

**The burden of overweight  
and obesity in Kenya**

**Analyses of the known determinants  
and control responses for overweight  
and obesity in Kenya.**

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The Netherlands**

49th International Course in Health Development  
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KIT (ROYAL TROPICAL INSTITUTE)  
Development Policy & Practice/  
Vrije Universiteit Amsterdam

**The burden of overweight and obesity in Kenya**  
***Analyses of the known determinants and control responses for overweight and obesity in Kenya.***

A thesis submitted in partial fulfillment of the requirement of the degree of Master of Public Health

By

Elsa Groenveld – van Dijk

The Netherlands

Declaration: Where other people's work has been used (either from a printed source, internet or any other source) this has been carefully acknowledged and referenced in accordance with the departmental requirements.

The thesis "**The burden of overweight and obesity in Kenya, Analyses of the known determinants and control responses for overweight and obesity in Kenya**" is my own work.

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**Contents**

- List of tables, figures and graphs.....v
- List of abbreviations .....vi
- Glossary.....vii
- Acknowledgements .....ix
- ABSTRACT .....x
- Introduction .....xi
  - Organization of the Thesis .....xi
- Chapter 1: Background information Kenya ..... 1
  - 1.1 Location and geography..... 1
  - 1.2 Demographic and socio economic situation ..... 1
  - 1.3 Economic situation ..... 2
  - 1.4 Educational situation ..... 2
  - 1.5 Health Profile..... 2
- Chapter 2: Problem statement, study objectives, study method, limitations of the study, analytical framework for the study ..... 4
  - 2.1 Problem statement and justification ..... 4
  - 2.2 Objectives and sub-questions..... 5
  - 2.3 Methods..... 5
  - 2.4 Limitations ..... 6
  - 2.5 Analytical Framework for the study..... 6
- Chapter 3: Findings from Literature Review ..... 8
  - 3.1 The prevalence of overweight and obesity in Kenya and the distribution over age groups, gender, wealth and ethnicity..... 8
    - 3.1.1 Prevalence of overweight and obesity in urban and rural areas..... 8
    - 3.1.2 Overweight and obesity prevalence in comparison to wealth..... 8
    - 3.1.3. Prevalence of overweight and obesity in female and male adults, according to region and ethnicity. .... 9
    - 3.1.4 Prevalence of overweight and obesity related to age in adults..... 11
    - 3.1.5 Prevalence of overweight and obesity in children and adolescents..... 12
    - 3.1.5 Quality of the data..... 14
  - 3.2 What are the known determinants of overweight and obesity in Kenya? .... 15
    - 3.2.1 Distal factors: globalization and urbanization ..... 15
    - 3.2.2 Intermediate factors..... 16

3.2.3 Proximate factors.....	19
3.2.4 Quality of the data.....	25
3.4 quality of the data .....	30
Chapter 4: Discussion.....	31
4.1 Prevalence findings .....	31
4.2 Known determinants and known responses.....	32
4.2.1 Distal factors.....	32
4.2.2 Intermediate factors.....	32
4.2.3 Proximate factors.....	33
4.2.4 Known responses .....	33
Chapter 5: Conclusion and Recommendations .....	34
5.1 Conclusion .....	34
5.2 Recommendations .....	35
References.....	37

# List of tables, figures and graphs

FIGURE 1 CIA UK FOREIGN OFFICE, AFRICA STUDIES CENTER ..... 1

FIGURE 2: PROPORTION MORTALITY, (WHO, 2011). ..... 2

FIGURE 3: THEORETICAL FRAMEWORK, A CAUSALITY CONTINUUM MODEL FOR OBESITY IN SSA (SCOTT ET AL, 2012). ..... 6

TABLE 1: PREVALENCE OF ABDOMINAL OBESITY, MEAN BMI, WC AND HIP MEASUREMENTS OF WOMEN ACCORDING TO THEIR INCOME GROUP (STEYN ET AL, 2010). 9

TABLE 2: PREVALENCE OF OVERWEIGHT AND OBESITY/ OR MEAN BMI (SD), WC IN ADULTS IN URBAN AND RURAL AREAS, ORDERED ACCORDING TO YEAR OF STUDY. 9

TABLE 3: PREVALENCE OF OBESITY IN CHILDREN IN RURAL AND URBAN AREAS, ORDERED ACCORDING TO YEAR OF STUDY 12

TABLE 4: INTAKE BY URBAN AND RURAL WOMEN 20

TABLE 5: PERCENTAGE TIME SPENT ON PHYSICAL ACTIVITY BY KENYAN WOMEN ACCORDING TO SOCIO-ECONOMIC GROUP (MBOCHI ET AL, 2012). 23

TABLE 6: DESCRIPTIVE CHARACTERISTICS OF KENYAN ADOLESCENTS MEAN VALUES (SD), (OJIAMBO ET AL, 2012). 24

TABLE 7: TRANSPORT TO SCHOOL FOR ADOLESCENTS AGE 12-16 YEARS (OJIAMBO ET AL, 2012) 25

## List of abbreviations

AFA	Arm Fat Area
APHCR	African Population and Health Research Center
BAP	BMI-for-age percentiles
BMI	Body Mass Index
CNCD-Africa	Consortium for Non-Communicable Disease Prevention and Control sub-Saharan Africa
DHIS	Division of Health Information Systems
DHS	Demographic Health Survey
GDP	Gross Domestic Product
HAKK	Healthy Active Kids Kenya
HINIs	High Impact Nutrition Interventions
IOTF	International Obesity Task Force
KNBS	Kenya National Bureau of Statistics
MMS	Ministry of Medical Services
MoPHS	Ministry of Public Health and Sanitation
MP	Medical Practitioners
NNAP	National Nutrition Action Plan
NCD	Non-Communicable Diseases
OR	Odds Ratio
PALs	Physical Activity Levels
MET	Metabolic equivalent
SD	Standard Deviation
SE	Social Economic
SSA	sub-Saharan Africa
WHO	World Health Organization
WC	Waist Circumference

## Glossary

This glossary is based on information of the Weight-control Information Network (WIN).

**BMI** –Body Mass Index is measure of body weight compared to height. For adults a BMI of  $> 18.5$  to  $24.9 \text{ kg/m}^2$  is considered as normal/healthy. A BMI of  $\geq 25.0$  to  $29.9 \text{ kg/m}^2$  is considered as overweight and a person with a BMI of  $\geq 30 \text{ kg/m}^2$  is considered to be obese. For children there are different cut off points as they grow at different rates. The BMI charts for children compare their weight and height to other children of the same sex and age. WHO cut-off points says children in the age group 2-19 who are at 85<sup>th</sup> percentile considered to be overweight and those who are above the 95<sup>th</sup> or 97<sup>th</sup> percentile considered to be obese. Cole uses lower cut-off points (WHO, 2007; Cole 2002).

**Calorie** – Unit of energy in food or drinks. Fat contains 9 calories per gram, alcohol 7, and carbohydrates and protein 4 calories per gram.

**Carbohydrates** – there are two kinds – simple carbohydrates contain the sugars that are part of some food like lactose in milk and fructose in fruit. These sugars may be added in the food preparation. Complex carbohydrates contain those that come from legumes like peas or beans, cereals and whole grain breads. Many of them contain lots of fibre.

**Diet** – what a person eats.

**Diabetes type 2** – a disease when the blood glucose level is above normal levels. Glucose comes from the food we consume. The hormone insulin assists the glucose to go into the cells to give them energy. Diabetes type 2 type presents when the body becomes resistant to insulin or when the body has to less insulin. A too high blood glucose level will cause problems over time and damage eyes, nerves, kidneys and blood vessels. Diabetes type 2 is a non-communicable disease.

**Healthy weight** – a weight that is based on having a BMI within the normal range:  $\geq 18.5 \text{ kg/m}^2$  and  $24.99 \text{ kg/m}^2$ .

**Hypertension** – high blood pressure. Optimal blood pressure is 120/80 mmHg. A high blood pressure is for example 150/95 mmHg. Hypertension can cause for example cardio vascular diseases and stroke, which are non-communicable disease.

**Nutrition** – The process of the body using food to sustain life.

**Obesity** – excess of body fat. Body fat can be calculated with the Body Mass Index. Adults with a BMI  $\geq 30 \text{ kg/m}^2$  are considered to be obese.

**Overweight** – refers to excessive amount of body weight. Adults with a BMI  $\geq 25.0$  to  $29.9 \text{ kg/m}^2$  are considered to be overweight which includes, fat, bone, water and muscles.

**Physical activity** – any form of exercise or movement like running, walking, biking or other sports. Physical activity may also include daily activities and chores like washing the car, walking the stairs or sweeping the floor. A sedentary lifestyle requires the minimal physical activity.



## **Acknowledgements**

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## **ABSTRACT**

**Elsa Groenveld – van Dijk, ICHD, Master Public Health 2013**

### **Background**

In Kenya and other Middle and Low income countries the prevalence of overweight and obesity is increasing. To analyse the burden we need to know what is known and which information is still lacking.

### **Thesis Objective**

To describe the extend of the problem of overweight and obesity in Kenya and analyze the magnitude, risk factors and public health responses for primary prevention of overweight and obesity. The aim is to understand which aspects of obesity in Kenya are well known and of good quality and which aspects of obesity are lacking with an aim to give a direction for future research and recommendations for the health authorities and policymakers what to focus on.

### **Study method**

Literature review.

### **Findings:**

Prevalence of overweight and obesity is increasing particularly in urban areas. Some age groups and areas have not been researched. Age, sex, physical activity and urbanization were the strongest determinants for overweight and obesity.

### **Conclusion**

The determinants of overweight and obesity play a vital role for developing overweight and obesity. Not all of these determinants have been researched in the context of Kenya. There is a need to understand these determinants to formulated evidence based interventions in an efficient and equitable way. This thesis attempts to provide an understanding of the magnitude and risk factors and public health responses in Kenya.

### **Recommendation**

Further research and in particular to set up a cohort study.

### **Keywords**

*Kenya, overweight, obesity, prevalence, determinants*

**Word Count: 11,504**

## **Introduction**

Overweight and obesity are on the rise globally and are a disorder of the 21<sup>st</sup> century. Overweight and obesity are getting more and more attention as it is associated with an increased risk of multiple health problems, especially non-communicable diseases (NCDs). It is the fifth prominent risk for global deaths. Globally each year at least 2.8 million adults die being overweight or obese. On top of this 23% of the ischemic heart disease burden and 44% of the diabetes burden and more than 7% of certain cancer burdens are attributable to overweight and obesity. (WHO, 2013). An unhealthy diet, physical inactivity and tobacco use are the most common risk factors for NCDs.

The World Health Organization (WHO) launched in 2004 “the WHO Global Strategy on Diet Physical Activity and Health” (WHO, 2004). This initiative deliberates and describes the actions needed to support a healthy diet and regular physical activity. The strategy was also a call for action on global, regional and local levels to improve diets and physical activity patterns at citizenry level.

Overweight and obesity was rare a few decades ago in East and Sub-Saharan Africa. Recently the number of cases has risen. Developed countries in Europe and also the United States of America are already trying to deal with the problem of overweight and obesity, but now it is increasing in low and middle income countries like Kenya as well. In the last ten years health experts in Kenya noticed that adults and children were experiencing overweight problems. The reason for the increase of overweight and obesity prevalence is likely to be attributable to a disturbed energy balance: a higher intake of energy and a decrease of physical activity (Popkin, 2002). Insight in which recent changes in Kenya drives the obesity epidemic is lacking, due to limited research in this area. This thesis will make an attempt to give insight in which information is known on overweight and obesity and in which area information is lacking.

## **Organization of the Thesis**

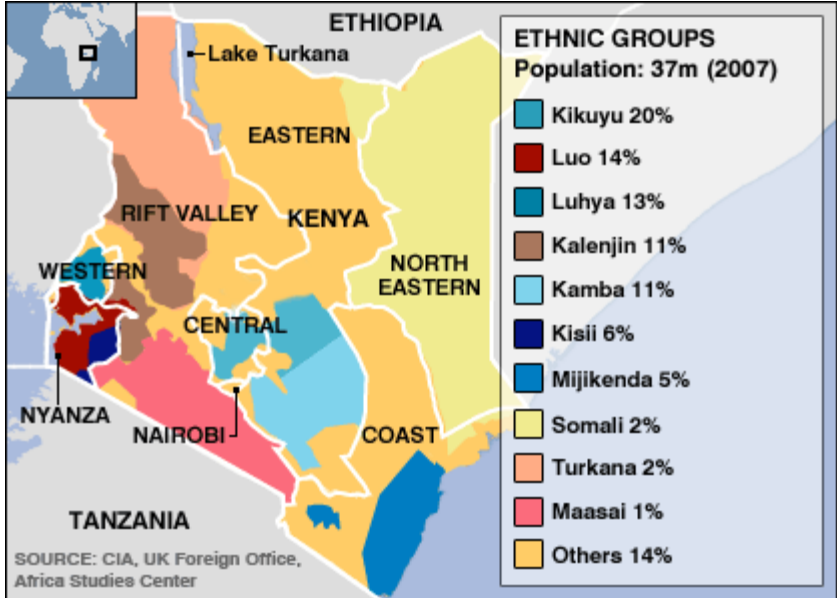
The first chapter gives background information on Kenya. Chapter two introduces the problem and objectives of the thesis; it also describes the methodology used for the literature review and the conceptual framework. Chapter three indicates the findings on the magnitude and trends in prevalence and known determinants and public health responses of overweight and obesity. Chapter four discusses the findings of this thesis and attempts to make some conclusions and recommendations in Chapter five. The findings may be used for further research and improvement of the overweight and obesity situation in Kenya.

# Chapter 1: Background information Kenya

## 1.1 Location and geography

Kenya is located in East Africa within the Sub Saharan Region and bordering Ethiopia and South Sudan to the North, Somalia to the East, Uganda to the West, Tanzania to the South and the Indian Ocean. The country is divided into 47 administrative counties (IEBC, 2013). Kenya is a low income country according to the World Bank Classification (World Bank).

Figure 1 CIA UK Foreign office, Africa Studies Center



## 1.2 Demographic and socio economic situation

The estimated population in Kenya is almost 40 million inhabitants, with a growth rate of 2.4% (CIA 2013). Around 43% of the total population is below the age of fifteen (KNBS, 2012). Nairobi is the capital and is situated in Nairobi County with a population of 3.14 million inhabitants. Kenya is home to different ethnic groups as Kikuyu, Luhya, Luo, Kalenjin, Kamba, Kisii, and Meru. It is also home to other Africans as well as to Non-Africans from Asia, Europe and Arab States (CIA Fact book). In total 35% of the population lives in urban areas and 65% in rural areas (KNBS, 2012).

### 1.3 Economic situation

Kenya is a low-income country and a centre for trade and business in East and Sub-Saharan Africa (SSA). Agriculture, especially tea and horticulture, and tourism are the primary foreign exchange earners (KNBS, 2012). Within Kenya the Gross Domestic Product (GDP) is 37.229 million US Dollars, with an estimated growth of 5.2% in 2013 (WorldBank; IMF). However approximately 46% of Kenyans live below the poverty line. The unemployment rate for 2012 was 40% with a Human Development Index (HDI) ranking 145 out of 187 (KNBS, 2012; UNDP, 2013).

### 1.4 Educational situation

Literacy and numeracy rates vary in each county. In Nairobi it is highest with 86.6% and lowest in North Eastern Province with 9.1%. Elementary school is free of charge and almost 80% of children have elementary education (KNBS, 2012).

### 1.5 Health Profile

The health sector is regulated by the Government of Kenya through the Ministry of Public Health and Sanitation (MoPHS) and the Ministry of Medical Services (MMS). Life expectancy at birth is 55 years for men and 53 years for women. The maternal mortality rate was 488/100.000 live births in 2008. The infant mortality rate was 52/1000 live births and the under five mortality rate was 74/1000 live births (KDHS, 2009).

**Figure 2: proportion Mortality, (WHO, 2011).**

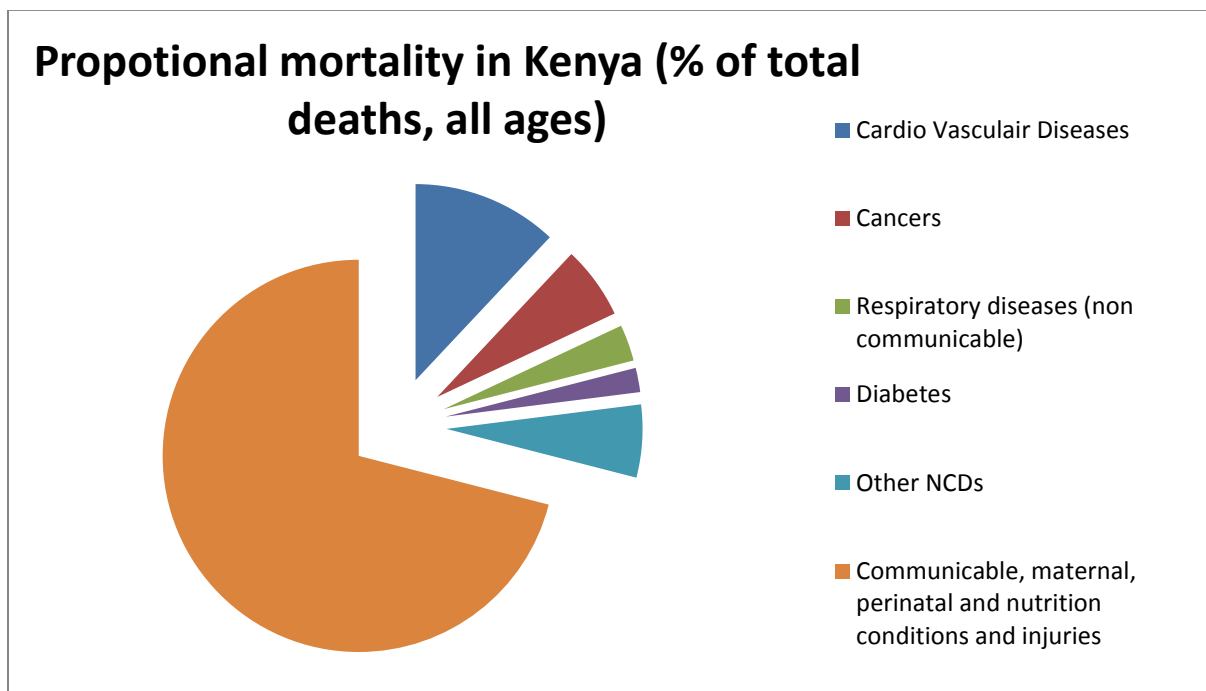


Figure 2 shows the proportion of mortality in Kenya. Kenya is facing a double burden of disease as the country is still fighting communicable diseases like malaria, HIV and tuberculosis. At the same time non-communicable diseases like diabetes type 2, cardio-vascular diseases and cancers are increasing and becoming a major public health problem. NCDs are estimated to account for 29% of the deaths (WHO, 2011).

A national Health Policy was developed to give directions to ensure significant improvement in the overall status of health in Kenya. This policy is in line with the country development agenda (Vision 2030) the Constitution of Kenya and commitments globally. The policy takes into account the responsibilities on national and county level (MoPHS, KHP 2012).

## **Chapter 2: Problem statement, study objectives, study method, limitations of the study, analytical framework for the study**

### **2.1 Problem statement and justification**

Overweight and obesity is a significant public health problem worldwide. It has been a problem exclusively for the Western world, but not anymore. A lot of developing countries need to reduce hunger and malnutrition; other more developed countries face the opposite: the problem of overweight and obesity.

Globally in 2008 around 35% of the adult populations above the age of 20 are overweight and 11% are obese. It is estimated that by 2030 over one billion adults are obese worldwide (Kelly et al, 2008).

Obesity is another word for severely overweight. Obesity is an abnormal fat accumulation that may have a negative effect on the health of a person and give health risks (WHO, 2012). We talk about obesity in Caucasian adults when a person Body Mass Index (BMI) is greater than 30 kg/m<sup>2</sup> and about overweight when a person has a BMI between 25 and 29.9 kg/m<sup>2</sup>. Overweight and obesity is caused by a disturbed energy balance. That means more calories are taken by eating and drinking than are consumed by the body as energy expenditure for physical activities, maintenance and diet-induced thermo genesis to process food. If this situation exists for some time, the surplus calories are converted to fat and can result in the long term to obesity.

Since 1980 obesity prevalence has risen worldwide alarmingly under adults and children and is one of the greatest public health challenges of this century. The prevalence of overweight and obesity is also increasing in Kenya (Ziraba et al, 2009). Data from the Demographic Health Survey (DHS) 2009 unveiled that the national prevalence of overweight and obesity in women between 15-49 years old was 23%, whereas in the same sex and age group 12.3% was underweight (KNBS 2010).

Globally overweight and obesity cause more deaths than underweight in adults. In low and middle income countries, as Kenya, the burden of diet and physical inactivity is risk equivalent to HIV/AIDS and Tuberculosis combined (WHO, 2009).

Overweight and obesity can cause major health problems including NCDs. To understand and to tackle the problem of overweight and obesity in Kenya it would be useful to know the determinants and consequences in order to set up appropriate prevention and intervention systems.

There is a need to know the current prevalence of overweight and obesity in Kenya in the rapid changing environment, to understand the determinants of this public health problem and why and where people are affected, to know their living conditions and the implications and methods of prevention and control of this public health problem. Some of the obese

people look well-fed, but not all obese people are necessarily better fed. Obesity may mask underlying deficiencies in vitamins and minerals. Therefore, the determinants and the consequences of overweight and obesity may not be the same in developed and developing countries. There is a national program on food and nutrition security. In the program outline there is attention to overweight and NCDs but much more attention is needed in practise to tackle the problems.

## **2.2 Objectives and sub-questions**

### Overall aim

To describe the extend of the problem of overweight and obesity in Kenya and analyze the magnitude, risk factors and public health responses for primary prevention of overweight and obesity. The aim is to understand which aspects of obesity in Kenya are well known and of good quality and which aspects of obesity are lacking with an aim to give a direction for future research and recommendations for the health authorities and policymakers what to focus on.

Specific objectives:

1. To identify the prevalence of overweight and obesity in Kenya. How is this distributed over age, gender, wealth and ethnic groups?
2. To identify the known determinants of obesity in Kenya. Are these determinants related to age, gender, wealth and ethnic groups?
3. To identify the targets of the current public health interventions and the consequences for primary prevention of obesity in Kenya.
4. For all these questions above, the thesis will also evaluate what the quality of the data is and identify the source of this information.

## **2.3 Methods**

To perform a qualitative review of the literature and to ensure a broad coverage of the topic, a wide scope of search was conducted. The search was done through Cochrane, PubMed, Scopus, Science Direct, Medline, Embase databases, Google Scholar, WHO website and the Rijkuniversity Groningen Library. Reports, policies and papers from various Ministries in Kenya including the Ministry of Medical Services and Ministry of Public Health and Sanitation are consulted. Key words for the search were: obesity, childhood obesity, overweight, prevalence, determinants, migration, urbanization, prevention, physical activity, control, equity, age, ethnic groups, Nairobi and Kenya. The keywords were used in various combinations or single. Inclusion criteria were documents and publications from 2003 – 2013 to recover the most current material and evidence. This included reviews, randomized control trials, observational studies and full text articles all in English language. Country reports and policies were included if they were in English.



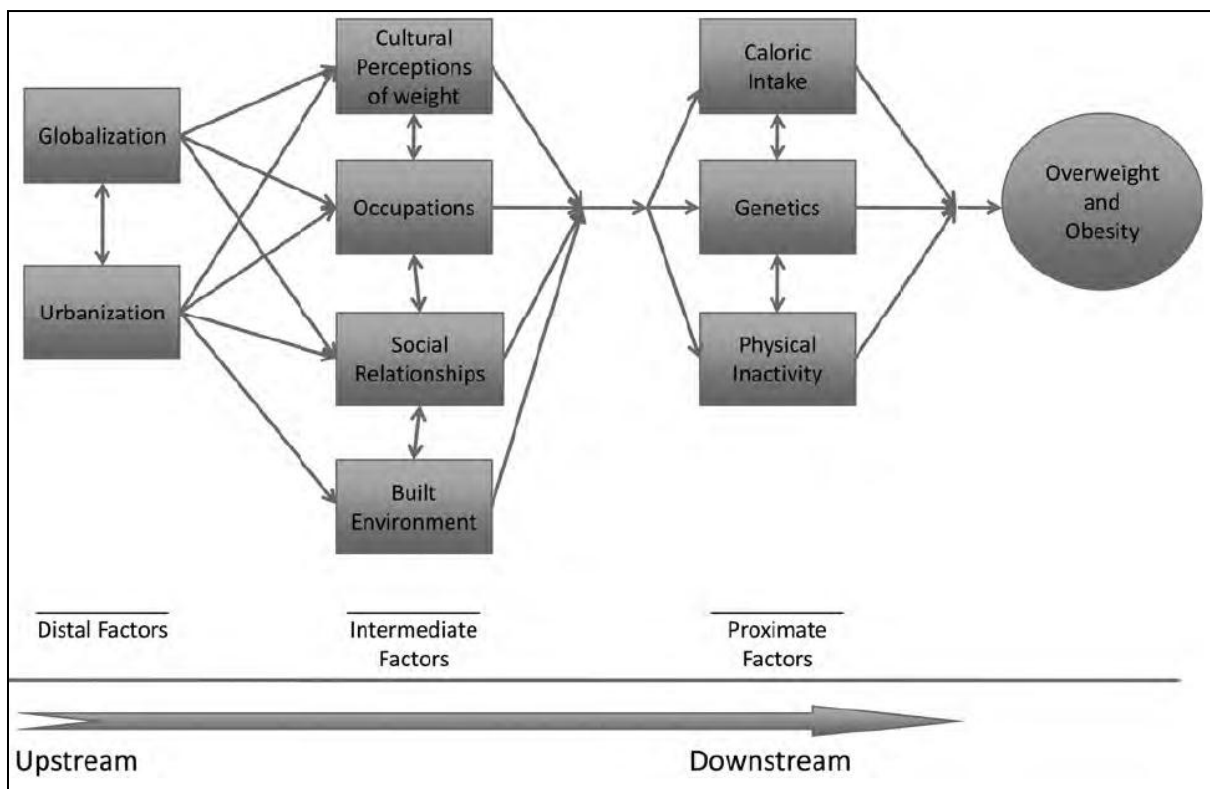
## 2.4 Limitations

Limitation of the study was the unavailability of some data, which have been mentioned in the study. Only documents and articles in English language have been used. Swahili language could have been useful to do a more into depth study. Very few studies on overweight and obesity have been done in Kenya. Unfortunately, there was no opportunity for primary data collection while working on this thesis.

## 2.5 Analytical Framework for the study

A theoretical Framework for causality continuum (figure 3) is used for this study to investigate the known determinants and responses in Kenya.

Figure 3: Theoretical Framework, a causality continuum model for obesity in SSA (Scott et al, 2012).



This theoretical framework is especially focused on SSA which explains the importance of interacting factors continuously from the individual to the global level. It will illustrate the interplay of distal, intermediate and proximate factors together to describe the known determinants and responses for overweight and obesity in Kenya.

- The Distal Factors describes globalization and urbanization.
- At the Intermediate level there are factors such as sedentary occupation, cultural perception of weight, built environment, social relationships. Wealth, public health, health care, media, land-use

and transport will be added as they have impact on the built environment.

- The Proximate level represents calorie intake, physical activity and genetics. Age and gender will be added.

## **Chapter 3: Findings from Literature Review**

### **3.1 The prevalence of overweight and obesity in Kenya and the distribution over age groups, gender, wealth and ethnicity.**

Most studies give some detail about age, gender, ethnicity and urban or rural regions. This is summarized in Table 2. In these reports, the findings are often interrelated, and give for example the differences for various ethnicities. Therefore it is difficult to separate these conclusions. First we will discuss general differences according to region and wealth, and next we will focus on the differences in age and gender and add in these paragraphs information on region and ethnicity according to age and gender. Finally we will present data on childhood obesity.

#### **3.1.1 Prevalence of overweight and obesity in urban and rural areas.**

In general, the proportion of overweight and obesity is highest in urban areas like Nairobi with 41% and lowest in rural areas like the North Eastern province with 11%. Kibera Division of Nairobi Province, an urban area had the highest prevalence of overweight and obesity and raised from 39% in 2003 KDHS to 41% in 2009 KDHS (KDHS, 2009). This shows that the prevalence is still not declining.

Two studies by Christensen et al looked into the impact of urbanization and ethnicity on obesity in Kenyan populations. A cross sectional study was done among Luo, Kamba and Maasai in rural and urban Kenya. The prevalence of overweight was highest in the urban areas vs. the rural areas: 39.8% vs. 15.8% and for obesity 15.5% vs. 5.1%.

#### **3.1.2 Overweight and obesity prevalence in comparison to wealth**

Steyn et al shows in their study that income and wealth plays a role in nutrition status and gives significant differences in anthropometry in women in Kenya. Significant higher BMI, waist circumference (WC) and HIP measurements were found in the upper income group compared with the middle and lowest income groups, see table 1 (Steyn et al, 2010). In contrast Mbochi et al found no significant differences in BMI, WC and body fat percentage for education levels (Mbochi et al, 2012). As an explanation it is good to take into account that the earlier study from Steyn et al had a representative sample from urban and rural areas, the current study from Mbochi et al is done in the urban area of Nairobi with was already known to have a high prevalence of overweight and obesity.

**Table 1: Prevalence of abdominal obesity, mean BMI, WC and HIP measurements of women according to their income group (Steyn et al, 2010).**

	<b>BMI (kg/m<sup>2</sup>)</b>	<b>Abdominal obesity prevalence</b>	<b>WC (cm)</b>	<b>Hip (cm)</b>
Upper income	27.3	26%	88	105
Middle Income	25.6	26%	80.2	102.3
Lower Income	23.9	18.4%	78.8	98.1

### **3.1.3. Prevalence of overweight and obesity in female and male adults, according to region and ethnicity.**

The BMI for females is higher than for males. For example 4.1% males are classified as overweight and obesity compared to 20.7% females, P=0.001 (Jayne et al, 2011). Most research has been done among women; there is also some data available about men as you can see in table 2.

**Table 2: Prevalence of overweight and obesity/ or mean BMI (SD), WC in adults in urban and rural areas, ordered according to year of study.**

Author and year of study	subject	Method	Study subjects	Prevalence of overweight (BMI 25 – 29.9 kg/m <sup>2</sup> ) and obesity (BMI > 30 kg/m <sup>2</sup> ) in <u>rural</u> areas, in% **	Prevalence of overweight (BMI 25 – 29.9 kg/m <sup>2</sup> ) and obesity (BMI > 30 kg/m <sup>2</sup> ) in <u>urban</u> areas, in% **	Mean waist circumference in cm in <u>rural</u> areas	Mean waist circumference in cm <u>urban</u> areas
Ayah et al, 2013	Prevalence of diabetes and correlates in urban slum, Nairobi	BMI and WC	n= 2036, male/female aged 18 - 90	n/a*	Male Overweight: 26.1% Obese 7.1% Female Overweight 32.2%, Obese 26.1%	n/a	Male: 2.6% had an elevated WC Female 41.5% had elevated WC
Mbochi et al, 2012	Predictors of obesity, Nairobi	BMI and WC	n = 365 female aged 25-54	n/a	Female Mean BMI 27.9 (5.3)	n/a	Female: 86.9 (13.5)
Jayne et al, 2011	Nutrition status rural population Kombewa division	BMI	n = 500, male/ female aged 18-55	Males 4.1%, Females 20.7%	n/a	Not measured	Not measured
Hansen et al, 2011	Dietary patterns rural Kenya, Bondo Kitui and Transmara district	BMI and WC	n = 1163 male/ female Luo, Kamba and Maasai aged 18 - 68	For overweight and obesity together: Male Luo:9.8% Male kamba:3.9% Male Maasai:14.0% Female Luo:14.0% Female Kamba:25.2% Female Maasai:17.9%	n/a	<u>Male</u> Luo:78.9 Kamba:76.9 Maasaai:80.3 <u>Female</u> Luo:77.4 Kamba:77.5 Maasai: 78.5	n/a
Steyn et al, 2011	Determinants of obesity in	BMI and WC	n = 1008 female aged	Female: Overweight 22%,	Female: Overweight 32.3	Female:78.9	Female: 80.8

Author and year of study	subject	Method	Study subjects	Prevalence of overweight (BMI 25 – 29.9 kg/m <sup>2</sup> ) and obesity (BMI > 30 kg/m <sup>2</sup> ) in rural areas, in% **	Prevalence of overweight (BMI 25 – 29.9 kg/m <sup>2</sup> ) and obesity (BMI > 30 kg/m <sup>2</sup> ) in urban areas, in% **	Mean waist circumference in cm in rural areas	Mean waist circumference in cm urban areas
	women, urban and rural, nation wide		15-60	Obese 10.3%	Obese 15.8		
Mathenga , 2010	Prevalence obesity in rural and urban population in in Nakuru	BMI	n = 4396 male/female, aged ≥ 50	For men and women together: Overweight 19%, Obese 10%	For men and women together: Overweight 30%, Obese 20%	Not measured	Not measured
Christens en et al, 2009	Prevalence glucose intolerance rural and urban	BMI and WC	n = 1459, male/female, Luo, Kamba, Maasai aged 17-68	Male mean BMI 20.8 SD 3.7 Female mean BMI 22.2 SD 4.3	Male mean BMI 22.3 (3.8), Female mean BMI 26.8 (3.8)	Male 79.0 Female 77.7	Male: 83.3 Female 87.0
DHS 2009	Demographic Health survey, nation wide	BMI	Women aged 15-49 from all provinces	Female: Overweight 14.5% Obese 5.6%	Female: Overweight 27,8% Obese 12,1%	Not measured	Not measured
Christens en et al 2008	Obesity and regional fat distribution, Bondo, Transmara, Kitui and Nairobi district	BMI and WC	n = 1430 male/female Luo, Kamba, Maasai aged 17-68	Male overweight: 7.2% Male obese: 2.8% Female overweight: 12.8% Female obese: 6.7%	Male overweight: 16% Male obese: 6.6% Female overweight: 34.4% Female obese: 25.9%	<u>Male</u> Luo:78.9 Kamba:76.9 Maasaai:80.3 <u>Female</u> Luo:77.4 Kamba:77.5 Maasai: 78.4	<u>Male</u> Luo:82.6 Kamba:82.8 Maasaai:85.3 <u>Female</u> Luo:80.3 Kamba:88.6 Maasai: -

\*n/a = not applicable, \*\*for some studies prevalence was not available, in this cases mean BMI (±SD) have been used  
All studies are cross-sectional studies

Body composition may differ between ethnic groups, because of differences in energy intake, physical activity and genetics.

There was a distinct difference in overweight between the genders. Women had a much higher prevalence of overweight compared to men in rural areas (19.5% vs. 10.0%) and in urban areas (60.3% vs. 22.6%). After controlling for age and ethnicity the BMI outcomes for urban areas were substantially higher compared to rural areas, also for both genders (Christensen et al, 2008).

Christensen et al and Hansen et al both found similar results in the different ethnic groups. The WC measurements are almost the same, see table 2.

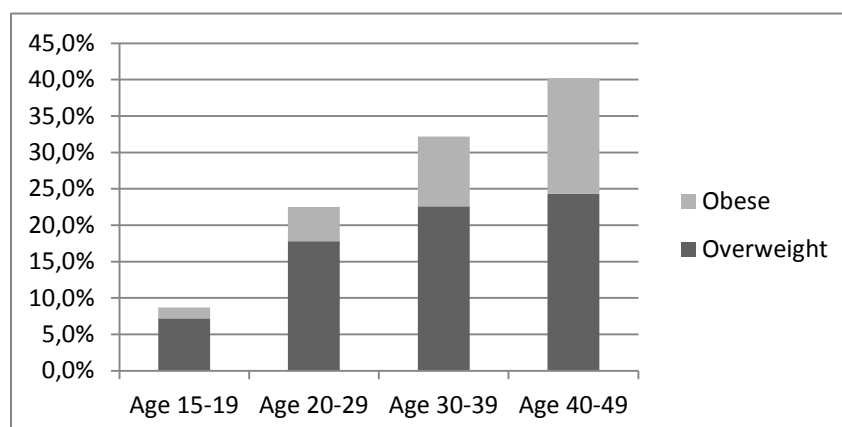
**Table 3: BMI mean values (SD) by ethnic group, gender and residence (Christensen et al, 2008)**

	<b>Luo (n=479)</b>	<b>Kamba (n=579)</b>	<b>Maassai (n=372)</b>	<b>p-value</b>
Body mass index (kg/m <sup>2</sup> )				
Female Rural	21.8 (2.7)	22.5 (4.4)	22.3(4.7)	0.135
Female Urban	25.0 (5.8)	27.4 (5.5)	-	0.094
Male Rural	21.2 (3.0)	20.0 (2.6)	21.0(4.7)	0.021
Male Urban	22.5 (3.8)	22.5 (3.9)	23.3(4.4)	0.872

### 3.1.4 Prevalence of overweight and obesity related to age in adults.

Some reports show the differences between age groups and BMI, most clearly in the DHS (table 4). This is mostly researched among women.

**Table 4: Overweight and obesity in women aged 15-49, DHS 2009 data**



Steyn et al stratified women to age groups and found that higher age was associated with overweight and obesity (Steyn et al, 2012). The KDHS 2009 unveiled the national prevalence of overweight and obesity for women aged 15-49 years was on average 23%. Overweight and obesity are more prevalent with higher age, the proportion overweight and obesity together rises from almost 9% at 15-19 years to 40% of women aged 40-49 years.

According to studies of Christensen, besides BMI, subcutaneous fat, abdominal visceral fat, AFA (arm fat area), WC were measured and were all increasing with age and highest in the Maasai and the urban population. Age in male has been researched very limited. In male it was found among Luo, Kamba and Maasai in rural and urban Kenya that the Luo male over age 55 in urban residency had 5.4 kg/m<sup>2</sup> 95% CI: (4.0;

6.9) and higher BMI ( $p < 0.001$ ) than Kamba's and Maasai male. After adjustment for ethnicity, it was found that for every 10 years of age the BMI of urban men was increased with  $2.0 \text{ kg/m}^2$ . In men from rural areas this was  $0.6 \text{ kg/m}^2$  (Christensen et al, 2008).

**3.1.5 Prevalence of overweight and obesity in children and adolescents**

The prevalence of overweight and obesity in children and adolescents are lower compared to adults. The average prevalence on overweight is 10% and obesity 5%. Table 3 shows the results of the researches that have been done in Kenya on prevalence of overweight and obesity in children in rural and urban area. Measurements methods are BMI and WC. For children different cut of points are used for BMI according to age and sex as body mass index does change substantially with age. Overall girls are slightly more overweight or obese, but the difference is small and not significant.

In general BMI is higher in children with a younger age. A study that looked into childhood overweight and obesity among Kenyan pre-school children showed that with higher age, ranging from 3-3.5 years 4.5-5 years the prevalence of overweight and obesity decreased with respectively 10 and 5% ( $P < 0.05$ ). Older children had lower odds of overweight and obesity (Gewa, 2009). A research on overweight and obesity in the age group 5 - 8 years has not been found.

**Table 3: Prevalence of obesity in children in rural and urban areas, ordered according to year of study**

Author and year of study	subject	Method	Study subjects	Prevalence of overweight and obesity in rural areas In%**	Prevalence of overweight in urban areas in%**	Mean waist circumference in rural areas	Mean waist circumference in urban areas
Héroux et al, 2013	Obesity in children in rural and urban areas	BMI with age and sex specific cut-points according to IOTF, $>85^{\text{th}}$ percentile = overweight and $\geq 95$ percentile is obese, WC	n = 179 Boys/girls aged 9 – 13	Urban and rural areas together: Boys overweight 1.9%, Boys obese 0.9%, Girls overweight 5.6% Girls obese 2.8%		Urban and rural areas together: Boys: 59.6 (58.5; 60.8) Girls: 60.4 (58.8; 62.0)	
Ojiambo et al, 2012	Effect of urbanization on adiposity, rural/urban adolescents	BMI, BMI z-score	n = 200 Boys/girls aged 12-16 years	Male: Mean BMI 15.0 (2.0) Female: Mean BMI 16.2 (2.5)	Male: Mean BMI 19.4 (2.8) Female: Mean BMI 20.0 (2.0)	Not measured	Not measured

Author and year of study	subject	Method	Study subjects	Prevalence of overweight and obesity in <u>rural</u> areas In%**	Prevalence of overweight and obesity in <u>urban</u> areas in%**	Mean waist circumference in cm in <u>rural</u> areas	Mean waist circumference in cm in <u>urban</u> areas
Kamau et al, 2011	Prevalence of overweight and obesity among children, Nairobi Province	BMI, WHO BMI-for age growth charts 2007, >85 <sup>th</sup> percentile = overweight and ≥95 percentile is obese	n = 5325 Boys/girls aged 10-15		Boys: overweight 6.5%, obese 2.6% Girls: overweight: 10.9, obese 3.6	Not measured	Not measured
Adamo et al, 2010	Obesity and fitness levels in children, rural and urban	BMI using cut-off points published by Cole (Cole 2000)	n = 179 Boys/girls aged 9 - 13	None	Overweight and obese together: Boys 6.8% Girls 16.7%	Boys:57.95 Girls:56.42	Boys:61.8 Girls:64.36
Gewa 2009	Childhood overweight and obesity (stratified by cluster sampling DHS data)	WHO growth reference standards sex and age specific Z-scores, BMI for age Z-score. Overweight +1SD<BAZ≤+2SD, obese, BAZ>2SD¥ equivalent to +1SD 85 <sup>th</sup> percentile +2SD is 97 <sup>th</sup> percentile	n = 740 boys, 703 girls aged 3- 5	Urban and rural areas together: Boys overweight: 13.85% Boys obese: 4.47% Girls overweight: 14.14% Girls obese: 3.07%		Not measured	Not measured

¥ = WHO, 2007  
\*n/a = not applicable, \*\*for some studies prevalence was not available, in this cases mean BMI (±SD) have been used, BMI cut off points for children have been used, see the method column to identify which cut off points have been used.  
All studies are cross-sectional studies

With regard to differences in region, Gewa shows that urban areas score higher in prevalence in BMI and WC. The odds ratio (OR) in children aged 9-13 associated with living in urban areas was 1.3 in comparison to a OR of 1.0 of rural residence for the same age group. No information has been found on children and ethnicity.

The KIDS-CAN alliance, a Canadian – Kenyan initiative, looked into “child obesity and fitness levels among Kenyan and Canadian children from urban and rural environments”. Children from the rural parts of Kenya were not overweight or obese. These children had a lower BMI and waist circumference than the urban Kenyan children and all Canadian children (P<0.05). In the group of children from the Kenyan urban areas 6.8% of the boys and 16.7% of the girls were overweight or obese. (Adamo, 2010).

In general, maternal factors can be important for childhood obesity. Wealth and education level of the mother is correlated. Higher education



of the mother is often associated with employment and also more household income (Nishiruma and Yamano, 2012). There are significant associations between higher wealth status of the mother and overweight and obesity in children ( $P < 0.05$ ). Odds of having a child overweight were increased 72 and 91% respectively for mothers who went to primary or secondary education (Gewa, 2009). More income may lead to access of high status food, which often contains high sugar and fat levels. In the same study it was found that a significantly higher percentage of obese children had mothers who were overweight or obese as well:  $P < 0.001$  (Gewa, 2009).

### **3.1.5 Quality of the data**

All studies on prevalence were cross sectional studies. Most studies on overweight and obesity focus on women, so information on men is lacking. The lower age groups have been studied very limited and age group between 5-8 has not been studied. The size of the research groups differ from 200 to 5,000 study subjects. Especially low number of participants may affect the correctness of the prevalence estimates.

For the prevalence data we have only used data from 2009 and beyond. We do realize that the figures probably have changed upwards in the last four years. In 2014 new DHS data are expected. Other studies used to identify the prevalence data are more recent.

With regard to representativeness, the DHS data are the only data that gives prevalence's for the whole country. Other studies are done in specific urban and rural areas, like Nairobi and Nakuru and some areas are not researched at all like areas in the North and South of Kenya.

All reports that are used for prevalence describe which criteria were used. For adults the international BMI cut off points for adult have been used (WHO, 2006). To determine overweight and obesity in children cut off points of Cole have been used (Cole, 2000). They are linked to the adult overweight and obesity cut off points of respectively 25 and 30  $\text{kg}/\text{m}^2$ . The WHO cut off points are based on 85 percentile for overweight and 95 for obesity. (WHO, 2007). The cut off points of Cole give higher prevalence's than the cut off points of WHO. The different cut-off points make it difficult to compare the results.

For a study among women aged 15-60 BMI was calculated as  $\text{kg}/\text{m}^2$ . It is not clear if for the women aged from 15-19 BMI-for-age cut off points or the Cole cut off points have been used. The differences in use of cut off points can give a total different outcome of the prevalence's of overweight and obesity. Measurements are the first step of the analyses. It gives a starting point for further research.

## **3.2 What are the known determinants of overweight and obesity in Kenya?**

This paragraph will describe the known determinants which contribute to overweight and obesity in Kenya. We will use the earlier explained Framework and start with the distal factors, which include macro-level. Next we will focus on the intermediate factors and the proximate factors. Finally we will review the quality of the data.

### **3.2.1 Distal factors: globalization and urbanization**

The distal factors describe the fundamental determinants of overweight and obesity related to social and economic factors, which include macro level.

#### **Urbanization**

In the paragraph on prevalence we have seen that the prevalence of overweight and obesity in urban areas is higher than in rural areas. This was for all age and sex groups. Gewa found also that a significantly higher percentage children with overweight and obesity lived in urban areas ( $P < 0.01$ ), (Gewa, 2009). This points out that urbanization is an important determinant of overweight and obesity. People in urban areas consume regularly significantly different diets in comparison to people in rural areas in Kenya, see also table 6 on page 24. Urban residents have increased access to Western food choices. People in urban areas are less physical active than in rural areas (see paragraph 3.2.3, Physical Activity, leisure time and entertainment).

The KIDS-CAN research alliance works on prevention of obesity and inactivity in Canada and Kenya. In the past computer games and movies were not so common in Kenya. Children were more used to do outdoor games like hide-and-seek. Nowadays due to the introduction of all this technologies like computers, internet, satellite TV and cell phones a lot of children and adults spend innumerable hours sitting at home in front of a TV or computer screen. Global research has been done that this behavior contributed to the increase of obesity. Urbanization can lead to a sedentary lifestyle which can lead to a lack of physical activity. To prevent this condition parents and caregivers are advised to watch out over the weight of their children and also over their own weight. Especially the bodies of young children need the essential nutrients for growth and development. Parents and caregivers should stimulate children doing physical activity (Adomo et al, 2011).

#### **Globalization**

One of the outcomes of the globalization of food markets is the introduction of unhealthy and processed foods, especially to urban centers (Abdulai, 2010). Most Kenyans are becoming more globally aware. It also means they are more aware of other brand names and are quality conscious. The last 16 years more Western fast food branches have

started in the Kenyan market, like for example Steers, KFC, Pizza Hut, Wimpy and Subway (Mulipi, 2013). To have more fast food branches in an area gives the potential to affect BMI in users and higher density of fast food restaurants may tempt people to eat food that contain a lot of calories. Research done in the US has found that Fast Food density at 0.5, 1 and 2 miles was positively associated with higher BMI in African Americans (Reitzel et al, 2013). Additional research is needed in particular on the impact of western diet and fast food restaurants on BMI in Kenya.

### **3.2.2 Intermediate factors**

The intermediate factors include community level influences, and mediate the relationship between the distal and proximate factors. It will also represent sedentary occupations, cultural perception of weight, built environment like governance of health care and social relationships.

#### **Occupation, wealth/socio economic group and transportation**

There is not much known about occupations in Kenya in relation to overweight and obesity. We assume that there is a shift in urban areas to more sedentary work, as jobs in urban areas are often more sedentary than the rural jobs (Misra and Khurana 2008). This will lead to drops in physical activity at work.

We have not found evidenced based articles about transportation particularly in Kenya, but from articles of the Daily Nation we have found that probably the higher income class in Kenya uses cars for commuting (Onyango, 2011). The lower income status group uses matatus and buses or walks to and from their job. A lot of accidents happen in traffic, roads are not safe and that is one of the reasons for people not to use a bike or walk when it is not necessary. Most roads are not safe for children to play and the city is lacking playing fields. (Odero et al, 2003). When fewer calories are burnt it will give an increase in body mass among extensive share of the population (Font et al, 2012).

#### **Cultural perception of weight**

In Kenya being thin is in some cases associated with not healthy. In a study about knowledge on HIV/AIDS in Kenya 5% said they could tell if someone had HIV by looking at the person and see if this person was thin. Thinness was associated with HIV infection, being fat associated with healthy and meant that someone was not infected (Oballa, 2007).

Furnham and Alibhai assessed differences in the perception of body shapes in Britain and Kenya. One of the findings was that Kenyan Asians in Kenya consider fat body shapes significantly more positive and thin body shapes more negatively than the British. Kenyan Asians who were living in Britain were more similar in their perceptions to the British group than Kenyan Asians who live in Kenya (Furnham and Alibhai, 1983). Nothing was mentioned about Kenyan Africans but we assume it is almost the same with African Asians as they also live in Kenya. Renzaho outlines a description of changing socio-cultural paradigms associated with obesity

that in SSA overweight and obesity is associated with success, wealth, healthy life and happiness (Renzaho, 2004). These cultural norms may drive up the prevalence of overweight and obesity and can function as an important barrier to success of an intervention program. There is a possibility that this is changing over time as well. As Kenyan people are more globally aware it is possible that they adopt Western thinking about body image and weight such as thin is the ideal body size.

### **Built environment: Governance of health care**

Built environment refers to human-made environment that provide a surrounding for human activity in which people live, work and recreate.

The government and health care system have an important role in the design of building environments. They can stimulate people to eat healthier and exercise more. It can also regulate food products and make the streets safer so people can be more physical active outside (Novak and Brownell, 2012).

Kenya's government was focusing in the past mainly on under nutrition. The MoPHS is making efforts to realize the Millennium Development Goals through adaptation of 12 of the High Impact Nutrition Interventions (HINIs) which are especially focused on under nutrition. Besides under nutrition we see that the government of Kenya and especially the Ministries of Health are concerned about the rising prevalence of dietary related NCDs. The Kenyan Health Policy 2012-2030 gives directions to the health sector under stewardship of the government to improve the overall status of health in Kenya and has made objectives to implement programs for non-communicable diseases prevention and control (MoPHS, KHP 2012). The strategy also describes screening and interventions for people affected with non-communicable dietary related diseases such as hypertension and Diabetes Mellitus. Together with the 2012-2017 National Nutrition Action Plan further strategies and interventions will be set up and provide a framework for coordinated implementation of this interventions (MoPHS, NNAP 2012). To plan these interventions data on nutrition and weight are needed. On a national level data on nutrition and body weight are collected by the Division of Health Information System (DHIS) since 2012. This is routine data collection. Challenges with decent reporting of this data have been noted. This was due to lack of tools and insufficient training of the staff (not known, 2012). It is important that the routine data on nutrition and weight of the population is accurate otherwise the data are less of use in order to plan interventions.

We have not found any information about initiatives by the government on food regulation, to promote healthier food, sidewalks, parks and play fields to encourage physical activity. Given the above information we do see that a lot has been done in terms of policies. However, it is not clear what has been done with the implementation. Andrew Suleh, medical superintendent of the Mbagathi District Hospital in Nairobi said: "We need to see more commitment in terms of resources. We have policies and guidelines for the management of NCD, but we need to strategic focus on operational implementation".

## **Public Health**

Timely identification of overweight and obesity by health care providers is crucial in the management of the problem (O'Brien et al, 2004). Research has been done by a Master student of Nutrition in Nairobi, Mombasa and Kisumu especially on aspects of knowledge, attitudes and practices of medical practitioners (MP) on overweight and obesity. One of the findings in this study was that 53% of the MP had received training on nutrition and only 15% of the MP had received training on obesity. The MP did not feel confident to give advice on diet and they referred less than 3% patients to dieticians for weight management (Owang, 2005).

It is not clear how much attention overweight and obesity receives in teaching new nurses and other health workers in Kenya. I have looked into a training curriculum for Bachelor of Science in Nursing (University of Nairobi). From this information it is still not clear how much attention overweight and obesity receives in relation to NCDs. Nurses and other health workers are more and more involved in lifestyle management of patients. Successful weight management will be possible when nurses and other health workers understand the obstacles that people face. Nursing students need to be equipped in overweight and obesity management (Keyworth et al, 2013). More information on knowledge and perception of doctors, nurses and other health workers is needed.

## **Media**

The media has an important role in the space where people live, work, play and eat. In the media in Kenya there is attention to obesity. Kenyan newspapers like the Standard, Daily Nation and internet papers like Standard Digital and newsKenya.co.ke publish articles about overweight and obesity (Obala, 2011; Daily Nation, 2013). Also on TV there are documentaries and advertisements that warn against NCDs and say that overweight and obesity are related to lifestyle and are risk factors. It is not known what the impact is of mass media in Kenya on overweight and obesity.

Research from the UK showed that the media is regularly mentioned as a reason of increase in obesity prevalence. Especially the association with consumption of higher intake of energy foods and unhealthy consumption through advertising is mentioned (Boyce, 2007).

Another research mentioned media as a public health educator with the 'Fighting Fat, Fighting Fit' campaign of the BBC. A comparison between the baseline and five months after the campaign had started showed that a majority of the overweight and obese participants displayed a significant reduction in weight and significant increase in exercise levels. They reported also a reduced fat and snack intake, but an increase in vegetables, fruits and starch intake (Milles et al, 2001). The results mentioned before might show that mass media can have a contribution to weight control at population level.

### **Land-use**

There is not much known about land-use and the relation to overweight and obesity in Kenya. Food security is for especially small farmers unreliable. A comprehensive land-use policy is lacking which conduct difficulties in access and utilization of land to cultivate (Alila and Atieno, 2006). To have some land is an important resource for people to cultivate crops and lack of access and-or ownership regards a major cause of poverty and that people have to get their food some were else. Less than 20% of Kenya's land is high or medium potential for agriculture and cultivation (UNDP, 2002).When people are not able to cultivate, they have to go to the market, shops, kiosk or supermarkets to buy food. With the increased numbers of these shops and supermarkets people have more choice to buy high calorie dense food what can make them fat. Especially in relation with less physical activity what could have been done when cultivating.

### **Social Relationships**

Social relationships are important in Kenyan society. In Kenya there are a lot of different social norms and values; one of the reasons is the ethnic diversity. Family plays a big role in Kenyan society. To take care first of your own family, but also be hospitable to guests and providing them with food is important. Traditionally the Kenyan men have power, today's situation is that less Kenyan women do tolerate this situation and divorce from the man when they are able to live independent (Mburugu and Adams, 2004). Cultivating, providing and preparing food was done mainly by women. When gender roles changes this can have an impact on food intake and physical activity levels.

### **3.2.3 Proximate factors**

The distal and intermediate factors set the stage for the proximate factors as they have the most direct impact on overweight and obesity. It will also include individual behavior, like calorie intake and physical activity. Age, gender and genetics are mentioned here, as it is a personal unchangeable factor which can have impact on overweight and obesity.

### **Calorie intake and Dietary factors**

A study done by Steyn et al shows that there are significant differences in diet between the urban and rural study population. The total energy intake was not different, but there were significant differences in macronutrient intake. The mean fat, saturated fat and cholesterol intake was in women who lived in urban areas significantly higher than for women who lived in rural areas. The rural women had significantly higher intake of carbohydrate and polyunsaturated fat. Animal fat was consumed more by urban women, although rural women had a higher intake of total protein; see Table 4, (Steyn et al, 2010).

**Table 4: Intake by urban and rural women**

	<b>Urban women</b>	<b>Rural women</b>
<b>Fat intake</b>	65,8 g	53,9 g
<b>Saturated fat</b>	22 g	17,2 g
<b>Cholesterol intake</b>	181,1 g	146 g
<b>Carbohydrate</b>	223,1 g	250,9 g
<b>Total Proteins</b>	41,0 g	45,8 g
<b>Animal protein</b>	11,1 g	7,8 g

Mbochi et al had similar results for high Social Economic (SE) groups of women; it was found that nutrition transition and urbanization were predictors of overweight and obesity. In comparison to the low SE groups, the high SE group physical activity response was more sedentary and these women consumed a diet high in energy, fat, cholesterol, protein and alcohol. Their diet was lower in carbohydrate and fibre (Mbochi et al, 2012).

#### **Calorie intake and Food retail**

The increased number of supermarkets in Kenya has possibly implications on agrifood and eating behavior. The growing rate for supermarkets is 18% per year (Neven and Reardon, 2005). Food retailers and supermarkets do advertise food products on TV, newspapers, internet, social media and billboards. There are no regulations known which regulate the food retail. Research done by Andreyeva T. et al found as a result that advertisement of fast food was significantly associated with higher BMI especially in children. Exposure to calorie dense and nutrient poor food advertisements may be a cause for the increase of the overall consumption of unhealthy food (Andreyeva et al, 2011). Research done in Nairobi's slum found that for the main source of non-home prepared food people shifted from buying street foods to a kiosk/small licensed restaurant, this consuming was seen with increase of socio economic levels (t Riet van et al, 2003). It was not clear how much energy the people consumed with street food and with food from the kiosk.

#### **Calorie intake and education and income**

In paragraph 3.1.2 we discussed education as a sign of wealth and looked into the prevalence. Steyn et al found similar results in comparing different education categories. Higher intakes of energy, fat and cholesterol were found with people with a higher education in comparison with individuals with a lower level of education. In protein, carbohydrate and added sugar there were no significant differences throughout the education categories. Dietary intake was significantly impacted by income. Women in the upper income group consumed significantly higher intakes

of energy and fats: 7272 KJ/72.6 g vs. 6374 KJ/52.1 g in the lower income groups (Steyn et al, 2010).

### **Calorie intake and Beverage**

Kenyan market is dominated by soft drinks branches like Coca Cola and Pepsi. These manufacturers produce carbonated drinks which contain a lot of sugar and calories, which can attribute to overweight and obesity if people consume these drinks too often.

The KNBS statistics show that in the last half year of 2012 187.9 million liters soft drinks were produced in the country (KNBS, 2012). It is not known how much of this is consumed within Kenya and how much has been exported. It would be interesting to know how much Kenyans consume of soft drinks and alcohol and investigate the impact on overweight and obesity. In Europe and the United States soft drinks are suspected to be responsible for overweight and obesity and the related lifestyle diseases such as hypertension and diabetes (Harvard School of Public Health, 2012).

A survey done in the urban slum community in Nairobi showed a high level of alcohol consumption. In the twelve previous days of the survey 19.7% consumed alcohol on a daily basis and 43.4% between 1-6 days a week. On average four to six drinks were consumed per sitting. Males showed a higher consumption of alcohol than women, 79% of the male reported to have consumed alcohol vs. 66% of the female (Ayah et al, 2013). Alcohol contains a lot of energy. Researchers said it is controversial if alcohol consumption is attributable to weight gain and obesity. They suggest that the energy counts more for non daily alcohol consumers than in daily/heavy consumers. Calories from alcohol count more in combination with a high fat diet (Suter and Tremblay, 2005).

### **Genetics**

There has no research been done in Kenya on obesity and genetics. It is possible that individuals have a genetic predisposition for obesity. In combination with an obesogenic environment this can result in the development of obesity. These genes probably interact with environmental factors which relate to energy intake and expenditure to enhance the risk of obesity. To identify these genes in the Kenyan population will help to explain the etiology and the metabolic consequences and complications of obesity. It will also help to identify risk groups beyond the population because of their genetic profile in order to personalize prevention and treatment strategies (Idemyor, 2010).

### **Age, gender, households and socio economic status**

In the paragraph on prevalence we have seen that there is a higher prevalence among women and especially among women with a higher age. In children we see that age is an important factor but children's gender does not give significant differences. Gewa used multistage cluster sampling for children between 3 and 5 for the DHS 2009 data. According



to BMI-for age Z-score it was found that in this age group 30% of the children were stunted, almost 16% underweight, 4% wasted, almost 18% overweight and 4% obese. The prevalence of overweight and obesity decreased with age. Higher odds for overweight and obesity was found for maternal overweight and obesity, higher level of education of the mother, being born large/very large and stunting. Lower odds ratio for overweight and obesity was found in children of large household and older children (Gewa, 2009). There is a possibility that children in larger households did not get overweight and obese as they had to share food with siblings. Mbochi et al found that increased parity was a significant predictor for BMI and WC. Women with no or only one child had a mean BMI (SD) of 26.4 (5) and women with four or more children had a mean BMI (SD) of 30.8 (5.8). On estimation the BMI increased with 1 kg/m<sup>2</sup> per giving birth. It was not mentioned if the parity was calculated on the children that are currently living, or all the births. A possible explanation is that more children have to do something with status. And a higher socio economic status results in a higher BMI as we have seen in the paragraph on prevalence. Another explanation is that women who gave more birth got the 'best' food as a reward which was more energy dense. The above analysis expresses the presence of under and over nutrition amidst the pre-school children in Kenya. It shows also the importance of focussing on under and over nutrition together at the same time.

A study that has been done in Nairobi province looked into the predictors of overweight and obesity in adult women. The study showed that a higher mean BMI, percentage body fat and waist circumference was found in women with a higher age, higher socio-economic states, increased number of births that a women has given, women with a higher number of rooms in the house as a measure of wealth and increased expenditure. The outcome of the study suggests that age was the most meaningful predictor of all the depending variables.

The dietary factors were different among women in the different SE groups. Women in the lower SE group had significantly higher mean fibre and carbohydrate. Women of the two higher SE groups had significantly higher mean protein,  $p < 0.05$ , alcohol  $p < 0.001$  and cholesterol  $p < 0.05$  intake and consumed significantly more beef, chicken, processed meat, and eggs. The Lower and Upper-Lower SE group eat significantly more maize meal and dry beans and had significantly higher mean fibre,  $p < 0,001$ (Mbochi, 2012).

### **Physical activity, leisure time and entertainment**

A lack of physical activity can contribute to obesity, especially when energy intake is high. Excess energy that is not burnt will be stored as fat.

Research done in Nairobi Province showed that highest physical activity levels were found in women in the lowest Social Economic Status (SES) groups. This Lower, Upper-Lower and Middle SES have the lowest levels of

sedentary/sitting time. At lower PAL levels higher BMI, body fat and WC is observed. Women with the highest BMI are having the highest level of sedentary time (P-values are all<0.05) (Mbochi et al, 2012).

Urban households and schools are having modern necessities like piped water, electricity and motorized transportation. Rural areas do have this less or not at all which may help to explain the more physical active lifestyle of the rural group.

Ojiambo et al unveiled in their research that all of their rural adolescent study objects were engaged in active transport to school (i.e. ran or walk to school); compared to the urban adolescents which half of them used motorized transportation. The rural adolescents consistently reported being engaged in physically active household chores like fetching water and/or firewood, running and walking for cattle herding and gardening during their time away from school. The urban adolescents in the study did not report these activities, or very infrequently. The urban adolescents reported spending their time from school doing mostly sedentary activities such as watching TV, computer gaming, listening to the radio and studying (Ojiambo et al, 2012). These distinctions in physical profiles between urban and rural areas are an identification between the socio economic and constructed environments between the two groups.

**Table 5: percentage time spent on physical activity by Kenyan women according to socio-economic group (Mbochi et al, 2012).**

	Lower N (%)	Uper-Lower N (%)	Middle N (%)	Lower-Upper N (%)	Upper N(%)	Total N (%)	Chi- square
<b>PAL</b>							
High	61(32)	44 (23)	45 (23)	28 (15)	14 (7)	192 (58)	P<0.001*
Moderate	7 (10)	17 (28)	13 (19)	16 (24)	12 (18)	67 (20)	
Low	7 (10)	11 (15)	16 (22)	29 (40)	10 (14)	73 (22)	
<b>Sedentary time per day</b>							
<5 hours	31 (37)	19 (22)	16 (19)	13 (15)	6 (7)	85 (26)	P<0.001*
5-10 hours	23 (18)	35 (27)	33 (25)	20 (15)	19 (15)	130 (39)	
>10 hours	21 (18)	20 (17)	25 (21)	40 (34)	11 (9)	117 (35)	
PAL= physical activity level, * Significant differences at P<0.001							

**Table 6: Descriptive Characteristics of Kenyan Adolescents mean values (SD), (Ojiambo et al, 2012).**

	All	Rural		Urban	
		Male	Female	Male	Female
<b>Subjects</b>	200	47	50	52	51
<b>Age in years</b>	13.0 (1.0)	13.3 (0.7)	13.3 (0.6)	13.0 (1.0)	12.8 (0.7)
<b>BMI, kg/m<sup>2</sup></b>	18.0 (3.0)	15.0 (2.0)	16.2 (2.5)	19.4 (2.8)*	20.0 (6.3)¥
<b>Transport to school,% car/walk/run</b>	26/41/34	0/19/81	0/40/60	50/39/12	51/43/6
<b>Sedentary in min</b>	584 (113)	555 (67)	539 (91)	678 (95)*	694 (81)¥
<b>MVPA in min</b>	54 (23)	68 (22)	62 (20)	50 (17)*	37 (20)¥
<b>% Sedentary</b>	72	65	66	78	80
<b>% MVPA</b>	7	9	8	6	5
<b>TIB</b>	43 (23)	54 (24)	52 (21)	38 (16)*	29 (19)¥

¥= Significant differences between rural and urban females  
 \*= Significant differences between rural and urban males  
 MVPA = moderate/to vigorous physical activity, TIB = time spent in MVPA bouts per day

Table 6 shows that rural males spent more time in moderate-to vigorous intensity physical activities (MVPA) compared to urban males ( $68 \pm 22$  vs.  $50 \pm 17$  min, respectively;  $P < 0.001$ ). This was similar in the rural female group as they spent more time in MVPA compared to urban females ( $62 \pm 20$  vs.  $37 \pm 20$  min, respectively;  $P < 0.001$ ). Beyond this there were differences in daily sedentary time between the rural and urban study objects ( $P < 0.001$ ), the effect was a little bit stronger among female. Physical activity, MVPA, sedentary time and the BMI Z-score were both significantly influenced by residence ( $P < 0.001$ ) (Ojiambo et al, 2012). This data push forward lack of physical activity and urbanization as important determinants of overweight and obesity.

There is insufficient information on the influence of family and their perception on physical activity in Kenya. When parents or other household members are positive about the neighborhood environment it is associated in other countries with less screen time and more increased active transportation (Carson et al, 2010).

**Table 7: Transport to school for adolescents age 12-16 years (Ojiambo et al, 2012)**

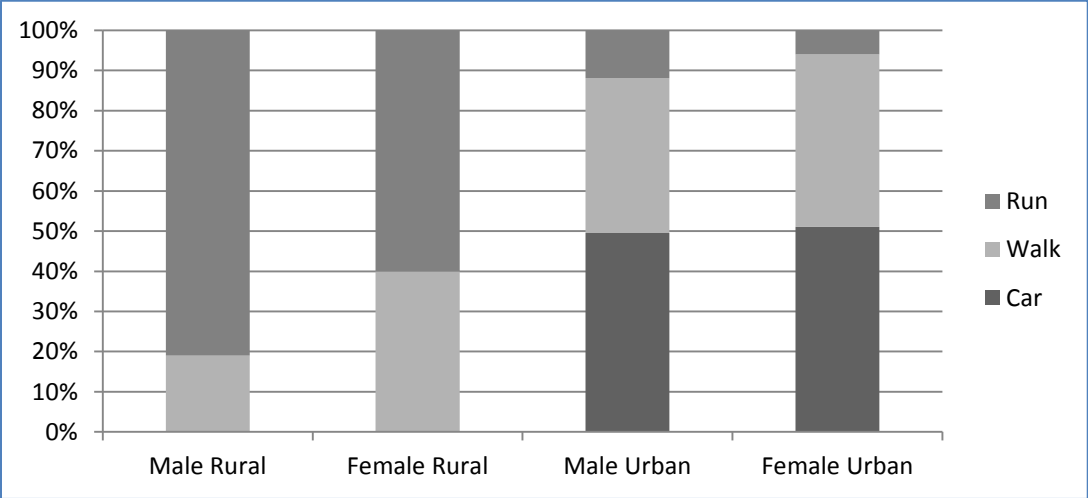


Table 7 is an enlargement of the figures mentioned in table 6 on transportation to school for adolescents in rural and urban adolescents. The urban adolescents use in 50% the car to go to school and the rural adolescents do not use the car at all. Bike use was not mentioned and also not the distance to school.

In the school environment physical education is scheduled for 40 minutes three times a week for children and youth. This is a requirement of the Ministry of Education (Ministry of Education, 2012). However, there is insufficient evidence on the trends and amount of time used for physical activity. In some cases it may be used to train students on other examinable subjects (HAKK, 2011)

**3.2.4 Quality of the data**

All studies are cross sectional studies. Information was found on distal, intermediate and proximate factors that can influence overweight and obesity. The data on the proximate factors like physical activity and diet seems reliable as more studies in different areas found the same results. It is remarkable that very limited information is available on physical activity especially on the mode of transportation and active play. We have looked in the studies for selection bias. One thing we noted was that some study groups were really small and there was no explanation given why was chosen for this sample size. Studies looked into confounders, especially when they had strange outcomes and discussed explanations in there discussion part. The study of Jayne et al shows a significant correlation between BMI and French fries consumption, this is not possible as only 18,6% of the study subjects had reported to eat French fries once or twice a week (Jayne et al, 2011). An explanation is that they had errors in the 24 hours recall or just a calculation error. Most studies did not assess food aid among the study subjects. I think this would have been a

valid point as under and over nutrition are found in the same areas. Kenya has received nearly 50 million Dollars (USD) and will receive this in the next year as well on food aid from the United States Agency for International Development (USAID, 2013). Kenya has also received food aid contributions from the World Food Program and other international aid agencies.

### **3.3. The targets of the current public health interventions and the consequences to primary prevention of overweight and obesity in Kenya.**

In this paragraph we give a description of the targets of the current public health interventions. We also try to identify the consequences to primary prevention of overweight and obesity.

#### **3.3.1 The Government and current public health interventions**

There are some initiatives from the government to combat overweight and obesity. These initiatives are mainly focused on policies. There is not much known about the implementation.

The National Food and nutrition security policy in Kenya acknowledge that Kenya is in a nutritional transition and that this is part of globalization. The traditional diet which is rich in fibre and low in fat has shifted towards a more commercial pattern with processed food products from which many contain high levels of saturated fat and simple carbohydrates and sugars. The nutritional transition to a more Western lifestyle has been growing in Kenya for some time. The National Nutrition Action Plan 2012-2017 describes in their strategy to reduce the prevalence rates of overweight and obesity in the population. Awareness, prevention and training are the main activities. The implementation level for these activities is the Health Facility and community level with MoH as the lead agency (MOPHS NNAP, 2012). Follow up activities and information about the implementation has not been found.

Besides the nutrition transition there has been an increase in prevalence of diet and lifestyle related NCDs. The Government of Kenya will support the promotion and consumption of healthy foods and promote physical activity and screening for NCDs to prevent and control diet and lifestyle related NCD (ASCU, 2011).

In June 2013 President Uhuru's government is planning to spend only 5.7% of the 1.6 trillion budget in Kenyan Shilling on health care (Wafula, 2013). This is much below the 15% of the annual budget what was pledged in the Abuja declaration to improve the health sector (WHO, 2011). To intensify the prevention and control of overweight and obesity resources are needed. In this time that the government is dealing with a double burden of diseases it is difficult to focus on new priorities like preventing overweight and obesity in order to control NCDs.

The first Kenyan national Forum on NCDs was held and ended with Naivasha call for action with 37 points on NCDs. Overweight and obesity were not mentioned in itself, but unhealthy diets and physical inactivity were (Participants Naivasha Call, 2011). One of the reasons that overweight and obesity is not mentioned is that the focus is still on treatment and screening of NCDs and not on primary prevention. Another

explanation is that overweight and obesity are still seen as a sign of wealth.

There is not much known about handling overweight and obesity in primary health care in Kenya. The Kenya essential package for Health (KEPH) is used and communicable diseases and reproductive health get's most attention in this. It is not known if doctors and nurses automatically think about prevention and treatment of obesity.

In the Kenya Health policy of 2012-2030 it is mentioned that obesity and physical inactivity are risk factors to health in Kenya. One of the policy objectives and strategies is to "Halt and reverse rising burden of NCDs" and another one "minimizes the exposure to health risk factors" (MoPHS, KHP 2012). In these objectives acknowledgement of overweight and obesity is intertwined. It is known that in primary health care in Kenya exclusively breastfeeding for the first 4-6 months is promoted to prevent under nutrition and infections (Kimani-Murage et al, 2011). Exclusively breastfeeding is suggested to give a limited degree of protection against childhood obesity. The exclusive breastfeeding should go together with age-appropriate introduction of complimentary foods in the first years of the child. Through breastfeeding the child can self regulate the energy intake by drinking to respond to hunger and stop by satiety signals (Institute of Medicine, 2005).

### **3.3.2 Other initiatives with targets of public health interventions**

In addition to the government there are also private and non-government organizations which have initiatives to combat overweight and obesity.

The African Population and Health Research Center (APHRC) are implementing a community based intervention program. The name of the project is SCALE UP "Sustainable model for cardiovascular health by Adjusting Lifestyle and treatment with Economic perspective in settings of Urban Poverty". This is a three year study in the slums of Nairobi and the purpose is to shape a effective and efficient model for primary prevention especially for cardiovascular diseases and it will entangle community screening for overweight and obesity. The project will also raise awareness by going door to door and counsel the population about the danger of an unhealthy lifestyle. This form of primary prevention can have a big impact and positive impact on prevention of overweight and obesity. Awareness raising can help people to change their lifestyle and assist them to make better choices in diet and physical activities. When this project is proven to be cost-effective the APHRC is hoping that the Government of Kenya will scale up the program to other areas (Oti, 2013).

In some areas there are screenings on NCDs like community and home based screening for diabetes and hypertension (Pastakia et al, 2013). In the community based screening there was attention for weight, but at the home based screening blood pressure and blood glucose was taken, but there was nothing mentioned about food habits and weight taking.

The Healthy Active Kids Kenya (HAKK) has developed a report card on physical activity with evidence information to raise awareness on the importance of healthy active living in Kenya. This was done in partnership with Active Health Kids Canada, which shared a lot of Canadian experiences. After the release of the cards the interest of stakeholder groups like policymakers health personal, public health officials, teachers, parents, the media and other public was significant. (HAKK, 2011). After this the conclusion was that there was evidence from Kenya and Canada that the release of the report cards is feasible and effective for prevention of NCDs. Although it is possible that it is effective, it is too early to say it is effective and what the impact is as the effectiveness has not been measured.

The Consortium for Non-Communicable Diseases Prevention and Control Sub-Saharan Africa (CNCD-Africa) is a Network that links up multiple disciplines and partners. The consortium works in various methods to address NCDs like hypertension and Diabetes. They also work on prevention of the common risk factors like unhealthy diet and physical inactivity. The Kenyan Diabetes Management and Information Centre and The African Institute for Health and Development are partners in Kenya. Healthy lifestyle screening services have been held by CNCD-Africa in Upper Hill (Nairobi) to screen for overweight, obesity, diabetes and hypertension. The screening was carried out in a church camp. Adults and children with high blood sugar and/or blood pressure levels were referred to an onsite clinician and some clients to nearest clinics for further examination. Health teaching was on themes like balanced diet, physical activity, avoiding drug abuse and adequate sleep and rest (CNCD-Africa, 2012). A church can be a meaningful way for health promotion to advocate for change in diet and lifestyle (Campbell et al, 2007).

### **3.3.3 Foundations**

There are foundations in Kenya which commit themselves to fight obesity. One of them is Afya Kenya Foundation. It mentions in the objectives to educate communities on nutrition to maintain good health and advise them on the health risks of overweight and obesity and the benefits of a healthy lifestyle (AfyaKenyanFoundation). It is not clear what the impact is of foundations like this. More research is needed to clarify if and how they can play an important role in interventions.



### **3.3.4 The Media and current public health interventions**

Health related theatre has almost not been used for preventing NCDs. It has been used widely for social problems, development issues and awareness rising for HIV/AIDS. It has a potential to be very useful in a wide range of issues like in promoting and prevention of a healthy weight and a healthy lifestyle (Oanda, 2012).

A lot of blogs, internet sites, Facebook, Twitter, gives attention to overweight and obesity in Kenya. For example the Facebook page "Weight Loss Kenya" tries to evoke people to a healthier lifestyle (WeightLossKenya). It is not known what the impact of these writings is.

### **3.4 quality of the data**

There was quite some data available about the targets of current public health interventions, especially in policies. This data was clear and easy to access. However, information on implementation of these policies and the consequences and the impact on primary health care was difficult to access and very limited. The information of other initiatives of public health interventions was very wide, but not evidenced based.

## **Chapter 4: Discussion**

This study is aiming to identify the burden of obesity. This chapter will focus on the data and information of previous chapters in order to answer the objectives in Chapter 2.

The focus of this thesis has been on three key issues: identifying the prevalence, the known determinants of overweight and obesity and the current public health responses in Kenya.

In summary the study findings identified the prevalence.

### **4.1 Prevalence findings**

The studies show that prevalence of obesity is increasing in Kenya even while underweight is still prevalent. Around 40% of the Kenyan population has been diagnosed with either overweight or obesity. The prevalence of overweight and obesity in females is significantly higher than in males.

Sex, age, education, wealth and ethnicity show a strong correlation with the prevalence of overweight and obesity. Sex and age doubles the prevalence in older women in urban areas.

Most data that are available in Kenya about the prevalence of overweight and obesity is measured by BMI; some of the studies give WC measurements as well. It is questionable if relying on BMI only is enough to assess overweight and obesity, due to fat accumulation is insufficient and adiposity measurement is missed. Sex dimorphism in subcutaneous fat and abdominal visceral fat may be a limitation. It is arguable if we do need different cut off points for sub-population groups. In different global body composition and BMI studies there is evidence that Africans and Asians have more body fat than Caucasians in Europe and the USA. In that sense the likelihood is higher for Africans to experience NCD outcomes at lower BMI levels (Popkin, 2002).

The gender difference gave outcomes to a higher prevalence of overweight and obesity among urban females. Similar results have been seen in surrounding countries, like Tanzania (Shayo and Mugusi, 2011). Overweight and obesity has been more comprehensively researched on women while in some areas data on men is not available. There is inadequate information about underweight, overweight and obesity in adolescent boys and men (Jayne, 2011). One of the reasons could be that most health programs focus on women in their reproductive age.

Differences in prevalence have been found among different ethnic groups. The Maasai had the highest prevalence, but in the urban sample only seven males and no females were included.

## **4.2 Known determinants and known responses**

### **4.2.1 Distal factors**

Urbanization has been highlighted as an important determinant for overweight and obesity. Reasons for people to move to urban areas are probably because of the conveniences that exist in urban areas. Nearby work, nearby shops, family, school to reduce expenses and save on time that would have been spent otherwise on traveling. Kenyan people are changing their lifestyle behaviour. Besides that there are a lot of technical advancements which encourage overconsumption of energy-dense food and a sedentary lifestyle which engage insufficient amount of physical activity.

It is likely that urbanization has an impact on overweight and obesity in Kenya as rural Kenyan adolescents in comparison to urban adolescents are significantly more physical active and have less sedentary time and lower prevalence of overweight and obesity.

The studies suggest that urbanization is an important determinant for overweight and obesity as it is more prevalent in urban areas, these findings are similar of other sub-Saharan studies (Awah et al, 2008, Kimokoti and Hamer, 2008). BMI in Kenya is showing a socioeconomic gradient. The highest income group of women shows higher BMI and the lowest of the lower income group do not or much less. This is in contrast with the United States of America where the gradient is reversed and the lowest income group shows high rates of overweight and obesity (McLaren, 2007).

### **4.2.2 Intermediate factors**

In governance we have seen that there are some policies. It is not clear if these policies have been implemented in primary health care. MD and other health practitioners did not have a lot of knowledge about overweight and obesity and gave it little attention.

Body perception can have a big impact on how people look at weight and obesity and has implication for prevention and intervention programs. The information we had was dated, so further research is needed.

The built environment in Kenya has changed rapidly. More people have moved into the cities. Communities, jobs have changed through urbanization, which has impact on how people behave. Also transportation has changed although not much is known in relation to overweight and obesity.

There is not much information known about the implementation of interventions. The information which is known is not evidenced based.

### **4.2.3 Proximate factors**

Overweight and obesity is found as a predictor in the upper income group. The bulk food of the participants of research done under women were energy dense food products like maize, bread, rice, fats and oils. This could be interpreted in the context of urbanization and Westernization of the diet. Currently only the upper income group is able to afford the Westernized diet (Mbochi et al, 2012).

Physical activity was found as a determinant for obesity. Most of the urban study subjects reported that they used their leisure time more sedentary and were doing fewer chores.

The current public health response focuses on prevention of NCDs, especially on healthy lifestyle and physical activity. These are the proximate factors. Corresponding changes in the intermediate and distal factors are needed as well as they shape and constrain the individual behavior and choices.

### **4.2.4 Known responses**

Policies on targets of public health responses on overweight and obesity have been found. This policies and strategies are clearly described. The mean reasons behind the policies are the prevention of Non-communicable diseases. Unfortunately it is not clear how this policies and strategies have been implemented. One of the reasons is maybe that there is no funding available for NCD preventions, health promotion and monitoring and evaluation. Besides that there is no topic-specific operational program for unhealthy diet/overweight and obesity (WHO, 2011).

There are initiatives by non-government organizations like APHCR and CNCD-Africa, which do incredible work to combat overweight and obesity in relation to NCDs. It does not seem that the initiatives of the government and other organizations are linked together.

## **Chapter 5: Conclusion and Recommendations**

### **5.1 Conclusion**

Findings from the study show that the prevalence of overweight and obesity is increasing among Kenyan adults and children particularly in urban areas. At the same time the country is still fighting under nutrition especially stunting. This has not only a negative impact on health, but it will also have impact on indirect costs due to loss of productivity.

The objectives of Chapter 2 have been answered. We have identified the prevalence and to analyse the burden we have described what is known and we have identified which information is still lacking.

The known determinants and responses are multiple and complex and have distal, intermediate and proximate factors. Daily physical activity time, calorie intake, urbanization, sex, age and wealth have been found as important determinants. Policies on NCDs are available including overweight and obesity. Focus should be more on implementation. Studies done on overweight and obesity are few. Some areas and groups have not been researched. The higher obesity prevalence with gender, age and ethnic differences and the relationship with NCDs need to be further explored in the Kenyan population.

Some age groups, children from 5 -13 years of age, have not or only once been studied for overweight and obesity. An explanation can be that research in the past was mostly focused on under nutrition. A few studies in under nutrition describe stunting, under weight and severe underweight. If we look at the BMI out comes and we use the SD, we can calculate that probably in that area some children were overweight and obese as well (DHS 2009).

The area of Nairobi has been studied quite often and also some of the middle parts of Kenya, probably because of the density of the population. Other areas like in the South such as Kajiado, Machakos, Makueni and in the North such as Marsabit, Mandera, Wajir and Garissa have not been studied on overweight and obesity. Probably because the population is less dense, it's a rural area and in the North-East refugees from Somalia are coming into the country and the area is notified as not safe.

## 5.2 Recommendations

Based on the study findings the following recommendations will be given to the health authorities and policymakers with an aim to give a direction for further research and where to focus on.

My main recommendation is to focus in further research not only on the prevalence of overweight and obesity but also on the risk factors of NCDs. To develop an effective strategy which should be based on the factors that cause overweight and obesity and the consequences as making people prone for NCDs. Future studies should include information on diet, physical exercise, lifestyle behavior, perception on weight and body, stress, BMI, WC and NCD outcomes. The research should include especially the areas in the north and south, males and lower age groups that are not covered with research yet.

Most information that is available now on prevalence, determinants and the response is a snapshot of the current situation or looking into the past. To analyze overweight and obesity prevalence in the Kenyan population and to identify the suspected factors and determinants for the occurrence of certain health effects over a period of time it would be recommended to set up a cohort study in order to plan effective and efficient interventions. To examine how body weight and fat develop and what factors contribute to the onset of obesity at an early age. In the cohort study, the growth of the children is followed from birth. It looks at nutrition, exercise and biological factors. Height, weight, WC and blood pressure need to be measured. From the age of 5 years parents will be asked to complete a questionnaire once every two years, together with the measurements. These questionnaires contain questions about nutrition, exercise, biological factors, social factors, environmental factors and disease. Furthermore, additional data are collected in many children. For example, urine samples and blood samples will be collected. The children need to be followed from birth until the adult age. For good results, it is important that both children with and without overweight and obesity continue to participate in the study. Stakeholders should be the MOPHS and MMS, academic research institutions and general practitioners. The outcome of the cohort study will lead to further understanding and improvement of overweight and obesity prevention management directed on the population in Kenya.

Furthermore it would be important to take into account:

- To standardize BMI cut off points for children for whole Kenya in order to results better comparable. For example for all Kenyan children Cole cut off points will be used.
- To study the differences in body composition in the Kenyan and SSA population, especially in the different ethnic groups to identify and explain differences in consequences of overweight and obesity in this different groups.

- To follow further studies on overweight and obesity globally in order to view homogenous trends and in order to learn from it.
- DHS should include registration of weight of all age groups and sex. To explain the trend in prevalence, questions on diet and physical activity should be asked.
- The ministries of MoPHS and MMS should take the lead in the development of streamlined policies which include health, education, justice and economic affairs and environment.
- To set up a technical working group on Overweight and Obesity in relation to diet and lifestyle diseases in order to improve the collaboration among partners that work on Overweight and Obesity Research or Prevention programs.
- To do follow up research on the effects of interventions. It would be important to understand how effective and realistic an intervention is to prevent overweight and obesity and to treat it were necessary. It is also important to know the economic costs and benefits of interventions.
- To study the food retail in Kenya and the impact of the food retail on people's diet and weight gain in order to advocate for regulation and set up appropriate interventions.
- To study what people buy as non-home prepared food and to understand why they make that choice and the impact on people's weight.
- To study the mode of transportation and occupations in Kenya and the impact on physical activity level in order to make up good interventions.
- To investigate if mass media can have a positive contribution for weight control at population level. It might be that particular subgroups like young people need specific target campaigns.
- Education on overweight and obesity in relation to lifestyle and disease should be given high attention in school curriculums for doctors, nurses and other health workers. This is important for prevention and treatment of patients, health workers can play an important role in research on overweight and obesity too. Improve the capacity of the Ministries of Health in leadership and coordination on overweight and obesity.
- Increase government expenditure on health in order to make money available to combat overweight and obesity.

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