

Executive Summary

Expenditures for health care in the United States continue to rise and are estimated to reach \$1.66 trillion in 2003. Much of these costs can be attributed to the diagnosis and treatment of chronic diseases and conditions such as diabetes, obesity, cardiovascular disease and asthma.

- Approximately 129 million U.S. adults are overweight or obese which costs this Nation anywhere from \$69 billion to \$117 billion per year.
- In 2000, an estimated 17 million people (6.2 percent of the population) had diabetes, costing the U.S. approximately \$132 billion. People with diabetes lost more than 8 days per year from work, accounting for 14 million disability days.
- Heart disease and stroke are the first and third leading causes of death in the United States. In 2003 alone, 1.1 million Americans will have a heart attack. Cardiovascular diseases cost the Nation more than \$300 billion each year.
- Approximately 23 million adults and 9 million children have been diagnosed with asthma at some point within their lifetime, with costs near \$14 billion per year.

A much smaller amount is spent on preventing these conditions. There is accumulating evidence that much of the morbidity and mortality associated with these chronic diseases may be preventable.

For many Americans, individual behavior and lifestyle choices influence the development and course of these chronic conditions. Unhealthy behaviors, such as a poor diet, lack of physical activity and tobacco use are risk factors for many chronic conditions and diseases. A high calorie diet and sedentary lifestyle commonly result in excessive weight gain. Overweight and obesity are risk factors for a large number of chronic diseases, most significantly, type 2 diabetes, congestive heart failure, stroke, and hypertension. Encouraging individuals to adopt healthy habits and practices may

reduce the burden of chronic disease in communities throughout the United States.

Recently, public and private efforts and programs are increasingly designed to promote healthy behaviors. Employers are becoming more aware that overweight and obesity, lack of physical activity, and tobacco use are adversely affecting the health and productivity of their employees and ultimately, the businesses' bottom line. As a result, innovative employers are providing their employees with a variety of work-site-based health promotion and disease prevention programs. These programs have been shown to improve employee health, increase productivity and yield a significant return on investment for the employer. For example, a recent review of health promotion and disease management programs found a significant return on investment for these programs, with benefit-to-cost ratios, ranging from \$1.49 to \$4.91 (median of \$3.14) in benefits for every dollar spent on the program. Several major companies with award-winning cost-saving health promotion disease prevention programs are profiled in this report and include¹:

- Motorola's wellness programs which saves the company \$3.93 for every \$1 invested.
- Northeast Utilities WellAware Program which in its first 24 months reduced lifestyle and behavioral claims by \$1,400,000.
- Caterpillar's Healthy Balance program which is projected to result in long term savings of \$700 million by 2015.
- Johnson & Johnson's Health and Wellness Program which has produced average annual health care savings of \$224.66 per employee.

By changing the way they live, individual Americans could change their personal health status and the health landscape of the Nation dramatically.

In 2003, it is estimated that the U.S. will spend \$1.66 trillion on health care expenditures.² Health care spending is growing faster than the gross domestic product (GDP) and is projected to account for 17.7 percent of the GDP by 2012, up from 14.1 percent in 2001. A small number of chronic disorders—such as diabetes and cardiovascular diseases—account for the majority of deaths each year, and the medical care costs of people with chronic diseases account for more than 75 percent of the nation’s medical care costs.³ As the population of the United States ages substantially over the next several decades, the prevalence of chronic diseases, and their impact on health care costs, will likely increase.

Each individual’s health is shaped by many factors including medical care, social circumstances, and behavioral choices.⁴ Increasingly, there is clear evidence that the major chronic conditions that account for so much of the morbidity and mortality in the U.S., and the enormous direct and indirect costs associated with them, in large part are preventable—and that to a considerable degree they stem from, and are exacerbated by, individual behaviors. In particular, overweight and obesity, lack of physical activity, and smoking greatly increase the risk of developing the most serious chronic disorders. Most of the dollars spent on health care in the United States, however, are for the direct care of medical conditions, while only a very small portion is targeted on preventing those conditions.⁵ As Americans see health care expenditures continue to increase, it is important to focus on strategies that reduce the prevalence and cost of preventable diseases. This paper summarizes recent research findings on the prevalence, effects and costs of some of these key preventable conditions and highlights several award-winning business prevention programs that make common “cents.”⁶

“So many of our health problems can be avoided through diet, exercise and making sure we take care of ourselves. By promoting healthy lifestyles, we can improve the quality of life for all Americans, and reduce health care costs dramatically.” Tommy G. Thompson, Secretary, DHHS.

OVERWEIGHT AND OBESITY

Public health officials refer to obesity as an epidemic. The prevalence of overweight and obesity has increased dramatically in recent years, doubling since 1980,⁷ and now is seen by the CDC as one of the top threats to the health of the Nation. Weight gain is a direct function of an imbalance between the amount of calories consumed and the amount of calories expended by an individual. While there are some genetic determinants of obesity, much, if not most, of the recent increase in prevalence of obesity in the US population stems from changes in people’s diets and the level of their physical activity. To some extent, these dietary changes may reflect the greater availability of pre-packaged foods, low-cost-big-portion restaurant meals, and soft drinks, all of which may be high in sugar, calories, and/or fat. This increase in obesity has

occurred even though the public generally is more educated about what constitutes a healthy diet and ingredients in food products have become more clearly identified on labels.

On the other side of the equation, changing people's habits related to physical activity has proved to be a challenging task. Individuals who want to be more physically active, often find it difficult to do so because of demands, and other constraints associated with their work, family, and community. According to a recent study by the National Center for Health Statistics (NCHS), less than a third of US adults engage in regular leisure-time physical activity, and only about one-fifth of adults engage in a high level of overall physical activity.⁸ One study looked at adults who were *trying* to lose or not gain weight and found that less than 20 percent of the individuals were following recommendations about increasing physical activity and reducing calories.⁹ Also notable is a finding that only 42.8 percent of obese people who had routine checkups in the past months had been urged during those visits to lose weight.¹⁰

The current widely-used definition for overweight in adults is a body mass index (BMI) of 25 to 29.9, and for obesity in adults, a BMI of 30 or over. BMI is calculated solely on the basis of the height and weight of an individual; the calculation does not take into consideration the sex of the individual, the proportion of fat and muscle, or different body shapes. Waist circumference is also an independent predictor of risk factors and morbidity.¹¹ Overweight and obesity are defined differently for children and adolescents; they are considered to be overweight at or above the 95th percentile of the sex-specific BMI for age growth charts. Obesity in children is not specifically defined.

Motorola

Forty-five thousand U.S. employees, family members, retirees benefit from Motorola's wellness programs. Motorola invests \$6 million annually in wellness and work/life programs. Motorola's Long-term wellness program goals include: enhance education, prevention, and wellness strategy; demonstrate return on investment; advocate healthy culture. Support programs include disease management (asthma, cancer, depression, diabetes, infectious diseases); flu immunizations, cancer screenings, smoking cessation; health screenings and health risk appraisals; 24x7 nurse telephone line; health fairs; back care; on-site/external wellness centers; children's aerobics and nutrition; stress management, and shiftwork wellness.

Evidence of the program's cost-effectiveness include: for every \$1 invested in wellness benefits, \$3.93 saved; a 2.4% increase in annual aggregate health care costs for participating employees compared with 18% increase for non-participants; \$6.5 million annual savings in medical expenses for lifestyle-related diagnoses (e.g., obesity, hypertension, stress) compared with non-participants; and \$6.5 million annual savings in medical expenses for lifestyle-related diagnoses (e.g., obesity, hypertension, stress) compared with non-participants.

To contact Motorola for more detailed information, see: www.motorola.com.

Table 1: Body Mass Index for Adults

							25	26	27	28	29	30	31	32	33	34	35	36	37	38
HGT ^a	Body Weight (pounds)																			
	Normal						Overweight						Obese							
							119	124	129	134	138	143	148	153	158	162	167	172	177	181
							124	128	133	138	143	148	153	158	163	168	173	178	183	188
							128	133	138	143	148	153	158	163	168	174	179	184	189	194
							132	137	143	148	153	158	164	169	174	180	185	190	195	201
							136	142	147	153	158	164	169	175	180	186	191	196	202	207
							141	146	152	158	163	169	175	180	186	191	197	203	208	214
							145	151	157	163	169	174	180	186	192	197	204	209	215	221
							150	156	162	168	174	180	186	192	198	204	210	216	222	228
							155	161	167	173	179	186	192	198	204	210	216	223	229	235
							159	166	172	178	185	191	198	204	211	217	223	230	236	242
							164	171	177	184	190	197	203	210	216	223	230	236	243	249
							169	176	182	189	196	203	209	216	223	230	236	243	250	257
							174	181	188	195	202	209	216	222	229	236	243	250	257	264
							179	186	193	200	208	215	222	229	236	243	250	257	265	272
							184	191	199	206	213	221	228	235	242	250	258	265	272	279
							189	197	204	212	219	227	235	242	250	257	265	272	280	288
							194	202	210	218	225	233	241	249	256	264	272	280	287	295
							200	208	216	224	232	240	248	256	264	272	279	287	295	303
							205	213	221	230	238	246	254	263	271	279	287	295	304	312

Source: www.nhlbi.nih.gov/guidelines/obesity/bmi_tbl.htm

^a HGT refers to height in inches

As displayed above, an individual who is 5 feet 10 inches and weighs 195 pounds would have a BMI of 28 and would be considered overweight. An adult who is 5 feet 10 inches and weighs 250 pounds would have a BMI of 36 and would be considered obese.

The Prevalence of Overweight and Obesity

Recent estimates indicate that more than 129 million U.S. adults are considered to be overweight or obese.¹² Approximately two-thirds of the adult population are either overweight or obese, and slightly less than one-third are obese.¹³ [Note: While there have been lower estimates of the proportions of overweight and obese individuals recently, they were based on self-reported measures of height and weight and consequently are most likely under-estimates.¹⁴] Even though their specific prevalence estimates may differ somewhat, all studies in recent years have

shown dramatic *increases* in the prevalence of overweight and obesity, with one study determining that obesity rose from 22.9 percent to 30.5 percent between 1988 and 2000, while extreme obesity, defined as a BMI of 40 or over, increased from 2.9 percent to 4.7 percent over this period.¹⁵

Prevalence of Obesity by Age

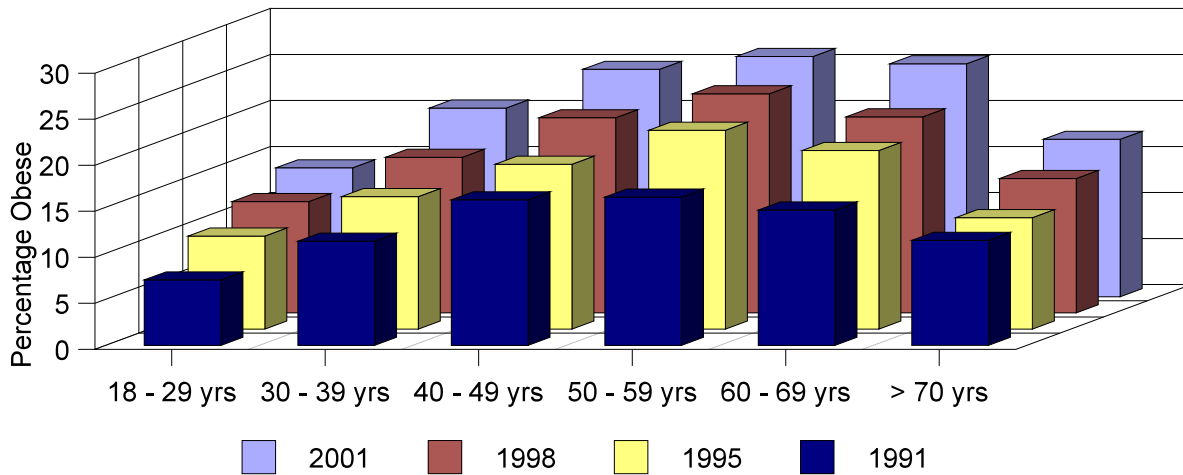


Figure 1 Source of data: 1991–2001 Prevalence of Obesity Among U.S. Adults, by Characteristics; Behavioral Risk Factor Surveillance System; Self-reported data.
 CDC website: www.cdc.gov/nccdphp/dnpa/obesity/trend/prev_char.htm

While the prevalence of overweight and obesity is high and increasing in all ages, in men and women, across different racial and ethnic groups, and across education and income levels, it does vary somewhat. Among adults, the age group with the smallest proportion of obese people is ages 18 through 29 years. However, this same age group has shown the largest percentage increase in obesity of all age groups, rising from 7.1 percent in 1991 to 14 percent in 2001—a 97 percent increase.^{16,17}

Dramatic increases in the prevalence of overweight and obesity also have occurred in children and adolescents of both sexes, with approximately 15.3 percent of children aged 6 to 11 years and 15.5 percent of adolescents aged 12 to 19 years considered to be overweight.¹⁸ The prevalence in adolescents has almost tripled in the past twenty years.¹⁹ More than 10 percent of children aged 2 through 5 years are overweight.²⁰ As is the case with adults, children and adolescents have become less physically active and are consuming more calories. They also have greater access to increasingly larger portions of foods high in calories, fat, and sugar. Research has shown that children will eat more when served large portions than they will when they serve themselves,²¹ and when adolescents eat on their own and not with their families, they are less likely to eat healthy food including fruits and vegetables.²²

The Effects of Overweight and Obesity

Overweight and obesity significantly affect the health, quality of life, and life expectancy of the US population. Excess weight is a risk factor for a large number of diseases and chronic conditions; it can contribute to the onset of these disorders and it can make them worse. Conversely, overweight individuals can reduce the risk for some chronic disorders by losing as little as 5 percent to 15 percent of their weight.²³ Obesity is believed to be associated with more chronic disorders and worse physical health-related quality of life than is smoking or problem

Overweight and obesity raise the risk for:

- **type 2 diabetes**
- **high blood pressure**
- **high cholesterol levels**
- **coronary heart disease**
- **congestive heart failure**
- **angina pectoris**
- **stroke**
- **asthma**
- **osteoarthritis**
- **musculoskeletal disorders**
- **gallbladder disease**
- **sleep apnea and respiratory problems**
- **gout**
- **bladder control problems**
- **poor female reproductive health**
 - **complications of pregnancy**
 - **menstrual irregularities**
 - **infertility**
 - **irregular ovulation**
- **cancers of the**
 - **uterus**
 - **breast**
 - **prostate**
 - **kidney**
 - **liver**
 - **pancreas**
 - **esophagus**
 - **colon and rectum**

drinking.²⁴ Estimates of the deaths of US adults due to causes related to obesity range from 280,000 to 325,000 each year.^{25,26,27} There is evidence that overweight and obesity raise the risk for a wide variety of medical conditions.

It is estimated that 47 million U.S. adults have a cluster of medical conditions, referred to as the “metabolic syndrome,” characterized by insulin resistance and the presence of obesity, abdominal fat, high blood sugar and triglycerides, high blood cholesterol, and high blood pressure.²⁸ Recent research also suggests that obesity increases the risk for progression to advanced stages of age-related macular degeneration, a disorder affecting a large proportion of the elderly.²⁹ Overweight and obesity also can reduce mobility and physical endurance, can lead to psychological disorders, and can result in social, academic, and job discrimination.^{30,31,32,33,34,35,36}

Estimates of the number of years of life lost as a result of overweight and obesity range as high as 20 years of life lost for certain age and racial/ethnic groups. For example, a 20-year-old white male could realize a 17 percent reduction in life expectancy due to obesity.³⁷ Years of life lost

Life Expectancy

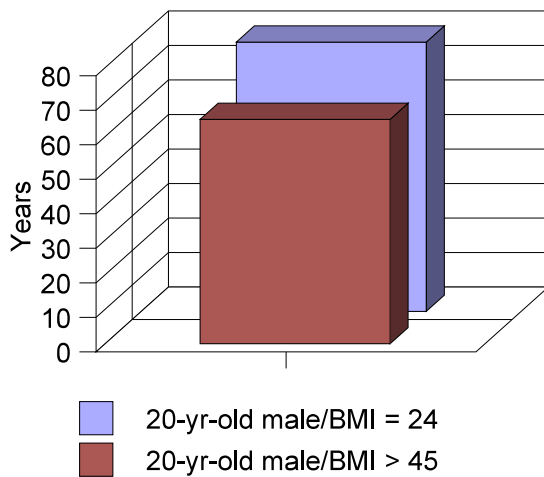


Figure 2. Source of data: Ref. 37.

is a simple measure of mortality, and does not reflect the full impact of obesity on morbidity and quality of life. It has been suggested that measuring the number of *healthy, disability-free* years of life lost might be more informative than focusing only on actual years lost.³⁸ Researchers have suggested that in terms of the physical quality of life, the effect of obesity can be the equivalent of aging as much as 30 years.³⁹

The Costs of Overweight and Obesity

Over the last several decades, researchers have provided many estimates of the costs of overweight and obesity. These estimates differ according to their scope (e.g., the individual person, a particular company or health plan, or the Nation as a whole), the timeliness of the data,

and the methods used to derive them, including how obesity is defined, how the prevalence of obesity is determined, what associated disorders are included, the degree to which these disorders and obesity are considered to be associated, how costs are defined, and the assumptions used in calculating those costs. As with other chronic conditions, estimates may focus on direct costs to the community, including the costs of health care services, physicians and other health care professionals, hospital admissions, and medicines; indirect costs, such as loss of productivity caused by absenteeism, disability, and premature death; or personal costs, such as reduced earnings, higher insurance costs, reduced quality of life, and out-of-pocket expenses for individuals.⁴⁰ These cost estimates are approximations, and it becomes even more difficult to estimate the costs of the effects of obesity over very long periods of time.

Health Care Utilization—Research has shown that as body mass increases, so too do health care utilization and costs.⁴¹ Obesity may account for as much as a 36% increase in costs for inpatient and ambulatory care for individuals—a greater increase than that attributed to aging 20 years, smoking, or problem drinking.⁴² In addition to using more physician and hospital services, obese individuals have high annual costs for medications, particularly those for diabetes and cardiovascular disease (CVD). One researcher estimated that obese individuals may pay as much as 77 percent more for medications compared to non-obese individuals.⁴³ Conversely, there is evidence that patients who lose weight reduce their use of these kinds of medications, and even modest sustained weight loss (a reduction of 10 percent in body weight) may reduce expected lifetime health care costs for major obesity-related diseases by \$2,200 to \$5,300, depending on age, gender, and initial BMI.^{44,45,46,47}

Personal Costs—Even the financial well-being of individuals may be associated with their weight. Researchers analyzed data from the University of Michigan Health and Retirement Study on more than 7,000 men and women between the ages of 57 and 67, and found that

heavier women had significantly smaller individual net worth, even after controlling for health, marital status and other demographic factors.⁴⁸ (The effects of obesity on the net worth of the men were smaller and not statistically significant.)

Significant Costs—Most estimates of total (direct and indirect combined) costs of overweight and obesity to the Nation range from \$69 billion per year to \$117 billion per year.^{49,50,51,52,53} This estimated \$117 billion includes \$61 billion for direct costs and \$56 billion for indirect costs. One study of the costs of treating major disorders relating to obesity estimated that obesity cost the Nation as much as \$102 billion for direct costs alone in 1999. (These amounts represent 27 percent to 31 percent of the total costs of treating these disorders, regardless of obesity.)⁵⁴ Included in this \$102 billion were:

- \$6.7 - \$7.4 billion for arthritis;
- \$25.5 - \$30.6 billion for heart disease;
- \$18.4 - \$20.5 billion for type 2 diabetes;
- \$8.3 - \$9.6 billion for hypertension; and
- \$6.1 - \$8.1 billion for stroke.

Contributing to the overall trends, annual hospital costs for obesity-related disorders in children ages 6 to 17 years increased from \$35 million to \$127 million between 1979 and 2000.⁵⁵

DaimlerChrysler

DaimlerChrysler is an international automotive and transportation company with over 95,000 employees throughout the United States. Its *National Wellness Program* began in 1985 and is a negotiated benefit between DaimlerChrysler Corporation and the International Union, UAW. All U.S. sites with 500+ employees have on-site contracted health and fitness business partners (over 100 FTEs) to administer program. The program has voluntary participation. Key components of the *National Wellness Program* includes: targeted education programs, based on identified health risks and interests; focused education programs which support employees throughout process of lifestyle change; smoking cessation, weight management, cholesterol management, and fitness activities; one-time workshops, multi-session classes, individual counseling, and self-directed modules; maintenance strategies which include ongoing awareness, interactive campaigns, group support with on-site services (e.g., fitness facilities, cafeteria/vending programs, walking routes);

Savings estimates revealed that participation in the *National Wellness Program* was associated with significant savings in dollars per employee from 1991 to 1995, with the highest dollar savings achieved in 1995 (\$16 per employee per month). Evaluation of the program showed that health risk assessment was associated with significant and substantial reductions in healthcare costs. Employees who completed one, two, or three health risk assessments on average had lower 1997 health care costs of \$112.89, \$134.22, and \$152.29, respectively. Employees who had completed at least one health risk assessment and participated in an additional wellness activity had an average cost savings of \$200.35 per year.

To contact DaimlerChrysler for more detailed information, see: www.Chrysler.com.

Per Capita Medicare Spending, 1996-1998

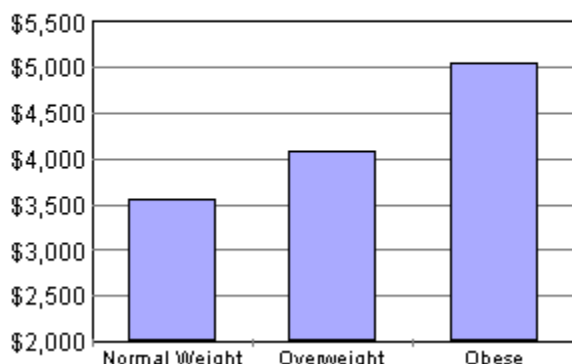


Figure 3. Source of data: Ref. 58.

annual Medicare expenditures than non-obese people. For the period between 1996 and 1998, a 15 percent increase in annual per capita Medicare spending is attributable to being overweight, and a 37 percent increase is attributed to being obese.⁵⁸

Increasing U.S. Health Care

Costs—The direct health care costs of overweight and obesity represent a significant portion of *total* annual US health care expenditures, with estimates ranging from 4.3 percent⁵⁶ of total expenditures to as much as 9.1 percent.⁵⁷ Moreover Medicare and Medicaid may finance as much as half of these costs, with Medicare covering the larger share, due to the more substantial medical problems associated with obesity in the elderly. Researchers have found that obese people who reach 65 years of age have much larger

Impact on Businesses—Employers and businesses bear a sizable portion of costs associated with treating obesity-related conditions, primarily in terms of lost productivity and the increased cost of health and disability insurance. Studies of overweight and obese employees have shown that obese employees take more sick leave than non-obese employees and are twice as likely to have high-level absenteeism (seven or more health-related absences during the last six months).^{59,60} In addition, another study found a reduction in the use of sick leave and disability pension by obese employees in the second and third years following surgical treatment of their obesity.⁶¹ An analysis of business costs in the late 1980s through the mid 1990s found that in 1994, due to conditions associated with obesity:

- employees lost 39.3 million workdays (a 50 percent increase since 1988);
- made 62.7 million visits to physician offices (a 88 percent increase);
- had 239 million restricted activity days (a 36 percent increase), and
- 89.5 bed-days (a 28 percent increase)^{62,63}

The costs to US businesses of obesity-related health problems in 1994 added up to almost \$13 billion, with approximately \$8 billion of this paying for health insurance expenditures, \$2.4 billion for sick leave, \$1.8 billion for life insurance, and close to \$1 billion for disability insurance.⁶⁴

DIABETES

Diabetes is a group of diseases in which blood glucose (sugar) levels are elevated either because of failure to make adequate amounts of the hormone insulin or failure of cells to respond to

insulin. Diabetes results from interaction between inherited, autoimmune, and environmental factors.

There are two principal forms of diabetes that account for the majority of cases.

- **Type 1 diabetes**—often called “insulin-dependent diabetes mellitus” or juvenile-onset diabetes, develops when the body’s immune system destroys pancreatic beta cells, the cells in the body that make the hormone insulin that regulates blood glucose. Thus the pancreas can no longer produce insulin. This form of diabetes usually strikes children and young adults, and requires them to take several insulin injections a day to survive. Type 1 diabetes may account for 5 to 10 percent of all diagnosed cases of diabetes.⁶⁵
- **Type 2 diabetes**—is sometimes termed “adult onset diabetes” or “non-insulin dependent diabetes mellitus,” even though some affected individuals require insulin for control of the disease. Type 2 diabetes usually begins as insulin resistance, a disorder in which cells do not use insulin properly. As it progresses, the pancreas gradually loses its ability to produce insulin. Type 2 diabetes often appears after age 40, although it is now being diagnosed increasingly in children and adolescents. This form of diabetes accounts for 90 to 95 percent of all diagnosed cases of diabetes.⁶⁶

In addition, some women develop diabetes during pregnancy. This form of diabetes is called gestational diabetes, and affects 2 to 5 percent of all pregnancies. After pregnancy, 5 to 10 percent of women with gestational diabetes are found to have type 2 diabetes and women who have had gestational diabetes are at increased risk for developing type 2 diabetes in the next 5 to 10 years⁶⁷. Other less common types of diabetes result from specific genetic conditions, surgery, drugs, malnutrition, infections and other illnesses. Taken together, these causes account for 1 to 5 percent of all diagnosed cases of diabetes.

The Prevalence of Diabetes

Diabetes affects a substantial proportion of the U.S. adult population. In 2000, it was estimated that 17 million people—6.2 percent of the population had diabetes⁶⁸. This included 11.1 million people with diagnosed diabetes and 5.9 million people whose diabetes was undiagnosed. Of this number 7.8 million were men and 9.1 million were women. One million new cases of diabetes in people aged 20 years or older are diagnosed each year, and diabetes was the 6th leading cause of death in 1999.

While increases in the prevalence of diabetes have been documented in the past, more research is needed to determine the extent to which the prevalence of diabetes is changing, and the factors that are contributing to such changes. Most research suggests that overweight and obesity, and lack of physical activity, are associated with an increased risk for diabetes. However, it is possible that an association between recent increases in the prevalence of obesity and overweight and the prevalence of diabetes may not be immediately apparent but only observed over the long term.⁶⁹

Risk factors for Type 1 diabetes include autoimmune, genetic and environmental factors. Type 2 diabetes is associated with older age, obesity, family history of diabetes, prior history of gestational diabetes, impaired glucose tolerance, physical inactivity and race/ethnicity. African Americans, Hispanic/Latino Americans, American Indians and some Asian Pacific Islanders are at particularly high risk for Type 2 diabetes.⁷⁰

Increasingly, health care providers are finding more and more children and teens with type 2 diabetes, which is usually found in people over age 40. Although there are no national data, it is estimated that type 2 diabetes represents 8 to 45 percent of all patients with diabetes currently diagnosed in large U.S. pediatric centers. However, this may represent an underestimate and the incidence may likely be rising. African American, Hispanic/Latino American, and American Indian children who are obese and who have a family history of type 2 diabetes are at especially high risk.⁷¹ The CDC has estimated that one in three persons born in the U.S. in 2000 have a life-time risk of developing diabetes, unless significant changes occur in patterns of eating and exercising, and that 39 million people in the U.S. could have diabetes by 2050.

The Effects of Diabetes

Untreated or poorly treated diabetes can result in death or significant disability, including heart disease and stroke, kidney failure, blindness and lower limb amputations. More than 60 percent of non-traumatic lower-limb amputations occur among diabetics. Diabetes is the leading cause of new cases of blindness for adults aged 20-74, and is the leading cause of treated end-stage renal disease accounting for 43 percent of new cases. Other complications of diabetes include: high blood pressure, nervous system damage, dental disease, complications of pregnancy, acute life threatening events caused by biochemical imbalances, and susceptibility to other illnesses

Union Pacific

Union Pacific's vision is to be the healthiest company in America. Over 27,000 employees have participated in Union Pacific's Health Risk Assessment and participated in follow-up programs when appropriate. Union Pacific's long-term wellness program goals include: continue decrease in lifestyle related health care claims, enhance employee productivity, improve employer relations and decrease injuries and absenteeism.

The Health Track Program includes a Health Risk Assessment, follow-up intervention programs which are stage based, a Smoking Cessation Program called Butt Out and Breathe which includes a pharmacological assistance benefit, over 500 contracted Fitness Facilities across our system, an incentive program tied to the Company's incentive program and research study participation. Health Screenings, an occupational health nurse network in our major repair facilities and support of local management and Executive Staff of the Company facilitate the program.

Evidence of the program's cost-effectiveness include: over a 10% decrease in Health Care Costs due to Lifestyle Related Factors equating to a \$53.6 million dollar difference in 2001; smoking prevalence at Union Pacific has dropped from 40% to 28% in the last 10 years; and Union Pacific has won a number of national awards in the last several years for its health programs.

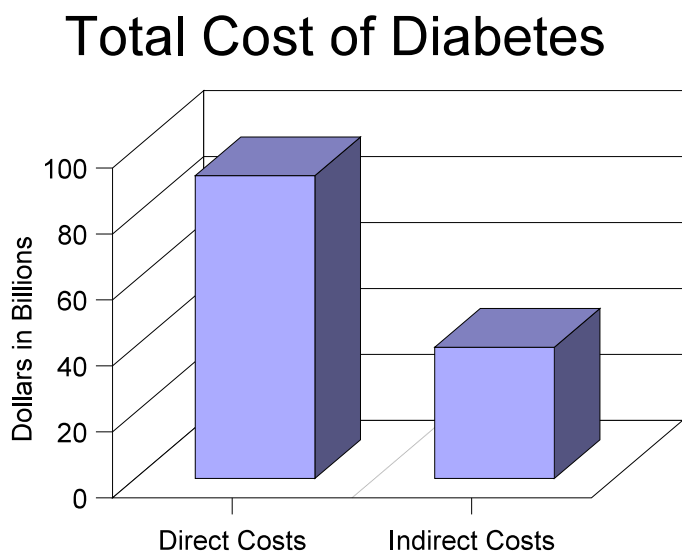
To contact Union Pacific for more detailed information, see: www.up.com.

and worse prognosis over the course of these illnesses.⁷²

The Costs of Diabetes

A comparison of national cost estimates over time is difficult because of changes in the U.S. population and changes in the cost of health care services. The American Diabetes Association (ADA) estimated the national cost of diabetes in 1997 to be \$98 billion⁷³. The ADA has updated this estimate for 2002 to \$132 billion. This includes \$91.8 billion in direct medical expenditures (\$23.2 billion for diabetes care, \$24.6 billion for chronic complications attributable to diabetes, and \$44.1 billion for excess prevalence of general medical conditions.), with inpatient days, nursing home care and office visits making up the biggest expenditure categories by service setting. Indirect expenditures totaled \$39.8 billion and resulted from lost workdays, restricted activity days, mortality and permanent disability due to diabetes. CDC research has shown that people with diabetes lost 8.3 days per year from work, accounting for 14 million disability days, compared to 1.7 days for people without diabetes.⁷⁴ The ADA study examined total U.S. expenditures for major health care services, including inpatient, hospital outpatient, emergency, physician office, nursing home, home health and hospice care, and determined that these services cost a total of \$865 billion, and that \$160 billion or 18.5 percent of this total was incurred by people with diabetes. Per capita medical expenditures totaled \$13,243 for people with diabetes and \$2,560 for people without diabetes. When differences in age, sex, and race/ethnicity are adjusted for, people with diabetes had medical expenditures that were 2.4 times higher than expenditures that would have been incurred by the same group if they had not had diabetes.⁷⁵

There are no known methods for preventing type 1 diabetes. Research studies have found that lifestyle changes, such as altering diet, increasing moderate physical activity and lowering body weight by 5 to 7 percent, can prevent or delay the onset of type 2 diabetes.⁷⁶ Studies have also shown that medications have been successful in preventing diabetes in some population groups.



Once diagnosed, effective management of diabetes is key to preventing its complications. Controlling glucose, blood pressure and blood lipids reduce health risks. Preventive care can also reduce eye disease, reduce the risk of amputation and allow for the early detection and treatment of diabetic-related kidney disease. The American Diabetes Association reports that people with diabetes who control their disease by keeping their blood sugar down cost employers only \$24 a month, compared

Figure 4. Source of data: Ref. 73.

with the \$115 a month for people with diabetes who do not control their blood sugar.⁷⁷

Numerous studies have found that disease management programs have substantial benefits for people with diabetes, in terms of improving health outcomes and the quality of life⁷⁸. Particular interventions are associated with improved outcomes. Screening and timely intervention with laser photocoagulation reduces the incidence of severe vision loss as a consequence of diabetes and has been called cost-effective. According to a 1996 study, the currently recommended screening and treatment for eye disease in persons with diabetes cost \$1,757 per life-year of sight saved or \$3,190 per quality-adjusted life year gained (1990 dollars).⁷⁹ Similarly, yearly foot exams for high risk patients, which have increased dramatically in the past decade, reduce the risk of lower extremity amputation⁸⁰.

Health plans and providers are increasingly looking to disease management programs as a means for improving care and controlling costs. The American Association of Health Plans reports that virtually all health plans now offer at least one disease management program.⁸¹ Often these programs focus on diabetes. For example, Cor Solutions Medical, a privately held disease management contractor, works with diabetics, primarily over the phone, answering questions, reminding them of routine medical appointments and helping patients manage their disease. Its CEO states that its approach cuts the cost for caring for a diabetic by up to 20 percent per month, while improving rates of diagnostic testing, and annual foot exams.

Caterpillar

The goals of Caterpillar's Healthy Balance Program include: motivate positive change in modifiable health risk behaviors; reduce health risks, improve long-term health status; promote self-efficacy and informed decision-making; reduce healthcare and related costs; achieve exceptional participation via strong incentives. The program has a high participation and retention rate: 93% of incented employees and 62% of spouses. Key features of the Healthy Balance Program include: strong incentives; top-down management support; spouses included; continuous evaluation/improvement. Components of the program include: both demand reduction and behavior change components; low-cost confidential health assessment; personalized health education messages; stratification: low/high risk, periodic assessment based on risk; individualized interventions, targeted to health risks and readiness-to-change; intensive high risk/chronic condition interventions, including disease management phone counseling; serial tracking, ongoing monitoring/adjustment of interventions; coordination with related interventions (on-site classes, referral to community programs, etc.); self-care book and quarterly newsletters; toll-free health information line and audio library; internet website with links to sites with scientifically validated information; and ongoing evaluation of claims, health assessments; communication of summary results to employees.

Caterpillar predicts that the Healthy Balance Program will lead to long term savings of \$700 million by 2015. To date, the program has reduced the aggregate health risk score by 6% for the "low-risk" population and 14% for "high-risk" subjects. This decline in aggregate risk represents improvement in major risk factors: physical activity, cigarette smoking, stress, fat and fiber consumption, etc. Participants who completed the high-risk program reduced their doctor office visits by 17%, and hospital days by 28%.

To contact Caterpillar for more detailed information, see: www.caterpillar.com.

Despite growing evidence that diabetes disease management programs result in improved health outcomes, opportunities exist to improve the effectiveness of these interventions. A disease

management program typically is a bundle of services, designed to improve the care delivered and compliance with recommended treatments and behaviors. Because of the multi-pronged approach, it is challenging to disentangle the value of each component part of a disease management program.⁸²

In addition, measurement issues are also challenging since diabetes is a disease whose natural progression is to worsen over time. That said, one study suggests a payback on investment within 33 months but calls for further study prior to major implementation.⁸³ Other studies are more cautious, although they find substantial benefits in terms of health outcomes over time. A 2003 study examined the business case for diabetes management programs in two managed care plans and quantified the health benefits for participants in a diabetes disease management program over 10 years at \$31,000 per patient in terms of length and quality of life.⁸⁴

Cardiovascular Disease

Cardiovascular disease (CVD) is predominantly caused by atherosclerosis—a hardening of the arteries—due to a thickening of the lining of the arteries. Atherosclerosis results in inadequate blood flow to particular tissues in the body, causing poor function, damage, or death of those tissues. In heart disease and stroke, the principal components of CVD, atherosclerosis affects the arteries of the heart and brain, respectively. CVD accounts for 40 percent of the mortality in the United States, killing about 950,000 Americans annually.⁸⁵ Taken as a whole, CVD is the cause of more deaths than the next five causes of death combined.^{86,87}

The Prevalence of Cardiovascular Disease

Heart disease and stroke are the first and third leading causes of death in the United States, respectively, in both men and women. The 2000 age-adjusted death rate from CVD among the general population was 343.1 per 100,000 people.⁸⁸

Coronary heart disease (CHD), caused by blockage of the arteries supplying the heart, is the single leading cause of death within the array of cardiovascular diseases. This year, an estimated 1.1 million Americans will have a new or recurrent coronary attack and more than 45 percent of the people experiencing these attacks will die of them. The age-adjusted 2000 death rate from coronary heart disease was about 186.9 per 100,000 for the total population.⁸⁹ Recent studies have demonstrated that the number of sudden deaths from heart disease among people aged 15-34 have increased from 2,719 in 1989 to 3,000 in 1996.⁹⁰

It is commonly believed that CVD primarily affects men and older people. However, research shows that more than half of all CVD deaths each year occur among women.

A consideration of mortality alone understates the burden of CVD. About 61 million Americans (almost one-fourth of the general population) live with some form of CVD, including coronary heart disease, stroke, high blood pressure, congestive heart failure, congenital heart defects, and other diseases of the circulatory system.⁹¹ Prevalence rates for CVD vary by race and ethnicity.⁹²

Heart disease also results in significant disability among working adults. Stroke is a leading cause of serious, long-term disability that accounts for more than half of all patients hospitalized

for a neurological disease. Of the 4.5 million Americans who have had a stroke, 1 million have been impaired by some form of long-term disability. Almost 6 million hospitalizations each year are due to CVD.⁹³

Deaths from Cardiovascular Disease 1999

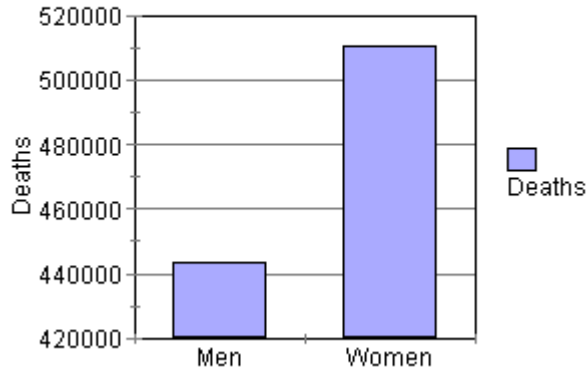


Figure 5. Source: CDC Compressed Mortality Data

Risk Factors for Cardiovascular Disease

As discussed earlier, untreated or poorly treated diabetes can result in cardiovascular disease. In addition, the CDC has identified five key risk factors for CVD: tobacco use, high cholesterol levels, lack of physical activity, poor nutrition, and high blood pressure.

- High blood pressure: About 90 percent of middle-aged Americans will develop high blood pressure in their lifetime, and nearly 70 percent of people with high blood pressure do not have it under control. Of the estimated 50 million Americans with high blood pressure, 31.6 percent are unaware of their condition.⁹⁴
- High cholesterol: About 40.6 million Americans have cholesterol levels of 240 mg/dL or above, which is considered high risk. Meanwhile, a 10 percent decrease in cholesterol levels may result in an estimated 30 percent reduction in the incidence of coronary heart disease.⁹⁵
- Tobacco use: About 1 in 5 deaths from CVD are attributable to smoking. 2000 age-adjusted prevalence rates for Americans 18 and older show that 27.1 percent of men and 22.2 percent of women are smokers. The World Health Organization estimates that one year after quitting, the risk of coronary heart disease decreases by 50 percent, and within 15 years, the relative risk of dying from CHD for an ex-smoker approaches that of a lifetime nonsmoker. The risk of death from coronary heart disease increases by up to 30 percent among those exposed to *environmental* tobacco smoke at home or at work.⁹⁶
- Poor diet leading to overweight and obesity: Using BMI definitions, more than 129 million adults are overweight or obese and 61 million are in the obese category of BMI.⁹⁷ In addition, an estimated 5 million children are considered overweight.⁹⁸
- Physical inactivity: The relative risk of coronary heart disease associated with physical inactivity ranges from 1.5 to 2.4, an increase in risk comparable to that observed for high blood cholesterol, high blood pressure, or smoking.⁹⁹

The Costs of Cardiovascular Disease

The costs of CVD have steadily increased past the \$300 billion dollar mark over the past three years. The first comprehensive economic analysis based on 2000 Census data, performed by the

National Heart, Lung, and Blood Institute (NHLBI) and the American Heart Association (AHA), estimated the total cost of the disease to be \$298.2 billion for the year 2001.¹⁰⁰ Subsequent updates to this analysis gave an estimated total cost of \$329.2 billion for 2002¹⁰¹ and \$351.8 billion for 2003.¹⁰²

Total Cost of Cardiovascular Disease

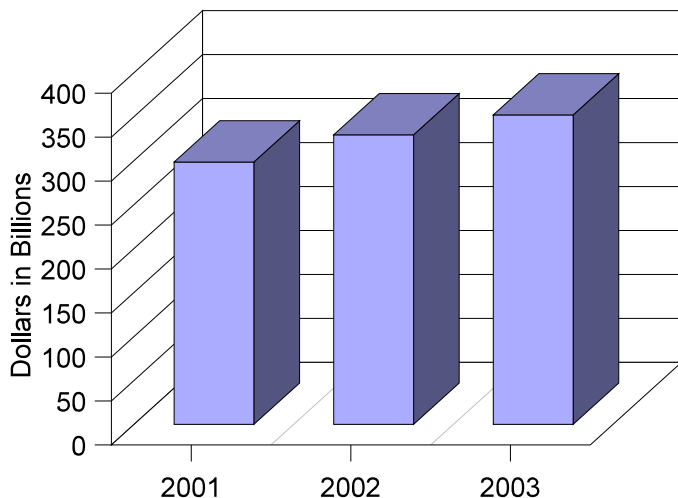


Figure 6. Source of data: Refs. 100, 101, 102.

The NHLBI/AHA studies of CVD evaluated both direct costs (physician services, hospital and nursing home services, medications, home healthcare, and other durables) and indirect costs of lost productivity resulting from morbidity and mortality (days of work lost due to absence from work or premature death). For the year 2003, these cost categories totaled \$209.3 billion and \$142.5 billion, respectively. Direct medical care costs covered approximately 66 million physician office visits and 7 million outpatient department visits and over 4 million emergency department visits.¹⁰³ CVD ranks highest among all disease categories in hospital discharges.

Given the age effects of CVD, it poses a substantial economic burden on Medicare: in 1999, \$26.3 billion in payments were made to hospitals for Medicare beneficiaries' expenses due to cardiovascular problems. That was an average of \$7,883 per discharge.¹⁰⁴

The indirect costs of CVD are also substantial; most of these costs are due to lost productivity and are borne by employers. According to the CDC, if all forms of major CVD were eliminated, life expectancy would rise by almost 7 years. The same study indicates that the probability at birth of dying from major CVD is 47 percent. While death rates from CVD have declined over the past ten years, actual (absolute) deaths have increased over the same period of time.¹⁰⁵ Great strides have been made in the treatment of CVD, but treatment can only be part of the solution. An estimated 3 million Americans ages 35-64 who are currently free of coronary heart disease will develop the disease in the next ten years in the absence of intervention to reduce risk factors.¹⁰⁶

ASTHMA

Asthma is an obstructive lung disease caused by an inflammatory reaction and hyperreactivity of the airways to various triggers. Inflammation and bronchospasm of the airways restricts airflow into and out of the lungs. Asthma is characterized by periodic attacks of wheezing, shortness of breath, chest tightness, and coughing. In sensitive individuals, asthma symptoms can be triggered by inhaled allergens (allergy triggers), such as pet dander, dust mites, cockroach allergens, molds, or pollens. Symptoms of asthma can also be triggered by respiratory

Northeast Utilities

The goal of Northeast Utilities' WellAware program is to improve the health and wellbeing of employees and families through participation in targeted programs and services that address lifestyle-related health risks; and to reduce health care costs. Northeast Utilities found that almost 17% of its health care claims were attributable to modifiable, lifestyle behaviors. Key features of the program include: financial incentives for participation, employees and spouses eligible, strong senior management support, and ongoing evaluation and re-design.

The components of the program include: a health risk assessment which is the "ticket" into program, a telephonic high risk intervention, a secondary coronary artery disease management program, telephonic smoking cessation counseling and rebate for purchasing smoking cessation aids, integration with internal departments (health units, safety, EAP) and external partners (health plans, local hospitals, etc.), accessible via on-site programs, communication of community programs, guidebooks, videos, and telephonic intervention programs, Internet site allows access at work and home, and a toll free hotline for materials and questions.

In its first 24 months, Northeast Utilities documented a 1.6 return on investment from the WellAware program, including a \$1,400,000 reduction in lifestyle and behavioral claims and flat per capita costs for health care. Participants in the program demonstrated a reduction in health risk factors including a 31% decrease in smoking, a 29% decrease in lack of exercise, a 16% decrease in mental health risk, a 11% decrease in cholesterol risk, an 10% improvement in eating habits, and a 5% decrease in stress.

To contact Northeast Utilities for more detailed information, see: www.nu.com.

Pfizer

Pfizer employs 35,000 in the U.S., including Puerto Rico. The goals of Pfizer's *Employee Health and Wellness* strategy are to assist Pfizer to attract and retain best people; increase productivity; enhance employee and dependent health by primary, secondary, tertiary prevention; effectively manage health care resources; and help employees and dependents be informed and efficient health care consumers. Pfizer's *Employee Health and Wellness* strategy is a multi-dimensional, highly integrated approach with on-site administration and access. It includes: health risk assessment/identification initiatives, wellness and health education initiatives, disease management initiatives, medical clinics, fitness centers, on-site physical therapy, a ergonomics program, managed disability program, welfare benefits/health care delivery evaluation/enhancement initiatives, and an Employee Assistance Program.

In Pfizer's New York location, 85% of employees participated in one or more programs, and 80% of employees used on-site health services. Over 41% (1,850 members) of the total population participates in the fitness center at this site, with waiting list of 250 for enrollment. The Premier Employer Program is promoted via communication and education to employees delivered via a variety of media. Print materials, on-site communication, and intranet/internet access to information on the health management program ensures that employees have access to information regarding program initiatives. These media also provide up-to-date information on health risk reduction. New initiatives are added as needs are reassessed and program effectiveness evaluated. Pfizer's research staff measures the impact of initiatives and analyzes the cost-effectiveness and return on investment.

Pfizer's ergonomics program demonstrated a return on investment (ROI) of 3.51 to 1 and a net savings of \$1,153,206 for participants. The physical therapy program generated an average ROI of 3.61 to 1 (2001), and produced over \$579,000 in savings related to employee lost time avoided by on-site access to services. In 1998, the ROI for the fitness centers program was 4.29 to 1.

To contact Pfizer for more detailed information, see: www.Pfizer.com.

infections, exercise, cold air, tobacco smoke and other pollutants, stress, food, or drug allergies. Currently, asthma is the 6th-ranking chronic condition among the general American population in terms of prevalence and the leading serious chronic illness of children in the U.S.

The Prevalence of Asthma

Three metrics are used to describe asthma prevalence:

- Lifetime prevalence, which indicates how many individuals in the population have been diagnosed with asthma at least once in his or her lifetime
- Current prevalence, which indicates how many individuals in the population are currently diagnosed with asthma in a given year
- Attack prevalence, which indicates how many individuals in the population have had an asthma attack in a given year

The most recent data available, from 2001, show a lifetime prevalence rate of 113.4 per 1000 persons for the overall United States population. Approximately 22.2 - 23.2 million adults and 9.1 million children have been diagnosed with asthma at some point within their lifetime, giving a composite estimate of about 31.3 - 32.3 million Americans who have had or currently have asthma. Recently, children (ages 5-17) have displayed the highest lifetime prevalence rates; in 2001, the lifetime prevalence rate was 144.2 per 1000 children. Females have a 10 percent higher lifetime prevalence rate than males.¹⁰⁷

The current prevalence rate for 2001—the ratio of the U.S. population who actually had asthma during that year—was estimated to be 73.4 per 1000 persons, or about 20.3 million Americans. The highest current prevalence was observed in those 5-17 years of age at a rate of 98.1 per 1000 persons. The current prevalence rate in females, at 82.6 per 1000 persons, was 30 percent higher than that for males, at 63.6 per 1000 persons. This pattern was reversed in children: the current asthma prevalence rate for boys was 30 percent higher than for girls (ages 0-17).¹⁰⁸

Prevalence of Asthma By Gender, 2001	
Age/Gender Category	Asthma Prevalence Rate, 2001 (per 1000 population)
Girls, ages 0-17	74.4
Boys, ages 0-17	99.0
All Females	82.6
All Males	63.6
Overall	73.4

Source: *Trends in Asthma Morbidity and Mortality*. American Lung Association Epidemiology & Statistics Unit. March 2003.

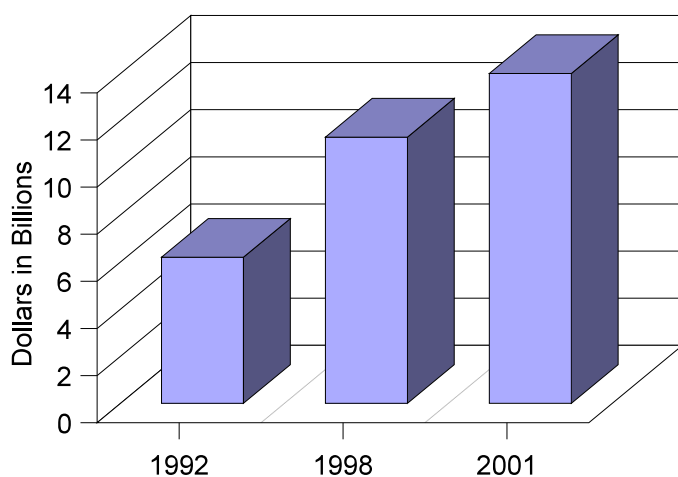
Within the population suffering from asthma in 2001, approximately 12 million Americans had an asthma attack; of this number, about 4 million were children under 18. The overall asthma attack rate in the general population was 43.4 per 1000 persons in 2001.¹⁰⁹

Reliable statistical data on asthma prevalence are available from the year 1980 forward. From 1980 to 1996, the number of Americans afflicted with asthma doubled to 15 million, with children under five years of age experiencing the highest rate of increase.¹¹⁰ Children (ages 5-17) have had the highest prevalence rates between 1997 and 2001, demonstrating that the asthma epidemic will continue to be a significant health problem for future generations.¹¹¹

The Costs of Asthma

The costs of asthma have increased in step with the rise in asthma prevalence. The first comprehensive economic evaluation of asthma in 1992 estimated the total cost of the disease to be \$6.2 billion per year.¹¹² A study on the national costs of asthma for the year 1997 estimated those costs at \$8 billion-\$11 billion.¹¹³

Total Cost of Asthma



The National Heart, Lung, and Blood Institute within the National Institutes of Health estimated that the annual costs of asthma were \$11.3 billion per year in 1998. The two most recent analyses of the economic impact of asthma, commissioned by the American Lung Association (ALA) to study asthma costs in 2000 and 2001, cited annual estimates of \$12.7 billion and \$14 billion, respectively.¹¹⁴

The ALA study of asthma costs in 2001 evaluated both direct health care costs of asthma (hospital care, physicians' services, and medications) and indirect costs of lost productivity (school days lost, work days lost, and lifetime

Figure 7. Source of data: NIH/NHLB; Refs. 112, 114.

earnings lost due to mortality). In 2002 dollars, these cost categories totaled \$9.4 billion and \$4.6 billion, respectively. Direct medical care costs covered approximately 465,000 hospitalizations, 1 million hospital outpatient department visits, 1.8 million emergency room visits, and 10.4 million physician office visits due to asthma each year.¹¹⁵ About 1 in 6 pediatric emergency room visits is caused by an asthma attack.^{116 117} Indirect costs encompass about 14 million lost school days, 14.5 million lost work days, and the productivity loss of the approximately 5,000 people who die from asthma each year. Asthma is the most common reason for school absence—this specific indirect cost alone results in an estimated \$1 billion annual productivity loss.¹¹⁸

The financial burden of asthma is borne heavily by patients and their families. Out-of-pocket expenses for asthma are estimated at roughly 25 percent of total medical costs compared to the average of 10 percent for medical expenses for all illnesses.¹¹⁹ The average family in the U.S. spends between 5.5 percent and 14.5 percent of its total income on treating an asthmatic child.¹²⁰ However, employers are not impervious to this cost burden. Annual per capita employer expenditures for asthmatic patients were approximately 2.5 times those for control subjects (\$5,385/employee versus \$2,121/employee). For asthmatic employees, wage-replacement costs for workdays lost as a result of disability and absenteeism accounted for almost as much as did medical care (40 percent versus 43 percent).¹²¹

As indicated above, both prevalence and costs of asthma have increased markedly over the past decade and a half. While there is no consensus as to why asthma prevalence has increased, scientists studying the phenomenon have postulated that obesity and lack of physical exercise, dietary changes, and increased exposure to indoor allergens are among the reasons for the increase.¹²² The growth in costs of asthma is largely due to the increase in asthma prevalence: prevalence rates increased by nearly 70 percent from 1986 to 1996, far outpacing the 12 percent growth in population. Average costs for asthma per capita actually decreased over this period, despite the significant increase in absolute costs.¹²³ That is, while treatments have become more cost-effective, total costs have still ballooned because of the greater proportion of the population with asthma. This indicates that, in order to contain asthma costs in the future, better treatments must be supplemented with prevention strategies aimed at reducing asthma prevalence.

TOBACCO USE

Efforts to promote smoking cessation have the potential to prevent substantial mortality and morbidity in this country. Over the past several decades, strong scientific evidence has emerged that smoking is addictive and has serious health consequences.¹²⁴

The Prevalence of Smoking

Recent prevalence estimates indicate that over 46 million (or approximately 23.5 percent) of adults in this country are current smokers – those who smoke every day or almost every day. Smoking rates tend to be somewhat higher among males, individuals between the ages of 18 and 44, and American Indians. Among adolescents, prevalence estimates are generally comparable to those of adults, with approximately 28.5 percent of high school students reporting that they are current smokers.¹²⁵ Approximately 80 percent of adult smokers started smoking before the age of 18. According to the 2001 NHSDA, 4,400 young people between the ages of 12-17 years try their first cigarette each day.¹²⁶

Despite these figures, it is encouraging to note that the majority of smokers (approximately 70 percent) have made at least one prior attempt to quit smoking, and between one-third to one-half of all smokers (34 to 46 percent) attempt to quit each year. However, very few of these individuals (approximately 2.5 percent) actually succeed in quitting. The high rate of relapse is largely attributable to the nicotine dependence that most smokers develop.¹²⁷ In fact, over 85 percent of current smokers acknowledge that cigarettes are addictive.¹²⁸

The Effects of Smoking

Prevalence of Smoking

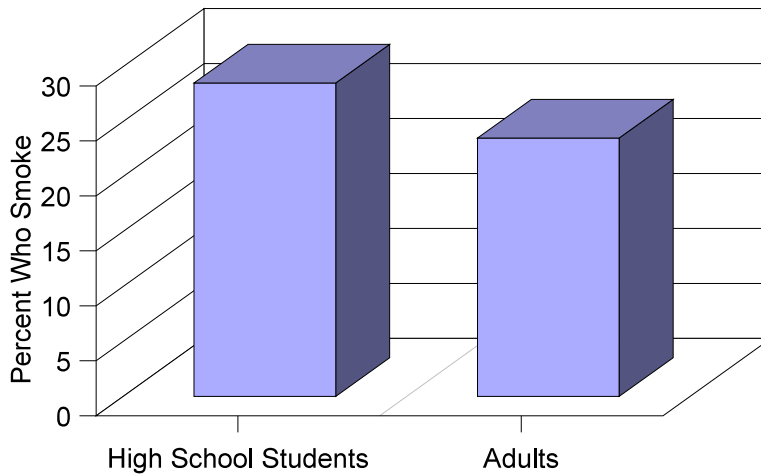


Figure 8. Source of data: Ref. 125.

Tobacco use is the single most preventable risk factor for death and disease, contributing to more than 440,000 premature deaths annually in the United States during 1995 through 1999. This figure represents one out of every five deaths each year being associated with tobacco use, ranking tobacco use as the number one health problem contributing to death and disability in the U.S. Tobacco use is a risk factor for chronic lung disease, heart disease, stroke, and several forms of

cancer, specifically cancer of the lungs, larynx, esophagus, mouth and bladder.^{129,130} Additionally, research indicates that smoking contributes to cancer of the cervix, pancreas and kidneys.¹³¹ Shorter-term effects of smoking include increased heart rate and blood pressure, coughing with phlegm or blood, shortness of breath when not exercising, wheezing or gasping, and reported poorer overall health.¹³²

The harmful effects of smoking do not appear limited only to those who use tobacco. Pregnant women who smoke are more likely to produce low birth weight babies and infants with a variety of health disorders, including those with an increased risk of death from sudden infant death syndrome and respiratory distress. In addition, an estimated 3,000 nonsmoking Americans die each year from lung cancer, and up to 300,000 children have respiratory tract infections due to increased susceptibility after exposure to secondhand smoke.¹³³

An international analysis estimates that roughly half of all adolescents who try smoking will become life-long smokers, and of this group, one in two will die as a result of smoking.¹³⁴ Unfortunately, the mortality rates from smoking suggest that given the current prevalence of smoking among adolescents, it can be expected that 6.4 million individuals under the age of 18 will die prematurely as a result of tobacco-related diseases.¹³⁵

The Costs of Smoking

The direct and indirect economic costs associated with tobacco use are significant. According to the National Institute on Drug Abuse (NIDA), the direct and indirect costs of smoking are estimated at \$138 billion per year.¹³⁶ As with other chronic conditions, employers are significantly affected by the indirect costs of the health problems that result from tobacco use. An extensive review of the literature published in 2001 found solid evidence that 6 to 14 percent

of personal health care expenditures could be attributed to smoking, and that smokers had greater medical costs over the course of their lifetimes. The review also found a large number of studies that demonstrated that smokers are more costly to their employers than those employees who do not smoke.¹³⁷ The economic costs of smoking are estimated to be about \$3,391 per smoker per year. Each pack of cigarettes sold in the United States costs the nation an estimated \$7.18 in medical care costs and lost productivity.¹³⁸ Roughly 14 percent of all Medicaid expenditures are for smoking related illnesses,¹³⁹ and more than \$20 billion of Medicare expenditures each year are related to smoking.¹⁴⁰

Treatment and Prevention

Efforts to promote smoking cessation have the potential to prevent substantial mortality and morbidity in the U.S. One year after quitting, a person's additional risk of heart disease is reduced by half, and after 15 years, this risk equals that of a person who never smoked. Within 10 years of quitting smoking a former smoker's risk of developing lung cancer is 30 to 50 percent below that of a current smoker. The benefits are even greater for individuals who quit smoking before the age of 50. Their risk of dying in the next 15 years is half that of a person who smokes.¹⁴¹

Tobacco dependence is a chronic condition that often requires repeated intervention. However, effective treatments do exist that can produce long-term or even permanent abstinence. Three types of counseling and behavioral therapies have been found to be especially effective in treating patients attempting tobacco cessation: practical counseling (problem solving/ skills training); social support as part of treatment; and help in securing social support outside of treatment.¹⁴² A number of smoking cessation treatments currently exist including over-the-counter medications (nicotine patches, nicotine gum), behavioral modification techniques, self-help efforts, and prescription medications (tablet, inhalers, nasal sprays).

A number of studies have examined the cost savings from tobacco prevention programs. The State of California estimates that their statewide tobacco prevention program resulted in an overall cost savings of \$8.4 billion from the years 1990-1998. This program included a statewide mass media campaign and community programs designed and implemented by local health departments, community coalitions, community-based organizations, and regional and statewide agency networks.¹⁴³ Over the course of the statewide program, \$3.62 in direct medical costs were avoided for every \$1 spent on the program. Reducing smoking prevalence among pregnant women by one percentage point over seven years would prevent 57,200 low birth weight deliveries and save \$572 million. Another study estimated that every \$1 invested in certain types of school-based tobacco prevention programs saves \$19.90 in associated medical costs. The economic benefits of prevention are also apparent for employers: an economic assessment found that a health care plan's annual cost of covering treatment to help people quit smoking ranged from \$0.89 to \$4.92 per smoker, whereas the annual cost of treating smoking-related illness ranged from \$6.00 to \$33.00 per smoker.¹⁴⁴

BUSINESSES AND OTHER EMPLOYERS PROMOTING HEALTH AND DISEASE PREVENTION

Employers have become increasingly aware that overweight and obesity, lack of physical activity, and smoking have a major impact not only on the health and productivity of their employees, but also on the financial “health” of their businesses. Since the 1970's, many employers have provided a variety of health promotion and disease prevention programs to their employees. These efforts often have focused on overweight and obesity, physical activity, and smoking, as well as other behaviors and conditions (such as depression and stress) linked to the health and well-being of their employees. The motivation behind these programs is to improve the health status of employees, increase the productivity and morale of employees and reduce absenteeism, and reduce business costs that are associated with chronic diseases and disorders among employees. Throughout this report, a small number of noteworthy businesses' health promotion and disease prevention programs along with their key features have been highlighted.¹⁴⁵ These particular companies have won national awards for their health programs, and are presented in this report because they illustrate some of the promising approaches to promoting wellness among employees that many companies across the country are operating.¹⁴⁶

The proportion of employers who provide such programs has increased over the years, and it is reported that health improvement programs of some kind now are being offered by over 80 percent of worksites with 50 or more employees and almost all large employers with more than 750 employees.¹⁴⁷ The focus and scope of these efforts vary substantially across companies. Some worksite programs may focus on a single risk factor, such as smoking, or a particular disease, such as CVD, while others may focus on a much wider set of risk factors and diseases.¹⁴⁸ Employers offer a wide variety of resources that differ considerably in comprehensiveness, intensity, and duration, and the extent to which they tie together health promotion and disease prevention activities with employee health benefits, occupational health, employee assistance programs, disease management, workers' compensation, disability benefits, and other benefit programs.¹⁴⁹ Clearly, small businesses face a much greater challenge in implementing practical, affordable efforts to improve their employees' health. Future research and public policies will need to address the special needs of small employers.

One survey of more than 1,000 U.S. employers (most of which had more than 1,000 employees) found that 72 percent provided education or training on lifestyle behaviors to their employees, and 40 percent offered financial incentives for participation in health appraisals or screenings.¹⁵⁰ Department of Labor data show that in 2000, 18 percent of all employees (including part-time) were eligible for wellness programs, and 9 percent were eligible for fitness center programs.¹⁵¹

Given the large number of companies that have implemented health promotion and disease prevention programs, many for several decades now, it is not surprising that a large amount of information has been reported on the effects of these programs on employee health and productivity, and on the costs and benefits of these programs to the companies that sponsor them. Moreover, many companies and studies have reported that these kinds of programs have had positive effects on employee health and job performance, and have resulted in cost savings for the companies that provide them. The nature and quality of this information vary a great

Support for Healthy Lifestyles Among Large U.S. Employers, 1999



Figure 9. Source of data: Ref. 150.

turn make it difficult for studies of worksite programs to attribute a causal relationship between the program and the measured effects and to generalize the findings to other locations, businesses, or workforces.¹⁵³

A number of comprehensive reviews, or meta-analyses, have analyzed findings across large numbers of individual studies of worksite health promotion and disease prevention programs in the recent years.^{154,155,156,157,158} These and other reviews categorize and examine a broad array of worksite programs, and provide in-depth information and conclusions about many aspects of health promotion and disease prevention activities and their effects on employees and businesses. While these reviews provide information that is too extensive and detailed to be adequately summarized in this brief discussion, they provide a strong indication that many health promotion and disease prevention programs *do* work and *do* result in significant cost savings.

Many studies have focused specifically on the return on investment (ROI) from worksite health promotion and disease prevention programs. One recent review identified well-conducted, rigorous evaluation studies of ROI, then documented the range of ROI estimates in these studies, and examined the factors that influenced program outcomes and ROI estimates.¹⁵⁹ Findings on the return on investment for health promotion and disease management programs were reported for nine employers: Canada & North America Life; Chevron.; City of Mesa, AZ; General Mills; General Motors; Johnson & Johnson; Pacific Bell; Procter & Gamble; and Tenneco. These programs provide health education to their employees to promote behaviors that will improve health or prevent disease, and typically include exercise programs, health-risk appraisal, weight control, nutrition information, stress management, disease screening, and smoking cessation.¹⁶⁰ The review found significant return on investment for the programs provided by these nine employers, with the range of benefit-to-cost ratios, ranging from \$1.49 to \$4.91 in benefits per dollar spent on the program, and a median of \$3.14. For instance, at the high end, General

deal, since these programs generally were not designed to be research studies. Many of the available reports are case studies. When more systematic studies are undertaken, they often must address limitations that include selection bias, skewed data, confounding variables, small sample sizes, and lack of control or comparison groups.¹⁵²

These limitations in

Motors realized at one of their sites an annual savings of \$105.50 in total health care costs per enrollee for an annual program cost of \$27 per enrollee—a ratio of 4.91 of benefits-to-cost.

These reviewers also examined what they call “demand-management programs,” or programs that encourage and help employees increase the use of self-care and decrease their use of medical care, often through self-care books, newsletters, telephone information lines, counseling, and other means. Looking at studies of ROI for demand-management programs (Blue Shield of California, five California counties, Group Health, Rhode Island Group Health Association, and United Health Care), they found greater variation in the return on investment in these kinds of programs, ranging from \$2.19 to \$13 in benefits per dollar spent. They also examined three studies of ROI for disease-management programs and found a range in benefit-to-cost ratios from \$7.33 to \$10.38. For multiple category programs that combined elements of these programs, they found a range of \$5.47 to \$6.47 in benefits per dollar spent.

CIGNA

The goal of CIGNA’s Working Well Program is to keep its 34,000 U.S. employees healthy and at work. The Working Well Program’s annual budget is \$2.5 million. The program is implemented at all 250 domestic offices. Working Well has a broad range of programs for all employees with special emphasis on issues of concern to women who make up 76% of CIGNA’s employees.

The *Working Well Moms Program* encourages and supports breast-feeding. Over three-quarters of CIGNA women are of childbearing age. Breast feeding duration rates for participants are 72% at 6 months and 36% at 12 months, significantly higher than control groups and US data. This has decreased pharmacy costs – 62% fewer prescriptions for breast-fed children. The program has also contributed to decreased medical costs – a savings of \$240,000 in healthcare expenses. In addition, program participants have 74 fewer absences per 100 mothers, a savings of \$60,000 in lost time annually.

The *Working Well Triumph Program* provides skill training and support for disabled employees to improve their health, adopt healthy lifestyles, and reduce the likelihood of future disability leave. This program has resulted in healthcare costs savings of more than \$900 per program participant.

The *Working Well Flu Shots Program* provides free immunization inoculations at all significant employee locations. The program is aimed at reducing workplace absenteeism. Program participants has 29% less absenteeism as compared to employees not getting a shot. This produced a savings of \$33 per employee participant. The overall return on investment for the program was 3 to 1.

CIGNA’s smoking cessation program, which combines behavioral counseling and pharmacologic treatment, is offered to all CIGNA employees and their benefits-eligible family members who want to quit smoking. The program helped 67 percent of its participants quit smoking after 12 months, a quit rate up to three times higher than comparable smoking cessation programs. CIGNA estimates saving \$949 in health care costs for each successful participant, a return on investment of 9.5 to 1.

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For these employers, disease management programs resulted in the highest returns on investment, and the educational health promotion and disease prevention programs the lowest returns. Moreover, the more expensive programs resulted in lower returns on investment than some of the less expensive ones. The reviewers suggest the possibility that the higher costs may

stem from the larger capital investments that go into on-site fitness centers or classroom-based education programs. They also point out that the typical health promotion and disease prevention program provides health education to most or all employees but usually shows savings for only a small portion of the neediest employees, whereas disease management programs are targeted on a smaller selected group of employees. They conclude that, in designing effective programs that will improve employee health and productivity and produce good returns on investment, employers should consider an array of health and productivity programs (rather than focus on the “pure” wellness program) and integrate them with health and demand-management or disease-management activities.¹⁶¹

Most of the information on the costs, effects, and benefits of corporate health promotion and disease prevention programs has come from studies of relatively short time periods, e.g., two years or less. Relatively little information is available on the long-term effects of such programs on the health status of employees and their utilization of health care services, and the return on investment over these longer periods. One recent study examined the long-term impact of the Johnson & Johnson Health & Wellness Program on medical care and expenditures.¹⁶² Johnson & Johnson has offered a health promotion program since 1979 and has spent several million dollars on evaluations of the program. According to this study, the Johnson & Johnson program integrates employee health, wellness, disability management, employee assistance, and occupational medicine programs, and places considerable emphasis on health promotion and disease prevention. The study looked at up to five years of data and found that, while there was a slight increase in emergency department expenditures per employee per year (\$10.87), there also were significant decreases in expenditures for outpatient and office visits (\$45.17), mental health visits (\$70.69), and inpatient hospital days (\$119.67). Across all of these categories, total savings were \$224.66 per employee per year. Moreover, the study found a substantial increase in savings in years 3 and 4 for outpatient and physician visits and inpatient days. While these researchers caution that a variety of methodological limitations make it difficult to definitively establish causality for the observed effects and savings, and to be certain about the exactness of the savings for each of the health outcome categories, they suggest that a more in-depth and comprehensive analysis would likely show that the total program savings were even greater, and they conclude:

*This study demonstrates that a well-conceived health and wellness program that focuses on prevention, self-care, risk factor reduction, and disease management can produce substantial benefits for employers and their employees. Utilization and expenditures may be reduced by better coordination of existing health and productivity management programs, with many of these benefits occurring in later years.*¹⁶³

CONCLUSION

There is clear evidence that the costs of chronic conditions are enormous, as are the potential savings from preventing them, even if there may not always be agreement on the exact amounts of these costs and savings. Since a large part of the root cause of chronic conditions involves attitudes and behavioral choices, the prospect of reducing their prevalence appears daunting and

promising at the same time. Attitudes and behaviors may be resistant to change, even when the desire to change is there. Moreover, people often encounter significant barriers in their social and physical environments. On the other hand, the actions that would eliminate much of the morbidity and mortality in our country are clear, and to a large extent these are practicable measures that the average person can take. By changing the way they live, Americans could change their personal health status and the health landscape of the Nation dramatically. Americans could save themselves, their employers, and the Nation substantial amounts of money if they took certain measures that are well-understood and relatively modest in scope. Even though some efforts over the last several decades to educate individuals about ways to improve their health and prevent disease have had limited influence on large proportions of our population, others have been very successful. Public and private policies need to focus on sustained efforts to encourage positive behaviors, building on proven, successful models. Key to these efforts is the recognition that the worksite is a place that can be conducive to good health.

The stakes are so great that the challenge must be met. It is ironic that in this day of high-tech, complex, and costly medical procedures and treatments, simple, inexpensive, easily-understood actions, such as increasing physical activity, controlling weight, and quitting smoking, could have such a huge impact on the quality of life and the cost of health care. While there always will be legitimate debate over the costs and benefits of particular health promotion and disease prevention endeavors, the Nation simply cannot afford *not* to step up efforts to reverse the growing prevalence of chronic disorders. Resources and energy need to be marshaled in all sectors and at all levels of society—federal, state, tribal, and local governments, foundations, associations, health care providers and insurers, businesses, communities, schools, families, and individuals—to control and prevent the chronic conditions that threaten the Nation’s physical and financial well-being.

REFERENCES

1. Health Project website: healthproject.stanford.edu/koop. Information presented in the report on notable employee wellness programs was obtained primarily from this website.
2. Table 2–National Health Expenditure Amounts and Average Percent Change by Type of Expenditure: Selected Calendar Years 1980-2012. CMS website/OACT projections (cms.hhs.gov/statistics/nhe/projections-2002/t2.asp).
3. CDC website: www.cdc.gov/nccdphp
4. McGinnis JM. “United States,” in *Critical Issues in Global Health*, ed. C.E. Koop (San Francisco: Jossey-Bass, 2001), 80-90.
5. McGinnis JM, Williams-Russo P, Knickman JR. The case for more active policy attention to health promotion. *Health Affairs*. 2002; 21(2):78-92.
6. Health Project website: healthproject.stanford.edu/koop. Information presented in the report on notable employee wellness programs was obtained primarily from this website.
7. Flegal KM, Carroll MD, Ogden CL, Johnson CL. Prevalence and trends in obesity among US adults, 1999-2000. *JAMA* 2002; 288(14): 1723-1727.
8. Barnes PM, Schoenborn CA. Physical activity among adults: United States, 2000. *Advance Data from Vital and Health Statistics*; no. 333. Hyattsville, Maryland: National Center for Health Statistics. 2003.
9. Mokdad AH, Bowman, BA, Ford ES, Vinicor F, Marks JS, Koplan JP. The continuing epidemics of obesity and diabetes in the United States. *JAMA* 2001; 286(10): 1195-1200.
10. Mokdad AH, Bowman, BA, Ford ES, Vinicor F, Marks JS, Koplan JP. The continuing epidemics of obesity and diabetes in the United States. *JAMA* 2001; 286(10): 1195-1200.
11. NIH/NHLBI. *Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults*. 1998.
12. *Heart Disease and Stroke Statistics – 2003 Update*. American Heart Association: 2003.
13. Flegal KM, Carroll MD, Ogden CL, Johnson CL. Prevalence and trends in obesity among US adults, 1999-2000. *JAMA* 2002; 288(14): 1723-1727.
14. Mokdad AH, Ford ES, Bowman BA, Dietz WH, Vinicor F, Bales VS, Marks, JS. Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. *JAMA*. 2003; 289(1):76-79
15. Flegal KM, Carroll MD, Ogden CL, Johnson CL. Prevalence and trends in obesity among US adults, 1999-2000. *JAMA* 2002; 288(14): 1723-1727.
16. The prevalence of obesity also varies across States, ranging from a low of 14.4 percent in Colorado to a high of 25.9 percent in Mississippi. (Note: These are relatively low estimates based on self-reported data.) Mokdad AH, Ford ES, Bowman BA, Dietz WH, Vinicor F, Bales VS, Marks, JS. Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. *JAMA*. 2003; 289(1):76-79.
17. Blacks have the highest rate of obesity (31.1 percent) compared with White (19.6 percent) and Hispanic (23.7 percent) populations. A greater proportion of individuals without a high school degree are obese (27.4 percent) compared with those with a college degree (15.7 percent). Flegal KM, Carroll MD, Ogden CL, Johnson CL. Prevalence and trends in obesity among US adults, 1999-2000. *JAMA* 2002; 288(14): 1723-1727.
18. Ogden CL, Flegal KM, Carroll MD, Johnson CL. Prevalence and trends in overweight among US children and adolescents, 1999-2000. *JAMA* 2002; 288(14): 1728-1732.

19. *The Surgeon General's call to action to prevent and decrease overweight and obesity*. Office of Disease Prevention and Health Promotion; Centers for Disease Control and Prevention, National Institutes of Health. - - Rockville, MD : U.S. Dept. of Health and Human Services, Public Health Service, Office of the Surgeon General ; Washington, D.C.
20. Ogden CL, Flegal KM, Carroll MD, Johnson CL. Prevalence and trends in overweight among US children and adolescents, 1999-2000. *JAMA* 2002; 288(14): 1728-1732.
21. Fisher JO, Rolls BJ, Birch LL. Children's bite size and intake of an entree are greater with large portions than with age-appropriate or self-selected portions. *The American Journal of Clinical Nutrition*. 2003; 77(5):1164-1170.
22. Videon TM, Manning CK. Influences on adolescent eating patterns: The importance of family meals. *Journal of Adolescent Health*. 2003; 32(5):365-373.
23. *The Surgeon General's call to action to prevent and decrease overweight and obesity* / Office of Disease Prevention and Health Promotion; Centers for Disease Control and Prevention, National Institutes of Health. - - Rockville, MD : U.S. Dept. of Health and Human Services, Public Health Service, Office of the Surgeon General ; Washington, D.C.
24. Sturm R, Wells KB. Does obesity contribute as much to morbidity as poverty or smoking? *Public Health*. 2001; 115:229-236.
25. Mokdad AH, Ford ES, Bowman BA, Dietz WH, Vinicor F, Bales VS, Marks, JS. Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. *JAMA*. 2003; 289(1):76-79.
26. *Prevention Report*. USDHHS. 2001; Volume 16:Issue 1
27. Allison DB, Fontaine KR, Manson JE, Stevens J, VanItallie TB. Annual deaths attributable to obesity in the United States. *JAMA*. 1999;282(16):1530-1538.
28. Ford ES, Giles WH, Dietz WH, Prevalence of the Metabolic Syndrome Among US Adults. *JAMA* 2002; 287(3): 356-359.
29. Seddon JM, Cote J, Davis N, Rosner B. Progression of age-related macular degeneration: Association with body mass index, waist circumference, and waist-hip ratio. *Archives of Ophthalmology*. 2003; 121:785-792.
30. Mokdad AH, Ford ES, Bowman BA, Dietz WH, Vinicor F, Bales VS, Marks, JS. Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. *JAMA*. 2003; 289(1):76-79.
31. NHLBI/NIH. *Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults*. 1998.
32. Finkelstein EA, Fiebelkorn IA, Wang G. National medical spending attributable to overweight and obesity: how much, and who's paying? *Health Affairs-Web Exclusive*. 2003 Project Hope.
33. *The Surgeon General's call to action to prevent and decrease overweight and obesity* / Office of Disease Prevention and Health Promotion; Centers for Disease Control and Prevention, National Institutes of Health. - - Rockville, MD : U.S. Dept. of Health and Human Services, Public Health Service, Office of the Surgeon General ; Washington, D.C.
34. CDC website: www.cdc.gov/nccdphp/dnpa/obesity
35. National Cancer Institute website: cis.nci.nih.gov/fact/3_70.htm
36. Manson JE, Bassuk SS. Obesity in the United States: A fresh look at its high toll. *JAMA* 2003; 289(2): 229-230.
37. Fontaine KR, Redden DT, Wang C, Westfall AO, Allison DB. Years of life lost due to obesity. *JAMA* 2003; 289(2): 187-193.

38. Manson JE, Bassuk SS. Obesity in the United States: A fresh look at its high toll. *JAMA* 2003; 289(2): 229-230.
39. Sturm R. The effects of obesity, smoking, and drinking on medical problems and costs. *Health Affairs*. 2002; 21(2):245-253.
40. Seidell JC. Societal and personal costs of obesity. *Exp Clin Endocrinol Diabetes*. 1998; 106 Suppl 2:7-9.
41. Heithoff KA, Cuffel BJ, Kennedy S, Peters J. The association between body mass and health care expenditures. *Clinical Therapy*. 1997 Jul-Aug; 19(4):811-820.
42. Sturm R. The effects of obesity, smoking, and drinking on medical problems and costs. *Health Affairs*. 2002; 21(2):245-253.
43. Narbro K, Agren G, Jonsson E, Naslund I, Sjostrom L, Peltonen M. Pharmaceutical costs in obese individuals: Comparison with a randomly selected population sample and long-term changes after conventional and surgical treatment: the SOS intervention study. *Archives of Internal Medicine*. 2002; 162:2061-2069.
44. Sturm R. The effects of obesity, smoking, and drinking on medical problems and costs. *Health Affairs*. 2002; 21(2):245-253.
45. Narbro AG, Naslund I, Sjostrom L, Peltonen M. Long-term effects of weight loss on pharmaceutical costs in obese subjects. A report from the SOS intervention study. *International Journal of Obesity-Related Metabolic Disorders*. 2002 Feb; 26(2): 184-192.
46. Narbro K, Agren G, Jonsson E, Naslund I, Sjostrom L, Peltonen M. Pharmaceutical costs in obese individuals: Comparison with a randomly selected population sample and long-term changes after conventional and surgical treatment: the SOS intervention study. *Archives of Internal Medicine*. 2002; 162:2061-2069.
47. Oster G, Thompson D, Edelsberg J, Bird AP, Colditz GA. Lifetime health and economic benefits of weight loss among obese persons. *American Journal of Public Health*. 1999 Oct; 89(10):1536-1542.
48. Fultz NH., Fonda SJ, Wheeler LM, Wray LA. Economic cost of obesity to women and men in their 50s and 60s. Paper presented at the annual meeting of the Gerontological Society of America, November 19, 2000.
49. *The Surgeon General's call to action to prevent and decrease overweight and obesity* / Office of Disease Prevention and Health Promotion; Centers for Disease Control and Prevention, National Institutes of Health. - - Rockville, MD : U.S. Dept. of Health and Human Services, Public Health Service, Office of the Surgeon General ; Washington, D.C.
50. Douglas BL, Smithline N. Obesity—an overview of an American epidemic. *Developed for the Washington Business Group on Health's Summit on Obesity, Cardiovascular Disease and Diabetes*. December 5, 2002.
51. Finkelstein EA, Fiebelkorn IA, Wang G. National medical spending attributable to overweight and obesity: how much, and who's paying? *Health Affairs—Web Exclusive*. 2003 Project Hope.
52. CDC website: www.cdc.gov/nccdphp/dnpa/obesity
53. NIH/NIDDK website: www.niddk.nih.gov/health/nutrit/pubs/statobes.htm
54. American Obesity Association/The Lewin Group. *Costs of Obesity*. September 13, 2000.
55. Wang G, Dietz WH. Economic burden of obesity in youths aged 6 to 17 years: 1979-1999. *Pediatrics* 2002; 45:439-445.

56. Allison DB, Zannolli R, Narayan KM. The direct health care costs of obesity in the United States. *American Journal of Public Health*. 1999; Vol 89, Issue 8 1194-1199.
57. Finkelstein EA, Fiebelkorn IA, Wang G. National medical spending attributable to overweight and obesity: how much, and who's paying? *Health Affairs–Web Exclusive*. 2003 Project Hope.
58. Finkelstein EA, Fiebelkorn IA, Wang G. National medical spending attributable to overweight and obesity: how much, and who's paying? *Health Affairs–Web Exclusive*. 2003 Project Hope.
59. Burton WN, Chen CY, Schultz AB, Edington DW. The economic costs associated with body mass index in a workplace. *Journal of Occupational and Environmental Medicine*. 1998 Sep; 40(9):786-792.
60. Tucker LA, Friedman GM. Obesity and absenteeism: an epidemiologic study of 10,825 employed adults. *American Journal of Health Promotion*. 1998; 12(3):202-207.
61. Narbro K, Agren G, Jonsson E, Larsson B, Naslund I, Wedel H, Sjostrom L. Sick leave and disability pension before and after treatment for obesity: a report from the Swedish Obese Subjects (SOS) Study. *International Journal of Obesity-Related Metabolic Disorders*. 1999 June; 23(6):619-624.
62. NIH/NIDDK website: www.niddk.nih.gov/health/nutrit/pubs/statobes.htm
63. Douglas BL, Smithline N. Obesity—an overview of an American epidemic. *Developed for the Washington Business Group on Health's Summit on Obesity, Cardiovascular Disease and Diabetes*. December 5, 2002.
64. Thompson D, Edelsberg J, Kinsey KL, Oster G. Estimated economic costs of obesity to U.S. business. *American Journal of Health Promotion*. 1998; 13(2):120-127.
65. NIDDK. *General Information and national estimates on diabetes in the United States, 2000* (Note: Similar information is found in the American Diabetes Association, “National Diabetes Fact Sheet.
66. NIDDK. *General Information and national estimates on diabetes in the United States, 2000* (Note: Similar information is found in the American Diabetes Association, “National Diabetes Fact Sheet.
67. CDC. *Diabetes at a Glance*
68. NIDDK “General Information and national estimates on diabetes in the United States, 2000 (Note: Similar information is found in the American Diabetes Association, “National Diabetes Fact Sheet. This number was updated for 2002 to 12.1 million diagnosed cases. “Economic Costs of Diabetes in the U.S. in 2002.” See discussion under Costs Associated with Diabetes.
69. A recent study of data from the National Health and Nutrition Examination surveys (NHANES) found that the prevalence of diabetes, either diagnosed or undiagnosed, and impaired fasting glucose did not appear to increase substantially during the 1990's. CDC. *Prevalence of Diabetes and Impaired Fasting Glucose in Adults–United States, 1999-2000*. MMWR. September 5, 2003; 52(35):833-837.
70. NIDDK. *General Information and national estimates on diabetes in the United States, 2000* (Note: Similar information is found in the American Diabetes Association, “National Diabetes Fact Sheet.
71. J Pediatr Endocrinol Metab. *Emergence of type 2 diabetes mellitus in children: epidemiological evidence*. 13 Suppl 6:1395-402, 2000.

72. NIDDK. *General Information and national estimates on diabetes in the United States, 2000* (Note: Similar information is found in the American Diabetes Association, “National Diabetes Fact Sheet.
73. American Diabetes Association: Economic consequences of diabetes mellitus in the U.S. in 1997. *Diabetes Care* 21:296-309, 1998
74. www.cdc.gov/diabetes/pubs/factsheets/atwork.htm
75. American Diabetes Association: Economic costs of diabetes in the U.S. in 2002. *Diabetes Care* 26(3):917-932, 2003.
76. CDC. *Preventing Heart Disease and Stroke: Addressing the Nation’s Leading Killers 2003*. ndep.nih.gov/get-info/dpc.htm#basis
77. www.cdc.gov/diabetes/pubs/factsheets/atwork.htm
78. Sprague, L. “Disease Management to Population-Based Health: Steps in the Right Direction?” *NHPF Issue Brief No.791*, Washington, DC. May 16, 2003.
79. Javitt JC, Aiello LP. Cost effectiveness of detecting and treating diabetic retinopathy. *Ann Intern Med* 1996; 124:164-169.
80. Baker S. et al “challenges of Changing Health Behavior in Medically Underserved Communities. *The Link*. Volume 14, No. 2 — Fall 2000
81. Tsao, Amy, Managing Illness by Phone and E-Mail. *Business Week online*, May 15, 2002, New York, McGraw Hill.
82. NHPF—op cit.
83. *Improving Chronic Disease Management: A Compelling Business Case for Diabetes*, Report from the Diabetes Working Group of the British Columbia Ministry of Health Planning and the British Columbia Ministry of Health Services, prepared by Deborah Shera, Sierra Systems. September 23, 2002
84. Beaulieu, ND et al. *The Business Case for Diabetes Disease Management at Two Managed Care Organizations: A Case Study*. The Commonwealth Fund. April 2003
85. *Preventing Heart Disease and Stroke: Addressing the Nation’s Leading Killers*. CDC: April 2002.
86. *Cardiovascular Diseases*. Stanford Health Library: 2002.
87. American Heart Association. *Heart and Stroke Statistics—2003 Update*.
88. Rates of death were 29 percent higher among black Americans compared to white Americans at 509.6 per 100,000 males and 397.1 per 100,000 females. *Heart Disease and Stroke Statistics – 2003 Update*. American Heart Association: 2003.
89. The CHD death rates were 262.4 per 100,000 black males and 187.5 per 100,000 population for black females (compared to 238.0 per 100,000 and 145.3 per 100,000 white males and females, respectively). *Heart Disease and Stroke Statistics – 2003 Update*. American Heart Association: 2003.
90. *Preventing Heart Disease and Stroke: Addressing the Nation’s Leading Killers*. CDC: April 2002.
91. *Preventing Heart Disease and Stroke: Addressing the Nation’s Leading Killers*. CDC: April 2002.
92. The prevalence rates for CVD are as follows: Non-Hispanic white men: 30 percent; Non-Hispanic white women: 24 percent; Non-Hispanic black men: 41 percent; Non-Hispanic black women: 40 percent; Mexican-American men: 29 percent; Mexican-American women: 27 percent. *Heart Facts 2002: All Americans*. American Heart Association: 2002.

93. *Cardiovascular Diseases*. Stanford Health Library: 2002
- 94 *Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure*. NHLBI: 1994.
- 95 *Morbidity and Mortality Weekly Report*. Vol. 49, No. 33. CDC/NCHS: Aug 25, 2000.
96. American Heart Association. *Heart and Stroke Statistics–2003 Update*.
97. American Heart Association. *Heart and Stroke Statistics–2003 Update*.
- 98 *National Health and Nutrition Examination Survey III*. CDC/NCHS: 1994.
- 99 Pate RR et al. Physical Activity and Public Health. A Recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *JAMA* 1995; 273:402-407.
- 100 *Heart Disease and Stroke Statistics – 2001 Update*. American Heart Association: 2001.
- 101 *Heart Disease and Stroke Statistics – 2002 Update*. American Heart Association: 2002.
102. *Heart Disease and Stroke Statistics – 2003 Update*. American Heart Association: 2003.
- 103 *National Hospital Ambulatory Medical Care Survey*. CDC/NCHS: 2000.
104. *Heart Disease and Stroke Statistics – 2003 Update*. American Heart Association: 2003.
105. *Heart Disease and Stroke Statistics – 2003 Update*. American Heart Association: 2003.
- 106 Oster G and Thompson D. Estimated effects of reducing dietary saturated fat intake on the incidence and costs of coronary heart disease in the United States. *Journal of the American Dietetic Association*. Feb 1996; 96(2): 127-131.
- 107 *Trends in Asthma Morbidity and Mortality*. American Lung Association Epidemiology & Statistics Unit. March 2003.
108. A disparity between blacks and whites was evident, with a current prevalence rate 22.7 percent higher for blacks than for whites. *Trends in Asthma Morbidity and Mortality*. American Lung Association Epidemiology & Statistics Unit. March 2003.
109. *Trends in Asthma Morbidity and Mortality*. American Lung Association Epidemiology & Statistics Unit. March 2003.
- 110 *Action Against Asthma. A Strategic Plan for the Department of Health and Human Services*. aspe.hhs.gov/sp/asthma/ May 2000.
111. *Trends in Asthma Morbidity and Mortality*. American Lung Association Epidemiology & Statistics Unit. March 2003.
- 112 Weiss KB, Gergen PJ, Hodgson TA. An economic evaluation of asthma in the United States. *N Engl J Med* 1992; 326:862-6.
- 113 Chestnut L, Mills D, Agras J. *National Costs of Asthma for 1997*. Prepared for US Environmental Protection Agency by Stratus Consulting Inc. August 2000.
114. *Trends in Asthma Morbidity and Mortality*. American Lung Association Epidemiology & Statistics Unit. March 2003.
115. *Trends in Asthma Morbidity and Mortality*. American Lung Association Epidemiology & Statistics Unit. March 2003.
116. Weiss KB, Gergen PJ, Hodgson TA. An economic evaluation of asthma in the United States. *N Engl J Med* 1992; 326:862-6.
- 117 Paralleling the disparity in asthma prevalence, rates of death, hospitalization, and emergency department visits are 2-3 times higher for black Americans than for white Americans. Redd SC. Asthma in the United States: burden and current theories. *Environ Health Perspect* 2002 Aug; 110 Suppl 4:557-60.

118. *Trends in Asthma Morbidity and Mortality*. American Lung Association Epidemiology & Statistics Unit. March 2003.
119. *Trends in Asthma Morbidity and Mortality*. American Lung Association Epidemiology & Statistics Unit. March 2003.
120. Weiss KB, Gergen PJ, Hodgson TA. An economic evaluation of asthma in the United States. *N Engl J Med* 1992; 326:862-6.
121. Birnbaum HG, Berger WE, Greenberg PE, Holland M, Auerbach R, Atkins KM, Wanke LA. Direct and indirect costs of asthma to an employer. *J Allergy Clin Immunol* 2002 Feb; 109(2):264-70.
122. Platts-Mills TA, Carter MC, Heyman PW. Specific and nonspecific obstructive lung disease in childhood: causes of changes in the prevalence of asthma. *Environmental Health Perspectives* 2000; 108 Suppl 4: 725-31.
123. Chestnut L, Mills D, Agras J. *National Costs of Asthma for 1997*. Prepared for US Environmental Protection Agency by Stratus Consulting Inc. August 2000.
124. The Health Consequences of Smoking: Nicotine Addiction: A Report of the Surgeon General” (1988).
125. Centers for Disease Control and Prevention, *Targeting Tobacco Use: The Nation’s Leading Cause of Death, At a Glance 2003*, www.cdc.gov/nccdphp/aag/aag_osh.htm
126. SAMHSA. *Summary of Findings from the 2001 National Household Survey on Drug Abuse: Volume 11. Technical Appendices and Selected Data Tables*. Office of Applied Studies, NHSDA Series H-18; DHHS Publication Number SMA02-3759. Rockville, MD.
127. National Institute on Drug Abuse. *Research Report Series: Nicotine Addiction*. NIH Publication No. 01-4342, August, 2001; 1-8.
128. *Treating Tobacco Use and Dependence*. Summary, June 2000. U.S. Public Health Service. www.surgeongeneral.gov/tobacco/smokerssum.htm
129. Kuper H, Boffetta P, Adami H. *Tobacco Use and Cancer Causation: Association by Tumour Type*. *Journal of Internal Medicine*. September 2002; 252(3):206-224.
130. Alberg A, Samet J. *Epidemiology of Lung Cancer*. *Chest*. January 2003; 123(1) 21S-49S.
131. Centers for Disease Control and Prevention, *Targeting Tobacco Use: The Nation’s Leading Cause of Death, At a Glance 2003*, www.cdc.gov/nccdphp/aag/aag_osh.htm
132. US Department of Health and Human Services, *Preventing Tobacco Use Among Young People: A Report of the Surgeon General*, (1994).
133. Centers for Disease Control and Prevention, *Targeting Tobacco Use: The Nation’s Leading Cause of Death, At a Glance 2003*, www.cdc.gov/nccdphp/aag/aag_osh.htm
134. World Health Organization, "Combating the Tobacco Epidemic." *The World Health Report, 1999*. Geneva: The World Health Organization
135. Centers for Disease Control and Prevention, *Preventing Tobacco Use*, www.cdc.gov/nccdphp/pe_tobacco.htm (Last update February 19, 2003).
136. National Institute on Drug Abuse. *Research Report Series: Nicotine Addiction*. NIH Publication No. 01-4342, August, 2001; 1-8.
137. Max W. The financial impact of smoking on health-related costs: a review of the literature. *American Journal of Health Promotion*. 2001; 15(5):321-331.
138. CDC. *Annual Smoking –Attributable Mortality, Years of Potential Life Lost, and Economic Costs*, United States, 1995 –1999. *MMWR* April 12, 2002; 51(14).

139. Centers for Disease Control and Prevention, *Preventing Tobacco Use*, www.cdc.gov/nccdphp/pe_tobacco.htm (Last update February 19, 2003).
140. Zhang, X. et al., *Cost of Smoking to the Medicare Program*, 1993.
141. National Cancer Institute, *Questions and Answers About the Benefits of Smoking Cessation*, March 31, 2000, www.cis.nci.nih.gov/fact.
142. *Treating Tobacco Use and Dependence*. Summary, June 2000. U.S. Public Health Service. www.surgeongeneral.gov/tobacco/smokerssum.htm
143. California Department of Health Services Tobacco Control Section. *California Tobacco Control Update*. August 2000; 1-9.
144. Centers for Disease Control and Prevention, *Preventing Tobacco Use*, www.cdc.gov/nccdphp/pe_factsheets/pefs_tobacco.pdf.
145. Health Project website: healthproject.stanford.edu/koop. Information presented in the report on notable employee wellness programs was obtained primarily from this website.
146. The inclusion of these specific companies' programs does not indicate any endorsement by the Department of Health and Human Services.
147. Riedel JE, Lynch W, Baase C, Hymel P, Peterson KW. The effect of disease prevention and health promotion on workplace productivity: a literature review. *American Journal of Health Promotion*. 2001; 15(3): 167-191.
148. Heaney CA, Goetzel RZ. A review of health-related outcomes of multi-component worksite health promotion programs. *American Journal of Health Promotion*. 1997;11(4):290-308.
149. Ozminkowski RJ, Ling D, Goetzel RZ, Bruno JA, Rutter KR, Isaac F, Wang S. Long-term impact of Johnson & Johnson's health & wellness program on health care utilization and expenditures. *Journal of Occupational and Environmental Medicine*. 2002; 44:21-29.
150. Christensen R. Employment-based health promotion and wellness programs. *Employee Benefit Research Institute*. 2001 (July); 22(7):1-6.
151. Department of Labor. *National Compensation Survey: Employee Benefits in Private Industry in the United States, 2000*. January 2003.
152. Christensen R. Employment-based health promotion and wellness programs. *Employee Benefit Research Institute*. 2001 (July); 22(7):1-6.
153. Anderson DR, Serxner SA, Gold DB. Conceptual framework, critical questions, and practical challenges in conducting research on financial impact of worksite health promotion. *American Journal of Health Promotion*. 2001 (May/June); 15(5):281-288.
154. Riedel JE, Lynch W, Baase C, Hymel P, Peterson KW. The effect of disease prevention and health promotion on workplace productivity: a literature review. *American Journal of Health Promotion*. 2001; 15(3): 167-191.
155. Pelletier KR. A review and analysis of the health and cost-effective outcome studies of comprehensive health promotion and disease prevention programs at the worksite: 1993-1995 update. *American Journal of Health Promotion*. 1996; 10(5):380-388.
156. Chapman LS. Meta-evaluation of worksite health promotion economic return studies. *The Art of Health Promotion*. 2003(February);6(6):1-10.
157. Aldana SG. Financial impact of health promotion programs: a comprehensive review of the literature. *American Journal of Health Promotion*. 2001;15(5):296-320.
158. Heaney CA, Goetzel RZ. A review of health-related outcomes of multi-component worksite health promotion programs. *American Journal of Health Promotion*. 1997;11(4):290-

308.

159. Goetzel RZ, Juday TR, Ozminkowski RJ. What's the ROI? A systematic review of return-on-investment studies of corporate health and productivity management initiatives. *AWHP's Worksite Health*. 1999;6(3):12-21.

160. Goetzel RZ, Juday TR, Ozminkowski RJ. What's the ROI? A systematic review of return-on-investment studies of corporate health and productivity management initiatives. *AWHP's Worksite Health*. 1999;6(3):12-21.

161. Goetzel RZ, Juday TR, Ozminkowski RJ. What's the ROI? A systematic review of return-on-investment studies of corporate health and productivity management initiatives. *AWHP's Worksite Health*. 1999;6(3):12-21.

162. Ozminkowski RJ, Ling D, Goetzel RZ, Bruno JA, Rutter KR, Isaac F, Wang S. Long-term impact of Johnson & Johnson's health & wellness program on health care utilization and expenditures. *Journal of Occupational and Environmental Medicine*. 2002; 44:21-29.

163. Ozminkowski RJ, Ling D, Goetzel RZ, Bruno JA, Rutter KR, Isaac F, Wang S. Long-term impact of Johnson & Johnson's health & wellness program on health care utilization and expenditures. *Journal of Occupational and Environmental Medicine*. 2002; 44:21-29.