



# Working Towards Wellness: The Business Rationale

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# Executive Summary

“We have to move from illness to wellness. Businesses will have to invest in wellness. There is no choice. It’s not philanthropy. It’s enlightened self-interest.”

Shrinivas M. Shanbhag, Medical Adviser, Reliance Industries, India

Chronic disease is responsible for more than half of all deaths in the world and is projected to account for two-thirds of all deaths globally in the next 25 years. This progression of chronic disease is occurring despite the fact that these diseases are largely preventable. While the chronic disease epidemic was initially concentrated in developed countries, globalization has caused the increase in chronic disease to be even greater in emerging economies. Countries such as Brazil, China, Russia and India currently lose more than 20 million productive life-years annually to chronic disease, and that number is expected to grow 65% by 2030. This poses significant threats to the vitality of a highly-interdependent global ecosystem, which in turn can threaten the sustainability of already burdened social security systems in industrialized societies.

Organizations have a clear interest in prevention of chronic disease for four major reasons:

## **Chronic Disease Drives Healthcare Costs**

- In the US alone, people with chronic disease account for more than 75% of the nation’s US\$ 2 trillion in medical spending. Whether healthcare is financed by employers, individuals or social programmes, the impact of chronic disease is placing an increasing burden on health systems, taxes and costs of coverage, which increasingly burden organizations and their employees.
- Additionally, the risk factors that lead to chronic disease are cumulative, as are the costs associated with them. For example, metabolic syndrome, which includes a combination of obesity and other health risks, is associated with a two to nine times higher prevalence of chronic diseases.

## **Productivity Losses Associated with Chronic Disease Are Even Greater**

- Productivity losses associated with workers with chronic disease are as much as 400% more than the cost of treating chronic disease. Losses in productivity include disability, unplanned absences, reduced workplace effectiveness, increased accidents and negative impacts on work quality or customer service.
- The most costly conditions and health risk factors related to productivity are different from those when considering only the cost of treating the disease. Depression, as well as fatigue and sleeping problems – conditions or risks that are often co-morbid with chronic diseases – have the largest impact on productivity. As with healthcare costs, more risk factors multiply the losses in productivity.

## **Workplace Wellness Efforts Can Positively Impact Human Capital Investments**

- Organizations invest an average of US\$ 290 in labour costs to generate US\$ 1,000 in revenue. By helping employees work longer and have more productive lives, organizations can protect this asset in the face of growing labour shortages globally.
- An organization that shows that it values its workers is more likely to attract, retain and motivate employees. Leading organizations have utilized prevention and wellness programmes to demonstrate the value they place on their workers.

## **Sustainability Is Threatened by the Epidemic of Chronic Disease**

- The epidemic of chronic disease – a product of both environment and behaviours – is a social phenomenon that is as equally prevalent and preventable as issues such as global warming, infectious diseases, poverty, terrorism, unsanitary water and basic infrastructure. In fact, many of those issues are intertwined with the issue of chronic disease.

- As the economic burden of chronic disease grows, it could crowd out monies needed to improve other critical issues as well as to meet basic needs such as education and infrastructure in both industrialized and emerging economies. Furthermore, any drag on the growth of emerging economies can threaten the vitality of a highly interdependent global ecosystem which in turn can threaten the sustainability of already burdened social security systems in industrialized societies.

The four critical issues – healthcare costs, productivity costs, human capital investment and sustainability – can drive a focus on wellness in an organization, especially if leadership believes that:

- Chronic disease is a major global threat
- Organizations have the capability to take action
- More extensive partnerships and collaborations can help address the broader environment



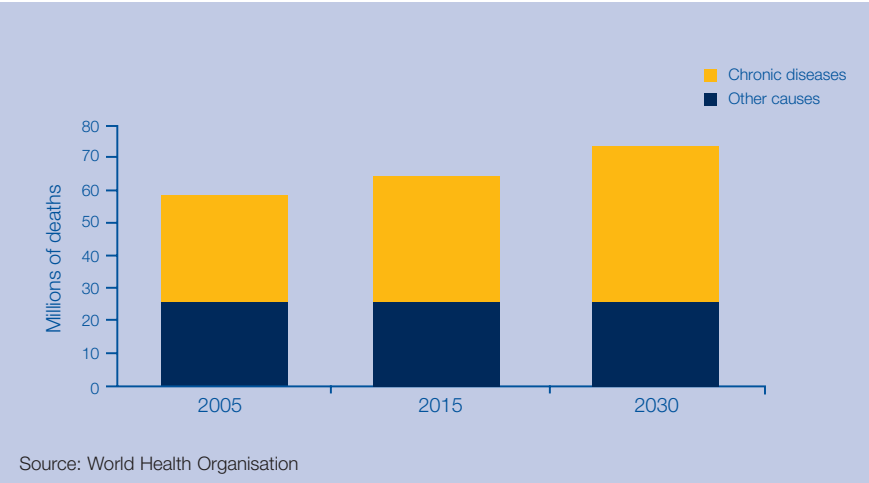
# Chronic Disease Prevention: A Rationale for Workplace Wellness

## 1. The Global Prevalence and Economic Burden of Chronic Disease

“The disease profile of the world is changing at an astonishingly fast rate, especially in low- and middle-income countries. Long-held notions about the nature of chronic diseases, their occurrence, the risk factors underlying them and the populations at risk are no longer valid.”

from Preventing Chronic Diseases: A Vital Investment, World Health Organization

### Exhibit 1: Projected Deaths from Chronic Disease



Globally, chronic diseases<sup>i</sup> represent 57% of all deaths annually, and the World Health Organization (WHO) predicts that chronic diseases will account for approximately 65% of all deaths (over 47 million deaths annually) by 2030. Deaths due to chronic diseases are expected to rise by 23% over the next 20 to 25 years, while deaths due to other causes<sup>ii</sup> are expected to remain roughly stable through 2030 (see Exhibit 1).

Globally, chronic-disease-related deaths account for approximately 56% of all deaths in the working-age population (15 to 69 years of age)<sup>iii</sup>.

Chronic disease is the prime cause of lost work time in the working-age population. Chronic disease accounted for about 40% of total lost time in 2005<sup>iv</sup>. And while the relative burden of chronic disease is still greatest in industrialized countries, the convergence of the global economies and the Western influence on lifestyles throughout the world will increasingly impact emerging economies at a like rate. For example, by 2030, the total number of productive years lost in Brazil, South Africa, Russia, China and India is expected to increase 64% from 20.6 million in 2000 to 33.7 million in 2030 due to cardiovascular disease alone (see Exhibit 2)<sup>v</sup>. In many emerging economies, lack of effective treatment of chronic disease during the working years also contributes to the higher numbers of lost years of productive life. This poses significant threats to the vitality of a highly interdependent global ecosystem, which in turn can threaten the sustainability of already burdened social security systems in industrialized societies.

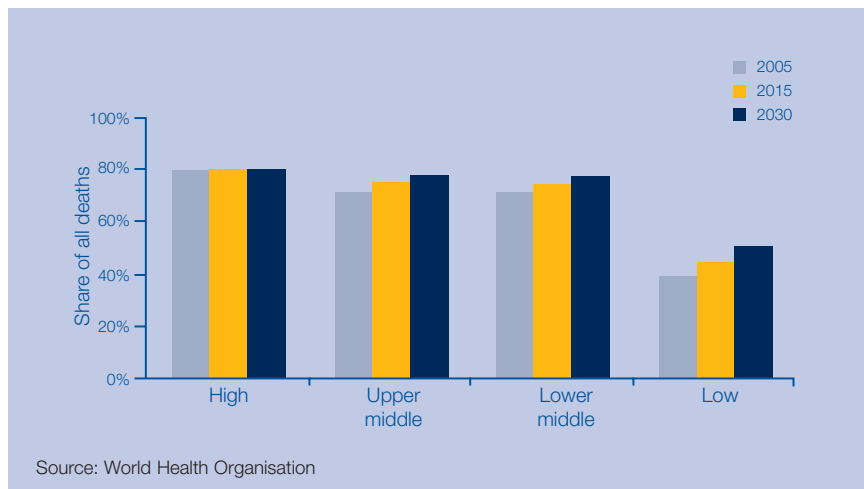
### **Exhibit 2: Productive Years of Life Lost and Death Rate Due to Cardiovascular Disease**

	2000		2030	
	Years Lost	Rate per 100,000	Years Lost	Rate per 100,000
<b>Brazil</b>	1,060,840	2121	1,741,620	1957
<b>South Africa</b>	302,265	2753	391,980	2667
<b>Russia</b>	3,314,014	5684	3,208,265	5887
<b>China</b>	6,666,990	1595	10,460,030	1863
<b>India</b>	9,221,165	3572	17,937,070	3707
<b>Subtotal</b>	<b>20,565,274</b>		<b>33,738,965</b>	
<b>US</b>	1,631,825	1267	1,972,215	1661
<b>Portugal</b>	40,880	1103	53,125	1317
<b>Subtotal</b>	<b>1,672,705</b>		<b>2,025,340</b>	

Source: "A Race Against Time: The Challenge of Cardiovascular Disease in Developing Economies", Center for Global Health and Economic Development, 2004



### Exhibit 3: Chronic-Disease-Related Deaths by Income Region



The WHO predicts – across countries – considerable convergence in the high- to low-income groups over the next 20 to 25 years (see Exhibit 3). Currently, chronic-disease-related deaths represent almost 80% of deaths in high-income, developed countries annually, and they are expected to reach a similar level by 2030 in all but the lowest-income regions<sup>vi</sup>. Consequently, developing countries will increasingly face the same economic burden of chronic disease that developed countries already experience. Furthermore, the risk factors that impact chronic disease are driven by many socioeconomic and cultural factors and, within industrialized societies, are usually disproportionately evident in populations of lower socioeconomic status.

The long-term economic impact of chronic diseases will reduce the available labour supply, savings (and therefore, investment and, ultimately, capital stock) and productivity. Chronic disease can be prevented and its effects mitigated through modification of lifestyle choices – such as maintaining a healthy weight and following a nutritional diet – as well as by prophylactic treatment, which can avoid the high costs of acute episodes and related productivity costs.

## **2. Organizations Have a Clear Interest in Chronic Disease Prevention**

While the burden of chronic disease has emerged as a global threat to health and economic systems, there is also growing evidence that organizations have a clear interest in chronic disease prevention by supporting and promoting the health and well-being of their employees. There are at least four areas that companies are considering in their business rationale:

- Healthcare costs
- Productivity and performance
- Human capital
- Sustainability

### **The Impact of Health on Healthcare Costs**

Chronic disease is the primary driver of healthcare costs. In the US alone, approximately 30% of Americans live with chronic disease, and their healthcare costs account for more than 75% of the nation's US\$ 2 trillion in medical spending<sup>vii</sup>. Whether healthcare is financed by employers, individuals or social programmes, the impact of chronic disease is placing an increasing burden on health systems, taxes and costs of coverage, all of which in turn place an increasing burden on organizations and their employees.

The chronic-disease healthcare-cost burden is intertwined with the impact of modifiable risk factors such as smoking, lack of exercise and poor nutrition. Reducing the risk factors can result in potential cost savings to employers. One study found modifiable risk factors increase an employer's healthcare expenditures by approximately 25%<sup>viii</sup>. Even where healthcare coverage is adequate, there is increasing concern that individuals sheltered from the consequences of their behaviours may be less prone to live a healthy lifestyle.

The cost of poor health behaviours is an influence in both developed and developing countries. Risk factors such as smoking, alcohol use, obesity and hypertension are expensive, accounting for 1.5% of the gross domestic product in China and 2.1% in India<sup>x</sup>. In 2000, there were nearly 5 million smoking deaths worldwide, with one-third due to heart disease and stroke, 850,000 due to lung cancer and another million due to other lung diseases<sup>x</sup>. Smoking risk has been on public health

agendas for decades, while other health risks are becoming more clearly associated with chronic disease prevention and wellness initiatives. The obesity epidemic is particularly pronounced:

- The WHO estimates that more than 400 million people are obese and over 1 billion are overweight globally. The number of obese people is expected to grow by 75% by 2015.
- The rate of adult obesity more than doubled from 15% to 32% in the past 25 years across the United States. Childhood obesity in the US has increased more than threefold to 20% in the past 40 years, thereby setting a higher obesity baseline for future workforces<sup>xi</sup>.
- Half of all households in Brazil and three-quarters in Russia have at least one obese person. Mexico has the second-highest prevalence of obesity among the countries of the Organization for Economic Cooperation and Development, after the United States<sup>xii</sup>.
- The obesity rate in Britain is 23%, and there are now cities in China where the obesity rate is over 20%<sup>xiii</sup>.

Obesity is a health risk factor that is highly correlated with low socioeconomic status. Those who are obese are more likely to develop many conditions, including:

- Hypertension
- High total cholesterol or triglycerides
- Type 2 diabetes
- Coronary heart disease
- Stroke
- Gallbladder disease
- Osteoarthritis
- Sleep apnea and respiratory problems
- Some cancers (endometrial, breast and colon)

While it is widely accepted that individuals who are obese are at greater risk of developing diabetes or heart disease than those who are not, recent medical studies have concluded that those with a combination of obesity, high blood sugar, high blood pressure and high cholesterol have a condition called metabolic syndrome<sup>xiv</sup>. Individuals with this condition were found to have a significantly higher prevalence of diabetes and

heart disease (see Exhibit 4). The presence of metabolic syndrome results in two to four times higher healthcare costs for those with the syndrome than for those without it<sup>xv, xvi, xvii</sup>

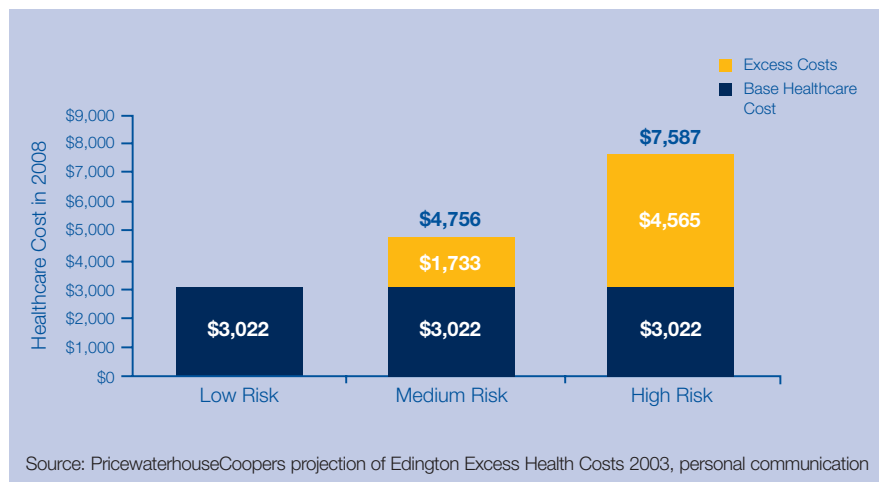
**Exhibit 4: Relative Prevalence of Chronic Disease with and without Metabolic Syndrome**

Co-Morbidities	Prevalence Metabolic Syndrome	Non-Metabolic Syndrome
Diabetes	18%	2%
Coronary artery disease	15%	4%
Hypertension	48%	13%
Stroke	2%	1%

Source: “Metabolic Syndrome and Employer-Sponsored Medical Benefit: An Actuarial Analysis”, Kathryn Fitch et al, Milliman, March 2006

Other studies have shown that risk factors in general are cumulative in nature and that people with multiple risk factors are more likely to have higher healthcare costs (see Exhibit 5).

**Exhibit 5: Estimated 2008 US Healthcare Costs by Number of Health Risks**

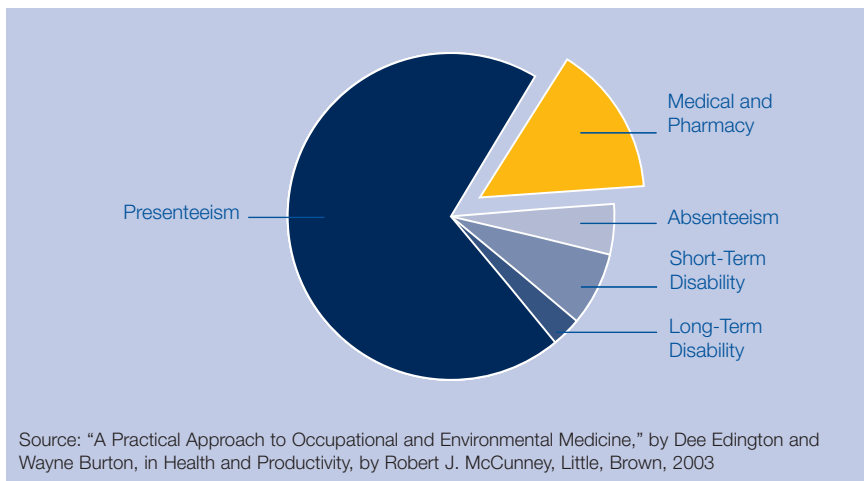


A comprehensive review of the health research found clear evidence that healthcare costs were significantly impacted by the prevalence of obesity, stress and multiple risk factors<sup>xix,xx</sup>. In addition, there is evidence that health risks that are addressed by means of an effective strategy focused on health promotion can reduce costs, even in the absence of disease.

### **The Impact of Health on Productivity and Performance**

Chronic disease and related health risks have a significant and measurable effect on the cost of healthcare. However, the related productivity costs are even higher (see Exhibit 6). Studies have consistently shown productivity costs related to these factors to be up to four times those of healthcare costs for employers. While most of the research related to health and productivity has involved US employees, the results demonstrate that similar productivity costs could face exponential growth with the increasing prevalence of behavioural health risks and chronic conditions on a global level.

### **Exhibit 6: The Costs of Health Risks**



Productivity is demonstrably impacted by chronic conditions and health risk. A recent study of four large employers in the US showed that these costs were more than four times greater than medical and pharmacy costs. In addition, when considering productivity losses, the top 10 conditions most expensive to employers were different from the top 10 when considering only healthcare costs (see Exhibit 7)<sup>xxi</sup>.

### **Exhibit 7: Top 10 Drivers of Healthcare and Productivity Costs**

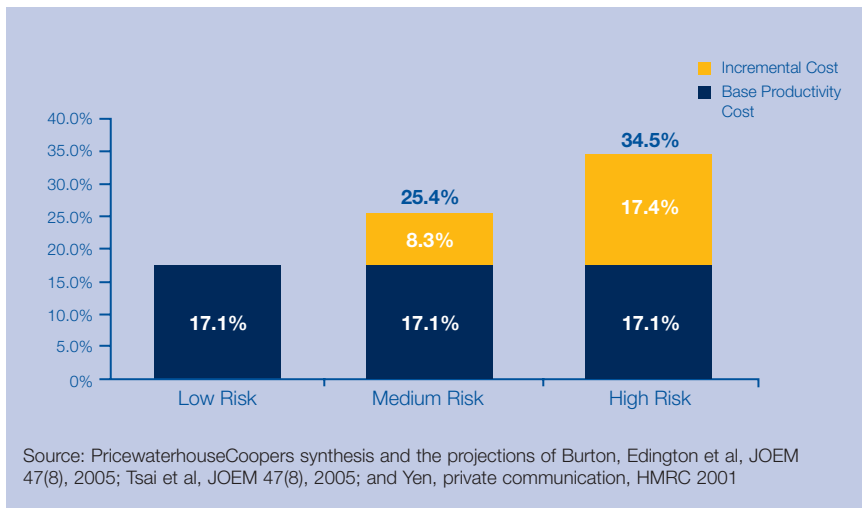
<b>Rank</b>	<b>Healthcare Cost</b>	<b>Productivity Cost</b>	<b>Total Cost</b>
1	Other cancer	Fatigue	Back/neck pain
2	Back/neck pain	Depression	Depression
3	Coronary heart disease	Back/neck pain	Fatigue
4	Other chronic pain	Sleeping problem	Other chronic pain
5	High cholesterol	Other chronic pain	Sleeping problem
6	Gastroesophageal reflux disease (GERD)	Arthritis	High cholesterol
7	Diabetes	Hypertension	Arthritis
8	Sleeping problem	Obesity	Hypertension
9	Hypertension	High cholesterol	Obesity
10	Arthritis	Anxiety	Anxiety

Source: "Health and Productivity as a Business Strategy," by Ronald Loeppke et al, Journal of Occupational & Environmental Medicine, July 2007

The productivity costs of health directly affect the bottom line and can come in several forms. First, productivity costs arise from disability and unplanned absences due to the costs of benefits and replacement workers. In addition, productivity can be impacted even when employees are able to go to work. Workplace effectiveness – impacted by the normal distractions of daily life and motivation factors for everyone – is also impacted specifically due to health concerns<sup>xxii</sup>. This effect is frequently referred to as “presenteeism” and exceeds the costs of both healthcare costs and the direct costs of absence. In addition, there is increasing evidence that a substantial proportion of workplace accidents are influenced by inadequately addressed health problems. Of similar concern is the impact on quality of work product or customer service when employees are not at their best.

The evaluation of the impact of health on productivity across companies, industries and geographical locations can vary due to differences in the nature of the work, differences in culture and differences in general policies. However, there is clear evidence based on multiple research studies that the degree of productivity loss is related directly to health risks (see Exhibit 8).

### Exhibit 8: Lost Productivity Related to Health Risk Stratification



**The impact of health on productivity is increasingly being recognized across the globe.**

- In the next 10 years, China, India and the UK are projected to lose US\$ 558 billion, US\$ 237 billion and US\$ 33 billion, respectively, in national income as a result of heart disease, stroke and diabetes and partly as a result of reduced economic productivity<sup>xxiii</sup>.
- A 12-month study conducted at Unilever sites in the UK showed that implementing health risk reduction programmes resulted in an average reduction of half a risk factor per individual and an average increase of 8.5% in work performance in their study group, compared with no significant change over baseline by the control group that did not receive any interventions. A conservative estimate of the return on investment for this programme is 3.73 to 1<sup>xxiv</sup>.
- According to Ronald C. Kessler, Professor of Health Care Policy, Harvard Medical School, USA, “a substantial proportion of workplace accidents and injuries are related to inadequately treated chronic conditions.”



## The Impact of Health on Human Capital

Human capital is an increasingly scarce organizational resource on a global level. The demand for talented people is increasing, and an ageing workforce is creating an additional drain on organizations' workforces. For example, China will be moving from an era of labour surplus into an era of labour shortage as early as 2010, according to the Chinese Academy of Social Sciences. Because organizations invest an average of US\$ 290 in labour costs to generate US\$ 1,000 in revenue and because the amount of labour investment per dollar generated is increasing, there is a significant opportunity for improvement of return on investment in the workforce<sup>xxv</sup>.

In addition, organizations that show they value people on a more personal level are more likely to attract, retain and motivate the right employees. For example, 85% of CEOs surveyed by Saratoga say they use healthcare benefits as part of their retention programme. In a survey of Canadian workers, 67% of respondents said they view health promotion programmes as an indicator of a good job, and 61% said they would prefer to have a health benefit plan than 20,000 Canadian dollars<sup>xxvi</sup>. To support employer-of-choice efforts, many organizations are seeking to develop a culture that is supportive of health and well-being both at work and within their communities. For example:

- FedEx Mexico has distinguished itself as the “best place to work” in Latin America. It utilizes its workplace wellness efforts to help communicate and reinforce its People First philosophy with its employees.
- Lawrence B. Costello, Senior Vice-President, Human Resources, Trane, USA, said: “Our values drive us to create an environment for our employees that is safe, healthy and secure. Not only is it the right thing to do for our employees; it’s the smart thing to do for our businesses. When employees see the investment the company makes in their working environment, it reinforces their commitment back to the organization, enhances productivity and distinguishes Trane as an employer of choice in the battle for human capital.”

Employees who are engaged and incented are motivated to perform at their highest levels and commit discretionary time to the success of an organization. In fact, employee engagement, financial motivations and individuals' personal value of their health are intertwined. A Health as Human Capital Foundation study found that individuals with more stake

in their personal work performance tended to value their personal health even more in the context of business performance<sup>xxvii</sup>. Others have found that the lowest-paid workers are more likely to have medical issues but are least likely to participate in company-sponsored wellness, and consequently are attempting to better align pay with good health.

Finally, an ageing population will result in a drain on trained and experienced resources as workers retire or experience a reduction in their health status. Older workers are more likely to develop chronic health conditions that can result in early retirement or long-term disability. Health promotion and wellness efforts are likely to keep older workers healthy longer by reducing health risks and thus avoiding or delaying the development of new chronic conditions or the exacerbation of existing ones.

### **The Impact of Health on Sustainability**

The success of every organization is intertwined and interdependent with its suppliers, customers and societies. Organizations across the globe have participated in efforts to modify or eradicate issues that affect health and well-being on a global level, such as global warming, infectious diseases, poverty, terrorism, unsanitary water and public infrastructure. The globalization and increased connectedness of the world's economies and societies has reinforced those interdependencies and created a mandate and respect for leadership by both individuals and organizations that have helped improve these critical human issues.

The epidemic of chronic disease is a social phenomenon that is equally prevalent and preventable (see Exhibit 9). Like all of these issues, it is a product of both our environments and our progress. To put the impact and growth of chronic disease and other risk factors in context, the following provides information on prevalence and anticipated growth in the absence of sustained efforts by our global communities.

## Exhibit 9: Current and Projected Impact of Chronic Conditions and Other Global Issues

Condition / Issue <sup>1</sup>	Number of Current Impacted (thousands)	Number of Current <sup>2</sup> Deaths (thousands)	Number of Projected Deaths in 2030 (thousands)
Asthma	300,000	255	360
Cancer <sup>3</sup>	277,400	7,600	11,400
Cardiovascular Disease <sup>3</sup>	638,750	17,500	23,300
Chronic Obstructive Pulmonary Disease (COPD)	80,000	3,000	5,700
Diabetes	180,000	1,100	2,200
<b>Selected Chronic Conditions</b>	<b>1,476,150</b>	<b>29,455</b>	<b>42,960</b>
<b>HIV/AIDS</b>	<b>39,500</b>	<b>2,900</b>	<b>6,500</b>
<b>Global Warming Health Issues</b>	<b>5,500</b>	<b>166</b>	<b>332</b>

(1) Source: World Health Organization, <http://www.who.int/mediacentre/factsheets/en>

(2) Current year refers to 2005 for all conditions and 2006 for HIV/AIDS.

(3) Projected impacted numbers estimated based on the average multiplier of chronic diseases

Furthermore, the issue of health is intertwined with many other current issues:

- In the arena of global warming, the effects of climate change on conditions such as asthma, chronic obstructive pulmonary disease (COPD) and cardiovascular disease (CVD) serve only to further exacerbate the problems associated with diseases. Julie Louise Gerberding, Director, Centers for Disease Control and Prevention, USA, said: “Many trends within this larger, interdependent, ecologic system influence health on a global scale. The public health response to such trends requires a holistic understanding of disease and the various external factors influencing public health.”
- In countries where prevalence remains high, corporate health programmes that focus on the overall wellness of a population include issues associated with infectious disease. Increasingly, preparedness for infectious disease is a core responsibility of corporate medical directors similarly responsible for safety and wellness. Furthermore, an employer that operates in an area underserved by health providers may find it necessary and beneficial to put in a clinic that is accessible to its employees, employees’ dependents and the community at large.

- The WHO estimates that one-half of the global population – 3 billion people – are malnourished. Of these, 1.1 billion are hungry; an equal number over-consume; and the remainder (and significant numbers of those in the first two categories) suffer from vitamin and mineral deficiencies<sup>xxviii</sup>. In Chile, for example, obesity has overtaken hunger as a concern. “The growing number of obese in lower economic levels is a great concern due to the poor access to medical services, food and job insecurity and high stress that low-income individuals encounter<sup>xxix</sup>.”
- There is also an opportunity cost related to poor health. Dollars spent on treatment of chronic disease are already creating a burden on both developed and developing countries, thereby creating current and long-term financial pressures and potentially crowding out resources available to put towards education, infrastructure and other social concerns.

While it would be inappropriate to subjugate other global issues to a focus on chronic condition management and prevention, it is clear that the issue of chronic disease prevention belongs as one of the key issues on the radar of organizations committed to sustainability as a core business strategy.

### **With Appropriate Leadership, Organizations Can Help Drive Change**

Finally, organizations can make and are making a difference. Reducing modifiable health risks and intermediate health risks in the workplace will serve as a systematic approach to improvement of overall health, prevention of chronic diseases and the driving down of healthcare costs<sup>xxx, xxxi, xxxii</sup>.

Some examples:

- K. Srinath Reddy, President, Public Health Foundation of India, indicates that “In 12 industries across India, interventions that use primary prevention programmes, mostly education, have shown a dramatic improvement in their working population.”
- At Lincoln Industries, wellness is a “talent magnet and considered a huge benefit.” Marc E. LeBaron, Chairman and Chief Executive Officer, Lincoln Industries, USA, estimates that, through its wellness

programmes, the company has cut healthcare costs to 50% below the national average, has reduced workers' compensation costs to less than 1% of total payroll and is experiencing multiple years of negative healthcare cost trends.

- In a highly competitive software industry, SAS Institute has focused on a comprehensive strategy around employee health and well-being and has been estimated to save US\$ 67 million per year in avoided turnover costs<sup>xxxiii</sup>.
- PepsiCo Foundation announced a grant of US\$ 5.2 million in September 2007 to support a community-based initiative in India, China, Mexico and the UK<sup>xxxiv</sup>. The project, Community Interventions for Health, will evaluate how to reduce chronic disease risks in developing countries through interventions in the workplace.

While it is beyond the scope of this discussion to outline all of the critical factors for success, there are common threads that start with visible and committed leadership and disciplined execution of targeted prevention based on the needs of the population. Effective workplace wellness efforts can lead to solid returns on those organizational investments and contribute to a more coordinated response to this critical global issue.

The opportunity to overcome and mitigate the epidemic of chronic disease will be greatest if leaders understand and believe:

- Chronic disease is a major global threat
- All organizations have the capability to take action
- More extensive partnerships and collaborations can help address the broader environment

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We would like to thank them for their invaluable support.

# Appendix 1: Interviewee List

Interviewee	Title	Organization	Location
Paul Litchfield, OBE OSTJ FRCP FFOM	Chief Medical Officer and Head of Health and Safety	BT Group plc	UK
Ron Z. Goetzel, PhD	Director, Institute for Health and Productivity Studies and Vice President, Consulting and Applied Research	Emory University, Rollins School of Public Health and Thomsom Healthcare	US
Mike McKay, OAM	Director	Fitness2Live	Australia
Ronald Kessler, PhD	Professor	Harvard Medical School Department of Health Care Policy	US
Wendy Lynch, PhD	Executive Director	Health and Human Capital Foundation	US
Christopher Murray, MD, DPhil	Instiute Director	Institute for Health Metrics and Evaluation	US
Benjamin Amick, PhD	Scientific Director	Institute for Work and Health	Canada
Tonya Vyhldal, MEd, CHPD	Director of Wellness and Life Enhancement	Lincoln Industries	US
Ronald Loeppeke, MD	Chief Strategic Officer, EVP	Matria Healthcare	US
K. Srinath Reddy, MD	President	Public Health Foundation of India	India
Shrinivas M. Shanbhag	Group Medical Advisor	Reliance Industries	India
Stephen Leeder, AO, MD, PhD, BSc (Med), FRACP, FAFPHM, FFPH (UK), FRACGP (H	Director	The Australian Health Policy Instiute	Australia
Bruce Sherman, MD, FCCP	Medical Director, Global Services	The Goodyear Tire and Rubber Company	US
Debra Lerner, MS, PhD	Senior Scienist, Associate Professor, and Director, Program on Health, Work and Productivity	The Institute for Clinical Resarch and Health Policy Studies, Tufts-New England Medical Center, Tufts University School of Medicine	US
Larry Costello	Senior Vice President of Human Resources	Trane	US
Dee Edington, PhD	Director, Health Management Reseach Center	University of Michigan	US

# Appendix 2: Endnotes

- i. For the purposes of this paper, chronic disease refers to the following disease types: cardiovascular (including stroke), diabetes mellitus, malignant neoplasms, respiratory, neuropsychiatric (excluding epilepsy and Alzheimer's), digestive (excluding appendicitis) and musculoskeletal.
- ii. Other causes include communicable diseases such as infectious and parasitic diseases, respiratory infections and perinatal conditions, as well as intentional and unintentional injuries.
- iii. World Health Organization.
- iv. A widely used summary measure of the burden of disease is the disability-adjusted life-year (or DALY), which combines the number of years of healthy life lost due to premature death and also the time lost as a consequence of ill health.
- v. World Health Organization.
- vi. World Health Organization.
- vii. National Center for Chronic Disease Prevention and Health Promotion, [www.cdc.gov](http://www.cdc.gov), 2005.
- viii. "The Relationship between Modifiable Health Risks and Group-Level Health Care Expenditures", by David Anderson et al, American Journal of Health Promotion, September/October 2000.
- ix. "Public Policy and the Challenge of Chronic Non-communicable Diseases", by Olusoji Adeyi et al, The World Bank, 2007.
- x. "Estimates of Global Mortality Attributable to Smoking in 2000", by Majid Ezzati and Alan Lopez, The Lancet, September 13, 2003.
- xi. Centers for Disease Control and Prevention.
- xii. "The Maladies of Affluence: Globalisation and Health", The Economist, August 11, 2007.
- xiii. "Public Policy and the Challenge of Chronic Non-communicable Diseases", by Olusoji Adeyi et al, The World Bank, 2007.
- xiv. According to ATP (Adult Treatment Panel) III criteria, metabolic syndrome is identified by the presence of three or more of the following components:  
Central obesity, as measured by waist circumference:  
Men: greater than or equal to 40 inches  
Women: greater than or equal to 35 inches  
Fasting blood triglycerides greater than or equal to 150 mg/dL  
Blood HDL cholesterol:  
Men: less than 40 mg/dL  
Women: less than 50 mg/dL  
Blood pressure greater than or equal to 130/85 mmHg  
Fasting glucose greater than or equal to 100 mg/dL
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\*Major medical problems include one or more of the following diagnosed conditions: heart problems, diabetes, chronic obstructive pulmonary disease, back pain, migraines, hypertension, asthma, allergies, cancer, past stroke, arthritis, depression, heartburn, high cholesterol, irritable bowel syndrome, kidney disease, osteoporosis and chronic pain.
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## About PricewaterhouseCoopers

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