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Review

Obesity: A major public health challenge of 21st century in the United Kingdom (UK)

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Obesity is one of the greatest public health challenges of modern times, especially in the UK, with its attendant negative health consequences and huge wider cost to the society. This paper aims to shed more light, stimulate debate and further research into the fifth wave of public health as well as emphasizing the strength and pitfall of basic principles of public health in addressing obesity. It examines the problem by drawing evidence from the literature, arguments and empirical observations and then theorizing from these. Though not well understood, evidence suggests that obesity may have stemmed out of fast changing human socio-economic and cultural systems, as conditions associated with modernity (improved technology, consumerism, economism, individualism and breakdown of social capital) appear to be the drivers. Asides this, public health policies and programmes are riddled with loopholes and seems uncoordinated. In conclusion, the basic public health principle for addressing the scourge of obesity seems ineffective because obesity is a disease with poorly understood ecology and mechanisms. Control strategies are inconsistent and not holistic, therefore, it will be reasonable to explore the fifth wave of public health intervention while fortifying the basic public health principle of "understand, control and predict". Furthermore, there must be concerted effort from every member of the society to embrace control measures, take responsibility to improve their health and government should be more sincere in implementing public health policies aimed at stemming this epidemic.

Key words: Obesity epidemic, modernity, UK, fifth wave, modernity, principles of public health.

INTRODUCTION

Definition of obesity

Obesity is a condition characterized by excessive body fat with potentially adverse health consequences. Essentially, it describes excess adiposity due to sustained positive energy balance consequent upon energy intake being more than energy expenditure (Lake, 2011). Obesity is defined by body mass index (BMI) of ≥ 29.9 kg/m^2, while overweight is BMI ≥ 25 kg/m^2 (WHO, 1997). BMI has been in use for more than two centuries to measure body fat (Rothman, 2008), and still widely used, even at the population level to measure the burden of obesity, and potentially inform public health interventions. However, the inability of BMI to distinguish between fat and fat-free cell has made other techniques such as waist circumference, waist to hip ratio and MRI-based imaging of visceral adiposity, clinically more important in defining obesity as a risk factor for metabolic disorders such as type 2 diabetes mellitus, hyperfibrinogenaemia, dyslipidaemia, hyperinsulinaemia and insulin resistance. Furthermore, BMI does not take into consideration the effect of age and sex as well as body fat distribution. It is also of poor sensitivity and specificity (Rothman, 2008). Therefore, the ideal and more objective methods of classifying body fat should be based on direct measurement such as densitometry, dual energy x-ray absorption (DEXA) and bioelectrical impedance (Rothman, 2008), though such measures are not feasible in clinical settings.

BURDEN OF OBESITY IN THE UK

Obesity is a major public health challenge in the UK and

worldwide with increasing prevalence, especially in the last 30years (WHO, 2003; Prentice, 2006). The prevalence of obesity in the UK has proceeded at a doubling rate in the past 25years, and it has been projected that about 40% of UK adult population will be obese by 2025 (McPherson et al., 2007), with children and adolescents not being spared (Foresight Report, 2007). An average person in the UK is overweight with a BMI of 27 kg/m^2 (Lobstein and Leach, 2007), that is, tending towards being obese. Similar findings have been reported in other regions of the world, particularly North America, as well as the developing world (International Obesity Task Force, 2002; Prentice, 2006). This trend poses a significant public health concern in the developing world, as it gives rise to double burden of diseases (communicable and non-communicable), which may be overwhelming to their poorly funded health services.

Obesity is associated with a number of negative mental, physical and social consequences (DOH, 2004; Francis, 1996). It is associated with certain metabolic abnormalities and diseases such as hyperinsulinaemia, insulin resistance, type 2 diabetes mellitus, dyslipidaemia, coronary heart diseases, hypertension, stroke and some malignancies. Others are psychological distress/depression, arthritis, low back pain, sleep apnea and poor wound healing, and these are associated with significant morbidity and mortality. It constitutes a huge burden on the individual health, the health system (Lake and Townshend, 2006; Must et al., 1999) and the economy (Kenkel and Manning, 1999; Lang and Heasman, 2004). For example, in the UK, it accounted for 7% of morbidity (Allender and Rayner, 2007), 30,000 deaths, and an annual cost of 3.3 to 3.7 billion GBP (House of Commons Health Committee, 2004). At the current rate, National Health Service expenses attributable to obesity and overweight are likely to double to 10 billion GBP and the extended cost implication on the society and investments may reach 49.9 billion GBP per year by 2050 (McPherson et al., 2007; McCormack and Stone, 2007). In other words, obesity and its related disease conditions appear to have significant adverse socio-economic implications at individual and population levels (work absenteeism, reduced productivity, psycho-social distress, overwhelming health expenditures, increased dependency ratio, etc). The aforementioned statistics may however be an under-estimate of the burden of obesity in the UK.

It should be noted that the rising individual and population level of obesity has stimulated research into its aetiopathogenesis and drivers, aimed at informing public health policies towards halting or slowing down the rising prevalence. Arguably, such (current) public health policies appear to be ineffective in controlling the rising epidemic (Lake, 2006), thus demanding radical and holistic but sustained efforts/ interventions to reverse this trend. The failure of the current public health interventions may be due to inconsistent, non-sustained, fragmented anti-obesity measures, poor understanding of the ecology of obesity (until recently), seemingly societal "normalization" of obesity, lack of strong political will in converting research findings into actions owing to unbridled economic interests, and top-down approach in programme implementation.

DETERMINANTS OF HEALTH IN THE CONTEXT OF OBESITY

Genetics

There is extensive documentation on the prevalence of obesity; however, evidence for the causes of the emerging epidemic and its socio-spatial spread are not clearly understood (Pearce and Witten, 2010). There seems to be a genetic link to obesity (Farooqi and O'Rahilly, 2007), such as identification of 'ob' gene, interacting with neuro-hormonal pathways. Pieces of evidence from the study on adoptee adults (Stunkard et al., 1986) and twin studies (Bouchard et al., 1990) showed that genetics may play a dominant role in the aetiology of obesity. Furthermore, recent advances in the science of obesity have unraveled mutations in six human genes responsible for monogenic obesity which account for about 4% of morbid obesity (Barsh GS et al., 2000; Vaisse et al., 2000). These forms of monogenic obesity are largely independent of other influences or modifiers such as environment, and all (leptin, LepR, POMC, PC-1, Mc4r and SIM1) involve proteins in the leptin-melanocortin signaling pathways, thus providing a window of opportunity for pharmacotherapy (Rankinen et al., 2001). Furthermore, more research is underway in the identification of candidate genes responsible for polygenic obesity (notable among them are syndromes such as Prader-Willi, Bardet- Biedl, Beradinelli-Seip Congenital Lipodystrophy) (Cummings and Schwartz, 2003), which will inform future preventive and management strategies. However, the proponents of "obesogenic environments" have espoused that genetic factor may not be sufficient to explain the sharp rise of obesity within two or three decades (Cummings and Schwartz, 2003; Pearce and Witten, 2010) and there are still gaps in the genetic basis of obesity. Though, the relative contributions of genetics and environment to the aetiology of obesity as found in most studies are variable, there are significant interactions between environmental factors and genetics in the phenotypic expression of obesity in individuals (Pi-Sunyer, 2002).

Obesogenic environments

Obesogenic environment is the sum of influences that the surroundings, opportunities or conditions of life have on promoting obesity in individuals or populations (Swinburn

et al., 1999). The import of this definition is that the surrounding natural, built, social, food environments, and even economic (growth) and cultural changes may be driving the obesity epidemic. Obesity appears to be commoner among the poor (Davies et al., 1995). Furthermore, there is an association between neighbourhood level of deprivation and exposure to fast-food outlets or unhealthy diets (Cummins et al., 2005). However, Mcintyre et al. (2005) found no association between areas of deprivation and access to take-away outlets. Understanding food, socio-economic and physical activity environments could be important to providing clues about how the obesity epidemic can be controlled in the UK. The representation in Figure 1 is a synopsis of the obesogenic environment. It shows the complex interactions of man and the drivers of obesity; these interwoven relationships between socio-economic, political, environmental and technological changes accompany modernity. These relationships appear to be a vicious cycle which will demand a new wave of evidence-based ideas to break.

There have also been suggestions that the changing lifestyles and structure of the society characterised by individualism, overconsumption, excessive convenience and reduced physical activity (Hanlon and Carisle, 2008; Lake and Townshend, 2006; Swinburn and Egger, 2002; Popkin et al., 2005), and increasingly obesogenic environments may have contributed significantly to the obesity epidemic. In other words, obesity is an un-anticipated consequences of social, economic, political and technological changes or advances of the (past few decades) which have resulted in increased automated services (domestic and industrial); fast and convenient transport services; multiple electronic entertainment media which discourages physical activity and social contacts; mechanized farming, biotechnology and improved food processing technologies that have significantly increased food supply (and accessibility) with high calories at reduced cost, particularly in developed countries, as well as safety concerns for physical activity participation, due to “unfriendly” road designs for recreational walking and cycling, fear of attack, rape and poor facility maintenance etc. in parks and recreational facilities. Though very complex (Stokols et al., 2003), these factors have been perceived as part of the driving forces behind this scourge (Swinburn et al., 1999). Hence, this underscores the need for greater understanding of the effects and relationships of diet, physical activity and time, space, social relationships, culture and nature with respect to the on-going obesity epidemic (Giles-Corti et al., 2010).

Life course approach

The pattern of growth in-utero and during early life is a determinant of adult risk of obesity and chronic diseases, even though the exact mechanism is not yet fully understood (Barker, 2007; Cameron and Demerath, 2002; Singhal and Lanigan, 2007). Growth rate of a foetus is partly dependent on parental factors, especially the mother’s nutrition and the nutrition milieu of the baby soon after delivery; these appear to set the baby on specific growth curve, with long lasting consequences (Foresight Report, 2007). While low birth weight is associated with increased risk of chronic diseases in later life (Barker, 2007; Osmond and Barker, 2000), early life weight gain seems important to obesity in adulthood (Barker, 2007; Osmond and Barker, 2000; Whitetaker et al., 1998; Williams and Dickson, 2002). However, there is limited evidence of a direct link between birth weight and obesity (Barker, 2007; Osmond and Barker, 2000). Mothers with low socio-economic status tend to deliver low birth weight baby; perhaps, this may explain why obesity and its negative health consequences are more common among deprived and less educated individuals within the society (Davies et al., 1995; Gordon-Larsen et al., 2006; Kaufman et al., 1997; Neumark-Sztainer et al., 2002; Wang and Beydoun, 2007). Early adiposity rebound has been associated with high parental BMI, high BMI before the rebound period and increased height; all these are risk factors for adult obesity (Whitetaker et al., 1998; Williams et al., 2002). Breast feeding however, seems to be protective against the development of rebound obesity (Bergmann et al., 2003). It appears that social circumstances, lifestyle and pre-adult conditions may modify the course of development of obesity in adulthood (Langenberg et al., 2003; Woodward-Lopez et al., 2006), and possibly in later life. From the available evidence, it seems logical that life course approach may be a plausible explanation for some commentators’ assertion that human beings are “obesogenic organisms” (Hanlon and Carlisle, 2010).

Another key concept of public health towards understanding complexity of obesity is the “hierarchy of systems”. This approaches obesity from the lowest level (molecular) to the most complex level (system) and from individual-family-population to the society.

Combating the scourge of Obesity

Arguably, obesity cankerworm appears to have evaded basic public health principle (“understand, predict and control”), of which most successes recorded in public health was based upon. There has been limited overall success, stemming from poor understanding of the roles of environmental influences and their interactions with the established genetic and behavioural factors (Jackson, 2003; Francis, 1996). In addition, this failure might have arisen from obesity prevention and treatment strategies being focused largely on use of drugs, educational and behavioural interventions (Lang and Heasman, 2004; Lake and Townshend, 2006), however these seem

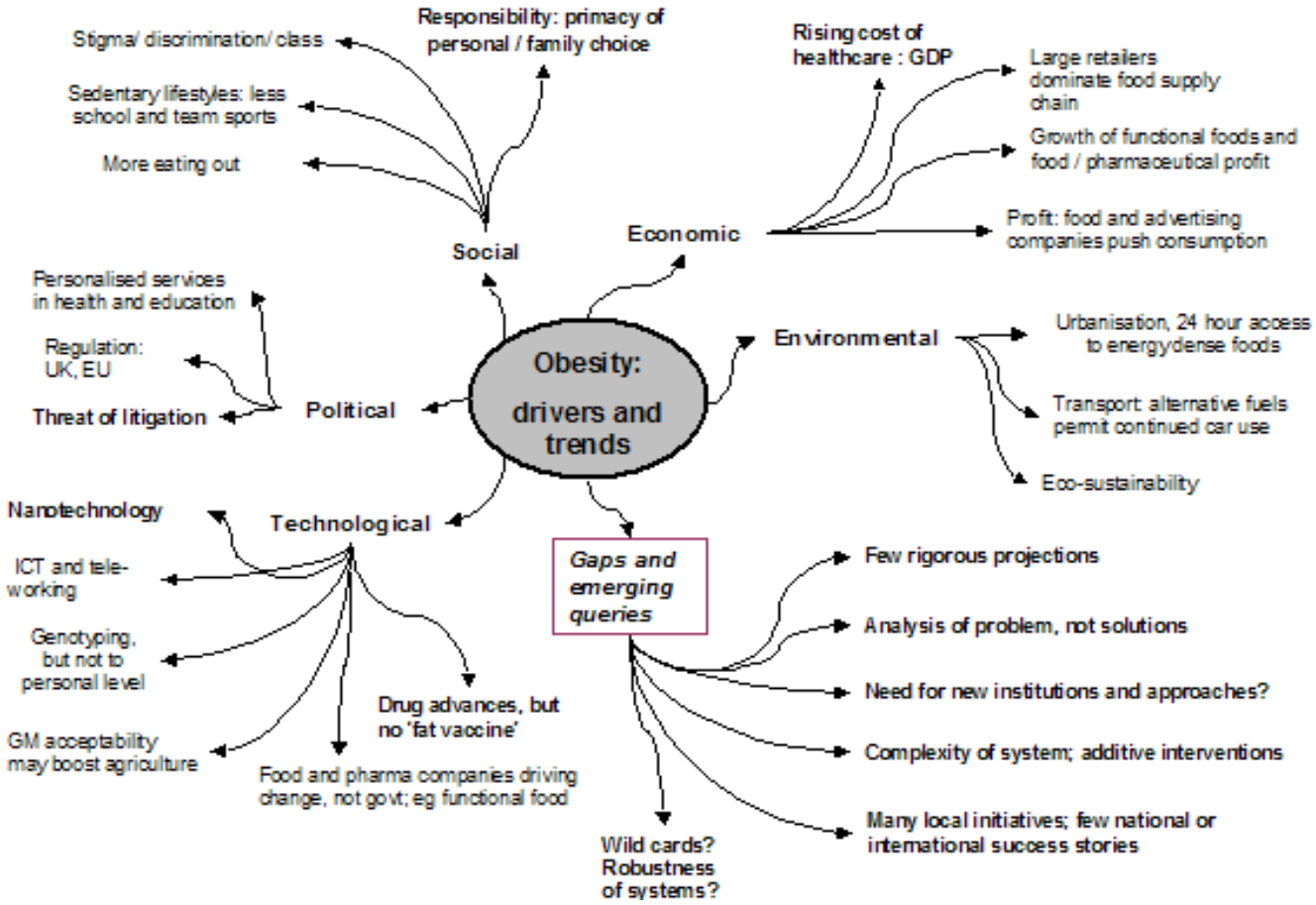

Figure 1. Synopsis of the obesogenic environment (Source: Principles of Public Health Lecture by Prof. Phil Hanlon).

incomprehensive and inconsistent. A practical illustration of the inconsistencies was observed in the behavioural intervention campaigns aimed at encouraging walking and cycling where participants were being given high-calories snacks as incentives after each episode of task and on examining the calorie content, the estimated energy burnt from the exercise is just half that of the snacks being provided. Asides this, food advertisements to children have been regulated on children's TV programme; however, anecdoctal evidence suggests that an appreciable content of adults' TV programmes are being watched by children where unhealthy food adverts are not restricted. Children are being provided with fruits while in the school premises but they have unfettered access to fattening and energy-dense meals in the nearest convenience store. These are grossly counterproductive and inconsistent.

Furthermore, the new world order of "economism", that is, unbridled desire for economic growth with the expectation of increased wealth and elimination of poverty, has led to increased use of active transport, increased traffic hazards for walkers and cyclist (Hanlon and Carlisle, 2010), increased working hours in automated work environments and grossly reduced leisure time physical activity (Foresight Report, 2007; Popham and Mitchell, 2006). Furthermore, there has been increased availability of cheap and energy- dense foods (Prentice and Jebb, 2003), following increased food production, which in turn, may have fueled the proliferation of fast-food outlets and restaurants, contributing to the local economy. Consequent upon the desire to make massive profits, huge resources are being expended on advertisement and marketing by food companies which is grossly more than what is available for healthy food promotion by government agencies (The Advertising Association, 2003). This might have stimulated the malignant culture of "eating-out" (Foresight Report, 2007).

In response to the relationship between food and economic environments, use of fiscal policies on fatty and sweetened food such as taxations are being exploited in some countries such as Denmark, Romania Canada and Australia; however, there are resistance against its implementation (BBC News, 2011; Holt, 2010). These fiscal policies have also been suggested to the UK government by some obesity experts in the UK, given the experience (reduction in consumption and prevalence of tobacco smoking related ailments) from tobacco control initiatives (Jofre, 2010); however, this should be

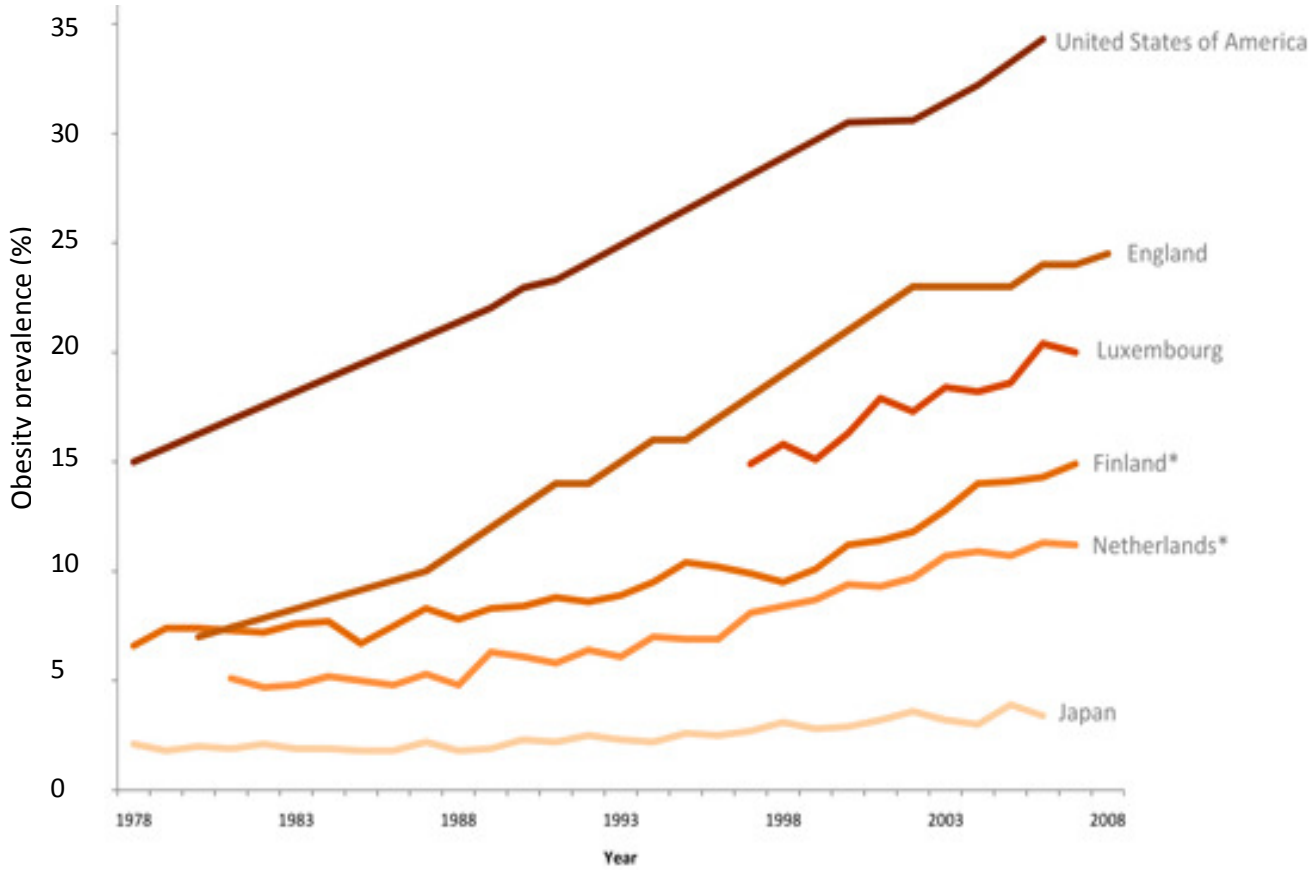

Figure 2. Trends in adult prevalence of obesity (BMI ≥ 30 kg/m^2) – percentage of the adult population assessed as obese in a selection of countries. Source: OECD.http://www.ecosante.org/index2.php?base=OCDE&langs=ENG&langh=ENG.*Self reported data (prevalence rates for the other countries are based on measured data).

accompanied by appropriate health education on healthy food choices in order to promote its effectiveness, as well as subsidising healthy food options (particularly fruits and vegetables), if economically sustainable. Though promising, it should be noted that there are no available data or studies yet to prove the effectiveness of these strategies from countries that have implemented taxations on junk or fatty foods as part of measures for obesity prevention and control. Furthermore, there is also a suggestion of legislating to regulate the distance and density of convenience and junk food store within neighborhoods as a step towards discouraging access and consumption of unhealthy foods.

Advancement in telecommunication especially internet, and proliferation of media houses with multiple entertainment programmes could have encouraged sedentary behavior (Hanlon and Carlisle, 2010).

Arguably, anti-social behaviour and violence following increased use of alcohol and drugs could have also discouraged active walking/transportation (Hanlon et al., 2010). Plausibly, “economism” could have contributed to the evolution and sustenance of the obesity epidemic. Perhaps, if long term and broad-based interventions are put in place to correct these aforementioned anomalies in a population-wide manner, we ‘may’ possibly be able to control the obesity ‘epidemic’.

Figure 2 clearly shows the secular trend in the increasing prevalence of obesity worldwide particularly, Europe and America. Arguably this can be linked to aforementioned advances/changes earlier mentioned in the discussion as plausible and possible drivers of the obesity trends.

THE FIFTH WAVE

This Public heath response simply means radical and new ways of thinking, being and doing derived from, but transcends modernity, giving rise to integral and ecological public health (Hanlon et al., 2010). This may have been necessitated by changing epidemiology and poor understanding of the ecology of diseases confronting public health such as obesity, and also, the previous four waves appears to have lost momentum, and therefore not effective in addressing diseases created and fueled by modernity (Hanlon et al., 2010).

Social re-engineering of the society, which includes the culture of consumerism, individualism and economism, excessive dependence on technology etc, have contributed in some ways to the emergence and perpetuation of diseases of modernity (Hanlon et al., 2010). This approach is encompassing, taking into consideration not only the traditional surveillance and behavioral epidemiology but also the environmental, socio-economic, cultural risks as well as genetics in tackling obesity. Given the available wealth of knowledge and present public health efforts (put in place by the government and public health professionals) which appear ineffective/ inadequate in reversing the rising tend of obesity, it is therefore important for individual and community to come to realisation that they can modify and influence their environments in complement with the government to achieve reasonably healthy and sustainable livelihood for all.

RECOMMENDATIONS

1. Strategies should be directed towards tackling obesity in multi-sectoral manner, given the fact that obesity's drivers traverse various sectors of our lives. In addition, there is need for further multi-disciplinary research into the complex aetiology and drivers of obesity, as a lot is still yet to be understood.
2. Population-wide interventions and holistic policies that focus on obesity prevention rather than management should be advocated as urgent public health priorities, as many are in the UK population who are in the process of becoming obese. Such policy can borrow cues from tobacco control initiatives to enforce regulations that can enhance large scale behavioural changes such as outright ban on unhealthy food marketing and advertisement, imposition of taxes on fattening and energy-dense foods, (thus discouraging eating-out culture and consumption of unhealthy diets) and also re-designing the built environment for safe physical activity participation etc.
3. A comprehensive social re-engineering by government and civic societies has to be initiated and sustained, as the society (modern) has receded into obesity promoting behaviours, values and lifestyles. This may be a window of opportunity to consider the fifth wave of public health interventions (Hanlon et al., 2010), as obesity transcends being a mere medical condition.
4. A robust and long-lasting surveillance scheme should be put in place by the National Health Service to monitor and evaluate programmes designed to tackle obesity.

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