CHAPTER ONE

INTRODUCTION

1.1 Introduction

Diabetes mellitus (DM) is a global public health problem. As a matter of fact, it is one of the five leading non-communicable diseases (NCDs) in the world today (WHO, 2011). Towards the end of the 20th century, there was a substantial increase in the incidence of DM particularly type 2 diabetes (Zimmet *et al.* 2005). It killed 5.1 million people and costs the world 548 billion US dollars in healthcare expenditure in 2013 (IDF, 2014). More disturbing figures from the International Diabetes Federation show there are 382 million people living with DM globally of which 80 percent live in low and middle income countries (LMCs) (IDF, 2014). The figure is expected to rise to 592 million by 2035 (IDF, 2014); with the Middle Eastern region, Sub Saharan Africa and India as future epicentres of this fast growing epidemic (Wild *et al*. 2004). The worst hit would be India. Presently, the total number of diabetic persons there stands at 40.9 million, and is projected to hit 69.9 million by the year 2025 (Sicree *et al.* 2006). This probably explains why India is tagged the diabetic capital of the world (Mohan and Pradeepa, 2009). The largest number of people with DM are between 40 and 59 years of age (IDF, 2014).

Elsewhere, prevalence rates are rising to levels with awful implications on households and national economies (Williams, 2009). In sub-Saharan Africa, DM is a major cause of deaths and disability (Young *et al.* 2009). Africa's prevalence estimate for 2006 was approximately 10.8 million and would increase to 18.7 million in 2025 (IDF, 2006). Though Azevedo and Alla (2008) have indicated that some African governments have taken severe measures to deal with heavy death tolls associated with DM, many others perceive that NCDs (including DM) are not a health priority. If unabated, Africa in the future would be one of the worst affected regions. With respect to Nigeria, it is not only a cause of morbidity and mortality (Ogbera *et al.* 2007), but "one of the most important chronic and degenerative disease and second only to hypertension in terms of public significance" (Ogbera, 2009 p.2). The increasing trend of diabetes particularly type 2 is attributed to lifestyle practices which are symptomatic of the influence of westernization (Alebiosu *et al.* 2009).

The epidemiological transition, as some have recently noted, is well advanced in the developed countries- where DM was once described as a disease of an affluent lifestyle (Mayosi *et al.* 2009). Alongside this development, a noticeable and gradual shift of DM with NCDs is taking place from the rich to poor countries where policy response to disease control and prevention is still based on the infectious disease model (Mayosi *et al*. 2009); Poor countries are also where infectious diseases are still a significant health burden. Sadly, these countries have the double burden of infectious and chronic degenerative diseases to contend with. For instance, the changes in demographic structures and disease patterns in West African populations have altered the disease burden, thereby shifting from communicable to both communicable and chronic NCDs. (Ezzati, 2005 cited in Abubakari et al. 2009)

1.2 Research problem

DM, like other NCDs, is multifactorial in nature. It is caused by multiple risk factors. As a matter of fact, Barker et al. (2011, p.434) explained that DM is "… strongly affected by behavioural, cultural and the environmental factors clustered and overlaid on genetic susceptibility". Zimmet (2000) observed that striking changes in human environment, behaviour and lifestyle have resulted in very high rates of obesity and DM. These high incidence rates have been attributed specifically to modifiable risk factors such as unhealthy diets, overweight/obesity, physical inactivity and tobacco use (WHO, 2011).

Generally, the rise in DM is very swift in the developing countries undergoing economic transition (Hjataker et al. 2008) and also seen to be one of the results of globalization processes in different forms such as availability and consumption of energy dense foods rich in salt, fat and sugar, proliferation of service industries and fast food outlets, rapid urbanisation, and ageing population (WHO, 2011; IDF, 2013; Godref and Julien, 2005; Mayosi et al, 2009, Battams et al. 2013). According to Zimmet et al. (2001) cited in Sierra (2009; p.4), "in the past two decades, we have seen an explosive increase in the number of people diagnosed with diabetes worldwide. This effect is most probably due to the pronounced changes in human behaviour and lifestyle that have accompanied globalization…" This, to a certain extent, explains why researchers have argued that these modifiable risk factors must

not be isolated from the globalization context, given the fact that the risk factors are associated with these pronounced changes that follow globalization (Mckinlay, 1984, Zimmet, 2000, Mohan et al. 2004; WHO, 2008; Sierra, 2009, Williams, 2009). Furthermore, it has been expressed that DM prevalence would further rise in the next decades with the force of globalisation and industrialisation moving at an increasing rate (Hjartaker et al. 2008).

Despite these several claims and some calls for further investigation on this interesting nexus (Miranda et al. 2008), the association between DM and these social and economic changes has still not been empirically verified. Thus, the focus of this study was to analyze the geographical pattern of DM in Oyo state, Nigeria and establish its association with broader economic and social changes resulting from the globalization process. In view of the foregoing, this research seeks to answer the following questions:

- What is the spatial pattern of DM in Oyo state?
- What are the environmental, socio economic and lifestyle risk factors that lead to people's vulnerability to diabetes?
- What is the spatial variation in the level of development in Oyo state?
- To what extent is the spatial distribution of DM related to the level of development in Oyo state?
- Has DM incidence been increasing or decreasing from over time?

The fundamental question to be addressed in this study is: To what extent is DM incidence significantly related to the level of development?

The need for this study arises from two major considerations. First, the geographical variation in the incidence of DM has not been explored within Nigeria. A geographical analysis of DM incidence would provide important guidance for NCD control and prevention practices by highlighting high risk areas in need of interventions, and provide useful information on the ecological and socioeconomic correlates of DM. Moreover this is in line with the aspirations of the World Health Organisation (2008, p.3) which are:

> *"…mapping the emerging epidemics of non-communicable diseases and analysing their social, economic, behavioral and political determinants; reducing the level of exposure of individuals and populations to the common modifiable risk factors for non-communicable diseases and their determinants…"*

A study of this kind no doubt demands attention because of its potential to influence policy decisions on diabetes surveillance and control. Second, the study is an important contribution to the ongoing research on the relationship between the geographical distribution of diabetes in Nigeria and the spatial variations in the level of development.

1.3 Aim and Objectives

The aim of the study is to examine the geographical pattern of DM in Oyo state, in relation to the level of development, with a view to verifying aspects of the human ecology of disease model and the epidemiological transition theory.

Specifically, the objectives are to:

1. Identify the spatio-temporal pattern of DM in Oyo state.
2. Establish the relationship between geographical pattern of DM and the level of development in Oyo state.
3. Identify the environmental, socioeconomic and lifestyle factors associated with the spatial variability of DM.
4. Determine the perception of DM among the people of Oyo state.

1.4 Research hypotheses

1. There is a significant clustering of DM rates in Oyo state
2. Geographic variability in DM is significantly influenced by genetic susceptibility, socio economic, environmental, and lifestyle risk factors.
3. There is an upward trend in the incidence of DM in Oyo state.
4. Spatial variation in DM is related to the differences in the level of development in Oyo state.
5. Perception of DM is affected by sex, age, income, education and occupation.

1.5 Study area

Oyo state is located in the south western part of Nigeria. It lies between latitudes 6º55' and 8 º 45'N of the equator, and longitudes 2º 50'and 3º 56'E of the Greenwich meridian. It shares boundaries with Ogun state in the south, Osun in the east, Kwara state in the north and an international boundary with Benin Republic along its western side (see Fig. 1.1). With a land area of 27, 249 square kilometres, Oyo state is divided into thirty three local government areas. It had a population of 5,591,589 (Males: 2,809,840 and Females: 2,781,749) in 2006 which makes it one of the most populous states in Nigeria. The state's population density is 204 persons per square kilometre (sq.km). However, there are wide variations in population density between the thirty three LGAs. Ibadan Southeast LGA has the highest population density of 4,567 persons while Egbeda LGA has the lowest average of 39 persons per sq.km. In addition, only five LGAs namely Ibadan Northeast (6,447), Ibadan Southeast (4,567), Ibadan Northwest (2,590), Ibadan North (2,315) and Ibadan Southwest (2,117) LGAs have their population density above 1,000 persons per sq.km. The state capital, Ibadan is the largest indigenous city in Africa. Oyo state is predominantly occupied by the Yorubas, with varied dialect groups.

Oyo State is one of the most urbanized States in Nigeria because of its large urban settlements such as the state capital, Ibadan, Ogbomoso, Oyo and Saki. Other towns include Eruwa, Igbetti, Lalupon, Kisi, Igbo-Ora, Igboho, and Okeho. The state is divided into three senatorial districts namely Oyo North, Oyo Central and Oyo South (see Fig 1.1). Oyo North has thirteen local governments: Atisbo, Kajola, Irepo, Iseyin, Itesiwaju, Iwajowa, Saki West, Saki East, Olorunsogo, Ogbomoso North, Ogbomoso South, Oorelope, and Oriire. Oyo Central comprises eleven local governments: Afijio, Akinyele, Egbeda, Ogo-Oluwa, Surulere, Lagelu, Oluyole, Ona-Ara, Oyo East, Oyo West and Atiba. Oyo South consists of nine Local Governments. They are Ibadan North, Ibadan North East, Ibadan North West, Ibadan South East, Ibadan South West, Ibarapa Central, Ibarapa East, Ibarapa North and Ido.

The topography of Oyo state comprises lowlands in the south and highlands in the north. The state is well drained with rivers Ogun, Ofiki, Osun etc. Oyo state's climate is characterised by dry and wet seasons and a relatively high level of humidity. The dry season lasts five months. On the other hand, April marks the onset of the rainy

season which draws to an end in October. Average daily temperature ranges between 25 °C (77.0 °F) and 35 °C (95.0 °F), almost throughout the year. There are two distinct vegetation zones of Oyo State namely tropical rain forest in the south and guinea savannah in the north. (Oyo State Government, 2014 www.oyostate.gov.ng)

Agriculture is the mainstay of the Oyo state economy. The tropical climate in the state strongly influences agricultural production. A large proportion of the state population is engaged in farming. Oyo state is well known for the cultivation of numerous food and cash crops such as maize, yam, cassava, millet, rice, plantain, cocoa and cashew. A number of government farm settlements have been established in Ipapo, Ilora, Eruwa, Ogbomosho, Iresaadu, Ijaiye, Akufo and Lalupon (see Fig 1.1). In addition, cattle ranches are located in Saki, Fasola and Ibadan (Fig 1.1). The Oyo State Agricultural Development Programme has its headquarters in Saki. (Oyo State Government, 2014 www.oyostate.gov.ng)

Tertiary educational institutions in the state include two private universities (Lead City University, Ibadan; Ajayi Crowther University, Oyo), one state owned university (Ladoke Akintola University, Ogbomoso) and one federal university (the University of Ibadan). Currently, there are three state owned polytechnics namely the Polytechnic, Ibadan, Oke-Ogun Polytechnic, Saki and Eruwa Polytechnic, Eruwa. The two colleges of education- Federal College of Education (Special) and Emmanuel Alayande College of Education are both based in Oyo town. In addition, the state has several primary and secondary schools. In 2007, there were 2,175 public primary schools, 1,074 public secondary schools, 14,694 secondary teachers, seven science schools (Pade, Idere, Oyo, Ogbomoso, Okeho, Elekuro, Ibadan, and Oke Bola) and five technical schools (Oyo, Ogbomoso, Iseyin, Aperin and Saki). This may in fact account for the state's high literacy rate: 70% (female) and 85% (male) (NDHS, 2008).

The health status profile of Oyo state is quite worrisome. As at 2008, the low birth weight rate was 17.9%; maternal mortality rate was 6.9 per 1,000 and infant mortality rate was 6.9 per 1,000 (Oyo State Ministry of Health, 2010). In addition, stunting in under 5 children are 37% and 12% respectively (Nigerian Demographic Health Survey, 2008). In terms of health care provision, there were 2 teaching hospitals, 4

state hospitals, 27 general hospitals, 1 maternity hospital, 1 children hospital, 7 dental centres, 351 primary health care centers, 166 health clinics, 113 health posts, 887 registered private health providers among others (Oyo state Ministry of Health, 2010).

Development indicators show that Oyo state, in relative terms, is a fairly developed state in Nigeria with a state GDP per capita of $280.29 and Human Development Index (HDI) value of 0.48, Human Poverty Index (HPI) value of 21.90 and poverty incidence rate of 62.53% (United Nations Development Programme, 2009; National Bureau of Statistics, 2009).

The choice of Oyo state as the study area was based on the following reasons: its relatively high degree of urbanization, and the presence of medical facilities with up-to-date diabetes registries.

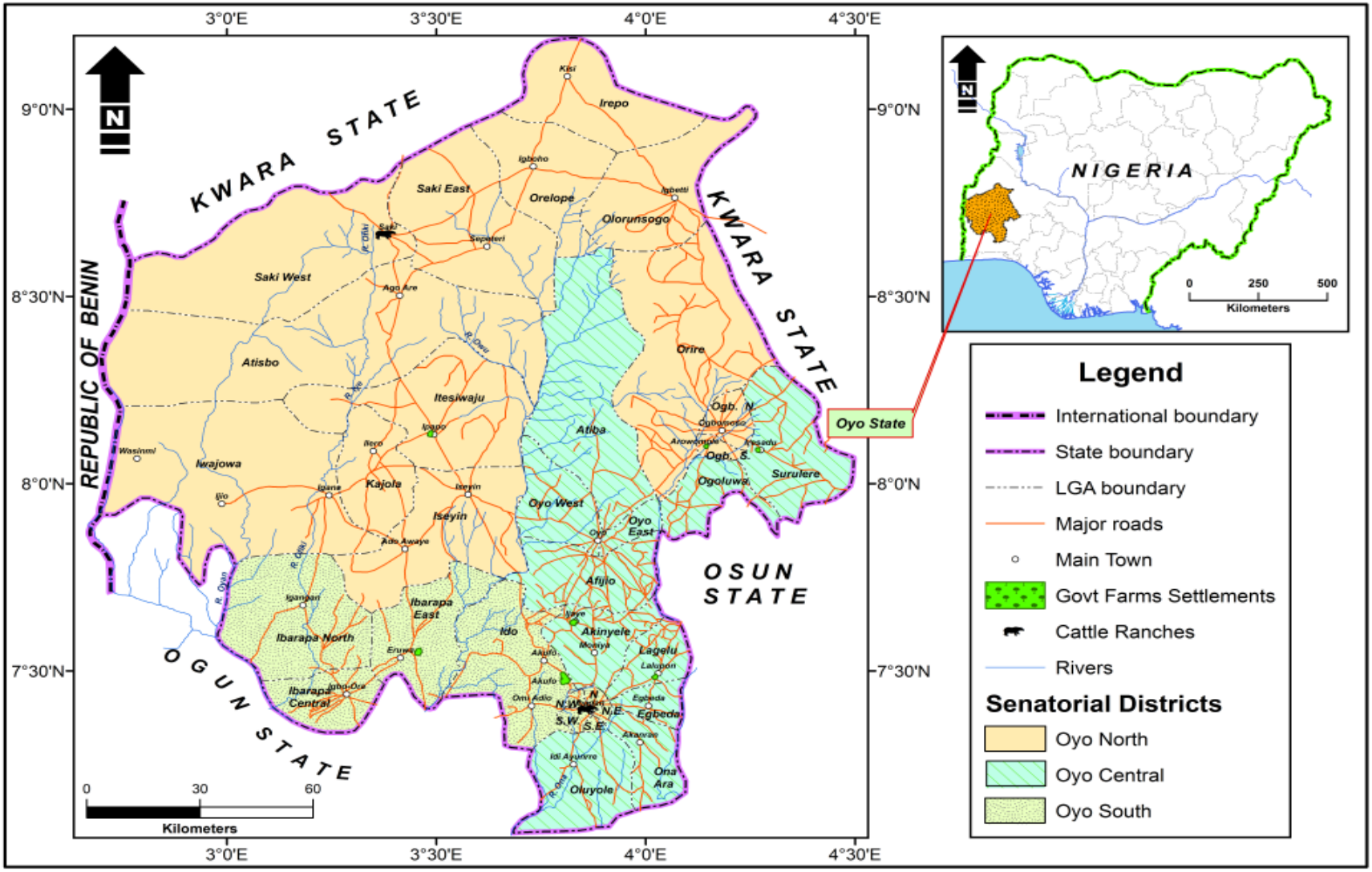

Figure 1.1: Oyo State

1.6 Structure of the thesis

The thesis comprises seven chapters. The first chapter presents the research problem, aim and objectives of the study as well as the study area. The second chapter discusses the conceptual and theoretical frameworks, and presents a review of the relevant literature. The third chapter contains the study's methodology. The fourth describes and analyses the spatial and temporal patterns of DM in Oyo state. The fifth chapter analyses the relationship between the geographical pattern of DM and level of development in Oyo state. The sixth chapter discusses the awareness and perception of causes, symptoms and treatment modes of DM. The thesis ends with the summary and conclusion in chapter seven where a summary of major findings and their theoretical and policy implications are presented.

CHAPTER TWO

CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

2.1 Introduction

This chapter presents the conceptual frameworks and the literature review for this study. It discusses the theoretical concepts used in the study of the spatial pattern of DM incidence. The choice of these frameworks is informed by the need to understand the following: the effect of development on diabetes, and the geography of DM and its associated risk factors. This chapter is organised into two broad sections. The first section gives a detailed description of conceptual frameworks and their relevance to the study. The second section provides a broad review of the relevant literature on the subject

2.2 Conceptual framework

The study is situated within the following conceptual frameworks: Human Ecology of Disease and the Epidemiological Transition theory.

2.2.1 Human Ecology of Disease

In explaining the occurrence and prevention of diseases, the human ecology of disease is frequently used. The model is primarily concerned with the interaction between humans and the environment in the production and prevention of diseases. It is based on the view that disease is the outcome of the interplay of three major variables namely habitat, population and behaviour. This view is illustrated as the triangle of human ecology (Figure 2.1). The diagram comprises three vertices each representing the three critical factors. The interrelationship between the three has significant influence on the health of an individual or population.

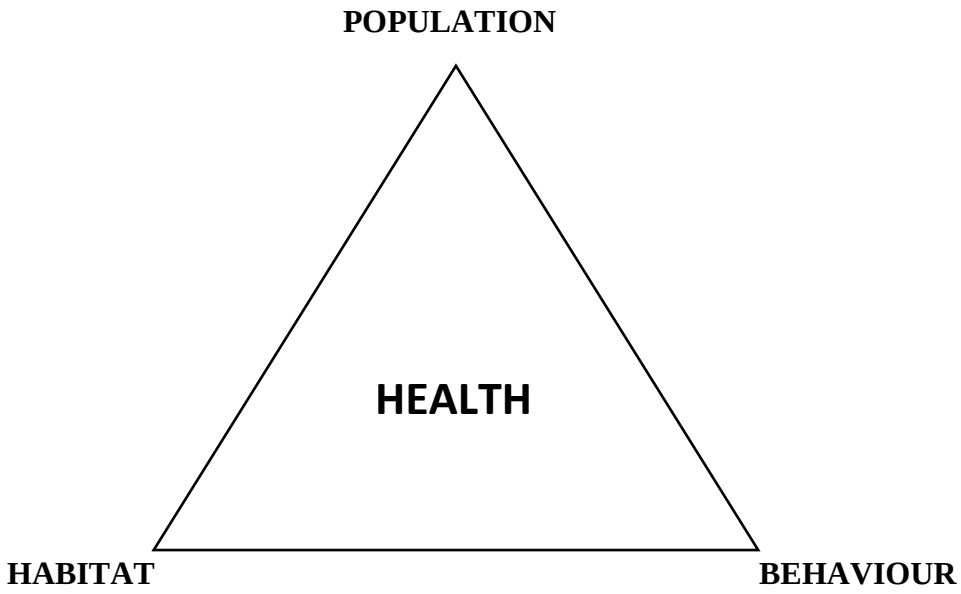

Figure 2.1: The Human Ecology of Disease.

Source: Meade and Earickson (2000)

Habitat is classified into two subgroups: the natural and built (or human created) habitats. Natural habitat consists of the topography, land cover, land use, water, plants, animals, soil, climate, and weather patterns of a given area. One aspect of the natural habitat which seems to have an influence on the prevalence of DM is hilliness. Walking up hills is a form of physical activity, which has been proven to help reduce the odds of developing chronic health conditions such as type 2 DM and obesity (Haskell et al, 2007 cited in Villanueva et al 2013). To shed more light, Eves et al (2006) explain that overweight persons would dissipate more energy when walking in neighbourhoods with steeper slopes. On the other hand, neighbourhoods with steeper slopes may dissuade people from climbing especially those who are physically unfit, physically challenged and overweight (Gomes et al 2010, Toped et al 2001 cited in Villanueva et al. 2013). In other words, living in hilly areas does not necessarily guarantee protection against DM.

Built habitat, in the words of Pasala et al. (2010; p.1), refers to "the environments that are modified by humans, including homes, schools, workplaces, highways, urban sprawls, accessibility to amenities, leisure and pollution." In sum, it is the urban and residential environments in which people work and live. (Meade and Earickson, 2000;

Meade and Emch, 2010). This includes all aspects of construction materials, sanitation and waste disposal, water sources, building design, air flow and lighting, health care facilities, and transportation (Meade and Earickson, 2000; Meade and Emch, 2010). As far as disease causation is concerned, the built environment is becoming increasingly important because people spend more time there. In sum, where one lives and works affects one's health status.

One can learn from previous studies, the significance of the built habitat in the occurrence of DM. Where we live affects our wellbeing through physical activity patterns (Saelens and Handy, 2008 cited in Villanueva et al. 2013). Some studies like Srinivasan (2003) and Giles-Corti (2002) cited in Bettencourt (2009) found that people who dwell near parks tend to use them more and to be more physically active than those who live farther away. On the other hand, neighbourhoods with convenience stores, fast food restaurants had the increased likelihood of having risk factors of DM complications (Bettencourt, 2009). Similarly, Allender *et al.* (2008) carried out a systematic review of the literature on urbanization in relation to chronic diseases in developing countries and found that diabetes prevalence is higher in urban areas than rural areas.

The second vertex, population, is mainly concerned with genetic influences. Other factors are age, socio economic characteristics (education, income), immunity and gender. The vulnerability and resistance to infection is dependent on these attributes. Interestingly, these are the only variables that humans have no control over. Many diseases have genetic associations; they could either be genetically-based, or related to genetic predisposition. Genetic causation is uncommon. As a matter of fact, most diseases emanate from genetic susceptibility, which means diseases need a stimulus to occur (Meade and Emch, 2010). In practical terms, a person who is not genetically susceptible to DM will not respond to stimulus related to DM.

Diabetes has genetic affiliations (Green et al., 2003, Barker et al. 2011). This genetic susceptibility varies by racial/ethnic group. Since ethnic groups vary geographically in their distribution, it follows that genetic predisposition is not uniformly distributed (Meade and Emch, 2010). It is expected that the burden of DM will be higher in some groups than in others. Specifically, DM is higher in racial/ethnic minorities than in

whites. For instance, Diabetes UK (2006) revealed that persons from the black and minority ethnic (BME) groups are six times more likely to develop diabetes than other ethnic/racial groups.

In addition, persons of aboriginal, black and Mexican American origin are genetically predisposed to develop type 2 diabetes due to the presence of the thrifty gene. Mohan *et al.* (2007) brought to light the phenomenal Asian Indian Phenotype in Indians which makes them more susceptible to DM and some cardiovascular diseases (CVDs). Similarly, South Africans of Indian extraction are more insulin resistant than other South African ethnic groups and are thus at greater risk of type 2 DM (Bejay et al 2004 cited in Mayosi et al 2009).On the other hand, some ethnic groups enjoy diabetic immunity. For instance, the Amerindian subgroup of Latin America is resistant to childhood-onset type 1 diabetes probably due to their genetic makeup (Collado-Mesa et al. 2004).

Furthermore, the family history of DM is a critical factor. A study based on National Health and Nutrition Examination Survey (NHANES) data from 1999 to 2002 proved that diabetes prevalence among people with a family history of DM was more than four times higher than the prevalence for individuals without a family history (Beckman et al. 2002 cited in Bettencourt, 2009). In that same study, it was discovered that diabetes prevalence increased with a corresponding increase in the number of family members with diabetes, and among adults with a family history (Beckman et al. 2002 cited in Bettencourt, 2009).

Age and gender have important implications for disease occurrence and prevention. Comparatively speaking, children and infants have lower levels of immunity than adults. On the other hand, women are more susceptible to morbidity than men. With respect to diabetes, age and gender are significant risk factors (CDC, 2002).Diabetes is more prevalent among the elderly populations (Afolabi *et al.*, 2002, Okesina *et al.* 2003). In the United Kingdom, 1.3 million people with DM are at least 65 years and above (Diabetes UK, 2006). The high prevalence could be the result of a combination of problems which often plague the elderly such as anxiety, lack of confidence, social isolation and poor mobility (Diabetes UK, 2006). On the other hand, it has been noted that men are more susceptible than women (Wild et al. 2004).

Behaviour (the third vertex) collectively refers to cultural practices, movement patterns (circulation and migration) and the implementation of disease prevention and control measures. Behaviour either exposes or protects humans from threats. When enough individuals behave in ways which predispose them to particular diseases, then the population which these individuals are part of, are at an increased risk of developing diseases (if they behave in a way which predisposes them to the diseases in question). Behavioural practices as diverse as tobacco smoking, consumption of diets rich in fats and sugar, consumption of soft and alcoholic drinks and physical inactivity are examples of behavioural patterns that fuel DM. All these three components: habitat, population and behaviour constitute an important conceptual framework for explaining disease occurrence and prevention.

The model is seen to be of great value because of its holistic approach which takes into account a wide range of factors that threaten health or prevent ill health. However proponents of structuralism argue that the framework does not take into account political economic considerations. For example, Aggarwal (2002; p.1) claimed that the human ecology of disease "has primarily been concerned with the transmission and spread of infectious diseases**.** But what we are interested in knowing here is whether or not a broader disease ecology perspective is capable of explaining the occurrence and prevalence of non-infectious diseases as well". Disease ecologists react that the "… approach is flexible enough to incorporate all variables of interest in any situation" (Gesler, *et al.* 1997; p.668).

2.2.2 Epidemiological Transition model

Economic development and urbanization, associated with increased sedentary practices, tobacco use, and high-fat diets, have resulted in increased rates of NCDs (Tellnes et al., 2005). This is reflected in a noticeable shift of attention from infectious diseases to chronic, non-communicable lifestyle related diseases. This is captured in the concept of the epidemiological transition propounded by Omran.

According to Omran (2005), the epidemiological transition model comprises five propositions. First: "the theory … begins with the major premise that mortality is a fundamental factor in population dynamics" (p.732). Secondly, "During the transition, a long term shift occurs in mortality and disease patterns whereby pandemics of

infection are displaced by degenerative and man-made diseases (like diabetes) as the chief form of morbidity and primary cause of death." (p.736). The third proposition states that "during the epidemiologic transition, the most profound changes in health and disease patterns are among children and young women." (p.742). The fourth proposition holds that "the shifts in health and disease patterns that characterize the epidemiologic transition are closely associated with the demographic and socioeconomic transitions that constitute the modernization complex." (p.744). The last proposition outlines three basic models of the epidemiological transition that are a function of "peculiar variations in the pattern, pace, determinants and consequences of population change" (p.751). These three models are the classical/western model (it depicts the slow decline in death rates followed by lower fertility that accompanies modernization in developed countries); the accelerated model (here, the course of the transition was much more rapid and the amount of time required to reach the milestone mortality rate of 10 deaths per 1,000 population is much shorter); and the contemporary/delayed model (it reveals the experiences of developing countries where there has been more recent declines in mortality).

However, critics point out some inadequacies in the conceptual framework. Firstly, the framework overlooked the role of wealth and poverty in health and wellbeing at each transition stage. Secondly, it did not foresee the emergence of HIV/AIDS, emerging infectious diseases and antibiotic resistance. Thirdly, the theory oversimplifies the patterns and causes of mortality and life expectancy. In reality, the patterns are more complex than just decreasing mortality from infectious diseases and increasing NCD incidence rates (McKeown, 2009).

2.3 Literature review

The literature review has five sub themes: (i) classification of diabetes (ii) geographical distribution of diabetes; (iii) genetic, environmental and demographic risk factors (iv) behavioural, socio economic, lifestyle risk factors and (v) effect of development on DM.

2.3.1 Classification of Diabetes

Diabetes: Nomenclature, Classification and Pathogenesis

The term *"diabetes mellitus"* is a combination of Greek and Latin expressions (Williams, 2009). It is a chronic and degenerative disease that occurs when the pancreas does not produce enough insulin (a hormone that regulates blood sugar) or alternatively, when the body cannot effectively use the insulin it produces (WHO, 2010). It has also been defined as "… a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both." (American Diabetes Association, 2014; p.1).

Diabetes is categorized into three main groups:

1. Insulin dependent diabetes mellitus (IDDM) Type 1
2. Non-insulin dependent diabetes mellitus Type 2
3. Gestational diabetes

Initially, they were classified into two subtypes: juvenile onset diabetes mellitus and maturity onset diabetes mellitus, categorized on the basis of age of onset (Williams, 2009). Williams (2009) noted that these terms had to be dropped in favour of insulin dependent diabetes mellitus (IDDM) and non-insulin dependent diabetes mellitus (NIDDM) so as to reflect differences in duration of illness and their treatment requirements. Eventually, type 1 and type 2 were adopted to emphasize differences in pathogenesis rather than the insulin treatment. Type 1 diabetes signifies an autoimmune pathogenesis leading to insulin lack and type 2 diabetes increasing resistance to insulin action (Williams, 2009).Type 2 diabetes is characterised by high blood sugar from a combination of insulin resistance and limited supply of insulin. Gestational diabetes is any degree of glucose intolerance with onset or first recognition during pregnancy (Azevedo and Alla, 2008). A fourth group called tropical diabetes was first detected in the early 20th century. It is said to be malnutrition related but of minimal effect in Africa (McMillan, 1986, Ducorp et al, 1997 cited in Azevedo and Alla, 2008).

Diabetes causes kidney failure, cardiovascular diseases (CVDs), stroke, blindness, and foot ulcers (WHO, 2015). The symptoms of diabetes are as follows (WHO,

2015), frequent urination (polyuria), thirst (polydipsia), hunger, weight loss and poor vision.

For a long time, Type 1 and Type 2 diabetes were known to have distinct etiologies (Dorman et al., 1995 cited in Liese et al. 2010) until the development of a new theory- "the accelerator hypothesis", which suggests that type 1 and type 2 DM share a common etiology (Wilkin, 2001; Wilkin, 2008 cited in Liese et al., 2010). This followed a noticeable emergence of type 2 DM in youth. This hypothesis is however greatly contested with evidence of mixed results (Dabelea et al., 2006; Knerr et al., 2005). Liese et al (2010) viewed this theoretical proposition from a spatial perspective. Their study showed a moderate cross correlation between types I and 2 diabetes in non-hispanic whites in South Carolina and Colorado. However, results were negative at the census tract level.

Clinical research has shown that diabetes has a strong connection with a number of infectious diseases such as HIV/AIDS, malaria and tuberculosis (TB). This link is known as the co-morbidity between infectious and chronic diseases. In this case, these two broad types of diseases act together, and one exacerbates the other. A relationship has been observed between diabetes and tuberculosis (TB) and malaria. For instance, people with diabetes are 2.5 times more likely to contract TB (Ottmani et al 2010). Similarly, diabetes records high prevalence levels in malaria endemic regions, and anti-retroviral treatment for HIV/AIDS induces diabetes (IDF, 2011).

2.3.2 Geographical distribution of diabetes

Like other non-communicable diseases, diabetes varies in space. Because of its geographical variability, it has been of major interest to medical geographers. All over the world, noticeable variations in the incidence of diabetes mellitus have been reported (Alwan and Maclean, 2009, Karvonen et al. 2000, Williams, 2009, IDF, 2006, WHO, 2011, IDF, 2014).

These noticeable geographical variations have been confirmed by the latest edition of International Diabetes Federation (IDF) Diabetes Atlas (2014). Based on the findings of the above named report, the global distribution of DM, based on IDF classification, is reviewed below:

It is the fourth or fifth leading cause of death in most high income countries and an emerging public health problem in the economically developing countries (IDF, 2014). More than 79,000 children developed type 1 diabetes in 2013; more than 21 million live births were affected by diabetes during pregnancy in 2013. The highest number of deaths due to diabetes occurred in countries with the largest numbers of people with the disease: China, India, USA, and the Russian Federation (IDF, 2014). Worldwide, more diabetics live in urban areas (246 million) than in the rural areas (136 million), although the numbers in the rural areas are on the rise (IDF, 2014). Likewise, the number of diabetics in the urban areas (181 million) of low and medium income countries (LMICs) is more than those (122 million) in the rural areas (IDF, 2014).

There are seven IDF regions namely Europe (EUR), Africa (AFR), Middle East and North Africa (MENA), North America and Caribbean (NAC), South America and Central America (SACA), South East Asia (SEA) and Western Pacific (WP).

Europe (EUR)

Turkey has the highest prevalence (14.8%) while the Russian Federation has the largest number of people with diabetes (10.9 million). After Turkey, the countries with the highest prevalence rates are Montenegro (10.1%), Macedonia (10.0%), Serbia (9.9%) and Bosnia and Herzegovina (9.7%) (IDF, 2014). The countries with the largest number of people with diabetes are in Western Europe including Germany, Spain, France and the United Kingdom (UK). In Europe, 37 percent of the population is over 50 years of age. This is expected to increase to over 44 percent by 2035 (IDF, 2014). To a large degree, the high prevalence of type 2 and impaired glucose intolerance (IGT) are a consequence of the ageing of the region's population. In addition, Europe has the largest number of children with type 1 diabetes compared to other IDF regions. The countries with largest contributions to the type 1 diabetes in young people are the UK, the Russian Federation and Germany.

Africa (AFR)

The highest prevalence of DM in Africa is on the island of Reunion (15.4%), followed by Seychelles (12.1%), Gabon (10.7%) and Zimbabwe (9.7%). Some of Africa 's most populous countries have the largest numbers of people with diabetes including

Nigeria (3.9 million), South Africa (2.6 million), Ethiopia (1.9 million)and the United Republic of Tanzania (1.7 million). More than half of all people with diabetes in the region live in just four of these high population countries (IDF, 2014).

Middle East and North Africa (MENA)

Three of the world's top ten countries with the highest prevalence of diabetes are in the Middle East and North Africa region namely Saudi Arabia, Kuwait and Qatar. Rapid economic development and population ageing has resulted in a dramatic increase in the prevalence of type 2 diabetes (IDF, 2014). Over three decades, major social and economic changes such as rapid urbanisation, reduced infant mortality and increasing life expectancy have transformed many countries in the region. This dramatic development in the Middle East especially among wealthy Gulf states, has with it a mix of unhealthy behavioural and lifestyle changes such as poor quality nutrition and reduced activity, giving rise to increased obesity. The explosion of diabetes in the region is due to type 2 (IDF, 2014).

North America/ Caribbean (NAC)

USA, Mexico and Canada account for the large majority of people with diabetes in this region However, the Caribbean islands have the highest prevalence rate in the region and it exceeds the global average. An estimated 36.8 million people with diabetes live in the region. By 2035, the number is expected to increase by almost half to 50.4 million. Belize (15.9%), Guyana (15.9%), Curacao (14.5%) and Martinique (14.3%) have the highest prevalence of diabetes. Meanwhile USA with 24.4 million has the highest number of people with diabetes followed by Mexico, Canada, and Haiti. A large proportion of the burden of diabetes in the USA and Canada can be attributed to the ageing of the population. Currently, 39.5 percent of the region's population is over 50 years. USA accounts for almost 80 percent of the total number of new cases of type 1 diabetes in children followed by Canada IDF, 2014).

South/Central America (SACA)

Countries within the region are experiencing economic transition. As urbanisation continues, and the population grows older, diabetes will become an ever greater public health priority throughout the region (IDF, 2014). Presently, 24.1 million people in the region have DM. Brazil has the largest number of people living with

diabetes (11. 9 million), followed by 2.1 million, Argentina (1.6 million and Chile (1.3 million) (IDF, 2014). Puerto Rico has the highest prevalence rate (13.0%), Nicaragua (12.4%), the Dominican Republic (11.3%) and Guatemala (10.9%) (IDF, 2014)

South East Asia (SEA)

India alone accounts for 86 percent of the total number of diabetics in the region- 883 million specifically. India and China are experiencing economic growth. Mauritius with a GDP per capita of 15,800 USD has the highest prevalence of diabetes (14.8%), followed by India at 9.1 % (IDF, 2014). People with diabetes in India, Bangladesh and Sri Lanka make up 98.8% of the diabetic population in the region. With 1.2 million deaths in 2013, this region has the 2nd largest number of deaths attributable to diabetes of any of the seven IDF regions. India is the largest contributor to regional mortality, with 1.1 million deaths attributable to diabetes in 2013 (IDF, 2014).

Western Pacific (WP)

It is home to 36 percent of the total number of people with diabetes in the world. The world's highest is the island of Tokelau (37.5%) while Cambodia (2.9%) is the least affected. The Federated States of Micronesia (35%), Marshall Islands (34.9%), Kiribati (28.8%) and Cook Islands (25.7%) closely follow Tokelau as the highest prevalence countries. China has the largest number of people with diabetes in the world (98 million) but has a prevalence of 9.6 %. By 2035, the number of people with diabetes in China will reach 143 million. It has over 36 percent of global mortality due to diabetes in all of the seven IDF regions. More men (1,080,000) than women (789,000) died of diabetes in the region (IDF, 2014).

National/Subnational/Rural-Urban Patterns

At the national scale, studies have considered the geographic distribution of diabetes in the United States (Barker *et al.* 2011), China (Zhou et al. 2014) and Finland (Rytkonen, 2004). Barker *et al.* (2011) identified 644 counties with high diabetes prevalence in the fifteen states of the United States namely Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, and West Virginia. The study attributed the high prevalence of DM in the belt to the presence of more

Hispanics, and African-Americans than in the rest of the country (23.8% in the diabetes belt were African-Americans versus 8.6% for the rest of the country), higher obesity prevalence rate (32.9% in the diabetes belt were obese compared to 26.1% in the rest of the country), sedentary lifestyles (30.6% of people in the diabetes belt live sedentary lifestyles against the 24.8% for the rest of the nation),and educational status (24.1% of people in the diabetes belt counties possess college degrees vs. 34.2% in the rest of the U.S).

Using national surveillance data, Zhou et al. (2014) investigated geographic variations in diabetes prevalence and detection at multiple levels (province, disease surveillance point (DSP), towns, villages) in China. Substantial regional variations in the prevalence and detection of diabetes were reported with the highest prevalence in the north and the lowest in the northeast and northwest of China. Diabetes prevalence varied more at the village and DSP level. Variation in the detection of diabetes was greatest at the DSP, provincial, and village levels but very small between towns. The geographical variation in diabetes was explained by the odds of individual without an educational qualification, low health literacy and at least one health check within six months before the survey.

Rytkonen (2004) found a clear geographic variation in the incidence of type 1 in Finland during 1987-1996. The persistent high risk areas of type 1 in Finland over the entire 10 year period were found in the eastern most part of Finland, in mid-western Finland and in smaller pockets in southern Finland.

Research also demonstrates that diabetes varies at the sub national level. The study by Liese *et al.* (2010) stands out in this regard. They identified small area, localized spatial autocorrelation with type 1 and type 2 diabetes in the counties of four states in the United States and established their relationship with some risk factors. Liese et al. (2010) specifically found the presence of spatial autocorrelation of type 1 diabetes in only Colorado, Ohio and South Carolina and it was inversely related to population density, urbanization, crowding, and deprivation. With respect to type 2 diabetes, spatial autocorrelation was seen in Colorado, Ohio, South Carolina, and Washington. The spatial pattern had a likelihood of being related to “low socio economic status,

high body mass index, unhealthy dietary intake, physical inactivity" (Liese *et al.* 2010; p.554).

Rural and urban disparities in diabetes incidence exist, though with varied results. On the one hand, urban areas have higher diabetes prevalence than rural areas. Type 2 diabetes is particularly higher among urban populations (Sierra, 2009). For example, the prevalence of type 2 diabetes is four to six times higher in the urban populations in India than in rural areas. This imbalance is attributed to the fact that urban areas have more people who tend to be less physically active and consume diets rich in saturated fats and refined sugars (Azevedo and Alla, 2008**).** In addition, these urban areas have high levels of obesity and low levels of physical activity. This can be further explained by the fact that "urbanization is accompanied by a shift from labour intensive occupational activities to more sedentary, service based occupations that require less energy" (Abubakari *et al.* 2009, p.610).

This claim is noticeable among urban populations of Cameroun, Sierra Leone, Nigeria (Afolabi *et al.* 2002, Abidoye *et al.* 2002), India (Allender *et al.* 2008, Mohan *et al.* 2008 cited in Mohan and Preepha, 2009, Mohan and Preedpha, 2009), Western Australia (Haynes et al. 2006; Haynes *et al*. 2007 cited in Miller et al. 2011) and New Zealand (Miller et al. 2011). The National NCD risk factor surveillance study conducted in six different geographical regions of India reported that the highest prevalence of self-reported diabetes was observed in the urban areas. (Mohan et al. 2008 cited in Mohan and Preepha, 2009).

On the other hand, some research indicates rural areas bear a heavier burden of diabetes (Patterson and Waugh, 1992, Staines et al, 1997). This assertion is evidenced in Finland (Rytkonen, 2004).According to Rytokonen (2004), living in a rural community is likely to increase the risk of type 1 among Finnish children. In his study, he found that high incidence areas of type 1 in Finland coincide with areas of low population density, and densely populated parts of Finland are low incidence areas. The mean incidence was specifically 8 percent higher in rural heartland areas than in urban areas in Finland during 1987-1996.

2.3.3 Risk factors

Risk factors, in the words of Battams et al. (2013, p.33), are "behaviours or characteristics (including genetic) which increase one's propensity to acquire a disease". Diabetes like other non-communicable diseases is multifactorial in nature. Using the words of Burnley (1998; p.23), it is "…caused by many factors operating in a web of causation". Given its nature, it is impossible to point out a single cause. Similarly, Barker et al. (2011) see the disease as the product of the interplay between genetic, physical and social environments. To have a full understanding of these risk factors, they have been subdivided into three parts:

Genetic, Environmental and Demographic risk factors

There are claims of genetic and immunological factors in diabetes pathogenesis. This obviously suggests that diabetes has a clear genetic involvement (Green et al., 2003). According to Neel (1962) in Zimmet (2000), high genetic susceptibility to diabetes has been attributed to the thrifty gene. Neal (1962) and Zimmet (1999) further explain this phenomenal genotype, summarised by Zimmet et al. (2005; p.8):

> *Historically, this genotype permitted populations such as the Polynesians in the Pacific to survive long famines, unfavourable environments and migration by favouring energy conservation and fat accumulation.*

Zimmet (1999) however suggested that these genes which once encouraged fat storage, led to non-communicable conditions like obesity, hyperinsulinaemia, type 2 diabetes during the transition in lifestyle practices such as sedentary activity and unhealthy diets.

Besides the Polynesians of Samoa, Micronesians of Nauru (de Courten, 1997 cited in Zimmet et al. 2005), Tonga (Colaguiri, 2002 cited in Zimmet et al. 2005), Aboriginal, black and Mexican American populations are said to be genetically predisposed to type 2 diabetes because of the high frequency of thrifty genes in their respective population gene pools. Indians too are genetically susceptible to diabetes not due to the thrifty gene but as a result of the phenomenal Asian Indian Phenotype which contains certain unique clinical and biochemical abnormalities in Indians which include increased insulin resistance (Mohan *et al*. 2007).

In addition, hereditary susceptibility plays a fundamental role in the pathogenesis of diabetes. This means persons with diabetes were born with a genetic predisposition to it. For instance, a Finnish study showed fathers are more likely to transmit diabetes to their daughters and mothers to their sons. However, it must be noted that genetic susceptibility to diabetes does not automatically lead to the onset of the disease but some of the genetically predisposed individuals who are exposed to environmental triggers will be diabetic (Rytokonen, 2004).

This assertion clearly points out the contribution of environmental factors in the incidence of diabetes. Schober *et al.* (2003) attribute the increasing incidence in diabetes in many regions of the world to environmental factors. Besides the genetic affiliation, the occurrence of diabetes is viewed to be the result of residence (Cruickshank *et al.* 2001; Swai, 1990) and urbanization (Azevedo and Alla, 2008). The literature has also found that the built environment is a contributor to diabetes and obesity epidemic. The built environment in the words of Pasala *et al.*(2010, p.1) refers to "the environments that are modified by humans including homes, schools, workplaces, highways, urban sprawls, accessibility to amenities, leisure and pollution". These features control the ways in which urban dwellers function in their everyday lives, which in turn has implications for their health status. In summary, any of these factors could either increase or reduce the risk of diabetes. Urban sprawl, for instance, generally creates a wide gulf between work places and homes leading to automobile dependence which gives little or no opportunity for physical activity (Azevedo and Alla, 2008). Consequently, diabetes and other chronic degenerative diseases set in.

The occurrence of diabetes can be viewed from the perspective of the 'broken windows syndrome'. The belief of this theoretical proposition is that neighbourhoods with broken windows and dilapidated housing encourage crime and isolated residents thereby reducing trust among neighbours (Cohen et al. 2000 cited in Pasala *et al.* 2010). In addition, an unfriendly and dangerous neighbourhood would not promote any form of physical activity but induce indoor sedentary activities which people would be more comfortable with (Health Survey for England, 2003 cited in Diabetes UK, 2006). For instance, Day (2006) reported that forty one percent of non-white respondents were fearful when walking alone at night. Given these conditions,

mobility and any form of physical activity would be greatly discouraged with attendant health effects.

On the other hand, studies show that neighbourhoods with a mix of land use types like commercial, industrial, residential and offices, public parks/community gardens promote physical activity and thus reduce the risk of obesity and other health related problems(Frank et al 2005 cited in Pasala et al. 2010). Proximity to fast-food restaurants are a contributor to the prevalence of chronic and degenerative diseases such as diabetes and obesity. In a study conducted in California, USA, Davis and Carpenter (2009) investigated the effect of proximity of fast food joints to schools and found that students with fast food restaurants near their schools consumed less of fruits and vegetables and became more overweight than those whose schools were not near fast food restaurants. In a similar study, Maddock (2004), in a state level analysis of the relationship between obesity and the prevalence of fast food restaurants, observed that obesity prevalence was high in areas with more fast food outlets.

Research shows that nutrients are a key factor in diabetes pathogenesis and progression (Tuvemo and Gebre-Medium, 1983). Trace elements like zinc, copper or chromium boost body immunity. Evidence shows the metabolism of several trace elements like nitrate and zinc is altered in persons with diabetes (Rytkonen, 2004). This research however has yielded mixed results. In Sweden, increased incidence of type 1 diabetes was found in areas with low levels of zinc in drinking water (Haglund et al. 1996 cited in Rytkonen,, 2004). Contrary to that, Schober *et al.* (2003) analysed the ecological relationship between childhood type 1 diabetes on one hand and population density and nitrate level in drinking water, and found that districts with higher populations of children exhibit lower incidence rates but significant positive association with nitrate intake. Rytkonen (2004)’s results proved to be contradictory. They showed that one unit increase (mg/l) in the concentration of Nitrate concentrates in groundwater resulted in an average of 0.3 percent increase in the risk of TI in Finland. The chemical composition of groundwater however did not have significant effect on the incidence and spatial distribution of type 1 diabetes.

Age and gender are significant risk factors for diabetes (CDC, 2002). With respect to age, diabetes is more prevalent in the elderly than the young (Okesina et al. 1999,

Nyenwe et al. 2003). Among children and adolescents, type 1 is one of the most common chronic diseases (Rytkonen, 2004, Balfe, 2007). In fact, type 1 diabetes among children in Finland is the highest in the world and is rising (Karvonen et al.1993 and Karvonen et al. 2000 cited in Rytkonen 2004). Diabetes is higher in men than in women (Wild et al. 2004, Mbanya et al. 1997 cited in Mohan *et al.* 2004, Nyenwe et al. 2003). Rytkonen (2004) found that the male –female ratio in diabetes varied geographically in Finland. Over all, the male excess was evident throughout the country.

Behavioural, Socio economic and Lifestyle risk factors

Diabetes mellitus has socio economic, behavioural and lifestyle risk associations. Higher rates of television viewing, increased computer use, little contact with neighbour and fear of crime have contributed to the incidence of NCDs such as obesity, cardiovascular diseases, mental health problems and increased rates of mortality (Pasala, 2010).

A review of the literature shows that DM is a significant problem among those who are socioeconomically disadvantaged (Diabetes UK, 2006, Tompkin et al. 2010). In the developed countries, the prevalence of diabetes is negatively related to socio economic status (SES). In Europe, the high prevalence of diabetes is associated with relative poverty. Robbins *et al.* (2005) reported in their study a strong inverse association with type 2 among women across several different SES measures and population but less consistent with men. This clearly points out that diabetes is connected to poverty (Alwan and Maclean, 2009). In fact, diabetes is highly embedded in areas of poverty and disempowerment (Green et al. 2003). Diabetes' association with poverty can be explained by the fact that residents in concentrated poverty or economically deprived areas have limited access to nutritional resources (Schulz, 2005).

In India, the prevalence of DM in the higher SES group was surprisingly two times higher than that of the lower SES category (Mohan et al 2001 cited in Mohan et al 2004). The disparity in the DM prevalence was linked to unhealthy meals and lack of physical activity among people of higher SES (Mohan et al. 2004). On the other hand,

NCD conditions have been noticed to increase rapidly with national income and urbanization (Ezzati cited in Allender et al 2008).

Physical inactivity is a high risk factor in the development of chronic diseases (Hu et al. 2008). It prevents the body from properly processing insulin, therefore increasing the risk of type 2 DM (Brooks *et al* n.d). Physical inactivity stems from a variety of factors identified by Battams *et al.* (2013; p.34):

> *… the design of cities (the level of urban density and availability of safe places/lanes for walking/cycling, the car culture(versus cycling/walking culture, sedentary leisure activities (e.g. watching television, playing video games), increase in white collar work (service industries and the mechanisation of work)"*

In contrast, the National Health Insurance Service (NHIS) found that specific aspects of the built habitat such as the presence of sidewalks, streetlights, population density, and mixed land use reduce the risk of obesity and other chronic health problems (Pasala et al 2010, Franks et al 2009 cited in Pasala et al 2010). European countries with the highest levels of walking and cycling have much lower rates of obesity, diabetes and hypertension than the United States (Dother, 2001 and WHO, 2002 cited in Pasala et al. 2010). There is a different picture in West Africa. One in seven West Africans is physically inactive (Abubakari *et al*. 2009). Almost 75 percent of urban residents are sedentary in their daily occupations and half of government workers do not undertake any leisure time physical activity (Ojofeitimi et al 2003). Inactivity is higher in women, and urban residents than among men and rural dwellers (Abubakari et al 2009). Urban west Africans have higher rates of obesity than rural residents (Abubakari et al 2008).

Obesity is a significant factor to diabetes, leading to the use of the term "diabesity" (IDF, 2007). The combined effect of obesity and physical activity accounts for nearly a third of the increased risk for type 2 DM for those who live in the US diabetes belt (Barker et al 2011). Eighty percent of people with type 2 in the United Kingdom are overweight or obese at diagnosis (Diabetes UK, 2006).

In addition, it has been found that social capital provides protection against diabetes. Holgrave and Crosby (2006) analysed the correlations between social capital and two

related forms of morbidity that account for a large share of disease burden in the US, diabetes and obesity at the state level. Social capital correlated moderately with obesity and strongly with diabetes, explaining approximately 10 percent and 44 percent of variance respectively. This suggested that social capital has health protective benefits.

2.3.4 Effect of socio-economic development on DM

Globalisation which is the interconnectedness of countries and the openness of national borders to ideas, people, trade, and financial capital (Woodward et al. 2001, Yach and Bettcher, 1998) has brought with it the burden of non-communicable diseases including diabetes. This view is confirmed by Zimmet et al. (2001) cited in Sierra (2009; p.4):

> *In the past two decades, we have seen an explosive increase in the number of people diagnosed with diabetes worldwide. This effect is most probably due to the pronounced changes in the human behaviour and lifestyle that have accompanied globalization translating into rapidly escalating rates of both obesity and diabetes.*

Zimmet (2000) sees the epidemic of diabetes as a symptom of "coca-colonisation". Coca-colonisation describes the impact of the western world on the developing countries. Rapid socio-economic development in the last 50 years has resulted in a dramatic change in lifestyle from traditional to modern which is characterised by "…sedentary way of life and a diet of energy dense, high saturated fat processed food…"(p.306) particularly with the proliferation of fast food outlets.

These changes manifest not only in the western world but also in many developing countries in Africa and Asia where the disease profile is gradually changing from infectious diseases to non-communicable diseases. In India, the growth and development of degenerative and lifestyle diseases is the result of current social and economic changes (Ramaraj and Albert, 2008).

Some empirical studies have shown that socio-economic factors have a significant effect on NCD patterns. Drewnoswki and Popkin (1997) disentangled the classic relationship between income and fat intake. The increasing availability of cheap

vegetable oils and fats has resulted in higher fat consumption in low income nations. The nutrition transition occurs at lower levels of GNP. It is further accelerated by high rates of urbanization. They concluded that though economic development may have improved food security and brought better health outcomes in some instances, the nutrition transition has its adverse public health effects such as childhood obesity. Patterson et al. (2001) used correlation and regression analyses to study the relationship between DM incidence and various environmental, health and economic indicators. Wide variations in childhood type 1 diabetes within Europe could be partly explained by indicators of national prosperity such infant mortality and gross domestic product. More recently, Domingo (2011) examined the disease transition in relation to the level of development in the city of Ibadan, Nigeria over a five year period. The results showed that as the level of development increased, the prevalence of infectious diseases fell while non-communicable disease prevalence rose.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

The chapter is divided into three subsections namely data sources, data collection and data analysis.

3.1.1 Types of Data Sources

Data for this study were obtained from two sources namely primary and secondary sources.

3.1.1.1 Primary sources

This study is both a hospital based and cross-sectional study. Primary data were collected through a questionnaire survey conducted in the thirty three LGAs of Oyo state. The questionnaire was divided into four sections. The first section is concerned with information on the demographic and socioeconomic attributes of respondents such as residential address, local government area of residence, sex, age, ethnicity, religion, marital status, education, occupation, income, and family size. The second section is about health status, lifestyle and physical activity and contained questions on respondent's DM status, self-rated health status, smoking, alcohol, fast food, fruits and vegetable, and soft drink consumption levels, level of physical activity, obesity levels (derived from the self-reported height and weight of respondent). The third section is concerned with dwelling unit and neighbourhood characteristics such as family size, construction material for wall, bedrooms, household facilities, occupancy rates, perceived neighbourhood safety, provision of social amenities/neighbourhood facilities and walkability features like sidewalks, street lights, community/public parks, physical fitness outlets, recreational facilities and mixed land use Finally, the last section is about the awareness and perception of DM and obtained information on the level of awareness, source of awareness, the perception of the cause(s), prevention and treatment of DM.

3.1.1.2 Secondary sources

Secondary data for this study were extracted from multiple sources. Data were collected from National Population Commission, Oyo State Ministry of Finance, Oyo State Health Management Board, University College Hospital, Ibadan, Ring Road State Hospital, Ibadan; Bowen Teaching Hospital (formerly Baptist Medical Centre), Ogbomoso, Jericho Nursing Home, University Health Services, University of Ibadan; Baptist Hospital, Oyo; Baptist Medical Centre, Saki, and General Hospital, Moniya. Information on DM were collected from these eight health institutions. At each of these major health facilities, DM data for the years 2000 to 2014 (a period of fifteen years) were extracted from case files. With the assistance of medical records officers, the case files of diabetics were assembled and handed to the researcher. Thereafter, the researcher extracted information on sex, age at diagnosis, year of diagnosis, and address at diagnosis. The DM cases were assigned to their respective LGAs based on the registered address of residence in the case file. Addresses located outside the study area were excluded. Population data for each of the 33 LGAs were obtained from the 2006 census report published by the National Population Commission. The publication provides population figures at the local government level based on the 2006 national census.

Development indicators were extracted from the Oyo State Compendium of Health Facilities (Oyo State Ministry of Health (2010), Oyo State Ministry of Finance, Community Service Development Report (Oyo State Community Service Development Agency), and the Oyo State Digest of Statistics (2007) (Oyo State Planning Commission) and the National Population Commission. The development indicators used are in Table 3.1.

Table 3.1: Development indicators

	Development indicator	Development variable
1	Income	Internally generated revenue
		Total revenue per capita
2	Urbanisation	Percent of population that is urban
3	Health	Number of medical facilities
		Number of primary health centres
		Number of nurses/midwives
		Number of medical doctors
		Number of beds in health institutions
4	Education	Number of primary schools
		Number of secondary schools
		Number of primary school teachers
		Number of secondary school teachers
		Primary school enrolment
		Secondary school enrolment
5	Services/manufacturing	Number of commercial banks
		Number of manufacturing industries
		Number of hotels
6	Basic amenities	Number of households with access to telephone.
		Number of households with access to electricity as main source of energy.
		Number of households with access to pipe borne water

3.1.2. Data collection

There are two possible ways of obtaining data on DM. The first is to collect information from patient records at hospitals from which sex, age, location and year of diagnosis can be obtained. The second is to derive self-reported DM diagnosis through a survey like that of the Behavioural Risk Factor Surveillance Survey (BRFSS) in the United States of America, or the Health Wellbeing Surveillance System (HWSS) of Australia - by simply asking the question "Have you been told by your doctor or nurse that you have been diagnosed of DM?". In this study, both approaches were used so as to have a robust understanding of the geography of DM.

Eight health facilities were purposively selected for the study because they are among the few health institutions in Oyo state that have diabetes registries. Data extraction from the case files took two years to complete; it began in April, 2012 and ended in May, 2014. Out of the thirty three local government areas in Oyo state, the study could extract DM data for 27 LGAs only. The other six LGAs namely Ibarapa North, Ibarapa Central, Ibarapa East, Iseyin, Irepo and Olorunsogo had no DM data; therefore they were excluded from the analysis.

Data on many of the socio economic, environmental and lifestyle risk factors that might affect variability in DM were collected at the LGA level through the use of the questionnaire. This is because surveillance data on major risk factors are uncommon in developing countries like Nigeria (Abubakari *et al*. 2008, Ezzati et al. 2004 cited in Abubakari *et al*. 2009). The questionnaire survey was conducted from February to April, 2014 in all the 33 LGAs.

Sample size determination

In order to arrive at an appropriate sample size for this study, a sampling ratio of one percent (1%) was used. This choice was based on Neuman's (1991) recommendation that a sampling ratio of at least one percent is adequate for populations with one million elements and above (>1,000,000).

The total number of households in Oyo state, Nigeria in 2006 stood at 1, 246,105 (NPC, 2006). With an annual growth rate of 3.2 percent (N.P.C, 2006), the number of

households for year 2014 in Oyo state was estimated to be 1,555,998, using the formula below:

$P_1 = P_0 (1 + r)^t$

Where P_1 is projected population

P_0 is the base population

r is rate of population growth, and

t is the time difference

With the sampling ratio of one percent, the sample size is 1,555. The sample size was increased to 1,650 among the 33 LGAs of Oyo state.

Sampling procedure

Multistage sampling technique was adopted. The state was divided into the thirty three existing local government areas. In each LGA, a community was selected, and at each community some households were picked for the survey.

Questionnaire forms were administered in all the thirty three LGAs of Oyo state so as to ensure an adequate representation of all parts of the state. In each LGA, fifty (50) households were selected, using the systematic sampling technique. In each locality, the first house along a major street was picked and subsequent housing units were chosen at a uniform interval. In each selected house, a household was interviewed. In the case where there were more than one household in a building, one household was interviewed. The sample for this study consisted of household heads. Data were collected from this category of people because they were in a better position to provide adequate information to the questions. In the absence of the household head, any adult above the age of 18 years was approached.

A total of one thousand six hundred and fifty (1,650) questionnaire forms were distributed. However, 1,619 forms were returned, which gives the survey a response rate of 98 percent.

3.1.3 Data analysis

Data were processed and analysed using the Statistical Package for Social sciences (SPSS) version 17. Frequency distributions and cross tabulations were produced. In

addition, some data were illustrated with the aid of line graphs, bar charts and statistical maps. Chloropleth maps were produced to show the spatial distribution of DM: overall DM, male DM, female DM, overall self-reported DM, male self-reported DM and female self-reported DM. Spatial analysis was done for each of these periods: 2000-2004, 2005-2009, 2010-2014 and 2000-2014. Temporal patterns were displayed by plotting the yearly number of DM cases (overall DM, male DM and female DM rates).

The statistical techniques employed in this study are global and local Moran's *I*, local Getis Ord statistic, simple linear regression, Pearson correlation, and multiple regression analysis. The DM incidence rate (D.I.R) rate per 10,000 was expressed as the number of DM cases (overall DM, male DM and female DM) per 10,000. For each local government area, DM rates were calculated by dividing the DM cases per LGA by the 2014 projected population size of the LGA multiplied by 10,000.

$$\text{D.I.R} = \frac{\text{DM cases per local government A}}{\text{Population of local government A}} \times 10{,}000$$

Similarly, the male and female DM rates were calculated using the number of DM cases for each sex, and the projected 2014 male and female population sizes for each LGA.

Self-reported DM prevalence rate was computed by dividing the number of persons who reported, in the questionnaire survey, that they had been diagnosed of DM by the total number of respondents in each LGA multiplied by 100. Self-reported male and female DM prevalence rates were computed in the same manner.

The first hypothesis was tested using both the global Moran's I, local Moran's I and local Getis statistic (see Table 3.3). The analysis was in two phases. The first phase was to determine the degree of spatial clustering of DM, using Global Moran's *I*. The second was to identify the location of spatial clusters with the aid of the Local Moran's *I* statistic, and the local Getis Ord statistic (G^*_i).

Global Moran's I statistic determines the degree of spatial autocorrelation of a given phenomenon. Simply, it measures the degree to which a given phenomenon is clustered in space. In particular, spatial autocorrelation determines the nature and measures the strength of relationship between values of a given phenomenon in space. Positive spatial autocorrelation occurs where similar values of DM rates tend to occupy adjacent location whereas negative autocorrelation implies that high DM values tend to be located next to low ones and vice versa. The absence of spatial autocorrelation is said to exist if the spatial structure is random. The global Moran's I value generates a single summary value (*I*) and a z score with its associated probability value (p-value) indicating the presence or absence of concentration/dispersion. The Moran's I ranges approximately from +1 (for positive spatial autocorrelation) to -1 (negative autocorrelation) and any value close to zero suggests the absence of autocorrelation. However, it does not show where the clusters or outliers are located (Anselin et al., 2007 cited in Uthman *et al*. 2009).

The global Moran's I (Wikipedia, 2014) is expressed as:

$$I = \frac{N}{\sum_i \sum_j w_{ij}} \frac{\sum_i \sum_j w_{ij}(X_i - \bar{X})(X_j - \bar{X})}{\sum_i (X_i - \bar{X})^2} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where *N* is the number of spatial units (LGAs) indexed by *i* and *j*;

X is the variable of interest (DM incidence rates)

$\bar{X}$ is the mean value of DM incidence rates

w_{ij} is an element of a matrix of spatial weights which expresses the degree of proximity between LGAs *i* and *j*. The spatial weights are in binary form (0, 1). LGAs that share boundaries with others were considered to be contiguous and therefore assigned a value of 1 whereas non-contiguous LGAs have a value of zero.

Local Moran's I statistic (or Anselin's Local Moran's I statistic) is an indicator of local spatial association used for identifying whether the incidence of any given occurrence (in this case, DM) is clustered among different spatial units. It specifically identifies clusters of features with values similar in magnitude and also to identify outliers by comparison to neighbouring features and the mean of the entire population. Local Moran's I measures whether for each state or LGA, the DM rate is closer to the values

of its neighbours. Five types of clustering patterns were anticipated: High-High (HH) indicates clustering of high rates of DM (positive spatial autocorrelation); Low-High (LH) means low DM rates are adjacent to high ones (negative spatial autocorrelation); Low-Low (LL) means clustering of low rates of DM (positive spatial autocorrelation); High-Low (HL) indicates that high rates are adjacent to low DM values, and not significant means there is no spatial autocorrelation.

The formula is as follows (Anselin, 1995 cited in Djukpen, 2012):

$$I_i = p_i \sum_j w_{ij} p_j$$

Where I is the local Moran's I

p is the difference between the DM rate in LGA *I* and the mean DM rate,

W_{ij} is a weight noting the strength of connection (geographic proximity) between LGAs *i* and *j* is standardized to adjust for the number of neighbours.

The Local Getis (G_i^*) statistic is a spatial cluster analysis tool employed to identify clusters with high values otherwise known as hotspots and clusters with low values called cold spots. In this study, it revealed the presence of both hotspots and cold spots of DM. Their presence of both was determined using Z-score values at a significance level of 0.05. High and positive clusters with Z score values below 1.96 suggest the presence of DM cold spots while values above 1.96 indicate DM hotspots. The magnitude of the z-score indicates the association of values among neighbours. The higher/lower the z- score is, the stronger/weaker the relationship would be. If it is close to zero, there is no evidence of any cluster.

The formula is expressed below:

$$I_i = \frac{\left(y_i - \bar{y}\right)\sum_{j=1}^{n} w_{ij}\left(y_j - \bar{y}\right)^2}{m_2} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

Where I is the local Getis I index

yi is the value of the variable (DM rate) at the *i*th location,

n is the number of LGAs.

wij is a spatial weight matrix indicates the spatial relationship among the LGAs *i* and *j*, m_2 is the average of the squared deviations from the mean of DM rates.

The second hypothesis was tested using the multiple regression method. Two separate regression models were estimated. The dependent variables were overall DM incidence rate (2000-2014) (Y_1) and self-reported prevalence rate (Y_2) while the independent variables ($X_1 \ldots X_n$) consisted of genetic susceptibility, socio-economic, environmental, and lifestyle risk factors (see Table 3.3).

The DM incidence rate (D.I.R) rate per 10,000 was expressed as the number of DM cases per 10,000. For each local government area, DM rate was calculated by dividing the DM cases per local government area by the population size of the local government area multiplied by 10,000.

$$\text{D.I.R} = \frac{\text{DM cases per local government A}}{\text{Population of local government A}} \times 10{,}000$$

Self-reported DM prevalence, on the other hand, was expressed as the percentage of the sample who reported positive diagnosis of DM in each LGA.

The simple linear regression was used to test the third hypothesis if there was an upward trend in the DM incidence rates in Oyo state for the period 2000-2014 (see Table 3.3). The simple linear regression is as follows:

$Y = a + bX + e$ …… (3)

Where Y is the DM incidence rate

a is the intercept term

b is the slope (regression coefficient). It controls the rate at which the line rises (or falls) as X (the number of years from the base year 2000) increases. If *b* is positive ($b > 0$), the relationship between X and Y is positive. If *b* is negative ($b < 0$), the relationship is negative.

e is the error term.

Therefore if the *b* value is positive, it indicates an upward trend in DM incidence and if negative, a downward trend in DM incidence. Three separate linear regression

models were estimated for overall DM, male DM and female DM rates (see Table 3.3).

The fourth hypothesis (spatial variation in DM incidence is related to the differences in the level of development in Oyo state) was tested with the Pearson correlation technique. Six separate analyses were conducted for overall DM, male DM, female DM incidence rates, overall, male and female self-reported DM prevalence rates (see Table 3.3).

Development index was computed with the aid of the principal component analysis (PCA) technique. The following twenty variables were analysed to identify the major dimensions: Internally generated revenue, total revenue per capita, level of urbanisation, number of medical facilities, number of medical doctors, number of nurses/midwives, number of beds in health institutions, number of households with access to telephone, number of households with access to electricity as main source of energy, number of households with access to pipe borne water, number of primary schools, number of secondary schools, primary school enrollments, secondary school enrollments, and number of primary school and secondary school teachers (see Table 3.3). The index of development for each LGA was calculated by deriving the arithmetic mean of the major component scores.

The fifth hypothesis was tested with Chi-square (X^2) test (see Table 3.3). X^2 is a non-parametric test. It is used to determine the degree of independence between categorical variables. In other words, the test will only tell us whether or not two variables are independent. However, it does not indicate the degree of association nor the direction of the association. The Chi-Square test is expressed as:

$$X^2 = \sum \frac{(O-E)^2}{E}$$

Where X^2 = Chi- square

O = Observed value

E= Expected value

Table 3.2: Measurement of variables

	Hypothesis/Variable	Operational variable
1	**Hypothesis 1**	Overall DM incidence (2000-2014)
	DM incidence rates	Overall DM incidence (2000-2004)
		Overall DM incidence (2005-2009)
		Overall DM incidence (20010-2014)
		Male DM incidence (2000-2014)
		Male DM incidence (2000-2005)
		Male DM incidence (2005-2009)
		Male DM incidence (2010-2014)
		Female DM incidence (2000-2014)
		Female DM incidence (2000-2004)
		Female DM incidence (2005-2009)
		Female DM incidence (2010-2014)
		Self-reported DM prevalence
		Male self-reported prevalence
		Female self-reported prevalence
2.	**Hypothesis 2**	
	DM incidence:	Overall DM incidence rate (2000-2014)
		Self-reported DM prevalence rate
	Genetic & Socioeconomic:	Family history of DM
		Percent households below the poverty line (below 18,000 naira per month)
		Percent household heads with university education
		Percent household heads with employment.
	Lifestyle:	Percent always engaged in physical activity
		Percent living near fast food outlets
		Percent living near physical fitness centres
		Percent consuming alcohol
		Percent consuming fruits and vegetables
		Percent consuming soft drinks
		Percent consuming fast foods
		Percent consuming tobacco
		Percent of those whose B.M.I is equal to or greater than 30 (obesity).
	Environmental:	Sidewalks: Percent living in neighbourhoods with sidewalks
		Percent living in neighbourhoods with streetlights

Table 3.2: Measurement of variables

		Percent overcrowded households (3 or more persons per bedroom) Level of urbanisation (Percent of LGA population that is urban) Proximity to bus stop (Percent living within easy walking distance to the nearest bus stop) Proximity to neighbourhood stores (percent living within easy walking distance to stores) Neighbourhood safety (Percent who perceive neighbourhood to be relatively safe) Neighbourhood social capital (Percent who believe most people in the neighbourhood can be trusted)
3.	**Hypothesis 3**	
	DM incidence	Overall DM incidence rate per 10,000/calendar year Male DM incidence rate per 10,000/calendar year Female DM incidence rate per 10,000/calendar year
	Time	Number of years from the base year 2000
4.	**Hypothesis 4**	
	DM incidence	Overall DM incidence rate per 10,000 (2000-2014) Male DM incidence rate per 10,000 (2000-2014) Female DM incidence rate per 10,000 (2000-2014) Self-reported DM prevalence (%) Male self-reported DM prevalence (%) Female self-reported DM prevalence (%)
	Level of development	P.C.A-derived index of development for each LGA.
	Hypothesis 5	
	Perception of DM	Awareness of DM Source of awareness Willingness to go for diagnosis Perceived symptoms Treatment of DM
	Socio economic characteristics	Age, Sex, Income, Education, Occupation

3.2 Ethical considerations

Ethical approval for the study (**UI/EC/13/260**) was obtained from the University of Ibadan/University College Hospital Institutional Review Board (UI/UCH IRB) at the College of Medicine, University of Ibadan (See Appendix A-1). Ethical clearance was received from the Office of the Permanent Secretary, Oyo State Hospital Management Board (OYSHMB), Ibadan for access to DM data sources in some of the public hospitals in Oyo state. In addition, informed consent was obtained from all the respondents before questionnaire forms were administered.

In the course of the survey, respondents were assured that information gathered will be kept confidential; will not inflict harm on them, and their right to decline or to withdraw from participating in the research process was respected. Thus no one was, in any way, coerced to participate in the research. The informed consent form (Appendix A-2) and questionnaire form (Appendix A-3) were verbally translated for non-English speaking persons in their local language. Respondents indicated their consent by appending their signatures or applying their thumbprints.

CHAPTER FOUR

SPATIAL PATTERN OF DIABETES MELLITUS IN OYO STATE

4.1 Introduction

In this chapter, the spatial variations in DM incidence and self-reported prevalence in Oyo state are analysed in order to identify the areas and populations at risk. Subsequent sections examine the degree of clustering of DM and the location of DM hotspots and cold spots within the state, using three spatial analytical techniques: Global Moran's I, Local Moran's I and Local Getis Ord statistic. In addition, the temporal patterns of DM from 2000 to 2014 were described and analysed.

4.2 Spatial distribution of DM in Oyo state

4.2.1 Spatial pattern of overall DM incidence

Figures 4.1- 4.4 show the spatial distribution of DM incidence in Oyo state from 2000 to 2014. As earlier outlined in Chapter 3, DM incidence rates were calculated by dividing the DM cases per LGA by the population size of the LGA multiplied by 10,000.

On the whole, the overall DM incidence follows a south-north pattern. In 2000-2004 period, the overall DM cases (i.e. both male and female DM cases) were concentrated in Ibadan North (8.8), Akinyele (2.1), Ibadan Northwest (1.5) and Ibadan Southwest (1.5) LGAs. In contrast, most of the LGAs in the northern part had very low incidence rates. The lowest incidence rates were particularly found in Oyo West (0), Ona Ara (0), Iwajowa (0), Itesiwaju (0), Atiba (0.1), Egbeda (0.1), Kajola (0.1), Orelope (0.1), Saki East (0.1) and Surulere (0.1) (Figure 4.1). The spatial pattern in 2005-2009 is similar to that of 2000-2004 except for the increase in DM incidence rate in Saki East (1.5) LGA. DM cases are mainly concentrated in Ibadan North (11.4) and Akinyele (6.1) (Figure 4.2 and 4.3). From 2000 to 2014, high DM incidence rates are concentrated in Ibadan North (29.3), Akinyele (17.5), Ido (7.4), Ibadan Southwest (5.7) and Ibadan Northwest (5.2) (Figure 4.4).

From a temporal perspective, DM incidence greatly increased in eight LGAs namely Akinyele, Egbeda, Ibadan Northeast, Ibadan Southeast, Ido, Lagelu, Saki East and

Ona Ara. On the other hand, only Orire LGA experienced a decline in incidence from 0.2 in 2000-2004 to 0 in 2010-2014 (Appendix A-5)

Ibadan region has the highest DM rates. This can be attributed to two likely factors. The first factor stems from the fact that most of the hospitals, from which DM cases were culled are located in Ibadan region- such as the University College Hospital; University Health Services U.I; General Hospital, Moniya; Jericho Nursing Home and the Ring Road State Hospital, Adeoyo. The second is associated with the relatively high level of urbanisation in Ibadan region. The spatial pattern of DM in Oyo state corresponds with its pattern of urbanisation. This strongly supports the fact that urbanisation is a major driver of the diabetes prevalence in Africa (Godfrey and Julien, 2005 cited in Gill et al 2008). Also, it agrees with Al-Moosa et al (2006)'s observation which identified a higher DM prevalence in the capital region of Muscat in Oman than in the rural areas. In fact, the urban residents were two times more likely to have diabetes than those in the rural regions and also are at greater risk of developing cardiovascular diseases.

Saki West LGA is an outlier due to its relatively high DM rate. This observation could be due to the presence of Saki town, a hilly and fairly large urban centre within the LGA and a popular border town in Nigeria.

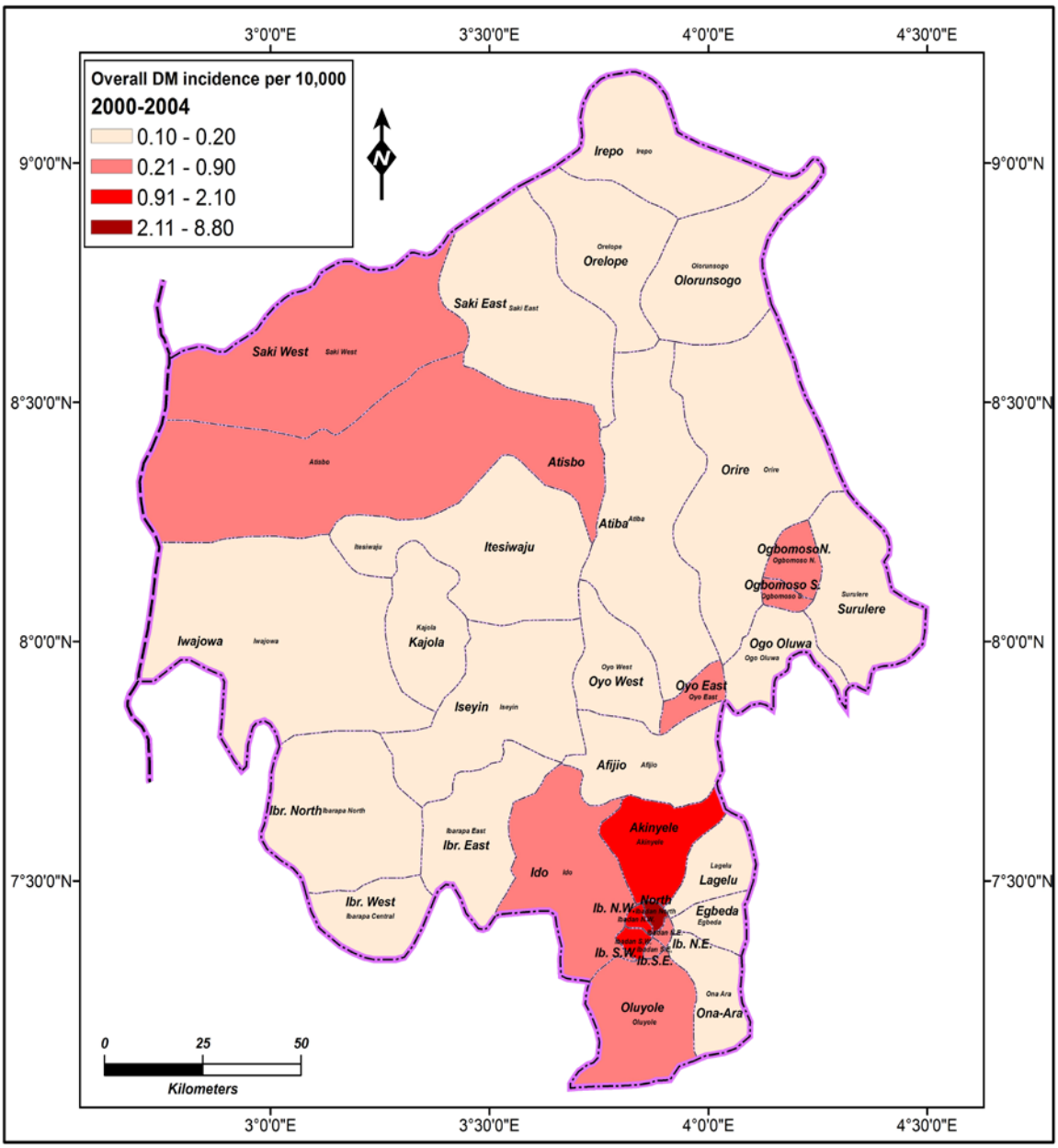

Figure 4.1: Spatial distribution of overall DM incidence (2000-2004)

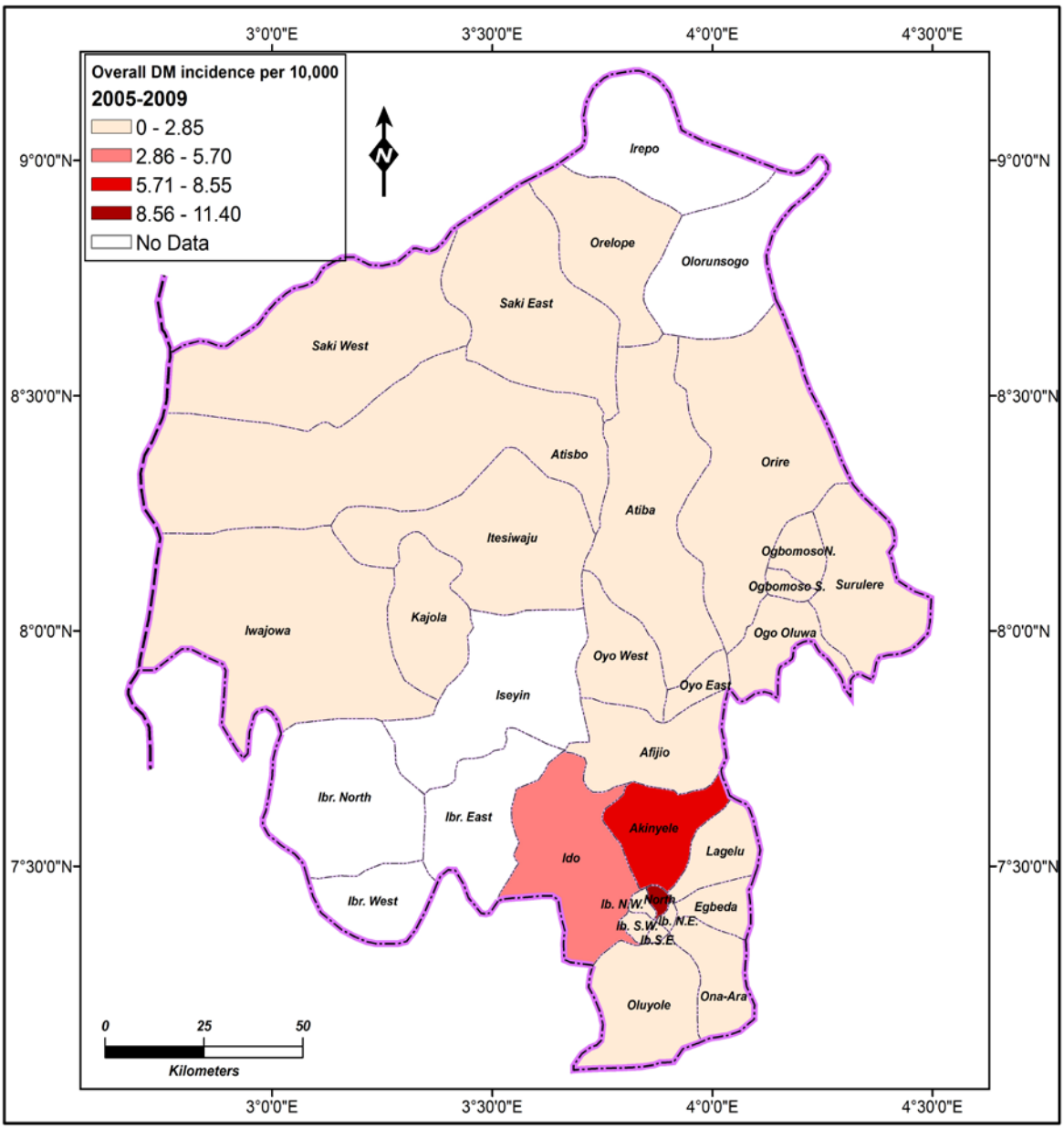

Figure 4.2: Spatial distribution of overall DM incidence (2005-2009)

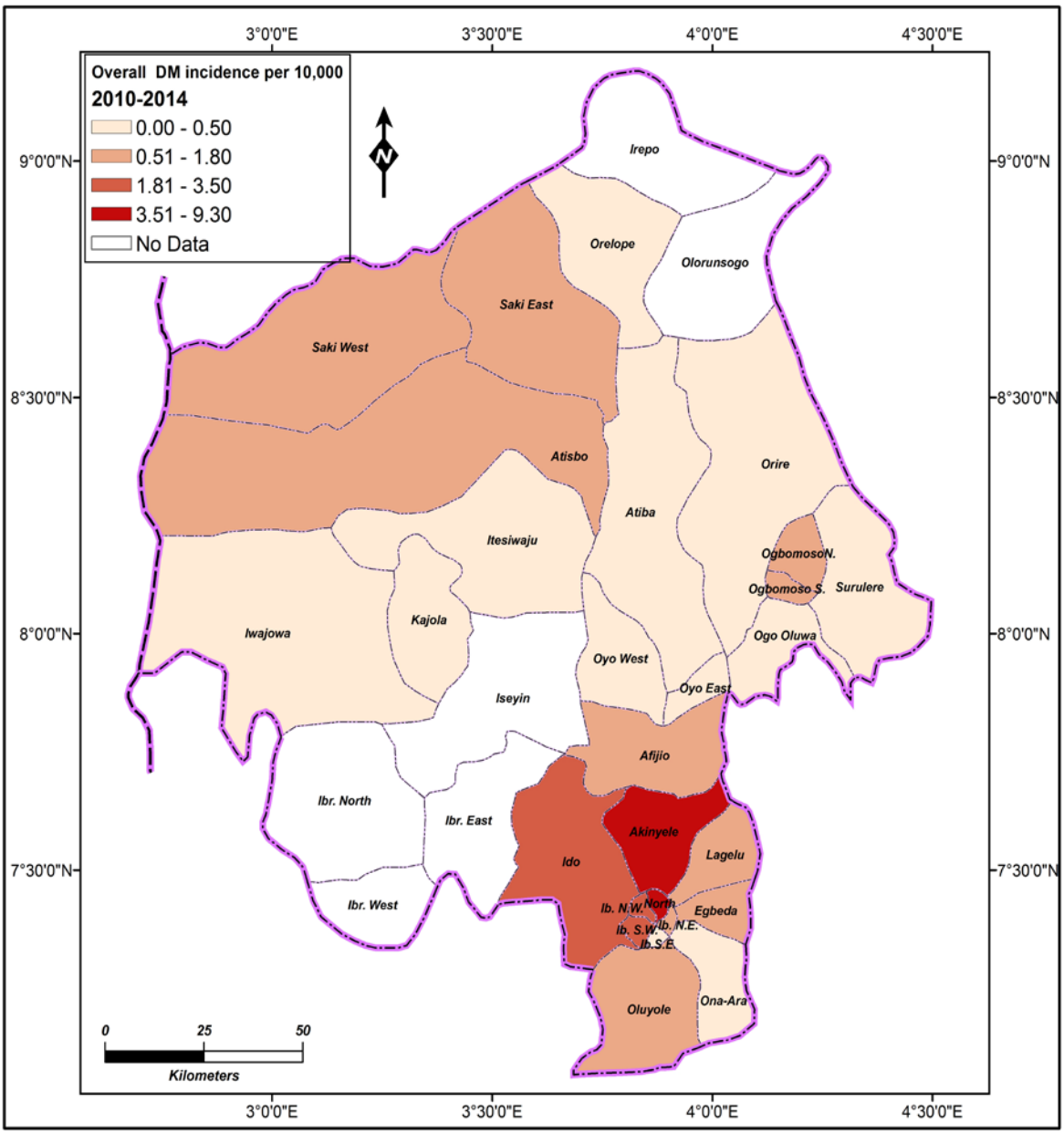

Figure 4.3: Spatial distribution of overall DM incidence (2010-2014)

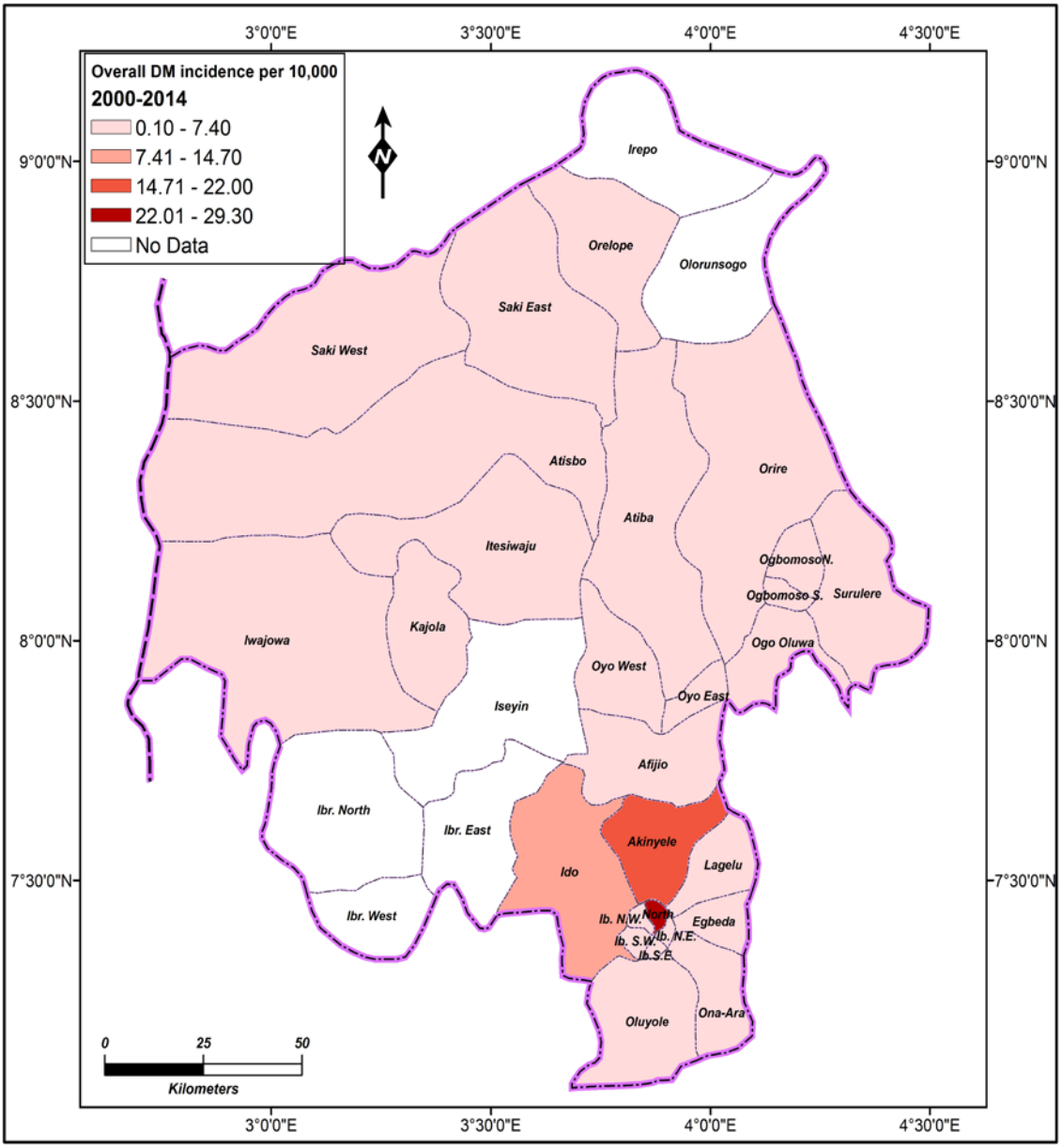

Figure 4.4: Spatial distribution of overall DM incidence (2000-2014)

4.2.2 Spatial pattern of male DM incidence

The spatial distribution of male DM incidence in the state is shown in Figures 4.5-4.8. In the 2000-2004 period, the LGA with the highest male DM incidence rate is Ibadan North (10.3). Apart from Ibadan North, the map shows that Akinyele (2.1), Orire (2.0), Ibadan Northwest, Ibadan Southwest (1.3) and Ido (1.1) had the highest rates in the state. In contrast, the low incidence rates were mainly concentrated in some northern parts of the state (Figure 4.5).

As seen on the map (Figure 4.6), the pattern of male DM incidence in 2005-2009 is somewhat different from that of 2000-2004. Though Ibadan North and Akinyele LGAs still had the highest rates, Ido (3.5), Ogbomoso South (1.7) and Saki West (1.7) emerged as high risk areas. Again, Ibadan North (9.6), Akinyele (8.2) LGAs had the highest DM incidence rates in the 2010-2014 period. Ido (3.2), Ibadan Southwest (2.2) and Lagelu (2.0) LGAs which are located in the Ibadan region, were among the high burden DM LGAs (Figure 4.7)

Appendix A-5 shows that male DM incidence generally increased in nine LGAs from 2000 to 2014. They are Akinyele, Egbeda, Ibadan Northeast, Ibadan Southeast, Itesiwaju, Iwajowa, Lagelu, Oyo West, Saki East and Surulere. On the other hand, there was a gradual decline in incidence among males in Ogo Oluwa and Oyo East LGAs.

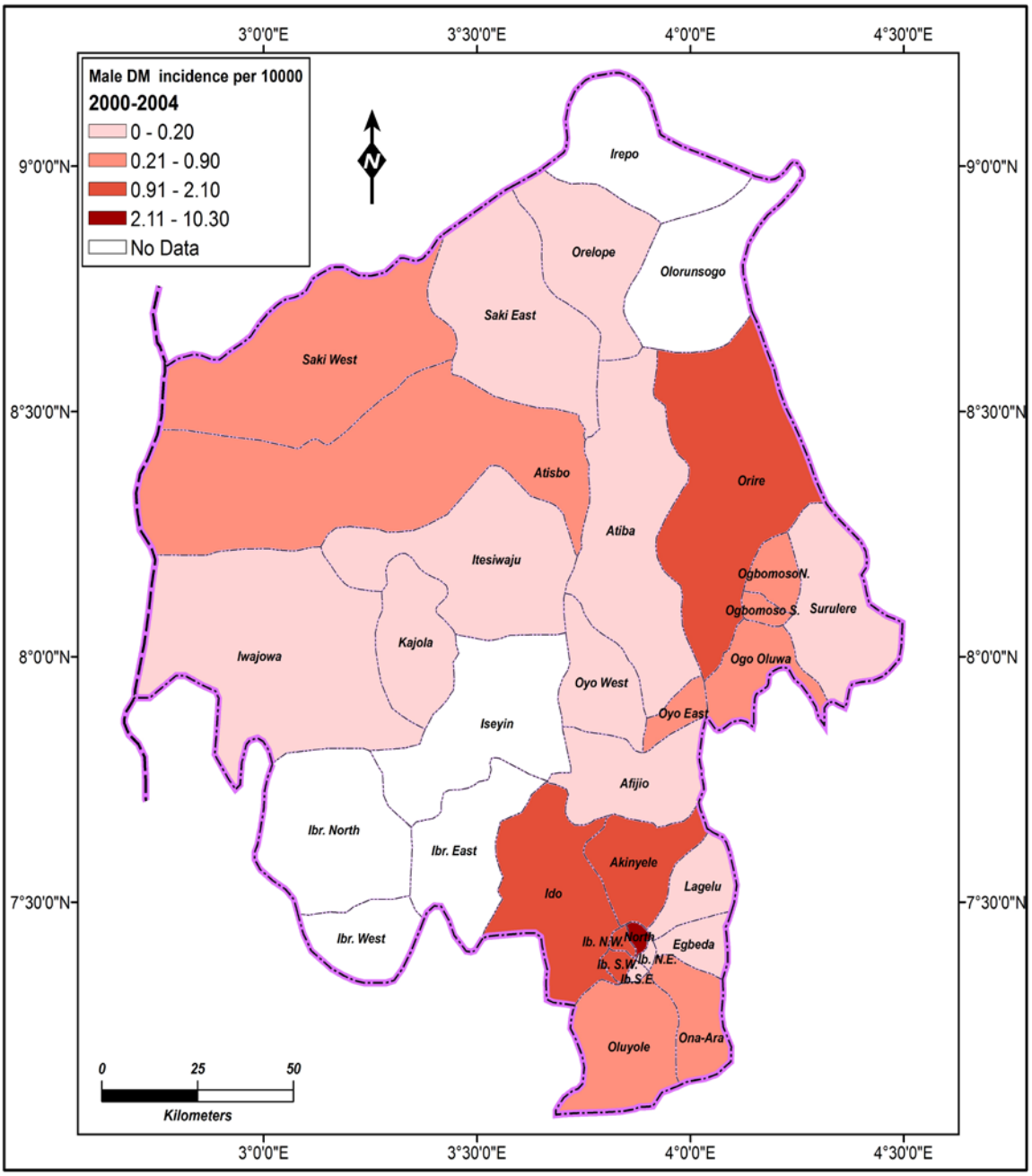

Figure 4.5: Spatial distribution of male DM incidence (2000 – 2004)

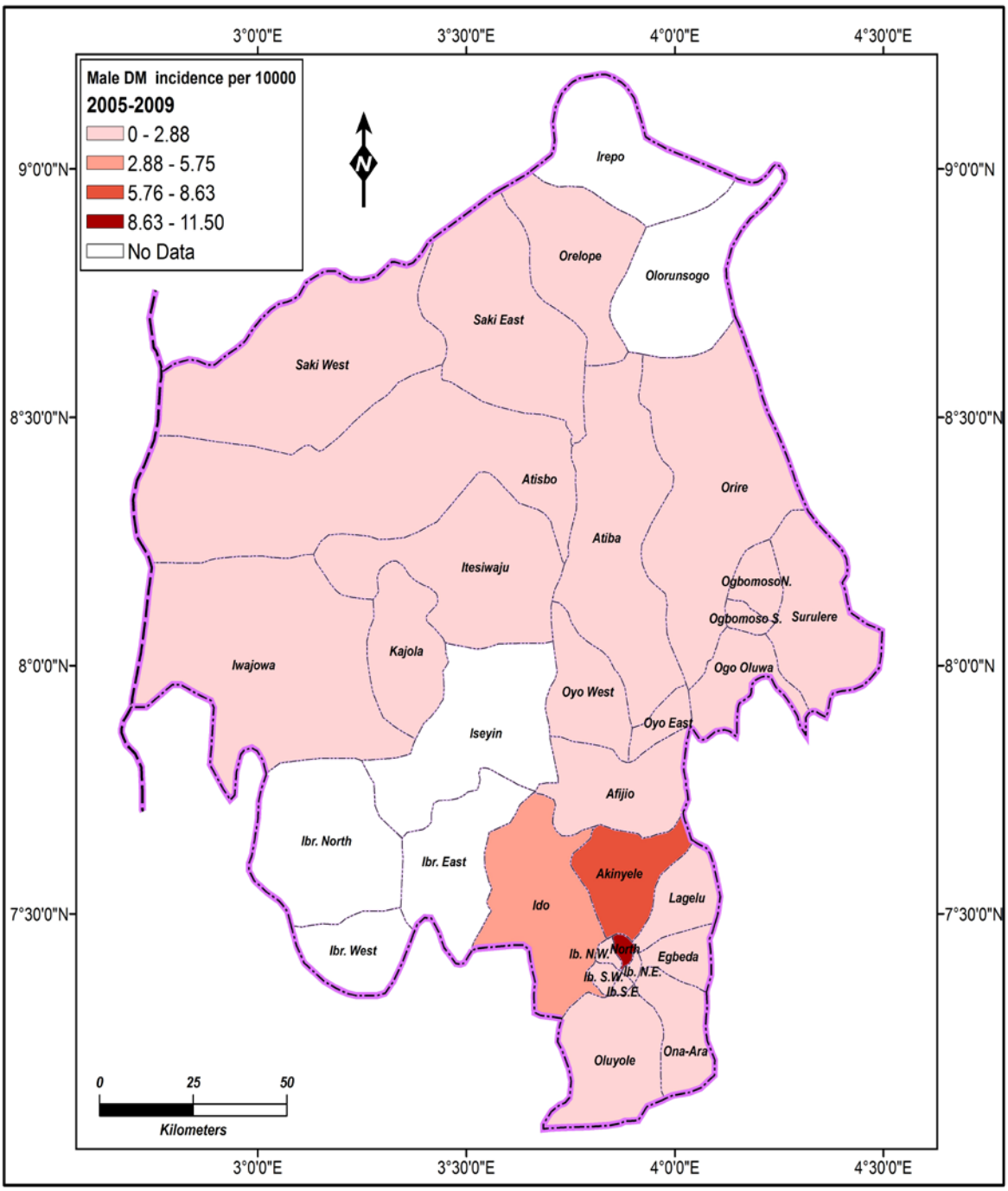

Figure 4.6: Spatial distribution of male DM incidence (2005-2009)

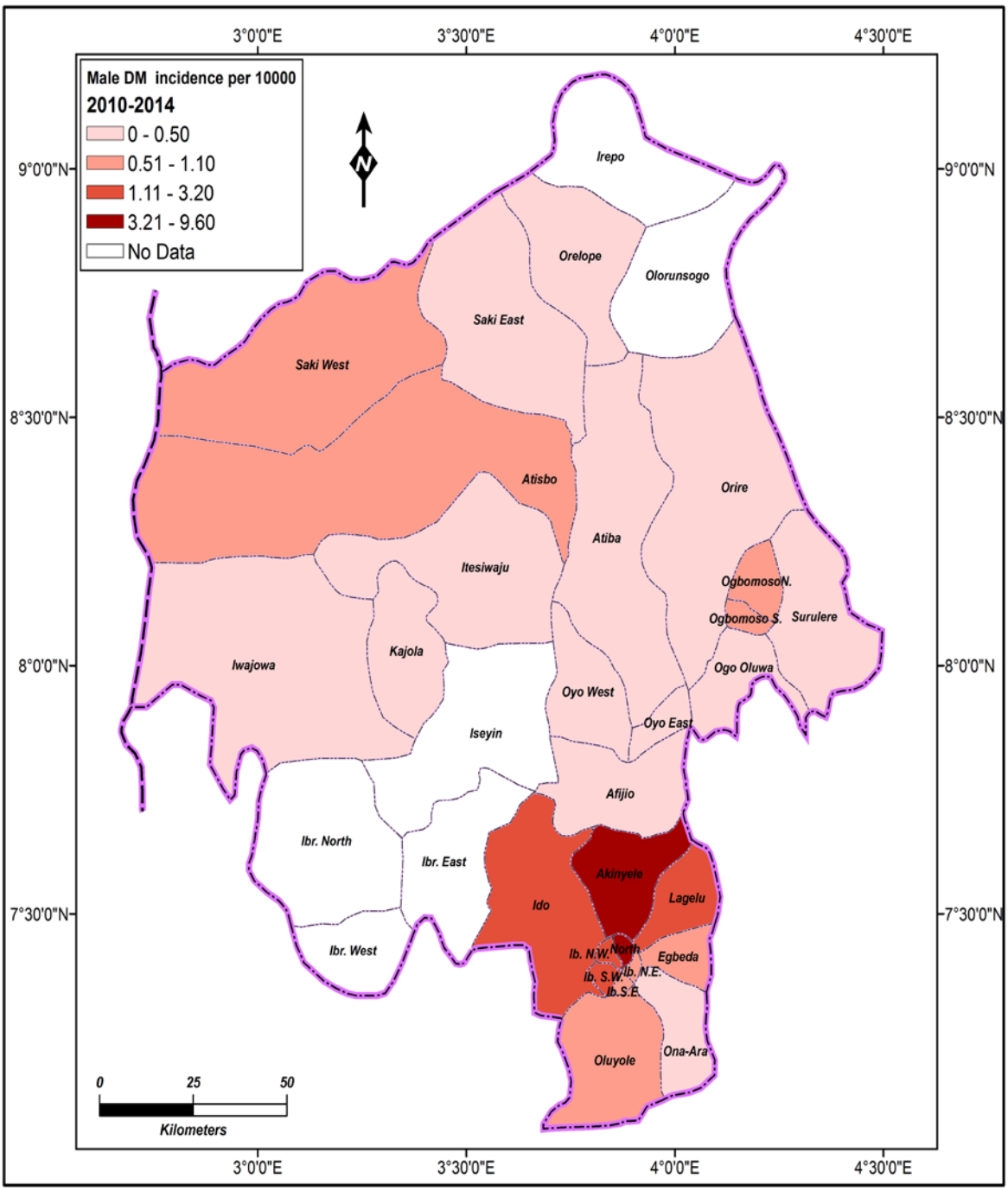

Figure 4.7: Spatial distribution of male DM incidence (2010-2014)

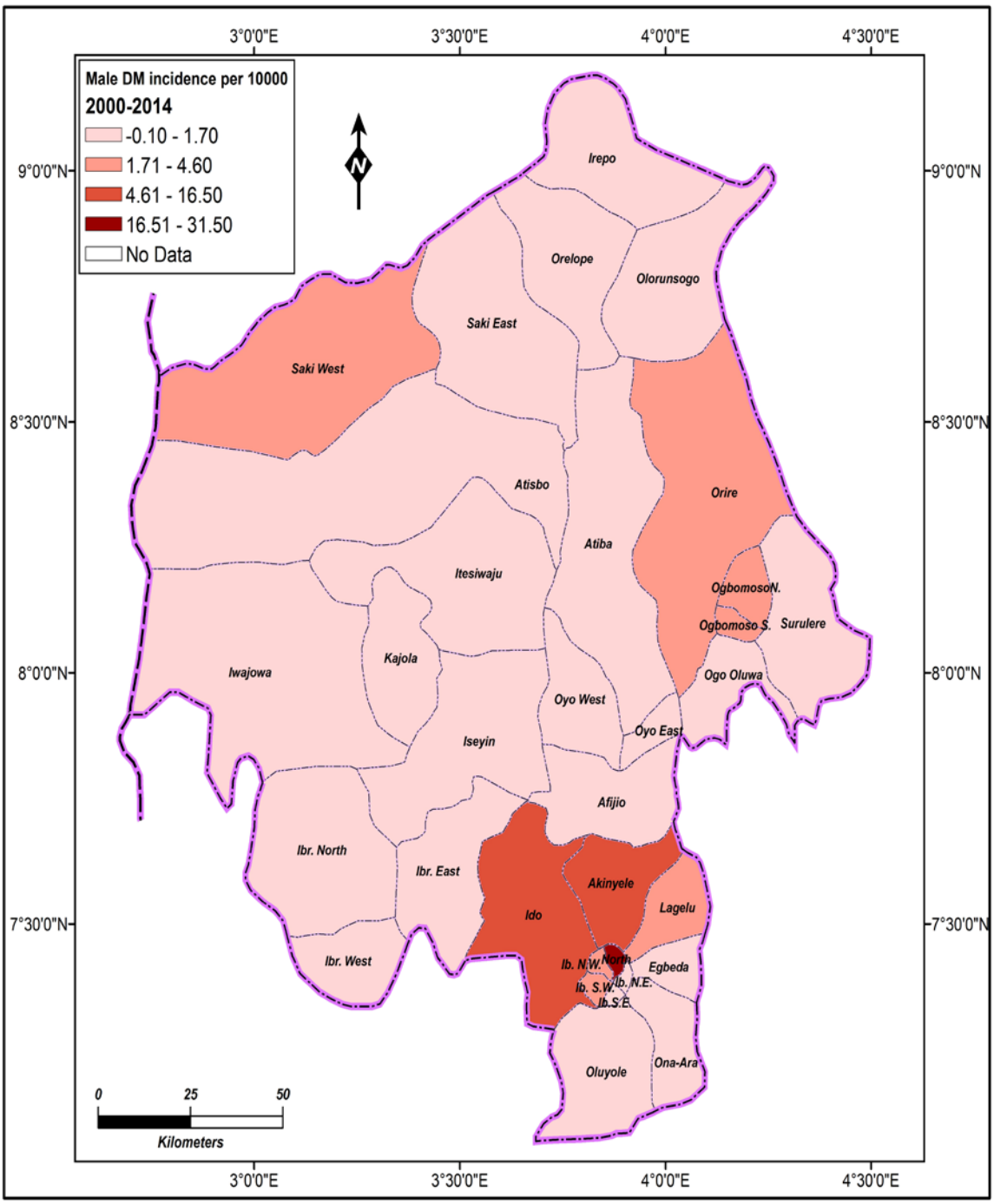

Figure 4.8: Spatial distribution of male DM incidence (2000-2014)

4.2.3 Spatial pattern of female DM incidence

Figures 4.9- 4.12 display the spatial pattern of female DM incidence in Oyo state. In 2000-2004, the highest rates for female were reported in Ibadan North (7.4), Akinyele (2.2), Ibadan Northwest (1.8) and Ibadan Southwest (1.6) while Itesiwaju, Iwajowa, Ogo Oluwa, Orelope, Oyo West, Saki East reported the lowest female DM prevalence rates (Figure 4.9).

For the 2005-2009 period, Ibadan North (11.5), Akinyele (6.2), Ido (2.6), Ibadan Southwest (1.9) recorded highest incidence rates while the lowest rates were found in Afijio (0), Iwajowa, (0) and Surulere (0) (Figure 4.10). With respect to the 2010-2014 period, Akinyele LGA had the highest incidence rate (10.5) followed by Ibadan North (8.8), Ido (3.9), Ibadan Southwest (3.5), Ibadan Northwest (2.5). In contrast, Orelope (0), Orire (0), Surulere (0) and Itesiwaju (0.1) had the lowest female DM rates (Appendix A-5 and Figure 4.11).

There was an increase in the female DM incidence from 2000 to 2014 in eleven LGAs namely Akinyele, Atiba, Atisbo, Egbeda, Ibadan Northeast, Ibadan Southwest, Ido, Lagelu, Oyo East and Saki East. On the other hand, the incidence rates fell during the study period in Kajola, Oriire, and Surulere LGAs only. The remaining LGAs experienced fluctuations in incidence. They are Ibadan North and Ogbomoso South LGA, just to mention a few (Appendix A-5)

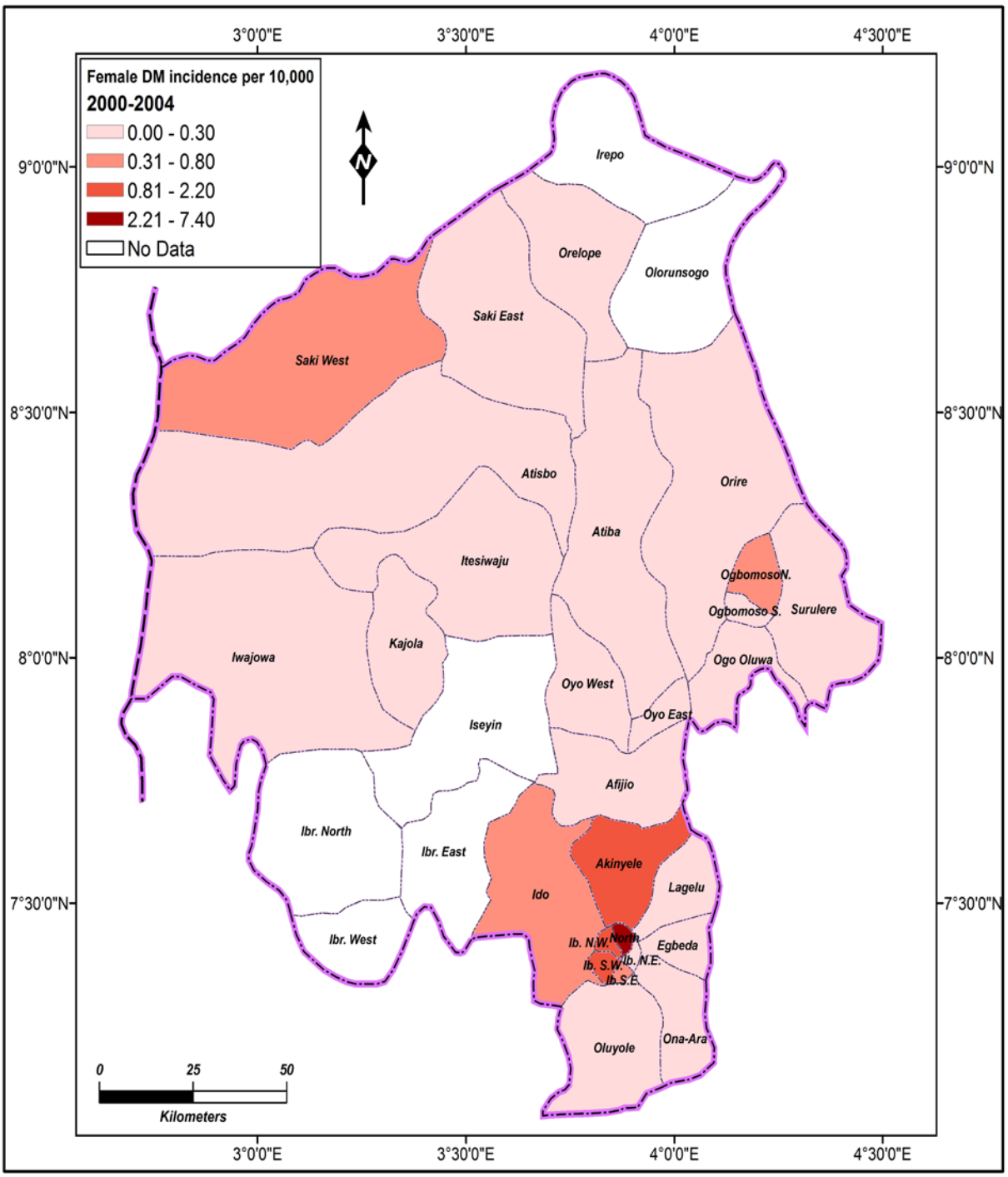

Figure 4.9: Spatial distribution of female DM incidence (2000 - 2004)

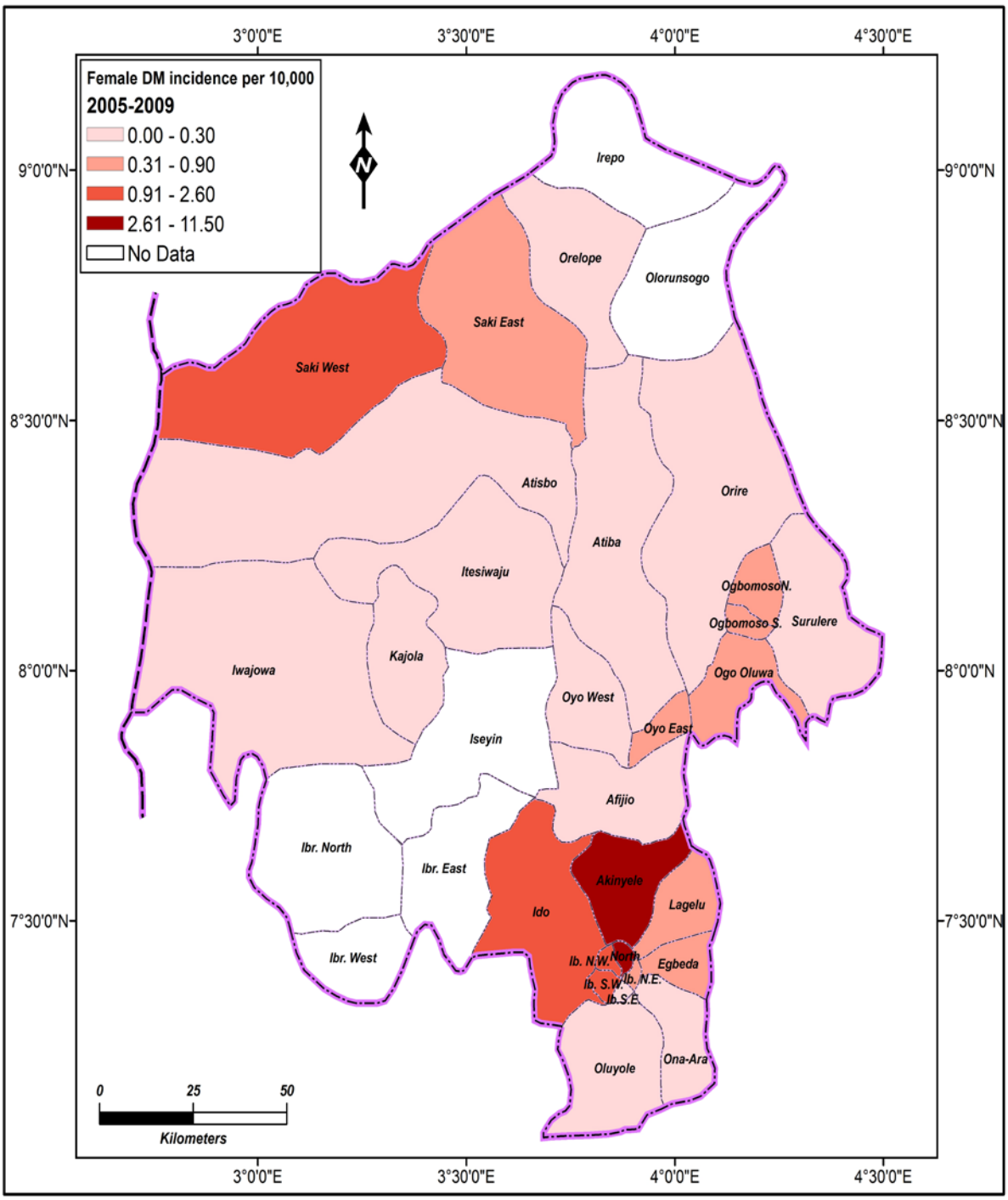

Figure 4.10: Spatial distribution of female DM incidence (2005-2009)

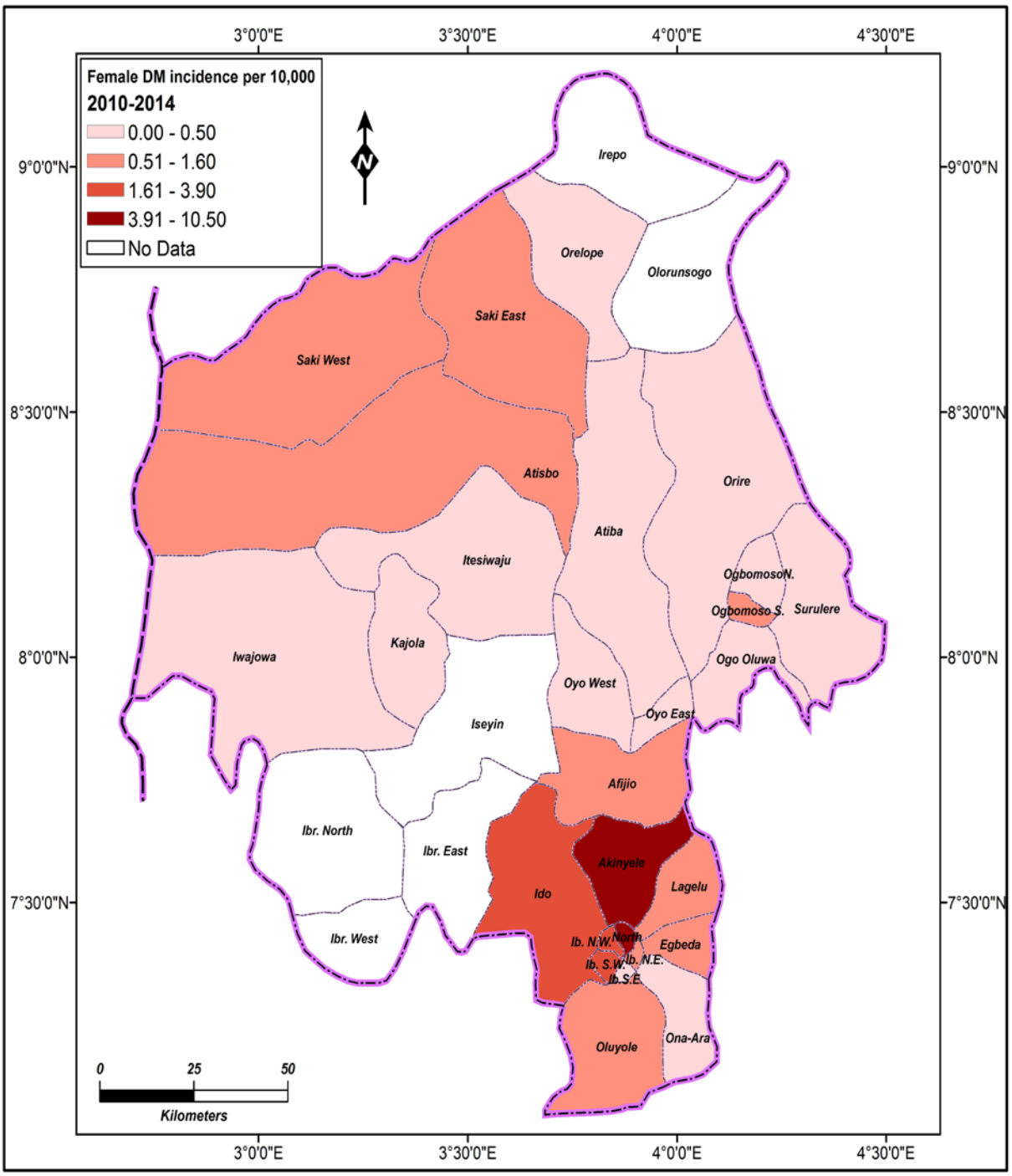

Figure 4.11: Spatial distribution of female DM incidence (2010- 2014)

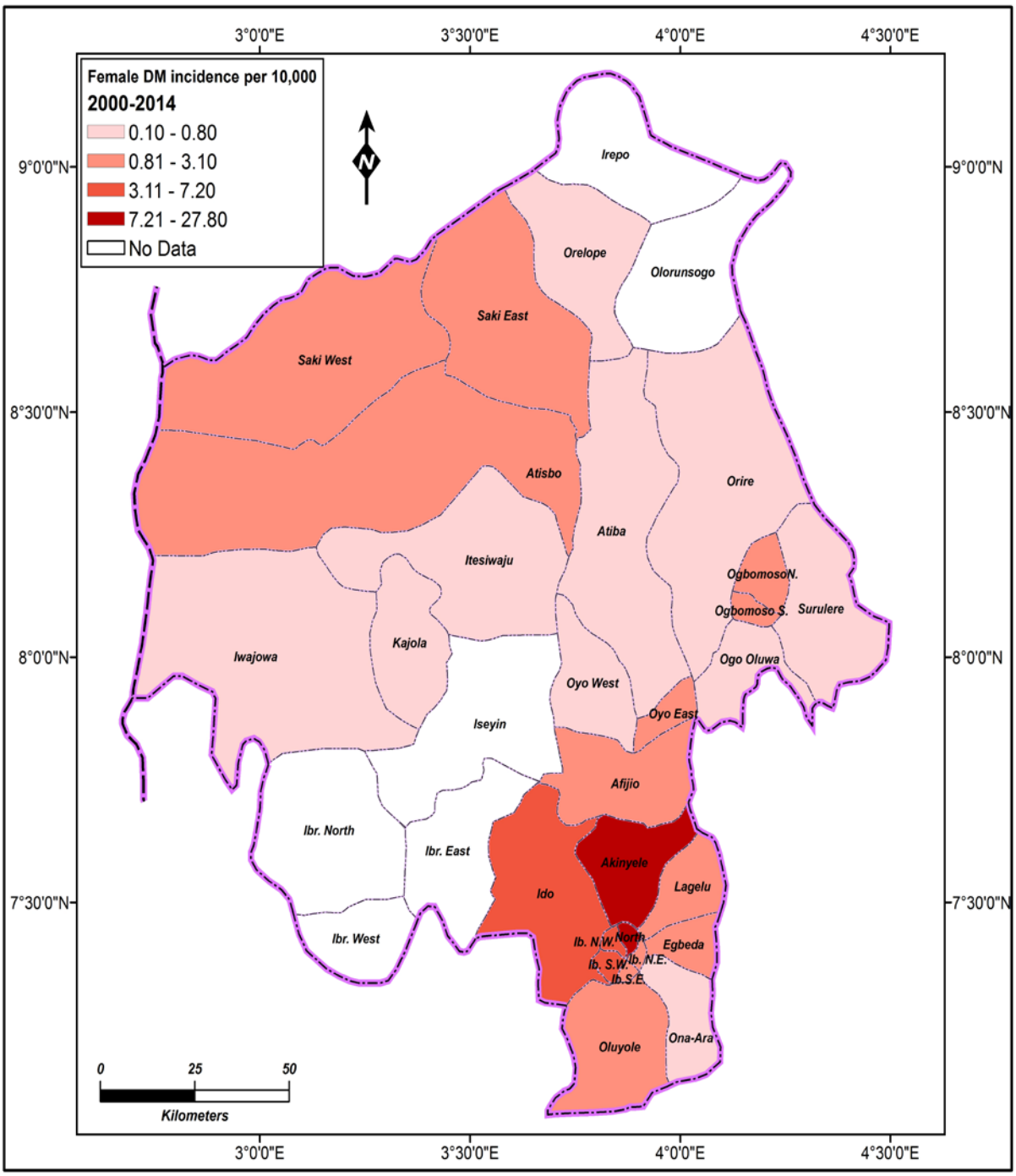

Figure 4.12: Spatial distribution of female DM incidence (2000 – 2014)

4.3 Spatial pattern of self-reported DM prevalence

4.3.1 Overall self-reported DM prevalence

Figure 4.13 shows the geographical distribution of self-reported, male and female self-reported DM prevalence in Oyo state. As earlier stated in Chapter 1, DM prevalence rates were computed by dividing the number of respondents who reported that they had been diagnosed of DM by the total number of respondents in each LGA.

Oyo state has an average prevalence rate of 13.7 percent. A total of ten LGAs had prevalence rates that exceeded the state average. They are Afijio, Atisbo, Ibadan Southeast, Ibarapa East, Ido, Irepo, Iseyin, Itesiwaju and Kajola. In contrast, 23 LGAs had lower-than-average prevalence rates (Appendix A-5).

In terms of distribution, there is a west-east gradient in the self-reported prevalence of DM. Prevalence rates were very high in Atisbo (37.5%), Ibadan North (26%), Ibadan Southwest (30%), Ibarapa North (26%), Ido (24%), Irepo (34%), Iseyin (42.2%), Itesiwaju (20%), and Orelope (22%) LGAs. The lowest prevalence rate was in Ibadan North East LGA (0%).

4.3.2 Male self-reported DM prevalence

As shown in Appendix A-5, the state's male self-reported DM prevalence was 14.5 %. Fourteen LGAs had rates above the state average. Figure .4.13 reveals that the highest prevalence rates for males were found in Atisbo (42.9%), Afijio (20.7%) Iseyin (36.4%), Ibadan North (21.7%), Ibadan Southwest (29.4%), Ibarapa North (26.1%), Ido (30.8%), Irepo (25.9%), Itesiwaju (28.6%), Olorunsogo (20.7%), Orelope (29.7%), Iwajowa (22.2%), Olorunsogo (20.7%) LGAs. Ibadan Northwest and Ibadan Southeast LGAs recorded zero percent.

4.3.3 Female self-reported DM prevalence

The prevalence of DM among females was 12.5 percent (Appendix A-5). Furthermore, it was at its lowest in Orelope, Olorunsogo, Ido and Ibadan Northwest (0%) LGAs. There are only eight LGAs with higher than state average female DM prevalence rate. In contrast, Ibadan North (29.6%), Ibadan Southwest (31.3%), Irepo (43.5%), Iseyin (47.8%) and Saki East (21.4%) LGAs had the highest female DM prevalence rates in the state.

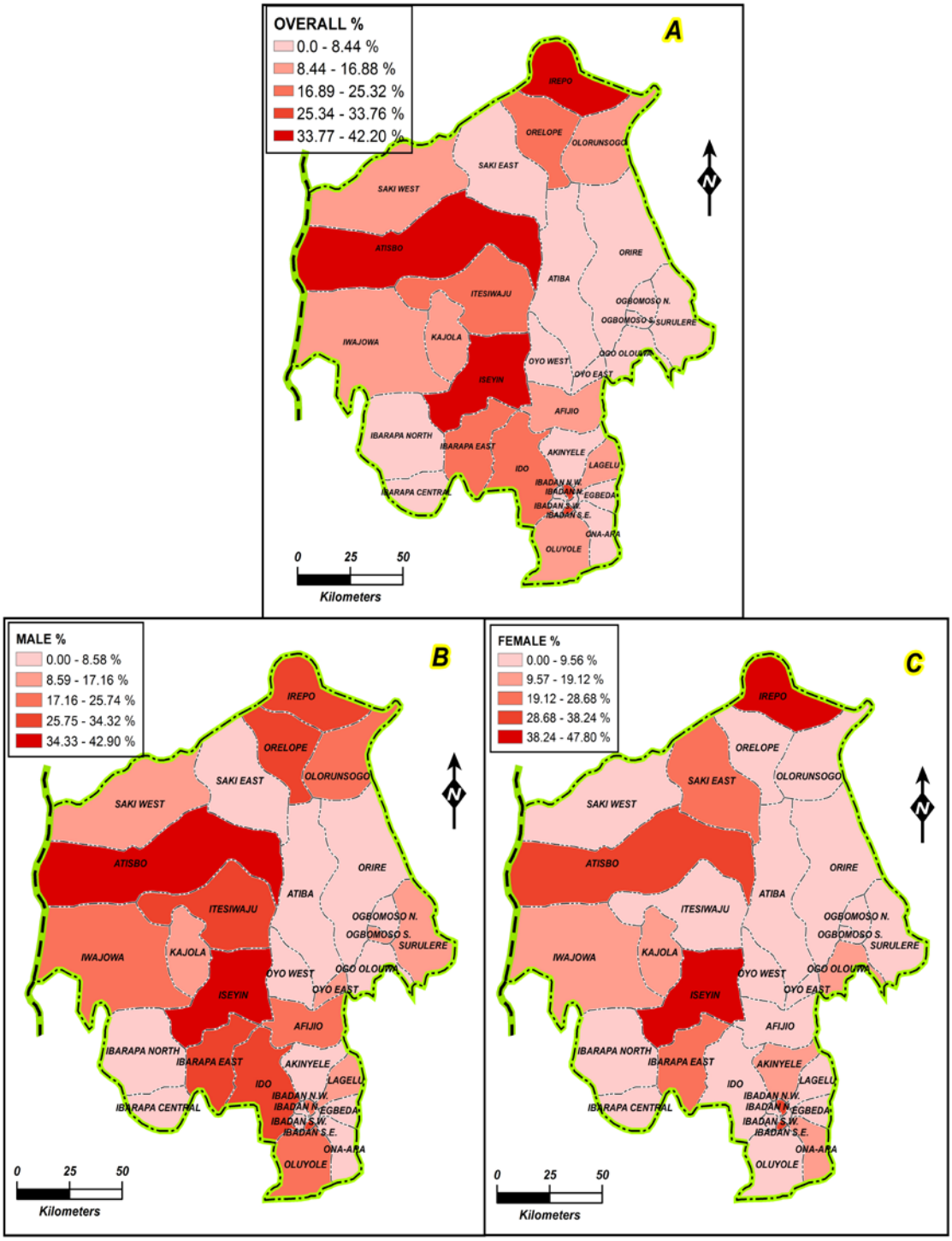

Figure 4.13: Spatial distribution of self-reported DM prevalence in 2014

4.4 Spatial clustering of DM

Overall DM, male DM, female DM and self-reported DM prevalence were subjected to spatial autocorrelation analysis using Global Moran's I. The results are set out in Table 4.1. With respect to overall DM, there was evidence of significant positive autocorrelation throughout the study period. As a matter of fact, the degree of autocorrelation increased from 0.157279 ($p < 0.05$) in 2000-2004 to 0.414495 ($p < 0.05$) in 2010-2014, which means the degree of clustering grew stronger with time (Table 4.1). Similarly, male and female DM incidence had evidence of positive autocorrelation with noticeable increases from 2000-2004 to 2010-2014. Clustering was strongest among males in 2010-2014 ($I = 0.424810$; *z* score= 5.113649; p= 0.0000) (see Table 4.1) and females in 2010-2014 ($I= 0.401846$; *z* score = 4.78893; p= 0.00002) (see Table 4.1). These results certainly indicate that contiguous LGAs have similar values than distant ones-LGAs with low DM rates are close to LGAs with similar rates and vice versa. With respect to self-reported DM, the Moran's I results suggested randomness in the spatial pattern of the overall, male and female self-reported DM (Table 4.1). Therefore, the results of analysis validate the hypothesis which states that there is a significant clustering of DM rates in Oyo state. In summary, DM is clustered significantly in space. This brings to mind Tobler's first law of geography which states "everything is related to everything else but near things are more related than distant things" (Tobler, 1970; p.236).

Table 4.1: Global Moran's I

Overall DM				
Year	**Moran's I**	***z*-score**	**p-value**	**Remark**
2000-2004	0.157279	3.582157	0.000341	Clustered
2005-2009	0.222994	3.354571	0.000795	Clustered
2010-2014	0.414495	4.927624	0.00001	Clustered
2000-2014	0.300278	4.58106	0.000032	Clustered
Male DM				
Year	**Moran's I**	***z*-score**	**p-value**	**Remark**
2000-2004	0.083880	2.233796	0.025496	Clustered
2005-2009	0.197983	2.971211	0.002966	Clustered
2010-2014	0.424810	5.113649	0.000000	Clustered
2000-2014	0.259963	3.883388	0.000103	Clustered
Female DM				
Year	**Moran's I**	***z*-score**	**p-value**	**Remark**
2000-2004	0.219273	4.02717	0.000056	Clustered
2005-2009	0.237599	3.561593	0.000369	Clustered
2010-2014	0.401846	4.78893	0.000002	Clustered
2000-2014	0.325945	4.244269	0.00002	Clustered
Self-reported prevalence				
DM prevalence	**Moran's I**	***z*-score**	**p-value**	**Remark**
Overall	0.016254	0.452631	0.650815	Random
Male	0.064089	0.892713	0.372011	Random
Female	-0.089727	-0.569172	0.569240	Random

Source: Author

4.5 Hotspot analysis

4.5.1 Local Moran's I results

A local Moran's I analysis of overall DM, male DM and female DM was carried out and the results are shown in Tables 4.2 to 4.4. Table 4.2 shows that in 2000-2004 and 2000-2014, hotspots of overall DM (High-High) were found in Akinyele, Ibadan North and Northwest LGAs while DM hotspots were detected in only Akinyele and Ibadan North LGAs in 2005-2009. In 2010-2014, significant clustering of high-high Dm rates was found in Akinyele, Ibadan North and Ibadan Northwest and Ido LGAs. Generally, these LGAs are positively auto correlated. This simply means they are LGAs with high DM rates bounded by LGAs with similarly high values.

Table 4.2: Local Moran's I results (Overall DM incidence)

Year	LGA	I	*z*-score	P value	Remark
2000-2004	Akinyele	5.45603	4.34776	0.000014	HH
	Ibadan North	6.25212	5.64724	0.000000	HH
	Ibadan Northwest	4.44396	3.56372	0.000366	HH
2005-2009	Akinyele	12.3825	7.86884	0.000000	HH
	Ibadan North	10.0353	7.12374	0.000000	HH
2010-2014	Akinyele	18.8826	10.5531	0.0000000	HH
	Ibadan North	15.2097	9.40849	0.0000000	HH
	Ibadan Northwest	4.80421	2.74954	0.005968	HH
	Ido	4.29772	2.29282	0.0021858	HH
2000-2014	Akinyele	14.066	8.62512	0.0000000	HH
	Ibadan North	12.6998	8.66502	0.0000000	HH
	Ibadan Northwest	3.51031	2.2236	0.026176	HH

Source: Author.

Similarly, significant male DM clusters (High-High) were observed in Akinyele, Ibadan North and Ibadan Northwest LGAs and persisted throughout the study period (see Table 4.2). Like overall DM and male DM, statistically significant clusters of female DM were seen in the same LGAs, with Ido LGA being significant only in 2010-2014. As shown in Table 4.3, it can be deduced that female DM is mostly found in Ibadan region specifically Akinyele, Ibadan North and Ibadan Northwest.

Table 4.3: Local Moran's I results (Male and Female DM incidence)

Male DM					
Year	**LGA**	**I**	***z*-score**	**P value**	**remark**
2000-2004	Akinyele	4.02089	3.26882	0.00108	HH
	Ibadan North	2.87702	2.68915	0.00716	HH
	Ibadan Northwest	2.42909	2.02316	0.043057	HH
2005-2009	Akinyele	12.3073	7.72922	0.0000	HH
	Ibadan North	8.80504	6.181	0.0000	HH
2010-2014	Akinyele	18.2864	10.3297	0.0000	HH
	Ibadan North	10.3297	10.3192	0.0000	HH
	Ibadan Northwest	5.07129	2.92794	0.003412	HH
2000-2014	Akinyele	12.6621	8.10102	0.0000	HH
	Ibadan North	11.4176	8.15497	0.0000	HH
Female DM					
2000-2004	Akinyele	7.07588	5.12791	0.0000	HH
	Ibadan North	9.07359	7.37449	0.0000	HH
	Ibadan Northwest	6.60336	4.79287	0.000002	HH
2005-2009	Akinyele	12.2075	7.77976	0.0000	HH
	Ibadan North	10.8193	7.69577	0.0000	HH
2010-2014	Akinyele	18.7278	10.4658	0.0000	HH
	Ibadan North	13.7512	8.51236	0.0000	HH
	Ibadan Northwest	4.7128	2.67549	0.007462	HH
	Ido	5.19831	2.75284	0.007462	HH
2000-2014	Akinyele	15.1013	8.91054	0.0000	HH
	Ibadan North	13.4242	8.79041	0.0000	HH
	Ibadan Northwest	4.46634	2.69963	0.006942	HH

Source: Author.

With respect to self-reported DM, the results presented a somewhat different cluster pattern (See Table 4.4) No significant cluster was detected in the overall self-reported DM prevalence. The significant clusters of high values in male self-reported DM were seen in Iwajowa and Itesiwaju LGAs. On the other hand, hotspots of female self-reported DM were found in Irepo and Ibadan Southwest LGA. In addition, the cluster analysis identified a spatial outlier (High-Low) in Ibadan Southwest, suggesting that it is a high female DM LGA surrounded by LGAs with lower female DM rates. In summary, these DM hotspots (including male and female) were found mostly in the Ibadan region of Oyo state.

Table 4.4: Local Moran's I results (Self-reported DM prevalence)

	L.G.A	Local Moran's I	*z* score	p-value	remark
Overall	-	-	-	-	-
Male	Iwajowa	4.17449	2.11303	0.034598	HH
	Itesiwaju	4.18482	1.98271	0.0474	HH
Female	Irepo	-5.16130	-3.87417	0.0000	HL
	Ibadan Southwest	-5.71566	-2.79684	0.00516	HL

Source: Author.

4.5.2 Local Getis Ord statistics

In addition to the local Moran's I analysis, local Getis Ord analysis was carried out. The results are set out in Tables 4.5 to 4.8. Table 4.5 reveals there were statistically significant clusters of LGAs with high overall DM incidence rates in some parts of Ibadan region in all the observation periods except that of 2010-2014. In 2010-2014, all the hotspots occurred predominantly in the eleven LGAs that constitute Ibadan region.

With respect to male DM incidence, there was a noticeable and consistent clustering in Akinyele, Ibadan North, Ibadan Northwest and Lagelu LGAs from 2000- 2004 to 2010-2014 and even in the 2000-2014 (see Table 4.6). Like male DM, Akinyele, Ibadan North, Ibadan Northwest and Lagelu LGAs were identified as DM hotspots for females in all the observation periods. Ido and Ibadan Northeast LGAs were hotspots only in 2010-2014 and 2000-2004 periods respectively (Table 4.7).

However, hotspots for overall and female self-reported DM prevalence were found in only in Iwajowa LGA. Hot clusters for males were spotted in Iwajowa and Kajola LGAs (Table 4.8).

Table 4.5: Local Getis Ord results (Overall DM incidence)

Year	**L.G.A**	**Getis score**	***z***	**P value**	**Remark**
2000-2004	Akinyele	2.975520		0.002925	Hotspot
	Ibadan North	3.134690		0.00172	Hotspot
	Ibadan Northeast	2.110780		0.034791	Hotspot
	Ibadan Northwest	3.381040		0.000722	Hotspot
	Lagelu	2.667320		0.007646	Hotspot
2005-2009	Akinyele	3.449680		0.000561	Hotspot
	Ibadan North	3.326960		0.000878	Hotspot
	Ibadan Northwest	3.633680		0.000279	Hotspot
	Lagelu	3.173010		0.001509	Hotspot
2010-2014	Afijio	2.886950		0.001316	Hotspot
	Akinyele	3.057200		0.003241	Hotspot
	Egbeda	2.886950		0.00389	Hotspot
	Ibadan North	3.057200		0.002234	Hotspot
	Ibadan Northeast	3.198290		0.001382	Hotspot
	Ibadan Northwest	3.198290		0.001382	Hotspot
	Ibadan Southeast	3.198290		0.001382	Hotspot
	Ibadan Southwest	3.198290		0.001382	Hotspot
	Ido	3.242680		0.001184	Hotspot
	Lagelu	3.132240		0.001735	Hotspot
	Ona Ara	2.886950		0.00389	Hotspot
2000-2014	Akinyele	3.642949		0.00027	Hotspot
	Ibadan North	3.569490		0.000358	Hotspot
	Ibadan Northwest	3.907290		0.000093	Hotspot
	Lagelu	3.243310		0.001182	Hotspot

Source: Author

Table 4.6: Local Getis Ord results (Male DM incidence)

Year	L.G.A	Getis score	*z*	P value	Remark
2000-2004	Akinyele	2.705540		0.006819	Hotspot
	Ibadan North	2.830940		0.004641	Hotspot
	Ibadan Northwest	3.028750		0.002456	Hotspot
	Lagelu	2.456500		0.01403	Hotspot
2005-2009	Akinyele	3.457800		0.000545	Hotspot
	Ibadan North	3.1869610		0.001425	Hotspot
	Ibadan Northwest	3.497940		0.000469	Hotspot
	Lagelu	3.081650		0.002059	Hotspot
2010-2014	Akinyele	3.998870		0.000064	Hotspot
	Ibadan North	3.947740		0.000395	Hotspot
	Ibadan Northwest	4.145010		0.000079	Hotspot
	Lagelu	3.535000		0.000034	Hotspot
2000-2014	Akinyele	3.539290		0.000401	Hotspot
	Ibadan North	3.475940		0.000509	Hotspot
	Ibadan Northwest	3.718910		0.0002	Hotspot
	Lagelu	3.186110		0.001442	Hotspot

Source: Author

Table 4.7: Local Getis Ord results (Female DM incidence)

Year	L.G.A	*z* score	P value	Remark
2000-2004	Akinyele	3.155730	0.0001601	Hotspot
	Ibadan North	3.341950	0.000832	Hotspot
	Ibadan Northeast	2.413170	0.015815	Hotspot
	Ibadan Northwest	3.627100	0.000287	Hotspot
	Lagelu	2.762460	0.005737	Hotspot
2005-2009	Akinyele	3.401430	0.00067	Hotspot
	Ibadan North	3.409050	0.000652	Hotspot
	Ibadan Northwest	3.746180	0.00018	Hotspot
	Lagelu	3.234540	0.001218	Hotspot
2010-2014	Akinyele	3.928510	0.000085	Hotspot
	Ibadan North	3.644150	0.000268	Hotspot
	Ibadan Northwest	4.251280	0.000021	Hotspot
	Ido	2.461150	0.013849	Hotspot
	Lagelu	3.276510	0.001051	Hotspot
2000-2014	Akinyele	3.688760	0.000225	Hotspot
	Ibadan North	3.610500	0.000306	Hotspot
	Ibadan Northwest	4.057500	0.00005	Hotspot
	Lagelu	3.256050	0.00113	Hotspot

Source: Author.

Table 4.8: Local Getis Ord results (Self-reported DM prevalence)

	L.G.A	Getis z score	P value	Remark
Overall	Iwajowa	3.060590	0.002209	Hotspot
Male	Iwajowa	3.248630	0.00116	Hotspot
	Kajola	2.023080	0.043065	Hotspot
Female	Iwajowa	2.394020	0.016665	Hotspot

Source: Author

From the results of the hotspot analysis, the significant DM hotspots were mainly found in the eleven LGAs that constitute Ibadan region. The presence of this cluster indicates that there could be local ecological factors that might encourage the occurrence of DM in the region. Two likely factors come to the fore. The first is the presence of fast food brands and eateries. In the last thirteen to fifteen years, the fast food sub sector has been rapidly growing in the city. As at 2013, there were 35 fast food joints/eateries in Ibadan (Adegun, 2013). The number is very likely to increase in the future. Like other established brands, they sell snacks, food and drinks rich in fats, salt and sugar. Their frequent consumption could increase the level of overweight, obesity and DM. Second is the state of planlessness in the city. Ibadan is one of the many Nigerian cities without a masterplan (Ayeni, 1994). In fact, as Filani (1994, p.188) observes:

> *"Lack of physical planning in many parts of the city contributes… to the almost disorganised arrangement of buildings which in turn negates and continues to prevent the development of better road connectivity, most especially in the indigenous and most populous sections of the city. Even in the areas which appear to be better planned, there is no adequate provision of sidewalks to facilitate pedestrian movements. Where sidewalks exist, they are usually taken over by road side traders forcing more pedestrians to walk on the road pavements."*

In addition, the street patterns have been described to be chaotic and roads are narrow, winding and without pedestrian sidewalks (Faniran, 1994; Filani, 1994). The neighbourhoods of Ibadan can generally be described as pedestrian unfriendly. These unfriendly pedestrian conditions do not support walkability, which in turn promotes physical inactivity. The increased risk of DM stems from physical inactivity which prevents the body from producing insulin needed to control sugar levels.

With regard to self-reported DM prevalence, Iwajowa LGA emerged as a DM hotspot. This could be attributed to the frequent consumption of a local alcoholic beverage known as "Oti baba". It is locally prepared from guinea corn. The drink is served at social functions. Its main nutrient is carbohydrates. Frequent consumption results in high glucose levels which consequently lead to the onset of DM.

4.6 Geographical distribution of risk factors

The distribution of environmental, genetic and socioeconomic and lifestyle risk factors among the 33 LGAs of Oyo state are contained in Table 4.9. Considerable variation is noticed in all the variables except tobacco use, alcohol consumption, unemployment and fast food consumption. Very wide variations were observed in the level of urbanisation, sidewalks, proximity to physical fitness centres, proximity to fast food outlets and physical activity. Among the LGAs, the level of urbanisation ranges from zero percent in Oyo East LGA to 87 percent in Ibadan Southwest LGA. Clear spatial patterns were found for sidewalks (ranges from 2% in Ibarapa North to 90% in Ibadan Southwest), proximity to physical fitness centres (0 to 77.5%), proximity to fast food outlets (4.1% in Ibarapa North to 76% in Ibadan Southwest LGA) and physical activity level (0% in Ibadan Southwest to 82% in Ibarapa Central LGAs). A high prevalence of tobacco use was noted in Kajola (15%), Ido (12%) Orire (10%), Irepo (10%) LGAs. Alcohol consumption rates were high in Olorunsogo (20%), Orire (18%), Irepo (16%) and Akinyele (16%) LGAs. Lastly, Iseyin (35.6%), Saki West (34%), Irepo (30%) had the highest concentration of fast food consumption.

Table 4.9: Geographical distribution of DM and risk factors

LGA	Overall DM	Self-reported DM	Sidewalks	Overcrowding	Neighbourhood safety	Social capital	Stores within walking distance	Proximity to bus stop	urbanisation
Afijio	1.0	16.00	42.00	2.00	72.00	70.00	68.00	48.00	2.70
Akinyele	17.5	8.00	66.00	20.00	70.00	56.00	66.00	66.00	1.60
Atiba	0.6	8.00	34.00	22.00	82.00	66.00	72.00	80.00	N/A
Atisbo	1.5	37.50	80.00	2.50	57.50	20.00	47.50	55.00	1.50
Egbeda	1.3	6.10	40.80	6.10	79.60	49.00	79.60	79.60	4.80
Ibadan North	29.3	26.00	64.00	20.00	70.00	92.00	86.00	28.00	85.00
Ibadan Northeast	1.5	6.00	8.00	22.00	50.00	28.00	84.00	76.00	68.00
Ibadan Northwest	5.2	0.00	62.00	2.00	70.00	64.00	70.00	82.00	61.00
Ibadan Southeast	1.2	4.00	48.00	16.00	86.00	50.00	68.00	78.00	80.00
Ibadan Southwest	5.7	30.00	90.00	12.00	84.00	66.00	86.00	62.00	87.00
Ibarapa Central	N.D.	6.00	10.00	28.00	100.00	76.00	90.00	80.00	2.50
Ibarapa East	N.D.	6.00	62.00	12.00	78.00	52.00	62.00	60.00	N/A
Ibarapa North	N.D.	24.50	2.00	16.30	95.90	71.40	77.60	81.60	N/A
Ido	7.4	24.00	66.00	6.00	66.00	58.00	54.00	70.00	0.90
Irepo	N.D.	34.00	50.00	22.00	64.00	50.00	74.00	62.00	1.20
Iseyin	N.D.	42.20	48.90	17.80	66.70	44.40	64.40	73.30	5.90
Itesiwaju	0.2	20.00	58.00	26.00	42.00	30.00	56.00	48.00	3.30
Iwajowa	0.2	16.00	56.00	12.00	76.00	84.00	66.00	72.00	N/A
Kajola	0.2	15.00	57.50	0.00	35.00	65.00	77.50	52.50	1.70

Lagelu	2.8	10.00	76.00	10.00	82.00	58.00	70.00	84.00	0.40
Ogbomoso North	1.8	6.00	38.00	16.00	76.00	60.00	72.00	68.00	7.20
Ogbomoso South	2.6	4.00	44.00	12.00	86.00	70.00	72.00	68.00	7.20
Ogooluwa	0.8	8.00	46.00	20.00	88.00	62.00	76.00	72.00	2.50
Olorunsogo		12.00	44.00	18.00	68.00	54.00	70.00	64.00	0.13
Oluyole	1.7	12.80	42.00	38.30	87.20	85.10	62.00	56.00	N/A
Onaara	0.8	8.00	66.00	20.00	70.00	60.00	97.90	89.40	1.00
Orelope	0.4	22.00	34.00	8.00	84.00	58.00	70.00	58.00	1.00
Oriire	0.3	8.00	80.00	52.00	84.00	76.00	82.00	72.00	1.80
Oyo east	1.1	6.10	40.80	14.30	75.50	46.90	86.00	82.00	0.00
Oyo west	0.4	6.00	64.00	6.00	92.00	64.00	71.40	51.00	9.00
Saki east	1.1	8.00	8.00	28.00	58.00	76.00	72.00	72.00	0.00
Saki west	3.2	10.00	62.00	10.00	86.00	54.00	78.00	66.00	1.50
Surulere	0.1	8.00	48.00	16.00	80.00	72.00	48.00	68.00	3.50
Mean	**3.32**	**13.88**	**47.77**	**16.16**	**74.59**	**60.24**	**72.18**	**67.53**	**15.54**
Standard Deviation	**6.28**	**10.60**	**22.10**	**10.74**	**14.54**	**15.84**	**11.42**	**13.09**	**29.20**

LGA	education	unemployment	Poverty	Family history of DM	Fast foods outlets	obesity	Fruits/veg	tobacco	fast foods	Soft drink	alcohol	Physical activity
Afijio	22.00	18.00	48.00	18.00	44.00	25.60	54.00	0.00	12.00	30.00	6.00	46.00
Akinyele	16.00	8.00	36.00	32.00	26.00	21.40	52.00	3.00	12.00	40.00	16.00	54.00
Atiba	18.00	10.00	62.00	22.00	54.00	44.90	64.00	0.00	12.00	22.00	4.00	20.00
Atisbo	20.00	12.50	37.50	40.00	67.50	27.50	30.00	5.00	20.00	22.50	5.00	40.00
Egbeda	30.60	22.40	22.40	12.20	57.10	16.30	57.10	0.00	16.30	30.60	4.10	46.90
Ibadan North	46.00	2.00	32.00	42.00	64.00	40.00	60.00	2.00	22.00	22.00	6.00	28.00
Ibadan Northeast	14.00	10.00	40.00	24.00	60.00	11.50	66.00	0.00	10.00	16.00	4.00	2.00
Ibadan Northwest	52.00	12.00	38.00	18.00	54.00	24.00	44.00	0.00	10.00	34.00	10.00	48.00
Ibadan Southeast	30.00	6.00	20.00	16.00	34.00	2.10	52.00	8.00	6.00	20.00	12.00	32.00
Ibadan southwest	48.00	14.00	22.00	36.00	76.00	16.70	48.00	0.00	12.00	24.00	4.00	0.00
Ibarapa Central	6.00	6.00	78.00	10.00	6.00	54.50	80.00	0.00	8.00	8.00	0.00	82.00
Ibarapa East	0.00	2.00	86.00	10.00	42.00	6.00	58.00	2.00	8.00	14.00	10.00	38.00
Ibarapa North	2.00	0.00	61.20	36.70	4.10	52.90	93.90	0.00	0.00	10.20	0.00	65.30
Ido	20.00	18.00	70.00	30.00	72.00	13.30	32.00	12.00	16.00	16.00	4.00	16.00
Irepo	6.00	8.00	28.00	44.00	58.00	12.50	70.00	10.00	30.00	40.00	16.00	44.00
Iseyin	13.30	20.00	48.90	55.60	68.90	39.50	55.60	8.90	35.60	42.20	8.90	44.40
Itesiwaju	22.00	8.00	52.00	8.00	34.00	18.00	30.00	4.00	18.00	22.00	2.00	68.00
Iwajowa	32.00	18.00	40.00	38.00	74.00	27.70	54.00	8.00	6.00	38.00	2.00	54.00
Kajola	2.50	5.00	30.00	40.00	37.50	17.90	50.00	15.00	22.50	25.00	10.00	35.00
Lagelu	36.00	14.00	28.00	30.00	46.00	24.00	70.00	2.00	22.00	16.00	12.00	46.00
Ogbomoso North	60.00	2.00	36.00	22.00	52.00	27.10	60.00	2.00	6.00	8.00	0.00	32.00

Ogbomoso South	46.00	20.00	30.00	14.00	54.00	44.00	54.00	4.00	8.00	16.00	0.00	28.00
Ogooluwa	42.00	10.00	38.00	20.00	46.00	22.40	72.00	4.00	18.00	14.00	4.00	30.00
Olorunsogo	6.00	6.00	62.00	16.00	60.00	8.00	66.00	4.00	28.00	34.00	20.00	44.00
Oluyole	6.40	4.30	72.30	12.80	10.60	25.00	53.20	2.10	0.00	8.50	10.60	44.70
Onaara	30.00	10.00	30.00	24.00	30.00	12.00	16.00	0.00	0.00	2.00	2.00	14.00
Orelope	24.00	30.00	48.00	38.00	50.00	24.10	60.00	2.00	22.00	28.00	8.00	21.00
Oriire	22.00	6.00	50.00	14.00	34.00	48.00	74.00	10.00	18.00	20.00	18.00	26.00
Oyo east	69.40	0.00	24.50	14.30	42.90	32.50	61.20	2.00	2.00	2.00	0.00	59.20
Oyo west	44.00	12.00	30.00	24.00	44.00	27.00	68.00	0.00	6.00	6.00	0.00	72.00
Saki east	18.00	8.00	46.00	22.00	54.00	25.60	78.00	0.00	8.00	20.00	12.00	52.00
Saki west	8.00	24.00	48.00	42.00	48.00	28.00	64.00	4.00	34.00	40.00	6.00	50.00
Surulere	6.00	10.00	24.00	16.00	30.00	6.00	64.00	2.00	12.00	14.00	12.00	20.00
MEAN	**24.79**	**10.79**	**42.99**	**25.50**	**46.50**	**25.03**	**57.91**	**3.52**	**13.95**	**21.36**	**6.93**	**39.47**
STANDARD DEVIATION	**18.11**	**7.28**	**17.23**	**12.27**	**18.28**	**13.58**	**15.60**	**4.01**	**9.45**	**11.48**	**5.66**	**19.09**

4.7 Relationship between DM and genetic, environmental, socio-economic and lifestyle factors

From Table 4.9, there is some evidence of association between the DM variables and risk factors. With respect to overall DM incidence, the rates were higher in LGAs with high degree of urbanisation, small proportion of households within walking distance to the nearest bus stop, large proportion of households in safe neighbourhoods, low educational status, low poverty levels, high fast consumption, large proportion of people with positive family history, low tobacco use, high alcohol consumption, high soft drink consumption, high obesity prevalence, large proportion of people who live near fast food outlets, and low physical activity levels.

For self-reported DM prevalence, DM was found to be higher in LGAs with few sidewalks, large number of households in safe neighbourhoods, low social capital, low degree of urbanisation, low educational status, low poverty level, small proportion of households within walking distance to the nearest bus stop large proportion of people with positive family history, large proportion of people who live near fast food outlets, high soft drink consumption, low alcohol consumption, low physical activity levels, high tobacco consumption, high fast food consumption, and low obesity prevalence.

Some of the observations on the association between DM and risk factors are counterintuitive such as high DM prevalence with low obesity, tobacco prevalence etc. A possible explanation for this is that the risk factors like the earlier highlighted ones are very likely to be less significant in DM causation. In other words, there are more influential factors affecting DM incidence, which would be revealed subsequently.

Bivariate correlation analysis was performed to confirm or refute the relationship between the DM variables (overall DM incidence rate 2000-2014 and overall self-reported DM prevalence) and the environmental, socioeconomic and lifestyle risk factors. Table 4.10 shows the results of the bivariate correlation analysis. On one hand, overall DM incidence rate (2000-2014) is significantly and positively correlated with positive family history of DM ($r = 0.401$), degree of urbanization ($r = 0.437$) and

proximity to bus stop (r = -0.456). On the other hand, self-reported DM prevalence is significantly and positively related to positive family history of DM (r = 0.730), fast food consumption (r = 0.367), tobacco use (r =0.353), soft drinks consumption (r = 0.367), proximity to fast food outlets (r =0.368) and inversely related to proximity to bus stop (r = -0.312).

Table 4.10: Relationship between DM and risk factors

	Risk factors	Overall DM	Self-reported DM
1	Tobacco use	-0.055	**0.353***
2	Fast foods	0.209	**0.498****
3	Soft drinks	0.236	**0.367***
4	Proximity to fast food outlets	0.168	**0.368***
5	Alcohol consumption	0.152	0.029
6	Positive family history of DM	**0.401***	**0.730****
7	Proximity to bus stop	**-0.456 ****	**-0.312***
8	Degree of urbanisation	**0.437****	0.027
9	Sidewalks	0.299	0.276
10	Overcrowding	0.019	-0.109
11	Neighbourhood safety	-0.045	-0.273
12	Social capital	0.285	-0.205
13	Unemployment	-0.211	0.182
14	Poverty	-0.065	0.029
15	Obesity	0.180	0.095
16	Fruits and Vegetables	-0.044	-0.171
17	Physical activity	-0.064	-0.081
18	Educational Status	0.153	-0.219
19.	Stores within walking distance	0.091	-0.181

Note: * Significant at 0.05 sig. level; ** significant at 0.01 sig. level
Significant correlation coefficients in bold print

In order to identify the most significant factors that are critical to the spatial distribution of DM in Oyo state, a stepwise regression technique was applied to the above factors. The results of the stepwise regression analysis are displayed in Tables 4.11 and 4.12. The positive family history of DM factor contributed 53 percent of the variation in self-reported DM prevalence (see Table 4.11) while proximity to bus stop and degree of urbanization both contributed 34 percent of the variation in overall DM incidence rate (2000-2014) (See Table 4.12). Tables showing the excluded variables from the two regression analyses: Overall DM and self-reported DM are in Appendix A-5.

Table 4.11: Summary of stepwise regression results (self-reported DM prevalence)

Step	Variables	b coefficient	Std error of b	R	R^2	t-value	p-value	F stat
1	Positive family history of DM	0.631	0.106	0.73	0.533	5.944	0.000	35.332

Note: * Significant at 0.05 sig. level; ** significant at 0.01 sig. level

Table 4.12: Summary of stepwise regression results (overall DM incidence)

Step	Variables	b coefficient	Std error of b	R	R^2	t-values	p-value	F stat
1	Proximity to bus stop	-0.183	0.081			-2.265		
				0.587	0.344		0.01	5.768
	Degree of urbanisation	0.082	0.037			2.215		

Note: * Significant at 0.047 sig. level; ** significant at 0.001 sig. level.

Proximity to bus stop is negatively related to DM incidence. Proximity to bus stop is a rough measure of physical activity. As far as this study is concerned, bus stops are within the easy walking distance of the homes of some respondents. This in a way encourages some degree of physical activity when they wish to take a taxi, bus or a bike to work or any other destination. However, it must be stressed that those who live closer to the bus stop would be more physically active than those farther away if the latter have some means of transport. Thus, frequent walking between bus stop and home reduces the odds of developing DM. This finding is confirmed by Booth et al. (2012). They analysed the relationship between neighbourhood walkability and the incidence of diabetes among long term residents and recent immigrants in Canada. Area-level attributes such as population density, dwelling density, street connectivity, the availability of walkable destinations (number of retail stores and services within a 10 minute walk) were selected for the computation of a Principal Component Analysis (PCA) based index of neighbourhood walkability. They hypothesized that living in a less walkable environment increases the risk of diabetes, and found that recent immigrants residing in the least walkable neighbourhoods had diabetes incidence rates that were over 50 percent higher than those living in the most walkable areas. This finding suggests that the health status of residents is either positively or negatively affected by neighbourhood design.

Degree of urbanisation, on the other hand, is positively related to DM incidence. This means that the high level of urbanisation probably brings about a high prevalence of DM. This can be explained by the fact that DM like other "… NCDs are exacerbated in urban areas by changes in diet and physical activity, exposure to air pollutants (including tobacco smoke) and harmful use of alcohol…" (WHO, 2011, p.33).Besides the fact that urbanization leads to increased consumption of diets high in fat and sugar, it is also characterised by a shift from non-sedentary activities to more sedentary, service-based occupations that require less energy (Abubakari, 2009), which creates a mass of less physically active people (Azevedo and Alla, 2009).

Another explanation could be that the in-migration of people to urban areas in Africa is predictably linked to a shift in lifestyle from a healthy traditional diet to the urban setting of increased food quantity with little nutritional quality, small amounts of

exercise, smoking and increased alcohol availability (Beaglehole and Tack, 2003 cited in Mbanya et al 2008). In India, the prevalence of DM is at its highest in the urban areas. Mohan and Pradeepa (2009, p.6) account for the observed trend:

> "*Traditional dietary patterns are disappearing as Indians are adapting themselves to living in the more industrialized urban environments that are brought about by globalisation. The major dietary changes that urbanisation and affluence bring about are substitution of unrefined wheat or millets by highly polished wheat or rice and increased intakes of fats in higher income groups.*"

The significant contribution of urbanisation to the DM in Oyo is confirmed by studies such as Abubakari et al (2009)'s systematic review of diabetes in West Africa and Al-Moosa et al. (2009)'s study of the association between diabetes and urbanisation in the Omani population in Oman.

The significance of positive family history of DM is a strong indication of the fact that genetic susceptibility is critical to DM causation. As previously discussed, genetic susceptibility suggests that a disease requires a stimulus to occur. A person who is not genetically susceptible to a given disease will not respond to disease (Meade and Emch, 2010). Genetically predisposed individuals or families have the strong likelihood of developing DM if the triggers (e.g unhealthy dietary pattern) are present (Rytokonen, 2004). This finding confirms the observations of Barker et al (2011) and Chandialia (2011). One of the factors responsible for the rapid rise in DM among Indians is genetic (Mohan and Pradeeepa, 2009). Studies found that the prevalence of DM increased with family history of DM. For instance, 55 percent of offspring of two diabetic parents had diabetes or glucose intolerance compared to 15.6% in those without a family history of DM (Mohan et al. 2003). The strong genetic affiliation can be attributed to the presence of the Asian Indian phenotype, which put Indians at increased risk of DM (Mohan et al. 2007).

These results confirm the hypothesis which states the geographic variability in DM is significantly influenced by genetic susceptibility, socio-economic, environmental and lifestyle risk factors.

4.8 Temporal patterns of DM

Figures 4.14 and 4.15 show the temporal distribution of DM from 2000 to 2014. The overall DM trends refer to both male and female DM trends while cumulative DM trends describe the successive number of DM cases in each year. There was a total of 2,724 DM cases (male: 1,334; female: 1,323). The incidence rates for both sexes range from 0.5 to 8.3 per 100,000 (Appendix A-5). Male DM incidence ranged from 0.6 to 7.7 per 100,000. The incidence rates for females range from 0.4 to 8.9 per 100,000. The DM incidence rates for both sexes showed fluctuations over the 2000-2014 period. As shown in, Figures 4.14 and 4.15, from a baseline figure of 1.5 per 100,000, the figure increased to 2.3 and 2.5 in 2003 and 2005 respectively; reached its peak (8.3) in 2012, followed by the lowest decline (0.5) in 2013 and 2014. Similarly, male and female DM rates follow the overall pattern. The incidence rates for males (7.7) and females (8.9) in 2012 were the highest. Cumulatively, overall DM cases increased from 111 in 2000 to 2,724 in 2014, male DM cases grew from 63 in 2000 to 1374 in 2014 and there was a rise in female DM cases from 48 in 2000 to 1,350 in 2014 (Figure 4.15).

These data however need to be treated with caution for one reason namely cases of underreporting cannot be ruled out. People's refusal to report their DM status or failure to determine their status may account for the small numbers recorded in the latter years of the study period. Regardless of this observation, it seems, from the table and Figures 4.14-4.15, that DM is on the increase. The simple linear regression technique was applied to estimate the trend of DM incidence. The results of the analysis are presented in Table 4.13.

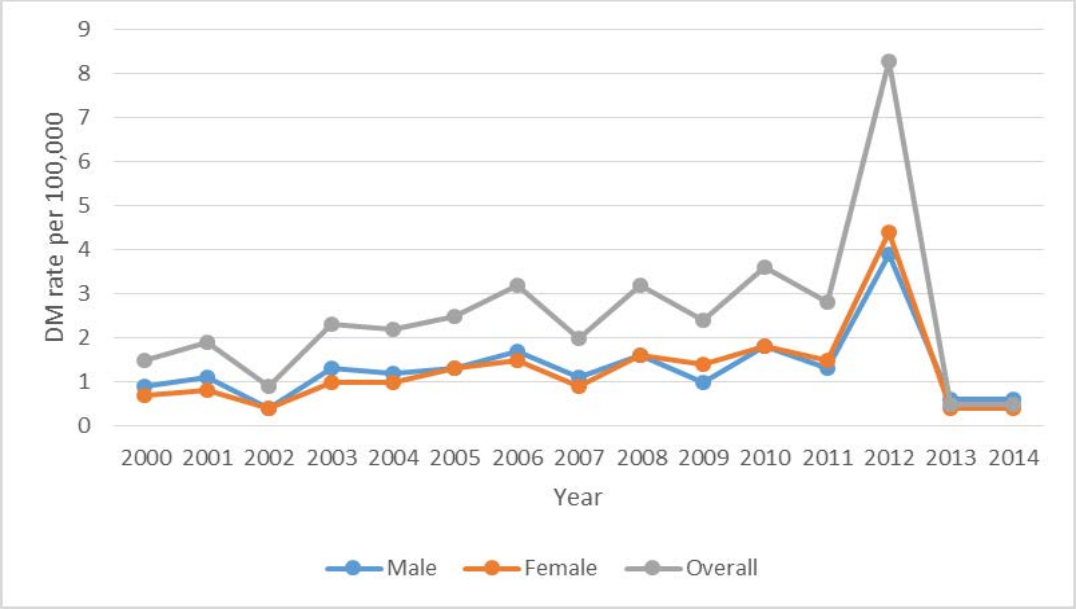

Figure 4.14: Temporal pattern of DM incidence rates in Oyo state.

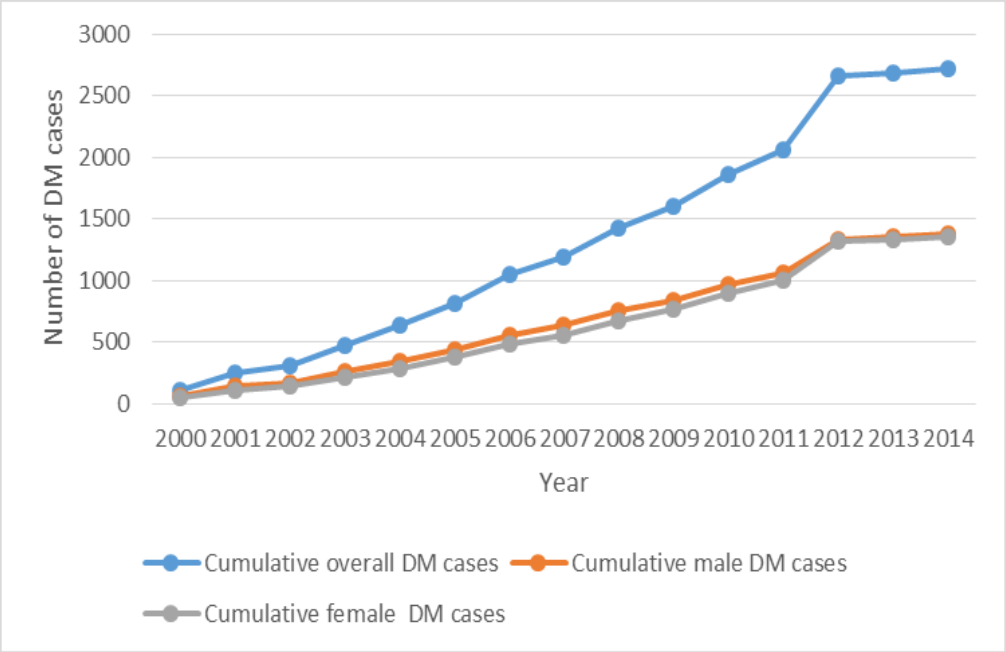

Figure 4.15: Temporal pattern of cumulative DM cases

Table 4.13: Results of the linear regression analysis (2000-2014)

Variable	Constant (a)	Year (b)	t-value	R^2	F-stat	p value
Overall DM rates	1.849	0.096	0.859	0.054	0.738	0.406
Male DM rates	2.053	0.069	0.663	0.033	0.440	0.519
Female DM rates	1.644	0.124	1.023	0.074	1.046	0.325
Cumulative overall	-92.958	202.318	23.712	0.98	562.246	0.000
Cumulative male	-20.825	101.032	28.041	0.98	786.300	0.000
Cumulative female	-72.133	101.286	20.381	0.97	415.369	0.000

Source: Fieldwork data (2012-2014).

The results of the regression analysis showed that the coefficient of determination (R^2) for overall, male and female DM rates ranged from 0.033 to 0.070. This suggests that time explains less than one percent of the variation in DM incidence. In addition, the overall, male and female DM rates models were not significant at 0.05 (see Table 4.13). Therefore, DM incidence did not significantly increase over time.

On the other hand, a significant increase in DM in the cumulative total (b=202.318; t=23.712; p=0.000), cumulative male (b=101.032; t=28.041; p=0.000) and cumulative female (b=101.286; t=20.381; p=0.000) was observed. The coefficient of determination (R^2) for cumulative overall, male and female DM ranged from 0.97 to 0.98. This means that time accounts for 98 percent of the variation in cumulative overall and male DM and 97 percent of the variation in cumulative female. Moreover, the models were statistically significant (p= 0.000) (see Table 4.13). The results clearly indicate that the upward trend in DM is highly significant. This agrees with the findings of Zimmet et al. (2005), Alebiosu et al. (2009) and Sierra (2009). They observed that a global pandemic of diabetes has emerged in the last few decades, and it is rapidly driven by lifestyle changes and the increasing rate of urbanisation. The results of the temporal analysis validate the hypothesis which states there is an upward trend in DM incidence.

CHAPTER FIVE

RELATIONSHIP BETWEEN DM INCIDENCE AND LEVEL OF DEVELOPMENT

5.1 Introduction

The chapter examines the relationship between DM incidence and the level of development in Oyo state. The chapter has four sections. The first section briefly reviews the conceptualisation of development in the literature. The second section examines the spatial pattern of development indicators. The third section deals with the computation of the index of development in Oyo state, and the last section shows the results of the analysis of association between DM incidence and economic development.

5.2 Conceptualization of development

Despite the numerous studies on development, there is no widely acceptable definition and indicator of this concept. The lack of consensus stems from the multifaceted nature of the phenomenon. There are a number of viewpoints on this concept. They include development as economic growth, development as distributive justice and development as modernisation.

Development is often seen to be synonymous with macro-economic growth which is indexed by gross domestic product (GDP) per capita, and gross National Income (GNI). These indices simply measure the total value of goods and services produced by a country within a period of time. Based on the foregoing, it is assumed that the higher the GNI or GDP, the higher the level of development. However, some have argued that economic growth is not a true reflection of development. In other words, a country may perform well economically but fail in health and education sectors. In addition, economic growth does not fully guarantee the resolution of social, economic, environmental and political problems; in some cases, it may generate more of such (House, 1993). Lastly, these economic indicators say little or nothing on income distribution and poverty reduction.

Development is also said to be achieved when the basic needs of the society (such as good nutrition, education, access to social services such sanitation, medical care,

affordable housing) are met, and poverty is reduced. This definition is concerned with distributive justice. To support this assertion, the World Development Report of 1990 boldly declared that poverty reduction is the fundamental goal of economic development (Houser, 1993).

Finally, development as modernization is premised on the fact that development can occur if modernization takes place. This emphasizes “changes in family structures, attitudes and mentalities, cultural changes, demographic developments, political changes and nation building, the transformation of rural societies and processes of urbanisation” (Szirmai, 2005; p.7). It is believed that these changes are required in order to bring about economic advancement.

It is clear, from the above discussion, that there is no single explanation on the concept of development. Development, ultimately, is about improvement in human well-being and the second definition captures it more than the others. Therefore, most of the development indicators used in the study relate with the development-as-distributive-justice viewpoint. In line with this view, this study uses multiple variables to represent the numerous dimensions of development.

5.3 Spatial pattern of development indicators

Table 5.1 shows the distribution of nineteen development indicators in Oyo state. At a glance, it is easy to conclude that the development indicators are not uniformly distributed over space. As Table 4.1 reveals, some indicators are more concentrated in some LGAs than in others. With regard to IGR, Ibadan SW has the largest amount of IGR, followed by Oluyole and Ogbomoso North LGAs. Total revenue per capita is high in Olorunsogo, Atisbo and Ogbomoso South LGAs. With respect to the level of urbanisation, Ibadan North (85%), Ibadan Northeast (68%), Ibadan Northwest (61%), and Ibadan Southwest (87%) LGAs are the most urbanised LGAs in Oyo state.

Medical facilities are unevenly distributed in the state. They are mainly concentrated in Ibadan Southwest and North LGAs. The distribution of doctors, nurses/midwives is lopsided. Ibadan North LGAs has the largest concentration of doctors (523) and nurses/midwives (1,475). Most of the hospital beds in Oyo state are found in Ibadan Southwest, Ibadan North and Ogbomoso North LGAs.

Many of the primary schools are in Akinyele (147) and Oluyole (143) LGAs while Ibadan North (86) and Ibadan Northeast (66) LGAs have the largest concentration of secondary schools. The largest number of primary school teachers is in Ibadan Northeast (1,751) and Ibadan Southwest (1,650) LGAs. A sizable proportion of secondary school teachers are found in Ibadan North (1,954) and Ibadan Southwest (1,505) LGAs. In terms of pupil enrollment, Ibadan Southeast has the largest primary school enrollment (71,739) while Ibadan North LGA has the largest secondary school enrollment (68,051).

Ibadan North, Oyo East, Ibadan Southwest LGA have a significant share of commercial banks in Oyo state. Most of the state's manufacturing industries are based in Oluyole (36), Ibadan Southwest (25) and Ibadan North (24) LGAs. The number of hotels vary from LGA to LGA. Many hotels are found in Ibadan Southwest (31) and Ibadan North (29) LGAs.

With respect to utilities, Ibadan Northeast (62,601), Ibadan North (58,393) and Ibadan Southeast (55,602) LGAs have the greatest access to telephone. Households with access to electricity are mostly concentrated in Ibadan city particularly Ibadan Southwest (55,578) and Ibadan Northeast (52,986) LGAs. Similarly, homes with access to pipe borne water are more in Ibadan Southwest (13,580) and Ibadan Northeast LGA (13,051).

Table 5.1: Spatial Pattern of Development Indicators

LGA	IGR	TR	UR	MED	NUR	DOC	BED	PS	SS	PT
Afijio	4918240	7343	3	29	26	5	126	73.0	20	875
Akinyele	20731363	98	2	68	91	49	113	147.0	43	1111
Atiba	9608160	7454	0	25	28	15	0	68.0	26	918
Atisbo	16620158	11147	2	19	27	3	317	43.0	12	586
Egbeda	13471772	4465	5	83	78	47	98	108.0	42	1080
Ibadan North	15309067	4210	85	154	1475	523	383	140.0	86	1548
Ibadan Northeast	15158816	3975	68	50	154	29	50	116.0	64	1751
Ibadan Northwest	11507493	43	61	37	191	46	137	68.0	26	1003
Ibadan Southeast	12504650	81	80	36	78	32	68	93.0	66	1615
Ibadan Southwest	138177988	4822	87	160	391	58	418	138.0	61	1650
Ibarapa Central	12809885	10507	3	18	38	8	46	60.0	26	737
Ibarapa East	166666573	9261	0	28	33	5	81	58.0	19	605
Ibarapa North	3908806	9288	0	23	25	6	20	59.0	11	480
Ido	10393334	9004	1	53	11	2	63	87.0	24	715
Irepo	9461426	8438	1	19	46	4	102	36.0	9	411
Iseyin	14054176	5064	6	41	73	17	50	119.0	40	1083
Itesiwaju	11239340	8272	3	26	19	4	122	51.0	11	418
Iwajowa	11797548	10324	0	26	26	2	53	40.0	10	523
Kajola	12141467	6326	2	22	66	8	99	62.0	53	685
Lagelu	7763631	8674	0	28	30	6	192	105.0	34	1024

Ogbomoso North	38685781	6206	7	42	131	38	395	32.0	26	808
Ogbomoso South	31464113	10489	3	23	22	7	116	53.0	40	702
Ogooluwa	6359024	1033	0	40	13	2	60	58.0	11	517
Olorunsogo	16464839	13033	0	24	39	6	111	43.0	8	312
Oluyole	39262259	5630	1	48	30	3	83	143.0	43	783
Onaara	14261641	4707	1	56	32	21	72	97.0	46	891
Orelope	12576880	10189	2	14	37	7	83	42.0	11	461
Oriire	4061132	7520	0	33	26	5	71	19.0	17	642
Oyo East	13102089	4706	9	31	34	18	134	55.0	27	841
Oyo west	53102089	7166	0	35	18	15	276	45.0	18	790
Saki east	9041044	8796	2	15	16	3	16	68.0	10	500
Saki west	32520972	5316	4	57	134	45	47	72.0	32	1072
Surulere	19406320	8526	0	82	16	1	407	109.0	22	985

LGA	ST	PE	SE	BANK	IND	HOT	TEL	ELE	PIP
Afijio	341	32793	9545	3	0	3	17618	14834	376
Akinyele	567	48353	12062	13	5	12	31625	26416	881
Atiba	439	43556	10984	0	0	2	17504	14120	5638
Atisbo	88	37375	8827	2	0	4	27591	5318	423
Egbeda	575	46344	28135	10	3	22	48018	541	3133
Ibadan North	1954	59440	68051	15	24	29	58393	55478	8618
Ibadan Northeast	1313	48608	47833	8	0	3	62601	52986	13051
Ibadan Northwest	490	47846	18928	13	9	1	28831	31036	6565
Ibadan Southeast	1320	71739	53452	5	2	7	55602	48426	10244
Ibadan Southwest	1505	52773	54119	12	25	31	52909	55578	13580
Ibarapa Central	181	31163	7348	5	0	1	13287	6887	272
Ibarapa East	161	25256	7906	2	0	3	13722	8188	802
Ibarapa North	110	27789	5645	0	0	2	7527	867	284
Ido	190	38814	3056	0	1	2	15718	13943	221
Irepo	49	21987	7149	0	0	3	8645	7616	2019
Iseyin	377	54910	10140	11	0	13	32474	25682	2943
Itesiwaju	82	22109	11259	4	0	3	10466	9465	363
Iwajowa	45	31134	4370	3	0	4	8662	3588	213
Kajola	220	38300	9507	4	0	5	27082	18354	719
Lagelu	533	39917	19124	3	0	0	20456	14147	503
Ogbomoso North	106	43366	13512	12	4	5	30173	24499	2343
Ogbomoso South	600	26924	25122	4	1	1	13771	12340	551
Ogooluwa	664	28928	4638	3	0	1	7438	3368	131
Olorunsogo	73	30483	3043	3	1	3	6387	5346	900
Oluyole	318	39658	24813	0	36	10	30293	22136	954
Onaara	498	27190	15222	3	0	2	40231	29495	1098

Orelope	82	26816	6450	2	0	2	10205	7733	544
Oriire	132	40207	8488	2	0	1	9200	2206	258
Oyo East	595	23817	11383	15	2	8	16175	13840	2693
Oyo west	96	32393	16269	2	0	3	17209	15067	2169
Saki east	8	23210	3453	2	0	3	11262	3191	436
Saki west	155	55500	12002	12	0	5	28529	17451	2284
Surulere	39	52280	11224	3	2	0	11482	5084	131

Key: IGR- Internally generated revenue; **TR**- Total revenue per capita; **UR**-level of urbanisation; **MED**- medical facilities; **NUR**- nurses; **DOC**- doctors; **BED**- hospital beds, **PS**- primary schools; **SS**- secondary schools; **PT**- primary school teachers; **ST**-secondary school teachers; **PE**- primary school enrollments; **SE**-secondary school enrolment; **IND**- industries; **TEL**- telephone, **ELE**- electricity and **PIP**- pipe borne water.

5.4 Computation of index of development

Principal component analysis (PCA) is a multivariate statistical technique whose objective is to reduce large data sets to fewer unrelated factors which best describe the nature of the data set. These factors are also described as orthogonal because they represent perpendicular variates in the domain of the transformed set of variables (Ayeni, 1986). PCA has proven to be useful in handling very large numbers of variables in numerous fields such as climatology, meteorology, soil studies, environmental studies, disease ecology, development studies etc. Furthermore, it is used for different purposes. It helps to identify the effective dimensions of data sets (Kendall and Stuart, 1976 cited in Ayeni, 1986). Second, it creates new and fewer variables that could be used in the multiple regression analysis (Ayeni, 1986). Third, it is useful for index construction.

The ultimate objective of the PCA is to create a set of new variables from an original data set. In the attempt to achieve this, PCA proceeds in the following manner:

1. Construct a data matrix
2. Compute a zero order correlation matrix
3. Compute the eigenvalues and eigenvectors of the correlation matrix. Eigenvalues are the characteristic values representing important attributes of this matrix while eigenvectors are the column vectors associated with each eigenvalue.
4. The component scores represent the performance of each and every observation on the new variates and their interpretation. These component scores can be mapped so as to show the spatial variations in the phenomena they represent.

Each variable has a component loading for each component. The component loading represents the amount of correlation of that particular variable with the corresponding component. The factor loadings are coefficients which indicate the extent of the relationship between a variable and a factor. Thus, factors with high loadings are closely related to such variables. In search for simple structures, the varimax rotation procedure is used. Those principal components (PCs), which explained only a small fraction of the variance, could be then neglected without much loss of information.

Kaiser's criterion (Kaiser, 1959) was used to determine the statistically significant PCs. This is the most widely used criterion. The final stage of the method consisted in the rotation of axes, a process necessary in order to achieve a better discrimination among the components and therefore, an easier interpretation of the results. These components were subjected to the orthogonal varimax rotation.

In this study, the PCA was employed not to only identify the underlying dimensions but also to build an index of development in the state. The technique was used to collapse the twenty variables into fewer uncorrelated factors. The results of the analysis are presented in Tables 5.2- 5.4. PCA was accomplished by identifying 20 mutually uncorrelated PCs and determining the proportion of the total variance associated with each of them. Table 5.2 shows the total variance explained by each component. The first column of the table shows the PCs. The second column displays eigenvalues of each PC, while third column shows the total variance explained by each PC. The fourth column shows the cumulative percentage of the total variance attributable to each PC.

Based on the Kaiser criterion, only factors with eigenvalue of 1 and above were extracted for interpretation and further analysis. Therefore, the first four PCs were extracted for further examination and analysis (Table 5.2). The four PCs collectively account for over eighty percent of total variance in the data set. The corollary of this is that these four components best describe the nature of the original data set and therefore constitutes the main dimensions of development in Oyo state. Each of the four PCs accounted for a certain percentage of the total variance. The first PC, with an eigenvalue of 11.455, accounted for the largest amount of variance (60.235%). The second factor, with an eigenvalue of 1.863, explained 9.806 percent. The third has an eigenvalue of 1.309 and accounted for 6.892 percent while the fourth PC, with an eigenvalue of 1.011, contributed the least amount of the total variance (5.322 percent). A summary of the component loadings is displayed in Table 5.3.

Table 5.2: Total variance explained

Components	Eigenvalues	Percent of variance	Cumulative percentage
1	**11.445**	**60.235**	**60.235**
2	**1.863**	**9.806**	**70.042**
3	**1.309**	**6.892**	**76.933**
4	**1.011**	**5.322**	**82.255**
5	.906	4.769	87.024
6	.654	3.443	90.467
7	.470	2.476	92.943
8	.300	1.578	94.521
9	.283	1.488	96.009
10	.227	1.193	97.202
11	.159	.835	98.037
12	.129	.680	98.718
13	.069	.364	99.082
14	.057	.302	99.384
15	.048	.253	99.637
16	.032	.166	99.803
17	.018	.095	99.898
18	.017	.090	99.987
19	.002	.013	100.000

Source: Analysis. Note: the major PCs in bold print.

From each of the extracted PC, the variables with the largest loadings were chosen and regarded as significant. Based the largest loadings within a PC, a label is given to that PC. The loadings of these four PCs on the nineteen variables are shown in Table 5.3. It is apparent from the table that PC 1 has the largest loadings on primary school teachers (0.889), urbanisation (0.845), electricity (0.858), pipe borne water (0.895), and telephone (0.835). In PC 2, the largest loadings are associated with doctors (0.928) and nurses/midwives (0.893). Primary schools has the largest loading (0.803) in PC 3. Lastly, the highest loading of PC 4 was on IGR per capita (0.853). Given the nature of the component loadings, the first PC was referred as the modernisation/urbanization factor. The second was labelled as medical services factor. The third was identified as the primary education factor and the fourth PC was named revenue base factor.

Table 5.3: Rotated Components Matrix

Variable	PC 1	PC 2	PC 3	PC 4
Secondary teachers	.788	.427	.235	.127
Primary teachers	**.889**	.148	.303	.133
Secondary school enrolments	.784	.400	.206	.282
Primary school enrolments	.710	.151	.292	.073
IGR	.249	-.150	.315	**.853**
Industries	.183	.298	.631	.442
Banks	.485	.345	.296	.080
Hotels	.351	.450	.586	.386
Total revenue per capita	-.661	-.009	-.381	.218
Level of urbanisation	**.845**	.330	.026	.274
Electricity	**.858**	.233	.221	.207
Pipe borne water	**.895**	.127	.038	.290
Telephone	**.835**	.210	.344	.095
Medical facilities	.399	.464	.536	.468
Doctors	.285	**.928**	.190	.054
Nurses/Midwives	.335	**.893**	.188	.175
Primary schools	.464	.120	**.803**	-.003
Secondary schools	.759	.330	.406	.042
Beds	.045	.369	-.058	.735

Source: Author Note: Largest component loadings in bold print.

5.5 Spatial pattern of the dimensions of development

As earlier indicated, four dimensions of economic development were identified by the PCA. Component scores of each factor for each of the thirty three LGAs are presented in Appendix A-6. High positive scores mean high levels of development while negative scores suggest lower levels of development.

5.5.1 Modernization/Urbanization factor

With respect to the modernisation/urbanization factor, the highest positive scores were mainly found in the five LGAs of Ibadan city namely Ibadan Southeast (3.15), Ibadan Northeast (3.01), Ibadan Southwest (1.59), Ibadan Northwest (1.35), and Ibadan North (0.95). (Figure 5.1). This can be easily explained by the fact that Ibadan has been a capital city from pre-independence times. Given its status, it has a disproportionate share of public facilities and population in Oyo state. Besides these five LGAs, Egbeda, Akinyele, Ona Ara, Saki West and Atiba had positive but low scores. Lowest negative scores are seen in Saki East (-0.83), Olorunsogo (-1.03),Iwajowa (-0.82), Ibarapa North (-0.85) and Oluyole (-0.79) LGAs (Figure 5.1). This certainly means these LGAs are predominantly rural.

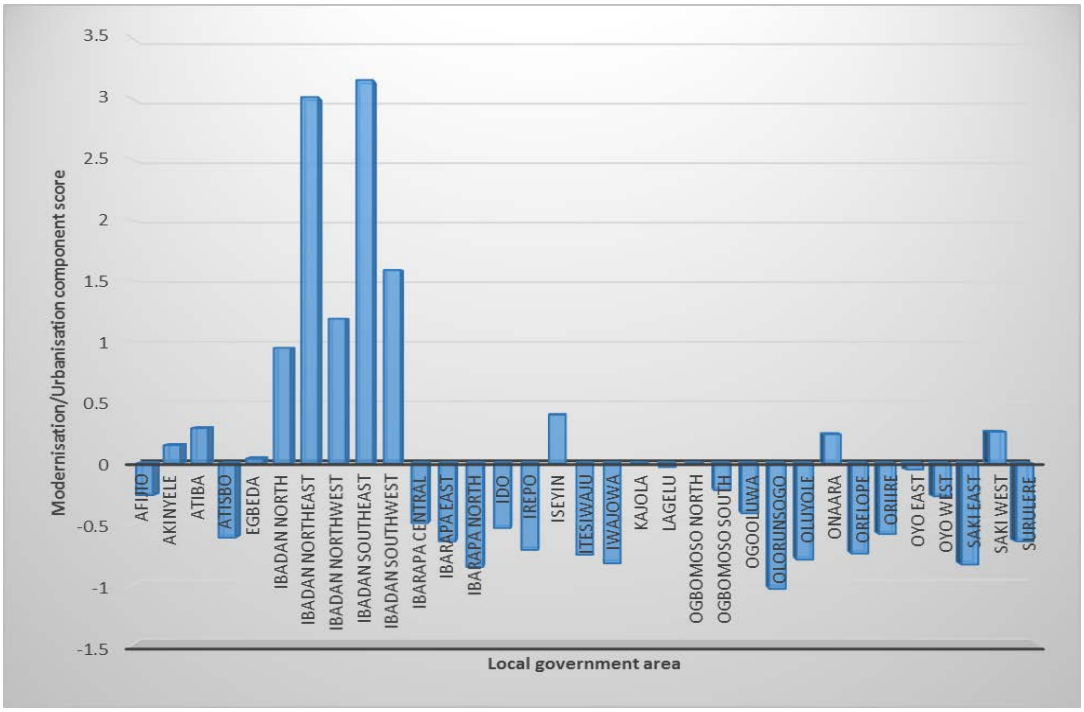

Figure 5.1: Modernisation/Urbanisation factor

5.5.2 Medical services factor

There is a wide disparity in the spatial pattern of medical services in the state as indicated in Appendix A-6 and Figure 5.2. The medical services factor has the highest loading in Ibadan North LGA (5.34) while Ibadan Northeast (-0.75) and Oluyole LGAs (-0.83) have the lowest scores on this component. As indicated in the preceding sections, Ibadan North LGA has the largest concentration of medical personnel (i.e doctors and nurses/midwives) in Oyo state. In addition, it is the home to the Nigeria's premier University College Hospital (U.C.H), and the Adeoyo Maternity Teaching Hospital. This in fact accounts for Ibadan North LGA's disproportionate share of doctors, nurses/midwives.

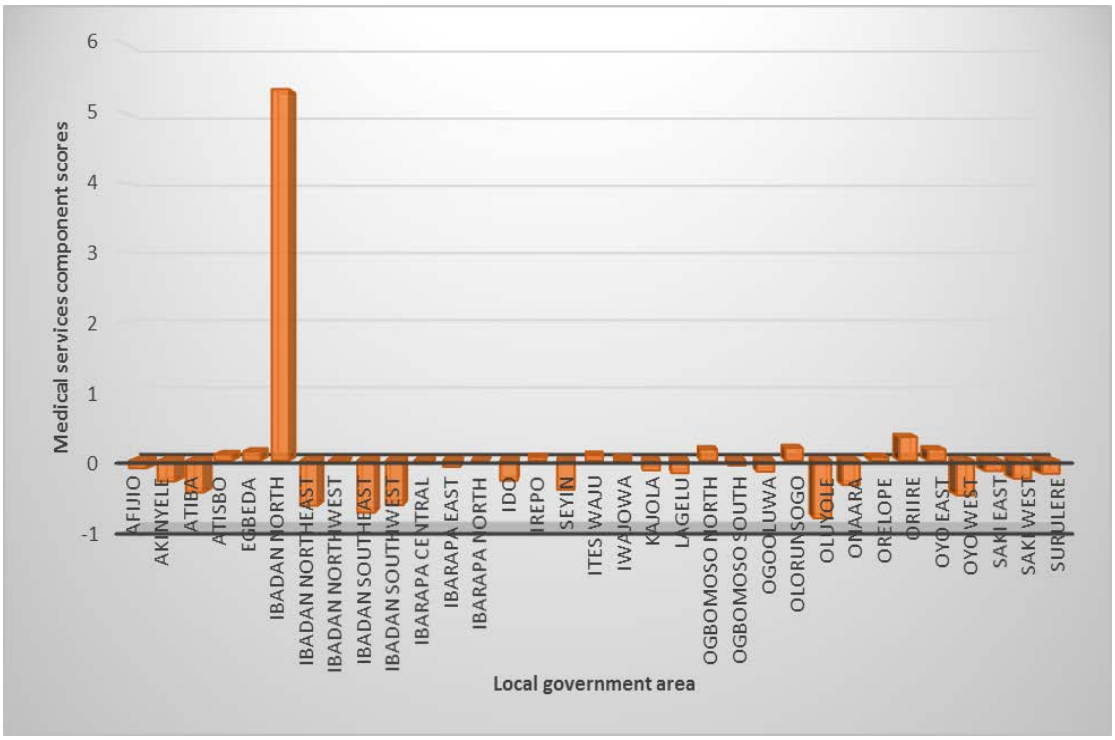

Figure 5.2: Medical services factor

5.5.3 Primary education factor

Appendix A-6 and Figure 5.3 show the spatial pattern of the primary education factor. The highest component scores for PC4 are for Oluyole (3.05), Akinyele (2.30), Egbeda (1.67), Ibadan SW (1.44), and Iseyin (1.22) LGAs. These scores imply that these LGAs are more developed in terms of primary education facilities. Besides, there is a noticeable spatial concentration of educational facilities in the peri-urban LGAs of Ibadan region and some rural LGAs of Oyo state. One would naturally expect that the LGAs in Ibadan city would have more primary schools. The results contradict expectations. The least developed LGAs in terms of primary education resources are Oriire (-1.37) and Atisbo (-1.04). These LGAs are predominantly rural.

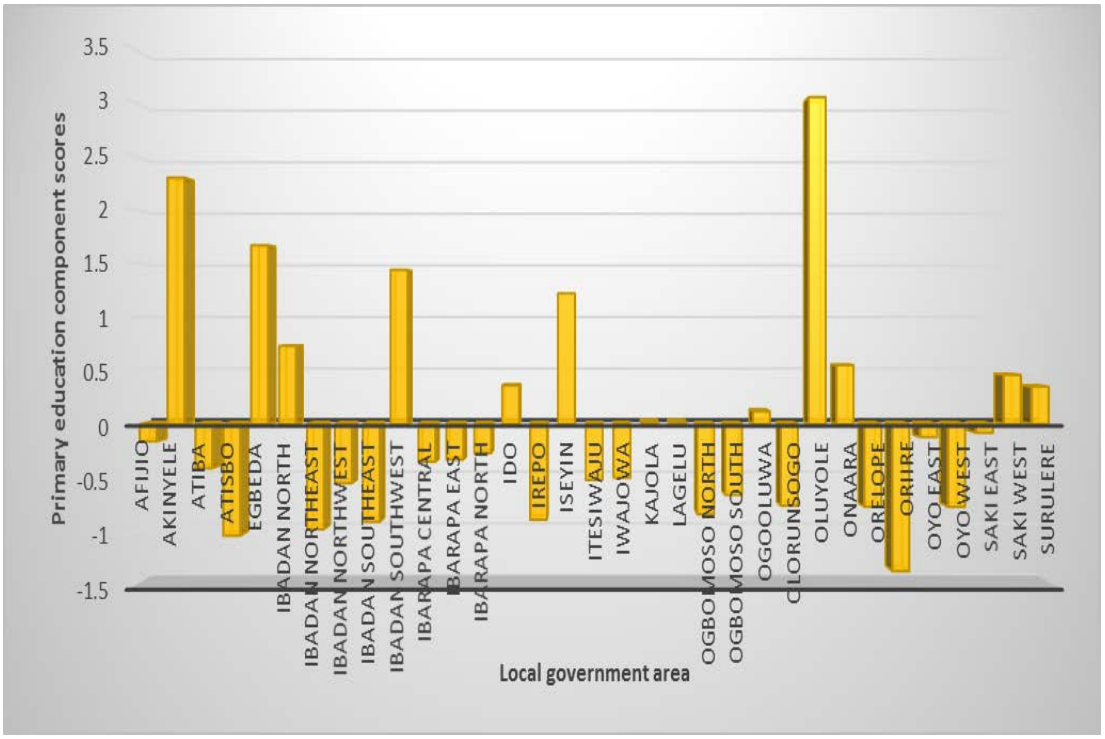

Figure 5.3: Primary education factor

5.5.4 Revenue base factor

Figure 5.4 depicts the spatial pattern of the revenue base factor in the state. From the figure, the revenue base factor indicates that Ibadan SW LGA has the largest revenue base (4.32) in the state, followed by Oyo West (1.38), Ogbomoso North (1.30) and Surulere (0.90) LGAs. On the other hand, Akinyele (-1.07) Iseyin (-0.97) and Ogooluwa (-0.92) LGAs had the smallest revenue base in the state. The presence of the industrial estate, fast food joints, shopping malls and hotels explain why Ibadan SW LGA has the strongest revenue base.

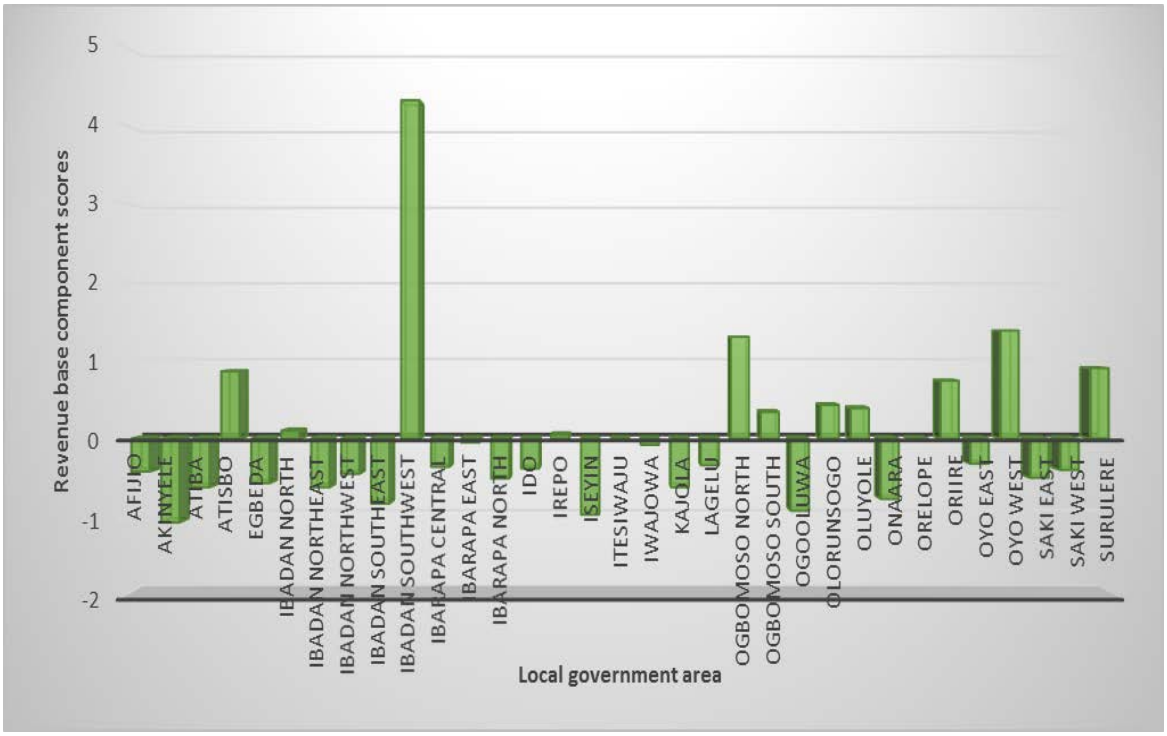

Figure 5.4: Revenue base factor

5.6 Spatial variations in the level of development

In order to compute the index of development, the four PC scores were summed and divided by four, for each LGA. Subsequently, each LGA was ranked based on the level of development. LGAs with positive scores are developed and those with negative scores are less developed. From Table 5.4 and Figure 5.5, it is clear that most of Ibadan city tops the development list. In particular, Ibadan North LGA (1.78) is the most developed LGA in the Oyo state. This is followed by Ibadan Southwest (1.67), Oluyole (0.46), Egbeda (0.32) and Akinyele (0.27) Ibadan Northeast (0.67), and Ibadan Southeast (0.22) LGAs. The least developed LGAs are Ibarapa North (-0.41), Saki East (-0.39), Irepo (-0.38), Orelope (-0.37) and Iwajowa (-0.34). Many of these LGAs are largely rural and agrarian. Based on the development scores, 12 LGAs are considered to be developed while the remaining 21 LGAs are less developed (Table 5.4)

Much of the development in the state is found in the Ibadan city and in its surrounding peri-urban LGAs. A product of inter-tribal wars, Ibadan city has grown in size and influence over the years. From a war camp, it became more and more prominent as years progressed. It was the capital of the Western region. In spite of several territorial fragmentations of the country, it has remained a centre of political influence and it is currently the capital of Oyo state. Its status has attracted development. It is one of the foremost educational centres in the country. It is the home of Nigeria's premier university, University of Ibadan, and many research institutes such as the International institute of Tropical Agriculture (IITA), Nigerian Institute of Social and Economic Research (NISER), and Nigerian Institute of Horticultural research (NIHORT) just to mention a few. It has also the first university teaching hospital in Nigeria. In addition, the city has a significant share of private sector establishments. For instance, Ibadan has 52 percent of the industries, 30.1 percent of the commercial banks and 37 percent of the hotels in Oyo state. In addition, Ibadan city has 24 percent of the state's population, nearly 90 percent of public medical practitioners and 75 percent of nurses/midwives in the public sector. The city is well connected with road, rail and air routes. Ibadan- Ilorin and Ibadan-Lagos expressways are two major expressways that connect the city to other parts of the country.

Table 5.4: Development ranking

LGA	Development index	Rank	Development Status
Ibadan North	1.78	1	Developed
Ibadan Southwest	1.67	2	Developed
Oluyole	0.46	3	Developed
Egbeda	0.32	4	Developed
Akinyele	0.27	5	Developed
Ibadan Northeast	0.19	6	Developed
Ibadan Southeast	0.17	7	Developed
Ogbomoso North	0.15	8	Developed
Surulere	0.11	9	Developed
Iseyin	0.06	10	Developed
Ibadan Northwest	0.04	11	Developed
Saki West	0.02	12	Developed
Oyo West	-0.04	13	Less developed
Oyo East	-0.08	14	Less developed
Onaara	-0.08	15	Less developed
Lagelu	-0.13	16	Less developed
Ogbomoso South	-0.15	17	Less developed
Atisbo	-0.17	18	Less developed
Kajola	-0.19	19	Less developed
Ido	-0.21	20	Less developed
Oriire	-0.22	21	Less developed
Afijio	-0.24	22	Less developed
Ibarapa East	-0.28	23	Less developed
Itesiwaju	-0.30	24	Less developed
Olorunsogo	-0.30	25	Less developed
Atiba	-0.30	26	Less developed
Ibarapa Central	-0.31	27	Less developed
Ogooluwa	-0.34	28	Less developed
Iwajowa	-0.34	29	Less developed
Orelope	-0.37	30	Less developed
Irepo	-0.38	31	Less developed
Saki east	-0.39	32	Less developed
Ibarapa North	-0.41	33	Less developed

Source: Author

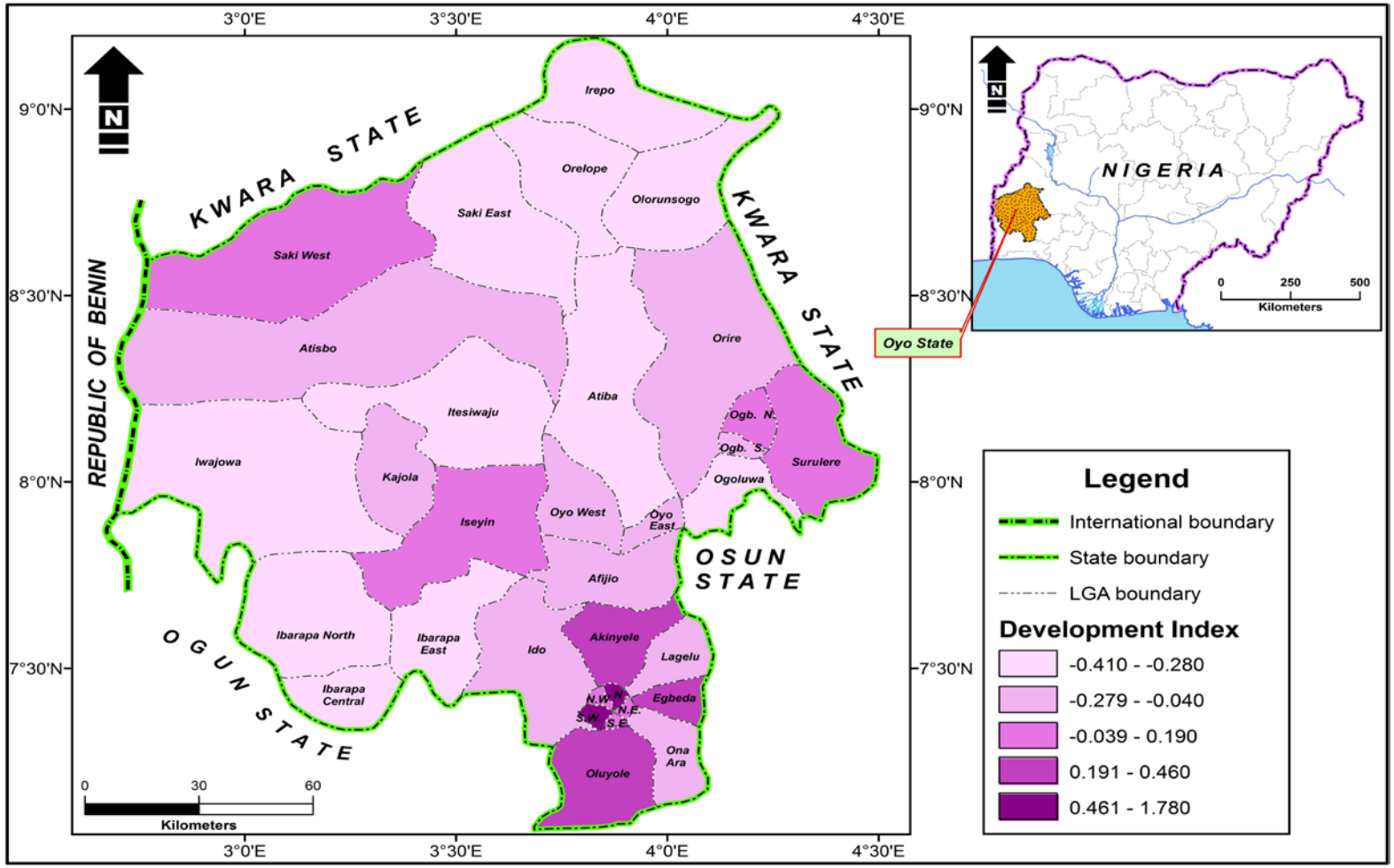

Fig 5.5: Spatial pattern of development in Oyo state

5.7 Association between DM and level of development

The question arises: do areas with high levels of development have more DM cases? In an attempt to answer the question, a Pearson correlation analysis was conducted to determine the degree of association between DM and development. The correlational analysis was performed at three levels: the state level (N=33), the developed LGAs (N=12) and the less developed LGAs (N=21). The results of the analyses are set out in Table 5.5.

Significant positive correlations between overall DM ($r = 0.681$; $p = 0.05$), male DM ($r = 0.668$; $p = 0.01$) and female DM ($r = 0.688$; $p = 0.01$) incidence rates and the level of development were found at the state level. Also, significant positive correlations between overall DM ($r = 0.635.$; $p = 0.05$), male DM ($r = 0.631$; $p = 0.05$), and female DM ($r = 0.634$; $p = 0.05$) were found among the developed LGAs. In contrast, the association is low, positive but statistically insignificant among the less developed LGAs. On the other hand, no significant relationship between overall self-reported, male and female self-reported DM and the level of development was observed at the state level, among developed and less developed LGAs (Table 5.5).

Table 5.5: Bivariate correlation results

Factor	Oyo state	Developed LGAs	Less developed LGAs
Overall DM incidence	0.681**	0.635*	0.172
Male DM incidence	0.668**	0.631**	0.190
Female DM incidence	0.688**	0.634*	0.149
Self-reported DM	0.187	0.504	-0.307
Self-reported Male DM	0.080	0.498	-0.240
Self-reported Female DM	0.287	0.475	-0.276

Source: Author. Note: * significant at 0.05 sig. level, ** significant at 0.01 sig. level

Based on the results, DM is higher in LGAs with high levels of development. These LGAs in general are located in the extreme southern part of Oyo state particularly the Ibadan region. The strong and significant association between DM and the level of development could be explained by possible pathways identified by the IDF (2013). The pathways through which development influences DM prevalence are urbanisation, the food environment and changing population demographics.

Presently, more than half of the world's population live in urban areas. The highest rates of the urbanisation are being experienced in developing countries. Current levels of urbanisation tend to create a "diabetogenic" environment defined by unhealthy dietary choices, high level of physical inactivity, mechanised transport and sedentary occupations (IDF, 2014).

Global population is growing very fast. Much of the world's population growth comes from the developing world. Besides the global increase, the demographics are significantly changing particularly in the developing countries where the population is more youthful. Worldwide, the population is aging. The prevalence of NCDs such as DM increases with age (IDF, 2012). It simply means the older a person becomes, the more likely it is for the person to have DM.

Lastly, the global food environment is a significant pathway through which DM prevalence rises. As IDF (2012, p.10) puts it "economic development and the globalization of the world's food system have led to major changes in dietary patterns. As people's incomes increase, food consumption moves away from traditional diets based on staple grains, locally grown vegetables and fruits, to diets high in processed foods, saturated fats and sugar, and low in fibre." In addition, the demand for processed food has been high since the last century. Naturally, most of the demand comes from the urban areas where there is a relatively limited supply of traditional fresh foods (IDF, 2014). It is expected that in urban centres the increased consumption of processed foods would increase the risk of DM and obesity.

As far as this study is concerned, this result validates the hypothesis which states that the spatial pattern of DM matches that of the level of development. This finding is consistent with previous studies. For instance, Collado-Mesa et al (2004) found that

diabetes incidence rate in Latin America was strongly and significantly correlated with some indicators of national prosperity such as infant mortality (r = -0.64) and gross domestic product (r = 0.58). In addition, Al-Moosa et al. (2006) attributed the high prevalence of DM in Oman to the dramatic socioeconomic changes related to increasing car ownership rates, high rate of high fat caloric food consumption and increased smoking rate.

CHAPTER SIX

AWARENESS AND PERCEPTION OF DIABETES MELLITUS

6.1 Introduction

This chapter examines the pattern of awareness and perception of DM in Oyo state. The first section presents the demographic and socio-economic characteristics of respondents. The second section examines the spatial pattern of awareness of DM, followed by the perception of causes of DM and perception of treatment options.

6.2 Sample characteristics

Table 6.1 shows the demographic and socio-economic characteristics of respondents who participated in the perception survey. The sample was predominantly male (57.4%), Yoruba (91.6%), Christian (67.4%), and married (52.7%). Approximately 41 percent are within the age group 18-30. Nearly 26 percent were university graduates. Traders are in the majority (22.2%). More than forty percent earned less than 18,000 naira per month

Table 6.1: Sample characteristics

Variable	Frequency	(N= 1,619)	Percentage (%)
Sex	Male:	931	57.5
	Female:	688	42.5
Age	18-30 years:	662	40.9
	31-45 years:	567	35.0
	46-59 years:	285	17.6
	60+ years:	105	6.5
Educational level	No response:	37	2.3
	No formal education:	64	4.0
	Primary education:	154	9.5
	Secondary education:	364	22.5
	College of education:	267	16.5
	Polytechnic:	274	16.9
	University:	417	25.8
	Others:	42	2.6
Religion	Christianity:	1091	67.4
	Islam:	512	31.6
	Traditional:	11	0.7
	Others:	5	0.3
Occupation	No response:	25	1.5
	Unemployed:	175	10.8
	Student:	347	21.4
	Farmer:	115	7.1
	Trader:	360	22.2
	Civil servant:	349	21.6
	Professional:	143	8.8
	Retired:	38	2.3
	Others:	67	4.1
Monthly income (in naira)	No response:	138	8.5
	0-17,999:	697	43.1
	18,000-49,999:	505	31.2
	50,000-79,999:	185	11.4
	80,000- 109,999:	25	1.5
	110,000 and above:	69	4.3
Ethnicity	Yoruba:	1483	91.6
	Igbo:	75	4.6
	Hausa:	24	1.5
	Others:	37	2.3
Marital status	No response:	138	0.5
	Single:	652	40.3
	Married:	853	52.7
	Divorced/Separated/ Widowed:	106	6.5

Source: Field survey, 2014

6.3 Awareness of DM

Table 6.2 shows the spatial variations in the levels of awareness among the thirty three LGAs. The table shows that majority of the respondents in Oyo state (90.3%) are aware of the disease called DM. The highest awareness level was found in Itesiwaju (100%) and Oluyole (100%) LGAs while the lowest level was in Ido LGA (72%). From the urban–rural viewpoint, no significant differences were observed between urban and rural LGAs. For instance, awareness levels in urban LGAs such as Ibadan North (98%), Ibadan (96%), Ogbomoso North (98%) were as high as those in rural LGAs such as Iwajowa (96%), Ibarapa North (98%), Ogooluwa (98%). Given this very high level of awareness, it is expected that respondents would have some basic knowledge to either prevent or manage DM because people are more likely to be actively engaged in prevention and control of DM (Wee et al. 2002). On the other hand, a low level of health literacy suggests that many people lack the essential information for the successful management of DM (Brooks et al. n.d).

Table 6.2: Spatial pattern of awareness of DM

LGA	No response	Aware	Not aware	Total
Afijio	0 (0%)	37 (74%)	13 (26%)	50 (100%)
Akinyele	3 (6%)	42 (84%)	5 (10%)	50 (100%)
Atiba	1 (2%)	47 (94%)	2 (4%)	50 (100%)
Atisbo	0 (0%)	38 (95 %)	2 (5%)	40 (100%)
Egbeda	0 (0%)	47 (95.9%)	2 (4.1%)	49 (100%)
Ibadan North	0 (0%)	49 (98%)	1 (2%)	50 (100%)
Ibadan Northeast	0 (0%)	43 (86%)	7 (14%)	50 (100%)
Ibadan Northwest	0 (0%)	42 (84%)	8 (16%)	50 (100%)
Ibadan Southeast	0 (0%)	45 (90%)	5 (10%)	50 (100%)
Ibadan Southwest	0 (0%)	48 (96%)	2 (4%)	50 (100%)
Ibarapa Central	0 (0%)	46 (92%)	4 (8%)	50 (100%)
Ibarapa East	0 (0%)	37 (74%)	13 (26%)	50 (100%)
Ibarapa North	0 (0%)	48 (98%)	1 (2%)	49 (100%)
Ido	3 (6%)	36 (72%)	11 (22%)	50 (100%)
Irepo	1 (2%)	47 (94%)	2 (4%)	50 (100%)
Iseyin	0 (0%)	44 (97.8%)	1 (2.2%)	45 (100%)
Itesiwaju	0 (0%)	50 (100%)	0 (0%)	50 (100%)
Iwajowa	0 (0%)	48 (96%)	2 (4%)	50 (100%)
Kajola	0 (0%)	35 (87.5%)	5 (12.5%)	40 (100%)
Lagelu	0 (0%)	46 (92%)	4 (8%)	50 (100%)
Ogbomoso North	1 (2%)	49 (98%)	0 (0%)	50 (100%)
Ogbomoso South	0 (0%)	45 (90%)	5 (10%)	50 (100%)
Ogooluwa	0 (0%)	49 (98%)	1 (2%)	50 (100%)
Olorunsogo	0 (0%)	46 (92%)	4 (8%)	50 (100%)
Oluyole	0 (0%)	47 (100%)	0 (0%)	47 (100%)
Onaara	0 (0%)	47 (94%)	3 (6%)	50 (100%)
Orelope	0 (0%)	46 (92%)	4 (8%)	50 (100%)
Oriire	0 (0%)	42 (84%)	8 (16%)	50 (100%)
Oyo East	1 (2%)	40 (81.6%)	8 (16.3%)	49 (100%)
Oyo west	0 (0%)	48 (96%)	2 (4%)	50 (100%)
Saki east	0 (0%)	43 (86 %)	7 (14%)	50 (100%)
Saki west	0 (0%)	37 (74%)	13 (26%)	50 (100%)
Surulere	3 (6%)	47 (94%)	0 (0%)	50 (100%)
Total	**13 (0.8%)**	**1462(90.3%)**	**144 (8.9%)**	**1619(100%)**

Source: Field survey, 2014

Sex, age, income education and occupation have implications for perception of disease, its preventive behaviour and treatment patterns. Appendix A-4 presents the cross tabulation between the socio-demographic characteristics and awareness of DM. Males (53.7%) are more aware of DM than females (42.7%). Younger age groups are more aware of DM than the older age categories. Appendix A-4 shows that persons within 18-30 (39.4%) and 31-45 (36%) age groups have the highest awareness levels.

With respect to education, awareness levels are higher among university graduates (26.7%), secondary school leavers (22.5%) and polytechnic graduates (17%). (see Appendix A-4). Appendix A-4 also indicates that awareness of DM varies by income status. Person who earned less than 18,000 naira (42.3%) were more aware than the other income categories. It was observed that awareness of DM also differed by occupation. In order of magnitude, traders had the highest level of awareness of DM (22.4%), followed by civil servants (22%) and students (20.4%).

In order to determine the effect of the socio demographic characteristics on awareness of DM, chi square test was performed. The results of the chi square are set out in Table 5.3. The results indicate that awareness of DM significantly differs on the basis of age (X^2= 22.0; df=6; p= 0.001), education (X^2= 36.8; df =14; p =0.001) and income (X^2= 31.1; df=10, p=0.001) only. Gender and occupation do not seem to affect awareness.

Table 6.3: Chi square results (Awareness of DM)

Variable	X^2	df	p value
Sex	3.950	2	0.139
Age	22.0	6	0.001*
Education	36.8	14	0.001*
Income	31.1	10	0.001*
Occupation	28.3	16	0.029*

Note: * significant at 0.05 significance level

6.4 Source of awareness of DM

Figure 6.1 shows that electronic media (29%), hospital (26.4%) and the print media (10.6%) were identified as the top three sources of information on DM. With respect to electronic media, most of the respondents were found in Oluyole LGA. Respondent with hospital as a source were concentrated in Kajola (60%). With regard to the print media, Oyo West had the largest numbers (30%) while Olorunsogo, Iseyin and Oluyole LGAs had zero percent (Appendix A-6).Though this result shows that these three channels of information, in relative terms, are actively promoting diabetes education, the proportion of respondents who relied on them is small.

The above result is somewhat similar to that of Wee et al. (2002)'s study of public perception of diabetes among Singaporeans. They found that many of the respondents obtained their information from friends/relatives, books and magazines and television/radio.

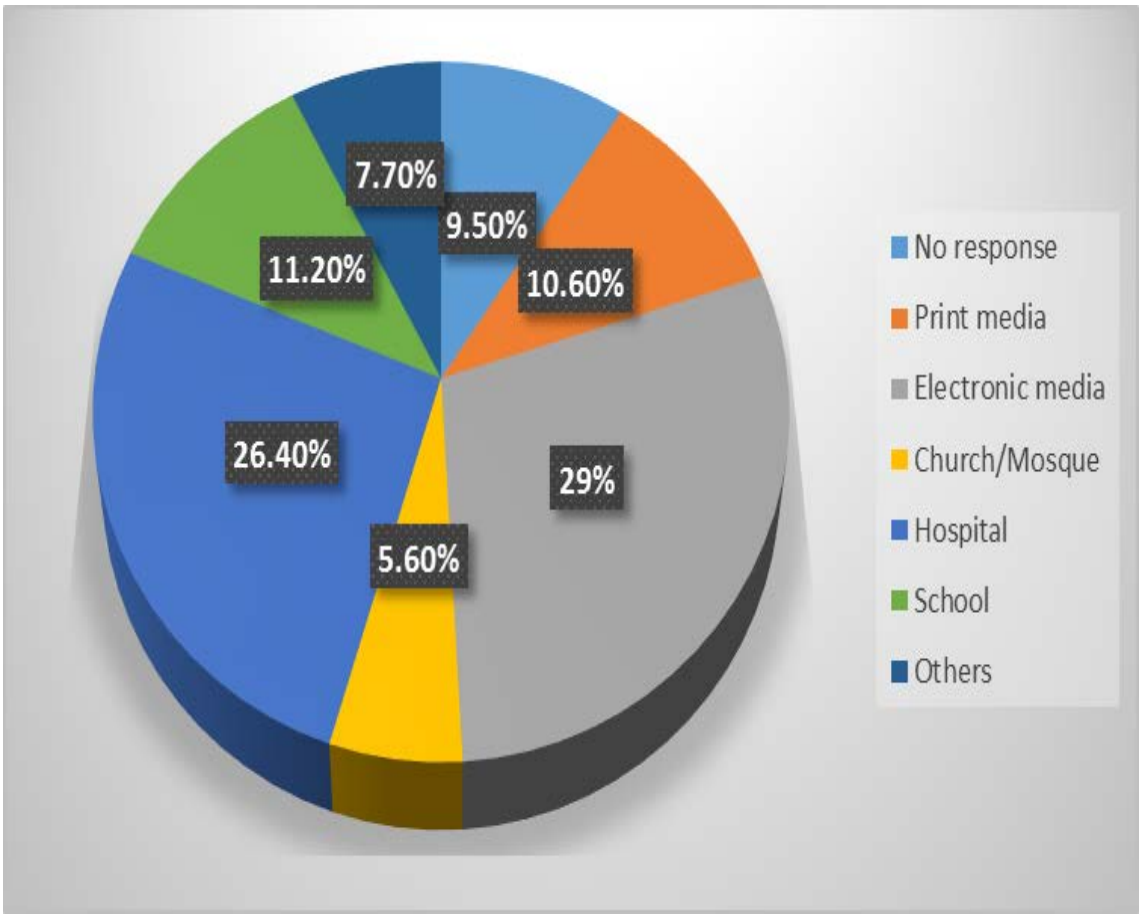

Figure 6.1: Sources of awareness of DM

Appendix A-4 presents the cross tabulation between sources of awareness and the socio demographic variables: sex, age, income, education and occupation. More males obtained information about DM, and more males obtained information about DM from the electronic media (58.9%) and hospitals (53.9%).

With regard to age, most of the respondents within 18-30 (25.5%) and the 46-59 age group (30.5%) obtained information about DM from hospitals while the electronic media was a major source of information for the 31-45 age group (32.8%) and 60 and above (34.3%).

The electronic media was the major source of awareness among respondents with primary (35.1%), secondary (35.7%), polytechnic education (32.8%) and others such as Teacher Grade II, adult literacy certificate and technical school (26.2%). Most of the respondents who trained at colleges of education (30.3%) and universities (26.1%) identified the hospital as their source of DM awareness.

The hospital was the main source of information among the 50,000-79,999 (27%) and the 110,000 and above naira income classes while the electronic media was dominant among the 0-17,999 (29.8%), 18,000-49,999 (31.7%) and 80,000-109,000 (39.1%). With reference to occupation, all the occupational groups except students and the unemployed identified the electronic media as a key information outlet (see Appendix A-4).

The results of the chi square test are presented in Table 6.4. From the table, one can conclude that all socio demographic variables except sex have a significant influence on the source of awareness of DM. Therefore, the source of awareness of DM varies significantly on the basis of age (X^2= 71.110; df=18; p=0.000), education (X^2=181.446; df=42; p=0.000), income (X^2= 58.788, df= 30, p=0.001), and occupation (X^2= 120.561; df=48; p=0.000)

Table 6.4: Chi square results (Source of awareness)

Variable	X^2	Df	p value
Sex	7.652	6	0.265
Age	71.110	18	0.000*
Education	181.446	42	0.000*
Income	58.788	30	0.001*
Occupation	120.561	48	0.000*

Note: * significant at 0.05 significance level

6.5 Diagnosis of DM

Table 6.5 shows that 60.8 percent of respondents indicated they had not checked their DM status. More than half of the respondents in Ibadan North (60%), Oyo West (52%), Oyo East (55.1%), Iwajowa (54%), Itesiwaju (54%) and Atisbo (60%) LGAs had not checked their DM status. On the other hand, thirty eight percent indicated they had checked their DM status. Most of these who had checked are in Ibadan North (60%), Atisbo (60%), Oyo East (55.1%), Itesiwaju (54%), Iwajowa (54%) whereas Ibarapa Central (12%), Oluyole (12.8%) and Atiba (18%) LGAs have the smallest proportions of those who have checked DM status.

Table 6.5: Diagnosis of DM

LGA	No response	Yes	No	Total
Afijio	0 (0%)	20 (40%)	30 (60 %)	50 (100%)
Akinyele	4 (8%)	23 (46%)	23 (46%)	50 (100%)
Atiba	1 (2%)	9 (18%)	40 (80%)	50 (100%)
Atisbo	0 (0%)	24 (60%)	16 (40%)	40 (100%)
Egbeda	1 (2%)	15 (30.6%)	33(67.3%)	49 (100%)
Ibadan North	0 (0%)	30 (60%)	20 (40%)	50 (100%)
Ibadan Northeast	0 (0%)	22 (44%)	28 (56%)	50 (100%)
Ibadan Northwest	0 (0%)	21 (42%)	29 (58%)	50 (100%)
Ibadan Southeast	2 (4%)	19 (38%)	29 (58 %)	50 (100%)
Ibadan Southwest	0 (0%)	24 (48%)	26 (52%)	50 (100%)
Ibarapa Central	0 (0%)	6 (12%)	44 (88%)	50 (100%)
Ibarapa East	1 (2%)	10 (20%)	39 (78%)	50 (100%)
Ibarapa North	0 (0%)	12 (24.5%)	37 (75.5%)	49 (100%)
Ido	1(2%)	19 (38%)	30 (60%)	50 (100%)
Irepo	1 (2%)	14 (28%)	35 (70%)	50 (100%)
Iseyin	0 (0%)	20 (44.4%)	25 (55.6%)	45 (100%)
Itesiwaju	0 (0%)	27 (54%)	23 (46%)	50 (100%)
Iwajowa	0 (0%)	27 (54%)	23 (46%)	50 (100%)
Kajola	0 (15%)	15 (37.5%)	25 (62.5%)	40 (100%)
Lagelu	0 (0)%	20 (40%)	30 (60%)	50 (100%)
Ogbomoso North	1 (2%)	22 (44%)	27 (54%)	50 (100%)
Ogbomoso South	0 (0%)	24 (48%)	26 (52%)	50 (100%)
Ogooluwa	0 (0%)	17 (34%)	33 (66%)	50 (100%)
Olorunsogo	0 (0%)	15 (30%)	35 (70%)	50 (100%)
Oluyole	0 (0%)	6 (12.8%)	41 (87.2%)	47 (100%)
Onaara	0 (0%)	10 (20%)	40 (80%)	50 (100%)
Orelope	0 (0%)	20 (40%)	30 (60 %)	50 (100%)
Oriire	2 (4%)	20 (40%)	28 (56%)	50 (100%)
Oyo East	0 (0%)	27 (55.1%)	22 (44.9%)	49 (100%)
Oyo west	0 (0%)	26 (52%)	24 (48%)	50 (100%)
Saki east	2 (4%)	19 (38%)	29 (58%)	50 (100%)
Saki west	0 (0%)	16 (32%)	34 (68%)	50 (100%)
Surulere	3 (6%)	22 (44%)	25 (50%)	50 (100%)
Total	**19 (1.2%)**	**616 (38%)**	**984(60.8%)**	**1619(100%)**

Source: Field survey, 2014

Appendix A-4 shows the cross tabulation between socio demographic variables and diagnosis of DM among the respondents. It was found that more males (56.3%) had checked their DM status than females (43.7%). Most of the respondents in 31-45, 46-59, and 60 and above age groups claimed they had not checked their DM status. Most of the university graduates (49.9%) indicated their DM status had been checked. On the other hand, more than 60 percent of those with no formal education (65.6%) had not checked.

More than fifty percent of the respondents (53.1%) within the 110,000 and above income group have checked their DM status. Within the non-formal education group, those who have not gone for a diagnostic test constituted 33.1%. More than 60 percent in each of the occupational groups have not taken a DM diagnostic test.

The chi square results set out in Table 6.6 reveal that there are statistically significant differences in actual diagnosis of DM on account of age (X^2=19.576, df =6; p= 0.003), education (X^2=58.979, df=14, p=0.000) and income (X^2= 41.588, df=10; p=0.000).

Table 6.6: Chi square results (Diagnosis of DM)

Variable	X^2	Df	p value
Sex	0.753	2	0.686
Age	19.576	6	0.003*
Education	58.979	14	0.000*
Income	41.588	10	0.000*
Occupation	24.525	16	0.079

Note : * significant at 0.05 significance level

6.6 Willingness to check DM status

Table 6.7 shows that less than fifty percent (46.5%) of respondents in the state expressed willingness to check their DM status in the future. Ibarapa Central (80%), North (75.5%) and East (70%) LGAs have the highest willingness levels while very few people indicated their willingness in Akinyele (24%) LGA.

Table 6.7: Willingness to check DM

LGA	No response	Yes	No	Total
Afijio	20 (40%)	17 (34%)	13 (26%)	50 (100%)
Akinyele	26 (52%)	12 (24%)	12 (24%)	50 (100%)
Atiba	10 (20%)	39(78%)	1 (2%)	50 (100%)
Atisbo	24 (60%)	12 (30 %)	4 (10%)	40 (100%)
Egbeda	16 (32.7%)	23 (46.9%)	10 (20.4%)	49 (100%)
Ibadan North	29 (58%)	19 (38%)	2 (4%)	50 (100%)
Ibadan Northeast	20(40%)	26 (52%)	4 (8%)	50 (100%)
Ibadan Northwest	21 (42%)	27 (54%)	2 (4%)	50 (100%)
Ibadan Southeast	21(42%	20 (40%)	9 (18%)	50 (100%)
Ibadan Southwest	24 (48%)	23 (46%)	3 (6%)	50 (100%)
Ibarapa Central	6 (12%)	40 (80%)	4 (8%)	50 (100%)
Ibarapa East	2 (4%)	35 (70%)	13 (26%)	50 (100%)
Ibarapa North	12 (24.5%)	37 (75.5%)	0 (0%)	49 (100%)
Ido	21 (42%)	21 (42%)	8 (16%)	50 (100%)
Irepo	13 (26%)	29 (58%)	8 (16%)	50 (100%)
Iseyin	20 (44.4%)	16 (35.6%)	9 (20%)	45 (100%)
Itesiwaju	27 (54%)	19 (38%)	4 (8%)	50 (100%)
Iwajowa	27 (54%)	19 (38%)	4 (8%)	50 (100%)
Kajola	15 (37.5%)	19 (47.5%)	6 (15%)	40 (100%)
Lagelu	19 (38%)	16 (32%)	15 (30%)	50 (100%)
Ogbomoso North	23 (46%)	17 (34%)	10 (20%)	50 (100%)
Ogbomoso South	23 (46%)	20 (40 %)	7 (14%)	50 (100%)
Ogooluwa	17(34%)	26 (52%)	7 (14%)	50 (100%)
Olorunsogo	15 (30%)	25 (50%)	10 (20%)	50 (100%)
Oluyole	6 (12.8%)	17(36.2%)	24 (51.1%)	47 (100%)
Onaara	10 (20%)	35 (70%)	5 (10%)	50 (100%)
Orelope	18 (36 %)	24 (48%)	8 (16%)	50 (100%)
Oriire	22 (44%)	21 (42%)	7 (14%)	50 (100%)
Oyo East	27 (55.1%)	17 (34.7%)	5 (10.2%)	49 (100%)
Oyo west	26 (52%)	17 (34%)	13(26%)	50 (100%)
Saki east	16 (32%)	20 (40%)	14 (28%)	50 (100%)
Saki west	16 (32%)	26 (52%)	8 (16%)	50 (100%)
Surulere	25 (50%)	19 (38%)	6 (12%)	50 (100%)
Total	617 (38.1%)	753 (46.5%)	249 (15.4%)	**1619(100%)**

Source: Field survey, 2014

Cross tabulation between willingness to check DM status and socio demographic shows that more males (56.8%) were willing to go for DM diagnostic test than females (46.5%). The younger age groups especially the 18-30 (46.5%) and 31-45 (33.5%) age groups were more willing to be diagnosed than the older ones. With reference to educational background, the secondary school certificate holders were found to be the most willing (25.5%). Low income earners in the 0-17,999 (47.9%) and 18,000-49,999 (30.1%) were more willing than the high income earners. Fifty one percent of students and 53 percent of farmers indicated willingness to go for the diagnostic test. The results of the chi square analysis shown in Table 6.8 indicate that willingness to check DM status is affected by all the socio-demographic variables except sex.

Table 6.8: Chi square results (Willingness)

Variable	X^2	Df	p value
Sex	3.786	2	0.151
Age	28.813	6	0.000*
Education	59.263	14	0.000*
Income	31.251	10	0.001*
Occupation	39.353	16	0.001*

Note: * significant at 0.05 significance level

6.7 Perception of causes of DM

Clinical research has proved that very high blood sugar level is the main cause of DM. As Table 6.9 reveal, excess sugar intake was identified as the main cause of DM by 60.5 percent of respondents. Other perceived main causes of DM include excessive carbohydrates consumption (13.4%), insufficient insulin in the body (5.1%), inheritance (2.5%), alcohol intake (1.7%) and sexual intercourse (1.2%). The pattern of perceived causes of DM varies from one local government area to another. Most of the respondents in Saki West and Iwajowa LGAs (84%) perceived high sugar intake as the main cause of DM. Excess carbohydrate consumption was the perceived main cause in Kajola (30%) and Olorunsogo (28%) LGAs. Insufficient insulin in the body was identified as the main cause in Ibadan North (16%) and Itesiwaju LGAs (16%).

Table 6.9: Distribution of perceived causes of DM

LGA	No response	Excess sugar	Excess carbohydrate	Hereditary	Alcohol consumption	Insufficient insulin	Overweight	Sexual Intercourse	Old age	Disease	Insufficient water	Total
Afijio	5 (10%)	29 (58%)	7 (14%)	3 (6%)	2 94%)	4 (8%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Akinyele	8 (16%)	27 (54%)	11 (22%)	0 (0%)	1 (2%)	3 (6%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Atiba	5 (10%)	28(56%)	11 (22%)	4 (8%)	0 (0%)	2 (4%)	0(0%)	0(0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Atisbo	4 (10%)	32 (80%)	3 (7.5%)	0 (0%)	0 (0%)	0(0%)	0 (0%)	1 (2.5%)	0 (0%)	0 (0%)	0 (0%)	40 (100%)
Egbeda	11 (22.4%)	28 (57.1%)	4 (8.2%)	3 (6.1%)	1 (2%)	1 (2%)	0 (0%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	49 (100%)
Ibadan North	0 (0%)	37 (74%)	3 (6%)	2 (4%)	0 (0%)	8 (16%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Ibadan Northeast	19 (38%)	22 (44%)	2 (4%)	1 (2%)	0 (0%)	5 (10%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Ibadan Northwest	6 (12%)	38 (76%)	5 (10%)	0 (0%)	0 (0%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Ibadan Southeast	12 (24%)	27 (54%)	5 (10%)	0 (0 %)	1 (2%)	1 (2%)	1 (2%)	0 (0%)	0 (0%)	3 (6%)	0 (0%)	50 (100%)
Ibadan Southwest	3 (6%)	39 (78%)	6 (12%)	0 (0%)	1 (2%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Ibarapa Central	0 (0%)	29 (58%)	12 (24%)	1 (2%)	6 (12%)	1 (2%)	0 (0%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Ibarapa East	21 (42%)	23 (46%)	6 (12%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Ibarapa North	0 (0%)	25 (51%)	9 (18.4%)	4 (8.2%)	6 (12.2%)	0 (0%)	0 (0%)	5 (10.2%)	0 (0%)	0 (0%)	0 (0%)	49 (100%)
Ido	17 (34%)	18 (36%)	10 (20%)	0(0%)	0 (0%)	5 (10%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Irepo	4 (8%)	39 (78%)	3 (6%)	0 (0%)	0 (0%)	3 (6%)	0 (0%)	0 (0%)	1 (2%)	0 (0%)	0 (0%)	50(100%
Iseyin	5 (11.1%)	33(73.3%)	7 (15.6%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	45 (100%)

Itesiwaju	0 (0%)	29(58%)	13 (26%)	0 (0%)	0 (0%)	8 (16%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Iwajowa	0 (0%)	42 (84%)	3 (6%)	0 (0%)	0(0%)	5(10%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Kajola	1 (2.5%)	27 (67.5%)	12 (30%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	40 (100%)
Lagelu	8 (16%)	31 (62%)	5 (10%)	3 (6%)	0 (0%)	1 (2%)	0 (0%)	2 (4%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Ogbomoso North	11 (22%)	26 (52%)	5 (10%)	3 (6%)	1 (2%)	4 (8%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Ogbomoso South	9 (18%)	20 (40%)	13 (26%)	3 (6%)	0 (0%)	5 (10%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Ogooluwa	11 (22%)	34 (68%)	2 (4%)	1 (2%)	1 (2%)	0(0%)	0 (0%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Olorunsogo	6 (12%)	28 (56%)	14 (28%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (4%)	0 (0%)	0 (0%)	50 (100%)
Oluyole	1 (2.1%)	24 (51.1%)	13 (27.7%)	4 (8.5%)	3 (6.4%)	0 (0%)	1(2.1%)	1 (2.1%)	0 (0%)	0 (0%)	0 (0%)	47 (100%)
Onaara	8 (16%)	35 (70%)	2 (4%)	1 (2%)	0 (0%)	4 (8%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Orelope	4 (8%)	32 (64%)	8 (16%)	0 (0%)	1 (2%)	3 (6%)	2 (4%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Oriire	14 (28%)	23(46%)	4(8%)	1 (2%)	1(2%)	7 (14%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Oyo East	8 (16.3%)	35 (71.4%)	3 (6.1%)	0 (0%)	0 (0%)	3 (6.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	49 (100%)
Oyo west	12 (24%)	21 (42%)	7(14%)	4 (8%)	2 (4%)	4 (8%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Saki east	10 (20%)	34 (68%)	2 (45%)	0 (0%)	0 (0%)	3 (6.4%)	0 (0%)	0 (0%)	0 (0%)	0(0%)	1 (2%)	50 (100%)
Saki west	1 (2%)	42 (84%)	4 (8%)	1 (2%)	0 (0%)	1 (2%)	0 (0%)	1(2%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Surulere	16 (32%)	23 (46%)	3 (6%)	1 (2%)	1 (2%)	0 (0%)	0 (0%)	6 (12%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Total	240 (14.8%)	980 (60.5%)	217 (13.4%)	40 (2.5%)	28 (1.7%)	83 (5.1%)	5 (0.3%)	19 (1.2%)	3 (0.2%)	3 (0.2%)	1 (0.1%)	**1619(100%)**

Source: Field survey, 2014

More males believed that excess sugar (56.4%), excess carbohydrates (56.7%), inheritance (52.5%), alcohol (50%), insufficient insulin (60.2%), sexual intercourse (52.6%) and old age (100%) were the main causes of DM while females identified overweight (60%), diseases (66.7%) and insufficient water in the human body (100%) as the causes of DM (see Appendix A-4). All the age groups identified excess sugar as the main causes of DM. Similarly, excess sugar was perceived as the dominant cause of DM by at least 50 percent in each educational, income and occupational group (see Appendix A-4).

Significant differences in perceived causes of DM were noticed in respect of education (X^2= 99.094; df=70; p=0.013) and occupation (X^2= 118.195; df=80; p= 0.004) (see Table 6.11).

Table 6.10: Chi square results (Cause of DM)

Variable	X^2	Df	p value
Sex	11.292	10	0.335
Age	38.282	30	0.143
Education	99.094	70	0.013*
Income	66.639	50	0.058*
Occupation	118.195	80	0.004*

Note: * significant at 0.05 significance level

6.8 Perceived symptoms

Table 6.11 reveals that nearly forty percent (39.1%) identified frequent urination as a major symptom of DM. Other identified symptoms of DM include clustering of ants around urine pools (15.4 %), profuse perspiration (9.6%), weight loss (7.2 %) and hypertension (1.9%). Others include coloured urine, fatigue and low sperm count. Frequent urination was perceived to be a major DM symptom in Ibadan Southwest (70%), Kajola (70%) and Saki West (66%) while clustering of ants was identified as the major symptom of DM in Ibadan Northwest (34%), Ibarapa North (32.7%) and Irepo (32%). Generally speaking, respondents have a fairly accurate knowledge of the symptoms of DM.

More males identified frequent urination (57.8%), ant clustering (56.8%), and weight loss (56%) as DM symptoms while more females were of the opinion that perspiration (50.6%) and hypertension (56.7%) are symptomatic of DM. Frequent urination was the dominant symptom in all the age, education and occupational categories (See Appendix A-4). Table 6.12 shows that there are significant differences in perceived symptoms of DM among all socio-demographic categories except sex.

Table 6.11: Spatial pattern of perceived symptoms of DM

LGA	No response	Ant clustering	Frequent urination	Perspiration	Weight loss	Hypertension	Mucus	Coloured urine	Fatigue	Low sperm count	Total
Afijio	6 (12%)	3 (6%)	27 (54%)	2 (4%)	6 (12%)	6 (12%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Akinyele	10 (20%)	12 (24%)	13 (26%)	6 (12%)	9 (18%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Atiba	9 (18%)	15 (30%)	25 (50%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0(0%)	50 (100%)
Atisbo	10 (25%)	3 (7.5%)	19 (47.5%)	7 (17.5%)	0 (0%)	1 (2.5%)	0(0%)	0(0%)	0(0%)	0(0%)	40 (100%)
Egbeda	17 (34.7%)	3 (6.1%)	18 (36.7%)	2 (4.1%)	5 (10.2%)	0 (0%)	0 (0%)	1 (2%)	2(4.1%)	1 (2%)	49 (100%)
Ibadan North	2 (4%)	5 (10%)	20 (40%)	9 (18%)	12 924%)	2 (4%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Ibadan Northeast	24 (48%)	5 (10%)	16 (32%)	2 (4%)	2 (4%)	1 (2%)	0(0%)	0(0%)	0(0%)	0(0%)	50 (100%)
Ibadan Northwest	13 (26%)	17 (34%)	18 (36%)	2 (4%)	0 (0%)	0 (0%)	0 (0%)	0(0%)	0(0%)	0(0%)	50 (100%)
Ibadan Southeast	17 (34%)	1 (2%)	21 (42%)	3 (6%)	5 (10%)	0(0%)	1 92%)	2 (4%)	0(0%)	0(0%)	50 (100%)
Ibadan Southwest	5 (10%	4 (8%)	35 (70%)	6 (12%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Ibarapa Central	7 (14 %)	11 (22%)	19 (38%)	6 (12%)	1 (2%)	0 (0%)	0 (0%)	6 (12%)) (0%)	0 (0%)	0 (0%)	50 (100%)
Ibarapa East	37 (74 %)	8 (16%)	4 (8%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (2%)	0 (0%)	50 (100%)
Ibarapa North	2 (4.1%)	16 (32.7%)	15 (30.6%)	9 (18.4%)	0 (0%)	0(0)%)	0 (0%)	5 (10.2%)	2 (4.1%)	0 (0%)	49 (100%)
Ido	16 (32%)	6 (12%)	24 (48%)	2 (4%)	2(4%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Irepo	19 (38%)	16 (32%)	8 (16%)	2 (4%)	3 (6%)	0 (0%)	2 (4%)	0(0%)	0(0%)	0(0%)	50(100%
Iseyin	10 (22.2%)	7 (15.6%)	25 (55.6%)	2 (4.4%)	1 (2.2%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	45 (100%)
Itesiwaju	20 (40%)	10 (20%)	18 (36%)	2 (4%)	0 (0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	50 (100%)

Iwajowa	10 (20%)	2 (4%)	24 (48%)	2 (4%)	12(24%)	0(0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Kajola	6 (15%)	5 (12.5%)	28 (70%)	) (0%)	1 (2.5%)	0 (0%)	0(0%)	0(0%)	0(0%)	0(0%)	40 (100%)
Lagelu	18(36%)	4 (8%)	11 (22%)	9 (18%)	2 (4%)	4 (8%)	1 (2%)	0(0%)	1(2%)	0 (0%)	50 (100%)
Ogbomoso North	18 (36%)	2 (4%)	22(44%)	5 (10%)	3 (6%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	50 (100%)
Ogbomoso South	15 (30%)	8 (16%)	20 (40%)	6 (12%)	1 (2%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	50 (100%)
Ogooluwa	15 (30%)	9 (18%)	11 (22%)	9 (18%)	5 (10%)	0 (0%)	0 (0%)	1 (2%)	0 (0%)	0 (0%)	50 (100%)
Olorunsogo	7 (14%)	4 (8%)	31 (62%)	0 (0%)	8 (16%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	50 (100%)
Oluyole	2 (4.3%)	14 (29.8%)	19(40.4%)	7 (14.9%)	4 (8.5%)	1 (2%)	0(0%)	0(0%)	0(0%)	0(0%)	47 (100%)
Onaara	13 (25%)	8 (16%)	9 (18%)	20 (40%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	50 (100%)
Orelope	10 (20%)	7 (14%)	10 (20%)	6 (12%)	14 (28%)	3(6%)	0(0%)	0(0%)	0(0%)	0(0%)	50 (100%)
Oriire	15 (30 %)	4 (8%)	14 (28%)	1 (2%)	2 (4%)	11 (22%)	3 (6%)	0(0%)	0 (0%)	0 (0%)	50 (100%)
Oyo East	9 (18.4%)	5 (10.2%)	25 (51%)	10 (20.4%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	49 (100%)
Oyo west	10 (20%)	2 (4%)	25 (50%)	6 (12%)	6 (12%)	0 (0%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Saki east	10 (20%)	15 (30%)	17 (34%)	0 (0%)	7 (14%)	1 (2%)	0(0%)	0(0%)	0(0%)	0(0%)	50 (100%)
Saki west	3 (6%)	9(18%)	33 (66%)	5 (10%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	50 (100%)
Surulere	18 (36%)	10 (20%)	9 (18%)	7 (14%)	5 (10%)	0(0%)	0 (0%)	0 (0%)	1(2%)	0 (0%)	50 (100%)
Total	**403 (24.95)**	**250 (15.4%)**	**633 (39.1%)**	**156 (9.6%)**	**116 (7.2%)**	**30 (1.9%)**	**8 (0.5%)**	**15 (0.9%)**	**7 (0.4%)**	**1 (0.1%)**	**1619(100%)**

Source: Field survey, 2014

Table 6.12: Chi square results (Symptoms of DM)

Variable	X^2	Df	p value
Sex	14.310	9	0.112
Age	51.636	27	0.003*
Education	80.957	63	0.063
Income	69.831	45	0.010*
Occupation	11.875	72	0.002*

Note : * significant at 0.05 significance level

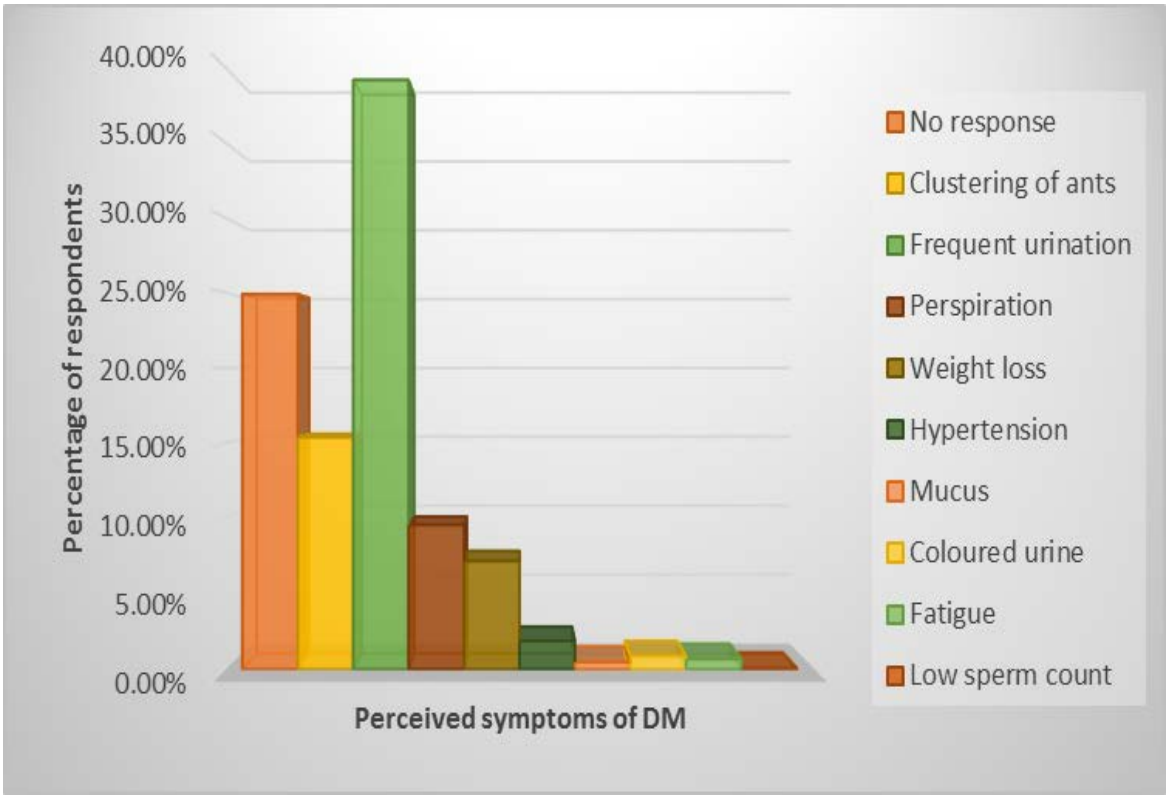

Figure 6.2: Perceived symptoms of DM

6.9 Perception of treatment of DM

With respect to treatment, 52.7 percent perceived insulin injection to be the main treatment option. Food supplements (13.2 %) and low sugar intake (6.4%) were also indicated. Other treatment options listed were herbal treatment, body exercise and prayer (Figure 6.3). Insulin injection was the dominant treatment mode in Ona Ara (84%), Oyo West (72%), Itesiwaju and Saki West (70%) LGAs while food supplement was the main treatment option of respondents in Akinyele (26%), Ibadan North (28%), Iwajowa (26%), Irepo (26%) LGAs

More than half of the respondents are knowledgeable about insulin therapy in the diabetes management. Insulin injection is the conventional treatment mode. This finding is similar to that of Al-Saraya and Khalidi (2012) whose research identified diet therapy and insulin as the most common methods of DM management.

More males indicated insulin injection (55.3%), food supplement (56.8%), body exercise (60%), herbal treatment (55.9%), low sugar intake (59.2%) and prayer (100%) than females. Insulin injection was the most preferred treatment mode in all the age, educational, income and occupational groups (see Appendix A-4).

Table 6.13 shows the results of chi square analysis (treatment of DM). Treatment options do not significantly vary on the basis of sex (X^2=6.922; df=6; p=0.328) and occupation (X^2=59.645, df=48, p=0.121). The chi square results confirm the hypothesis which says perception of DM is affected by socio-demographic characteristics such as age, income and occupation.

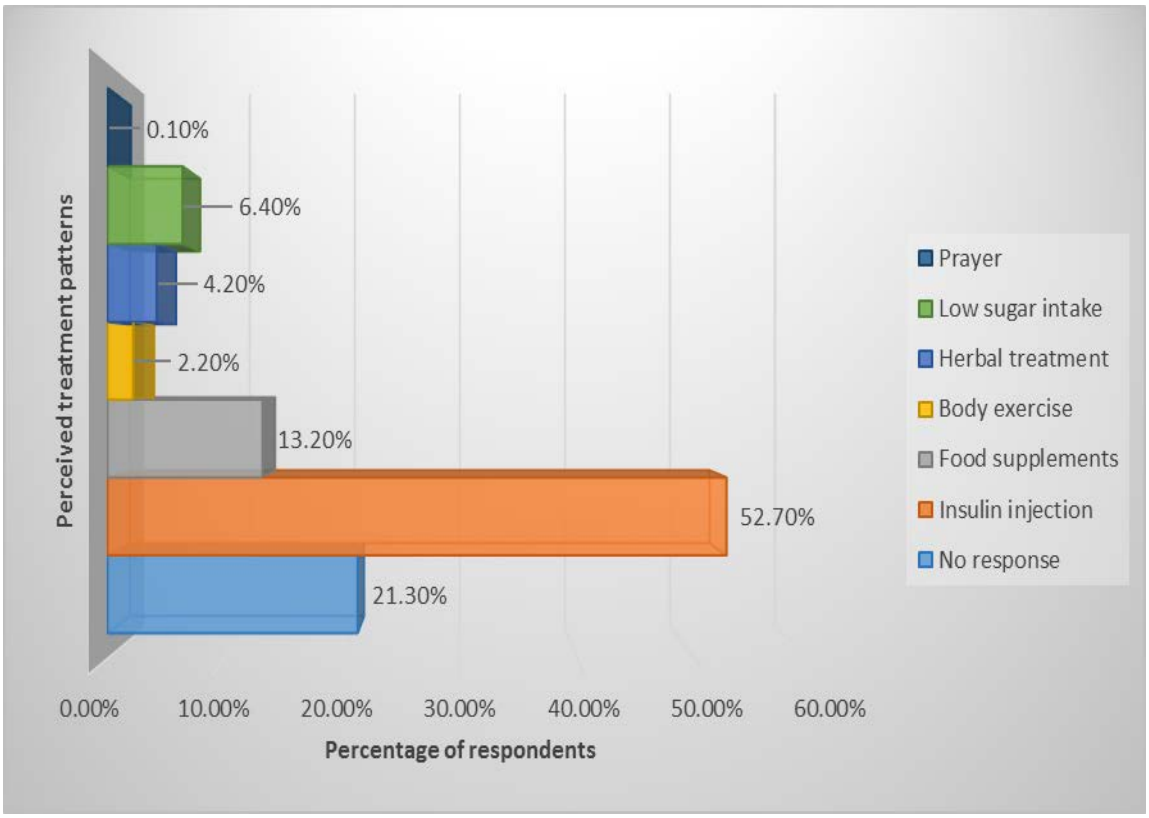

Figure 6.3: Perceived treatment options

Table 6.13: Chi square results (treatment options)

Variable	X^2	Df	p value
Sex	6.922	6	0.328
Age	35.452	18	0.008*
Education	78.971	42	0.000*
Income	60.675	30	0.001*
Occupation	59.645	48	0.121*

Note: * significant at 0.05 significance level

CHAPTER SEVEN

SUMMARY AND CONCLUSION

7.1 Introduction

This chapter presents the major findings of this study with respect to the spatial pattern of DM in Oyo state, risk factors associated with the geographic variability in DM, temporal pattern of DM incidence and the association between DM incidence and the level of development. Awareness and perception of DM in Oyo state were also examined. The rest of this chapter is divided into three sections. The first section discusses the significant findings of the study. The second and third considers the theoretical and policy implications of the study respectively. The final section suggests areas for further research.

7.2 Summary of findings

Among other things, this study investigated the geographical pattern of DM in relation to the level of development, with a view to verifying aspects of the human ecology of disease model and the epidemiological transition theory. It also analysed time trends of DM rates from 2000 to 2014. It determined the spatial pattern of development in Oyo state, and examined a relationship between it and the geographical pattern of DM. In addition, the study identified critical environmental, socio-economic, and lifestyle factors associated with the spatial variability of DM in Oyo state. Finally, the awareness, perception of causes, prevention, and treatment options of DM were examined.

Spatial variations in overall, male and female DM incidence from 2000 to 2014 and self-reported prevalence in Oyo state were analysed in order to identify areas and populations at risk. On the one hand, the overall DM incidence followed a south-north pattern from 2000 to 2014. The overall DM rates were high in the southern part of Oyo state particularly in some parts of Ibadan region while most of the northern section had very low incidence rates. The spatial patterns of male and female DM incidence are very similar to what was seen in the overall incidence pattern. On the other hand, the spatial pattern of self-reported DM prevalence in Oyo state was different from the pattern of overall DM incidence. West-east gradient in the prevalence in overall DM was observed. Prevalence rates were very high in Atisbo,

Ibadan North, Ibadan SW, Ibarapa North, Ido, Irepo, Iseyin and Orelope. The results for self-reported DM differ greatly from those of DM incidence. Similarly, male DM prevalence follows a west-east pattern with very high prevalence rates in Atisbo, Ido, Ibadan South west and Itesiwaju LGAs. The highest female DM prevalence rates in the state were found in Ibadan South west, Ibadan North, Irepo, Iseyin and Saki East LGAs.

The application of the Global Moran's I statistics showed that there was evidence of spatial clustering of DM in Oyo state. With regard to the overall DM, there was significant positive auto correlation from 2000 to 2014. The degree of clustering increased from 0.157279 ($p<0.01$) in 2000-2004 to 0.414495 ($p<0.01$) in 2010-2014. Similarly, male and female DM incidence had a positive spatial auto correlation. Clustering was strongest among males and females in 2010-2014 period. The result proved that nearby LGAs have similar DM rates than distant ones. With respect to self-reported DM, the Global Moran's I found no evidence of spatial autocorrelation in the distribution of overall, male and female self-reported DM prevalence.

In addition to this, local spatial analysis was performed to identify hotspots of DM in Oyo state, using the local Moran's I and local Getis Ord statistics. The Local Moran results found hotspots of overall DM in Akinyele, Ibadan North and North West LGA throughout the study period. Similarly, significant male and female DM clusters were seen in Akinyele, Ibadan North and Ibadan North West LGAs. The study reached the conclusion that DM is locally persistent in Akinyele, Ibadan North-Ibadan North west axis.

The local Getis Ord analysis indicated there were statistically significant clusters of LGAs with high overall DM incidence rates in some parts of Ibadan region in all the observation periods except of that 2010-2014. In the 2010-2014 period, all the hotspots were mainly found in the eleven LGAs of the Ibadan region. However, hotspots for overall and female self-reported DM prevalence were found in only Iwajowa LGA. Kajola and Iwajowa LGAs were the only hotspots for males.

In the attempt to identify the critical factors explaining the spatial pattern of DM in Oyo state, the results of the stepwise regression analysis revealed that only positive family history of DM was significant in the spatial pattern of overall self-reported DM (b=0.631, t=5.944;p=0.000). Its coefficient of determination (R^2) indicates that positive family history of DM explains more than fifty percent of the variation in DM incidence. With regard to overall DM incidence (2000-2014), proximity to bus stop and degree of urbanisation were the most significant factors influencing the spatial distribution of overall DM incidence in Oyo state.

With respect to the temporal distribution of DM, the overall male and female DM rates showed fluctuations over the 2000-2014 period. A linear regression model was estimated to determine the nature of the trend. A significant increase in DM cumulative total (b=202.318, t=23.712, p=0.000), DM cumulative male (b=101.032; t=28.041; p=0.000) and cumulative female (b= 101.286; t= 20.381; p=0.000) was observed in the trend analysis.

In examining the relationship between DM incidence and level of development, an index of development was computed using the principal component analysis (PCA). The computation of the development index was based on four significant principal components (PCs) namely modernization/urbanization, medical services, primary education and revenue based factors. There were noticeable spatial variations in the level of development in the state. Ibadan North LGA topped the development list while Ibarapa North LGA has the lowest ranking. Significant positive correlations between overall DM (r=0.681, p<0.05) male DM (r=0.668; p<0.01) and female DM (r=0.688; p<0.01) incidence rates and the level of development were found at the state level. Also, significant positive correlations between overall DM (r=0.635; p<0.01), male DM (r=0.631; p<0.01), and female DM incidence (r=0.634; p<0.01). No significant relationship between overall self-reported, male and female self-reported DM and the level of development was observed among the 33 LGAs in the state, and among the 12 developed and 21 less developed LGAs.

Finally, the study found a very high level of awareness of DM in Oyo state (90.3%). Though there were slight spatial variations in the awareness level among the LGAs, the awareness rates were still very high. The electronic media (29%), hospital (26.4%)

and the print media (10.6%) were main sources of information on DM for respondents. Only 60.8 percent of respondents indicated that they had not checked their DM status while 46.5% of respondents in Oyo state expressed willingness to check their DM status. Excess sugar intake was perceived to be the main cause of DM (60.5%). The most widely perceived major DM symptom was frequent urination while the most widely perceived treatment option was insulin injection. Lastly, the perception of DM is largely affected by socio demographic factors, especially sex, age, education, income and occupation.

7.3. Theoretical implications

The study applied the human ecology of disease model and the epidemiological transition theory to the study of the geographical patterns of DM in Oyo state in relation to genetic susceptibility, socio-economic, environmental and lifestyle risk factors, and the level of development. The human ecology of disease model is a conceptual framework which describes how habitat, population and behaviour work together to encourage and prevent disease occurrence among populations. The findings support the thesis of the conceptual framework. Habitat (level of urbanisation, proximity to fast food joint, and proximity to bus stop), population (positive family history of DM) and behaviour (soft drink consumption and fast food consumption) were identified as significant risk factors. Therefore, the framework is valid within the context of this study.

However, the conceptual framework overlooks two basic properties of spatial data: spatial autocorrelation and spatial non-stationarity. This study has demonstrated that DM is spatially dependent, that is, DM rate in one location is strongly influenced by values in neighbouring areas. This spatial property should be taken into cognisance in the habitat component of the disease triangle. More importantly, this fundamental fact should be borne in mind when examining the distribution of disease regardless of the scale of analysis. Spatial non-stationarity, on the other hand, points to the fact that there could be geographical variations in the relationship between DM and genetic, environmental, lifestyle and socio-economic factors across the state. In that case, some risk factors may be more prevalent in some locations than other factors. Therefore, it would be erroneous to conclude that a risk factor or some risk factors are

generally responsible for the spatial pattern of DM. This situation is somewhat symptomatic of ecological fallacy. The results of this study therefore suggest that the human ecology of disease model should be extended by adding these spatial peculiarities highlighted above. This would certainly produce a more spatially sensitive human ecology of disease model.

The findings corroborate the epidemiological transition theory. The theory states that as a country transits from the developing to developed status, the number of cases of non-communicable diseases increases. It was observed that there was a spatial match between the geographical pattern of DM and the level of development. LGAs with high levels of development were found to have high DM prevalence rates. Like the Human Ecology of Disease, the epidemiological transition theory lacks a spatial viewpoint, which this study has attempted to provide. Again, the study highlights the fact that the spatial perspective is equally important in the analysis of the incidence of morbidity and mortality in relation to development, and hence proposes that this perspective should be an integral part of the theoretical framework.

7.4 Policy implications

These results have important implications for policy. With the aid of spatial clustering techniques, the study found hotspots of DM in Oyo state. It is advised that the Oyo State government should direct geographically targeted interventions to the areas so as to reduce the prevalence rates. The study also highlights the role of the built environment in the incidence of DM. It is therefore recommended that the town planning boards should create and maintain walkable neighbourhoods in order to promote physical activity. Individuals with positive family history of DM should be advised not to take up unhealthy habits such as junk food consumption, and alcohol consumption which could induce DM. Based on the findings on the perception survey, the health authorities need to correct some of the misconceptions of DM held by some members of the public. They should organise health education campaigns that would enlighten people on the causes, prevention and treatment of DM.

7.5 Areas for further research

The study suggests that future studies should be undertaken to determine if there are other factors besides distance responsible for the phenomenon. In addition, there is the need to examine the geographical distribution and determinants of type 1 and type 2 DM. These two forms have distinct etiologies, pathogenesis and clinical signs. Given these dissimilarities, it is possible they might have different spatial manifestations. Assessing their geographies would help to empirically establish similarities or differences, as the case may be, between them. Another issue worth investigating is the location of DM hotspots. It is necessary to have a critical examination of local ecological conditions that may account for the excessively high prevalence rates in some places.

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APPENDIX A-1:

UI/UCH IRB ETHICAL APPROVAL

INSTITUTE FOR ADVANCED MEDICAL RESEARCH AND TRAINING (IAMRAT)
COLLEGE OF MEDICINE, UNIVERSITY OF IBADAN. IBADAN, NIGERIA.
Director: Prof. A. Ogunniyi, B.Sc(Hons), MBChB, FMCP, FWACP, FRCP (Edin), FRCP (Lond)
Tel: 08023038583, 08038094173
E-mail: aogunniyi@comui.edu.ng

UI/UCH EC Registration Number: **NHREC/05/01/2008a**

NOTICE OF FULL APPROVAL AFTER FULL COMMITTEE REVIEW

Re: Geographical Analysis of Diabetes Prevalence in Oyo State, Nigeria

UI/UCH Ethics Committee assigned number: UI/EC/13/0260

Name of Principal Investigators: **Tolulope Osayomi**

Address of Principal Investigators: Department of Geography,
University of Ibadan, Ibadan

Date of receipt of valid application: 30/07/2013

Date of meeting when final determination on ethical approval was made: **16/01/2014**

This is to inform you that the research described in the submitted protocol, the consent forms, and other participant information materials have been reviewed and *given full approval by the UI/UCH Ethics Committee.*

This approval dates from 16/01/2014 to 15/01/2015. If there is delay in starting the research, please inform the UI/UCH Ethics Committee so that the dates of approval can be adjusted accordingly. Note that no participant accrual or activity related to this research may be conducted outside of these dates. *All informed consent forms used in this study must carry the* UI/UCH EC *assigned number and duration of* UI/UCH EC *approval of the study.* It is expected that you submit your annual report as well as an annual request for the project renewal to the UI/UCH EC early in order to obtain renewal of your approval to avoid disruption of your research.

The National Code for Health Research Ethics requires you to comply with all institutional guidelines, rules and regulations and with the tenets of the Code including ensuring that all adverse events are reported promptly to the UI/UCH EC. *No changes are permitted in the research without prior approval by the* UI/UCH EC *except in circumstances outlined in the Code. The* UI/UCH EC *reserves the right to conduct compliance visit to your research site without previous notification.*

UI/UCH EC 16 JAN 2014 APPROVED COLLEGE OF MEDICINE

Professor A. Ogunniyi
Director, IAMRAT
Chairman, UI/UCH Ethics Committee
E-mail: uiuchirc@yahoo.com

APPENDIX A-2:

INFORMED CONSENT FORM

IRB Research approval number: UI/EC/13/0260

This approval will elapse on: 15th JANUARY, 2015

Title of the research: GEOGRAPHICAL ANALYSIS OF DIABETES MELLITUS PREVALENCE IN OYO STATE, NIGERIA.

Name and affiliation: The study is being conducted by Mr. Tolulope Osayomi (PhD researcher and Lecturer) of the Department of Geography, University of Ibadan.

Purpose of research: The purpose of the research is to is to examine the geographical pattern of diabetes mellitus prevalence in Oyo state, in relation to the level of development.

Procedure of the research: A total of 1,650 participants will be required for this study. Each participant is expected to fill a copy of the questionnaire

Expected duration of research and of participants' involvement: Each participant's involvement in the research will not exceed a day.

Costs to the participants: Your participation will be at no cost to you.

Benefits: The study's objective is to identify ecological and socio-economic correlates of diabetes prevalence. It is anticipated that findings would help slow the diabetes epidemic.

Confidentiality: All information collected in this study will be kept confidential. No name will be recorded. This cannot be linked to you in anyway and your name or any identifier will not be used in any publication or reports from this study.

Voluntariness

Your participation in this research is entirely voluntary.

Consequences of participants' decisions to withdraw from research and procedure for orderly termination of participation: You can also choose to withdraw from research at anytime. Please, note that some of the information that has been obtained about you before you choose to withdraw may have been modified or used in reports and publications. These cannot be removed anymore. However, the researcher promises to comply with your wishes as much as it is practicable.

Statement of person obtaining informed consent:

I have fully explained this research to _____
And have given sufficient information, including about risks and benefits, to make an informed decision.

DATE:_____

SIGNATURE:_____

NAME:___Mr. Tolulope Osayomi_____

Statement of person giving consent

I have read the description of the research or have had it translated into language I understand. I understand that my participation is voluntary. I know enough about the purpose, methods, risks and benefits of the research to study to judge that I want to take part in it. I understand that I may freely stop being part of this study at any time. I have received a copy of this consent form and additional information sheet to keep for myself.

DATE:_____

SIGNATURE:_____

NAME:_____

DETAILED CONTACT INFORMATION

This research has been approved by the Ethics Committee of the University of Ibadan and the Chairman of this Committee can be contacted at Biode Building, Room T10, 2nd Floor, Institute for Advanced Medical Research and Training, College of Medicine, University of Ibadan, Telephone: 08032397993, Email: uiuchirc@yahoo.com. In addition, if you have any question about your participation in this research, you can contact the principal investigator, Mr. Tolulope Osayomi (PhD. researcher and lecturer) at the Department of Geography, University of Ibadan, Ibadan.

APPENDIX A-3:

SURVEY QUESTIONNAIRE

DEPARTMENT OF GEOGRAPHY

UNIVERSITY OF IBADAN

QUESTIONNAIRE

Instruction: Please, tick where appropriate

Locality_____ Local government area_____

Section A: INFORMATION ON RESPONDENT

1. Sex: Male ( ) Female ( )
2. Age: 18-30 ( ) 31-45( ) 46-59( ) 60+ ( )
3. Ethnicity: Yoruba ( ) Igbo ( ) Hausa ( ) Others ( ) specify_____
4. Religion: Christian ( ) Muslim ( ) Traditional ( ) Others ( ) specify_____
5. Marital status: Single ( ) Married ( ) Divorced ( ) Separated ( ) Widowed ( )
6. Education: No formal education ( ) Primary education ( ) Secondary ( ) College of education ( ) Polytechnic ( ) University education ( )
7. Occupation: Unemployed ( ) Student ( ) Farmer ( ) Trader/Businessperson ( ) Civil servant ( ) Professional ( ) Retired ( ) Others ( ) specify_____
8. Monthly income (in naira): 0-17,999 ( ) 18-49,999 ( ) 50- 79,999 ( ) 80-109,999 110,000 and above ( )

SECTION B:

INFORMATION ON HEALTH STATUS, LIFESTYLE AND PHYSICAL ACTIVITY

9. How often do you fall ill? rarely ( ) once in two months ( ) once in two weeks ( ) once a week ( )
10. Have you been told by a doctor that you have been diagnosed with diabetes? Yes ( ) No ( )
11. Height_____
12. Weight_____
13. Do you eat fruits and vegetables? Never ( ) Sometimes ( ) Always ( )

14. Do you consume tobacco? Never ( ) Sometimes ( ) Always ( )
15. Do you consume fast foods? never ( ) sometimes ( ) always ( )
16. Do you drink soft drinks? never ( ) sometimes ( ) always ( )
17. Do you consume alcoholic drinks? never ( ) sometimes ( ) always ( )
18. Do you exercise your body? never ( ) sometimes ( ) always ( )
19. How would you describe the degree of body exercise? None ( ) Light ( ) Moderate ( ) Rigorous ( )

SECTION C:

INFORMATION ON DWELLING UNIT AND NEIGHBOURHOOD CHARACTERISTICS

20. How many household members live in this house?_____
21. Who is the head of the household? Male ( ) Female ( )
22. Is this household headed by a single parent? Yes ( ) No ( )
23. How many children do you have? 0 ( ) 1 ( ) 2 ( ) 3 or more ( )
24. Housing tenure: owner-occupied accommodation ( ) Tenant ( )
25. Building construction material: Mud ( )Wood ( ) Cement( ) Brick ( ) others ( ) specify_____
26. Type of floor: cement ( ) stone ( ) dust ( ) others ( ) specify_____-
27. How many bedrooms do you have? None ( ) 1 ( ) 2 ( ) 3 or more ( )
28. How many household members sleep in a bedroom? 1 person ( ) 2 persons ( ) 3 persons or more ( )
29. Does this household own a car? Yes ( ) No ( )
30. How many cars does your household own? None ( ) One ( ) Two ( ) Three or more ( )
31. Do you have a kitchen within your house? Yes ( ) No ( )
32. Cooking fuel: Sawdust ( ) Wood ( ) Charcoal ( ) Kerosene ( ) Gas ( )
33. Does your house have public electricity supply? Yes ( ) No ( )
34. Source of water supply: stream ( ) pond ( ) river ( ) well ( ) public tap ( ) borehole ( ) in house pipeborne water ( ) others ( ) specify_____
35. Which type of toilet do you use? None ( ) Bush ( ) pail latrine ( ) pit latrine ( ) flush toilet ( )
36. Does your neighbourhood have sidewalks? Yes ( ) No ( )

38. Does your neighbourhood have streetlights? Yes ( ) No ( )
39. Does your neighbourhood have a mix of different land use types? Yes ( ) No ( )
40. Does your neighbourhood have a community garden? Yes ( ) No ( )
41. Does your neighbourhood have a public park? Yes ( ) No ( )
41. Does your neighbourhood have a physical fitness outlet? Yes ( ) No ( )
42. Does your neighbourhood have a recreational facility? Yes ( ) No ( )
43. Does your neighbourhood have a fast food outlet? Yes ( ) No ( )
43. Do you feel your neighbourhood is relatively safe? Yes ( ) No ( )
44. Do you believe most people in your neighbourhood can be trusted? Yes ( ) No ( )

SECTION D:

INFORMATION ON AWARENESS AND PERCEPTION OF DIABETES

45. Have you ever heard of the disease called diabetes? Yes ( ) No ( )
46. If yes, how did you get to know about it? Print media ( ) Electronic media ( ) Church/Mosque ( ) Hospital ( ) School ( ) Others ( ) specify _____
47. Have you checked your diabetes status? Yes ( ) No ( )
48. If no, would you be willing to check your diabetes status? Yes ( ) No ( )
49. Do you believe people can inherit diabetes from parents? Yes ( ) No ( )
50. What is the main cause of diabetes? _____
51. What is the major symptom of diabetes?_____
52. How can diabetes be treated? _____
53. Are there indigenous ways of treating diabetes? Yes ( ) No ( )
54. If yes, please state specifically how it is treated locally _____ _____

APPENDIX A-4

Crosstab

			Have you ever heard of disease called diabetes?			
			No response	Yes	No	Total
Sex	Male	Count	11	837	83	931
		% within Sex	1.2%	89.9%	8.9%	100.0%
		% within Have you ever heard of disease called diabetes?	84.6%	57.3%	57.6%	57.5%
		% of Total	.7%	51.7%	5.1%	57.5%
	Female	Count	2	625	61	688
		% within Sex	.3%	90.8%	8.9%	100.0%
		% within Have you ever heard of disease called diabetes?	15.4%	42.7%	42.4%	42.5%
		% of Total	.1%	38.6%	3.8%	42.5%
Total		Count	13	1462	144	1619
		% within Sex	.8%	90.3%	8.9%	100.0%
		% within Have you ever heard of disease called diabetes?	100.0%	100.0%	100.0%	100.0%
		% of Total	.8%	90.3%	8.9%	100.0%

Sex * If yes, how did you get to know about it?

Crosstab

			If yes, how did you get to know about it?							
			No response	Print media	Electronic media	Church/Mosque	Hospital	School	Others	Total
Sex	Male	Count	92	106	277	47	230	100	79	931
		% within Sex	9.9%	11.4%	29.8%	5.0%	24.7%	10.7%	8.5%	100.0%
		% within If yes, how did you get to know about it?	60.1%	61.6%	58.9%	51.6%	53.9%	55.2%	63.2%	57.5%
		% of Total	5.7%	6.5%	17.1%	2.9%	14.2%	6.2%	4.9%	57.5%
	Female	Count	61	66	193	44	197	81	46	688
		% within Sex	8.9%	9.6%	28.1%	6.4%	28.6%	11.8%	6.7%	100.0%
		% within If yes, how did you get to know about it?	39.9%	38.4%	41.1%	48.4%	46.1%	44.8%	36.8%	42.5%
		% of Total	3.8%	4.1%	11.9%	2.7%	12.2%	5.0%	2.8%	42.5%
Total		Count	153	172	470	91	427	181	125	1619
		% within Sex	9.5%	10.6%	29.0%	5.6%	26.4%	11.2%	7.7%	100.0%
		% within If yes, how did you get to know about it?	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	9.5%	10.6%	29.0%	5.6%	26.4%	11.2%	7.7%	100.0%

Sex * Have you checked your diabetes status

Crosstab

			Have you checked your diabetes status			
			No response	Yes	No	Total
Sex	Male	Count	12	347	572	931
		% within Sex	1.3%	37.3%	61.4%	100.0%
		% within Have you checked your diabetes status	63.2%	56.3%	58.1%	57.5%
		% of Total	.7%	21.4%	35.3%	57.5%
	Female	Count	7	269	412	688
		% within Sex	1.0%	39.1%	59.9%	100.0%
		% within Have you checked your diabetes status	36.8%	43.7%	41.9%	42.5%
		% of Total	.4%	16.6%	25.4%	42.5%
Total		Count	19	616	984	1619
		% within Sex	1.2%	38.0%	60.8%	100.0%
		% within Have you checked your diabetes status	100.0%	100.0%	100.0%	100.0%
		% of Total	1.2%	38.0%	60.8%	100.0%

Sex * If no, would you be willing to check your diabetes status

Crosstab

			If no, would you be willing to check your diabetes status			
			No response	Yes	No	Total
Sex	Male	Count	346	428	157	931
		% within Sex	37.2%	46.0%	16.9%	100.0%
		% within If no, would you be willing to check your diabetes status	56.1%	56.8%	63.1%	57.5%
		% of Total	21.4%	26.4%	9.7%	57.5%
	Female	Count	271	325	92	688
		% within Sex	39.4%	47.2%	13.4%	100.0%
		% within If no, would you be willing to check your diabetes status	43.9%	43.2%	36.9%	42.5%
		% of Total	16.7%	20.1%	5.7%	42.5%
Total		Count	617	753	249	1619
		% within Sex	38.1%	46.5%	15.4%	100.0%
		% within If no, would you be willing to check your diabetes status	100.0%	100.0%	100.0%	100.0%
		% of Total	38.1%	46.5%	15.4%	100.0%

Sex * What is the main cause of diabetes?

Crosstab

			What is the main cause of diabetes?											Total
			No response	Excess Sugar	Excess Carbohydrate	Inheritance	Alcohol	Low level/lack of insuline	Overweight	Sexual intercourse	Old age	Diseases	Lack of water in the body	
Sex	Male	Count	154	553	123	21	14	50	2	10	3	1	0	931
		% within Sex	16.5%	59.4%	13.2%	2.3%	1.5%	5.4%	.2%	1.1%	.3%	.1%	.0%	100.0%
		% within What is the main cause of diabetes?	64.2%	56.4%	56.7%	52.5%	50.0%	60.2%	40.0%	52.6%	100.0%	33.3%	.0%	57.5%
		% of Total	9.5%	34.2%	7.6%	1.3%	.9%	3.1%	.1%	.6%	.2%	.1%	.0%	57.5%
	Female	Count	86	427	94	19	14	33	3	9	0	2	1	688
		% within Sex	12.5%	62.1%	13.7%	2.8%	2.0%	4.8%	.4%	1.3%	.0%	.3%	.1%	100.0%
		% within What is the main cause of diabetes?	35.8%	43.6%	43.3%	47.5%	50.0%	39.8%	60.0%	47.4%	.0%	66.7%	100.0%	42.5%
		% of Total	5.3%	26.4%	5.8%	1.2%	.9%	2.0%	.2%	.6%	.0%	.1%	.1%	42.5%
Total		Count	240	980	217	40	28	83	5	19	3	3	1	1619
		% within Sex	14.8%	60.5%	13.4%	2.5%	1.7%	5.1%	.3%	1.2%	.2%	.2%	.1%	100.0%
		% within What is the main cause of diabetes?	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Crosstab

			What is the main cause of diabetes?											Total
			No response	Excess Sugar	Excess Carbohydrate	Inheritance	Alcohol	Low level/lack of insuline	Overweight	Sexual intercourse	Old age	Diseases	Lack of water in the body	
Sex	Male	Count	154	553	123	21	14	50	2	10	3	1	0	931
		% within Sex	16.5%	59.4%	13.2%	2.3%	1.5%	5.4%	.2%	1.1%	.3%	.1%	.0%	100.0%
		% within What is the main cause of diabetes?	64.2%	56.4%	56.7%	52.5%	50.0%	60.2%	40.0%	52.6%	100.0%	33.3%	.0%	57.5%
		% of Total	9.5%	34.2%	7.6%	1.3%	.9%	3.1%	.1%	.6%	.2%	.1%	.0%	57.5%
	Female	Count	86	427	94	19	14	33	3	9	0	2	1	688
		% within Sex	12.5%	62.1%	13.7%	2.8%	2.0%	4.8%	.4%	1.3%	.0%	.3%	.1%	100.0%
		% within What is the main cause of diabetes?	35.8%	43.6%	43.3%	47.5%	50.0%	39.8%	60.0%	47.4%	.0%	66.7%	100.0%	42.5%
		% of Total	5.3%	26.4%	5.8%	1.2%	.9%	2.0%	.2%	.6%	.0%	.1%	.1%	42.5%
Total		Count	240	980	217	40	28	83	5	19	3	3	1	1619
		% within Sex	14.8%	60.5%	13.4%	2.5%	1.7%	5.1%	.3%	1.2%	.2%	.2%	.1%	100.0%
		% within What is the main cause of diabetes?	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	14.8%	60.5%	13.4%	2.5%	1.7%	5.1%	.3%	1.2%	.2%	.2%	.1%	100.0%

Sex * What is the major symptom of diabetes?

Crosstab

			What is the major symptom of diabetes?										
			No response	Ant gather on urine	Frequent Urinating	Sweating, swelling and prolong wounds	Loss of weight	Hypertension/blood disfunctions	Mucus excreta	coloured urine/eye	Fatigue	Low sperm count	Total
Sex	Male	Count	249	142	366	77	65	13	7	8	3	1	931
		% within Sex	26.7%	15.3%	39.3%	8.3%	7.0%	1.4%	.8%	.9%	.3%	.1%	100.0%
		% within What is the major symptom of diabetes?	61.8%	56.8%	57.8%	49.4%	56.0%	43.3%	87.5%	53.3%	42.9%	100.0%	57.5%
		% of Total	15.4%	8.8%	22.6%	4.8%	4.0%	.8%	.4%	.5%	.2%	.1%	57.5%
	Female	Count	154	108	267	79	51	17	1	7	4	0	688
		% within Sex	22.4%	15.7%	38.8%	11.5%	7.4%	2.5%	.1%	1.0%	.6%	.0%	100.0%
		% within What is the major symptom of diabetes?	38.2%	43.2%	42.2%	50.6%	44.0%	56.7%	12.5%	46.7%	57.1%	.0%	42.5%
		% of Total	9.5%	6.7%	16.5%	4.9%	3.2%	1.1%	.1%	.4%	.2%	.0%	42.5%

Total	Count	403	250	633	156	116	30	8	15	7	1	1619
	% within Sex	24.9%	15.4%	39.1%	9.6%	7.2%	1.9%	.5%	.9%	.4%	.1%	100.0%
	% within What is the major symptom of diabetes?	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	24.9%	15.4%	39.1%	9.6%	7.2%	1.9%	.5%	.9%	.4%	.1%	100.0%

Sex * how can diabetes be treated?

Crosstab

			how can diabetes be treated?							
			No response	Medical treatment and drugs like insuline	Food supplement to reduce sugar	Excercise	Herbal treatment/herbalist	Low sugar intake	Prayer	Total
Sex	Male	Count	217	472	121	21	38	61	1	931
		% within Sex	23.3%	50.7%	13.0%	2.3%	4.1%	6.6%	.1%	100.0%
		% within how can diabetes be treated?	62.9%	55.3%	56.8%	60.0%	55.9%	59.2%	100.0%	57.5%
		% of Total	13.4%	29.2%	7.5%	1.3%	2.3%	3.8%	.1%	57.5%
	Female	Count	128	382	92	14	30	42	0	688
		% within Sex	18.6%	55.5%	13.4%	2.0%	4.4%	6.1%	.0%	100.0%
		% within how can diabetes be treated?	37.1%	44.7%	43.2%	40.0%	44.1%	40.8%	.0%	42.5%
		% of Total	7.9%	23.6%	5.7%	.9%	1.9%	2.6%	.0%	42.5%

Total	Count	345	854	213	35	68	103	1	1619
	% within Sex	21.3%	52.7%	13.2%	2.2%	4.2%	6.4%	.1%	100.0%
	% within how can diabetes be treated?	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	21.3%	52.7%	13.2%	2.2%	4.2%	6.4%	.1%	100.0%

Age * Have you ever heard of disease called diabetes?

Crosstab

			Have you ever heard of disease called diabetes?			
			No response	Yes	No	Total
Age	18-30	Count	7	576	79	662
		% within Age	1.1%	87.0%	11.9%	100.0%
		% within Have you ever heard of disease called diabetes?	53.8%	39.4%	54.9%	40.9%
		% of Total	.4%	35.6%	4.9%	40.9%
	31-45	Count	2	526	39	567
		% within Age	.4%	92.8%	6.9%	100.0%
		% within Have you ever heard of disease called diabetes?	15.4%	36.0%	27.1%	35.0%
		% of Total	.1%	32.5%	2.4%	35.0%
	46-59	Count	1	267	17	285
		% within Age	.4%	93.7%	6.0%	100.0%
		% within Have you ever heard of disease called diabetes?	7.7%	18.3%	11.8%	17.6%
		% of Total	.1%	16.5%	1.1%	17.6%
	60 Plus	Count	3	93	9	105
		% within Age	2.9%	88.6%	8.6%	100.0%
		% within Have you ever heard of disease called diabetes?	23.1%	6.4%	6.3%	6.5%
		% of Total	.2%	5.7%	.6%	6.5%
Total		Count	13	1462	144	1619
		% within Age	.8%	90.3%	8.9%	100.0%
		% within Have you ever heard of disease called diabetes?	100.0%	100.0%	100.0%	100.0%
		% of Total	.8%	90.3%	8.9%	100.0%

Age * If yes, how did you get to know about it?

Crosstab

			If yes, how did you get to know about it?							Total
			No response	Print media	Electronic media	Church/Mosque	Hospital	School	Others	
Age	18-30	Count	84	76	167	39	169	94	33	662
		% within Age	12.7%	11.5%	25.2%	5.9%	25.5%	14.2%	5.0%	100.0%
		% within If yes, how did you get to know about it?	54.9%	44.2%	35.5%	42.9%	39.6%	51.9%	26.4%	40.9%
		% of Total	5.2%	4.7%	10.3%	2.4%	10.4%	5.8%	2.0%	40.9%
	31-45	Count	41	63	186	28	142	64	43	567
		% within Age	7.2%	11.1%	32.8%	4.9%	25.0%	11.3%	7.6%	100.0%
		% within If yes, how did you get to know about it?	26.8%	36.6%	39.6%	30.8%	33.3%	35.4%	34.4%	35.0%
		% of Total	2.5%	3.9%	11.5%	1.7%	8.8%	4.0%	2.7%	35.0%
	46-59	Count	17	31	81	18	87	20	31	285
		% within Age	6.0%	10.9%	28.4%	6.3%	30.5%	7.0%	10.9%	100.0%

		% within If yes, how did you get to know about it?	11.1%	18.0%	17.2%	19.8%	20.4%	11.0%	24.8%	17.6%
		% of Total	1.1%	1.9%	5.0%	1.1%	5.4%	1.2%	1.9%	17.6%
	60 Plus	Count	11	2	36	6	29	3	18	105
		% within Age	10.5%	1.9%	34.3%	5.7%	27.6%	2.9%	17.1%	100.0%
		% within If yes, how did you get to know about it?	7.2%	1.2%	7.7%	6.6%	6.8%	1.7%	14.4%	6.5%
		% of Total	.7%	.1%	2.2%	.4%	1.8%	.2%	1.1%	6.5%
Total		Count	153	172	470	91	427	181	125	1619
		% within Age	9.5%	10.6%	29.0%	5.6%	26.4%	11.2%	7.7%	100.0%
		% within If yes, how did you get to know about it?	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	9.5%	10.6%	29.0%	5.6%	26.4%	11.2%	7.7%	100.0%

Age * Have you checked your diabetes status

Crosstab

			Have you checked your diabetes status			
			No response	Yes	No	Total
Age	18-30	Count	9	219	434	662
		% within Age	1.4%	33.1%	65.6%	100.0%
		% within Have you checked your diabetes status	47.4%	35.6%	44.1%	40.9%
		% of Total	.6%	13.5%	26.8%	40.9%
	31-45	Count	6	224	337	567
		% within Age	1.1%	39.5%	59.4%	100.0%
		% within Have you checked your diabetes status	31.6%	36.4%	34.2%	35.0%
		% of Total	.4%	13.8%	20.8%	35.0%
	46-59	Count	1	132	152	285
		% within Age	.4%	46.3%	53.3%	100.0%
		% within Have you checked your diabetes status	5.3%	21.4%	15.4%	17.6%
		% of Total	.1%	8.2%	9.4%	17.6%
	60 Plus	Count	3	41	61	105
		% within Age	2.9%	39.0%	58.1%	100.0%
		% within Have you checked your diabetes status	15.8%	6.7%	6.2%	6.5%
		% of Total	.2%	2.5%	3.8%	6.5%
Total		Count	19	616	984	1619
		% within Age	1.2%	38.0%	60.8%	100.0%
		% within Have you checked your diabetes status	100.0%	100.0%	100.0%	100.0%

Crosstab

			Have you checked your diabetes status			
			No response	Yes	No	Total
Age	18-30	Count	9	219	434	662
		% within Age	1.4%	33.1%	65.6%	100.0%
		% within Have you checked your diabetes status	47.4%	35.6%	44.1%	40.9%
		% of Total	.6%	13.5%	26.8%	40.9%
	31-45	Count	6	224	337	567
		% within Age	1.1%	39.5%	59.4%	100.0%
		% within Have you checked your diabetes status	31.6%	36.4%	34.2%	35.0%
		% of Total	.4%	13.8%	20.8%	35.0%
	46-59	Count	1	132	152	285
		% within Age	.4%	46.3%	53.3%	100.0%
		% within Have you checked your diabetes status	5.3%	21.4%	15.4%	17.6%
		% of Total	.1%	8.2%	9.4%	17.6%
	60 Plus	Count	3	41	61	105
		% within Age	2.9%	39.0%	58.1%	100.0%
		% within Have you checked your diabetes status	15.8%	6.7%	6.2%	6.5%
		% of Total	.2%	2.5%	3.8%	6.5%
Total		Count	19	616	984	1619
		% within Age	1.2%	38.0%	60.8%	100.0%
		% within Have you checked your diabetes status	100.0%	100.0%	100.0%	100.0%
		% of Total	1.2%	38.0%	60.8%	100.0%

Age * If no, would you be willing to check your diabetes status

Crosstab

			If no, would you be willing to check your diabetes status			
			No response	Yes	No	Total
Age	18-30	Count	218	350	94	662
		% within Age	32.9%	52.9%	14.2%	100.0%
		% within If no, would you be willing to check your diabetes status	35.3%	46.5%	37.8%	40.9%
		% of Total	13.5%	21.6%	5.8%	40.9%
	31-45	Count	223	252	92	567
		% within Age	39.3%	44.4%	16.2%	100.0%
		% within If no, would you be willing to check your diabetes status	36.1%	33.5%	36.9%	35.0%
		% of Total	13.8%	15.6%	5.7%	35.0%
	46-59	Count	133	114	38	285
		% within Age	46.7%	40.0%	13.3%	100.0%
		% within If no, would you be willing to check your diabetes status	21.6%	15.1%	15.3%	17.6%
		% of Total	8.2%	7.0%	2.3%	17.6%
	60 Plus	Count	43	37	25	105
		% within Age	41.0%	35.2%	23.8%	100.0%
		% within If no, would you be willing to check your diabetes status	7.0%	4.9%	10.0%	6.5%
		% of Total	2.7%	2.3%	1.5%	6.5%
Total		Count	617	753	249	1619
		% within Age	38.1%	46.5%	15.4%	100.0%
		% within If no, would you be willing to check your diabetes status	100.0%	100.0%	100.0%	100.0%
		% of Total	38.1%	46.5%	15.4%	100.0%

Age * What is the main cause of diabetes?

Crosstab

			What is the main cause of diabetes?											
			No response	Excess Sugar	Excess Carbohydrate	Inheritance	Alcohol	Low level/lack of insuline	Overweight	Sexual intercourse	Old age	Diseases	Lack of water in the body	Total
Age	18-30	Count	119	387	86	13	11	34	2	9	0	1	0	662
		% within Age	18.0%	58.5%	13.0%	2.0%	1.7%	5.1%	.3%	1.4%	.0%	.2%	.0%	100.0%
		% within What is the main cause of diabetes?	49.6%	39.5%	39.6%	32.5%	39.3%	41.0%	40.0%	47.4%	.0%	33.3%	.0%	40.9%
		% of Total	7.4%	23.9%	5.3%	.8%	.7%	2.1%	.1%	.6%	.0%	.1%	.0%	40.9%
	31-45	Count	73	352	74	16	14	26	3	6	1	1	1	567
		% within Age	12.9%	62.1%	13.1%	2.8%	2.5%	4.6%	.5%	1.1%	.2%	.2%	.2%	100.0%
		% within What is the main cause of diabetes?	30.4%	35.9%	34.1%	40.0%	50.0%	31.3%	60.0%	31.6%	33.3%	33.3%	100.0%	35.0%
		% of Total	4.5%	21.7%	4.6%	1.0%	.9%	1.6%	.2%	.4%	.1%	.1%	.1%	35.0%
	46-59	Count	31	188	36	9	2	15	0	1	2	1	0	285

		% within Age	10.9%	66.0%	12.6%	3.2%	.7%	5.3%	.0%	.4%	.7%	.4%	.0%	100.0%
		% within What is the main cause of diabetes?	12.9%	19.2%	16.6%	22.5%	7.1%	18.1%	.0%	5.3%	66.7%	33.3%	.0%	17.6%
		% of Total	1.9%	11.6%	2.2%	.6%	.1%	.9%	.0%	.1%	.1%	.1%	.0%	17.6%
	60 Plus	Count	17	53	21	2	1	8	0	3	0	0	0	105
		% within Age	16.2%	50.5%	20.0%	1.9%	1.0%	7.6%	.0%	2.9%	.0%	.0%	.0%	100.0%
		% within What is the main cause of diabetes?	7.1%	5.4%	9.7%	5.0%	3.6%	9.6%	.0%	15.8%	.0%	.0%	.0%	6.5%
		% of Total	1.1%	3.3%	1.3%	.1%	.1%	.5%	.0%	.2%	.0%	.0%	.0%	6.5%
Total		Count	240	980	217	40	28	83	5	19	3	3	1	1619
		% within Age	14.8%	60.5%	13.4%	2.5%	1.7%	5.1%	.3%	1.2%	.2%	.2%	.1%	100.0%
		% within What is the main cause of diabetes?	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	14.8%	60.5%	13.4%	2.5%	1.7%	5.1%	.3%	1.2%	.2%	.2%	.1%	100.0%

Age * What is the major symptom of diabetes?

Crosstab

			What is the major symptom of diabetes?										Total
			No response	Ant gather on urine	Frequent Urinating	Sweating, swelling and prolong wounds	Loss of weight	Hypertension/blood disfunctions	Mucus excreta	coloured urine/eye	Fatigue	Low sperm count	
Age	18-30	Count	199	99	244	58	37	14	0	8	2	1	662
		% within Age	30.1%	15.0%	36.9%	8.8%	5.6%	2.1%	.0%	1.2%	.3%	.2%	100.0%
		% within What is the major symptom of diabetes?	49.4%	39.6%	38.5%	37.2%	31.9%	46.7%	.0%	53.3%	28.6%	100.0%	40.9%
		% of Total	12.3%	6.1%	15.1%	3.6%	2.3%	.9%	.0%	.5%	.1%	.1%	40.9%
	31-45	Count	111	99	218	62	50	9	7	6	5	0	567
		% within Age	19.6%	17.5%	38.4%	10.9%	8.8%	1.6%	1.2%	1.1%	.9%	.0%	100.0%
		% within What is the major symptom of diabetes?	27.5%	39.6%	34.4%	39.7%	43.1%	30.0%	87.5%	40.0%	71.4%	.0%	35.0%
		% of Total	6.9%	6.1%	13.5%	3.8%	3.1%	.6%	.4%	.4%	.3%	.0%	35.0%

	46-59	Count	61	36	130	29	22	6	0	1	0	0	285
		% within Age	21.4%	12.6%	45.6%	10.2%	7.7%	2.1%	.0%	.4%	.0%	.0%	100.0%
		% within What is the major symptom of diabetes?	15.1%	14.4%	20.5%	18.6%	19.0%	20.0%	.0%	6.7%	.0%	.0%	17.6%
		% of Total	3.8%	2.2%	8.0%	1.8%	1.4%	.4%	.0%	.1%	.0%	.0%	17.6%
	60 Plus	Count	32	16	41	7	7	1	1	0	0	0	105
		% within Age	30.5%	15.2%	39.0%	6.7%	6.7%	1.0%	1.0%	.0%	.0%	.0%	100.0%
		% within What is the major symptom of diabetes?	7.9%	6.4%	6.5%	4.5%	6.0%	3.3%	12.5%	.0%	.0%	.0%	6.5%
		% of Total	2.0%	1.0%	2.5%	.4%	.4%	.1%	.1%	.0%	.0%	.0%	6.5%
Total		Count	403	250	633	156	116	30	8	15	7	1	1619
		% within Age	24.9%	15.4%	39.1%	9.6%	7.2%	1.9%	.5%	.9%	.4%	.1%	100.0%
		% within What is the major symptom of diabetes?	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	24.9%	15.4%	39.1%	9.6%	7.2%	1.9%	.5%	.9%	.4%	.1%	100.0%

Age * how can diabetes be treated?

Crosstab

			how can diabetes be treated?							Total
			No response	Medical treatment and drugs like insuline	Food supplement to reduce sugar	Excercise	Herbal treatment/herbalist	Low sugar intake	Prayer	
Age	18-30	Count	156	324	103	9	22	48	0	662
		% within Age	23.6%	48.9%	15.6%	1.4%	3.3%	7.3%	.0%	100.0%
		% within how can diabetes be treated?	45.2%	37.9%	48.4%	25.7%	32.4%	46.6%	.0%	40.9%
		% of Total	9.6%	20.0%	6.4%	.6%	1.4%	3.0%	.0%	40.9%
	31-45	Count	111	300	78	21	24	32	1	567
		% within Age	19.6%	52.9%	13.8%	3.7%	4.2%	5.6%	.2%	100.0%
		% within how can diabetes be treated?	32.2%	35.1%	36.6%	60.0%	35.3%	31.1%	100.0%	35.0%
		% of Total	6.9%	18.5%	4.8%	1.3%	1.5%	2.0%	.1%	35.0%
	46-59	Count	57	170	24	3	14	17	0	285

		% within Age	20.0%	59.6%	8.4%	1.1%	4.9%	6.0%	.0%	100.0%
		% within how can diabetes be treated?	16.5%	19.9%	11.3%	8.6%	20.6%	16.5%	.0%	17.6%
		% of Total	3.5%	10.5%	1.5%	.2%	.9%	1.1%	.0%	17.6%
	60 Plus	Count	21	60	8	2	8	6	0	105
		% within Age	20.0%	57.1%	7.6%	1.9%	7.6%	5.7%	.0%	100.0%
		% within how can diabetes be treated?	6.1%	7.0%	3.8%	5.7%	11.8%	5.8%	.0%	6.5%
		% of Total	1.3%	3.7%	.5%	.1%	.5%	.4%	.0%	6.5%
Total		Count	345	854	213	35	68	103	1	1619
		% within Age	21.3%	52.7%	13.2%	2.2%	4.2%	6.4%	.1%	100.0%
		% within how can diabetes be treated?	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	21.3%	52.7%	13.2%	2.2%	4.2%	6.4%	.1%	100.0%

Education * Have you ever heard of disease called diabetes?

Crosstab

			Have you ever heard of disease called diabetes?			
			No response	Yes	No	Total
Education	No response	Count	2	33	2	37
		% within Education	5.4%	89.2%	5.4%	100.0%
		% within Have you ever heard of disease called diabetes?	15.4%	2.3%	1.4%	2.3%
		% of Total	.1%	2.0%	.1%	2.3%
	No former education	Count	0	56	8	64
		% within Education	.0%	87.5%	12.5%	100.0%
		% within Have you ever heard of disease called diabetes?	.0%	3.8%	5.6%	4.0%
		% of Total	.0%	3.5%	.5%	4.0%
	Primary education	Count	1	135	18	154
		% within Education	.6%	87.7%	11.7%	100.0%
		% within Have you ever heard of disease called diabetes?	7.7%	9.2%	12.5%	9.5%
		% of Total	.1%	8.3%	1.1%	9.5%
	Secondary	Count	4	329	31	364
		% within Education	1.1%	90.4%	8.5%	100.0%
		% within Have you ever heard of disease called diabetes?	30.8%	22.5%	21.5%	22.5%
		% of Total	.2%	20.3%	1.9%	22.5%
	Colleges of education	Count	2	231	34	267
		% within Education	.7%	86.5%	12.7%	100.0%
		% within Have you ever heard of disease called diabetes?	15.4%	15.8%	23.6%	16.5%
		% of Total	.1%	14.3%	2.1%	16.5%
	Polytechnic	Count	0	248	26	274

		% within Education	.0%	90.5%	9.5%	100.0%
		% within Have you ever heard of disease called diabetes?	.0%	17.0%	18.1%	16.9%
		% of Total	.0%	15.3%	1.6%	16.9%
	University education	Count	2	391	24	417
		% within Education	.5%	93.8%	5.8%	100.0%
		% within Have you ever heard of disease called diabetes?	15.4%	26.7%	16.7%	25.8%
		% of Total	.1%	24.2%	1.5%	25.8%
	Others	Count	2	39	1	42
		% within Education	4.8%	92.9%	2.4%	100.0%
		% within Have you ever heard of disease called diabetes?	15.4%	2.7%	.7%	2.6%
		% of Total	.1%	2.4%	.1%	2.6%
Total		Count	13	1462	144	1619
		% within Education	.8%	90.3%	8.9%	100.0%
		% within Have you ever heard of disease called diabetes?	100.0%	100.0%	100.0%	100.0%
		% of Total	.8%	90.3%	8.9%	100.0%

Education * If yes, how did you get to know about it?

Crosstab

			If yes, how did you get to know about it?							
			No response	Print media	Electronic media	Church/Mosque	Hospital	School	Others	Total
Education	No response	Count	4	0	11	1	7	3	11	37
		% within Education	10.8%	.0%	29.7%	2.7%	18.9%	8.1%	29.7%	100.0%
		% within If yes, how did you get to know about it?	2.6%	.0%	2.3%	1.1%	1.6%	1.7%	8.8%	2.3%
		% of Total	.2%	.0%	.7%	.1%	.4%	.2%	.7%	2.3%
	No former education	Count	6	1	15	6	16	3	17	64
		% within Education	9.4%	1.6%	23.4%	9.4%	25.0%	4.7%	26.6%	100.0%
		% within If yes, how did you get to know about it?	3.9%	.6%	3.2%	6.6%	3.7%	1.7%	13.6%	4.0%
		% of Total	.4%	.1%	.9%	.4%	1.0%	.2%	1.1%	4.0%
	Primary education	Count	19	6	54	10	26	19	20	154
		% within Education	12.3%	3.9%	35.1%	6.5%	16.9%	12.3%	13.0%	100.0%
		% within If yes, how did you get to know about it?	12.4%	3.5%	11.5%	11.0%	6.1%	10.5%	16.0%	9.5%
		% of Total	1.2%	.4%	3.3%	.6%	1.6%	1.2%	1.2%	9.5%
	Secondary	Count	32	36	130	13	107	20	26	364
		% within Education	8.8%	9.9%	35.7%	3.6%	29.4%	5.5%	7.1%	100.0%

	% within If yes, how did you get to know about it?	20.9%	20.9%	27.7%	14.3%	25.1%	11.0%	20.8%	22.5%
	% of Total	2.0%	2.2%	8.0%	.8%	6.6%	1.2%	1.6%	22.5%
Colleges of education	Count	35	22	73	15	81	30	11	267
	% within Education	13.1%	8.2%	27.3%	5.6%	30.3%	11.2%	4.1%	100.0%
	% within If yes, how did you get to know about it?	22.9%	12.8%	15.5%	16.5%	19.0%	16.6%	8.8%	16.5%
	% of Total	2.2%	1.4%	4.5%	.9%	5.0%	1.9%	.7%	16.5%
Polytechnic	Count	27	32	90	10	73	30	12	274
	% within Education	9.9%	11.7%	32.8%	3.6%	26.6%	10.9%	4.4%	100.0%
	% within If yes, how did you get to know about it?	17.6%	18.6%	19.1%	11.0%	17.1%	16.6%	9.6%	16.9%
	% of Total	1.7%	2.0%	5.6%	.6%	4.5%	1.9%	.7%	16.9%
University education	Count	27	71	86	30	109	68	26	417
	% within Education	6.5%	17.0%	20.6%	7.2%	26.1%	16.3%	6.2%	100.0%
	% within If yes, how did you get to know about it?	17.6%	41.3%	18.3%	33.0%	25.5%	37.6%	20.8%	25.8%
	% of Total	1.7%	4.4%	5.3%	1.9%	6.7%	4.2%	1.6%	25.8%
Others	Count	3	4	11	6	8	8	2	42
	% within Education	7.1%	9.5%	26.2%	14.3%	19.0%	19.0%	4.8%	100.0%
	% within If yes, how did you get to know about it?	2.0%	2.3%	2.3%	6.6%	1.9%	4.4%	1.6%	2.6%

	% of Total	.2%	.2%	.7%	.4%	.5%	.5%	.1%	2.6%
Total	Count	153	172	470	91	427	181	125	1619
	% within Education	9.5%	10.6%	29.0%	5.6%	26.4%	11.2%	7.7%	100.0%
	% within If yes, how did you get to know about it?	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	9.5%	10.6%	29.0%	5.6%	26.4%	11.2%	7.7%	100.0%

Education * Have you checked your diabetes status

Crosstab

			Have you checked your diabetes status			
			No response	Yes	No	Total
Education	No response	Count	0	17	20	37
		% within Education	.0%	45.9%	54.1%	100.0%
		% within Have you checked your diabetes status	.0%	2.8%	2.0%	2.3%
		% of Total	.0%	1.1%	1.2%	2.3%
	No former education	Count	3	19	42	64
		% within Education	4.7%	29.7%	65.6%	100.0%
		% within Have you checked your diabetes status	15.8%	3.1%	4.3%	4.0%
		% of Total	.2%	1.2%	2.6%	4.0%
	Primary education	Count	4	60	90	154
		% within Education	2.6%	39.0%	58.4%	100.0%
		% within Have you checked your diabetes status	21.1%	9.7%	9.1%	9.5%
		% of Total	.2%	3.7%	5.6%	9.5%
	Secondary	Count	4	112	248	364
		% within Education	1.1%	30.8%	68.1%	100.0%
		% within Have you checked your diabetes status	21.1%	18.2%	25.2%	22.5%
		% of Total	.2%	6.9%	15.3%	22.5%
	Colleges of education	Count	3	99	165	267
		% within Education	1.1%	37.1%	61.8%	100.0%
		% within Have you checked your diabetes status	15.8%	16.1%	16.8%	16.5%

		% of Total	.2%	6.1%	10.2%	16.5%
	Polytechnic	Count	0	88	186	274
		% within Education	.0%	32.1%	67.9%	100.0%
		% within Have you checked your diabetes status	.0%	14.3%	18.9%	16.9%
		% of Total	.0%	5.4%	11.5%	16.9%
	University education	Count	3	208	206	417
		% within Education	.7%	49.9%	49.4%	100.0%
		% within Have you checked your diabetes status	15.8%	33.8%	20.9%	25.8%
		% of Total	.2%	12.8%	12.7%	25.8%
	Others	Count	2	13	27	42
		% within Education	4.8%	31.0%	64.3%	100.0%
		% within Have you checked your diabetes status	10.5%	2.1%	2.7%	2.6%
		% of Total	.1%	.8%	1.7%	2.6%
Total		Count	19	616	984	1619
		% within Education	1.2%	38.0%	60.8%	100.0%
		% within Have you checked your diabetes status	100.0%	100.0%	100.0%	100.0%
		% of Total	1.2%	38.0%	60.8%	100.0%

Education * If no, would you be willing to check your diabetes status

Crosstab

			If no, would you be willing to check your diabetes status			
			No response	Yes	No	Total
Education	No response	Count	17	12	8	37
		% within Education	45.9%	32.4%	21.6%	100.0%
		% within If no, would you be willing to check your diabetes status	2.8%	1.6%	3.2%	2.3%
		% of Total	1.1%	.7%	.5%	2.3%
	No former education	Count	22	24	18	64
		% within Education	34.4%	37.5%	28.1%	100.0%
		% within If no, would you be willing to check your diabetes status	3.6%	3.2%	7.2%	4.0%
		% of Total	1.4%	1.5%	1.1%	4.0%
	Primary education	Count	62	67	25	154
		% within Education	40.3%	43.5%	16.2%	100.0%
		% within If no, would you be willing to check your diabetes status	10.0%	8.9%	10.0%	9.5%
		% of Total	3.8%	4.1%	1.5%	9.5%
	Secondary	Count	114	192	58	364
		% within Education	31.3%	52.7%	15.9%	100.0%
		% within If no, would you be willing to check your diabetes status	18.5%	25.5%	23.3%	22.5%
		% of Total	7.0%	11.9%	3.6%	22.5%

	Colleges of education	Count	100	127	40	267
		% within Education	37.5%	47.6%	15.0%	100.0%
		% within If no, would you be willing to check your diabetes status	16.2%	16.9%	16.1%	16.5%
		% of Total	6.2%	7.8%	2.5%	16.5%
	Polytechnic	Count	78	143	53	274
		% within Education	28.5%	52.2%	19.3%	100.0%
		% within If no, would you be willing to check your diabetes status	12.6%	19.0%	21.3%	16.9%
		% of Total	4.8%	8.8%	3.3%	16.9%
	University education	Count	209	168	40	417
		% within Education	50.1%	40.3%	9.6%	100.0%
		% within If no, would you be willing to check your diabetes status	33.9%	22.3%	16.1%	25.8%
		% of Total	12.9%	10.4%	2.5%	25.8%
	Others	Count	15	20	7	42
		% within Education	35.7%	47.6%	16.7%	100.0%
		% within If no, would you be willing to check your diabetes status	2.4%	2.7%	2.8%	2.6%
		% of Total	.9%	1.2%	.4%	2.6%
Total		Count	617	753	249	1619
		% within Education	38.1%	46.5%	15.4%	100.0%
		% within If no, would you be willing to check your diabetes status	100.0%	100.0%	100.0%	100.0%
		% of Total	38.1%	46.5%	15.4%	100.0%

Education * What is the main cause of diabetes?

Crosstab

			What is the main cause of diabetes?											Total
			No response	Excess Sugar	Excess Carbohydrate	Inheritance	Alcohol	Low level/lack of insuline	Overweight	Sexual intercourse	Old age	Diseases	Lack of water in the body	
Education	No response	Count	4	27	3	1	0	2	0	0	0	0	0	37
		% within Education	10.8%	73.0%	8.1%	2.7%	.0%	5.4%	.0%	.0%	.0%	.0%	.0%	100.0%
		% within What is the main cause of diabetes?	1.7%	2.8%	1.4%	2.5%	.0%	2.4%	.0%	.0%	.0%	.0%	.0%	2.3%
		% of Total	.2%	1.7%	.2%	.1%	.0%	.1%	.0%	.0%	.0%	.0%	.0%	2.3%
	No former education	Count	19	33	4	2	0	1	1	3	1	0	0	64
		% within Education	29.7%	51.6%	6.3%	3.1%	.0%	1.6%	1.6%	4.7%	1.6%	.0%	.0%	100.0%
		% within What is the main cause of diabetes?	7.9%	3.4%	1.8%	5.0%	.0%	1.2%	20.0%	15.8%	33.3%	.0%	.0%	4.0%
		% of Total	1.2%	2.0%	.2%	.1%	.0%	.1%	.1%	.2%	.1%	.0%	.0%	4.0%
	Primary education	Count	30	85	21	4	2	9	0	3	0	0	0	154
		% within Education	19.5%	55.2%	13.6%	2.6%	1.3%	5.8%	.0%	1.9%	.0%	.0%	.0%	100.0%
		% within What is the main cause of diabetes?	12.5%	8.7%	9.7%	10.0%	7.1%	10.8%	.0%	15.8%	.0%	.0%	.0%	9.5%

	% of Total	1.9%	5.3%	1.3%	.2%	.1%	.6%	.0%	.2%	.0%	.0%	.0%	9.5%
Secondary	Count	56	216	42	8	12	19	1	9	0	0	1	364
	% within Education	15.4%	59.3%	11.5%	2.2%	3.3%	5.2%	.3%	2.5%	.0%	.0%	.3%	100.0%
	% within What is the main cause of diabetes?	23.3%	22.0%	19.4%	20.0%	42.9%	22.9%	20.0%	47.4%	.0%	.0%	100.0%	22.5%
	% of Total	3.5%	13.3%	2.6%	.5%	.7%	1.2%	.1%	.6%	.0%	.0%	.1%	22.5%
Colleges of education	Count	32	169	45	3	3	11	1	2	1	0	0	267
	% within Education	12.0%	63.3%	16.9%	1.1%	1.1%	4.1%	.4%	.7%	.4%	.0%	.0%	100.0%
	% within What is the main cause of diabetes?	13.3%	17.2%	20.7%	7.5%	10.7%	13.3%	20.0%	10.5%	33.3%	.0%	.0%	16.5%
	% of Total	2.0%	10.4%	2.8%	.2%	.2%	.7%	.1%	.1%	.1%	.0%	.0%	16.5%
Polytechnic	Count	37	160	41	10	7	16	1	1	1	0	0	274
	% within Education	13.5%	58.4%	15.0%	3.6%	2.6%	5.8%	.4%	.4%	.4%	.0%	.0%	100.0%
	% within What is the main cause of diabetes?	15.4%	16.3%	18.9%	25.0%	25.0%	19.3%	20.0%	5.3%	33.3%	.0%	.0%	16.9%
	% of Total	2.3%	9.9%	2.5%	.6%	.4%	1.0%	.1%	.1%	.1%	.0%	.0%	16.9%
University education	Count	52	266	55	12	4	24	1	1	0	2	0	417
	% within Education	12.5%	63.8%	13.2%	2.9%	1.0%	5.8%	.2%	.2%	.0%	.5%	.0%	100.0%

		% within What is the main cause of diabetes?	21.7%	27.1%	25.3%	30.0%	14.3%	28.9%	20.0%	5.3%	.0%	66.7%	.0%	25.8%
		% of Total	3.2%	16.4%	3.4%	.7%	.2%	1.5%	.1%	.1%	.0%	.1%	.0%	25.8%
	Others	Count	10	24	6	0	0	1	0	0	0	1	0	42
		% within Education	23.8%	57.1%	14.3%	.0%	.0%	2.4%	.0%	.0%	.0%	2.4%	.0%	100.0%
		% within What is the main cause of diabetes?	4.2%	2.4%	2.8%	.0%	.0%	1.2%	.0%	.0%	.0%	33.3%	.0%	2.6%
		% of Total	.6%	1.5%	.4%	.0%	.0%	.1%	.0%	.0%	.0%	.1%	.0%	2.6%
Total		Count	240	980	217	40	28	83	5	19	3	3	1	1619
		% within Education	14.8%	60.5%	13.4%	2.5%	1.7%	5.1%	.3%	1.2%	.2%	.2%	.1%	100.0%
		% within What is the main cause of diabetes?	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	14.8%	60.5%	13.4%	2.5%	1.7%	5.1%	.3%	1.2%	.2%	.2%	.1%	100.0%

Education * What is the major symptom of diabetes?

Crosstab

			What is the major symptom of diabetes?										Total
			No response	Ant gather on urine	Frequent Urinating	Sweating, swelling and prolong wounds	Loss of weight	Hypertension/blood disfunctions	Mucus excreta	coloured urine/eye	Fatigue	Low sperm count	
Education	No response	Count	9	3	18	3	2	2	0	0	0	0	37
		% within Education	24.3%	8.1%	48.6%	8.1%	5.4%	5.4%	.0%	.0%	.0%	.0%	100.0%
		% within What is the major symptom of diabetes?	2.2%	1.2%	2.8%	1.9%	1.7%	6.7%	.0%	.0%	.0%	.0%	2.3%
		% of Total	.6%	.2%	1.1%	.2%	.1%	.1%	.0%	.0%	.0%	.0%	2.3%
	No former education	Count	19	15	21	3	4	1	1	0	0	0	64
		% within Education	29.7%	23.4%	32.8%	4.7%	6.3%	1.6%	1.6%	.0%	.0%	.0%	100.0%
		% within What is the major symptom of diabetes?	4.7%	6.0%	3.3%	1.9%	3.4%	3.3%	12.5%	.0%	.0%	.0%	4.0%
		% of Total	1.2%	.9%	1.3%	.2%	.2%	.1%	.1%	.0%	.0%	.0%	4.0%
	Primary education	Count	49	21	53	12	15	2	0	0	2	0	154
		% within Education	31.8%	13.6%	34.4%	7.8%	9.7%	1.3%	.0%	.0%	1.3%	.0%	100.0%
		% within What is the major symptom of diabetes?	12.2%	8.4%	8.4%	7.7%	12.9%	6.7%	.0%	.0%	28.6%	.0%	9.5%

		% of Total	3.0%	1.3%	3.3%	.7%	.9%	.1%	.0%	.0%	.1%	.0%	9.5%
	Secondary	Count	82	60	141	35	23	7	3	11	2	0	364
		% within Education	22.5%	16.5%	38.7%	9.6%	6.3%	1.9%	.8%	3.0%	.5%	.0%	100.0%
		% within What is the major symptom of diabetes?	20.3%	24.0%	22.3%	22.4%	19.8%	23.3%	37.5%	73.3%	28.6%	.0%	22.5%
		% of Total	5.1%	3.7%	8.7%	2.2%	1.4%	.4%	.2%	.7%	.1%	.0%	22.5%
	Colleges of education	Count	53	54	103	27	18	9	2	1	0	0	267
		% within Education	19.9%	20.2%	38.6%	10.1%	6.7%	3.4%	.7%	.4%	.0%	.0%	100.0%
		% within What is the major symptom of diabetes?	13.2%	21.6%	16.3%	17.3%	15.5%	30.0%	25.0%	6.7%	.0%	.0%	16.5%
		% of Total	3.3%	3.3%	6.4%	1.7%	1.1%	.6%	.1%	.1%	.0%	.0%	16.5%
	Polytechnic	Count	83	42	105	20	20	2	0	1	1	0	274
		% within Education	30.3%	15.3%	38.3%	7.3%	7.3%	.7%	.0%	.4%	.4%	.0%	100.0%
		% within What is the major symptom of diabetes?	20.6%	16.8%	16.6%	12.8%	17.2%	6.7%	.0%	6.7%	14.3%	.0%	16.9%
		% of Total	5.1%	2.6%	6.5%	1.2%	1.2%	.1%	.0%	.1%	.1%	.0%	16.9%
	University education	Count	97	50	176	51	29	7	2	2	2	1	417
		% within Education	23.3%	12.0%	42.2%	12.2%	7.0%	1.7%	.5%	.5%	.5%	.2%	100.0%
		% within What is the major symptom of diabetes?	24.1%	20.0%	27.8%	32.7%	25.0%	23.3%	25.0%	13.3%	28.6%	100.0%	25.8%

		% of Total	6.0%	3.1%	10.9%	3.2%	1.8%	.4%	.1%	.1%	.1%	.1%	25.8%
	Others	Count	11	5	16	5	5	0	0	0	0	0	42
		% within Education	26.2%	11.9%	38.1%	11.9%	11.9%	.0%	.0%	.0%	.0%	.0%	100.0%
		% within What is the major symptom of diabetes?	2.7%	2.0%	2.5%	3.2%	4.3%	.0%	.0%	.0%	.0%	.0%	2.6%
		% of Total	.7%	.3%	1.0%	.3%	.3%	.0%	.0%	.0%	.0%	.0%	2.6%
Total		Count	403	250	633	156	116	30	8	15	7	1	1619
		% within Education	24.9%	15.4%	39.1%	9.6%	7.2%	1.9%	.5%	.9%	.4%	.1%	100.0%
		% within What is the major symptom of diabetes?	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	24.9%	15.4%	39.1%	9.6%	7.2%	1.9%	.5%	.9%	.4%	.1%	100.0%

Education * how can diabetes be treated?

Crosstab

			how can diabetes be treated?							Total
			No response	Medical treatment and drugs like insuline	Food supplement to reduce sugar	Excercise	Herbal treatment/herbalist	Low sugar intake	Prayer	
Education	No response	Count	10	19	2	0	6	0	0	37
		% within Education	27.0%	51.4%	5.4%	.0%	16.2%	.0%	.0%	100.0%
		% within how can diabetes be treated?	2.9%	2.2%	.9%	.0%	8.8%	.0%	.0%	2.3%
		% of Total	.6%	1.2%	.1%	.0%	.4%	.0%	.0%	2.3%
	No former education	Count	20	30	7	1	5	1	0	64
		% within Education	31.3%	46.9%	10.9%	1.6%	7.8%	1.6%	.0%	100.0%
		% within how can diabetes be treated?	5.8%	3.5%	3.3%	2.9%	7.4%	1.0%	.0%	4.0%
		% of Total	1.2%	1.9%	.4%	.1%	.3%	.1%	.0%	4.0%
	Primary education	Count	45	76	16	1	8	8	0	154
		% within Education	29.2%	49.4%	10.4%	.6%	5.2%	5.2%	.0%	100.0%
		% within how can diabetes be treated?	13.0%	8.9%	7.5%	2.9%	11.8%	7.8%	.0%	9.5%
		% of Total	2.8%	4.7%	1.0%	.1%	.5%	.5%	.0%	9.5%
	Secondary	Count	76	196	40	11	22	19	0	364
		% within Education	20.9%	53.8%	11.0%	3.0%	6.0%	5.2%	.0%	100.0%

		% within how can diabetes be treated?	22.0%	23.0%	18.8%	31.4%	32.4%	18.4%	.0%	22.5%
		% of Total	4.7%	12.1%	2.5%	.7%	1.4%	1.2%	.0%	22.5%
	Colleges of education	Count	47	144	34	8	12	21	1	267
		% within Education	17.6%	53.9%	12.7%	3.0%	4.5%	7.9%	.4%	100.0%
		% within how can diabetes be treated?	13.6%	16.9%	16.0%	22.9%	17.6%	20.4%	100.0%	16.5%
		% of Total	2.9%	8.9%	2.1%	.5%	.7%	1.3%	.1%	16.5%
	Polytechnic	Count	62	152	42	3	3	12	0	274
		% within Education	22.6%	55.5%	15.3%	1.1%	1.1%	4.4%	.0%	100.0%
		% within how can diabetes be treated?	18.0%	17.8%	19.7%	8.6%	4.4%	11.7%	.0%	16.9%
		% of Total	3.8%	9.4%	2.6%	.2%	.2%	.7%	.0%	16.9%
	University education	Count	78	219	65	9	11	35	0	417
		% within Education	18.7%	52.5%	15.6%	2.2%	2.6%	8.4%	.0%	100.0%
		% within how can diabetes be treated?	22.6%	25.6%	30.5%	25.7%	16.2%	34.0%	.0%	25.8%
		% of Total	4.8%	13.5%	4.0%	.6%	.7%	2.2%	.0%	25.8%
	Others	Count	7	18	7	2	1	7	0	42
		% within Education	16.7%	42.9%	16.7%	4.8%	2.4%	16.7%	.0%	100.0%
		% within how can diabetes be treated?	2.0%	2.1%	3.3%	5.7%	1.5%	6.8%	.0%	2.6%
		% of Total	.4%	1.1%	.4%	.1%	.1%	.4%	.0%	2.6%

Total	Count	345	854	213	35	68	103	1	1619
	% within Education	21.3%	52.7%	13.2%	2.2%	4.2%	6.4%	.1%	100.0%
	% within how can diabetes be treated?	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	21.3%	52.7%	13.2%	2.2%	4.2%	6.4%	.1%	100.0%

Occupation * Have you ever heard of disease called diabetes?

Crosstab

			Have you ever heard of disease called diabetes?			
			No response	Yes	No	Total
Occupation	No response	Count	0	24	1	25
		% within Occupation	.0%	96.0%	4.0%	100.0%
		% within Have you ever heard of disease called diabetes?	.0%	1.6%	.7%	1.5%
		% of Total	.0%	1.5%	.1%	1.5%
	Unemployed	Count	1	159	15	175
		% within Occupation	.6%	90.9%	8.6%	100.0%
		% within Have you ever heard of disease called diabetes?	7.7%	10.9%	10.4%	10.8%
		% of Total	.1%	9.8%	.9%	10.8%
	Student	Count	2	298	47	347
		% within Occupation	.6%	85.9%	13.5%	100.0%
		% within Have you ever heard of disease called diabetes?	15.4%	20.4%	32.6%	21.4%
		% of Total	.1%	18.4%	2.9%	21.4%
	Farmer	Count	0	104	11	115
		% within Occupation	.0%	90.4%	9.6%	100.0%
		% within Have you ever heard of disease called diabetes?	.0%	7.1%	7.6%	7.1%
		% of Total	.0%	6.4%	.7%	7.1%
	Trader/Bussinessperson	Count	0	327	33	360
		% within Occupation	.0%	90.8%	9.2%	100.0%
		% within Have you ever heard of disease called diabetes?	.0%	22.4%	22.9%	22.2%

		% of Total	.0%	20.2%	2.0%	22.2%
	Civil servant	Count	6	322	21	349
		% within Occupation	1.7%	92.3%	6.0%	100.0%
		% within Have you ever heard of disease called diabetes?	46.2%	22.0%	14.6%	21.6%
		% of Total	.4%	19.9%	1.3%	21.6%
	Professional	Count	2	132	9	143
		% within Occupation	1.4%	92.3%	6.3%	100.0%
		% within Have you ever heard of disease called diabetes?	15.4%	9.0%	6.3%	8.8%
		% of Total	.1%	8.2%	.6%	8.8%
	Retired	Count	0	36	2	38
		% within Occupation	.0%	94.7%	5.3%	100.0%
		% within Have you ever heard of disease called diabetes?	.0%	2.5%	1.4%	2.3%
		% of Total	.0%	2.2%	.1%	2.3%
	Others	Count	2	60	5	67
		% within Occupation	3.0%	89.6%	7.5%	100.0%
		% within Have you ever heard of disease called diabetes?	15.4%	4.1%	3.5%	4.1%
		% of Total	.1%	3.7%	.3%	4.1%
Total		Count	13	1462	144	1619
		% within Occupation	.8%	90.3%	8.9%	100.0%
		% within Have you ever heard of disease called diabetes?	100.0%	100.0%	100.0%	100.0%
		% of Total	.8%	90.3%	8.9%	100.0%

Occupation * If yes, how did you get to know about it?

Crosstab

			If yes, how did you get to know about it?							
			No response	Print media	Electronic media	Church/Mosque	Hospital	School	Others	Total
Occupation	No response	Count	1	3	8	0	8	4	1	25
		% within Occupation	4.0%	12.0%	32.0%	.0%	32.0%	16.0%	4.0%	100.0%
		% within If yes, how did you get to know about it?	.7%	1.7%	1.7%	.0%	1.9%	2.2%	.8%	1.5%
		% of Total	.1%	.2%	.5%	.0%	.5%	.2%	.1%	1.5%
	Unemployed	Count	17	23	34	18	42	32	9	175
		% within Occupation	9.7%	13.1%	19.4%	10.3%	24.0%	18.3%	5.1%	100.0%
		% within If yes, how did you get to know about it?	11.1%	13.4%	7.2%	19.8%	9.8%	17.7%	7.2%	10.8%
		% of Total	1.1%	1.4%	2.1%	1.1%	2.6%	2.0%	.6%	10.8%
	Student	Count	48	33	78	20	104	51	13	347
		% within Occupation	13.8%	9.5%	22.5%	5.8%	30.0%	14.7%	3.7%	100.0%
		% within If yes, how did you get to know about it?	31.4%	19.2%	16.6%	22.0%	24.4%	28.2%	10.4%	21.4%
		% of Total	3.0%	2.0%	4.8%	1.2%	6.4%	3.2%	.8%	21.4%
	Farmer	Count	11	11	29	9	30	6	19	115
		% within Occupation	9.6%	9.6%	25.2%	7.8%	26.1%	5.2%	16.5%	100.0%

	% within If yes, how did you get to know about it?	7.2%	6.4%	6.2%	9.9%	7.0%	3.3%	15.2%	7.1%
	% of Total	.7%	.7%	1.8%	.6%	1.9%	.4%	1.2%	7.1%
Trader/Bussinessperson	Count	32	30	129	17	91	30	31	360
	% within Occupation	8.9%	8.3%	35.8%	4.7%	25.3%	8.3%	8.6%	100.0%
	% within If yes, how did you get to know about it?	20.9%	17.4%	27.4%	18.7%	21.3%	16.6%	24.8%	22.2%
	% of Total	2.0%	1.9%	8.0%	1.1%	5.6%	1.9%	1.9%	22.2%
Civil servant	Count	26	50	97	23	93	35	25	349
	% within Occupation	7.4%	14.3%	27.8%	6.6%	26.6%	10.0%	7.2%	100.0%
	% within If yes, how did you get to know about it?	17.0%	29.1%	20.6%	25.3%	21.8%	19.3%	20.0%	21.6%
	% of Total	1.6%	3.1%	6.0%	1.4%	5.7%	2.2%	1.5%	21.6%
Professional	Count	9	17	54	0	36	12	15	143
	% within Occupation	6.3%	11.9%	37.8%	.0%	25.2%	8.4%	10.5%	100.0%
	% within If yes, how did you get to know about it?	5.9%	9.9%	11.5%	.0%	8.4%	6.6%	12.0%	8.8%
	% of Total	.6%	1.1%	3.3%	.0%	2.2%	.7%	.9%	8.8%
Retired	Count	2	0	19	0	9	3	5	38
	% within Occupation	5.3%	.0%	50.0%	.0%	23.7%	7.9%	13.2%	100.0%
	% within If yes, how did you get to know about it?	1.3%	.0%	4.0%	.0%	2.1%	1.7%	4.0%	2.3%
	% of Total	.1%	.0%	1.2%	.0%	.6%	.2%	.3%	2.3%

Others	Count	7	5	22	4	14	8	7	67
	% within Occupation	10.4%	7.5%	32.8%	6.0%	20.9%	11.9%	10.4%	100.0%
	% within If yes, how did you get to know about it?	4.6%	2.9%	4.7%	4.4%	3.3%	4.4%	5.6%	4.1%
	% of Total	.4%	.3%	1.4%	.2%	.9%	.5%	.4%	4.1%
Total	Count	153	172	470	91	427	181	125	1619
	% within Occupation	9.5%	10.6%	29.0%	5.6%	26.4%	11.2%	7.7%	100.0%
	% within If yes, how did you get to know about it?	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	9.5%	10.6%	29.0%	5.6%	26.4%	11.2%	7.7%	100.0%

Occupation * Have you checked your diabetes status

Crosstab

			Have you checked your diabetes status			
			No response	Yes	No	Total
Occupation	No response	Count	0	8	17	25
		% within Occupation	.0%	32.0%	68.0%	100.0%
		% within Have you checked your diabetes status	.0%	1.3%	1.7%	1.5%
		% of Total	.0%	.5%	1.1%	1.5%
	Unemployed	Count	3	64	108	175
		% within Occupation	1.7%	36.6%	61.7%	100.0%
		% within Have you checked your diabetes status	15.8%	10.4%	11.0%	10.8%
		% of Total	.2%	4.0%	6.7%	10.8%
	Student	Count	2	118	227	347
		% within Occupation	.6%	34.0%	65.4%	100.0%
		% within Have you checked your diabetes status	10.5%	19.2%	23.1%	21.4%
		% of Total	.1%	7.3%	14.0%	21.4%
	Farmer	Count	0	34	81	115
		% within Occupation	.0%	29.6%	70.4%	100.0%
		% within Have you checked your diabetes status	.0%	5.5%	8.2%	7.1%
		% of Total	.0%	2.1%	5.0%	7.1%
	Trader/Bussinessperson	Count	3	131	226	360
		% within Occupation	.8%	36.4%	62.8%	100.0%
		% within Have you checked your diabetes status	15.8%	21.3%	23.0%	22.2%

		% of Total	.2%	8.1%	14.0%	22.2%
	Civil servant	Count	7	153	189	349
		% within Occupation	2.0%	43.8%	54.2%	100.0%
		% within Have you checked your diabetes status	36.8%	24.8%	19.2%	21.6%
		% of Total	.4%	9.5%	11.7%	21.6%
	Professional	Count	3	60	80	143
		% within Occupation	2.1%	42.0%	55.9%	100.0%
		% within Have you checked your diabetes status	15.8%	9.7%	8.1%	8.8%
		% of Total	.2%	3.7%	4.9%	8.8%
	Retired	Count	0	19	19	38
		% within Occupation	.0%	50.0%	50.0%	100.0%
		% within Have you checked your diabetes status	.0%	3.1%	1.9%	2.3%
		% of Total	.0%	1.2%	1.2%	2.3%
	Others	Count	1	29	37	67
		% within Occupation	1.5%	43.3%	55.2%	100.0%
		% within Have you checked your diabetes status	5.3%	4.7%	3.8%	4.1%
		% of Total	.1%	1.8%	2.3%	4.1%
Total		Count	19	616	984	1619
		% within Occupation	1.2%	38.0%	60.8%	100.0%
		% within Have you checked your diabetes status	100.0%	100.0%	100.0%	100.0%
		% of Total	1.2%	38.0%	60.8%	100.0%

Occupation * If no, would you be willing to check your diabetes status

Crosstab

			If no, would you be willing to check your diabetes status			
			No response	Yes	No	Total
Occupation	No response	Count	8	13	4	25
		% within Occupation	32.0%	52.0%	16.0%	100.0%
		% within If no, would you be willing to check your diabetes status	1.3%	1.7%	1.6%	1.5%
		% of Total	.5%	.8%	.2%	1.5%
	Unemployed	Count	67	81	27	175
		% within Occupation	38.3%	46.3%	15.4%	100.0%
		% within If no, would you be willing to check your diabetes status	10.9%	10.8%	10.8%	10.8%
		% of Total	4.1%	5.0%	1.7%	10.8%
	Student	Count	111	177	59	347
		% within Occupation	32.0%	51.0%	17.0%	100.0%
		% within If no, would you be willing to check your diabetes status	18.0%	23.5%	23.7%	21.4%
		% of Total	6.9%	10.9%	3.6%	21.4%
	Farmer	Count	33	61	21	115
		% within Occupation	28.7%	53.0%	18.3%	100.0%
		% within If no, would you be willing to check your diabetes status	5.3%	8.1%	8.4%	7.1%
		% of Total	2.0%	3.8%	1.3%	7.1%
	Trader/Bussinessperson	Count	129	178	53	360
		% within Occupation	35.8%	49.4%	14.7%	100.0%
		% within If no, would you be willing to check your diabetes status	20.9%	23.6%	21.3%	22.2%
		% of Total	8.0%	11.0%	3.3%	22.2%
	Civil servant	Count	160	141	48	349

		% within Occupation	45.8%	40.4%	13.8%	100.0%
		% within If no, would you be willing to check your diabetes status	25.9%	18.7%	19.3%	21.6%
		% of Total	9.9%	8.7%	3.0%	21.6%
	Professional	Count	61	66	16	143
		% within Occupation	42.7%	46.2%	11.2%	100.0%
		% within If no, would you be willing to check your diabetes status	9.9%	8.8%	6.4%	8.8%
		% of Total	3.8%	4.1%	1.0%	8.8%
	Retired	Count	19	17	2	38
		% within Occupation	50.0%	44.7%	5.3%	100.0%
		% within If no, would you be willing to check your diabetes status	3.1%	2.3%	.8%	2.3%
		% of Total	1.2%	1.1%	.1%	2.3%
	Others	Count	29	19	19	67
		% within Occupation	43.3%	28.4%	28.4%	100.0%
		% within If no, would you be willing to check your diabetes status	4.7%	2.5%	7.6%	4.1%
		% of Total	1.8%	1.2%	1.2%	4.1%
Total		Count	617	753	249	1619
		% within Occupation	38.1%	46.5%	15.4%	100.0%
		% within If no, would you be willing to check your diabetes status	100.0%	100.0%	100.0%	100.0%
		% of Total	38.1%	46.5%	15.4%	100.0%

Occupation * What is the main cause of diabetes?

Crosstab

			What is the main cause of diabetes?											Total
			No response	Excess Sugar	Excess Carbohydrate	Inheritance	Alcohol	Low level/lack of insuline	Overweight	Sexual intercourse	Old age	Diseases	Lack of water in the body	
Occupation	No response	Count	3	14	6	0	0	2	0	0	0	0	0	25
		% within Occupation	12.0%	56.0%	24.0%	.0%	.0%	8.0%	.0%	.0%	.0%	.0%	.0%	100.0%
		% within What is the main cause of diabetes?	1.3%	1.4%	2.8%	.0%	.0%	2.4%	.0%	.0%	.0%	.0%	.0%	1.5%
		% of Total	.2%	.9%	.4%	.0%	.0%	.1%	.0%	.0%	.0%	.0%	.0%	1.5%
	Unemployed	Count	34	104	21	1	3	11	0	1	0	0	0	175
		% within Occupation	19.4%	59.4%	12.0%	.6%	1.7%	6.3%	.0%	.6%	.0%	.0%	.0%	100.0%
		% within What is the main cause of diabetes?	14.2%	10.6%	9.7%	2.5%	10.7%	13.3%	.0%	5.3%	.0%	.0%	.0%	10.8%
		% of Total	2.1%	6.4%	1.3%	.1%	.2%	.7%	.0%	.1%	.0%	.0%	.0%	10.8%
	Student	Count	49	221	50	5	2	16	1	3	0	0	0	347
		% within Occupation	14.1%	63.7%	14.4%	1.4%	.6%	4.6%	.3%	.9%	.0%	.0%	.0%	100.0%
		% within What is the main cause of diabetes?	20.4%	22.6%	23.0%	12.5%	7.1%	19.3%	20.0%	15.8%	.0%	.0%	.0%	21.4%
		% of Total	3.0%	13.7%	3.1%	.3%	.1%	1.0%	.1%	.2%	.0%	.0%	.0%	21.4%

Farmer	Count	16	75	15	0	2	4	1	1	1	0	0	115
	% within Occupation	13.9%	65.2%	13.0%	.0%	1.7%	3.5%	.9%	.9%	.9%	.0%	.0%	100.0%
	% within What is the main cause of diabetes?	6.7%	7.7%	6.9%	.0%	7.1%	4.8%	20.0%	5.3%	33.3%	.0%	.0%	7.1%
	% of Total	1.0%	4.6%	.9%	.0%	.1%	.2%	.1%	.1%	.1%	.0%	.0%	7.1%
Trader/Bussinesperson	Count	49	215	45	7	12	18	3	10	0	0	1	360
	% within Occupation	13.6%	59.7%	12.5%	1.9%	3.3%	5.0%	.8%	2.8%	.0%	.0%	.3%	100.0%
	% within What is the main cause of diabetes?	20.4%	21.9%	20.7%	17.5%	42.9%	21.7%	60.0%	52.6%	.0%	.0%	100.0%	22.2%
	% of Total	3.0%	13.3%	2.8%	.4%	.7%	1.1%	.2%	.6%	.0%	.0%	.1%	22.2%
Civil servant	Count	55	221	41	14	4	10	0	0	1	3	0	349
	% within Occupation	15.8%	63.3%	11.7%	4.0%	1.1%	2.9%	.0%	.0%	.3%	.9%	.0%	100.0%
	% within What is the main cause of diabetes?	22.9%	22.6%	18.9%	35.0%	14.3%	12.0%	.0%	.0%	33.3%	100.0%	.0%	21.6%
	% of Total	3.4%	13.7%	2.5%	.9%	.2%	.6%	.0%	.0%	.1%	.2%	.0%	21.6%
Professional	Count	22	71	25	7	5	10	0	2	1	0	0	143
	% within Occupation	15.4%	49.7%	17.5%	4.9%	3.5%	7.0%	.0%	1.4%	.7%	.0%	.0%	100.0%
	% within What is the main cause of diabetes?	9.2%	7.2%	11.5%	17.5%	17.9%	12.0%	.0%	10.5%	33.3%	.0%	.0%	8.8%

		% of Total	1.4%	4.4%	1.5%	.4%	.3%	.6%	.0%	.1%	.1%	.0%	.0%	8.8%
	Retired	Count	4	16	9	1	0	7	0	1	0	0	0	38
		% within Occupation	10.5%	42.1%	23.7%	2.6%	.0%	18.4%	.0%	2.6%	.0%	.0%	.0%	100.0%
		% within What is the main cause of diabetes?	1.7%	1.6%	4.1%	2.5%	.0%	8.4%	.0%	5.3%	.0%	.0%	.0%	2.3%
		% of Total	.2%	1.0%	.6%	.1%	.0%	.4%	.0%	.1%	.0%	.0%	.0%	2.3%
	Others	Count	8	43	5	5	0	5	0	1	0	0	0	67
		% within Occupation	11.9%	64.2%	7.5%	7.5%	.0%	7.5%	.0%	1.5%	.0%	.0%	.0%	100.0%
		% within What is the main cause of diabetes?	3.3%	4.4%	2.3%	12.5%	.0%	6.0%	.0%	5.3%	.0%	.0%	.0%	4.1%
		% of Total	.5%	2.7%	.3%	.3%	.0%	.3%	.0%	.1%	.0%	.0%	.0%	4.1%
Total		Count	240	980	217	40	28	83	5	19	3	3	1	1619
		% within Occupation	14.8%	60.5%	13.4%	2.5%	1.7%	5.1%	.3%	1.2%	.2%	.2%	.1%	100.0%
		% within What is the main cause of diabetes?	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	14.8%	60.5%	13.4%	2.5%	1.7%	5.1%	.3%	1.2%	.2%	.2%	.1%	100.0%

Occupation * What is the major symptom of diabetes?

Crosstab

			What is the major symptom of diabetes?										Total
			No response	Ant gather on urine	Frequent Urinating	Sweating, swelling and prolong wounds	Loss of weight	Hypertension/blood disfunctions	Mucus excreta	coloured urine/eye	Fatigue	Low sperm count	
Occupation	No response	Count	4	10	9	2	0	0	0	0	0	0	25
		% within Occupation	16.0%	40.0%	36.0%	8.0%	.0%	.0%	.0%	.0%	.0%	.0%	100.0%
		% within What is the major symptom of diabetes?	1.0%	4.0%	1.4%	1.3%	.0%	.0%	.0%	.0%	.0%	.0%	1.5%
		% of Total	.2%	.6%	.6%	.1%	.0%	.0%	.0%	.0%	.0%	.0%	1.5%
	Unemployed	Count	54	14	76	18	10	2	0	0	0	1	175
		% within Occupation	30.9%	8.0%	43.4%	10.3%	5.7%	1.1%	.0%	.0%	.0%	.6%	100.0%
		% within What is the major symptom of diabetes?	13.4%	5.6%	12.0%	11.5%	8.6%	6.7%	.0%	.0%	.0%	100.0%	10.8%
		% of Total	3.3%	.9%	4.7%	1.1%	.6%	.1%	.0%	.0%	.0%	.1%	10.8%
	Student	Count	109	61	130	23	13	8	0	1	2	0	347
		% within Occupation	31.4%	17.6%	37.5%	6.6%	3.7%	2.3%	.0%	.3%	.6%	.0%	100.0%
		% within What is the major symptom of diabetes?	27.0%	24.4%	20.5%	14.7%	11.2%	26.7%	.0%	6.7%	28.6%	.0%	21.4%
		% of Total	6.7%	3.8%	8.0%	1.4%	.8%	.5%	.0%	.1%	.1%	.0%	21.4%
	Farmer	Count	29	16	43	12	10	2	1	2	0	0	115

	% within Occupation	25.2%	13.9%	37.4%	10.4%	8.7%	1.7%	.9%	1.7%	.0%	.0%	100.0%
	% within What is the major symptom of diabetes?	7.2%	6.4%	6.8%	7.7%	8.6%	6.7%	12.5%	13.3%	.0%	.0%	7.1%
	% of Total	1.8%	1.0%	2.7%	.7%	.6%	.1%	.1%	.1%	.0%	.0%	7.1%
Trader/Bussinessperson	Count	81	63	136	33	31	5	2	7	2	0	360
	% within Occupation	22.5%	17.5%	37.8%	9.2%	8.6%	1.4%	.6%	1.9%	.6%	.0%	100.0%
	% within What is the major symptom of diabetes?	20.1%	25.2%	21.5%	21.2%	26.7%	16.7%	25.0%	46.7%	28.6%	.0%	22.2%
	% of Total	5.0%	3.9%	8.4%	2.0%	1.9%	.3%	.1%	.4%	.1%	.0%	22.2%
Civil servant	Count	73	45	157	40	24	6	2	0	2	0	349
	% within Occupation	20.9%	12.9%	45.0%	11.5%	6.9%	1.7%	.6%	.0%	.6%	.0%	100.0%
	% within What is the major symptom of diabetes?	18.1%	18.0%	24.8%	25.6%	20.7%	20.0%	25.0%	.0%	28.6%	.0%	21.6%
	% of Total	4.5%	2.8%	9.7%	2.5%	1.5%	.4%	.1%	.0%	.1%	.0%	21.6%
Professional	Count	31	24	42	17	15	6	3	4	1	0	143
	% within Occupation	21.7%	16.8%	29.4%	11.9%	10.5%	4.2%	2.1%	2.8%	.7%	.0%	100.0%
	% within What is the major symptom of diabetes?	7.7%	9.6%	6.6%	10.9%	12.9%	20.0%	37.5%	26.7%	14.3%	.0%	8.8%
	% of Total	1.9%	1.5%	2.6%	1.1%	.9%	.4%	.2%	.2%	.1%	.0%	8.8%
Retired	Count	11	6	14	4	3	0	0	0	0	0	38
	% within Occupation	28.9%	15.8%	36.8%	10.5%	7.9%	.0%	.0%	.0%	.0%	.0%	100.0%

		% within What is the major symptom of diabetes?	2.7%	2.4%	2.2%	2.6%	2.6%	.0%	.0%	.0%	.0%	.0%	2.3%
		% of Total	.7%	.4%	.9%	.2%	.2%	.0%	.0%	.0%	.0%	.0%	2.3%
	Others	Count	11	11	26	7	10	1	0	1	0	0	67
		% within Occupation	16.4%	16.4%	38.8%	10.4%	14.9%	1.5%	.0%	1.5%	.0%	.0%	100.0%
		% within What is the major symptom of diabetes?	2.7%	4.4%	4.1%	4.5%	8.6%	3.3%	.0%	6.7%	.0%	.0%	4.1%
		% of Total	.7%	.7%	1.6%	.4%	.6%	.1%	.0%	.1%	.0%	.0%	4.1%
Total		Count	403	250	633	156	116	30	8	15	7	1	1619
		% within Occupation	24.9%	15.4%	39.1%	9.6%	7.2%	1.9%	.5%	.9%	.4%	.1%	100.0%
		% within What is the major symptom of diabetes?	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	24.9%	15.4%	39.1%	9.6%	7.2%	1.9%	.5%	.9%	.4%	.1%	100.0%

Occupation * how can diabetes be treated?

Crosstab

			how can diabetes be treated?							
			No response	Medical treatment and drugs like insuline	Food supplement to reduce sugar	Excercise	Herbal treatment/herbalist	Low sugar intake	Prayer	Total
Occupation	No response	Count	9	12	2	0	1	1	0	25
		% within Occupation	36.0%	48.0%	8.0%	.0%	4.0%	4.0%	.0%	100.0%
		% within how can diabetes be treated?	2.6%	1.4%	.9%	.0%	1.5%	1.0%	.0%	1.5%
		% of Total	.6%	.7%	.1%	.0%	.1%	.1%	.0%	1.5%
	Unemployed	Count	42	84	24	6	9	10	0	175
		% within Occupation	24.0%	48.0%	13.7%	3.4%	5.1%	5.7%	.0%	100.0%
		% within how can diabetes be treated?	12.2%	9.8%	11.3%	17.1%	13.2%	9.7%	.0%	10.8%
		% of Total	2.6%	5.2%	1.5%	.4%	.6%	.6%	.0%	10.8%
	Student	Count	71	169	66	4	8	29	0	347
		% within Occupation	20.5%	48.7%	19.0%	1.2%	2.3%	8.4%	.0%	100.0%
		% within how can diabetes be treated?	20.6%	19.8%	31.0%	11.4%	11.8%	28.2%	.0%	21.4%
		% of Total	4.4%	10.4%	4.1%	.2%	.5%	1.8%	.0%	21.4%
	Farmer	Count	19	64	12	3	11	6	0	115

	% within Occupation	16.5%	55.7%	10.4%	2.6%	9.6%	5.2%	.0%	100.0%
	% within how can diabetes be treated?	5.5%	7.5%	5.6%	8.6%	16.2%	5.8%	.0%	7.1%
	% of Total	1.2%	4.0%	.7%	.2%	.7%	.4%	.0%	7.1%
Trader/Bussinessperson	Count	77	195	35	12	20	21	0	360
	% within Occupation	21.4%	54.2%	9.7%	3.3%	5.6%	5.8%	.0%	100.0%
	% within how can diabetes be treated?	22.3%	22.8%	16.4%	34.3%	29.4%	20.4%	.0%	22.2%
	% of Total	4.8%	12.0%	2.2%	.7%	1.2%	1.3%	.0%	22.2%
Civil servant	Count	72	196	47	6	8	19	1	349
	% within Occupation	20.6%	56.2%	13.5%	1.7%	2.3%	5.4%	.3%	100.0%
	% within how can diabetes be treated?	20.9%	23.0%	22.1%	17.1%	11.8%	18.4%	100.0%	21.6%
	% of Total	4.4%	12.1%	2.9%	.4%	.5%	1.2%	.1%	21.6%
Professional	Count	37	70	16	2	6	12	0	143
	% within Occupation	25.9%	49.0%	11.2%	1.4%	4.2%	8.4%	.0%	100.0%
	% within how can diabetes be treated?	10.7%	8.2%	7.5%	5.7%	8.8%	11.7%	.0%	8.8%
	% of Total	2.3%	4.3%	1.0%	.1%	.4%	.7%	.0%	8.8%
Retired	Count	6	26	2	1	1	2	0	38
	% within Occupation	15.8%	68.4%	5.3%	2.6%	2.6%	5.3%	.0%	100.0%
	% within how can diabetes be treated?	1.7%	3.0%	.9%	2.9%	1.5%	1.9%	.0%	2.3%

		% of Total	.4%	1.6%	.1%	.1%	.1%	.1%	.0%	2.3%
	Others	Count	12	38	9	1	4	3	0	67
		% within Occupation	17.9%	56.7%	13.4%	1.5%	6.0%	4.5%	.0%	100.0%
		% within how can diabetes be treated?	3.5%	4.4%	4.2%	2.9%	5.9%	2.9%	.0%	4.1%
		% of Total	.7%	2.3%	.6%	.1%	.2%	.2%	.0%	4.1%
Total		Count	345	854	213	35	68	103	1	1619
		% within Occupation	21.3%	52.7%	13.2%	2.2%	4.2%	6.4%	.1%	100.0%
		% within how can diabetes be treated?	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	21.3%	52.7%	13.2%	2.2%	4.2%	6.4%	.1%	100.0%

Monthly income (in naira) * Have you ever heard of disease called diabetes?

Crosstab

			Have you ever heard of disease called diabetes?			
			No response	Yes	No	Total
Monthly income (in naira)	No response	Count	2	124	12	138
		% within Monthly income (in naira)	1.4%	89.9%	8.7%	100.0%
		% within Have you ever heard of disease called diabetes?	15.4%	8.5%	8.3%	8.5%
		% of Total	.1%	7.7%	.7%	8.5%
	0-17,999	Count	2	619	76	697
		% within Monthly income (in naira)	.3%	88.8%	10.9%	100.0%
		% within Have you ever heard of disease called diabetes?	15.4%	42.3%	52.8%	43.1%
		% of Total	.1%	38.2%	4.7%	43.1%
	18-49,999	Count	7	459	39	505
		% within Monthly income (in naira)	1.4%	90.9%	7.7%	100.0%
		% within Have you ever heard of disease called diabetes?	53.8%	31.4%	27.1%	31.2%
		% of Total	.4%	28.4%	2.4%	31.2%
	50-79,999	Count	0	175	10	185
		% within Monthly income (in naira)	.0%	94.6%	5.4%	100.0%
		% within Have you ever heard of disease called diabetes?	.0%	12.0%	6.9%	11.4%
		% of Total	.0%	10.8%	.6%	11.4%
	80-109,999	Count	2	22	1	25
		% within Monthly income (in naira)	8.0%	88.0%	4.0%	100.0%
		% within Have you ever heard of disease called diabetes?	15.4%	1.5%	.7%	1.5%

		% of Total	.1%	1.4%	.1%	1.5%
	110, 000 Plus	Count	0	63	6	69
		% within Monthly income (in naira)	.0%	91.3%	8.7%	100.0%
		% within Have you ever heard of disease called diabetes?	.0%	4.3%	4.2%	4.3%
		% of Total	.0%	3.9%	.4%	4.3%
Total		Count	13	1462	144	1619
		% within Monthly income (in naira)	.8%	90.3%	8.9%	100.0%
		% within Have you ever heard of disease called diabetes?	100.0%	100.0%	100.0%	100.0%
		% of Total	.8%	90.3%	8.9%	100.0%

Monthly income (in naira) * If yes, how did you get to know about it?

Crosstab

			If yes, how did you get to know about it?							
			No response	Print media	Electronic media	Church/Mosque	Hospital	School	Others	Total
Monthly income (in naira)	No response	Count	16	16	31	8	44	18	5	138
		% within Monthly income (in naira)	11.6%	11.6%	22.5%	5.8%	31.9%	13.0%	3.6%	100.0%
		% within If yes, how did you get to know about it?	10.5%	9.3%	6.6%	8.8%	10.3%	9.9%	4.0%	8.5%
		% of Total	1.0%	1.0%	1.9%	.5%	2.7%	1.1%	.3%	8.5%
	0-17,999	Count	74	61	208	40	180	66	68	697
		% within Monthly income (in naira)	10.6%	8.8%	29.8%	5.7%	25.8%	9.5%	9.8%	100.0%
		% within If yes, how did you get to know about it?	48.4%	35.5%	44.3%	44.0%	42.2%	36.5%	54.4%	43.1%
		% of Total	4.6%	3.8%	12.8%	2.5%	11.1%	4.1%	4.2%	43.1%
	18-49,999	Count	44	54	160	21	124	64	38	505
		% within Monthly income (in naira)	8.7%	10.7%	31.7%	4.2%	24.6%	12.7%	7.5%	100.0%
		% within If yes, how did you get to know about it?	28.8%	31.4%	34.0%	23.1%	29.0%	35.4%	30.4%	31.2%
		% of Total	2.7%	3.3%	9.9%	1.3%	7.7%	4.0%	2.3%	31.2%
	50-79,999	Count	10	31	49	13	50	23	9	185

		% within Monthly income (in naira)	5.4%	16.8%	26.5%	7.0%	27.0%	12.4%	4.9%	100.0%
		% within If yes, how did you get to know about it?	6.5%	18.0%	10.4%	14.3%	11.7%	12.7%	7.2%	11.4%
		% of Total	.6%	1.9%	3.0%	.8%	3.1%	1.4%	.6%	11.4%
	80-109,999	Count	3	5	8	4	2	0	3	25
		% within Monthly income (in naira)	12.0%	20.0%	32.0%	16.0%	8.0%	.0%	12.0%	100.0%
		% within If yes, how did you get to know about it?	2.0%	2.9%	1.7%	4.4%	.5%	.0%	2.4%	1.5%
		% of Total	.2%	.3%	.5%	.2%	.1%	.0%	.2%	1.5%
	110, 000 Plus	Count	6	5	14	5	27	10	2	69
		% within Monthly income (in naira)	8.7%	7.2%	20.3%	7.2%	39.1%	14.5%	2.9%	100.0%
		% within If yes, how did you get to know about it?	3.9%	2.9%	3.0%	5.5%	6.3%	5.5%	1.6%	4.3%
		% of Total	.4%	.3%	.9%	.3%	1.7%	.6%	.1%	4.3%
Total		Count	153	172	470	91	427	181	125	1619
		% within Monthly income (in naira)	9.5%	10.6%	29.0%	5.6%	26.4%	11.2%	7.7%	100.0%
		% within If yes, how did you get to know about it?	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	9.5%	10.6%	29.0%	5.6%	26.4%	11.2%	7.7%	100.0%

Monthly income (in naira) * Have you checked your diabetes status

Crosstab

			Have you checked your diabetes status			
			No response	Yes	No	Total
Monthly income (in naira)	No response	Count	3	49	86	138
		% within Monthly income (in naira)	2.2%	35.5%	62.3%	100.0%
		% within Have you checked your diabetes status	15.8%	8.0%	8.7%	8.5%
		% of Total	.2%	3.0%	5.3%	8.5%
	0-17,999	Count	5	231	461	697
		% within Monthly income (in naira)	.7%	33.1%	66.1%	100.0%
		% within Have you checked your diabetes status	26.3%	37.5%	46.8%	43.1%
		% of Total	.3%	14.3%	28.5%	43.1%
	18-49,999	Count	8	196	301	505
		% within Monthly income (in naira)	1.6%	38.8%	59.6%	100.0%
		% within Have you checked your diabetes status	42.1%	31.8%	30.6%	31.2%
		% of Total	.5%	12.1%	18.6%	31.2%
	50-79,999	Count	0	91	94	185
		% within Monthly income (in naira)	.0%	49.2%	50.8%	100.0%
		% within Have you checked your diabetes status	.0%	14.8%	9.6%	11.4%

		% of Total	.0%	5.6%	5.8%	11.4%
	80-109,999	Count	2	12	11	25
		% within Monthly income (in naira)	8.0%	48.0%	44.0%	100.0%
		% within Have you checked your diabetes status	10.5%	1.9%	1.1%	1.5%
		% of Total	.1%	.7%	.7%	1.5%
	110, 000 Plus	Count	1	37	31	69
		% within Monthly income (in naira)	1.4%	53.6%	44.9%	100.0%
		% within Have you checked your diabetes status	5.3%	6.0%	3.2%	4.3%
		% of Total	.1%	2.3%	1.9%	4.3%
Total		Count	19	616	984	1619
		% within Monthly income (in naira)	1.2%	38.0%	60.8%	100.0%
		% within Have you checked your diabetes status	100.0%	100.0%	100.0%	100.0%
		% of Total	1.2%	38.0%	60.8%	100.0%

Monthly income (in naira) * If no, would you be willing to check your diabetes status

Crosstab

			If no, would you be willing to check your diabetes status			
			No response	Yes	No	Total
Monthly income (in naira)	No response	Count	51	61	26	138
		% within Monthly income (in naira)	37.0%	44.2%	18.8%	100.0%
		% within If no, would you be willing to check your diabetes status	8.3%	8.1%	10.4%	8.5%
		% of Total	3.2%	3.8%	1.6%	8.5%
	0-17,999	Count	226	361	110	697
		% within Monthly income (in naira)	32.4%	51.8%	15.8%	100.0%
		% within If no, would you be willing to check your diabetes status	36.6%	47.9%	44.2%	43.1%
		% of Total	14.0%	22.3%	6.8%	43.1%
	18-49,999	Count	200	227	78	505
		% within Monthly income (in naira)	39.6%	45.0%	15.4%	100.0%
		% within If no, would you be willing to check your diabetes status	32.4%	30.1%	31.3%	31.2%
		% of Total	12.4%	14.0%	4.8%	31.2%
	50-79,999	Count	88	71	26	185
		% within Monthly income (in naira)	47.6%	38.4%	14.1%	100.0%

		% within If no, would you be willing to check your diabetes status	14.3%	9.4%	10.4%	11.4%
		% of Total	5.4%	4.4%	1.6%	11.4%
	80-109,999	Count	14	9	2	25
		% within Monthly income (in naira)	56.0%	36.0%	8.0%	100.0%
		% within If no, would you be willing to check your diabetes status	2.3%	1.2%	.8%	1.5%
		% of Total	.9%	.6%	.1%	1.5%
	110, 000 Plus	Count	38	24	7	69
		% within Monthly income (in naira)	55.1%	34.8%	10.1%	100.0%
		% within If no, would you be willing to check your diabetes status	6.2%	3.2%	2.8%	4.3%
		% of Total	2.3%	1.5%	.4%	4.3%
Total		Count	617	753	249	1619
		% within Monthly income (in naira)	38.1%	46.5%	15.4%	100.0%
		% within If no, would you be willing to check your diabetes status	100.0%	100.0%	100.0%	100.0%
		% of Total	38.1%	46.5%	15.4%	100.0%

Monthly income (in naira) * What is the main cause of diabetes?

Crosstab

			What is the main cause of diabetes?											Total
			No response	Excess Sugar	Excess Carbohydrate	Inheritance	Alcohol	Low level/lack of insuline	Overweight	Sexual intercourse	Old age	Diseases	Lack of water in the body	
Monthly income (in naira)	No response	Count	28	87	12	2	0	6	0	3	0	0	0	138
		% within Monthly income (in naira)	20.3%	63.0%	8.7%	1.4%	.0%	4.3%	.0%	2.2%	.0%	.0%	.0%	100.0%
		% within What is the main cause of diabetes?	11.7%	8.9%	5.5%	5.0%	.0%	7.2%	.0%	15.8%	.0%	.0%	.0%	8.5%
		% of Total	1.7%	5.4%	.7%	.1%	.0%	.4%	.0%	.2%	.0%	.0%	.0%	8.5%
	0-17,999	Count	114	399	103	14	13	38	4	12	0	0	0	697
		% within Monthly income (in naira)	16.4%	57.2%	14.8%	2.0%	1.9%	5.5%	.6%	1.7%	.0%	.0%	.0%	100.0%
		% within What is the main cause of diabetes?	47.5%	40.7%	47.5%	35.0%	46.4%	45.8%	80.0%	63.2%	.0%	.0%	.0%	43.1%
		% of Total	7.0%	24.6%	6.4%	.9%	.8%	2.3%	.2%	.7%	.0%	.0%	.0%	43.1%
	18-49,999	Count	62	305	80	13	12	23	1	3	3	2	1	505
		% within Monthly income (in naira)	12.3%	60.4%	15.8%	2.6%	2.4%	4.6%	.2%	.6%	.6%	.4%	.2%	100.0%
		% within What is the main cause of diabetes?	25.8%	31.1%	36.9%	32.5%	42.9%	27.7%	20.0%	15.8%	100.0%	66.7%	100.0%	31.2%
		% of Total	3.8%	18.8%	4.9%	.8%	.7%	1.4%	.1%	.2%	.2%	.1%	.1%	31.2%
	50-79,999	Count	24	131	10	6	1	11	0	1	0	1	0	185

		% within Monthly income (in naira)	13.0%	70.8%	5.4%	3.2%	.5%	5.9%	.0%	.5%	.0%	.5%	.0%	100.0%
		% within What is the main cause of diabetes?	10.0%	13.4%	4.6%	15.0%	3.6%	13.3%	.0%	5.3%	.0%	33.3%	.0%	11.4%
		% of Total	1.5%	8.1%	.6%	.4%	.1%	.7%	.0%	.1%	.0%	.1%	.0%	11.4%
	80-109,999	Count	5	16	3	0	1	0	0	0	0	0	0	25
		% within Monthly income (in naira)	20.0%	64.0%	12.0%	.0%	4.0%	.0%	.0%	.0%	.0%	.0%	.0%	100.0%
		% within What is the main cause of diabetes?	2.1%	1.6%	1.4%	.0%	3.6%	.0%	.0%	.0%	.0%	.0%	.0%	1.5%
		% of Total	.3%	1.0%	.2%	.0%	.1%	.0%	.0%	.0%	.0%	.0%	.0%	1.5%
	110, 000 Plus	Count	7	42	9	5	1	5	0	0	0	0	0	69
		% within Monthly income (in naira)	10.1%	60.9%	13.0%	7.2%	1.4%	7.2%	.0%	.0%	.0%	.0%	.0%	100.0%
		% within What is the main cause of diabetes?	2.9%	4.3%	4.1%	12.5%	3.6%	6.0%	.0%	.0%	.0%	.0%	.0%	4.3%
		% of Total	.4%	2.6%	.6%	.3%	.1%	.3%	.0%	.0%	.0%	.0%	.0%	4.3%
Total		Count	240	980	217	40	28	83	5	19	3	3	1	1619
		% within Monthly income (in naira)	14.8%	60.5%	13.4%	2.5%	1.7%	5.1%	.3%	1.2%	.2%	.2%	.1%	100.0%
		% within What is the main cause of diabetes?	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	14.8%	60.5%	13.4%	2.5%	1.7%	5.1%	.3%	1.2%	.2%	.2%	.1%	100.0%

Monthly income (in naira) * What is the major symptom of diabetes?

Crosstab

			What is the major symptom of diabetes?										Total
			No response	Ant gather on urine	Frequent Urinating	Sweating, swelling and prolong wounds	Loss of weight	Hypertension/blood disfunctions	Mucus excreta	coloured urine/eye	Fatigue	Low sperm count	
Monthly income (in naira)	No response	Count	48	12	56	12	7	1	0	1	0	1	138
		% within Monthly income (in naira)	34.8%	8.7%	40.6%	8.7%	5.1%	.7%	.0%	.7%	.0%	.7%	100.0%
		% within What is the major symptom of diabetes?	11.9%	4.8%	8.8%	7.7%	6.0%	3.3%	.0%	6.7%	.0%	100.0%	8.5%
		% of Total	3.0%	.7%	3.5%	.7%	.4%	.1%	.0%	.1%	.0%	.1%	8.5%
	0-17,999	Count	179	122	265	58	45	17	1	7	3	0	697
		% within Monthly income (in naira)	25.7%	17.5%	38.0%	8.3%	6.5%	2.4%	.1%	1.0%	.4%	.0%	100.0%
		% within What is the major symptom of diabetes?	44.4%	48.8%	41.9%	37.2%	38.8%	56.7%	12.5%	46.7%	42.9%	.0%	43.1%
		% of Total	11.1%	7.5%	16.4%	3.6%	2.8%	1.1%	.1%	.4%	.2%	.0%	43.1%
	18-49,999	Count	110	81	206	45	44	7	5	6	1	0	505
		% within Monthly income (in naira)	21.8%	16.0%	40.8%	8.9%	8.7%	1.4%	1.0%	1.2%	.2%	.0%	100.0%

		% within What is the major symptom of diabetes?	27.3%	32.4%	32.5%	28.8%	37.9%	23.3%	62.5%	40.0%	14.3%	.0%	31.2%
		% of Total	6.8%	5.0%	12.7%	2.8%	2.7%	.4%	.3%	.4%	.1%	.0%	31.2%
	50-79,999	Count	44	22	74	26	13	2	1	1	2	0	185
		% within Monthly income (in naira)	23.8%	11.9%	40.0%	14.1%	7.0%	1.1%	.5%	.5%	1.1%	.0%	100.0%
		% within What is the major symptom of diabetes?	10.9%	8.8%	11.7%	16.7%	11.2%	6.7%	12.5%	6.7%	28.6%	.0%	11.4%
		% of Total	2.7%	1.4%	4.6%	1.6%	.8%	.1%	.1%	.1%	.1%	.0%	11.4%
	80-109,999	Count	5	2	6	6	4	1	1	0	0	0	25
		% within Monthly income (in naira)	20.0%	8.0%	24.0%	24.0%	16.0%	4.0%	4.0%	.0%	.0%	.0%	100.0%
		% within What is the major symptom of diabetes?	1.2%	.8%	.9%	3.8%	3.4%	3.3%	12.5%	.0%	.0%	.0%	1.5%
		% of Total	.3%	.1%	.4%	.4%	.2%	.1%	.1%	.0%	.0%	.0%	1.5%
	110, 000 Plus	Count	17	11	26	9	3	2	0	0	1	0	69
		% within Monthly income (in naira)	24.6%	15.9%	37.7%	13.0%	4.3%	2.9%	.0%	.0%	1.4%	.0%	100.0%
		% within What is the major symptom of diabetes?	4.2%	4.4%	4.1%	5.8%	2.6%	6.7%	.0%	.0%	14.3%	.0%	4.3%

	% of Total	1.1%	.7%	1.6%	.6%	.2%	.1%	.0%	.0%	.1%	.0%	4.3%
Total	Count	403	250	633	156	116	30	8	15	7	1	1619
	% within Monthly income (in naira)	24.9%	15.4%	39.1%	9.6%	7.2%	1.9%	.5%	.9%	.4%	.1%	100.0%
	% within What is the major symptom of diabetes?	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	24.9%	15.4%	39.1%	9.6%	7.2%	1.9%	.5%	.9%	.4%	.1%	100.0%

Monthly income (in naira) * how can diabetes be treated?

Crosstab

			how can diabetes be treated?							
			No response	Medical treatment and drugs like insuline	Food supplement to reduce sugar	Excercise	Herbal treatment/herbalist	Low sugar intake	Prayer	Total
Monthly income (in naira)	No response	Count	45	64	14	1	3	11	0	138
		% within Monthly income (in naira)	32.6%	46.4%	10.1%	.7%	2.2%	8.0%	.0%	100.0%
		% within how can diabetes be treated?	13.0%	7.5%	6.6%	2.9%	4.4%	10.7%	.0%	8.5%
		% of Total	2.8%	4.0%	.9%	.1%	.2%	.7%	.0%	8.5%
	0-17,999	Count	157	362	88	11	43	35	1	697
		% within Monthly income (in naira)	22.5%	51.9%	12.6%	1.6%	6.2%	5.0%	.1%	100.0%
		% within how can diabetes be treated?	45.5%	42.4%	41.3%	31.4%	63.2%	34.0%	100.0%	43.1%
		% of Total	9.7%	22.4%	5.4%	.7%	2.7%	2.2%	.1%	43.1%
	18-49,999	Count	106	263	75	14	15	32	0	505
		% within Monthly income (in naira)	21.0%	52.1%	14.9%	2.8%	3.0%	6.3%	.0%	100.0%
		% within how can diabetes be treated?	30.7%	30.8%	35.2%	40.0%	22.1%	31.1%	.0%	31.2%
		% of Total	6.5%	16.2%	4.6%	.9%	.9%	2.0%	.0%	31.2%

	50-79,999	Count	24	107	30	5	4	15	0	185
		% within Monthly income (in naira)	13.0%	57.8%	16.2%	2.7%	2.2%	8.1%	.0%	100.0%
		% within how can diabetes be treated?	7.0%	12.5%	14.1%	14.3%	5.9%	14.6%	.0%	11.4%
		% of Total	1.5%	6.6%	1.9%	.3%	.2%	.9%	.0%	11.4%
	80-109,999	Count	6	15	3	0	0	1	0	25
		% within Monthly income (in naira)	24.0%	60.0%	12.0%	.0%	.0%	4.0%	.0%	100.0%
		% within how can diabetes be treated?	1.7%	1.8%	1.4%	.0%	.0%	1.0%	.0%	1.5%
		% of Total	.4%	.9%	.2%	.0%	.0%	.1%	.0%	1.5%
	110, 000 Plus	Count	7	43	3	4	3	9	0	69
		% within Monthly income (in naira)	10.1%	62.3%	4.3%	5.8%	4.3%	13.0%	.0%	100.0%
		% within how can diabetes be treated?	2.0%	5.0%	1.4%	11.4%	4.4%	8.7%	.0%	4.3%
		% of Total	.4%	2.7%	.2%	.2%	.2%	.6%	.0%	4.3%
Total		Count	345	854	213	35	68	103	1	1619
		% within Monthly income (in naira)	21.3%	52.7%	13.2%	2.2%	4.2%	6.4%	.1%	100.0%
		% within how can diabetes be treated?	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	21.3%	52.7%	13.2%	2.2%	4.2%	6.4%	.1%	100.0%

APPENDIX A-5: SPATIO-TEMPORAL PATTERN OF DM

Table : Overall DM incidence per 10,000

LGA	2000-2004	2005-2009	2010-2014	2000-2014
Afijio	0.2	0.1	0.7	1
Akinyele	2.1	6.1	9.3	17.5
Atiba	0.1	0.3	0.2	0.6
Atisbo	0.3	0.2	1	1.5
Egbeda	0.1	0.5	0.7	1.3
Ibadan North	8.8	11.4	9.1	29.3
Ibadan Northwest	1.6	1.2	2.4	5.2
Ibadan Northeast	0.3	0.4	0.8	1.5
Ibadan Southwest	1.5	1.4	2.8	5.7
Ibadan southeast	0.3	0.3	0.5	1.2
Ibarapa North	N.D	N.D	N.D	N.D
Ibarapa Central	N.D	N.D	N.D	N.D
Ibarapa East	N.D	N.D	N.D	N.D
Ido	0.9	3	3.5	7.4
Irepo	N.D	N.D	N.D	N.D
Iseyin	N.D	N.D	N.D	N.D
Itesiwaju	0	0.1	0.1	0.2
Iwajowa	0	0	0.2	0.2
Kajola	0.1	0.1	0	0.2
Lagelu	0.2	0.8	1.8	2.8
Ogooluwa	0.2	0.4	0.2	0.8
Ogbomoso North	0.4	0.7	0.7	1.8
Ogbomoso South	0.4	1.3	0.9	2.6
Olorunsogo	N.D	N.D	N.D	N.D
Oluyole	0.3	0.2	1.1	1.7
Onaara	0	0.2	0.3	0.8
Orelope	0.1	0.2	0.1	0.4
Oriire	0.2	0.1	0	0.3
Oyo east	0.3	0.4	0.4	1.1
Oyo west	0	0.1	0.3	0.4
Saki east	0.1	0.5	0.6	1.1
Saki west	0.8	1.5	1	3.2
Surulere	0.1	0	0.1	0.1

Source: Field work, 2012-2014. N.D: No data.

Table : Male DM incidence per 10,000

LGA	2000-2004	2005-2009	2010-2014	2000-2014
Afijio	0.1	0.2	0.5	0.8
Akinyele	2.1	6.1	8.2	16.5
Atiba	0.1	0.4	0.0	0.5
Atisbo	0.4	0.1	0.7	1.2
Egbeda	0.0	0.3	0.6	1.0
Ibadan North	10.3	11.5	9.6	31.5
Ibadan Northwest	1.4	0.8	2.4	4.6
Ibadan Northeast	0.2	0.3	1.0	1.6
Ibadan Southwest	1.3	0.9	2.2	4.5
Ibadan southeast	0.2	0.4	0.7	1.3
Ibarapa North	N.D	N.D	N.D	N.D
Ibarapa Central	N.D	N.D	N.D	N.D
Ibarapa East	N.D	N.D	N.D	N.D
Ido	1.1	3.5	3.2	7.7
Irepo	N.D	N.D	N.D	N.D
Iseyin	N.D	N.D	N.D	N.D
Itesiwaju	0.0	0.0	0.1	0.1
Iwajowa	0.0	0.0	0.3	0.3
Kajola	0.0	0.1	0.0	0.1
Lagelu	0.1	0.8	2.0	2.9
Ogooluwa	0.5	0.2	0.2	0.9
Ogbomoso North	0.5	0.9	0.8	2.2
Ogbomoso South	0.6	1.7	1.1	3.3
Olorunsogo	N.D	N.D	N.D	N.D
Oluyole	0.4	0.2	1.1	1.7
Onaara	0.3	0.2	0.4	0.9
Orelope	0.2	0.3	0.2	0.6
Oriire	2.0	0.0	0.0	2.0
Oyo east	0.4	0.2	0.2	0.9
Oyo west	0.0	0.1	0.3	0.5
Saki east	0.1	0.3	0.3	0.7
Saki west	0.9	1.7	0.9	3.5
Surulere	0.0	0.0	0.1	0.1

Source: Field work, 2012-2014. N.D: No data.

Table : Female DM incidence per 10,000

LGA	2000-2004	2005-2009	2010-2014	2000-2014
Afijio	0.2	0.0	0.9	1.2
Akinyele	2.2	6.2	10.5	19.0
Atiba	0.1	0.2	0.4	0.6
Atisbo	0.3	0.3	1.3	1.9
Egbeda	0.2	0.7	0.7	1.6
Ibadan North	7.4	11.5	8.8	27.8
Ibadan Northwest	1.8	1.5	2.5	5.8
Ibadan Northeast	0.3	0.5	0.7	1.4
Ibadan Southwest	1.6	1.9	3.5	7.1
Ibadan southeast	0.5	0.2	0.5	1.1
Ibarapa North	N.D	N.D	N.D	N.D
Ibarapa Central	N.D	N.D	N.D	N.D
Ibarapa East	N.D	N.D	N.D	N.D
Ido	0.8	2.6	3.9	7.2
Irepo	N.D	N.D	N.D	N.D
Iseyin	N.D	N.D	N.D	N.D
Itesiwaju	0.0	0.1	0.1	0.2
Iwajowa	0.0	0.0	0.2	0.2
Kajola	0.2	0.1	0.0	0.2
Lagelu	0.3	0.7	1.6	2.6
Ogooluwa	0.0	0.5	0.2	0.7
Ogbomoso North	0.4	0.5	0.5	1.4
Ogbomoso South	0.2	0.9	0.8	1.9
Olorunsogo	N.D	N.D	N.D	N.D
Oluyole	0.2	0.2	1.2	1.6
Onaara	0.3	0.1	0.3	0.8
Orelope	0.0	0.2	0.0	0.2
Oriire	0.2	0.1	0.0	0.3
Oyo east	0.3	0.5	0.5	1.3
Oyo west	0.0	0.0	0.3	0.3
Saki east	0.0	0.7	0.9	1.6
Saki west	0.7	1.3	1.0	3.1
Surulere	0.1	0.0	0.0	0.1

Source: Field work, 2012-2014. N.D: No data.

Table : Spatial distribution of self-reported DM prevalence

LGA	Overall (%)	Male (%)	Female (%)
Afijio	16	20.7	9.5
Akinyele	8	6.1	11.8
Atiba	8	8	8
Atisbo	37.5	42.9	31.6
Egbeda	6.1	5.4	8.3
Ibadan North	26	21.7	29.6
Ibadan Northwest	6	7.1	4.5
Ibadan Northeast	0	0	0
Ibadan Southwest	4	0	8
Ibadan Southeast	30	29.4	31.3
Ibarapa North	6	6.9	4.8
Ibarapa Central	6	4	8
Ibarapa East	24.5	26.1	23.1
Ido	24	30.8	0
Irepo	34	25.9	43.5
Iseyin	42.2	36.4	47.8
Itesiwaju	20	28.6	9.1
Iwajowa	16	22.2	12.5
Kajola	15	16	13.3
Lagelu	10	10.7	9.1
Ogooluwa	6	0	10
Ogbomoso North	4	7.1	0
Ogbomoso South	8	9.1	5.9
Olorunsogo	12	20.7	0
Oluyole	12.8	21.7	4.2
Onaara	8	6.1	11.8
Orelope	22	29.7	0
Oriire	8	7.7	9.1
Oyo east	6.1	11.8	3.1
Oyo west	6	4.2	7.7
Saki east	8	2.8	21.4
Saki west	10	11.5	8.3
Surulere	8	9.1	5.9
TOTAL	**13.7**	**14.5**	**12.5**

Source: Field work, 2012-2014. N.D: No data.

Excluded Variables[c] FOR OVERALL DM

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
1	universityeduc	.081[a]	.420	.678	.089	.976
	unemployment	-.098[a]	-.500	.622	-.106	.938
	poverty	.030[a]	.154	.879	.033	.979
	fruitsveg	.094[a]	.474	.640	.101	.925
	tobacco	-.063[a]	-.329	.746	-.070	.999
	fastfoods	.113[a]	.584	.565	.123	.963
	softdrinks	.281[a]	1.547	.136	.313	.999
	alcohol	.327[a]	1.705	.102	.342	.875
	physicalactivity	-.093[a]	-.491	.628	-.104	.996
	overcrowding	.117[a]	.606	.551	.128	.960
	sidewalks	.123[a]	.580	.568	.123	.802
	obesity	.176[a]	.928	.363	.194	.976
	socialcapital	.345[a]	1.957	.063	.385	1.000
	urbanrate	.386[a]	2.215	.037	.427	.983
	safeneighbourhood	.208[a]	.999	.329	.208	.801
	fastfdoutlets	.130[a]	.667	.511	.141	.948
	storeswithinwalk	.193[a]	1.006	.325	.210	.948
	familyhistory	.326[a]	1.707	.102	.342	.882
2	universityeduc	-.028[b]	-.151	.881	-.033	.902
	unemployment	-.027[b]	-.148	.884	-.032	.907
	poverty	.169[b]	.913	.372	.195	.881
	fruitsveg	.089[b]	.486	.632	.106	.925
	tobacco	.002[b]	.011	.992	.002	.971
	fastfoods	.154[b]	.866	.396	.186	.953
	softdrinks	.232[b]	1.354	.190	.283	.980
	alcohol	.306[b]	1.730	.098	.353	.872
	physicalactivity	.079[b]	.410	.686	.089	.824
	overcrowding	.121[b]	.681	.503	.147	.960

	sidewalks	.085[b]	.432	.670	.094	.796
	obesity	.269[b]	1.551	.136	.321	.933
	socialcapital	.331[b]	2.050	.053	.408	.998
	safeneighbourhood	.187[b]	.968	.344	.207	.799
	fastfdoutlets	-.018[b]	-.094	.926	-.021	.818
	storeswithinwalk	.077[b]	.404	.690	.088	.854
	familyhistory	.277[b]	1.539	.139	.318	.867

a. Predictors in the Model: (Constant), walktobusstop

b. Predictors in the Model: (Constant), walktobusstop, urbanrate

c. Dependent Variable: totalinR0014

Excluded Variables[b] for SELF REPORTED DM

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics: Tolerance
1	universityeduc	-.105[a]	-.754	.458	-.149	.954
	unemployment	.005[a]	.038	.970	.008	.919
	poverty	.198[a]	1.490	.149	.286	.985
	fruitsveg	-.217[a]	-1.656	.110	-.314	.995
	tobacco	.123[a]	.839	.409	.166	.858
	fastfoods	.187[a]	.963	.345	.189	.483
	softdrinks	.033[a]	.202	.841	.040	.693
	alcohol	-.064[a]	-.451	.656	-.090	.947
	physicalactivity	.006[a]	.039	.969	.008	.948
	overcrowding	.125[a]	.879	.388	.173	.905
	sidewalks	.043[a]	.271	.789	.054	.763
	obesity	.035[a]	.253	.802	.051	1.000
	walktobusstop	-.187[a]	-1.350	.189	-.261	.917
	socialcapital	-.147[a]	-1.078	.291	-.211	.971
	urbanrate	-.040[a]	-.291	.774	-.058	.991
	safeneighbourhood	-.136[a]	-.967	.343	-.190	.928
	fastfdoutlets	.178[a]	1.107	.279	.216	.696
	storeswithinwalk	-.035[a]	-.241	.811	-.048	.923

a. Predictors in the Model: (Constant), familyhistory

b. Dependent Variable: selfreporteddm

Table: Temporal pattern of DM from 2000 to 2014

Year	Overall DM cases	Overall DM rate per 100,000	Male DM cases	Male DM rate per 100,000	Female DM cases	Female DM rate per 100,000	Cumulative cases	Cum. male cases	Cum. female cases
2000	111	1.5	63	1.7	48	1.3	111	63	48
2001	135	1.9	76	2.1	59	1.6	246	139	107
2002	62	0.9	31	0.9	31	0.9	308	170	138
2003	167	2.3	93	2.6	74	2.1	475	263	212
2004	161	2.2	86	2.4	75	2.1	636	349	287
2005	182	2.5	91	2.5	91	2.5	818	440	378
2006	229	3.2	120	3.3	109	3.0	1047	560	487
2007	147	2.0	80	2.2	67	1.9	1194	640	554
2008	231	3.2	117	3.2	114	3.2	1425	757	668
2009	174	2.4	75	2.1	99	2.8	1599	832	767
2010	260	3.6	132	3.7	128	3.6	1859	964	895
2011	201	2.8	93	2.6	108	3.0	2060	1057	1003
2012	597	8.3	277	7.7	320	8.9	2657	1334	1323
2013	33	0.5	20	0.6	13	0.4	2690	1354	1336
2014	34	0.5	20	0.6	14	0.4	2724	1374	1350

Source: Fieldwork data (2012-2014).

APPENDIX A-6: RELATIONSHIP BETWEEN DM AND LEVEL OF DEVELOPMENT

Table : Distribution of PC scores in Oyo state

LGA	Modernization/ Urbanisation	Medical personnel	Primary Education	Revenue base
Afijio	-0.26	-0.11	-0.16	-0.42
Akinyele	0.15	-0.30	2.30	-1.07
Atiba	0.29	-0.46	-0.41	-0.62
Atisbo	-0.61	0.09	-1.04	0.86
Egbeda	0.04	0.13	1.67	-0.57
Ibadan North	0.95	5.34	0.73	0.10
Ibadan Northeast	3.01	-0.65	-0.98	-0.62
Ibadan Northwest	1.19	-0.03	-0.55	-0.45
Ibadan Southeast	3.15	-0.75	-0.91	-0.83
Ibadan Southwest	1.59	-0.64	1.44	4.32
Ibarapa Central	-0.49	-0.05	-0.35	-0.36
Ibarapa East	-0.64	-0.09	-0.33	-0.05
Ibarapa North	-0.85	0.00	-0.27	-0.51
Ido	-0.53	-0.29	0.36	-0.38
Irepo	-0.71	0.05	-0.89	0.05
Iseyin	0.40	-0.42	1.22	-0.97
Itesiwaju	-0.75	0.08	-0.52	0.00
Iwajowa	-0.82	0.03	-0.50	-0.08
Kajola	-0.01	-0.14	0.02	-0.62
Lagelu	-0.03	-0.18	0.02	-0.34
Ogbomoso North	0.00	0.16	-0.84	1.30
Ogbomoso South	-0.22	-0.07	-0.66	0.34
Ogooluwa	-0.41	-0.16	0.12	-0.92
Olorunsogo	-1.03	0.18	-0.76	0.43
Oluyole	-0.79	-0.83	3.05	0.39
Onaara	0.24	-0.35	0.55	-0.77
Orelope	-0.74	0.05	-0.77	-0.01
Oriire	-0.58	0.34	-1.37	0.74
Oyo East	-0.05	0.16	-0.12	-0.32
Oyo west	-0.27	-0.50	-0.77	1.38
Saki east	-0.83	-0.15	-0.08	-0.50
Saki west	0.26	-0.26	0.46	-0.40
Surulere	-0.64	-0.19	0.35	0.90

Source: Author

APPENDIX A-7: PERCEPTION OF DM

Table 5.4: Source of awareness of DM

LGA	No response	Print media	Electronic media	Church/Mosque	Hospital	School	Others	Total
Afijio	3 (6%)	3 (6%)	11(22%)	1 (2%)	19 (38%)	8(16%)	5(10%)	50 (100%)
Akinyele	8 (16%)	4 (8%)	14 (28%)	2 (4%)	9 (18%)	5 (10%)	8 (16%)	50 (100%)
Atiba	3 (6%)	3 (6%)	11(22%)	1 (2%)	19 (38%)	8 (16%)	5 (10%)	50 (100%)
Atisbo	2 (5%)	2 (5%)	11 (27.5%)	3 (7.5%)	15 (37.5%)	5 (12.5%)	2(5%)	40 (100%)
Egbeda	4 (8.2%)	7(14.3%)	9 (18.4%)	4 (8.2%)	10 920.4%)	12 (24.5%)	3 (6.1%)	49 (100%)
Ibadan North	1 (2%)	5 (10%)	20 (40%)	3 (6%)	10 (20%)	11 (22%)	0 (0%)	50 (100%)
Ibadan Northeast	7 (14%)	6 (12%)	17 (34%)	2 (4%)	12 (24%)	5 (10%)	1(2%)	50 (100%)
Ibadan Northwest	8 (16%)	10 (20%)	15 (30%)	0 (0%)	3 (6%)	13 (26%)	1 (2%)	50 (100%)
Ibadan Southeast	5 (10%)	7 (14%)	5 (30%)	5 (10%)	7 (14%)	6 (12%)	5 (10%)	50 (100%)
Ibadan Southwest	2 (4%)	3 (6%)	7 (14%)	7 (14%)	23 (46 %)	8 (16%)	0(0%)	50 (100%)
Ibarapa Central	1 (2%)	2 (4%)	25 (50%)	1 (2%)	13 (26%)	0 (0)%	13 (26%)	50 (100%)
Ibarapa East	11 (22%)	9 (18%)	12 (24%)	1 (2%)	13 (26%)	2 (4%)	2 (4%)	50 (100%)
Ibarapa North	0 (0%)	0(0%)	27 (55.1%)	0 (0%)	20 (40.8%)	1 (2%)	1 (2%)	49 (100%)
Ido	14 (28%)	10 (20%)	14 (28%)	4 (8%)	6 (12%)	0 (0%)	2 (4%)	50 (100%)
Irepo	3 (6%)	7 (14%)	100 (20%)	0 (0%)	14 (28%)	4 (8%)	12 (24%)	50 (100%)
Iseyin	1 (2.2%)	0 (0)%)	16 (32%)	5 (10%)	18 (36%)	2 (4%)	5 (11%)	45 (100%)
Itesiwaju	0 (0%)	2 (4%)	28 (56%)	2 (4%)	8 (16%)	8 (16%)	2 (4%)	50 (100%)
Iwajowa	1 (2%)	5 (10%)	11 (22%)	0 (0%)	20 (40%)	12 (24%)	1(2%)	50 (100%)

Kajola	5 (12.5%)	1 (2.5%)	4 (10%)	4(10%)	24 (60%)	1 (2.5%)	1 (2.5%)	40 (100%)
Lagelu	4(8%)	7 (14%)	24 (48%)	0 (0%)	12 (24%)	1 (2%)	2 (4%)	50 (100%)
Ogbomoso North	1 (2%)	8 (16%)	13 (26%)	4 (8%)	15 (30%)	3 (6 %)	6 (12%)	50 (100%)
Ogbomoso South	5 (10%)	11 (22%)	12 (24%)	4 (8%)	10 (20%)	4 (8%)	4 (8%)	50 (100%)
Ogooluwa	1 (2%)	3 (6%)	14 (28%)	1 (2%)	19 (38%)	4 (8%)	9 (18%)	4 (8%)
Olorunsogo	4 (8%)	0(0%)	16 (32%)	5 (10%)	18 (36%)	2 (4%)	5 (10%)	50 (100%)
Oluyole	0 (05)	4 (8.5%)	34 (72.3%)	1 (2.1%)	4 (8.5%)	1 (2.1%)	3 (6.4%)	47 (100%)
Onaara	3 (6%)	5 (10%)	12 (24%)	2 (4%)	21 (42%)	7 (14%)	0 (0)%	50 (100%)
Orelope	4 (8%)	8 (16%)	12 (24%)	5 (10%)	14 (28%)	7 (14%)	0 (0%)	50 (100%)
Oriire	8 (16%)	4 (8%)	14 (28%)	2 (4%)	9 (18%)	5 (10%)	7 (14%)	50 (100%)
Oyo East	9 (18.4%)	8 (16.3%)	9 (18.4%)	10 (20.4%)	3 (6.1%)	4 (8.2%)	6(12.2%)	49 (100%)
Oyo west	2 (4%)	15 (30%)	11 (22%)	4 (8%)	5 (10%)	9 (18%)	4 (8%)	50 (100%)
Saki east	7 (14%)	6 (12%)	12 (24%)	5 (10%)	7 (14%)	6 (12%)	3 (6%)	50 (100%)
Saki west	13 (26%)	2 (4%)	7 (14%)	0 (0%)	9 (18%)	12 (24%)	7 (14%)	50 (100%)
Surulere	3 (6%)	4 (8%)	14 (28%)	4 (8%)	9 (18%)	2 (4%)	14 (28%)	50 (100%)
Total	**153 (9.5%)**	**172 (10.6%)**	**470 (29%)**	**91 (5.6%)**	**427 (26.4%)**	**181 (11.2%)**	**125 (7.7%)**	**1619 (100%)**

Source: Field survey, 2014.

Table 5.12: Spatial pattern of perceived symptoms of DM

LGA	No response	Ant clustering	Frequent urination	Perspiration	Weight loss	Hypertension	Mucus	Coloured urine	Fatigue	Low sperm count	Total
Afijio	6 (12%)	3 (6%)	27 (54%)	2 (4%)	6 (12%)	6 (12%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Akinyele	10 (20%)	12 (24%)	13 (26%)	6 (12%)	9 (18%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Atiba	9 (18%)	15 (30%)	25 (50%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0(0%)	50 (100%)
Atisbo	10 (25%)	3 (7.5%)	19 (47.5%)	7 (17.5%)	0 (0%)	1 (2.5%)	0(0%)	0(0%)	0(0%)	0(0%)	40 (100%)
Egbeda	17 (34.7%)	3 (6.1%)	18 (36.7%)	2 (4.1%)	5 (10.2%)	0 (0%)	0 (0%)	1 (2%)	2(4.1%)	1 (2%)	49 (100%)
Ibadan North	2 (4%)	5 (10%)	20 (40%)	9 (18%)	12 924%)	2 (4%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Ibadan Northeast	24 (48%)	5 (10%)	16 (32%)	2 (4%)	2 (4%)	1 (2%)	0(0%)	0(0%)	0(0%)	0(0%)	50 (100%)
Ibadan Northwest	13 (26%)	17 (34%)	18 (36%)	2 (4%)	0 (0%)	0 (0%)	0 (0%)	0(0%)	0(0%)	0(0%)	50 (100%)
Ibadan Southeast	17 (34%)	1 (2%)	21 (42%)	3 (6%)	5 (10%)	0(0%)	1 92%)	2 (4%)	0(0%)	0(0%)	50 (100%)
Ibadan Southwest	5 (10%	4 (8%)	35 (70%)	6 (12%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Ibarapa Central	7 (14 %)	11 (22%)	19 (38%)	6 (12%)	1 (2%)	0 (0%)	0 (0%)	6 (12%)) (0%)	0 (0%)	0 (0%)	50 (100%)
Ibarapa East	37 (74 %)	8 (16%)	4 (8%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (2%)	0 (0%)	50 (100%)
Ibarapa North	2 (4.1%)	16 (32.7%)	15 (30.6%)	9 (18.4%)	0 (0%)	0(0)%)	0 (0%)	5 (10.2%)	2 (4.1%)	0 (0%)	49 (100%)
Ido	16 (32%)	6 (12%)	24 (48%)	2 (4%)	2(4%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Irepo	19 (38%)	16 (32%)	8 (16%)	2 (4%)	3 (6%)	0 (0%)	2 (4%)	0(0%)	0(0%)	0(0%)	50(100%
Iseyin	10 (22.2%)	7 (15.6%)	25 (55.6%)	2 (4.4%)	1 (2.2%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	45 (100%)
Itesiwaju	20 (40%)	10 (20%)	18 (36%)	2 (4%)	0 (0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	50 (100%)
Iwajowa	10 (20%)	2 (4%)	24 (48%)	2 (4%)	12(24%)	0(0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Kajola	6 (15%)	5 (12.5%)	28 (70%)	) (0%)	1 (2.5%)	0 (0%)	0(0%)	0(0%)	0(0%)	0(0%)	40 (100%)
Lagelu	18(36%)	4 (8%)	11 (22%)	9 (18%)	2 (4%)	4 (8%)	1 (2%)	0(0%)	1(2%)	0 (0%)	50 (100%)

Ogbomoso North	18 (36%)	2 (4%)	22(44%)	5 (10%)	3 (6%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	50 (100%)
Ogbomoso South	15 (30%)	8 (16%)	20 (40%)	6 (12%)	1 (2%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	50 (100%)
Ogooluwa	15 (30%)	9 (18%)	11 (22%)	9 (18%)	5 (10%)	0 (0%)	0 (0%)	1 (2%)	0 (0%)	0 (0%)	50 (100%)
Olorunsogo	7 (14%)	4 (8%)	31 (62%)	0 (0%)	8 (16%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	50 (100%)
Oluyole	2 (4.3%)	14 (29.8%)	19(40.4%)	7 (14.9%)	4 (8.5%)	1 (2%)	0(0%)	0(0%)	0(0%)	0(0%)	47 (100%)
Onaara	13 (25%)	8 (16%)	9 (18%)	20 (40%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	50 (100%)
Orelope	10 (20%)	7 (14%)	10 (20%)	6 (12%)	14 (28%)	3(6%)	0(0%)	0(0%)	0(0%)	0(0%)	50 (100%)
Oriire	15 (30 %)	4 (8%)	14 (28%)	1 (2%)	2 (4%)	11 (22%)	3 (6%)	0(0%)	0 (0%)	0 (0%)	50 (100%)
Oyo East	9 (18.4%)	5 (10.2%)	25 (51%)	10 (20.4%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	49 (100%)
Oyo west	10 (20%)	2 (4%)	25 (50%)	6 (12%)	6 (12%)	0 (0%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Saki east	10 (20%)	15 (30%)	17 (34%)	0 (0%)	7 (14%)	1 (2%)	0(0%)	0(0%)	0(0%)	0(0%)	50 (100%)
Saki west	3 (6%)	9(18%)	33 (66%)	5 (10%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	50 (100%)
Surulere	18 (36%)	10 (20%)	9 (18%)	7 (14%)	5 (10%)	0(0%)	0 (0%)	0 (0%)	1(2%)	0 (0%)	50 (100%)
Total	**403 (24.95)**	**250 (15.4%)**	**633 (39.1%)**	**156 (9.6%)**	**116 (7.2%)**	**30 (1.9%)**	**8 (0.5%)**	**15 (0.9%)**	**7 (0.4%)**	**1 (0.1%)**	**1619(100%)**

Source: Field survey, 2014

Table 5.14: Spatial pattern of perceived treatment options of DM

LGA	No response	Insulin injection	Food supplement	Body exercise	Herbal treatment	Low sugar intake	Prayer	Total
Afijio	7 (14%)	25 (50 %)	8 (16 %)	4 (8%)	2 (4%)	4 (8%)	0 (0%)	50 (100%)
Akinyele	9 (18%)	19 (38%)	13 (26%)	3 (6%)	0 (0%)	0 (0%)	0(0%)	50 (100%)
Atiba	9 (18%)	24 (48%)	10 (20%)	2 (4%)	2 (4%)	3(6%)	0 (0%)	50 (100%)
Atisbo	15 (37.5%)	22 (55%)	0 (0%)	0 (0%)	3 (7.5%)	0 (0%)	0 (0%)	40 (100%)
Egbeda	11 (22.4%)	28 (57.1%)	6 (12.2%)	1 (2%)	0 (0%)	3 (6.1%)	0(0%)	49 (100%)
Ibadan North	0 (0%)	32 (64%)	14 (28%)	0 (0%)	0 (0%)	4 (8%)	0 (0%)	50 (100%)
Ibadan Northeast	23 (46%)	22(44%)	3 (6%)	2 (4%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Ibadan Northwest	4 (8%)	34 (68%)	6 (12%)	2 (4%)	0 (0%)	4 (8%)	0 (0%)	50 (100%)
Ibadan Southeast	16 (32%)	22 (44%)	5 (10 %)	1 (2%)	1(2%)	5 (10%)	0 (0%)	50 (100%)
Ibadan Southwest	0 (0%)	3 (60%)	9 (18%)	2 (4%)	0 (0%)	9 (18%)	0(0%)	50 (100%)
Ibarapa Central	2 (4%)	33 (66%)	12 (24%)	0 (0%)	3 (6%)	0 (0%)	0 (0%)	50 (100%)
Ibarapa East	27 (54%)	12 (24%)	11 (22%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Ibarapa North	1 (2%)	35 (71.4%)	3 (6.1%)	0 (0%)	10 (20.4%)	0 (0%)	0 (0%)	49 (100%)
Ido	17 (34%)	17 (34%)	10 (20%)	4 (8%)	0 (0%)	2 (4%)	0 (0%)	50 (100%)
Irepo	2 (4%)	32 (64%)	13 (26%)	1 (2%)	1 (2%)	1 (2%)	0 (0%)	50(100%
Iseyin	13 (28.9%)	26 (57.8%)	1 (2.2%)	0 (0%)	3(6.7%)	2 (4.4%)	0 (0%)	45 (100%)
Itesiwaju	7 (14%)	35 (70%)	4(8%)	2 (4%)	2 (4%)	0 (0%)	0 (0%)	50 (100%)
Iwajowa	6 (12%)	22 (44%)	13 (26%)	1 (2%)	5 (10%)	3 (6%)	0 (0%)	50 (100%)
Kajola	3 (7.5%)	20 (50%)	1 (2.55)	2 (5%)	4 (10%)	10 (25%)	0 (0%)	40 (100%)
Lagelu	17 (34%)	26 (52%)	3 (6%)	0 (0%)	3 (6%)	0 (0%)	1 (2%)	50 (100%)
Ogbomoso North	21 (42%)	18 (36%)	3 (6%)	1 (2%)	1 (2%)	6 (12%)	0 (0%)	50 (100%)
Ogbomoso South	18 (36%)	22 (44%)	8 (16%)	0 (0%)	0 (0%)	2 (4%)	0 (0%)	50 (100%)
Ogooluwa	20 (40%)	21 (42%)	2 (4%)	0 (0%)	3 (6%)	4 (8%)	0 (0%)	50 (100%)
Olorunsogo	5 (10%)	33 (66%)	0 (0%)	0 (0%)	2 (4%)	10 (20%)	0(0%)	50 (100%)
Oluyole	2 (4.3%)	24 (51.1%)	6 (12.8%)	2 (4.35)	12 (25.5%)	1 (2.1%)	0(0%)	47 (100%)
Onaara	6 (12%)	42 (84%)	0 (0%)	2 (4%)	0 (0%)	0 (0%)	0 (0%)	50 (100%)
Orelope	5 (10%)	19 (38%)	13 (26%)	0 (0%)	3 (6%)	10 (20%)	0 (0%)	50 (100%)
Oriire	22 (44%)	15 (30 %)	4 (8%)	0 (0%)	2 (4%)	7 (14%)	0 (0%)	50 (100%)
Oyo East	11 (22.4%)	22 (44.9%)	11 (22.4%)	1 (2%)	0 (0%)	4 (8.2%)	0 (0%)	49 (100%)
Oyo west	7 (14%)	36 (72%)	4 (8%)	1 (2%)	0 (0%)	2 (4%)	0 (0%)	50 (100%)
Saki east	12 (24%)	8 (565	6 (125)	0 (0%)	4 (8%)	0 (0%)	0 (0%)	50 (100%)
Saki west	8 (16%)	35 (70%)	5 (10%)	1 (2%)	1 (2%)	0 (0%)	0 (0%)	50 (100%)
Surulere	19 (38%)	23 (46%)	6 (12%)	0 (0%)	1 (2%)	1(2%)	0 (0%)	50 (100%)
Total	**345 (21.3%)**	**854 (52.7%)**	**213 (13.2%)**	**35 (2.2%)**	**68 (4.2%)**	**103 (6.4%)**	**1 (0.1%)**	**1619(100%)**