



Health is one of our most basic needs. It is said that it is the greatest possession, the first liberty, the basis for hope, and the ultimate blessing. Life expectancy has increased steadily over the past century with the advent of treatments for infectious diseases, which used to be the leading cause of death worldwide. This has resulted in a rise in chronic diseases which has also led to initiatives encouraging healthy lifestyles. Contrary to infectious diseases, non communicable diseases are typically irreversible. Their prevention is therefore essential and understanding why such diseases arise has become the cornerstone to the future of healthcare.

Too often, health is not truly appreciated until it is lost. The average Canadian family spends more on transportation, clothing, recreation, insurance and furniture than on health. In fact, Canadians spend almost as much on tobacco and alcohol as they do on their health.¹ Not surprisingly, our health is often left wanting. The average Canadian employee misses seven days of work per year due to sickness and every week, 8.3% of Canadian workers are unexpectedly absent from work for at least a day.² In 2005, there were over two million hospitalizations in Canada - 8.4 hospitalizations per 100 residents.³ In the United States, there are more nurses than waiters, cleaners, truck drivers or elementary school teachers.⁴

Rank	Symptom	Million Visits
1.	Cough:	22.40
2.	Sore throat:	17.50
3.	Skin Rash:	13.37
4.	Vision disorders:	12.97
5.	Knee pain:	12.53
6.	Back aches:	12.46
7.	Gastrointestinal distress:	12.28
8.	Ear infections:	11.29
9.	Hypertension:	10.40
10.	Depression:	10.04

Symptoms prompting the most US doctors' visits in 2000.⁵

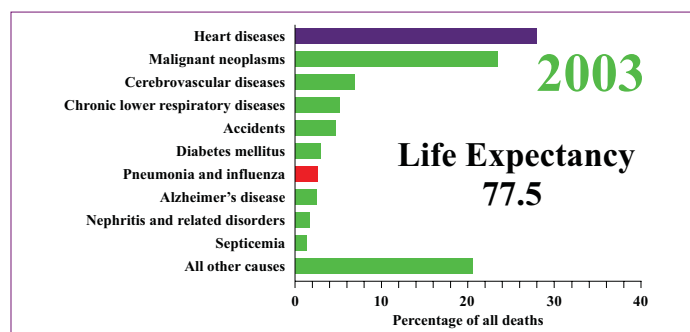
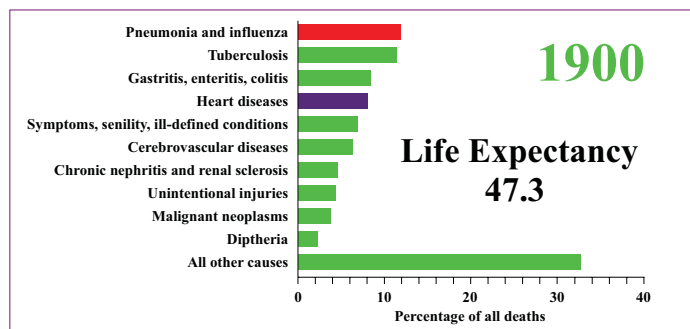
Cardiovascular disease:	64 million	
Hypertension:	50 million	
High cholesterol:	37 million	
Type 2 diabetes:	11 million	
Overweight:	65%	of US population aged 20 or more
Osteopenia:	39.65%	of women over 50
Osteoporosis:	7.2%	of women over 50

Chronic disease incidence in the United States:⁶

The things we worry about...

We wear seatbelts, hold handrails, buy cars with airbags, put on helmets and install smoke detectors in our homes because we all want to feel safe. We are scared of airplanes, public speaking, sharks, heights, terrorists, the avian flu, natural disasters, thunder, bees, snakes and mad cow disease... The problem is that on the grand scheme of things, accidents are not a major threat to us when they are compared to the leading causes of death.

We worry about the wrong things. Accidents are unpredictable and largely out of our control but chronic diseases which are the leading cause of death in North America are preventable.



Causes of death in the United States in 1900 and 2003.

Why do we become ill?

The traditional medical approach has been to look at how a disease develops. For instance, we know that heart attacks are caused by the occlusion of blood flow to the heart... but why does this occur? Understanding why diseases develop is essential to their prevention.

Life is only concerned with the survival of the species. This means that traits which promote the continuance of life are "naturally selected". As life evolved, the traits that favored successful reproduction and survival were passed on to future generations. Disadvantageous traits were selected against and eventually disappeared. Changes, although very slow, continue to occur in our physiology. For example, trends towards smaller molars and lower bone densities have been noticed in contemporary humans.⁷ Present day Europeans and Asians have bones that are 20 to 30% lighter than their ancestors from 30 000 years ago.⁸ The reason behind such a change is simple: bigger teeth and stronger bones offer no advantage because we do not need to chew as much and are less likely to suffer from bone fractures in our youth than our ancestors.

Shadows from the Past

Even though evolution can be driven by random mutations, there are no coincidences. The genes we possess today have gone through a use-it-or lose-it screening process. The diseases and illnesses we suffer from today can be understood by comparing what nature dictated in the past versus how we live today.

It is also important to realize that a gene has a multitude of effects and a specific disease may prevent another. There are several examples of such disease preventing other disease interactions.⁹ For instance, elevated uric acid levels in the blood as seen in gout provide additional antioxidant protection (uric acid is an antioxidant)¹⁰ and prevent the development of MS.¹¹ Sickle cell disease protects against malaria.¹² Cystic fibrosis reduces the likelihood of contracting tuberculosis¹³ and severe diarrhea.¹⁴ Phenylketonuria and type 1 diabetes may reduce the probability of miscarriages.¹⁵ Every disease, anatomical structure and physiological process can be rationalized by examining the costs and the benefits associated with it.

Interfering with complex disease interactions and mechanisms which appear to be counterproductive may not be in our best interest. For instance, diarrhea is a protective mechanism that helps to eliminate toxins and bacteria from the gastrointestinal tract. Patients given anti-diarrheal medication take longer to recover.¹⁶ Similarly, fever optimizes the immune response¹⁷ and anti-fever medications prolong illness in subjects infected with influenza A.¹⁸ Aspirin and acetaminophen increase nasal symptoms and lengthen the period of viral shedding (and therefore contagiousness) in rhinovirus-infected individuals.¹⁹ This suggests that the usefulness of these treatments should carefully be assessed. Evolution dictates that such mechanisms have been selected because they are beneficial. Although anti-fever and anti-diarrheal medications provide relief while we are sick, they also appear to keep us sick longer.²⁰

The disease of aging

Natural selection favors genes that maximize reproduction even if they compromise health and longevity.²¹ Aging is eventually fatal for all of us but if we did not age, probability dictates that half of us would live to 693 and 13 percent of the population would live to be 2000 years of age.²² This would lead to a phenomenal increase in the population which would not be able to sustain itself.²³ This explains the high birth rates seen in populations with high mortality rates and vice versa. The other important cause driving the aging process revolves around the costs and benefits that are associated with specific genes. Genes have a multitude of effects and those that are beneficial early in life may cause disease later on.²⁴

Aging is biologically controlled, with strong evidence that oxidation, glycation and methylation are closely associated with premature disease and the acceleration of the aging process.²⁵⁻³³ This explains why healthier lifestyles increase health span and longevity.^{34,35}

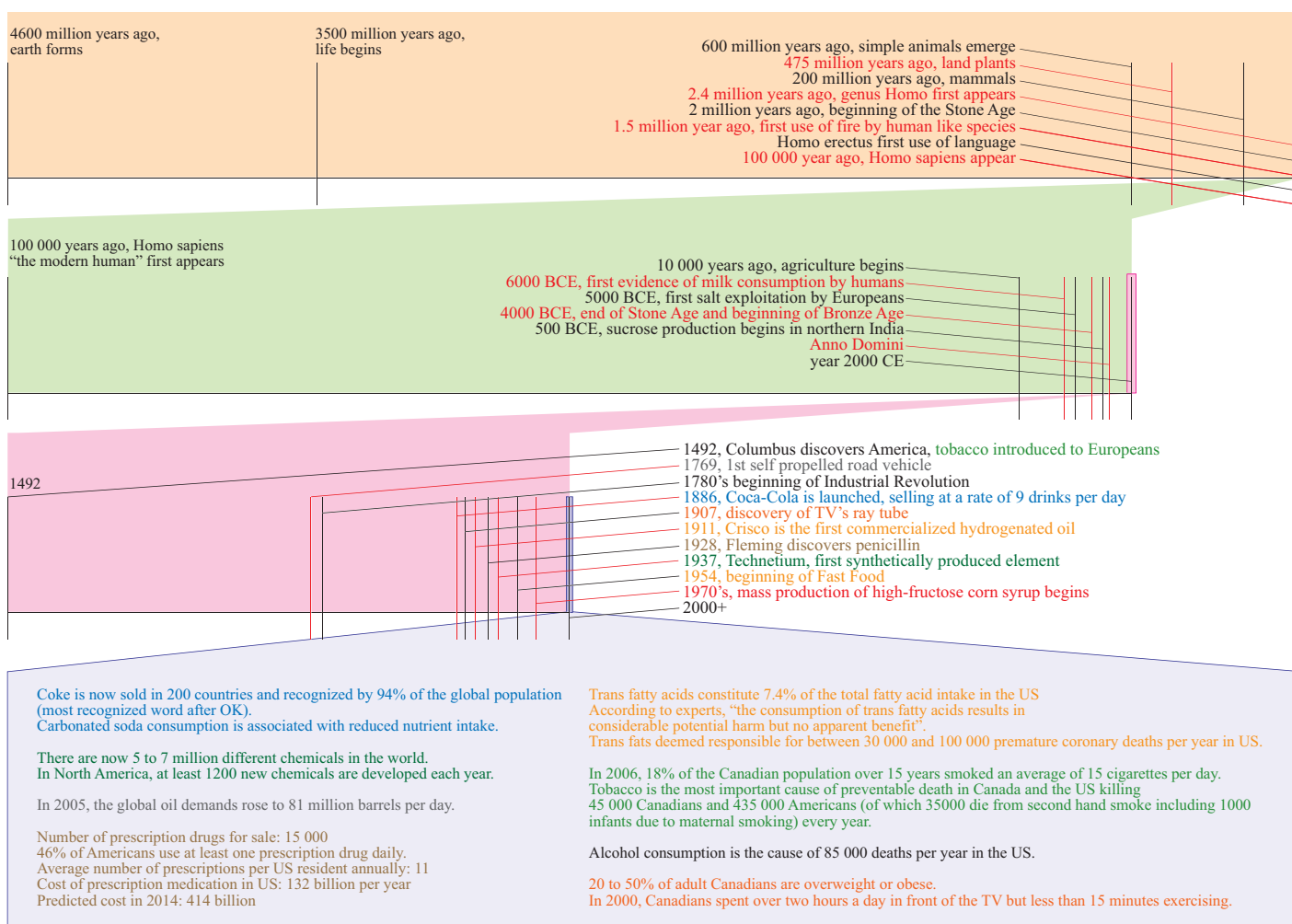
When maladaptation becomes the norm

Humans have thrived because of our seemingly infinite ability to adapt. Unfortunately, our relatively recent ability to modify the environment has changed our surroundings at a pace that is far too rapid for adaptation. This has resulted in our present state of health. Although we live longer than ever before and enjoy comforts previously unimaginable, we are also plagued by degenerative disorders and for the first time in recorded history, upcoming generations may well see shorter life expectancies.³⁶

According to evolutionary medicine, disease is caused by maladaptation - an event that occurs when an organism does not possess the genes suited for its environment. For example, sickle cell, which protects against malaria,³⁷ is of little benefit in countries where malaria is not present. In such cases, sickle cell is detrimental and represents a maladaptation.³⁸

If the environment changes rapidly, a large segment of the population becomes maladapted. A good illustration of this phenomenon is myopia. Can you imagine the disadvantage associated with shortsightedness prior to the availability of corrective lenses? The evolutionary selection against such a trait would be immense. The prevalence of myopia reaches close to 40% in some developed countries³⁹ but is rarely seen in hunter gatherers.⁴⁰

The evolution of life and disease



A study done in Singapore showed that as the education level increases, so does the incidence of myopia. The study demonstrated that in young men with no formal education, the prevalence of myopia was 15.4% but reached 65.1% in university graduates.⁴¹ This phenomenon is probably caused by a simple mechanism which stimulates the growth of the eye to ensure that vision remains focused. Close work would therefore lead to the formation of a visual focal point that is adapted for close work at the detriment of far sight. Myopia is a clear example of the health impact associated with maladaptation.

The problem is that evolution occurs over thousands of years and until recently our ancestors were hunters and gatherers.⁴² Unfortunately, our modern technological advances have changed our environment so rapidly that we are left with genetic traits that are suitable for a very different environment.⁴³

Our diet - past and present

For hunter-gatherer populations, the securing of food would have been the main purpose of life - starvation, malnutrition and irregular nutrition would have been common in such populations.⁴⁴ In today's developed world, changes in food staples and food processing have lead to a diet that is very different than that of our ancestors.

There are several consequences to these changes, one of which is an increase in the glycemic load. The glycemic load represents the effect of food on blood sugar and therefore insulin levels in our body. Carbohydrates, especially refined grains and sugars, have high glycemic loads and their consumption eventually leads to insulin resistance, a significant factor in the development of several diseases of civilization such as obesity, cardiovascular diseases, diabetes, hypertension and elevated blood lipid levels.⁵² Obesity alone is responsible for an estimated 350 000 deaths per year in the United States.⁵³

Major changes to human diet in the recent past:⁴⁵⁻⁵⁰

Highly refined grain flours, unavailable 200 years ago, now contribute 85.3% of the cereal and 20% of the total energy of the average US diet.

Fiber content has decreased from an estimated 42.5 g per day to 15.5 g per day.

Refined sugar consumption, estimated at 2 kg per person per year (from honey) in hunter-gatherers, has climbed from 6.8 kg in 1815 to 54.5 kg per person per year in England today.

90% of the salt intake in the US diet is added to the food supply. With refined salt, sodium consumption went from ~768 mg per day to ~4000 mg per day in Americans.

From 1909 to 1999, salad and cooking oil consumption increased by 130% in the United States, shortening (lard) consumption increased by 136% and margarine by 410%.

Animal fat consumption has increased from 8% of total calories in the 1960s to 13% in the 1990s.

In the United States, the greatest health threat to the population comes from the development of chronic diseases related to the diet.⁵¹

The type of fat present in the diet is also crucial for health and probably more important than the amount of total fat present in the diet.^{54,55} Unsaturated fats are beneficial whereas saturated and trans-fats are detrimental, especially when consumed in excess. The ratio of omega-6 to omega-3 oils is also important for health.⁵⁶ This ratio has now reached a 10-20:1 proportion whereas ancestral diets probably approached a more reasonable 1-3:1 ratio.⁵⁷⁻⁵⁹

Another serious consequence of eating more refined foods is a reduction of the nutrient density of the diet. Refined sugars are devoid of any nutrients and constitute empty calories. Refined vegetable oils also provide little nutritional value. Together, refined oils and carbohydrates contribute 36.2% of the energy in the average US diet.⁶⁰ The consequences of a reduction of the nutrient density of the diet have led to inadequate nutrient intakes in a large proportion of the population (see figure 1).

72.1% of the energy in the US diet comes from food which would not have contributed to the diet of our ancestors.⁶² This has led to diets that contain fewer amounts of antioxidants, fiber, vitamins and phytochemicals compared to hunter-gatherer diets.⁶³ It is probable that our preagricultural diets contained two to ten times more micronutrients.⁶⁴

Supplementation - a modern day necessity

Given the limitations of the 21st century lifestyle and the current dietary nutritional content, good quality nutritional supplements can be used to meet nutrient requirements and to improve the nutrient concentration of the diet. As already mentioned, the nutrient density of our diet has suffered from the addition of refined food products such as sugar and oils. This problem is further aggravated by modern farming techniques which have also depleted the nutrient supply. (See figure 1)

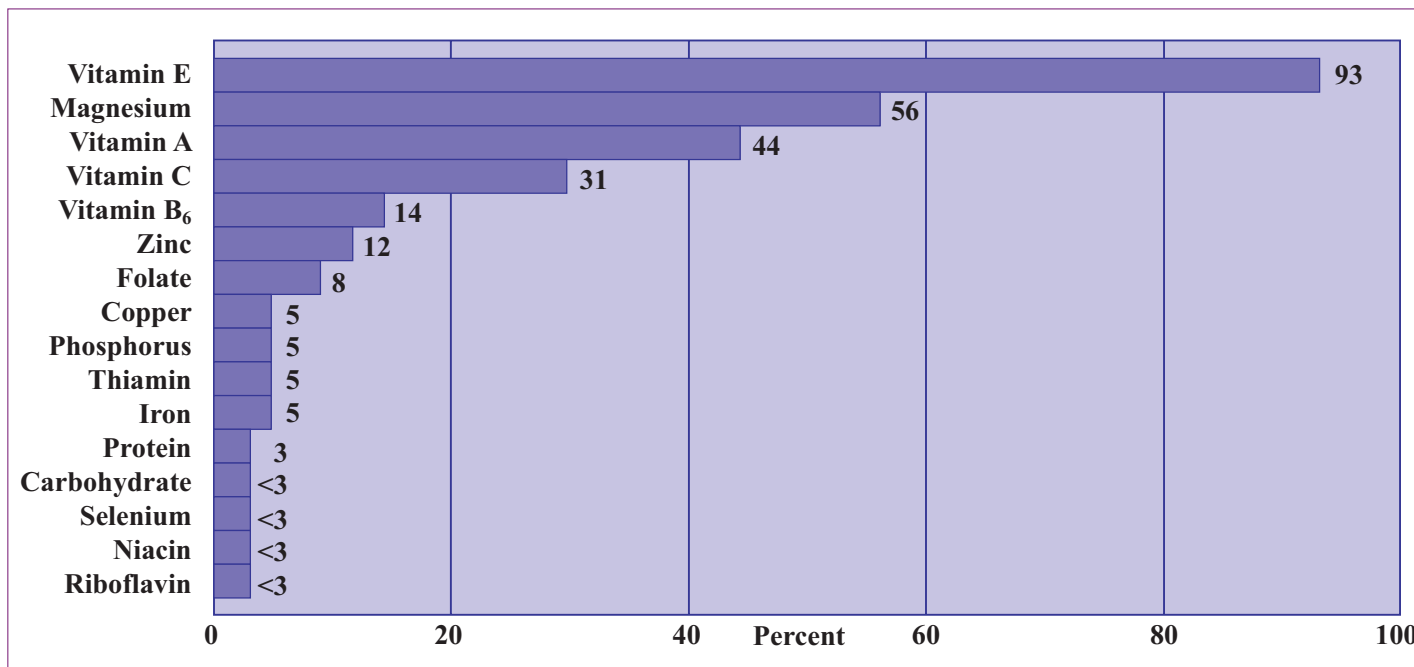


Figure 1: Percentage of Americans with Inadequate Intakes from Food Based on Estimated Average Requirements.⁶¹

Percentage change in the nutrient content of fruits and vegetables in Canada between 1951 and 1999.

Food	Calcium	Iron	Vitamin A	Vitamin C	Thiamine	Riboflavin	Niacin
Apple	20.0	-55.3	-41.1	16	-75.0	-66.7	-30.0
Banana	-23.8	-41.7	-81.2	-13.0	0	-100.0	-1.4
Broccoli	-62.8	-33.9	-55.9	-10.1	-40.0	-42.9	-2.7
Onion	-37.5	-52.9	-100.0	-54.8	56.9	-41.2	135.3
Potato	-27.5	-58.6	-100.0	-57.4	-14.6	-50.0	44.9
Tomato	-55.7	-18.8	-43.4	-1.6	0	21.8	46.3

source: Health Canada, compiled by Jeffrey Christian

Based on population studies and examinations of our dietary past, there is strong evidence suggesting that you may not be able to get all the nutrients you need from the food you eat. Reductions in the nutrient density of the diet has left the majority of the United States population with nutrient intakes not meeting the recommended intake levels, vitamin E being the most blatant example with an estimated 93% of the population below the Estimated Average Requirements (EAR) (see Holistic International, Volume 1 Issue 4 available online at www.aor.ca for more information on the importance vitamin E). This is a clear indication that dietary changes must be recommended and that fortification and supplementation are currently needed to fill this nutritional gap.

Humans have thrived because of our seemingly infinite ability to adapt. Unfortunately, our relatively recent ability to modify the environment has changed our surroundings at a pace that is far too rapid for adaptation. This has resulted in our present state of health. Although we live longer than ever before and enjoy comforts previously unimaginable, we are also plagued by degenerative disorders and for the first time in recorded history, upcoming generations may well see shorter life expectancies.⁶⁶

Health is simple. How we should be taking care of ourselves is based on how we have lived for thousands of years, which means that we should exercise more, eat fresh and unprocessed food, supplement our diet and maintain a healthy weight. We already know this and still 20% of us smoke and the vast majority of us do not meet our basic nutritional needs. Hopefully understanding why we must take better care of our health will give us the will to act accordingly. Whereas in the past, infectious agents posed the greatest threat, you are now the largest determinant of your health. You must stand up for yourself or endure the consequences and risk losing your greatest possession.

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