

Life expectancy in the world

Canada : 81.2 years. (82)
Ranked 8th in the world.

Average worldwide : 66.6 years.
Ranked 159th in the world.

Approximately 30 to 35 years in recorded history. (Stone Age)



In the last 6,000 years.

Only important people are in the recorded history.

Most improvement in life expectancy has happened in the last 150 years.

Science started in 1850

Life expectancy



Then vs Now

In 1900 the life expectancy was 44 years.
In 2004 life expectancy was at 82 years.

Death reason in 1900

Pneumonia (water in the lungs)
Tuberculosis
Influenza

Death reason now

Heart condition
Cancer
Stroke

Nowadays body wears out.

Diseases affects the quality of life

Back in the day we used to live with fleas and worms

It's not about how you live but the quality of life.

Things to improve life quality

Sanitation (outhouse, pots, sewer)

Clean water (guinea worm in poor countries)

Refrigeration (spoilage, they used ice box to store food in the winter)

Vaccination

Antibiotics

Greatest achievement in medicine

Vaccines (immunization)

Successful for viral diseases.

Small pox (scar vaccine)

Eliminated in 1977

Only exist in labs or biological weapons

Gene sequence found online.

Polio

North America

Less than 1000 cases in the world today.

10 or 11 countries.

Antibiotics is good to fight bacterial infections.

Penicillin reduced maternal mortality (1930)

Drug market in North America

300 billion prescription

25 billion over the counter medicine

United States 49.1 % in world drug market.

Types of medical treatment

Surgical : removal of modification

Medicinal : use of medical (chemical) compound to treat disease.

Source of medicine are plants

Plants use chemicals to defend themselves



Poison from plants used as medicine

Early drugs were poison

Drugs : desired biological effect (beneficial)

Poisons : undesired biological effect (harmful)

Poison $\xrightarrow{\text{Doses}}$ Drugs

Poison : kill

Potion : cure

We assume that the lower the doses the more beneficial it is.
The higher the dose the more harmful it is.

Sometimes it's the opposite in the case of insulin for diabetes

Discovery of drugs

Observation and experiment (rare way)

Used as main method today

Philosophy

Based in belief

Healing connected with superstition, religion, magic

Cured arrived at by reasoning

Only as good as information based on.

Drugs from observation and experiment

Strong : easily identified

Poison : low dose makes it into a drug

Weak poisons : large quantity for effect

Hippocrates 460-370 BC

Father of medicine

Promoted experimental methods

Rejected superstition and religion from healing

Opium for pain

Extracted from poppy seeds.

Narcotic pain killers

Sedative

Toxic in high doses

Drug in low doses

Poppy juice makes babies stop crying *

Cocaine as a stimulant

Coca leaves

Topical pain killer

Stimulant

Quinine (malaria treatment)

Quinine Peruvian bark was once more valuable than gold

2nd deadliest infection in the world (malaria)

* tonic water contains quinine

Problems with observation

The brain searches for patterns

Anecdotal evidence is unreliable

Once evidence is available it is hard to contradict

Harmful remedies retained because of anecdotal evidence

Parent cold remedies.

Apophenia : seeing patterns or connections in random data

Pareidolia : sounds or images as something else

Only experimental evidence is reliable.



Measurement

Measure properly

Accurately

Must rely on statistical significance



Collect data from large number of experiments
Average and trends

Problems with herbal treatments

Poor control over dose
Plants produce an active amounts of ingredients

Ex : dark vs light strawberries

Variation in preparation and administration
Raw vs cooked
No instructions (verbally, imprecise, poor reproducibility)

Philosophy to identify cures



Cured arrived by reasoning (made up)
Good information (proof)
Healing connected magic, religion, etc.

Doctrine of humors

Hippocrates was the founder
Earth, fire, air, water

Body : blood, phlem, yellow bile, black bile.

4 humors are balanced.
Too much or not enough causes disease.



Rebalancing humors by
Bloodletting
Leeches
Vomiting



Harmful and painful

Doctrine of signatures

Founder Jacob Bohme (shoemaker)
He believes that :

God left clues in things
Diseases + cures are linked

Things that resemble the body parts believed to help the specific part.

Ex : walnuts resemble brains

Sharks can't have cancer (myths)
Cartilage : cancer treatment.

Breath mints have chlorophyll (clorets)



All sugar, chlorophyll is the last ingredient list

Mythes

Fresh breaths. → Parsley → Green. → Chlorophyll → Freshens breaths

Mandrake roots

Medicinal and magical use
Cure devil possession
Use dogs to remove mandrake from ground to preserve their magic

Rhino horns

Phallic symbol
Powdered rhino horns used as aphrodisiac medicine

Mercury heavy liquid

Used as purgative

Doctrine of signatures was bullshit

Most remedies were harmful
At best they were harmless
Lack of evidence
Based on appearances (avocado looks like pregnant women to therefore good for pregnancy)



Shapes and meaning are limited by our imagination.

Some problems required surgery

Amputation without anesthetic
Done quickly while holding the person down
V cut shoes us the correct way to amputate someone.

Sir Humphrey Davy discovered nitrous oxide (less pain and was a propellant)

William T.G Morton and ether in 1846

Anesthetic makes modern surgery possible
Back in the day without anesthetic only 30% survived surgery (infections)

1860 the bacteria was discovered

John Lister used phenol as antiseptic

Carbolic acid sprayer was used in surgery and sprayed in area to prevent infections
Higher rate of survival and good for patients
Down side it was toxic to doctors

Wasting and gloves was safer.

Lister → Listerine
Listerine was used as dandruff remover back in the day
Today listerine no longer contains phenol.

Problems with drugs in 1800's

No regulations
Had more chances of fraud
Big markets

These problems always existed

Science and fraud

Patented means nothing
Scientifically proven

Science made is easier to identify fraud

1862: sugar and alcohol in wine.
1873: morphine content in opium
1874: first experiments in the effects of pesticides in humans

World War II

Humans experiments and torture on humans was allowed

Patent medicine in late 1800's

Mrs willow soothes with opium

Kickapoo Indian oil cures all with alcohol (Michigan company)

Alcohol doesn't cure only makes someone feel better and happy

Great radium spring water

Radiathor founded by William J.A Bailey



Radiation salt kills cancer cells.

Eben M. Buyers was a believer in radiathor. He consumed some everyday
Had to get part of his jaw surgically removed because of radiation.

Medicinal death lab

Board of food and drug inspection in 1907
Labelling only

Patent medicine today

Cold-Fx
Buckley's

Massengill company and drug safety 1930's
Sold sulfaminalide (antibiotics) as powder.
Parents wanted in in liquid for for kids to be able to drink



Was dissolved in ethanol (elixir)

Government inspectors recovered 234 of 240 gallons of elixir

The FDA was created to ensure safety, animal safety testing, clinical trials and direction to use on label.

Thalidomide

Sedative in 1957 and had few side effects.
In 1962 it was discovered as teratogen (phocomelia)
Was never marketed in the United States



Found before FDA approved was given

Pregnant use led to birth defects and still birth miscarriage.
Greek word for thalidomide is teratos meaning monster
It was tested on rats and rats produce less birth defects

Safety standards

Testing 2 species
One has to be a primate
Gets into the body
Must use relevant doses
Must show that drug is bioavailable

Changes in genetic engineering

Replaced many animal testing
Facilitates drug discovery
Safest source of human protein



Genetic engineering
800 billion dollars develop
Idea to market requires up to 8 years
High risk

Source of drugs today

Bio 14%
Vaccine 4%
Natural 5% (used mostly back in the day)
Semi synthetic 23%
Synthetic 54% (artificial)

Extracts plants/animal
Very popular to use but has a supply and demand problem

Drugs are computer made and usually found by random screening (best method involving luck)

1 in 10 drugs survives in the market (high failure rate)
10 000 compounds testing new drugs