PREVALENCE OF SEDENTARY LIFESTYLE AMONG BANKERS IN ILORIN METROPOLIS

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SUMMARY

Background: Many studies have shown the health burden of a sedentary lifestyle and the world health organization (WHO) rates inadequate physical activities as one of the three major threats to modern health alongside cigarette smoking and poor nutrition.

Objective: The main goal of this study was to determine the prevalence of sedentary lifestyle among bankers in Ilorin metropolis and to assess the main characteristic of sedentary people.

Methods: Two hundred and seventy bankers from 18 banks within the metropolis were randomly sampled in which two hundred and twenty eight bankers responded. Sedentary bankers were defined as those in the two lower quantities of the ratio percentage sedentary lifestyle/ percentage total activity. The data was collected using structured self administered questionairre and analyzed using Epi Info computer software (version 3.2.2). chi-square was used to determine the correlation of sedentary lifestyle with the socio-demographic variables of the respondents. (age, gender, body mass index, smoking status, marital status) and years of experience of the bankers in banking profession.

Result: The mean age of the bankers was 30.39 (SD 7.53) ranging between 21 and 56 years, 136(59.6%) were males while 92(40.4%) were females. The mean basal metabolic index of the participants was 25.77 (SD 4.81). One hundred and seventy four(76.3%) of the bankers were within their first 5 years in the banking sector, while 30(13.2%), 8(3.5%), and 16(7.0%) had spent 6-10, 11-15, 15 years and above respectively in the banking sector. From the findings of this research, the prevalence of sedentary lifestyle among bankers in Ilorin metropolis was 29.6%. The prevalence was also higher among females, obese, ex-smokers, widowed and individuals that had spent over 15 years in the banking industry.

Conclusion: The prevalence of sedentary lifestyle among bankers is high and if this prevalence cuts across the Nigerian populations, it becomes a public health burden and urgent preventive strategies will then be necessary.

KEYWORDS: Metabolic equivalents, Sedentary Lifestyle, Physical activity, Sedentary Index.

INTRODUCTION

The WHO rates inadequate physical activity as one of the 3 major threats to modern health alongside cigarette smoking and poor nutrition(WHO, 2OO2; Nicolas, 2004). Similarly, and among unhealthy lifestyle, smoking and lack of regular physical activity are of major importance in public Health because they are highly prevalent and potentially modifiable (Varo et al, 2003).

Twenty percent of all deaths of people 35 years and older were attributed to a lack of physical activity(Adams, 2006). Similarly, overall physical inactivity was estimated to cause 1.9million deaths and 19 million disability adjusted life year globally(WHO, 2002).

Sedentary lifestyle is said to increase the risk of dying from cancer by 45 percent for men and 28 percent for women, death from respiratory ailments was 92 percent higher for men and 75 percent higher for women. The risk of dying from heart diseases was 52 percent higher for

men and 28 percent higher for women(Adams, 2006).

Physical inactivity is estimated globally to cause about 10 to 16 percent cases of diabetes mellitus, and each of breast cancer, colon cancer, and rectal cancer. Also, physical inactivity cause about 22 percent of ischemic heart disease. Those who are physically inactive have between 1.5 and 2.4 times increased risk of developing coronary heart disease, comparable to that observed for high blood cholesterol, high blood pressure or cigarette smoking. Less-active, less-fit persons have a 30 percent to 50 percent greater risk of developing high blood pressure(American Heart Association, 2006).

In spite of the magnitude of problems associated with sedentary lifestyle, there is scarcity of international epidemiological studies assessing the prevalence of sedentary lifestyle. However, quite a number of studies have shown the health burden of a sedentary behaviour. Similarly, there is lack of a clear and universal definition of sedentary lifestyle(Varo et al, 2003). However, sedentary originally implies higher propensity of sitting and lack of exercise. Sedentary lifestyle refers to a lifestyle most commonly found in western culture, which is characterized by sitting or inactivity for most of the day, in an office or at homes. It is said to be a factor in obesity and other disorders, primarily heart disease, and as developing countries adopt Western cultures, more individuals are becoming sedentary and the burden on our health system is increasing dramatically

Thus the need of orientation of those tending towards being sedentary on how to adopt healthier lifestyles is of paramount interest in public health. However assessing the prevalence of sedentary lifestyles in our populations is an initial process towards achieving this orientation. This research thus aimed towards assessing the prevalence of sedentary lifestyle among bankers in Ilorin metropolis as the activity of the bankers require sitting for long hours of the day.

METHODOLOGY

Two Hundred and twenty eight subjects (Bankers) comprising of 136(59.6%) males and 92(40.4%) females aged 21 56 were involved in this research. The subjects were selected from 18 banks within Ilorin metropolis. The study included all bankers from trainees to managers and excluding other non-banker staff of the banks as well as industrial trainees that are still students in the universities or polytechnics.

Data Collection Instrument

Data for this study was collected using structured self administered questionnaire. The questionnaire sought information on socio-demographic status of the bankers and the activity level of the bankers during week days and week end days.

Sampling Technique and Ethical Issues

Multi-stage sampling was used in this study which includes systematic random sampling for the selection of the banks and simple random sampling for the selection of bankers in the selected banks. Ethical approval was sought and obtained from the ethical committee of University of Ilorin Teaching Hospital. Similarly, management of selected banks were consulted and duly informed about the research and the need for some of their staff to complete the questionnaire. Individual verbal consent were also obtained from the selected bankers.

Research Design and Procedure

The research design was descriptive cross sectional survey. The procedure used to determine the proportion of sedentary bankers was adopted from that used in a validation of physical activity questionnaire (Martinez Gonzalez et al, 2005).

The first part of the questionnaire consisted of questions about participation in 15 different activities during leisure time and time spent on each (obtained through 10 categories ranging between 'never' and '11 or more hours per week').

The second part of the questionnaire included questions about the number of hours spent in sedentary activities and indicators of physical activity at work.

The number of metabolic equivalents (METs) corresponding to each activity were obtained using the compendium of physical activity as the ratio of energy expended during a physical activity to the metabolic rate of sitting quietly (Booth et al, 1996; Ainsworth et al, 2000). Afterwards, the number of METs in each activity was multiplied by the weekly participation in that activity. Total physical activity (MET-h/week) was calculated by adding leisure-time physical activity to the work-time physical activity.

A sedentary lifestyle index was calculated using the sedentary lifestyle indicators included in the questionnaire for a typical work day and for a typical weekend day. A sedentary lifestyle was defined based on the total number of hours spent sitting down per week. A relative sedentary lifestyle index was calculated for each participant, assigning 100% to the most sedentary participant and classifying the rest of the participants according to that value (Percentage sedentary lifestyle). In the same vain, percentage total activity was also calculated.

The ratio, percentage sedentary lifestyle (h/week) to percentage total activity (h/week) was also calculated and expressed as MET-h week-1. This ratio was divided into five quintiles. Participants in the two lower quintiles were classified as sedentary individuals while the participants in the two higher quintiles were classified as active.

Data analysis

Data was sorted out manually and was entered into the EPI INFO computer software (version 3.2.2). Data was analyzed using this software package. The necessary means were obtained and appropriate corelation between

varibles done using chi-square to determine whether the result is significant or not.

RESULTS

Two Hundred and twenty eight bankers from 18 mega banks within Ilorin metropolis participated in this research. The mean age of the respondents was 30.39 (SD 7.53) with a minimum of 21 and maximum of 56 years. Of the 228 respondents, 136(59.6%) of them were males while 92(40.4%) were females.
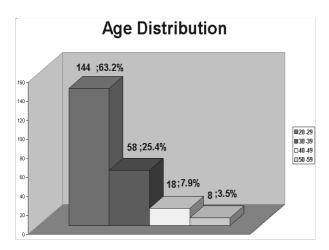

Figure 1: Age Distribution Of Respondents

Out of the 228 respondents, a greater proportion of the respondents, 144 (63.3%) were within the ages of 20 and 29; 58 (25%) respondents were within 30-39 age range. Also, 18 (8%) were within the ages of 40 and 49, while the remaining 8 (4%) were within the age range of 50 and 60
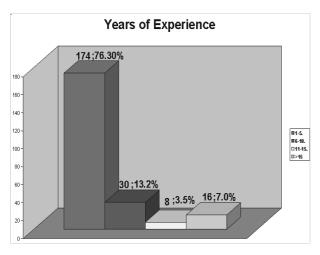

Figure 2: Years of Experience in Banking of the Respondents

One hundred and seventy four (76.3%) of the respondents were still in their first 5 years in banking; 30 (13.2%) were within 6-10 years in banking business; another 8 (3.5%) were between 10-15 years in this business while the remaining 16 (7%) have been over 15 years in the banking industry.

Table 1: Main Characteristics Associated with Body Composition

Measurement	Mean	S D	Range
Weight (kg)	69.18	11.28	49.0-97.0
Height (m)	1.64	0.10	1.35-1.90
Body Smass index (kg/m2)	25.77	4.81	17.36-40.43

The mean weight of the respondents was 69.18 kg (SD 11.28) with a range of 49 kg-97 kg, the mean of the height of respondents was 1.64 m (SD 0.10) having a range of 1.35 m-1.90 m. Also, the mean BMI of the respondents was 25.77 (SD 4.81) ranging between 17.36 and 40.43.

Table 2: Distribution of Sedentary Lifestyle among Bankers

Quintiles of Sedentary Lifestyle	Frequency (%)
1	44 (22.4)
2	48 (24.5)
3	46 (23.5)
4	20 (10.2)
5	38 (19.4)
Total	196 (100.0)

Fifty-eight (29.6%) respondents in quintiles 4 and 5 indicate the percentage of bankers that are sedentary, while the proportion 92 (46.9%) of respondents in quintiles 1 and 2 were the bankers that are physically active. The proportion of bankers in the third quintile, 46 (23.5%) are those at the border-line of being sedentary and moderately active.

Table 3: Correlation between Sedentary Lifestyle and the age of Respondents

	Quintiles Of Sedentary Lifestyle			
Age group of respondents	1 and 2 (Active) (%)	3 (Borderline) (%)	4 and 5 (Sedentary) (%)	Total
20-29	56 (45.9)	30 (24.6)	36 (29.5)	122
30-39	20 (41.7)	12 (25.0)	16 (33.3)	48
40-49	12 (66.7)	2 (11.1)	4 (22.2)	18
50-59	4 (50.0)	2 (25.0)	2 (25.0)	8
Chi-square	=	1.296		
P-value	=	0.730		

Highest level of sedentary respondents 16 (33.3%) occur in the individuals within the 30 and 39 age range with lowest level of sedentary respondents 4 (22.2%) in the 40-49 age range. 20-29 age range had 36 (29.5%) sedentary respondents while 2 (25%) respondents were sedentary in the 50-59 age range. These differences were however, not statistically significant which implies, sedentary lifestyle is independent of age of respondents.

Table 4: Correlation between Sedentary Lifestyle and Gender of the Respondents

Quintiles of Sedentary Lifestyle	Gender of Respondents	
	Female (%)	Male (%)
1 and 2 (Physically active)	40 (48.8)	52 (45.6)
3 (Borderline)	14 (17.1)	32 (28.1)
4 and 5 (Sedentary)	28 (34.1)	30 (26.3)
Total	82 (100.0)	114 (100.0)

Chi square = 0.031
P value   = 0.861

The proportions of sedentary female respondents 28 (34.1%) are more when compared to that of male respondents 30 (26.3%). The differences were not statistically significant which implies, sedentary lifestyle is independent of sex of respondents.

Table 5: Correlation Between Sedentary Lifestyle and Body Mass Index of Respondents

Quintiles of Sedentary Lifestyle	Body Mass Index of Respondents			
	<18.5 (%)	18.5-25.0 (%)	25-30 (%)	>30 (%)
1 and 2 (Physically active)	2 (100.0)	42 (58.3)	18 (37.5)	16 (50.0)
3 (Borderline)	0 (0.0)	14 (19.4)	18 (37.5)	2 (6.3)
4 and 5 (Sedentary)	0 (0.0)	16 (22.2)	12 (25.0)	14 (43.8)
Total	2 (100.0)	72 (100.0)	48 (100.0)	32 (100.0)

Chi square =2.711
P value   =0.438

The proportions of sedentary female respondents 28 (34.1%) are more when compared to that of male respondents 30 (26.3%). The differences were not statistically significant which implies, sedentary lifestyle is independent of sex of respondents.

Table 6: Correlation between Sedentary Lifestyle and the Marital Status of the Respondents

Quintiles of Sedentary Lifestyle	Marital Status of Respondents		
	Married (%)	Single (%)	widowed/ divorced (%)
1 and 2 (Physically active)	36 (51.4)	56 (45.2)	0 (0.0)
3 (Borderline)	12 (17.1)	34 (27.4)	0 (0.0)
4 and 5 (Sedentary)	22 (31.4)	34 (27.4)	2 (100.0)
Total	70 (100.0)	124 (100.0)	2 (100.0)

Chi square =1.774
P-value   = 0.412

Respondents that were married were more sedentary with 22 (31.4%) of them in the sedentary category while the unmarried respondents were less sedentary with 34 (27.4%) of them in the sedentary category. The only 2 (100%) respondents that were divorced were sedentary. These differences were however, not statistically significant.

Table 7: Correlation between Sedentary Lifestyle and Smoking Status of Respondents

Quintiles of Sedentary Lifestyle	Smoking Status of Respondents	
	Ex-smoker (%)	Non-smoker (%)
1 and 2 (Physically active)	6 (30.0)	86 (49.4)
3 (Borderline)	4 (20.0)	40 (23.0)
4 and 5 (Sedentary)	10 (50.0)	48 (27.6)
Total	20 (100.0)	174 (100.0)

Chi square =2.010
P value   =0.156

Sedentary respondents exist more among those that were once smoking but had quit the habit of smoking with 10 (50%) of them in the sedentary category. The respondents who had never smoked were however, less sedentary with 48 (27.6%) of them in the sedentary category. However, no statistically significant difference was found between sedentary lifestyle and smoking status of the respondents.

Table 8: Correlation between Sedentary Lifestyle and the years of Experience of the Bankers

Quintiles of Sedentary Lifestyle	Years of Experience in Banking			
	1-5	6-10	11-15	>15
1 and 2 (Physically active)	68 (45.9)	10 (41.7)	6 (75.0)	8 (50.0)
3 (Borderline)	32 (21.6)	10 (41.7)	2 (25.0)	2 (12.5)
4 and 5 (Sedentary)	48 (32.4)	4 (16.7)	0 (0.0)	6 (37.5)
Total	148 (100.0)	24 (100.0)	8 (100.0)	16 (100.0)

Chi square =1.919
P-value   =0.590

Highest proportion of sedentary respondents 6 (37.5%) occurs among respondents who had spent over 15 years in the banking industry. Forty-eight (32.4%) and 4 (16.7%) sedentary respondents occur among those in their first 5 years in banking as well as respondents within 6-10 years in banking industry respectively. The correlation between the two variables were however, not statistically significant.

DISCUSSION

The purpose of the present study was to assess the prevalence of sedentary lifestyle among bankers in Ilorin metropolis. It also aimed at exploring the socio-demographic variables that determine sedentary lifestyle in the banking population. This research appears to be the first to comprehensively analyze sedentary lifestyle in any Nigerian population and across any professional sub-group within the country. Other previous studies estimating the prevalence of physical inactivity and validation of physical activity questionnaire have provided important contributions to this research.

The prevalence of sedentary lifestyle among bankers based on the definition (ratio percentage sedentary lifestyle to percentage total activity) used in this research was 29.6% (Table 2). A recent report from the United States (US), National Health and Nutritional Examination Survey (NHANES) III(Crespo et al, 1999) showed that the prevalence of physical inactivity in the US was about 23%, while a similar report on the prevalence of sedentary lifestyle ranged between 43.3% and 87.8% across European Countries(Varo et al, 2003). The result of this present study and that of the former (NHANES III) appears to be similar. In NHANES III, the definition of sedentary lifestyle was based in reporting no participation in any leisure time physical activity. However, the prevalence of sedentary lifestyle in the latter (43.3% - 87.8%) was totally different from the result of this present study because of the definition of sedentary lifestyle used in their study was totally different from that used in this research. They refer to sedentary people as those that expend less than 10 percent of their leisure time energy expenditure in activities requiring greater than four metabolic equivalent (MET). MET is the ratio of energy expended during a physical activity to the metabolic rate of sitting quietly. However, work time physical activities was not taken into consideration in their own study. This work time physical activity is of great importance in this present study as the respondents spend bulk of their time at work. Another proposed definition of sedentary lifestyle by Martinez and Colleagues(Crespo et al, 1999; Varo et al, 2003) considered sedentary individuals as those who did not practice any physical activity during their leisure time and in addition, spent a total number of hours sitting down higher than the median of the distribution of hours sitting down a week for all participants. The above study reported the prevalence of sedentary lifestyle to be 15.1% across European countries.

Global estimate for the prevalence of physical inactivity according to the World Health Organization ranged between 31% and 51% across the 14 sub-regions with a global average of 41%(WHO, 2002) which is about midway between the previous two researches (US NHANES III and the 43.3% - 87.8% prevalence study). Highest prevalence still occurs in Europe with estimates higher than 50% for eleven countries and higher than 70% for five of them.

Assessment of leisure time physical activity has been controversial and there is still a lack of a universal measurement(Varo et al 2003). Most studies are based on self-reported physical activity from questionnaires, since they are easier, cheaper, and more reproducible than other methods, although the trend to over-report the actual level of physical activity is well known(Lichman et al 1992; Varo et al 2003). This might be a limitation of this present study. Nevertheless, exact indexes were calculated for each participant providing the possibility of individual comparisons. The application of varying measures and protocols to estimate prevalence of physical activity/inactivity make results difficult to compare and interpret, since large differences in estimates are obtained(Sarkin et al, 2000; Martinez Gonzalez et al, 2005).

The definition of sedentary lifestyle used in this present study, included work-time physical activity, leisure-time physical activity, sedentary index (Number of hours spent sitting down per week) as well as ratio percentage sedentary lifestyle to percentage total activity. This method was adopted ahead of others because it is most recent and it was used in a validation study of the estimates of sedentary lifestyle obtained through a self-administered questionnaire and that from a tri-axial accelerometer(Martinez Gonzalez et al, 2005). (the accelerometer objectivily detects and measures the frequency and magnitude of acceleration in 1 minute intervals in 3 axes). From the above validation study, the questionnaire was recommended for use in epidemiological studies assessing sedentary lifestyle and physical activity(Martinez Gonzalez et al, 2005), which was then adopted for use in this present study. Most previous assessments are probably affected by gross misclassification because they used a single question with only two or three categories, such as 'inactive/active', 'not vigorous/vigorous, or low/moderate/high physical activity(Varo et al, 2003).

The result of this present study confirms the well-known relationship between a sedentary lifestyle and overweight-obesity(Jebb and Moore, 1999; Martinez-Gonzalez et al, 1999). Body mass index (BMI) was associated with an increased likelihood of being sedentary. Self reported weight and height were used in calculating BMI in this study. The tendency of respondents to over-report height and under-report weight exists but despite this tendency, self reported height and weight have been found to be sufficiently accurate for use in epidemiological studies and their errors do not induce significant effects on measures of association(Willet, 1998; Varo et al 2003). The association of smoking status of respondents with sedentary lifestyle was not statistically significant. However, smokers were more sedentary when compared with non-smokers. The close relationship between physical inactivity, smoking are other unhealthy lifestyle had been previously reported to result in increased mortality and shorter life expectancy(Ferrucci et al. 1999).

Considering marital status, the level of physical

activity among singles and married respondents were not significant. Only 2 individuals among the respondents were widowed and they were both sedentary which is similar to a study that showed higher levels of sedentary lifestyle among widowed and divorced individuals than in the single and married groups(Varo et al, 2003).

The longer the respondents had been in the banking industry, the more sedentary they are as those that had spent more than 15 years in the industry were more sedentary.

In the report of US surgeon General(Centre for Desease Control, 1996), a minimum of 30 minutes of moderate to vigorous activity is recommended for every adult on most or preferably, all days of the week so as to reduce the burden of sedentary lifestyle on our health care system. However, assessing the prevalence of sedentary lifestyle in our population and knowing the main characteristics of sedentary people is an initial step towards achieving this goal.

CONCLUSION

From this study we can conclude that, 30% of bankers in Ilorin metropolis were sedentary which constitute a potential threat to the banking industry and adequate intervention is required on how they (sedentary bankers), can adopt healthier lifestyles. Extrapolating this data to the Nigerian population at large may indicate a significant public health problem that requires urgent attention. However, further reseach is necessary to determine the actual level of sedentary lifestyle in the Nigeria population at large.

REFERENCES

- Adams M (2006). Sedentary lifestyle causes more deaths than smoking. New Target.com. Available on http://www. News Target.com/001547.html. Extracted on 23/07/06

- Ainsworth BE, Haskell WL, Leon AS (2000). Compendium of physical activity: an update of activity codes and MET intensities. *Med Sci Sports Exerc* **32:** S498-504.

- American Heart Association. Biostatistical Factsheet on Physical Inactivity. Available on http://www.americanheart.org

- Booth ML, Owen N, Bauman AE and Gore CJ (1996). Retest Reliability of Recall Measures of Leisure Time Physical Activity in Australian adults. *Int. J. of Epid*. Vol 25. No 1.

- Centers for Diseases Control and Prevention (CDC). Press Release: Lower Direct Medical Costs Associated with Physical Activity. Available on http://www.cdc.gov/nccdphp/dnpa/pr-cost.htm

- Centers for Diseases Control and Prevention (CDC). Press Release. Twin Epidemics of Diabetes and Obesity Continue to Threaten the Health of Americans. Available on http://www.edc.gov/nccdphp/dnpa/press/twinepid.htm

- Crespo CJ, Ainsworth BE, Keteyian SJ, Health GW, Smit E (1999). Prevalence of physical inactivity and its relation to social class in United State adults: results form the Third National Health and Nutrition Examination Survey, 1998 1994. *Med Sci Sports Exerc.* **31:**182 27.

- Egger G, Swinburn B (1997). An ecological approach to the obesity Pandemic. BMJ. 315

- Ferrucci L, Izmirlian G, Leveille S (1999). Smoking, physical activity, and active life expectancy. *Am J Epidemiol.* **149:** 645-58.

- Firdaus M, Mathews M, Wright J (2006). Health promotion in adults. The role of lifestyle in the metabolic syndrome. *Geriatrics* **61(2):** 18 25.

- Friedland RP, Mittelman MS (1998). Patients with Alzheimer's disease have reduced activities in midlife compared with healthy control-group members. Proceedings of the National Academy of Sciences.

- Health and Human Services (1996). Centers for Disease Control and Prevention.

- How many calories have you burned? USATODAY.com. available on http:www.usatoday.com/lifestyle/2006-06-06-calorie-chart x.htm.

- Hu. F (2003). Television watching and other sedentary behaviours in relation to risk of obesity and type 2 Diabetes Mellitus in women *JAMA* (289) **14:**1785-1791.

- Hudgens D. Tripple Threats. Centre for Disease Control and Prevention. 2004

- Jebb SA, Moore MS (1999). Contribution of a sedentary lifestyle and inactivity to the etiology of overweight and obesity: current evidence and research issues. *Med Sci Sport Exerc.* **31:**534 41.

- Kopelman P. G (2000). Obesity as a medical problem. *Nature.* **404:** 635.

- Lichtman SW, Pisarska K, Berman ER (1992). discrepancy between self-reported and actual caloric intake and exercise in obese subjects. *N Engl J Med* **327:**1893-98 (Abstract).

- Martinez Gonzalez MA, Martinez JA, Hu FB, Gibey MJ, Kearney J (1999). Physical Inactivity, sedentary lifestyle and obesity in the European Union. *Int. J. Obes*. **23:**1192 201.

- Martinez Gonzalez MA, Lopez-Fontana C, Martinez A and Sanchez-Villegas (2005). A Validation of the Spanish version of the physical activity questionnaire used in the Nurses' Health Study and the Health Professionals' follow-up study. *Public Health Nutrition.* **8(7):** 920 927.

- Nicolas G (2004). An Active Vision. In Australian Future Directions Forum.

- Nutrition and physical Activity. EUROPA. Public Health. Health Determinants. Lifestyle. Nutrition. Available on http:/

/ec._Europa.eu/health/phdeterminants/life-style/nutrition/nutrition-en.htm. Extracted on 15/07/2006

- Physical Activity and Health (1996): A Report of the Surgeon General. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention

- Sarkin JA, Nichols JF, Sallis JF, Calfas KJ (2000). Self-report measures and scoring protocols affect prevalence estimates of meeting physical activity guidelines. *Med Sci Sports Exerc.* **32:**149 56.

- Schmitzk, French SA, Jeffery RW (1997). Correlates in leisure time physical activity over 2 years: The healthy worker project. *Prev med.* **26:**570-79.

- United State Department of Health and Human Services. Healthy people (2000): National Health Promotion and Disease Prevention Objectives. DHHS Publication No PHS 91 50213. Washington, DC: U.S. Government Printing Office

- United State Department of Health and Human Services (USDHHS) (2001). Physical Activity and Good Nutrition: Essential Elements to present Chronic Diseases and Obesity. Washington, DC: USDHHS, CDC.

- United State Department of Health and Human Services USDHHS (2001). The Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity. Rockville, MD: USDHHS, Public Health Service, Office of the Surgeon General, available on http://www.surgeongeneral.gov/library

- Varo JJ, Martinex-Gonzalez MA, Trala-Esterez J, Kearney J, Gibney M, Martinez JA. (2003) Distribution and Determinants of Sedentary lifestyles in the European Union. *International Journal of Epidemol.* **32:**138 146.

- World Health Organisation (1998). Obesity, Preventing and managing the global epidemic: Report of the WHO Consultation on obesity. World Health Organization: Geneva,

- World Health Organisation (2002). Physical Inactivity. In WHO Annual Report.

- Willett W (1998). Anthropometric measures and body composition. In: Nutritional Epidemiology. 2nd Edn. New York: Oxford University Press, pp. 245 47.