IMPACT OF LIFESTYLE BEHAVIORS OF MORTALITY AND MORBIDITY

Lifestyle changes and Mortality

Leading causes of death are heart disease and cancer, both of which can be reduced through lifestyle modification: 46.7% of all deaths are preventable by changes in lifestyle.

Heart disease

1. Can be reduced and possibly eliminated through diet (Esselstyn 1995[1], Gould 1995[2] Ornisr 1998[3])
2. May be reduced through adequate water consumption (Chan 2002[4])
3. May be reduced through adequate vitamin D/sunshine by lowering blood pressure and reducing inflammation (Giovannucci 2008[5])
4. Can be reduced through exercise (Giada 2008[6])
5. Can be reduced through stress reduction (Williams 1999[7])
6. Is negatively correlated with social support (Williams 1999)
7. "While life-event stress and poor social supports [appear to be independent] risk factors, the exact mechanism by which they impact on heart disease is not as yet well elicited, although disturbance in mood [e.g., depression] would appear to be the most likely intervening variable." (Tennant[8])
8. May be associated with problems revolving around toxicity and infections, which can be reduced and/or eliminated through lifestyle (Hagele 2007[9]) (Matsuura 2008[10])

Cancer

1. Smoking is responsible for 30% of cancers and not smoking or stopping smoking dramatically cuts cancer risks (US DHHS[11])
2. Can be reduced by another 1/3 by proper exercise, diet and maintaining appropriate body weight. (American Cancer Society[12])
3. Some types may be reduced through appropriate sun exposure (Ali 2007[13])

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[1] Esselstyn CB Jr. et al, "A Strategy to Arrest and Reverse Coronary Artery Disease: A 5 -Year Longitudinal Study of a Single Physician's Practice,"*The Journal of Family Practice*, 1995 December; 41(6): 560-68.

[2] Gould KL, Ornish D, et al., "Changes in myocardial perfusion abnormalities by positron emission tomography after long-term, intense risk factor modification," JAMA. 1995 Sep 20;274(11):894-901.

[3] Ornish et al, "Intensive Lifestyle Changes for Reversal of Coronary Heart Disease," JAMA, Dec 16, 1998, Vol 280, No. 23

[4] Chan J, Knutsen SF, Blix GG, Lee JW, Fraser GE. Water, other fluids, and fatal coronary heart disease: the Adventist Health Study. Am J Epidemiol. 2002 May 1;155(9):827-33.

[5] Giovannucci E, Liu Y, Hollis BW, Rimm EB. 25-hydroxyvitamin D and risk of myocardial infarction in men: a prospective study. Arch Intern Med. 2008 Jun 9;168(11):1174-80.

[6] Giada F, Biffi A, Agostoni P, Anedda A, Belardinelli R, Carlon R, Carù B, D'Andrea L, Delise P, De Francesco A, Fattirolli F, Guglielmi R, Guiducci U, Pelliccia A, Penco M, Perticone F, Thiene G, Vona M, Zeppilli P. Exercise prescription for the prevention and treatment of cardiovascular diseases: part I. J Cardiovasc Med (Hagerstown). 2008 May;9(5):529-44.

[7] Williams R, Kiecolt-Glaser J, Legato MJ, Ornish D, Powell LH, Syme SL, Williams V. "The impact of emotions on cardiovascular health," J Gend Specif Med. 1999 Sep-Oct;2(5):52-8

[8] Tennant, "Life stress, social support and coronary heart disease," Aust N Z J Psychiatry.1999 Oct;33(5):636-41.

[9] Hagele TJ, Mazerik JN, Gregory A, Kaufman B, Magalang U, Kuppusamy ML, Marsh CB, Kuppusamy P, Parinandi NL.Mercury activates vascular endothelial cell phospholipase D through thiols and oxidative stress. Int J Toxicol. 2007 Jan-Feb;26(1):57-69.

[10] Matsuura E, Kobayashi K, Lopez LR. Preventing autoimmune and infection triggered atherosclerosis for an enduring healthful lifestyle. Autoimmun Rev. 2008 Jan;7(3):214-22.

[11] U.S. Department of Health and Human Services.(1989b). Reducing the Health Consequences of Smoking: 25 Years of Progress. A Report of the Surgeon General. (DHHS Publication No. CDC 89-8411) and (1990b). The health benefits of smoking cessation: A Report of the Surgeon General. (DHHS Publication No. CDC 90-8416). Washington, DC: USDHHS, PHS, CDC, Center for Chronic Disease Prevention and Health Promotion, Office of Smoking and Health.

[12] American Cancer Society: http://www.cancer.org/Cancer/CancerCauses/DietandPhysicalActivity/diet-and-physical-activity

[13] Ali MM, Vaidya V. Vitamin D and cancer. J Cancer Res Ther. 2007 Oct-Dec;3(4):225-30.

4. May be influenced by emotions, stress and social support (Gidron 2008[14])

Leading causes of preventable death in the U.S. (Mokdad 2004[15])

1. Tobacco use (smoking) resulted in 435,000 deaths or 18.1% of the total deaths.
2. Poor diet and physical inactivity lead to 365,000 deaths or 15.2% of the total deaths.
3. Alcohol consumption resulted in 85,000 deaths or 3.5% of the total deaths.
4. Microbial agents resulted in 75,000 deaths or 3.1% of the total deaths.
5. Toxic agents resulted in 55,000 deaths or 2.3% of the total deaths.
6. Motor vehicle crashes resulted in 43,000 deaths or 1.8% of the total deaths.
7. Incidents involving firearms resulted in 29,000 deaths or 1.2% of the total.
8. Sexual behaviors resulted in 20,000 deaths or 0.8% of the total.
9. Illicit use of drugs resulted in 17,000 deaths or 0.7% of the total deaths.

Additional selected studies

When middle age adults adopted four health targets, eat at least 5 fruits and/or vegetables a day, regular exercise (at least 2.5 hrs/wk walking), BMI between 18.5 and 29.9 and no smoking, the risk of all cause mortality over the ensuing four years dropped by 40%. (King 2007[16])

Lifestyle changes and Morbidity

Top ten causes of lost years of healthy life

In developed countries, the top ten causes of lost years of healthy life at ages 15-44 (WHO[17])

1. Major Depressive Disorder
2. Alcohol Use
3. Road Traffic Accidents
4. Schizophrenia
5. Self-Inflicted Injuries
6. Bipolar Disorder
7. Drug Use
8. Obsessive-Compulsive Disorders
9. Osteoarthritis
10. Violence.

Leading disabilities among all age groups (WHO):

Almost all the reasons for loss of healthy life years (especially between the ages of 15-44) are related to mental illness and addiction.

1. Unipolar major depression
2. Anemia
3. Falls
4. Alcohol use
5. Chronic obstructive pulmonary disorder

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[14] Gidro Y, Ronson A, "Psychosocial factors, biological mediators, and cancer prognosis: a new look at an old story," Current Opinion in Oncology: July 2008 - Volume 20 - Issue 4 - p 386-392

[15] Mokdad, Ali H., Marks, James S. and Stroup Donna F. et. al. Actual Causes of Death in the United States, 2000. JAMA. 2004;291:1238-1245.

[16] King DE, Mainous AG 3rd, Geesey ME. Turning back the clock: adopting a healthy lifestyle in middle age. Am J Med. 2007 Jul;120(7):598-603.

[17] World Health Organization, http://www.who.int/whr/2003/chapter1/en/index3.html

6. Bipolar disorder
7. Congenital anomalies
8. Osteoarthritis
9. Schizophrenia
10. Obsessive compulsive disorder.

Depression

1. Can be reduced through exercise (van Gool 2007[18])
2. Can be reduced through diet (Torres 2008[19]) (Orr 2008[20]) (Bourre 2006[21])
3. Can be reduced through social networks
4. May be reduced through sunshine/vitamin D (Hoogendijk 2008[22])
5. Can be reduced through mental/emotional strategies
6. 85% of individuals with depression responded to lifestyle treatment, including adequate sleep, sunshine, omega-3 fats, social networking and exercise. (Illardi 2006[23])

Additional selected studies

Exercise and/or alcohol consumption either predicted or protected against depressed mood. Adopting or maintaining healthy lifestyles might be a starting point in preventing or treating depressed mood over time. (van Gool 2007[16])

Findings show that a motivational approach is a powerful tool for achieving better blood pressure control and is an essential skill for all healthcare professionals. (Scala 2008[24])

Group-based lifestyle interventions over 6 years can prevent or delay diabetes for up to 14 years after the active intervention. (Li 2008[25])

"The present study was designed to examine the effects of lifestyle modification in 19 overweight children (age 8-17) who were placed on a high-fiber, low-fat diet in a 2-week residential program where food was provided ad libitum and daily exercise (2-2.5h) was performed. The results indicate amelioration of several traditional as well as novel factors associated with atherosclerosis after lifestyle modification, even in youth without documented disease." (Roberts 2007[26])

We examined the effects of lifestyle modification on key contributing factors to atherogenesis, including oxidative stress, inflammation and cell adhesion. Diabetic men (N=13) were placed on

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[18] van Gool CH, Kempen GI, Bosma H, van Boxtel MP, Jolles J, van Eijk JT. Associations between lifestyle and depressed mood: longitudinal results from the Maastricht Aging Study. Am J Public Health. 2007 May;97(5):887-94.

[19] Torres SJ, Nowson CA, Worsley A.Dietary electrolytes are related to mood. Br J Nutr. 2008 May 9:1-8.

[20] Orr SK, Bazinet RP. The emerging role of docosahexaenoic acid in neuroinflammation. Curr Opin Investig Drugs. 2008 Jul;9(7):735-43.

[21] Bourre JM. Effects of nutrients (in food) on the structure and function of the nervous system: update on dietary requirements for brain. Part 1: micronutrients… Part 2 : macronutrients. J Nutr Health Aging. 2006 Sep-Oct;10(5):377-99.

[22] Hoogendijk WJ, Lips P, Dik MG, Deeg DJ, Beekman AT, Penninx BW. Depression is associated with decreased 25-hydroxyvitamin D and increased parathyroid hormone levels in older adults. Arch Gen Psychiatry. 2008 May;65(5):508-12.

[23] Illardi S. http://reporting.journalism.ku.edu/fall06/bradford-noland/2006/10/lifestyle_changes_cure_depress.html

[24] Scala D, D'Avino M, Cozzolino S, Mancini A, Andria B, Caruso G, Tajana G, Caruso D. Promotion of behavioural change in people with hypertension: an intervention study. Pharm World Sci. 2008 Jun 27.

[25] Li G, Zhang P, Wang J, Gregg EW, Yang W, Gong Q, Li H, Li H, Jiang Y, An Y, Shuai Y, Zhang B, Zhang J, Thompson TJ, Gerzoff RB, Roglic G, Hu Y, Bennett PH. The long-term effect of lifestyle interventions to prevent diabetes in the China Da Qing Diabetes Prevention Study: a 20-year follow-up study. Lancet. 2008 May 24;371(9626):1783-9.

[26] Roberts CK, Chen AK, Barnard RJ. Effect of a short-term diet and exercise intervention in youth on atherosclerotic risk factors. Atherosclerosis. 2007 Mar;191(1):98-106. Epub 2006 Oct 19.

a high-fiber, low-fat diet in a 3-week residential program where food was provided ad libitum and daily aerobic exercise was performed. A combination of diet and exercise ameliorates oxidative stress, inflammation, and monocyte-endothelial interaction. Intensive lifestyle modification may improve novel CAD risk factors in men with diabetes. The protocol reversed diabetes and metabolic syndrome in **50% of participants**" (Roberts 2006[24, 27]).

We conducted a pilot study to examine changes in prostate gene expression in a unique population of men with low-risk prostate cancer who…participated in an intensive nutrition and lifestyle intervention… (We) detected 48 up-regulated and 453 down-regulated transcripts after the intervention. Pathway analysis identified significant modulation of biological processes that have critical roles in tumorigenesis, including protein metabolism and modification, intracellular protein traffic, and protein phosphorylation (all $P < 0.05$). Intensive nutrition and lifestyle changes may modulate gene expression in the prostate (Ornish 2008[28]). Moreover, "comprehensive lifestyle changes significantly increase telomerase activity and consequently telomere maintenance capacity in human immune-system cells. Given this finding and the pilot nature of this study, we report these increases in telomerase activity as a significant association rather than inferring causation" (Ornish 2008[29]).

"A population-based multi-factorial lifestyle intervention [for individuals at high risk of ischemic heart disease] promoted significant greater beneficial long-term dietary changes compared to the control group, especially the intake of vegetables and saturated fat was improved." (Toft, 2008[30])

[27] Roberts CK, Won D, Pruthi S, Lin SS, Barnard RJ. Effect of a diet and exercise intervention on oxidative stress, inflammation and monocyte adhesion in diabetic men. Diabetes Res Clin Pract. 2006 Sep;73(3):249-59

[28] Ornish, et al, "Changes in prostate gene expression in men undergoing an intensive nutrition and lifestyle intervention," Proc Natl Acad Sci U S A. 2008 June 17; 105(24): 8369–8374

[29] Ornish, et al, "Increased telomerase activity and comprehensive lifestyle changes: a pilot study," Lancet Oncol. 2008 Nov;9(11):1048-57.

[30] Toft U, Kristoffersen L, Ladelund S, Ovesen L, Lau C, Borch-Johnsen K, Pisinger C, Jørgensen T. The impact of a population-based multi-factorial lifestyle intervention on changes in long-term dietary habits The Inter99 study. Prev Med. 2008 Jun 4.