

# Obesity in Sub-Saharan Africa

Charles Agyemang<sup>a\*</sup>, Sandra Boatemaa<sup>b</sup>, Grace Agyemang Frempong<sup>b</sup> and Ama de-Graft Aikins<sup>b</sup>

<sup>a</sup>Department of Public Health, Academic Medical Center, University of Amsterdam, Amsterdam, The Netherlands

<sup>b</sup>Regional Institute for Population Studies, University of Ghana, Legon, Ghana

## Abstract

This chapter outlines the epidemiology of overweight and obesity in sub-Saharan Africa, their determinants, and the relationship with cardiovascular diseases (CVDs) and diabetes. The review shows that overweight and obesity rates are increasing in all African regions with Southern African region being the most affected. The rate of overweight and obesity is higher among women than among men and in urban areas compared to rural areas. Socioeconomic status, age, parity, marital status, physical inactivity, body weight perceptions, and increased energy are powerful predictors of overweight and obesity in sub-Saharan Africa. The rapid urbanization accompanied by nutrition transition is changing the disease landscape in sub-Saharan Africa with CVD and its related risk factors gaining prominent position. The rising levels of overweight and obesity in sub-Saharan Africa are likely to exacerbate the burden of CVD and diabetes if measures are not taken to curb the problem. Public health strategies focusing on healthy diet, physical activity, weight reduction, and maintenance strategies are urgently needed in sub-Saharan African countries.

## Keywords

Overweight; Obesity; Cardiovascular diseases; Diabetes; Gender; Sub-Saharan Africa

## 1 Introduction

**Obesity** is a significant contributing factor for various chronic diseases such as cardiovascular diseases (CVD), type 2 diabetes (T2D), musculoskeletal disorders, and some cancers (Prospective Studies Collaboration 2009). Obesity and its related conditions lead to reduced quality of life and premature death. A meta-analysis of 97 studies, for example, showed that, compared with normal weight, being obese was associated with higher all-cause mortality for all grades of obesity combined (Flegal et al. 2013). Obesity is truly a global burden. In 2014, more than 1.9 billion adults were overweight. Of these over 600 million were obese (WHO 2015).

The fundamental cause of **overweight** and obesity is an energy imbalance between calories consumed and calories expended. The nutrition transition, characterized by the change from diets of high nutritional quality to those in low poor diets, is occurring globally (Popkin et al. 2011). The nutrition transition coupled with the epidemiological and demographic transitions has set population health toward high prevalence and incidence of obesity and related sequelae such as hypertension, diabetes, strokes, cancers, heart attacks, and other **chronic noncommunicable diseases** (NCDs) (Lancet 2011; Martorell et al. 2000; Rutter 2011). Africa is also experiencing these transitions (Abubakari et al. 2008; Awuah et al. 2014; Steyn and McHiza 2014).

---

\*Email: c.o.agyemang@amc.uva.nl

In **Africa**, a complex coexistence of undernutrition and overnutrition has been reported. Between 1992 and 2005, the prevalence of overweight and obesity increased by almost a third in sub-Saharan Africa (Ziraba et al. 2009). Until recently, this increase was reported among women and urban residents (Martorell et al. 2000); however, current data show consistent increase in overweight and obesity among men and rural residents as well (Afolabi et al. 2004; Kimani- Murage et al. 2011). The trend toward rising overweight and obesity poses both health and socioeconomic challenges to individuals and the region.

Reviews examining the prevalence of overweight and obesity have been limited in African nations (Chukwuonye et al. 2013; Micklesfield et al. 2013) and regions of Africa (Abubakari et al. 2008; Steyn and McHiza 2014). However, given the fast increasing prevalence of overweight- and obesity-related illnesses such as T2D, it is highly relevant to map the current information about overweight and obesity prevalence in Africa to help health workers, government agencies, and policy makers toward setting priorities and for designing interventions. In this chapter, therefore, we aimed to outline the **epidemiology** of overweight and obesity in **sub-Saharan Africa**. Secondly, we examined the determinants of overweight and obesity and their impact on CVDs and diabetes.

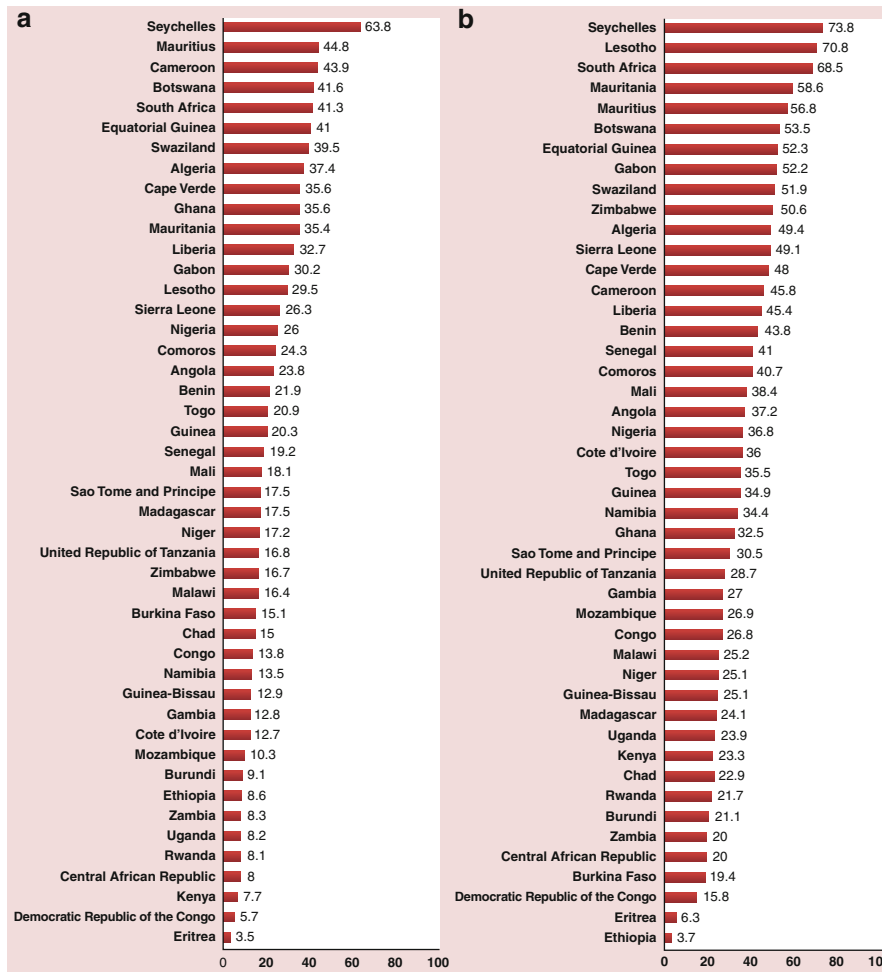
**Box 1 Search Strategy** Two kinds of data were used for this review study: the World Health Organization (WHO) Global InfoBase on overweight and obesity (<https://apps.who.int/infobase/Index.aspx>) and a review of determinants of overweight and obesity in Africa. **WHO Global InfoBase database** was used to provide prevalence estimates by sex, region, residence, and socioeconomic status and to depict trends of overweight and obesity over time in various African regions. In addition, we conducted a review on determinants of overweight and obesity in Africa using several electronic databases including ScienceDirect, EBSCOhost, Academic OneFile, eLibrayUSA, PubMed, JSTOR, and AJOL. In webpages where the advanced search option was allowed, the search was limited to English language, human studies, and peer review journal articles.

## 1.1 Measurement of Overweight and Obesity

**Body mass index (BMI)** is a simple index of weight for height that is commonly used to classify adult with overweight and obesity. It is defined as a person's weight in kilograms divided by the square of his height in meters ( $\text{kg}/\text{m}^2$ ). A BMI of 25–29.9  $\text{kg}/\text{m}^2$  is classified as overweight and BMI  $\geq 30$   $\text{kg}/\text{m}^2$  is classified as obesity.

## 2 Prevalence and Overweight and Obesity in Africa

Figure 1a, b shows **prevalence** of overweight in 46 **WHO African countries**. Among men (Fig. 1a), the prevalence of obesity ranged from 3.5 % in Eritrea to about 64 % in Seychelles in 2010. The top five countries with the highest prevalence of overweight were Seychelles (64 %) followed by Mauritius (44.8 %), Cameroon (43.9 %), Botswana (41.6 %), and South Africa (41 %). Conversely, the top five countries with the lowest rates include Eritrea (3.5 %), Democratic Republic of Congo (5.7 %), Kenya (7.7 %), Central African Republic (8.0 %), and Rwanda (8.1 %). Women in general have higher prevalence of overweight than men in all countries with the prevalence rates ranging from 3.7 % in Ethiopia to 74 % in Seychelles. The top five countries with the highest prevalence of overweight were Seychelles (73.8 %), Lesotho (70.8 %), South Africa (68.5 %), Mauritania (56.8 %), and Mauritius (53.5 %). The top five countries with the lowest rates include Ethiopia (3.7 %), Eritrea (6.3 %), Democratic Republic of Congo (15.8 %), and Central African Republic and Zambia with 20 %.

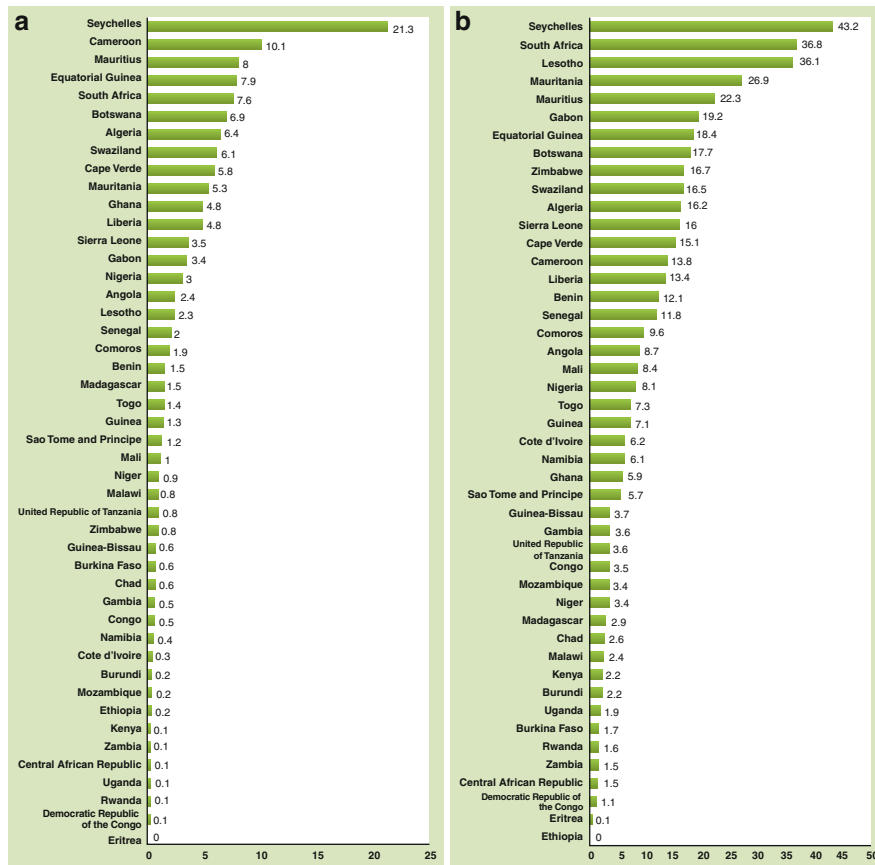


**Fig. 1** (a) (men) and (b) (women): estimated overweight and obesity (BMI  $\geq 25$  kg/m<sup>2</sup>), prevalence, males, aged 15+, 2010 (Source: WHO Global InfoBase)

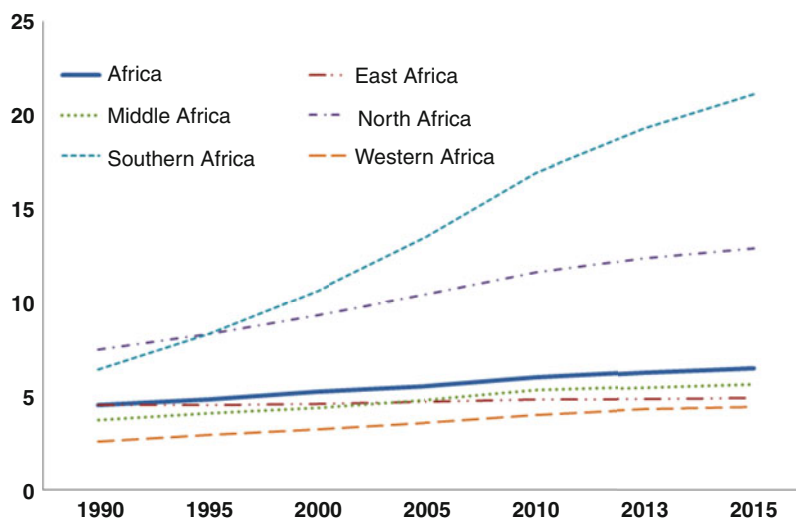
Figure 2a, b shows the prevalence of obesity in various WHO African countries. The prevalence of obesity ranged from 0 % in Eritrea to about 21 % in Seychelles in men and from 0 % in Ethiopia to about 43 % in Seychelles in women. In men, only two countries (Seychelles and Cameroon) out of the 46 countries had obesity prevalence of more than 10 %. Among women, however, 17 countries of the 46 countries (37 %) had prevalence of obesity of more than 10 %.

## 2.1 Regional Differences Overweight

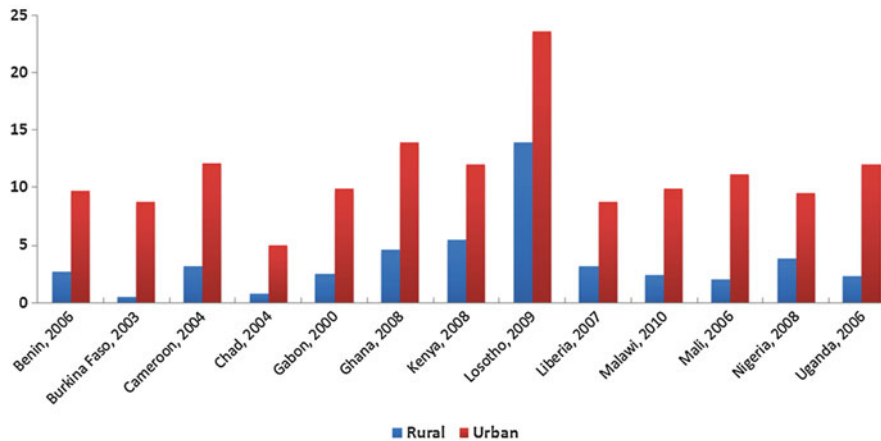
Figure 3 shows the time trend prevalence of overweight in various African regions. Overweight has been on the increase in all regions since 1990, although the extent of the increase has differed between regions. In 1990, the prevalence of overweight was highest in the **Northern Africa** (7.5 %) followed by **Southern Africa** (6.4 %), **Eastern Africa** (4.5 %), **Middle Africa** (3.7 %), and **Western Africa** (2.6 %). There has been a staggering increase of overweight in Southern African region since 1990 with average prevalence rate of 21 % in 2015 (330 % increase in the last 25 years) compared to other regions. Northern African region has also experienced rapid increase in overweight since 1990 with prevalence of 13 % in 2015 (73 % increase in the last 25 years). In other regions, the percentage increase in the last 25 years has been modest ranging from 9 % in Eastern Africa to 70 % in Western Africa.



**Fig. 2** (a) (men) and (b) (women): estimated obesity (BMI  $\geq 30$  kg/m<sup>2</sup>), prevalence, males, aged 15+, 2010 (Source: WHO Global InfoBase)



**Fig. 3** Time trend of overweight prevalence by African region (Source: WHO Global InfoBase)



**Fig. 4** Prevalence of obesity by rural and urban residence in selected African countries (Source: WHO Global InfoBase). The year represents the period the study was done

## 2.2 Urban and Rural Differences in Overweight and Obesity

**Urbanization** has been linked to increased risk of overweight and obesity in Africa; therefore, most urban populations have higher overweight and obesity rates than rural populations (Benkeser et al. 2012; Agyemang et al. 2009; Abubakari et al. 2008; Amoah 2003; Kandala and Stranges 2014). This reflects on the clear differences in the prevalence of obesity between rural and urban communities across sub-Saharan African countries (Fig. 4). As Fig. 4 shows, the percentage difference in the prevalence of obesity ranges from 4 % higher in rural Chad to about 10 % higher in **urban** Lesotho and Uganda compared with **rural** communities in these countries.

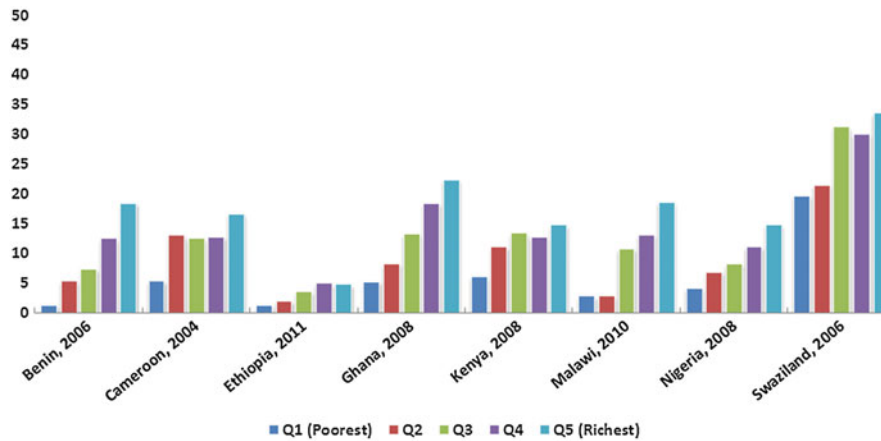
## 3 Determinants of Obesity

From the review the determinants of overweight and obesity were categorized into three: sociodemographic factors, **socioeconomic status**, and perceptions of weight and lifestyle factors.

### 3.1 Sociodemographic Factors and Obesity

Generally, obesity rates are higher among females than among males in Africa as indicated above. In 2006, obesity was six times as common in women as in men in Ghana, four times in Morocco, and in South Africa three times as common in women as in men (Prentice 2006). Pereko et al. (2013) in Ghana reported that females were about eight times more likely to be overweight/obese than males. In addition, Njelekela et al. (2009) reported that Tanzanian women were 4.5 times more likely to be obese compared to men. Similarly, obesity prevalence was higher among South African women compared with men (Malhotra et al. 2008).

Although body weight varies by **sex**, it is related to a specific stage of life. A number of studies in Africa have reported a positive association between **age** and obesity (Biritwum et al. 2005; Amoah 2003; Duda et al. 2007; Muhihi et al. 2012; Dake et al. 2010; Pobee et al. 2013; Iloh et al. 2011; Pereko et al. 2013; Atek et al. 2013; Shayo and Mugusi 2011; Masibo et al. 2013). While obesity increases with age, it increases up to a certain age and declines afterward. For instance, six papers reported that obesity prevalence increases for women from age 35 to 64 and declines after 64 years of age. For men, obesity increases until age 45 and usually remains constant.



**Fig. 5** Prevalence of obesity by wealth quintiles in selected African countries (Source: WHO InfoBase). The year represents the period the study was done

**Marital status** is also an important determinant of obesity on the continent. Being married increases the likelihood of being overweight or obese. Mogre et al. (2014) in a study among Ghanaian medical students found that individuals who were married were nearly six times more likely to be obese compared to those who were never married. Other Ghanaian studies including Pobee et al. (2013), Benkeser et al. (2012), Pereko et al. (2013), and Dake et al. (2010) found that married women were more likely to be obese compared to unmarried women). In South Africa, Malhotra et al. (2008) and Case and Menendez (2009) reported that never married participants were at a lower risk of being overweight/obese than those currently married. In Tanzania, married and cohabiting respondents showed significant increase risk for obesity compared to unmarried respondents (Shayo and Mugusi 2011). Similarly, Masibo et al.'s (2013) study in Kenya reported that women who were currently married were 1.9 times more likely to be overweight/obese compared to those who were not married.

Obesity also increases with **parity**. Women who had one or more children were more likely to be overweight or obese compared to those with no children (Dake et al. 2010; Pobee et al. 2013; Appiah et al. 2014; Agbeko et al. 2013).

### 3.2 Socioeconomic Status and Obesity

Among studies that examined the influence of **SES** on obesity, the results were inconsistent. Studies that used the wealth index as measure of SES in relation to obesity consistently found higher prevalence of obesity in rich households than poor households (Fezue et al. 2006; Case and Menendez 2009; Steyn et al. 2011), while studies that used the level of education as measure of SES found mixed results (Alaba and Chola 2014; Amoah 2003). As Fig. 5 shows, in all the regions, obesity rates were higher in rich households compare to the poor households. In some countries such as Benin, the richest quintile of the population has nearly 17 % higher prevalence of obesity than the poorest quintile of the population.

Women with secondary or higher **education** were about 60 % more likely to be obese than those with no formal education, and working women were 13 % more likely to be obese compared to those who were not working (Ziraba et al. 2009). Agbeko et al. (2013) in Ghana also reported that women with higher education were about two times more likely to be overweight or obese compared to those with no formal education. However, a study among Ibos in Nigeria by Anyanwu et al. (2010) observed a negative relationship between education and obesity. Although obesity was worse for all females of the various education groups, it was worst for those in the least educated group. A negative association between

education and obesity has also been observed in South Africa and Ghana (Alaba and Chola 2014; Amoah 2003).

### 3.3 Perception of Body Size and Obesity

Preferred body size has been associated with obesity particularly among African women. In some parts of Africa, obesity is associated with **wealth, beauty**, good health, strength, and respect (Holdsworth et al. 2004; Prentice 2006; Siervo et al. 2006; Amoah 2003). Appiah et al. (2014) reported that a point increase in preferred body size increases the likelihood of being overweight or obese. However, recent studies indicate that this **perception** is changing (Duda et al. 2007; Tlili et al. 2008; Puoane et al. 2013). In Tanzania, women associated obesity with greediness and the likelihood to develop chronic diseases such as diabetes, heart disease, and cancer. Majority (77.9 %) of overweight and obese women therefore indicated preference for a slimmer body size (Tlili et al. 2008). Puoane et al. (2013) observed a contradictory opinion of body size preference among South African adolescent girls. Although participants expressed positive feelings about being thin and being fat, majority (63 %) expressed preference for a low body weight. A Ghanaian study among women indicated the desire for a moderate or healthy weight, and this was influenced by the weight strategies of their partners. Moreover, obese women were more likely to have a greater dissatisfaction score with their bodies than women of all other categories (Duda et al. 2007).

### 3.4 Lifestyle Factors and Overweight and Obesity

**Unhealthy diet, physical inactivity, smoking, and alcohol consumption** are among the lifestyle factors that have been shown to be associated with overweight and obesity in sub-Saharan Africa. Regarding diet, the consumption of calorie-dense foods, low intake of fruits and vegetables, and drinking of tea have been related to obesity (Manyema et al. 2014). In Ghana, consuming less servings of fruit has been shown to be associated with increasing the likelihood of being overweight and obese (Biritwum et al. 2005). Physical inactivity also has a negative effect on obesity. Individuals who engaged in vigorous activities had lower risks for obesity as compared to those who did less rigorous activities (Shayo and Mugusi 2011).

The association between alcohol consumption, smoking, and obesity is not consistent. While some studies report a positive association, others report the inverse. Women who consumed alcohol were 1.37 ( $p = 0.002$ ) times more likely to be overweight or obese compared with those who did not consume alcohol (Agbeko 2013). In Malawi, however, the proportion of current drinkers who were obese (22.9 %) was less likely than nondrinkers (17.3 %) to be obese (Msyamboza et al. 2013). In terms of smoking, obesity was high among smokers. In Malawi, nonsmokers were 24 % more likely to be obese compared to 10 % of current smokers.

### 3.5 Relationship Between Overweight and Obesity and CVD and Diabetes in Africa

Obese individuals develop more CVD risk factors than persons of normal weight (Ayah et al. 2013; Njelekela et al. 2009; Okpechi et al. 2013). Six of the papers included in the review examined the impact of obesity on CVD risk and diabetes in Africa. Among the risk factors of CVD, obesity was considered the most dominant. Overweight and obese persons had higher systolic **blood pressure** and diastolic blood pressure compared with normal weight persons (Msyamboza et al. 2013). The data suggest that the risk is higher for men than for women (Mufunda et al. 2006; Njelekela et al. 2009). In Tanzania, a unit increase in BMI was associated with a 10 % increase odds of **hypertension** (Njelekela et al. 2009). In Nigeria, a BMI greater than 25 increased the odds of hypertension by 12 % (Okpechi et al. 2013). In addition, the risk of diabetes was higher among obese than normal weight people (Tibazarwa et al. 2009). In Kenya, the age-sex adjusted odds for **diabetes** increased by 3.2 % among obese compared to persons of normal weight (Ayah et al. 2013). Obesity was also positively related to hypercholesterolemia. In South Africa,

the total cholesterol levels of overweight women increased by 3 % compared to the normal weight (Tibazarwa et al. 2009).

## 4 Discussion

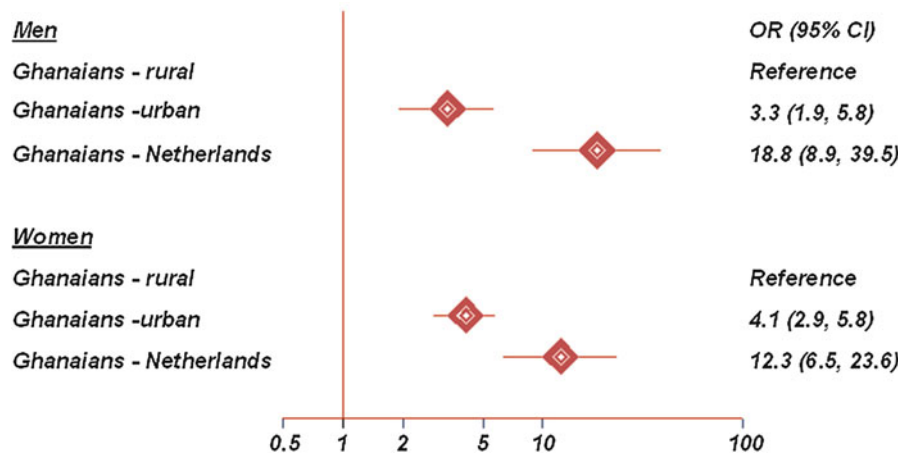
The aim of this study was to outline the epidemiology of obesity in sub-Saharan Africa, obesity determinants, and the risk of CVDs and diabetes due to obesity. The review shows that obesity rates have been increasing in all African regions. In addition, the rate of obesity is higher among women than among men and in urban areas compared to rural areas. Sex, age, marital status and parity, socioeconomic status, body weight perceptions, and lifestyle factors are among the determinants of obesity. The study also identified that obesity increases the risk of CVDs and diabetes.

The increasing prevalence of obesity in Africa over the last few decades could be explained by changes in livelihood and economic conditions. During the late 1980s, for example (a period described as the lost decades), the continent was in **economic crisis**: living standards fell and deprivation increased for a growing number of citizens in affected countries (Aryeetey et al 2012; Agyei-Mensah and de-Graft Aikins 2010). The first major wave of rural-urban migration occurred during this period (Agyei-Mensah and de-Graft Aikins 2010). There was a corresponding challenge of limited **food availability** and quality, and the region recorded high prevalence of undernutrition for both children and adults. This period was also characterized by the advent of the **HIV/AIDS crises** (Iliffe 2006). During this period the stigma attached to thinness intensified as thinness became associated not only with deprivation but also with HIV/AIDS status (Kruger et al. 2005). At the turn of the millennium, economic growth was reported in some African countries (Aryeetey et al. 2012). Globalization changed the sociocultural landscape of many countries with food market globalization playing a major role. African countries signed trade agreements that allowed increased importation of processed foods high in fat, sugar, and salt into the continent, the availability of which lessened the appeal and consumption of traditional wholesome foods (Agyei-Mensah and de-Graft Aikins 2010). The change in economic growth in combination with globalization forces led to changes in demographic profile, urban population, weight perceptions, and lifestyle behaviors. These factors are currently fuelling Africa's obesity crisis.

In demographic terms, socioeconomic status of individuals was first affected. For example, school enrolment rates increased on the continent. Between 1999 and 2008 gross enrolment ratios increased from 19 % to 27 % for upper secondary and 3 % to 6 % for tertiary education (UNESCO Institute for Statistics 2010). This educated population contributed to the growth of the urban wealthy who had access to a globalized food economy and engaged in sedentary work patterns and **lifestyles**. As a result this group may have maintained a positive energy balance over a long period of time (Addo et al. 2009; Mogre et al. 2012). It is not surprising therefore that until recently, wealthy persons were at higher risk of obesity in Africa compared to the poor (Ziraba et al. 2009). In terms of gender, research suggests that the gap between men and women can be explained by the low levels of physical activity among women (Amoah 2003; Averett et al. 2014; Puoane et al. 2003). In urban areas, processed foods high in fat, sugar, and salt are accessible, easy to cook, and preferred to traditional meals (Freidberg 2003; Kgaphola and Viljoen 2004; Kifleyesus 2002). As a result there is an increase in consumption of these **calorie-dense foods** but without the needed **physical activity** (Delisle et al. 2012).

The positive relationship between wealth and obesity reflects the **epidemiological transition** in sub-Saharan Africa (Agyei-Mensah and de-Graft Aikins 2010). The pattern is generally in line with the "diffusion theory" of the **epidemic of coronary heart disease** (CHD) as demonstrated in high-income countries (Mackenbach et al. 2000). The 'diffusion theory' postulates that the rise of CHD starts in high socioeconomic groups, because they are the first groups who can afford diets rich in saturated fats and





**Fig. 6** Age-adjusted odds ratios (95 % CI) of overweight/obesity among Ghanaians living in different locations

associated with overweight and obesity, which in turn increase the risk of CHD. With time, the disease spreads to lower socioeconomic groups as living standards improve for all. When the CHD epidemic starts to decline, the higher socioeconomic groups are once again the first groups to reap the benefit as they are the first to adopt healthy behavioral changes. Accordingly, it is expected that the current socioeconomic gradient in obesity which favors the poor in sub-Saharan Africa will reverse as standards of living improve unless measures are put in place to protect the poor. Evidence from Egypt suggests that the gradient is changing in favor of the rich. In Asfaw's (2007) study, poor people who had lived in urban areas for long periods were more likely than their rich peers to be obese due to their access to relatively inexpensive calorie-dense foods.

In terms of perceptions of body weight, the association of fat with wealth, health, and beauty has coexisted with the **stigmatization** of **thinness** in many African countries over a long period. The HIV/AIDS pandemic intensified the stigmatization of thinness, as strong associations were made between the emaciated body and HIV/AIDS status. Yet, current evidence suggests that perceptions of body weight and of fatness, in particular, are more nuanced than originally reported. In a number of empirical studies, lay communities appear to value healthy body weight, which corresponds to a **buxom** rather than obese body size (Benkeser et al. 2012; Brown 1991; Duda et al. 2006). There is also increasing awareness of the relationship between obesity and health risks including diabetes and CVD.

Evidence shows that obesity increases the risk of CVDs and related intermediate risk factors such as hypertension, diabetes, and hypercholesterolemia in several African countries (Agyemang 2006; Medeiros et al. 2012). The increasing burden of CVDs has increased in line with the rising levels of obesity in Africa. These conditions reduce the quality of life through disabilities and deaths (Bertram et al. 2013; Mayosi et al. 2009). The increasing burden of CVD is occurring at a time when infectious diseases are still highly prevalent, placing a great demand on the overburdened and impoverished **healthcare systems** in most of these countries. Given the rising numbers of urban population, accompanied by nutrition transition throughout sub-Saharan Africa (Population Reference Bureau 2013), the prevalence of obesity and its related problems such as diabetes and hypertension are likely to increase further if measures are not taken to address the problem head on (Sanuade et al. 2014). The potential impact of the changing **environment** on obesity has been demonstrated among sub-Saharan African **migrants** in Europe. In Agyemang et al.'s study (2009), the odds of overweight and obesity among Ghanaian migrant men and women in Amsterdam were 19 times and 11 times higher than their compatriot men and women living in rural Ghana (Fig. 6).

## 5 Conclusion

The rapid urbanization accompanied by **nutrition transition** is changing the disease landscape in Africa with CVD and its related risk factors gaining a prominent position. The rising levels of overweight and obesity in African are likely to exacerbate the burden of CVD if measures are not taken to curb the problem. **Public health** strategies focusing on healthy diet, physical activity, weight reduction, and maintenance strategies are clearly needed in sub-Saharan African countries, particularly in urban areas. Strategies must include measures such as price reduction for healthy foods (e.g., fruits and vegetables) and promotion of physical activity in workplace and schools. These strategies need to take gender, socioeconomic, and culturally specific factors into account.

## 6 Cross-References

- ▶ [Genetics of Obesity](#)
- ▶ [Obesity in East Asia](#)
- ▶ [Obesity in Latin America](#)
- ▶ [Obesity in Middle East](#)

## References

- Abubakari AR, Lauder W, Agyemang C et al. Prevalence and time trends in obesity among adult West African populations : a meta-analysis. *Obesity Reviews*. 2008; 9:297–311.
- Addo J, Smeeth L, Leon DA. Obesity in urban civil servants in Ghana: Association with pre-adult wealth and adult socio-economic status. *Public Health* 2009;123:365–370.
- Afolabi WA, Addo AA, Sonibare MA. Activity pattern, energy intake and obesity among Nigerian urban market women. *Int J Food Sci Nutr*. 2004;55:85–90.
- Agbeko, MP, Kumi-Kyereme A, Druye Adjei A et al. Predictors of Overweight and Obesity Among Women in Ghana. *The Open Obesity Journal*; 2013; 5:72–81.
- Agyei-Mensah S, de-Graft Aikins A. Epidemiological transition and the double burden of disease in Accra, Ghana. *J Urban Health*. 2010; 87(5):879–97.
- Agyemang C. Rural and urban differences in blood pressure and hypertension in Ghana, West Africa. *Public Health* 2006;120: 525–533.
- Agyemang C, Owusu-Dabo E, de Jonge A. et al. Overweight and obesity among Ghanaian residents in The Netherlands: how do they weigh against their urban and rural counterparts in Ghana? *Public Health Nutr* 2009;12:909–16.
- Alaba O, Chola L. Socioeconomic Inequalities in adult obesity prevalence in South Africa: a decomposition analysis. *Int J Environ Res Public Health*. 2014;11(3):3387–406.
- Amoah AG. Sociodemographic variations in obesity among Ghanaian adults. *Public Health Nutr*. 2003; 6:751–757.
- Anyanwu GE, Ekezie J, Danborno B, et al. Impact of education on obesity and blood pressure in developing countries: a study on the Ibos of Nigeria. *N Am J Med Sci*. 2010;2(7):320–324.
- Appiah CA, Steiner-Asiedu M, Otoo GE. Predictors of overweight/obesity in urban Ghanaian women. *Int J Clin Nutr*. 2014;2(3):60–68.

- Aryeetey E, Devarajan S, Kanbur R. et al. Overview. In E Aryeetey, S. Devarajan, R Kanbur and L. Kasekende (Eds). (2012). *The Oxford Companion to the Economics of Africa*. 2012; Oxford: Oxford University Press.
- Asfaw A. Do government food price policies affect the prevalence of obesity? Empirical evidence from Egypt. *World Development* 2007;35:687–701.
- Atek M, Traissac P, Ati J. et al. Obesity and association with Area of Residence , Gender and Socio-Economic Factors in Algerian and Tunisian Adults. *PloS One*. 2013;8:1–10.
- Averett SL, Stacey N, Wang Y. Decomposing race and gender differences in underweight and obesity in South Africa. *Econ Hum Biol*. 2014;15:23–40.
- Auwah RB, Anarfi J, Agyemang C, et al. Prevalence, awareness, treatment and control of hypertension in urban poor communities. *J Hypertens* 2014;32:1203–1210.
- Ayah R, Joshi MD, Wanjiru R, et al. A population-based survey of prevalence of diabetes and correlates in an urban slum community in Nairobi, Kenya. *BMC Public Health*. 2013;13:371.
- Benkeser RM, Biritwum R, Hill AG. Prevalence of overweight and obesity and perception of healthy and desirable body size in urban, Ghanaian women. *Ghana Med J*. 2012;46:66–75.
- Bertram MY, Jaswal AV, Van Wyk VP, et al. The non-fatal disease burden caused by type 2 diabetes in South Africa, 2009. *Glob Health Action*. 2013;6:19244.
- Biritwum RB, Gyapong J, Mensah G. The epidemiology of obesity in Ghana. *Ghana Med J*. 2005;39(3):82–85.
- Brown PJ. Culture and the evolution of obesity. *Human Nature* (Hawthorne, N.Y.). 1991; 2:31–57.
- Case A, Menendez A. Sex differences in obesity rates in poor countries: evidence from South Africa. *Econ Hum Biol*. 2009;7:271–282.
- Chukwuonye II, Chuku A, John C, et al. Prevalence of overweight and obesity in adult Nigerians – a systematic review. *Diabetes Metab Syndr Obes*. 2013;6:43–7.
- Dake FAA, Tawiah EO, Badasu DM. Socio-demographic correlates of obesity among Ghanaian women. *Public Health Nutr*. 2010;14(7):1285–1291.
- Delisle H, Ntandou-Bouzitou G, Agueh V, et al. Urbanisation, nutrition transition and cardiometabolic risk: the Benin study. *Br J Nutr*. 2012;107:1534–44.
- Duda RB, Jumah NA, Hill AG, et al. Interest in healthy living outweighs presumed cultural norms for obesity for Ghanaian women. *Health Qual Life Outcomes*. 2006;4:44.
- Duda RB, Jumah NA, Hill AG, et al. Assessment of the ideal body image of women in Accra, Ghana. *Trop Doct*. 2007;37:241–244.
- Fezue L, Minkoulou E, Balkau B, et al. Association between socioeconomic status and adiposity in urban Cameroon. *Int J Epidemiol*. 2006;35:105–111.
- Flegal KM, Kit BK, Orpana H, et al. Association of all-cause mortality with overweight and obesity using standard body mass index categories: a systematic review and meta-analysis. *JAMA*. 2013;309:71–82.
- Freidberg S. French beans for the masses: A modern historical geography of food in Burkina Faso. *J Historical Geography* 2003;29:445–463.
- Holdsworth M, Gartner A, Landais E, et al. Perceptions of healthy and desirable body size in urban Senegalese women. *Int J Obes Relat Metab Disord*. 2004;28:1561–1568.
- Iliffe J. *The African Aids epidemic: A history*. 2006, Oxford: James Currey.
- Iloh G, Amadi AN, Nwankwo BO, et al. Obesity in adult Nigerians: a study of its pattern and common primary co-morbidities in a rural Mission General Hospital in Imo state, South-Eastern Nigeria. *Niger J Clin Pract*. 2011;14:212–218.
- Kandala NB, Stranges S. Geographic variation of overweight and obesity among women in Nigeria: a case for nutritional transition in sub-Saharan Africa. *PLoS One*. 2014;9:e101103.

- Kgaphola MS, Viljoen AT. Food habits of rural Swazi households : Part 2 : Social structural and ideological influences on Swazi food habits. *Journal of Family Ecology and Consumer Sciences*. 2004;32;16–25.
- Kifleyesus A. Muslims and meals: The social and symbolic functions of foods in changing socio-economic environments. *J Int Afri Institute* 2002;72:245–276.
- Kimani-Murage E, Pettifor J, Tollman S, et al. Predictors of adolescent weight status and central obesity in rural South Africa. *Public Health Nutr* 2011;14:1114–1122.
- Kruger HS, Puoane T, Senekal M, van der Merwe MT. Obesity in South Africa: challenges for government and health professionals. *Public Health Nutr* 2005;8:491–500.
- Urgently needed: a framework convention for obesity control. *Lancet* 2011;378(9793): 741.
- Mackenbach JP, Cavelaars AE, Kunst AE, et al. Socioeconomic inequalities in cardiovascular disease mortality; an international study. *Eur Heart* 2000; 21:1141–51.
- Malhotra R, Hoyo C, Østbye T, et al. Determinants of obesity in an urban township of South Africa. *South Afr J Clin Nutr*. 2008;21:315–320.
- Manyema M, Veerman LJ, Chola L, et al. The potential impact of a 20% tax on sugar-sweetened beverages on obesity in South African adults: a mathematical model. *PLoS One*. 2014;9:e105287.
- Martorell R, Khan LK, Hughes ML, Grummer-Strawn LM. Obesity in women from developing countries. *Eur J Clin Nutr*. 2000;54(3):247–52.
- Masibo PK, Buluku E, Menya D, et al. Prevalence and determinants of under-and over-nutrition among adult Kenyan women; evidence from the Kenya Demographic and Health survey 2008-09. *East Afr J Public Health*. 2013;10:611–622.
- Mayosi BM, Flisher AJ, Lalloo UG, et al. The burden of non-communicable diseases in South Africa. *The Lancet* 2009;374(9693), 934–947.
- Medeiros F, Casanova MD, Fraulob JC, et al. How Can Diet Influence the Risk of Stroke ? *Int J Hypertens* 2012; 2012:763507.
- Micklesfield LK, Lambert EV, Hume DJ, et al. Socio-cultural, environmental and behavioural determinants of obesity in black South African women. *Cardiovasc J Afr*. 2013;24:369–75.
- Mogre V, Mwinlenaa PP, Oladele J, et al. Impact of physical activity levels and diet on central obesity among civil servants in Tamale metropolis. *J Med Biomed Sci*. 2012;1:1–9.
- Mogre V, Nyaba R, Aleyira S. Lifestyle risk factors of general and abdominal obesity in students of the school of medicine and health science of the University of Development Studies, Tamale, Ghana. *ISRN Obesity*. 2014. doi:10.1155/2014/508382.
- Msyamboza PK, Kathyola D, Dzowela T. Anthropometric measurements and prevalence of underweight, overweight and obesity in adult Malawians: nationwide population based NCD STEPS survey. *Pan Afr Med J*. 2013;15:108.
- Mufunda J, Mebrahtu G, Usman A, et al. The prevalence of hypertension and its relationship with obesity : results from a national blood pressure survey in Eritrea. *J Hum Hypertens* 2006;20:59–65.
- Muhihi A J. Obesity, overweight, and perceptions about body weight among middle-aged adults in Dar es Salaam, Tanzania. *Int Sch Res Netw*. 2012:1–6.
- Njelekela MA, Mpembeni R, Muhihi A, et al. Gender-related differences in the prevalence of cardiovascular disease risk factors and their correlates in urban Tanzania. *BMC Cardiovascula Disorders* 2009; 9:1–8.
- Okpechi I G, Chukwuonye II, Tiffin N, et al. Blood Pressure Gradients and Cardiovascular Risk Factors in Urban and Rural Populations in Abia State South Eastern Nigeria Using the WHO STEPwise Approach. *PloS One* 2013;8:4–6.

- Pereko KK, Setorglo J, Owusu WB, et al. Overnutrition and associated factors among adults aged 20 years and above in fishing communities in the urban Cape Coast Metropolis, Ghana. *Public Health Nutr.* 2013;16:591–595.
- Pobee RA, Owusu WB, Plahar WA. The prevalence of obesity among female teachers of child-bearing age in Ghana. *Afr J Food Agric Nutr Dev.* 2013; 3(3):7820–7839.
- Popkin, BM, Adair LS, Ng SW. Global nutrition transition and the pandemic of obesity in developing countries. *Nutrition Reviews* 2011;70:3–21.
- Population Reference Bureau. Population Reference Bureau (pp. 10–11). 2013, Washington, D.C.
- Prentice AM. The emerging epidemic of obesity in developing countries. *Int J Epidemiol.* 2006;35:93–99.
- Prospective Studies Collaboration. Body-mass index and cause-specific mortality in 900 000 adults: collaborative analyses of 57 prospective studies. *The Lancet* 2009;373(9669):1083–1096.
- Puoane TR, Fourie JM, Tsolekile L, et al. What do Black South African adolescent girls think about their body size? *J Hunger Environ Nutr.* 2013;8;1:85–94.
- Puoane T, Steyn K, Bradshaw D, et al. Obesity in South Africa : The South African Demographic and Health Survey. *Obesity Research* 2003;10:1038–1048.
- Rutter H. Where next for obesity? *Lancet* 2011;378(9793):746–7.
- Sanuade OA, Anarfi JK, de-Graft Aikins A, et al. Patterns of cardiovascular disease mortality in Ghana: A 5-year review of autopsy cases at Korle-Bu Teaching Hospital. *Ethn Dis.* 2014 Winter 24:55–9.
- Shayo GA, & Mugusi FM. Prevalence of obesity and associated risk factors among adults in Kinondoni municipal district, Dar es Salaam Tanzania. *BMC Public Health* 2011;11:365.
- Siervo M P, Grey P, Nyan OA, et al. Urbanization and obesity in The Gambia: a country in the early stages of the demographic transition. *Eur J Clin Nutr.* 2006;60:455–463.
- Steyn N, McHiza Z. Obesity and the nutrition transition in Sub-Saharan Africa. *Ann N Y Acad Sci.* 2014;1311:88–101.
- Steyn NP, Nel JH, Parker WA, et al. Dietary, social, and environmental determinants of obesity in Kenyan women. *Scand J Public Health.* 2011;39:88–97.
- Tibazarwa K, Ntyintyane L, Sliwa K, et al. A time bomb of cardiovascular risk factors in South Africa : Results from the Heart of Soweto Study “Heart Awareness Days. *Int J Cardiol.* 2009: 132:233–239.
- Tlili F, Mahjoub A, Lefèvre P, et al. Tunisian women’s perceptions of desirable body size and chronic disease risk. *Ecol Food Nutr.* 2008;47:399–414.
- UNESCO Institute for Statistics. (2010). Trends in Tertiary Education: Sub-Saharan Africa (pp. 1–7). Retrieved from <http://www.uis.unesco.org/FactSheets/Documents/fs10-2010-en.pdf>
- WHO. Obesity and overweight. WHO 2015, Fact sheet N°311. <http://www.who.int/mediacentre/factsheets/fs311/en/>. Accessed February 23, 2015.
- Ziraba AK, Fotso JC, Ochako R. Overweight and obesity in urban Africa: A problem of the rich or the poor? *BMC Public Health.* 2009;9:465.