diseases of interest within TCMH admissions

It should be noted that some areas of these maps, as discussed briefly above, seem devoid of both patients and diseases yet absence of evidence is not evidence of absence. Some of the cases of absence in certain areas may be attributed to the fact that certain areas were set aside as 'Native', 'Malay/Indian' locations in which the white population was not permitted to live. Another factor is that since the period being studied is a fairly early stage in Johannesburg's residential development, some areas seem devoid of human settlement and were either not developed during this period or because this land was set aside for factors devoted to the economy such as farming or mining. Another contributing factor may be the fact that there were a number of readily established hospitals at this time and patients may have been treated elsewhere. It is also likely that residences located on mining properties may have had access to basic clinics where parents would have taken their children and some richer families may have been able to afford at home doctor visits (Pirie & Da Silva 1986; Van Onselen 2001).

The chapter above has presented both the demographic information as well as diseases and afflictions within the study sample both as quantitative and as

mapped Data. The next chapter will discuss the implications of the above Data pertaining to socio-economic factors affecting the white population in Johannesburg during the 1920's. It will address and challenge the fostered notion of the white ruling class that linked race and class to disease in order to justify racial and class segregation.

CHAPTER 5: DISCUSSION

The previous chapter provides the results of the Data collecting and mapping process, providing both results pertaining to patient demographics as well as to diseases and ailments present within the hospital records. The following chapter provides insight into the interpretations of the results produced in the previous chapter. It is divided into three sections, the first provides a brief overview of the historical background to the suburbs of Johannesburg, the second is a discussion relating the demographic results produced by this project. Lastly, the third section pertains to the results associated with the diseases and afflictions of patients from TCMH which are of particular interest, as well as the spatial distribution of said diseases and afflictions.

5.1. A Brief Historical Background of the Johannesburg Suburbs

Although gold was discovered in the Rand in 1886 by white settlers, it was only until the early 1900's that settlement within the town stabilized and family life within the white population became common (Bonner & Segal 1998; Parnell 2003; Callinicos 1985; Brodie 2008). However, segregation was part of Johannesburg's establishment which meant that the town was continuously plagued by class conflict. Prior to the 1923 Native (Urban Areas) Act, no blueprint existed for urban segregation in terms of race, however urban segregation did exist along socio-economic lines and separated rich Randlords and the likes living in the North, from the working class whites and the people of colour who lived close to points of production and the city centre, mostly in the Southern suburbs below the mining belt (Van Onselen 2001; Brodie 2008; Parnell 2003; Callinicos 1985; Janzen 2003).

Although 'territories' were set aside for people of colour outside the city centre, their harsh conditions and lack of space saw many members of the 'non-white' population leaving these designated settlements to move into racially diverse inner city slums with the which became a growing concern for the white upper class (Callinicos 1985; Janzen 2002; Parnell 2003). This period saw the rise of racial segregation which ultimately built the foundations for the Apartheid regime

and was largely fuelled by socio-economic and political tensions within white society following the South African War (Parnell 2003). Class and race segregation, legitimised in part by the association of disease to 'blackness', helped uplift and unify the white population.

5.2. Discussion of Patient Demographic Results

The patient demographics provide insight into child and societal behaviour of the period. Patient demographics also provide a more detailed analysis of the social, political and economic factors at play within early Johannesburg. Firstly, the imbalance in sex ratio of patients admitted into hospital with more male to female patients is significant. The leading cause of male patient admittance was a result of Trauma and injury. This suggest a great freedom in male play activities as opposed to female activities, which were likely more restricted due to gender societal norms and accepted gender behaviours within a white European context. The likelihood of trauma being linked to childhood activities such as playtime is justified due to the fact that all patients within the study sample were under the age of 15.

According to Prangnel & Quirk (2009), a study analysing the mining city of Paradise in Queensland, Australia revealed the inner workings of white middle-class life in the Victorian Era. During this time, children were encouraged to play freely and enjoy their childhood whilst simultaneously receiving an education and worked only on occasion when necessity required (Prangnel & Quirk 2009). There is no evidence within newspaper articles which suggest that these childhood injuries may be attributed to child labour manly due to legalities associated with the employment of children during this period in South Africa. Therefore, due to the links between British dominions and colonies, it is likely that the freedoms enjoyed by Children in colonial Australia were similar to those fostered in segregation era South Africa. Child labour was also a taboo and contentious issue in dominions and colonies as it was believed that it detracted from education and childhood (Prangnel & Quirk 2009). These views were mirrored with regards to

the Union of South Africa where according to the Masters and Servants Act[19], a child was only permitted to enter into an apprenticeship if above the age of 16. In some cases, a child was able to apprentice to a mother, father or guardian if older than 10, but could not legally partake in child labour such as working in factories or in mines.

Through play, children were taught gender roles and societal roles which they would one day pursue. Sport, in particular, was important for boys in order to encourage fitness which would aid in jobs requiring physical labour when they were older (Prangnel & Quirk 2009). In contrast, girls were encouraged to engage in role related play such as having tea parties and playing with dolls in order to foster bot maternal instincts and societal rituals (Prangnel & Quirk 2009). This suggests that boys were likely partaking in more dangerous play activities as opposed to girls, whose play remained fairly inactive and indoors. Thus, the main goal of the Victorian middle-class girl was fostering 'femininity' most associated with a women's role as a wife or mother and thus this left middle-class women with less opportunities both in work and in general daily activities (Gorham 2013; Schwartz 2011). Similarly, although women of the lower and working classes may have placed the need to work above gender societal norms, it is still likely that parents would have fostered the role of the "homemaker" in their female children and imitated the classes above them by instilling 'feminine values' during play (Gorham 2013; Schwartz 2011).

The growing popularity of feminism during this period thus pushed for the education of women with the aim to improve society which would have ultimately 'freed' women from home and push them into the public sphere (Schwartz 2011). It is thus not surprising that multiple schools opened across Johannesburg for both girls and boys, although the majority of these schools were aimed at the upper and middle classes, some provided education to members of the working class. An

[19] Masters and Servant Act no. 13 of 1880

article released in *The Rand Daily Mail*[20] gives insight into just a few of the many schools which were opened in Johannesburg, of which include: King Edward the VII school; St Andrew's School for Girls; St John's College; Jeppe High School for Boys; Roedean School for Girls; and the first school to open in the Rand, St Mary's School, Waverley. In the adverts section of *The Rand Daily Mail*[21] on the 16th of January 1925, there were multiple adverts for primary schools, stationary and uniforms specials in order for children to be "back to school ready". This illustrates the encouragement by main stream press for the education of the future generation.

The imbalance in sex ratio may also speak to the "male idiot theory" as opposed to suggesting more compromise immune systems or more brittle skeletal structure (Lendrem, *et al.* 2014; Isaacs 2015). In this theory, male individuals are more likely to take greater risks by putting themselves in dangerous situations whereas females tend to be more hesitant and self-preserving (Lendrem, *et al.* 2014). Therefore, sex differences have historically existed in risk seeking behaviour, with a higher number of emergency hospital visits and mortality rates in boys and men (Lendrem, *et al.* 2010). Even though some of these behaviours may be attributed to cultural or socio-economic factors, risk seeking behaviour is often evident from a young age within a given population and thus cannot wholly be attributed to societal and cultural factors (Lendrem, *et al.* 2010).

Although this theory invites speculation, most notable through its naming which suggests an inherent bias, the conceptual framework of this theory is something which has been relevant in other contexts, most notably in the anthropological study by Grayson (1990) of The Donner Party. In 1846, 87 members of the Donne Party crossed America and became stranded during heavy snowfall, upon rescue only 47 survived (Grayson 1990). Grayson found that there was an inherent correlation of deaths with age, sex and size of kin finding female survivorship

[20] Matric Exams Transvaal Successes (Publish January 27th of 1912) in *The Rand Daily Mail* (Via Readex)
[21] Multiple Adverts (Published January 16th of 1925) in *The Rand Daily Mail* (Via Readex)

higher than that of male. This speaks to the self-preservation theories echoed in Lendrem, *et al.* (2014) and Isaacs (2015).

Patient age within the TCMH range from new-born patients to those up to 14 years of age. Patients over the age of 14 were likely admitted into general hospitals with adult patients as opposed to those specializing in paediatrics. The largest patient age range admitted were from new-borns to two years of age. This could be linked to the fragility in this group's skeletal structure, since their bone structure is still highly plastic at this age which means that they are prone to breakages both in play and in childbirth (Lewis 2002). Their still developing immune systems also means that this age group is more susceptible to certain contagious diseases as opposed to older children (Lewis 2002).

This means that children in this age group with diseases such as Whooping Cough (Pertussis) or Typhoid/Enteric Fever are more at risk of dying than older individuals (Lewis 2002). It is also possible that since this age group requires constant supervision, this was not a luxury which many working class parents could afford. Since poorer families required both parents to work during the day and with either older siblings or grandparents left to supervise toddlers, rather than a governess or nursery school, it is likely that small children's freedom in play was less restrictive in a more dangerous environment (Van Onselen 2001; Washington 2004).

The mortality rates of the hospital's patients are loq. However, some patients were recorded to have died out of the hospital's care. Some of the children admitted to TCMH were removed by their parents against the doctors recommendations which could mean that some patients with serious health conditions may have died subsequently at home and did not notify the hospital. The leading cause of death was due to complications associated with Chronic Malnutrition followed by Enteritis, Meningitis and TB.

Chronic Malnutrition may point to the fact that children were not receiving a proper and balanced diet due to either their economic situation or that their parents chose to feed them improperly (in cases of abused) (Lewis 2002). Since reported cases of abuse are low, it is possible that the majority of these cases are a result of the fact that parents could not afford to feed their children properly (Lewis 2002). It is also possible that children within the records could be malnourished as a result of an underlying health condition that had not yet been diagnosed (Washington 2004; Lewis 2002; Brown, *et al.* 2010; Meade & Emch 2010).

Deaths resulting from Enteritis, Meningitis and TB were presumably not only the result of the developing immune systems of these children; but also likely due to limited medical knowledge and treatment available to the doctors of this period (Lewis 2002). The notion. Of developing medical knowledge surrounding these ailments is substantiated by multiple newspaper articles within *The Rand Daily Mail* released between 1923 and 1925 which track warnings of cerebra-spinal meningitis outbreaks in October 1923 and November 1925 in the grater Johannesburg area and of Enteritis and Dysentery in children in October of 1921 which suggested precautions in order to avoid contraction of these infections[22]. The newspaper article also provides information on how TB can be better managed if the symptoms are treated in their earlier stages which is less likely to result in death.

The spatial distribution of mortality rates are spread over a three mile radius from the city's centre as well as a notable amount of cases occurring of Turf mine property. This points to high mortality rates within lower-economic income areas as opposed to upper-class suburbs (Washington 2004; Brown, *et al.* 2010; Meade & Emch 2010). However, the lack of mortality rates in wealthier areas does not automatically equate to no deaths occurring within these areas. Instead, it may suggest the use of private clinics or doctor house calls which wealthier families,

[22] Work of Phthisis Sanatorium (Published June 20th of 1925) in *The Rand Daily Mail* (Via Readex)

unlike poorer, could afford. This points to wealthier children either dying at home or in alternative medical facilities.

The number of free versus paying patients within the hospital record may also be skewed since these patients were only recorded if documentation was provided proving their inability to pay for medical care. However, this information is still important in providing information of areas which poorer families were living. Children admitted as non-paying patients are shown to reside in the city centre; within close proximity to mining areas such as Turffontein; or close to major transport. Routes which are suburbs most commonly associated with lower-income families. The accessibility of lower-income families to transport routes and places of employment infers that parents either worked as hard labourers within factories or mines or even illegally in the city centre, such as prostitutes; pick-pocketers or even illegal liquor brewers (Callinicos 1985; Van Onselen 2001).

The main reason for the admittance of patients who could not afford to pay their medical bills was TB as well as Trauma/Injury. Evidence that these patients were admitted for TB may further the notion of their parents working in or around mining properties as TB was rampant among the mining population of the Rand and across South Africa (Callinicos 1985; Van Der Merwe 2010). The high rates within this demographic group of Trauma and Injury may not wholly suggest cases of inter-personal violence such as child abuse but may point to hazardous living environments and unsupervised play whilst both parents were at work (Washington 2004).

Information provided in the record suggests that although strict economic segregation may have existed and separated the working classes from the upper classes, the social segregation and tensions which supposedly existed within the white population between ethnic and religious groups was less so. There was a far greater intermingling within the white population with European immigrants; Jewish people, Christians; English speakers and Afrikaans speakers where people

chose to live in areas which they could afford. Although Data from the records does provide slight ethnic majorities inhabiting certain suburban areas, it is likely that many of these areas experienced greater ethnic and religious intermingling than previously believed (Brodie 2008; Van Onselen 2001). Although on paper, tensions between such groups may have existed, the spatial distribution of these groups suggest otherwise. This is not however to suggest that hatred toward different language speakers; anti-Semitism and Xenophobia did not exist within the white population altogether during this period (Bonner & Segal 1998; Van Onselen 2001; Brodie 2008).

The results gathered pertaining to patient transfers are interesting as they likely account for the absence of patients from certain areas. The transfers of patients indicates different medical facilities being better equipped or specializing in the treatments and recovery of patients suffering from different diseases. For example, STI's such as Syphilis and Gonorrhoea were mainly treated at Rietfontein Hospital. During this time, there was no remedy for Gonorrhoea; no true test equivalent to the Wasserman test for Gonorrhoea as well as no standardized cure or treatment for Syphilis, according to an article from *The Rand Daily Mail*[23].

A need for uniform and permanent cures was seen to be a growing concern for medical practitioners (Gluckman 1926[24]). John Max Mehliss, a resident doctor at Rietfontein Hospital was able to develop a reliable cure for Syphilis which resulted in the direct admittance and transfer of patients to the facility for treatment (Collins 1993). Similarly, TCMH became famous in its treatment of childhood diseases since Dr Baumann, a resident TCMH doctor who was originally a senior physician at Johannesburg Hospital, was responsible for developing paediatrics in South Africa (Wade 2006). In particular, the hospital devoted its interests to the treatment, research and cure of Polio (Wade 2006).

[23] Grappling with V.D.: Problems Still Unsolved (Published November 14th of 1923) in *The Rand Daily Mail* (Via Readex)
[24] A Need for Uniform and Permanent Cures (Gluckman, H) Published July of 1926 in *The South African Medical Record* (Via Readex)

5.3. Discussion of Patient Data Results and the Spatial Distribution of Disease and Afflictions

The interpretation of the diseases chosen for investigation are important in understanding the social, political and economic climate of Johannesburg and how this led to anxieties pushed by the ruling class surrounding racial intermingling. Narratives of the period often associated diseases with poverty and what the ruling class commonly considered as 'loose morals'. These attitudes worked to justify segregationist regimes and policies enforced by both the Transvaal and National Government of the time. Thus, understanding the spatial distribution of these ailments within the white population is important as it will either refute or justify the legislations pertaining to racial and spatial engineering introduced in Johannesburg during this period.

The results show that the main contagious disease which children at TCMH were admitted for was Typhoid/Enteric Fever. Since this disease is mainly spread through contaminated water as well as close contact with those infected (Brown, *et al.* 2010; Washington 2004). It is argued that this disease, has throughout history, most readily affected those of low-socioeconomic standing whose living conditions are often associated with overcrowding and poor sanitation (Brown, *et al.* 2010; Washington 2004). It is therefore not surprising that the majority of patients suffering from this disease resided in poorer residential areas. However, the spatial distribution of this disease shows no clear trend through space and is present even within wealthier areas. This not only points to a common water source throughout the city which may have been contaminated by industry and mining, but also possibly the result of an infected carrier working within wealthier areas by domestic servant such as was the case with 'Typhoid Mary'.

'Typhoid Mary' was America's first known carrier of Typhoid/Enteric Fever and possibly the most famous carrier in history (Marr 1999). 'Typhoid Mary' was responsible for the spread of 54 cases and up to four deaths, spanning over nine different outbreaks (Marr 1999; Soper 1939; Bryson 2019). Mary Mallon was a Catholic Irish immigrant working as a cook for the upper class of New York in

their holiday homes (Marr 1999; Bryson 2019). Although very little is known of her, she was important in determining how Typhoid/Enteric Fever is transmitted within a society, knowledge which previously was unknown in the medical community as the spread of the contagion was predominantly attributed to contaminated milk/water along with putrefying organic matter and not transmissible through human agents (Soper 1939). 'Typhoid Mary' ultimately led to the understanding of Typhoid/Enteric Fever transmission and thus the disease tended to be attributed to female carriers who worked directly with food, accounting for the imbalance of sex ratio in Typhoid/Enteric fever cases in the TCMH patient records (Soper 1939).

There is however, a higher spatial distribution of this illness in poorer areas. This could be due to the fact that poorer suburbs had little or no access to clean water and proper sewerage removal which accounts for why this disease was most common amongst the poorer white population. Housing adverts published in *The Rand Daily Mail* in 1925[25] show multiple houses within different socio-economic areas which has sewerage systems, of which include La Rochelle; Auckland Park; Bellevue; Berea and Doornfontein. However, an earlier article released in the newspaper in 1907[26] suggests that while Johannesburg Town Council had implemented Sewerage schemes for the city, only some houses were connected to the pipes and thus most left without access to clean water and proper sanitation.

Other seemingly "less serious" diagnosed Diet Related Illnesses such as Vomiting, Diarrhoea and Constipation also appear widespread throughout the map with no distinct trends. However, there are fewer cases present within wealthier Northern Suburbs. This furthers the idea that poorer areas may have had access to the same sanitation, infrastructure or food quality than their richer counterparts (Van Onselen 2001; Brodie 2008; Washington 2004). An article

[25] Multiple Adverts (Published January 16th of 1925) in *The Rand Daily Mail* (Via Readex)
[26] "A Piece of Jobbery". (Published November 27th of 1907) in *The Rand Daily Mail* (Via Readex)

published in *The Rand Daily Mail* in 1925[27] states that the most troubling outbreaks of Typhoid/Enteric Fever and similar diseases have occurred from contaminated food, especially milk, calling this phenomenon "the milk supply epidemic"

The Vaal River Scheme was believed to be the first major breakthrough in the prevention of Diet Related Illnesses which was expected to provide fresh water to all Johannesburg residents irrespective of socio-economic standing (*The Rand Daily Mail* 1923[28]). However, another newspaper article published in 1923[29], "infantile or summer diarrhoea" was reposted to be a major threat to the city's more crowded areas. The article provides precautions which could be taken to avoid the contraction of such a serious illness, encouraging civilians to cover and boil their mil as well as cover manure to discourage flies from settling on food or in milk.

Whilst Houghton Estate residents had access to water and electricity, inner city and mining property residents may not have had (Brodie 2008). This is further substantiated by the high prevalence of Enteritis in these areas as compared to other suburbs on the map. It is interesting to note that incidences of Tapeworm seem to occur across the suburban sprawl of Johannesburg. This not only points to poor quality of meat but improper sanitation in meat markets and butchers alike and it is possible that residents were receiving their meat from a single source (Roberts & Manchester 2005). Articles from *The Rand Daily Mail* on Tapeworm seem to focus on the notion of Tapeworm existing as a disease among the black population an not one associated within the white population. An article released in May of 1923[30] states that at least 50% of the 'native' population has worms and

[27] People Who Carry Disease (Published December 3rd of 1925) in *The Rand Daily Mail* (Via Readex)
[28] The Purification of Water: How Many Lives Can Be Saved? (Published May 11th of 1923) in *The Rand Daily Mail* (Via Readex)
[29] The Enemy of Mankind: How Flies Spread Disease (Published November 22nd of 1923) in *The Rand Daily Mail* (Via Readex)
[30] A Ghastly Slash: Fatal End of Compound Quarrel (Published May 2nd of 1923) in *The Rand Daily Mail* (Via Readex)

associated this disease as a ‘Native peoples problem’ rather than a ‘White peoples problem’.

Like Typhoid/Enteric Fever, TB is prevalent within the TCMH medical records as the second main infectious disease affecting the hospital population. There is also a possibility that seemingly ‘less serious’ respiratory related illnesses, such as with the diet related diseases, may have been misdiagnosed as isolated ailments and may have actually been symptoms of TB. TB however, has a more distinct trend in its spatial distribution, occurring mainly in the city centre and on mining owned property suggesting the possibility of children contracting the disease from their parents who either were miners or worked within close contact of them (Van Onselen 2001; Callinicos 1985; Van Der Merwe 2010).

Since this disease mainly thrives in poorer, overcrowded urban communities, it is largely absent from wealthier suburbs where overcrowding was not permitted (Van Onselen 2001; Brodie 2008; Brown, *et al.* 2010). This justifies the notion of TB being the “disease of the urban poor” (Brown, *et al.* 2010). There is one outlier in Norwood/Orange Grove however, this does not refute the above statement as this area was a working class suburbs whose occupants mainly worked in factories in the East which leads to the possibility that the child may have contracted the disease from a parent who worked in an overcrowded factory (Brodie 2008).

Other Respiratory Related Illnesses such as the Pneumonia variants; Bronchitis and Influenza also seem more prevalent in inner city suburbs which is typical not only of overcrowded living and working conditions, but urban pollutants caused by industry (Grob 2002; Washing 2004). Surprisingly, cases of influenza are low which could indicate either herd immunity reached by the Greater Johannesburg/South African population, or, that the majority of these patients were being treated at Fever hospitals in order to prevent a larger outbreak.

According to an article in *The Rand Daily Mail*[31], in 1925 there was a slight increase in the number of white South Africans with Influenza but there seemed to be no public panic surrounding the ailment. This is likely due to the growing concern held over the prevalence of TB within the population of this period. Although Whooping Cough/Pertussis is classified as a serious childhood illness by Grob (2002), it is not a prevalent ailment within the hospital population especially with regards to mortality rates.

STI's within the hospital record and in their spatial distribution are uncommon. This is possibly linked to three factors, the first being that often STI's during this period were hard to diagnosed and the only sexual diseases that could be diagnosed were Gonorrhoea and Syphilis even though these test could be fairly unreliable. Multiple articles in *The Rand Daily Mail*[32] speak to this, stating that unlike the Wasserman test which was used to diagnose Syphilis, no true test such as this existed for Gonorrhoea (Grob 2002; Burns 2004; Legg 2009). The second is due to the stigma attached to STI's during this time which are still prevalent today (Grob 2002; Lewis 2004; Legg 2009). It is likely more sexual diseases were present within the population during this time period but due to social perceptions, may have been left untreated. Lastly, more serious cases may have resulted in the direct admittance of patients to Fever hospitals which would have been better equipped in the treatment of STI's.

Many STI's during this period were firmly associated with the 'criminal Native' and often referred to as 'a Native problem' such as was the perception with Tapeworm with reference to an article from *The Rand Daily Mail*[33]. However, this does not necessarily mean that sexual diseases would be duly underreported in white sufferers. The spatial distribution of these diseases show an equal

[31] Rand's Disease Barometer (Published September 22nd of 1925) in *The Rand Daily Mail* (Via Readex)
[32] Grappling with V.D.: Problems Still Unsolved (Published November 14th of 1925) in *The Rand Daily Mail* (Via Readex)
[33] Grappling with V.D.: Problems Still Unsolved (Published November 14th of 1925) in *The Rand Daily Mail* (Via Readex)

distribution of infection on mining property and within the inner city. The near absence of these cases in richer areas was likely fuel for the belief of the time of the 'decaying morals of the lower classes' which was a notion pushed by the upper class in order to gain greater social control and tackle the growing 'problem' of 'promiscuity' among the white working class (Van Onselen 2001; Callinicos 1985; Brodie 2008).

This is reflected in laws of the period such as the Immigrants Restriction Act[34] which was passed in order to curtail the sex industry and prevent the spread of infectious diseases such as Gonorrhoea and Syphilis. This law defines a "prohibited immigrant" in a number of way which include prostitutes and even "a leper or person suffering from an infectious disease" which echoes social taboos surrounding both the sex industry and sexual diseases during this time. Since prostitution and brothels were outlawed in the Immorality Act of 1903[35], the regulations outlined by these laws mimic popular societal taboos of the period, with harsher penalties given to brothels with prostitutes under the age of 12 as well as white prostitutes who were willing to 'service' black men.

However, nearly no punishments were given to white men employing the services of prostitutes. Since men were less likely to receive harsh penalties for adultery, the chances of the spread of these infectious sexual diseases to wives who then would pass it on congenitally to their children was in all likelihood high. Another avenue for children contracting the diseases congenitally could be due to their mothers working as sex workers, especially if the family was poor.

Cases of Improper Care and Neglect and the conditions class under them are not only important in determining cases where abuse may have occurred but also in determining poorer areas where proper childhood care was not something which was easily accessible to parents due to their socio-economic status (Lewis 2002).

[34] Immigrants Restriction Act no. 15 of 1907, later amended to the Immigrants Restriction Act no. 35 of 1908
[35] Immorality Act no. 46 of 1903

These cases appear evenly distributed across poorer areas such as in the urban city centre and on mine property yet there is one outlier case on Houghton Estate which may be attributed to either abuse or an underlying health condition since it is unlikely that someone residing in this suburbs could not access health care or a balanced diet. Cases of children with rotten teeth (Dental Carries) indicate not only poor hygiene, as in the case of children reported in the records as "dirty", but malnourishment and a high sugar diet (Lewis 2002; Roberts & Manchester 2010).

Skin conditions such as severe Eczema may also indicate a high stress environment or an irritation induced by exposure to harsh chemicals within their living environment (Washington 2004). Infectious skin conditions also often indicate cramped living conditions and improper hygiene. Septicaemia of wounds can also indicate that the sufferer may have not had access to proper sanitation and hygiene as well as a lack of access to proper treatment and medications. A hazardous environment where open wounds may become easily infection was common in poorer areas (Washington 2004).

Although infectious diseases in the record appear rampant, the government aimed to curtail their spread through both the Local Government Ordinance Bill[36] as well as the enactment of the Public Health Act[37] which as explored previously, resulted in the establishment of a Public Health Department. According to the Local Government Ordinance Bill, local authorities were responsible for the upkeep of the city which included ensuring the city was kept clean and its people safe from infectious disease. In particular, local authorities were required to establish sanitary services in order to remove night soil, urine, slops, rubbish, dead animals and refuge. Local governments within the Union were also required to prevent outbreaks of infectious diseases most commonly spread through contaminated food as water, such as TB in milk and any meat or animals which were agents of infectious disease. However, most important to their sanitation and public health duties, was to discourage and prohibit racial intermingling.

[36] Local Government Ordinance Bill no. 9 of 1912
[37] Public health Act no. 36 of 1919

The enactment of the Public Health Act allowed for a separate department to be established in order to ensure that the city's sanitation and public health regulations of the previous law were carried out. Their main role was to guard the population against infectious disease and limit/prevent their spread. They focused their attention on what they believed to be "notifiable diseases" which included TB; Typhoid/Enteric Fever and STI's as well as others. Specifically, the department required that those suffering from STI's would receive the necessary treatment until they were cured or they would be liable to a fine. The department also focused on ensuring dwellings were "safe" and would have proper ventilation; no overcrowding; access to sewerage removal and proper drainage as well as not be affected by pollutants from factories or other industries.

There is no clear spatial trend of Trauma and Injury within the TCMH patient records. It is not unusual that the main cause of patient admittance to the hospital is the result of Trauma/Injury which included broken bones; contusions; dislocations; sprains; poisonings or injuries caused by foreign objects. This is because children are generally more susceptible to getting hurt due to their natural curiosity of their living environment and lack of knowledge of the dangers around them as well as the fragility of their developing bones (Lewis 2002). These cases are spread across the maps and the lower number of cases in wealthier suburbs further suggests the ability of wealthier families to afford added supervision or private health care such as doctor house calls.

The accident reports detailing how children were injured within the TCMH records does not however credit possible cases of child abuse. However, at least some of these cases may have resulted from either abuse or neglect by their parents or guardians due to the vulnerability which children present when parents are faced with societal pressures and other external factors (Lewis 2002).

Most reported injuries in the patient record were accidents and encounters of children being hit by either motorbikes or motorcars whilst playing in the road.

An article form *The Rand Daily Mail* in 1923[38] noted a sharp increase in both road accidents and vehicles on roads, stating that Johannesburg was one of the "most dangerous and difficult towns for driving". This problem was again highlighted in another article in 1924[39] which recorded motorists to be "a public danger" noting that there were at least five street accidents every day in August of 1924, a total of 173 accidents altogether in resulting in the injury of at least 74 persons.

There is only one recorded case of rape within the hospital records which occurred on Turf mine property. This possibly speaks to societal taboos surrounding sexual harassment of the period and the failure of both parents and children to report cases of sexual and physical abuse. From this, it is impossible to infer that children within poorer areas were more susceptible to sexual, physical or verbal abuse, but rather that it was underreported in all areas.

Similarly, it is important to note that the near absence of certain disease and afflictions from certain areas of the map, such as in wealthier Northern Suburbs; Mining townships (apart form Turffontein) and 'Native'/'Malay' or 'Coolie' locations does not suggest a general immunity from these ailments by the children. Rather, this shows that children were likely being treated elsewhere or were not allowed to receive treatment at TCMH due to their race. In cases where white suburbs seem devoid of patients, it is possible that children were either left untreated or received medical treatment from other medical facilities/doctor house calls. The absence of patients from certain areas of the maps is thus of equal importance as those present on the maps. This notion not only suggests the racial prejudice which existed during this time in the form of open exclusion of the 'non-white' population, but also suggests that children received medical attention from other healthcare facilities and not only TCMH. It is also possible that parents pursued cures in alternative medicines and not always strictly Western Medicine such as African Traditional Medicine and Boer/Afrikaans Traditional Medicines.

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[38] Motor Accidents and Traffic (Published December 12th of 1923) in *The Rand Daily Mail* (Via Readex)
[39] Always Play for Safety: Growing Traffic and More Accidents (Published October 1st of 1924) in *The Rand Daily Mail* (Via Readex)

The racial prejudice evident within the patient Data is mirrored by contemporaneous laws such as the Housing Act; the Natives Land Act and the Natives (Urban Areas) Act. These acts all outline early segregation regimes which prohibited racial intermingling in residential zones with accommodation only supplied to persons of colour within their designated racial housing zones. Within these territories, local authorities were responsible for providing appropriate public health and sanitation provisions. With separate and racialized amenities, territories and facilities, it is likely a child born to 'non-white' parents would have been treated in separate medical facilities or taken to a traditional healer and would not have been treated with white children in hospitals such as TCMH.

It is important to acknowledge that the diseases and afflictions present within the white population as shown in this study sample is likely mirrored and possibly worse within the black population during this time in Johannesburg, even if the ratio of white children outweighed that of black. This is due to the fact that public health did little to focus on the black population with little to no access to health care facilities and living conditions which proved favourable in the spread of disease (Callinicos 1985; Bonner & Segal 1998). Thus, the fact that the study sample is devoid of black patients is equally as telling as if they were present.

The fact that diseases most commonly associated with the 'Native' as well as the 'criminal underclass' are also present within all sects of white society may be an indication that anxieties pushed by the ruling class were highly simplified truths. The interaction of diseases within different socio-economic classes is complicated and likely not as one-dimensional as perceived and fostered by the government during this era. Therefore, although social and economic factors are sometimes important in the contraction and spread of diseases, these factors are not solely responsible. Instead, multiple aspects of our lifestyle are important in their presence within a certain population.

The results produced and discussed above have therefore provided a more nuanced insight into the lives of the white population of Johannesburg during this period. It has demonstrated the highly complex interactions which exist between economic, socio-political and health factors within the given population which are important for our understanding of disease within the South African historical period.

The occurrence of the above investigated diseases within the study sample reflect the diseases present within the white population of Johannesburg from 1923 until 1925. Thus evidence reflects the Government's failure to control the spread and occurrence of social and sexual diseases within the population and therefore failed to engineer public health regimes which centre around both racial and spatial engineering. Regimes based on these ideologies were therefore not successful in containing and preventing the spread of both deadly and infectious diseases. The section to follow presents the reader with the conclusions drawn from this research project.

CHAPTER 6: CONCLUSION

This study investigated both the medical and surgical records from TCMH from its opening in 1923 until 1925 with the aim to investigate the spatial distribution of diseases in children in Johannesburg over a three year period. This Data was thereafter offset against Public Health legislations and perceptions of this period which placed both social and sexual diseases within a racialized context in a push for urban racial segregation as a way to develop a 'healthy and hygienic white city' within the Union of South Africa.

The study found it important not only to investigate the archival records of TCMH, but to investigate diseases in children who are a vulnerable demographic group who have been left under studied in the archaeological record. Most importantly, it was necessary to understand Public Health regimes operating in Johannesburg as well as the whole Union of South Africa during this period in order to better understand governmentality in countries who sought a need to enforce urban segregation by linking race to disease.

The literature review found evidence of socio-economic segregation not only between black and white residents of Johannesburg during the 1920's, but within the white population itself. The social, economic and political climate at this time in Johannesburg suggested that infectious diseases mainly favoured poorer areas, both black and white. Growing white puritanical racism was threatened by racial mixing between poorer members of society which ultimately gave rise to segregationist laws introduced before the Apartheid Era.

This project also provided a comprehensive insight into diseases affecting children and the various residential areas of Johannesburg within the study sample. Lastly, it outlines the importance of Medical and Health Geography which were disciplines employed in the formulation of this research's methodology. The methods of this project outlined the strategies of collecting Data as well as the mapping of demographic and epidemiological information. It spoke to the importance of the analysis of legislation and historical sources of this

period which ultimately impacted Public Health schemes and perceptions. Additionally, it addressed the problems encountered with Google Maps and the alternative mapping process as well as the limitations associated with this study.

The results produced showed the spatial distribution of diseases within the study sample and although the results indicated that the epidemiological and demographic spatial trends were not as distinct as expected, they did prove insightful in understanding the white population of Johannesburg during the 1920's. The lack of distinct spatial trends as well as the high densities of ailments across the suburbs indicated contradictory results to the perceptions perpetuated by white city fathers and the wealthier white classes. The results showed that infectious diseases were present within poorer and wealthier white residential areas showing that disease does not discriminate against race, class or creed.

Although white city fathers often equated disease to race and class, this was a highly simplified notion as diseases may result from a complicated interaction of numerous factors. Thus, public health regimes at this time focused on racial and spatial engineering which ultimately failed in preventing the spread and occurrence of diseases in Johannesburg. Instead, white ruling class anxieties which linked disease to factors such as race and socio-economic status had no sound foundation in truth but was used nevertheless by white puritans to conveniently justify the occurrence of disease. The results also indicated a large amount of ethnic intermingling within white residential areas where the white population lived where they could afford rather than dependents on their heritage, native language or religion.

Looking forward, there is a need to properly understand the epidemiological patterns of diseases during this period in Johannesburg and the whole Union of South Africa through different demographic groups which can vary from sex, age and race. This could in turn provide a greater all-encompassing evaluation of diseases operating within the population during this time. Since there have been no previous studies conducted on the TCMH patient records, it should be noted

that these archives require further analysis and could be useful in understanding specific childhood diseases such as that done on Polio by Wade (2006).

APPENDIX:

Appendix A:

A table providing a description and overview of suburbs of Johannesburg which patients of TCMH resided in. This table provides the name of each area/suburb as well as its date of establishment. Each area has also been provided with a brief background and demographic description which includes the socio-economic classes which resided in these areas. In some cases, a brief history is provided of the area. Lastly, the table provides an approximate distance from the city's centre and thus from the TCMH (provided in km's). In cases where the above information could not be provided for the area, the cell was left blank.

Area/ Suburb Name(s)	Establishment Date	Background (Demographics)	Approximate Distance from City Centre (km)	References
Argent/ Germiston	1902?	Working Class Mostly factory workers and miners.	>11.2	Conolly 1975
Auckland Park	1888	Middle Class Land usage was strictly controlled and monitored by the state, often prohibiting all commercial activities.	3.2	J.C. Council 1986
Belgravia	1888	Working to Middle Class Initially established as a middle-class white suburb but due to the demand of low income housing it became home to most skilled white labourers such as craftsmen.	1.6	Brodie 2008 Van Onselen 2001
Bellevue	1889	Upper Class Houses on sale in 1917 advertised houses featuring stables, staff residences and hot and cold water as well as a pantry and indoor bathroom.	1.6-3.2	J.C. Council 1986 An Important Sale of Residential Properties (Published November 13th of 1917) *The Rand Daily Mail* (Via Readex)
Berea	1893	Upper Class	1.6	J.C. Council 1986

		The suburb was marketed for sale in 1904 as "one of the finest land investments" with plentiful access to water; good schooling; great roads for cars and use of public squares and tennis courts.		Lazard and Company Sales (Published March 2nd of 1904) *The Rand Daily Mail* (Via Readex)
Bertrams	1902	Working Class and Lower Home to many of those under the poverty line, mainly white immigrants turning these areas into slum yards.	1.6	Chipkin 1993
Bezuidenhout (Bez) Valley	1902	Middle Class Land usage was strictly controlled and monitored by the state, often prohibiting all commercial activities.	3.2-4.8	J.C. Council 1986
Booysens Township	1887	Working Class Mostly miners.	3.2	Brodie 2008 J.C. Council 1986
Braamfontein	1888?	Upper Class Became home particularly to wealthy Western European Jewish immigrants.	<1.6-1.6	Brodie 2008
Brakpan	1888?	Working Class Mostly miners.	>11.2	Conolly 1975
Bramley	1897?	Upper Class Marketing for housing in 1904 stated the area to be a "charming suburb" with functioning electricity and indoor plumbing.	8	J.C. Kirkwood Sales (Published May 2nd of 1904) *The Rand Daily Mail* (Via Readex)
Brixton/ New Brixton	1903	Working Class Originally recommended for purchase to the government for the grazing of cattle but was later divided into 500 stands on what was named "Brixton	3.2-4.8	Brodie 2008 J.C. Council 1986

		Estate". It was a mix of residential and commercial activity and located near to industrial landmarks.		
Cleveland	1910	Working Class Mining area, described as "Thickly populated" and heavily industrial and thus likely housed miners and factory workers.	6.4	Short Notice Sales (Published February 14th of 1928) *The Rand Daily Mail* (Via Readex)
Cottesloe	1911	Working Class and Lower Lower income area and haven for the unemployed with a camp scheme set up in order to alleviate the stress of the white homeless population. Dwellings for rent were standard wood and iron housing with up to 5 rooms to rent in each dwelling. Most houses were located within close proximity to tram lines. There is no evidence of the area having electricity or indoor plumbing.	1.6-3.2	An Important Sale of Residential Properties (Published November 9th of 1922) *The Rand Daily Mail* (Via Readex) Moonlight Flitting (Published May 2nd of 1922) *The Rand Daily Mail* (Via Readex)
Craighall	1902	Middle Class The area originally housed the Craighall Park Hotel which was established in 1905 and marketed as a recreational spot for city dwellers, the land surrounding was sold and marketed toward the middle class yet the suburbs only became properly developed in the 1930's. Land usage was strictly controlled and monitored by the state, often prohibiting all	>11.2	Brodie 2008 J.C. Council 1986

		commercial activities.		
Crown Mine	1886?	Working Class Mainly miners, with majority Afrikaans.	1.6-3.2	Van Onselen 2001
Delmore		Working Class Home to miners working in Boksburg.	>11.2	Potgieter 1971
Denver	1906?	Working to Middle Class Home to a large white population between 1910 and 1933.	4.8	Potgieter 1971
Doornfontein	1912	Upper Class (Later became Middle Class and Working class and lower. It was also racially mixed) The first suburbs to be situated outside of the city centre and became home to wealthy Western European Jewish immigrants who could live freely. It became known as a "swagger suburb" originally housing the wealthier of Johannesburg's residents. Later it was evacuated by the wealthy and became a popular middle class Jewish residential area. Due to rising anti-Semitism however, property values in the area dropped which resulted in poorer Jews moving to the area where it became a major slum and gang district to many white immigrants living under the poverty line. By 1918, Doornfontein and	<1.6-1.6	Brodie 2008 Chipkin 1993 Parnell 2003

		its surrounding suburbs also became home to African workers who were housed close to factory sites by their employers. Behind formal housing was typically the location for the worst slum properties. The fall in property prices prompted whites to buy property at low prices and rent them out to black labourers turning the area into a multiracial settlement until it was cleared in the 1930's.		
EastTown	1904	Working to Middle Class Sale of a property in 1925 advertised 3 rooms and a kitchen stating fertile land and irrigation available for farming.	8	Cottage At EastTown (Published August 6th of 1925) *The Rand Daily Mail* (Via Readex)
Edenvale	1903	Working Class Originally populated by Immigrant Cornish miners due to its proximity to the Rietfontein gold mine.	>11.2	Raper, *et al.* 2014
Fairlands		Middle Class A Brick dwelling advertised in the Rand Daily Mail in 1924 was described as having a kitchen; three bedrooms as well as a garden.	>11.2	Sale of Freehold Properties Fairlands and Vrededorp (Published February 23rd of 1924) *The Rand Daily Mail* (Via Readex)
Fairview	1895?	Middle to Upper Class	1.6	*Leyds 1964* Musiker 2000 Shorten 1970
Ferreira/ Ferreira's Deep	1888	Working Class and Lower (racially mixed)	<1.6	Brodie 2008 Chipkin 1993

		This area became home to poor Eastern European Jewish immigrants. By 1918, it also became home to African workers who were housed close to factory sites by their employers. Behind formal housing was typically the location for the worst slum properties.		Parnell 2003
Florida	1889	Working Class Mainly an industrial area which likely housed factory workers due to the area being close to points of production.	>11.2	Raper, et al. 2014 Ratepayers Do Not Want Workshop (Published September 14th of 1926) *The Rand Daily Mail* (Via Readex)
Fordsburg	1887	Working Class and Lower Established by white miners but was later demolished and redeveloped in the 1900's due to threats of racial intermingling and poverty which posed threats to the rich. Close to points of production, Fordsburg was the location for boarding houses which housed poor immigrant whites. Home to most skilled white labourers such as craftsmen. The area was a mix of residential and commercial activity and located near to industrial landmarks.	>1.6-1.6	Brodie 2008 Chipkin 1993 J.C. Council 1986 Van Onselen 2001
Forest Town	1909	Upper Class An Affluent suburb to rich whites.	3.2	Raper, et al. 2014

Foresthill	1903	Upper Class Dwellings being sold in 1927 advertised housing with stables and access to a golf club on the estate.	4.8	Racing Stables, Forest Hill (Published March 19th of 1927) *The Rand Daily Mail* (Via Readex)
Geldenhuis Deep	1893?	Working Class Mostly home to miners due to its close proximity to Geldenhuis Mine.	6.4-8	Van Onselen 2001
Greymont/ Newlands	1902?	Working Class A mix of residential and commercial activity and located near to industrial landmarks.	4.8-6.4	J.C. Council 1986
Hillbrow	1895	Upper Class (later Middle Class) First established as an "elite suburb" and was originally marketed as Johannesburg's "healthiest" suburb (Brodie 2008:158). Between the World Wars this suburb became multi-storey apartment blocks.	1.6	Brodie 2008 J.C. Council 1986
Hospital Hill	1890?	Upper Class Boasted expensive housing	<1.6	J.C. Council 1986
Houghton	1896	Upper Class A suburb which originally formed part of Klipfontein but after being mined and yielding little return of gold it was set up for sale at the height of the South African War in 1901 and marketed as a wealthier upper class suburb as it remains today.	4.8	Brodie 2008 Chipkin 1993 J.C. Council 1986
Illovo	1902	Upper Class Expensive housing for wealthy whites, with some houses being sold on 2 acres of land, with	4.8-6.4	J.C. Council 1986 Sale of Eastview Illovo (Published June 21st of 1930) *The Rand Daily Mail* (Via Readex)

		access to their own water supply and tennis courts.		
Jeppe/ Jeppes/ Jeppestown	1888	Middle Class (Later Working Class and Lower) Initially established as middle-class white suburbs but due to the demand of low income housing it became home to most skilled white labourers such as craftsmen. Close to points of production, Jeppe was the location for boarding houses which housed poor immigrant whites. It was a mix of residential and commercial activity and located near to industrial landmarks.	1.6-3.2	Brodie 2008 J.C. Council 1986 Van Onselen 2001
Joburg/ City/ Local	1890?	Working Class and Lower (Racially mixed) Tended to be home to those of poorer economic background due to residences being within close proximity to points of production as well as high incidences of crime and overcrowding.	<1.6	Brodie 2008 Van Onselen 2001
Joubert Park		Middle to Upper Class Similar to Hillbrow as well as in close proximity to it, it mostly included small dwellings and high-rise buildings.	1.6	Brodie 2008
Jumpers Deep	1889?	Working Class Home to mainly miners working at Jumper's Mine.	4.8-6.4	Richardson & Van Helten 1984
Kenilworth	1906	Upper class Boasted "dainty" houses with dining and entertainment	4.8	J.C. Council 1986 Sale of a Dainty Villa Residence, Kenilworth

		rooms, pantries, bathroom; large kitchen; stables and servants housing with a front garden and lawns.		(Published August 16th of 1929) *The Rand Daily Mail* (Via Readex)
Kensington	1902	Middle to Upper Class Land usage was strictly controlled and monitored by the state, often prohibiting all commercial activities. Housing was relatively expensive compared to other areas.	3.2-6.4	J.C. Council 1986
La Rochelle	1903	Working Class Set for sale in1895 but did not sell due to its close proximity to mines, it later became a suburb providing cheap housing. It was home to mainly Portuguese immigrants.	3.2	Brodie 2008
Langlaagte	1886?	Working Class and Lower Remained home to many of lower socio-economic class, and consisted mainly of tin shanties.	8	Brodie 2008
Linden	1902	Middle to Upper Class Known as a "posh Afrikaaner suburb" and later came to be referred to as the "Boere Houghton", A middle class suburb and land usage was strictly controlled and monitored by the state, often prohibiting all commercial activities (Brodie 2008: 246).	6.4-8	Brodie 2008 J.C. Council 1986
Lorentzville	1902	Middle to Upper Class The area featured electric lights; a	1.6	J.C. Council 1986

		school for girls; a masonic temple and a library.		
Lyndhurst		Middle to Upper Class Access to public transport, but no educational facilities for children which proved problematic for residents. Larger houses with kitchen and pantries, many houses also had verandas, stabling and coach houses.	>11.2	Sale of Freehold Property (Published December 11th of 1906) *The Rand Daily Mail* (Via Readex) Uneducated Children – Strong Protest from Lyndhurst (Published March 6th of 1916) *The Rand Daily Mail* (Via Readex)
Malvern	1905	Working to Middle Class Also known as "Morristown", middle class Jews moved to this area once Doornfontein became dangerous with the influx of lower class Jewish families. The area was also a mix of residential and commercial activity and located near to industrial landmarks.	4.8-6.4	Brodie 2008 J.C. Council 1986
Maraisburg	1896?	Working Class Home to mainly miners since it was owned by Main Reef General Mines in Roodepoort.	>11.2	Raper, et al. 2014
Marshalltown	1888?	Working Class and Lower (Racially mixed) Became home to poor Eastern European Jewish immigrants. By 1918, it also became home to African workers who were housed close to factory sites by their employers. Behind formal housing was typically the location for the	<1.6	Brodie 2008 Chipkin 1993 Parnell 2003

		worst slum properties.		
Martindale		Working Class Close proximity to Brixton and Auckland park as well as easy access to tram lines as well as basic amenities.	11.2	Sale of Martindale (Published September 28th of 1904) *The Rand Daily Mail* (Via Readex)
Mayfair	1896	Working Class A mix of residential and commercial activity and located near to industrial landmarks.	1.6-3.2	J.C. Council 1986
Melville	1896	Middle Class Land usage was strictly controlled and monitored by the state, often prohibiting all commercial activities.	3.2-4.8	J.C. Council 1986
New Doornfontein	1906	Middle Class An area where Jews could live freely.	<1.6-1.6	Brodie 2008
Newtown	1903	Working Class Originally "Brickfields" (Vrededorp), it became the new commercial centre for Johannesburg.	<1.6	Brodie 2008 Van Onselen 2001
Norwood	1903	Working to Middle Class The suburb had access to public schools, post offices and shops within close proximity to Orange Grove. This meant it became home to Johannesburg's Italian population as the community of immigrants increased and housing in Orange Grove became sparse. This area's close proximity to explosive factories in Modderfontein meant that it was an ideal area to settle.	4.8	Asiatics' Right to Occupy (Published March 20th of 1928) *The Rand Daily Mail* (Via Readex) Freehold (Norwood) (Published March 10th of 1910) *The Rand Daily Mail* (Via Readex)

		By 1928, areas zoned off for "Asiatics" prompting evacuation by most white residents.		
Oaklands	1896	Upper Class	4.8	Leyds 1964
Observatory	1903	Middle Class Land usage was strictly controlled and monitored by the state, often prohibiting all commercial activities.	3.2-4.8	J.C. Council 1986
Ophirton	1887	Working Class One of Johannesburg's earliest residential areas. Also known as "Mewettsville" and "height's Township" and was home mainly to miners.	1.6-3.2	Brodie 2008 J.C. Council 1986
Orange Grove	1904	Working to Middle Class Land usage was strictly controlled and monitored by the state, often prohibiting all commercial activities. The original settlement location of Johannesburg's Italian population who immigrated to find work in the explosives manufacturing sector. Orange Grove's close proximity to explosive factories in Modderfontein meant it was ideal.	4.8-6.4	Brodie 2008 J.C. Council 1986
Orchards	1902	Upper Class	4.8-6.4	J.C. Council 1986 Leyds 1964
Parkhurst	1904?	Middle Class These estates were mostly marketed as "gentlemen's estates" and centred around the promotion of	6.4-8	Brodie 2008 J.C. Council 1986

		middle class recreation. Land usage was strictly controlled and monitored by the state, often prohibiting all commercial activities.		
Parktown	1893	Upper Class Was established in 1893 but remained a public estate until 1904. Steps were taken to reserve this area for the wealthy elite where commercial activity was prohibited and overcrowding was avoided by delegating only one dwelling per property. The suburb remained private with its own amenities; electric street lights; water; roads and sanitation services. Became home to wealthy Western European Jewish immigrants and other wealthier whites and steps were taken to secure this suburb as strictly segregationist for richer families.	1.6	Brodie 2008 Chipkin 1993
Parktown North	1902	Upper Class These estates were mostly marketed as "gentlemen's estates" and centred around the promotion of middle class recreation. Steps were taken to secure this suburb as strictly segregationist for richer families.	4.8-6.4	Brodie 2008 Chipkin 1993 J.C. Council 1986
Parkview	1908	Middle Class	3.2-4.8	J.C. Council 1986

		Land usage was strictly controlled and monitored by the state, often prohibiting all commercial activities.		
Randburg		Upper Class Settled as early as the 1850's by white farmers, originally a mix of Afrikaans, German, Dutch and Swiss Immigrants. It remained a predominantly Afrikaans area.	>11.2	Brodie 2008
Regent's Park	1903	Working Class Mainly miners due to its proximity to Turf Mines. In 1915, Johannesburg municipal candidates included a miner from Regent's Park.	3.2-4.8	Johannesburg's Municipal Elections, 1915 (Published October 28th of 1915) *The Rand Daily Mail* (Via Readex)
Richmond		Working Class Since the area was mainly industrial, most workers would have been located close to points of production.	6.4	Sale of Property and Machinery (Published September 19th of 1923) *The Rand Daily Mail* (Via Readex)
Rietfontein	1903	Working Class White miners (mostly immigrants such as the Cornish).	>11.2	Raper, et al. 2014
Rosebank	1896	Upper Class Wealthy area, large properties with tennis courts; croquet lawns and electric lights, residents also had access to indoor plumbing.	4.8-6.4	Sale of Gentleman's Country Residence (Published December 17th of 1919) *The Rand Daily Mail* (Via Readex)
Rosettenville	1889	Working to Middle Class First described as "a pleasant place to live" for the retired population of Johannesburg but remained home to mainly Portuguese immigrants since	3.2-4.8	Brodie 2008 J.C. Council 1986

		the area provided cheap housing (Brodie 2008: 181). It remained a working class area, with a mix of residential and commercial activity and located near to industrial landmarks.		
Rustenburg	1851	Middle to Upper Class Originally an administrative centre for farms run by the Afrikaans.	>11.2	Brodie 2008
Springfield	1906	Middle to Upper Class The Suburb was situated close to the main tram line, and advertised houses in 1909 which featured 4 bedrooms, kitchen, pantry and bathroom.	1.6	Raper, et al. 2014 Rent Producing Properties (Published September 15th of 1909) *The Rand Daily Mail* (Via Readex)
Springs	1904	Working Class Home to white miners due to the eight gold mines located in the area.	>11.2	Raper, et al. 2014
Sydenham	1904?	Middle to Upper Class Houses advertised for sale in 1929 boasted large rooms, a kitchen, pantry and scullery with water and lights.	6.4-8	Sale of Sydenham Residence (Published July 14th of 1929) *The Rand Daily Mail* (Via Readex)
Troyeville	1889	Working Class As an established residential area in Johannesburg's earlier years, it became home to mostly skilled white craftsmen. The area was also a mix of residential and commercial activity and located near to industrial landmarks.	1.6	J.C. Council 1986 Van Onselen 2001
Turffontein	1897?	Working Class	3.2-4.8	J.C. Council 1986

		A mix of residential and commercial activity and located near to industrial landmarks. Also home to white miners who worked at Turf Mines.		
Village Main Reef	1924	Working Class Dominated by mining activity.	<1.6	Raper, et al. 2014
Vrededorp	1895	Working Class and Lower (Racially mixed) Also known as "Brickfields" it was home to unskilled and unemployed whites and was often overcrowded. It was settled by the poor unskilled Afrikaans who came to manufacture bricks yet once the housing boom ended, many became vagrants but continued to squat in the area until it was demolished due to racial intermingling. Demolished in 1902 and became Newtown as well as a "Coolie location" (an area set aside for Indian people). This suburb was burnt down due to the outbreak of bubonic plague. Vrededorp's notorious reputation led to Afrikaans residents gentrification of the area between 1906-1908 in order for residents to self-consciously view themselves as members of the working middle class.	<1.6	Brodie 2008 Van Onselen 2001

Waverley	1897?	Middle to Upper Class Houses on sale in the area in 1930 advertised electric lights; servants residences with a dining room, garage and shed.	8	Raper, et al. 2014 Sale of Two Cottages, Waverley (Published November 6th of 1930) *The Rand Daily Mail* (Via Readex)
Westcliff	1902?	Upper Class Home to wealthier whites, It became known for its impressive mansions.	3.2	Chipkin 1993
Westdene	1904	Working Class A mixture of commercial activity as well as residential.	4.8	J.C. Council 1986
Wolhuter	1895	Working Class Mainly home to miners.	1.6	Wolhuter Deep Limited Notice (Published May 9th of 1908) *The Rand Daily Mail* (Via Readex)
Yeoville	1896	Middle Class (Later Working Class and Lower) Middle class Jews moved to this area once Doornfontein became dangerous with the influx of lower class Jewish families. It also became home to Johannesburg's Italian population as the community of immigrants increased and housing in Orange Grove became sparse. This area's close proximity to explosive factories in Modderfontein meant that it was an ideal area to settle. Home to many of those under the poverty line, mainly white immigrants turning these areas into slum yards.	1.6-3.2	Brodie 2008 Chipkin 1993

Appendix B:

A table providing a description and overview of diseases/afflictions of interest within the TCMH study sample. This table provides the name of each disease or ailment studied within this thesis which have each been assigned into a main category as outlined in the methodology section (i.e. Gonorrhoea is under the category of "Sexually Transmitted Infections/STI's). Each disease/affliction has been provided with an overview which places the disease within an archaeological framework and thus highlights its importance for exploration for this project. The table also provides symptoms of the ailment as well as vectors/causal factors which are important in understanding the contraction and spread of these diseases within a population during this period. In cases where the above information could not be provided for the disease/ailment, the cell was left blank.

Category:	Disease/ Ailment:	Overview:	Symptoms:	Vectors and Causal Factors:	Reference:
Sexually Transmitted Infections (STI's)	Syphilis	Controversial within archaeology as treponemal diseases are hard to differentiate on the skeleton. Since the discovery of gold in the Transvaal and Diamonds in Kimberley, incidences of Syphilis have risen dramatically, especially in African communities where before the arrival of Europeans, most venereal diseases remained fairly unknown. Contraceptives of this period focused on preventing pregnancy rather than preventing sexual diseases.	Treponemal infections are often recognized in different clinical stages Earlier stages classified by mild inflammation and minor lesions mostly on genital region Later stages classified by the spread of the infection throughout body (i.e. skin and soft tissues) and bone becomes compromised Areas of bone most readily affected include the knee; facial bones; teeth; tibia; ulna and radius The destruction of nasal cartilage and skull causes brain damage (cardiovascular and central	Bacterial (Treponemal which results in the inflammation in almost all bodily tissues). Contagious May be contracted congenitally or venereal. Congenital= the disease is passed from mother to child during gestation in the womb or during childbirth. Venereal = passed on through sexual contact. It enters the body through skin and mucous and spreads throughout the body using the circulatory system. Bad living conditions were conducive to the spread of sexually	Brown, *et al*. 2010 Burns 2004 Grob 2002 Kark 2003 Lewis 2002 Meade & Emch 2010 Roberts & Manchester 2005 Van Der Merwe, *et al.* 2010

		The two most readily identifiable venereal diseases at the turn of the century were Syphilis and Gonorrhoea, both congenital and venereal.	nervous system changes which lead to dramatic neurological and behavioural changes) A period of latency may ensue before more severe symptoms appear (a few months-decades). This period is also extremely dangerous since this is normally when the pathogen infects bone marrow, lymph glands and vital organs. Death (if not treated).	transmitted diseases such as drunkenness, overcrowding, filth, promiscuity and close working conditions, especially in mines where clothes were minimal and there was close contact between workers .	
	Gonorrhoea	Before the arrival of Europeans, most venereal diseases remained fairly unknown to indigenous peoples. Contraceptives of this time focused on preventing pregnancy rather than preventing sexual diseases. The two most readily identifiable venereal diseases at the turn of the century were Syphilis and Gonorrhoea, both congenital and venereal.	Initially confined to the genital region, the bacteria may easily spread throughout the body during a period of latency before more serious symptoms appear (a few months to decades). This is normally when the pathogen infects bone marrow, lymph glands and vital organs Gonorrhoea attaches itself to different epithelial cells and thus mostly appears as lesions on the genitals or orally Genital Gonorrhoea classified by genital pain; burning during urination; bleeding; swelling of testicles; fever;	Bacterial Contagious May be contracted congenitally or venereal. Congenital= the disease is passed from mother to child during gestation in the womb or during childbirth. Venereal = passed on through sexual contact. It enters the body through skin and mucous and spreads throughout the body using the circulatory system. Bad living conditions were conducive to the spread of sexually transmitted diseases such as drunkenness, overcrowding, filth, promiscuity	Brown, *et al.* 2010 Burns 2004 Grob 2002 Kark 2003 Little 2006 Meade & Emch 2010 Roberts & Manchester 2005 Van Der Merwe, *et al.* 2010

			malaise and weight loss. Rectal Gonorrhoea classified by rectal discharge; bleeding and painful bowel movements. Pharyngeal Gonorrhoea classified by Erythema; pain; itching; burning throat (may also be asymptomatic). Ophthalmia Gonorrhoea is classified by Conjunctivitis and corneal ulceration (if severe). Disseminated Gonorrhoea (rare) is classified by Myalgia; Arthralgia; Polyarthritis and skin lesions.	and close working conditions, especially in mines where clothes were minimal and there was close contact between workers.	
Diet Related Illnesses	Nutritional Disturbance	Those most at Risk of dying were children, infants and the elderly.	Paleness; fatigue; weakness; weight loss; stomach problems and fainting spells.	Parasitic infection such as Tapeworm may be a cause This ailment may be an isolated illness or may be a symptom of another underlying illness. Can also be caused by a poor diet which lacks nutrients.	Grivetti 2000 Grob 2002 Larson-Nath & Goday 2019 Meade & Emch 2010 Roberts & Manchester 2005
	Diarrhoea/ Diarrheal Disturbance	Those most at Risk of dying were children, infants and the elderly.	-	This ailment may be an isolated illness or may be a symptom of another underlying illness. May also be due to stress as well as the inability to digest certain	Grob 2002 Probert, *et al*. 2004

				foods (intolerance).	
	Enteritis	Those most at Risk of dying were children, infants and the elderly.	Diarrhoea; nausea; vomiting; abdominal pain; loss of appetite; fever and anal discharge/ bleeding.	Transmitted through the faecal-oral route (i.e. contaminated food or water sources with untreated sewage presenting as a major hazard).	Brown, *et al.* 2010 Grob 2002
	Dysentery	A leading cause of high mortality in the summer, especially at the turn of the century. Occurs Frequently in urban areas. Those most at Risk of dying were children, infants and the elderly.	Diarrhoea; cramps; fever and bloody stools. Death (results from severe dehydration and vascular collapse)	Transmitted through the faecal-oral route (i.e. contaminated food or water sources with untreated sewage presenting as a major hazard). Although micro-organisms tend to jump species, some develop a preference for a specific species such as Dysentery.	Brown, *et al.* 2010 Grob 2002
	Constipation/ Chronic Constipation	Those most at Risk of dying were children, infants and the elderly.	-	This ailment may be an isolated illness or may be a symptom of another underlying illness. low fibre diet; a sedentary lifestyle; malnutrition, and a lower socioeconomic status (lower access to proper nutrition) are all causal factors.	Alame & Bahna 2012 Grob 2002
	Tapeworm	Can give rise to chronic diseases and chronic ill-health such as severe malnutrition.	Nausea; loss of appetite; weight loss (malabsorption); abdominal pain; diarrhoea and general weakness May give rise to chronic ill-health such as Severe Malnutrition.	Parasitic Contracted through the consumption of contaminated food, mainly meat . Parasites such as Tapeworm are contracted especially when humans live in close contact with animals which results in humans becoming	Grob 2002 Roberts & Manchester 2005 Schmidt 1986

				"accidental hosts".	
	Vomiting/Cyclical Vomiting	Those most at Risk of dying were children, infants and the elderly.	-	This ailment may be an isolated illness or may be a symptom of another underlying illness. Gastro-intestinal diseases (i.e. hepatitis, pancreatitis); Infections; Metabolic diseases; Intra-cranial diseases (tumours, intra-cranial haemorrhage); Poisons and migraines.	Grahame-Smith 1986 Grob 2002
	Typhoid/ Enteric Fever	A leading cause of high mortality in the summer, especially at the turn of the century. Occurs Frequently in urban areas. Those most at Risk of dying were children, infants and the elderly.	Abdominal pain; general muscle ache; constipation; diarrhoea; vomiting; nausea; fever; fatigue; appetite loss; headache; weight loss and skin rashes.	Bacterial Transmitted through the faecal-oral route (i.e. contaminated food or water sources with untreated sewage presenting as a major hazard).	Brown, *et al.* 2010 Grob 2002
Respiratory Related Illnesses	Influenza	The Spanish Influenza was most active in the years from 1918 to 1919 And killed 6% of South Africa's Population upon its initial arrival. The spread of the contagion proved to be a point of contention politically, since black residential areas were pushed as "hotspots".	Fever; weight loss; malaise; fever; headache; muscle aches; sore throat; sneezing; nasal congestion; cough; watery eyes and sinus pain. Death (often swift, within three days after contraction) Even if one were to survive the initial attack, the virus had far reaching consequences with regards to health as many people came to	Viral Airborne (Droplet infection). Spread through salivary droplets during coughing, sneezing, talking or breathing. Originated with the domestication of animals such as pigs and tended to worsen with human mobility. Spread through migrants and soldiers fleeing for refuge from war. Can survive for long durations of	Brown, *et al.* 2010 Eccles 2005 Grob 2002 Meade & Emch 2010 Phillips 1984 Phillips 2012 Roberts & Manchester 2005

			suffer from Nephritis	time before entering the host via inhalation or ingestion differs from colds only in the type of infecting virus.	
	Bronchitis		Cough; mucus production; fatigue; shortness of breath; fever and chest discomfort.	Airborne (Droplet infection). Spread through salivary droplets during coughing, sneezing, talking or breathing. Can survive for long durations of time before entering the host via inhalation or ingestion.	Albert 2010 Grob 2002 Roberts & Manchester 2005
	Chronic Obstructive Pulmonary Disease	Leads to long term breathing and lung issues as it is a progressive illness.	Cough (with or without mucus) and breathlessness.	Long term exposure to irritants (i.e. air pollution; smoking etc.). May also be due to prior bacterial/viral infections.	Calverley & Georgopoulos 2006 Chhabra & Dash 2014
	Bronchopneumonia		Malaise; headache; rhinitis/pharyngitis; cough; production of mucus; fever and abdominal pain.	Viral Airborne (Droplet infection). Spread through salivary droplets during coughing, sneezing, talking or breathing. Can survive for long durations of time before entering the host via inhalation or ingestion.	Brown, *et al.* 2010 Gallagher 1934 Grob 2002 Roberts & Manchester 2005
	Pneumonia		Cough; mucus production; fatigue; fever and shortness of breath.	Viral Airborne (Droplet infection). Spread through salivary droplets during coughing, sneezing, talking or breathing.	Brown, *et al.* 2010 Grob 2002 Metlay, *et al.* 1997 Obrosky, *et al.* 1997 Roberts & Manchester 2005

	Consumption/ Tuberculosis (TB)	Tuberculosis is known as a disease associated with civilization and exemplifies the links between poverty and disease.	Affects the lungs; lymph nodes; skin; intestines and bones/joints. Chest pain; fever; fatigue; weight loss; malaise; loss of appetite and trouble breathing. Severe cases can also lead to blindness, deafness and mental defects. It usually has its onset in childhood. Infection may lie dormant and tends to flare up when the immune system is compromised and thus spread to numerous sites via the bloodstream and lymphatic system. Whooping Cough or even Measles have the ability to reactivate old infections. Skeletal areas most readily affected by Tuberculosis tend to be the spine, hip, knee and elbow. Children born to mothers with Tuberculosis tend to be still born or die shortly after birth. Attacks from Tuberculosis are often irregular and unpredictable.	Bacterial Airborne (Droplet infection). Spread through salivary droplets during coughing, sneezing, talking or breathing (Except for Bovine form). Originated in a bovine form but evolved to target human hosts when humans and animals came in closer contact. Tuberculosis is a disease of overcrowding and thus is conducive to urbanization. Poor housing and nutrition; close contact with the infected; poverty; climate and occupation (such as mining) are all causal factors. South Africa's first encounter with the deadly infection was during the first influx of migrants, in particular Irish miners who not only brought their expertise but Tuberculosis. Close contact with African miners underground meant that the disease was easily passed on. Protein deficiency may increase vulnerability but is little evidence that severe malnutrition was common amongst the urban poor and thus if diet plays a vital role in contraction.	Brown, *et al.* 2010 Grob 2002 Janzen 2002 Larsen 2002 Lewis 2002 Roberts & Manchester 2005 Van Der Merwe, *et al.* 2010

	Whooping Cough	This disease is unable to survive outside of its human host and is extremely dangerous to those under the age of four.	Fever; coughing attacks; sneezing; mucus production and diarrhoea. In younger patients it can cause brain damage; seizures; pneumonia; apnoea and convulsions. Death usually follows respiratory complications.	Viral Airborne (Droplet infection). Spread through salivary droplets during coughing, sneezing, talking or breathing.	Bettiol, *et al.* 2012 Brown, *et al.* 2010 Grob 2002 Harnden 2012 Meade & Emch 2010 Roberts & Manchester 2005
	Bad Cold/Rhinitis		Fever; weight loss; malaise; fever; headache, muscle aches; sore throat; sneezing; nasal congestion; cough; watery eyes, and sinus pain.	Viral Airborne (Droplet infection). Spread through salivary droplets during coughing, sneezing, talking or breathing. Can survive for long durations of time before entering the host via inhalation or ingestion.	Brown, *et al.* 2010 Eccles 2005 Grob 2002 Roberts & Manchester 2005
Cases of Improper Care/Neglect	Dermatitis/Eczema		Skin rashes; Itching; dryness; blisters; bumps; swelling and burning.	Bad reaction of skin to allergens or irritants. Can be conducive to poor living environments with exposure to air or environment pollution.	Meade & Emch 2010 Washington 2004
	Cellulitis/Skin Infection	Affects anyone regardless of sex or age.	Swelling; redness of area; skin sensitivity; pain; warmth of area; blistering; red spotting; fever; dimpling of area; production of pus; fever malaise. Most commonly affects lower extremities and face, later stages can result in sepsis, hypotension and tachycardia since it affects the	Bacterial Can be caused by trauma; ulcers; insect bites; tinea pedis; diabetes and obesity.	Vijayalakshmi & Ganapathy 2016

			lymph glands when left untreated.		
	Impetigo	Most commonly affects children ages 2-5. Highest incidences in summer months.	Rupturing red sores around nose and mouth which release a yellow-brown crust.	Contagious Transmitted through direct contact (nursery schools and child care facilities therefore hot spots for the skin infection). Poor hygiene and crowded living conditions are also problematic.	Cole & Gazewood 2007
	Chronic Malnutrition	Chronic malnutrition gives insight into the socio-economic conditions of past societies and individuals as is often associated with war, famine, poverty and movement. Good nutrition is seen as a foundation to good health since malnutrition makes the body more susceptible to disease.	Most commonly causes vitamin and mineral deficiencies such as Rickets (Vitamin D deficiency) and Scurvy (Vitamin C deficiency) which are the most common. Tiredness; inability to control body temperature; bone deformities; long healing time for wounds; inability to concentrate and weight loss.	Although a malnourished person is more likely to fall ill, sickness may also lead to malnutrition but dietary excess may also place an individual's health at risk. Most commonly due to improper diet but may also be caused by underlying health problems such as tapeworm, Tuberculosis etc. Mineral and vitamin deficiencies tend to result from general malnutrition and thus there is often more than one of these present in an individual. Normally occurs when nutrient intake does not meet the body's energy needs to help it function.	Larson-Nath & Goday 2019 Lewis 2002 Meade & Emch 2010 Van der Merwe, *et al.* 2010
	Neglected/Improper Care	In cases where children were reported as being neglected or under improper care they tended to	Poor hygiene; malnourishment; poor growth and poor dental hygiene	Most often occurs due to cases of child abuse or due to the families' inability to afford proper care for a child.	Brown, *et al.* 2010 Lewis 2002 Meade & Emch 2010

		embody one or multiple ailments under this category and thus were recorded as suffering from "improper care" or "neglect".			
	Septicaemia		Fever; fatigue; mental confusion/ delusions; difficulty breathing; organ dysfunction and skin discolouration.	Bacterial An infection of the blood which results in the spread of bacteria throughout the body. Thus it is a complication most associated with an infection.	Meade & Emch 2010
	Poor Hygiene	Indicates possible neglect or abuse cases as a result of poor living circumstances.	Dirty Appearance; Poor dental care or Absence of bathing.	Most often occurs due to cases of child abuse or due to the families' inability to afford proper care for a child.	Brown, *et al.* 2010 Lewis 2002 Meade & Emch 2010
	Rotten Teeth/Dental Caries	Dental diseases gives insight into both diet and socio-economic status since dental diseases are more prevalent in abused children and poorer homes.	Dental abscesses; Tooth Loss; Malnutrition and Progressive Demineralization of tooth surface	May be caused by improper diet, water quality and hygiene but genetics and the anatomical features of the teeth may also play a role. Dental Caries, for example, indicate a diet high in carbohydrates and give insight into the fluoride levels in water.	Lewis 2002 Van Der Merwe, *et al.* 2010
Trauma/Injury	Contusion	Trauma is "violent or accidental encounters with animals, humans or cultural hazards found in or around the home and workplace". Trauma may Indicate cases of child abuse or neglect and provides information about	Bruising normally as a result of a direct blow or impact.	Activities such as play, apprenticeships, warfare and physical abuse all exposed children to trauma, however, some genetic mutations may lead to a predisposition to injury (such as dislocation; breakages and internal bleeding).	Arena 1974 Hight, *et al.* 1979 Lewis 2002 Supakul, *et al.* 2015 Thornberry 2016 Van Der Merwe, *et al.* 2010
	Dislocation		Often visibly deformed; pain; swelling; bruising and inability to move joints.		
	Epiphyseal Separation		Can often go unnoticed in children. Warmth; swelling; pain and inability to use limb.		

	Foreign Body	occupation, interpersonal relationships, mortuary behavior, accidents as well as medical treatment of the past. Trauma and injury within the archaeological record are often high, the prevalence and location of the injury is normally influenced by age, sex and culture. The skeletal structure of a child also tends to influence the severity of the injury since child skeletal structure is plastic making them more susceptible to fatal soft tissue damage. Injuries left untreated may further indicate abuse, improper care and neglect.	A foreign object which has entered the body may be swallowed or inserted into orifices or enter the body by breaking through skin.		
	Head Injury		-		
	Eye Injury		-		
	Rape		The definition of rape during this period in South Africa and the laws which governed it centred only around female vaginal penetration by the male penis and did not include same sex rape, anal or oral penetration by foreign objects as well as any type of marital rape. These laws focused on white sexual protection which were based around white middle class norms of respectability and did not aim to protect persons of colour from sexual assault.		
	Poisoning		Intoxication as a result of toxic chemicals (natural or synthetic). Symptoms may differ depending on the toxin but commonly include nausea; diarrhoea; abdominal pain, faintness; loss of appetite; fever; difficulty swallowing or breathing; rash; blue lips/skin; seizures; loss of consciousness; vomiting and		

			mental confusion.		
	Broken Bone		Ribs and Pelvis (Most common in cases of child abuse). Pain; swelling; tenderness; bruising; bleeding (if skin broken); deformity and loss of function of broken limb. Three most common fractures are greenstick fractures (produces bowing); torus/buckle fractures (creates subtle bulge) and plastic deformation (unnatural bowing without a fracture). If left untreated may cause Periostitis or Osteomyelitis.		
	Burn		Blistering; pain; peeling or red skin; shock and swelling. Burns are classified according to the depth of the burns and severe burns often lead to death (can damage nearly every organ in the body).		

Appendix C:

Timeline of Events Relevant to This Study

1886- The Discovery of Gold in the Transvaal Area by Whites (Bonner & Segal 1998; Callinicos 1985, Parnell 2003).

1887- The First Stock Exchange of Johannesburg was established (Brodie 2008).

1890-1891- First Major Economic Depression in Johannesburg (Van Onselen 2001).

1893- Small Pox pandemic ends (Phillips 2012a).

1896-1897- Second Major Economic Depression in Johannesburg (Van Onselen 2001).

1899-1902- The Anglo-Boer War, also known as The South African War (Dennie 2009; Burns 2004; Van Onselen 2001).

1901-1907- The Outbreak of Bubonic Plague in Southern Africa (Phillips 2012a)

1902- The Collapse of the Transvaal Central Government and Replacement of Colonial Administration (Dennie 2009).

1902- Laws Passed Allowing Deeper Underground Mining (Worsened the Epidemic of Tuberculosis) (Callinicos 1985).

1902- The Reopening of the Rand after the South African War (Van Onselen 2001).

1903- The Immorality Act Established.

1904- Suspected Outbreak of Bubonic Plague (Brodie 2008).

1905- Laws Related to Africans in Urban Areas became Stricter (Harries 1994).

1906-1909- Increased Number of Whites move into Towns due to the Depression (Parnell 1993; Brodie 2008).

1906- Influx of Afrikaans labourers into the Rand as "scab labour" (Van Onselen 2001).

1906- The First African Township Established in Modern Soweto (Known as Klipspruit, later, Pimville) (Bonner & Segal 1998; Parnell 2003).

1906- The Establishment of First Tram Lines (Brodie 2008).

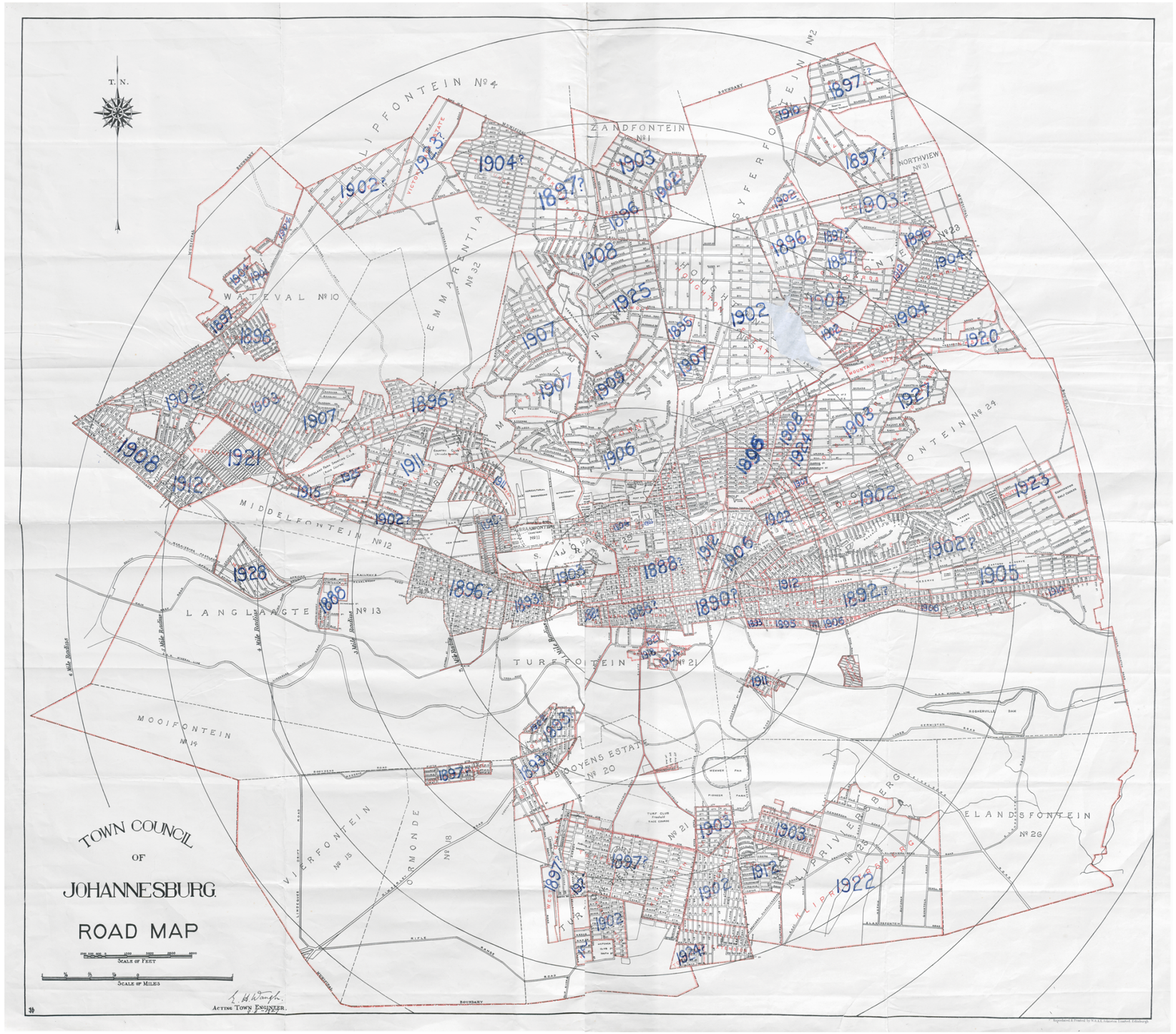
1906-1908- Third Major Economic Depression in Johannesburg (Van Onselen 2001).

1907-1908- Transvaal Immigration Restriction Act.

1909- The Establishment of the Provincial Housing and Town Planning Act (Parnell 1993).
1910- The Official Merging of the two Colonies (The Cape and Natal) with the two Boer Republics (The Transvaal and Free State) and formal independence gained of the Union of South Africa from British Empirical Rule (Posel 2001; Barber 1999).
1912- The Transvaal Local Government Ordinance Implemented (Parnell 1993).
1912-1913- Public Hysteria related to "The Black Peril" (Van Onselen 2001).
1913- The First Draft of the Public Health Act (Parnell 1993).
1913- The (Natives) Land Act (Callinicos 1985).
1913- The First Hostel for Black Males ('Mai-Mai) Opened in the Rand (Pirie & Da Silva 1986).
1914-1918- World War I.
1917-1918- Spanish Influenza Outbreak.
1918- The Burning of Urban Slums (Brodie 2008).
1918- The outbreak of Polio (Phillips 2012a).
1919- Jan Smuts becomes Prime Minister of the Union of South Africa (Barber 1999; Davenport 1991; Muller 1975).
1919- The Public Health Act (Parnell 1993).
1919- Unsuccessful Passing of the Unhealthy Areas Bill (Parnell 1993).
1919- Plans for the Establishment for The Transvaal Children's Memorial Hospital.
1920- The Housing Act Implemented (Parnell 1993).
1923- The Opening of the Transvaal Children's Memorial Hospital 1923- Natives (Urban Areas) Act Established (Parnell 2003).
1923- The Establishment of the Transvaal Children's Memorial Hospital (J.C. Council 1986).
1924- Jan Smuts is replaced by Barry Hertzop as ruling Prime Minister of the Union of South Africa (Barber 1999; Davenport 1991; Muller 1975).
1928- The Discovery of Penicillin by Alexander Fleming (Aminov 2010; Bryson 2019).
1934- The Union of South Africa becomes a sovereign state (Barber 1999).

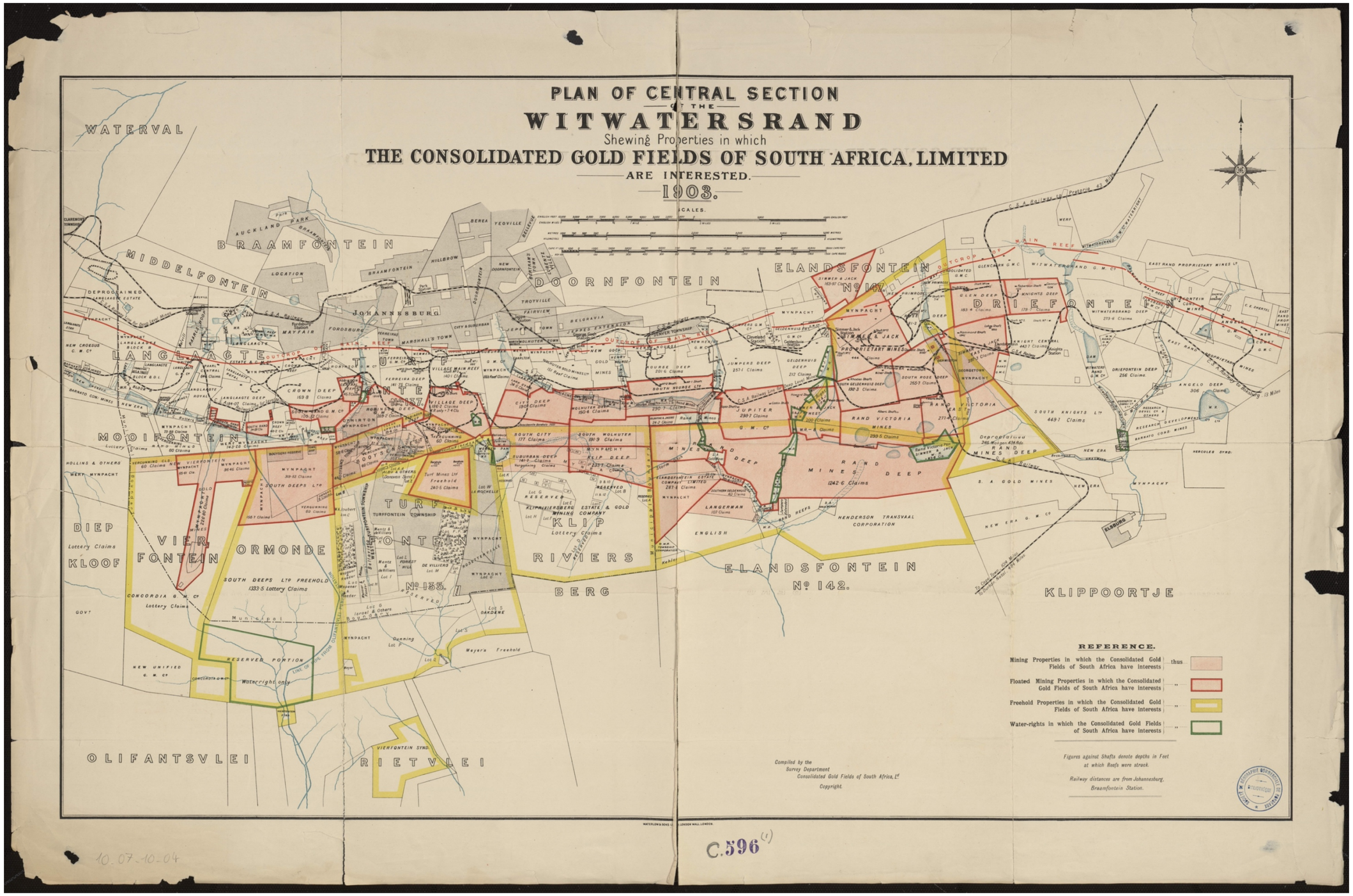
Appendix D:

First map used for the manual mapping process (Town Council Map of Johannesburg, 1927) (1:14 500) (Source: Waugh 1927)



Appendix E:

Second map used for the manual mapping process (Plan of Central Section of the Witwatersrand, 1903) (1:30 700) (Source: Consolidated Gold Fields of South Africa, Ltd. 1903)



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