

Life Expectancy / only dose makes the poison

Sunday, January 10, 2021 8:34 PM

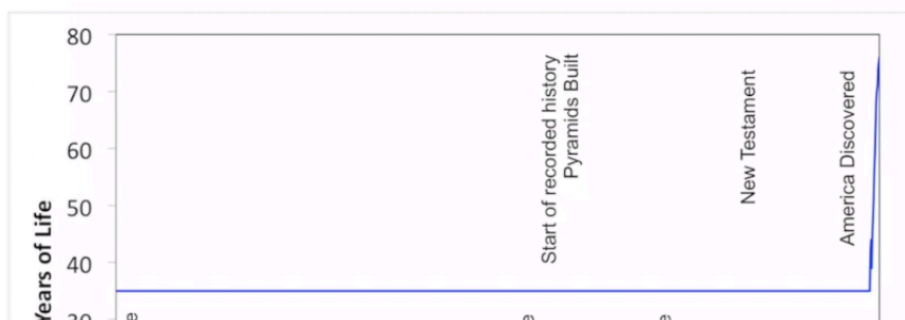
Life expectancy (2009)

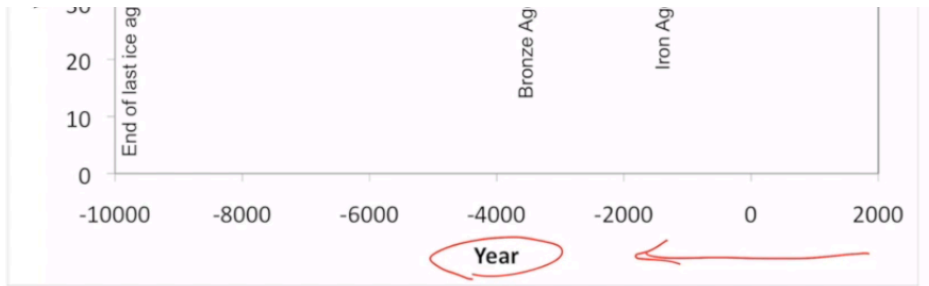
Rank	Country	Years of Life
1	Macau	84.4
2	Andorra	82.5
3	Japan	82.1
4	Singapore	82.0
5	San Marino	82.0
6	Hong Kong	81.9
7	Australia	81.6
8	Canada	81.2
9	France	81.0
159	World Average	66.6
224	Swaziland	31.9

Through History

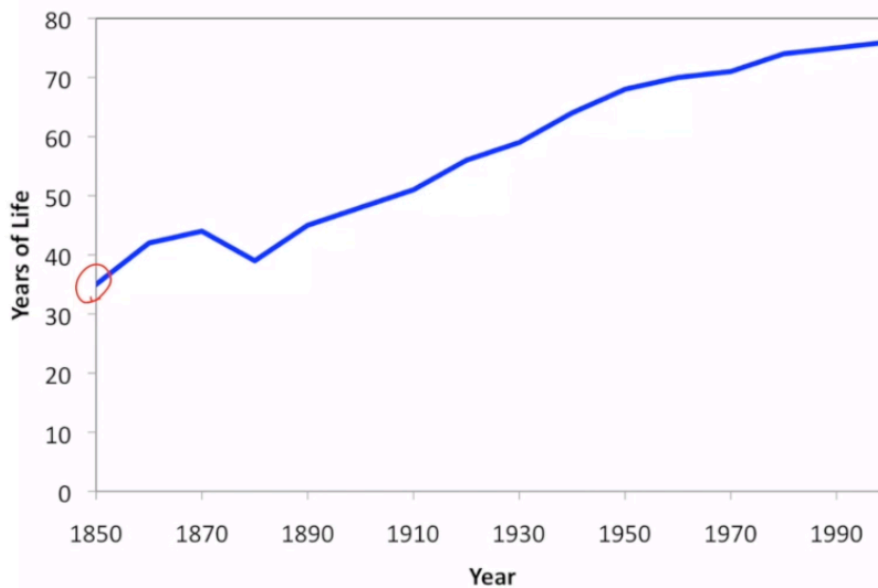
- Approx 30-35 years for the most of recorded history (last 6,000 years)
- Approx 30-35 years through the stone age (500,000-6,000 years ago)
- 82 years in 2009 (Canada)
 - Most improvements over the last 150 years

Life expectancy through history





Canada - Increase only in the last 150 years



Life in the "good old days"

- Harsh
- Cruel
- Short

We would expect to endure illness, hardship

- Disease was common and dangerous (sick the vast majority of the time)

Peoples used to carry parasites (lice and fleas, worms)

- We've eliminated a lot of these now, it still happens but very rare

Improved quality of life in Canada

- 1900
 - 44 years
- Main causes of death
 - Pneumonia
 - Tuberculosis
 - Influenza
- (this lasted until 1950's)
- 2004
 - 82 years
- Main causes of death
 - Heart disease
 - Cancer
 - Stroke
 - Lower respiratory infection
 - Traffic accidents
 - Diabetes

50-60% of deaths in Canada are from heart disease, cancer, stroke

Main reasons for improved health (scientific method)

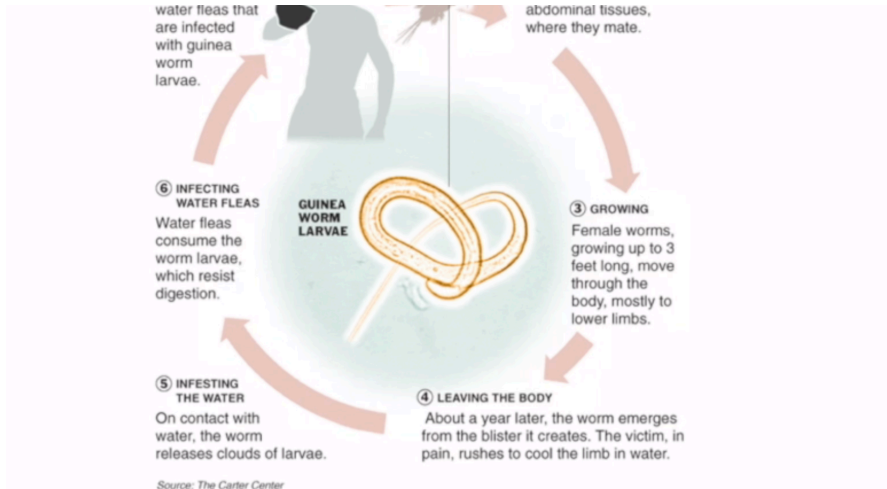
- Improved sanitation
 - Toilets separating people from waste (disease)
 - Before: outhouses, chamber pot, open sewers (200 years ago - closed sewers)
 - Health care workers separating people from the dead
 - Before: populations were exposed to dead and dying (carrying them out to the cart)
- Clean drinking water
 - Safe water supply (Some of the safest in the world)
 - Nature does not make pure water (things live in the water)

Guinea worm - dracunculiasis (Tropical Africa)

Guinea worm life cycle

The Life Cycle of Guinea Worm

- 
- ① ENTERING THE BODY
Person drinks water containing tiny
- WATER FLEA
- ② MULTIPLYING
The fleas are digested, releasing the larvae into



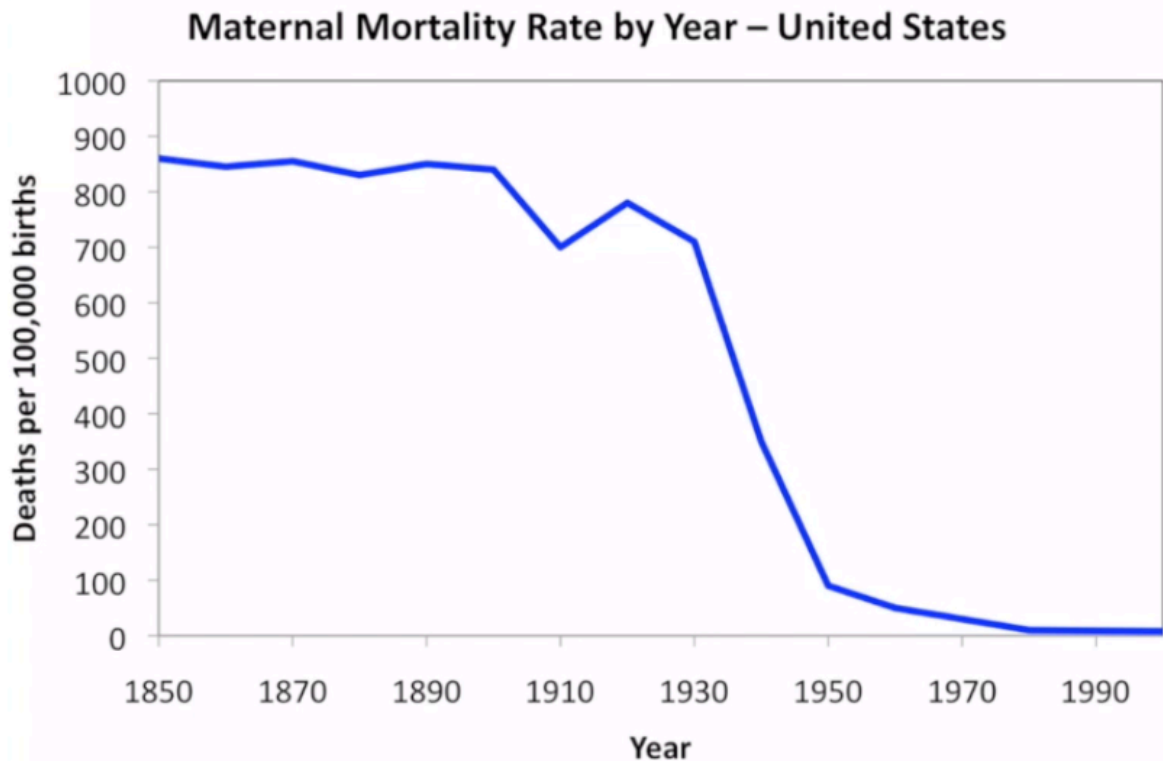
- Worm bursts out with secretion that amplifies pain
- Simple water treatment makes the difference
- **Major improvement is chlorination** (acts as a preservative)
- Refrigeration
 - Food spoilage was common before refrigeration (having to eat rotten food)
 - Refrigeration has given us seasonal availability and high quality food supply
 - Modern food storage year round

Pharmaceuticals improve health

- Vaccination
 - Greatest achievement in medicine
 - Very successful for viral diseases
 - Small pox
 - Eliminated in 1977
 - Only exists in labs and biological weapons
 - Polio
 - Eradicated from North America in 1991
 - Can only be found in 2 countries
 - Currently less than 30 cases world-wide. Over 300,000 cases in 1998
 - Major eradication barrier is politics
- Antibiotics
 - For bacterial infections

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Penicillin reduced maternal mortality



Modern drugs work

- Each starts with a scientific idea
- Each is optimized using scientific methods
- Each is tested scientifically

North American drug market (2016)

- Prescription drugs
 - \$470 billion
- Over-the-counter (OTC) drugs
 - \$35 billion

World drug markets (2019) (Billions)

United States	\$ 500
China	\$ 95
Japan	\$ 79
Germany	\$ 51
France	\$ 35
Italy	\$ 31
United Kingdom	\$ 26
Total	\$ 1,100

Modern pharmaceutical industry is young

- Started in 1856
- Uses scientific methods
 - Chemistry
 - Biology
 - Molecular biology
 - Epidemiology
- Works hard to remove bias (objective when evaluating)
- Regulated by government

Most ancient medications were useless

- Made-up cures
 - People believe in magic

- Feel better just by getting treatment
- Only a very small number of treatments actually worked
 - A few of these are still used today (Opium, treatments related to drugs by plants)
- Many treatments actually harmful

Most ancient drugs from plants

- Majority of ancient drugs were derived from plants
- Plants were by far the major source of treatments

Why plants?

- Plants secrete substances that are poisonous
- Plants are rooted in one spot and need to defend themselves in other ways (poisons)
- Poisons are the source of early drugs

Drugs are poison

- Drugs
 - Produce desired (beneficial) biological effect
- Poisons
 - Produce undesired (harmful) biological effect
- Difference: dose that you use , amount administered (Pharmakon)

Sola dosis facit venenum

- Poison - kill
- Potion - cure
- Only the dose makes the poison

Dosages

- Normally we assume
 - low doses produce beneficial effects (drug)
 - High doses produce harmful effects (poison)
- Sometimes
 - Low doses produce harmful effects (poison)
 - Higher doses produce beneficial effects (drug)
 - Ex. Insulin

Dose makes the poison

- Ask " how much"?