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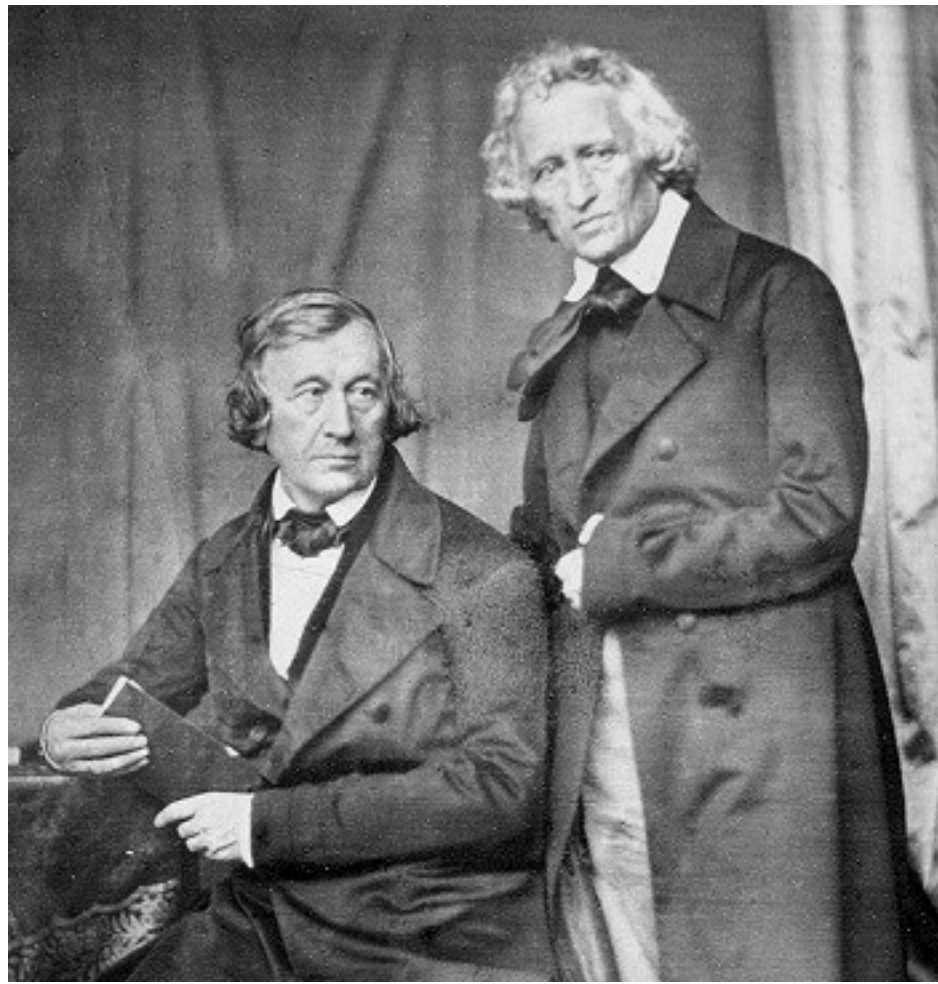
A diatribe on fluoride

The Lords of the Highly Reactive Ion Disposal Scheme

Once upon a time in a
land far, far away



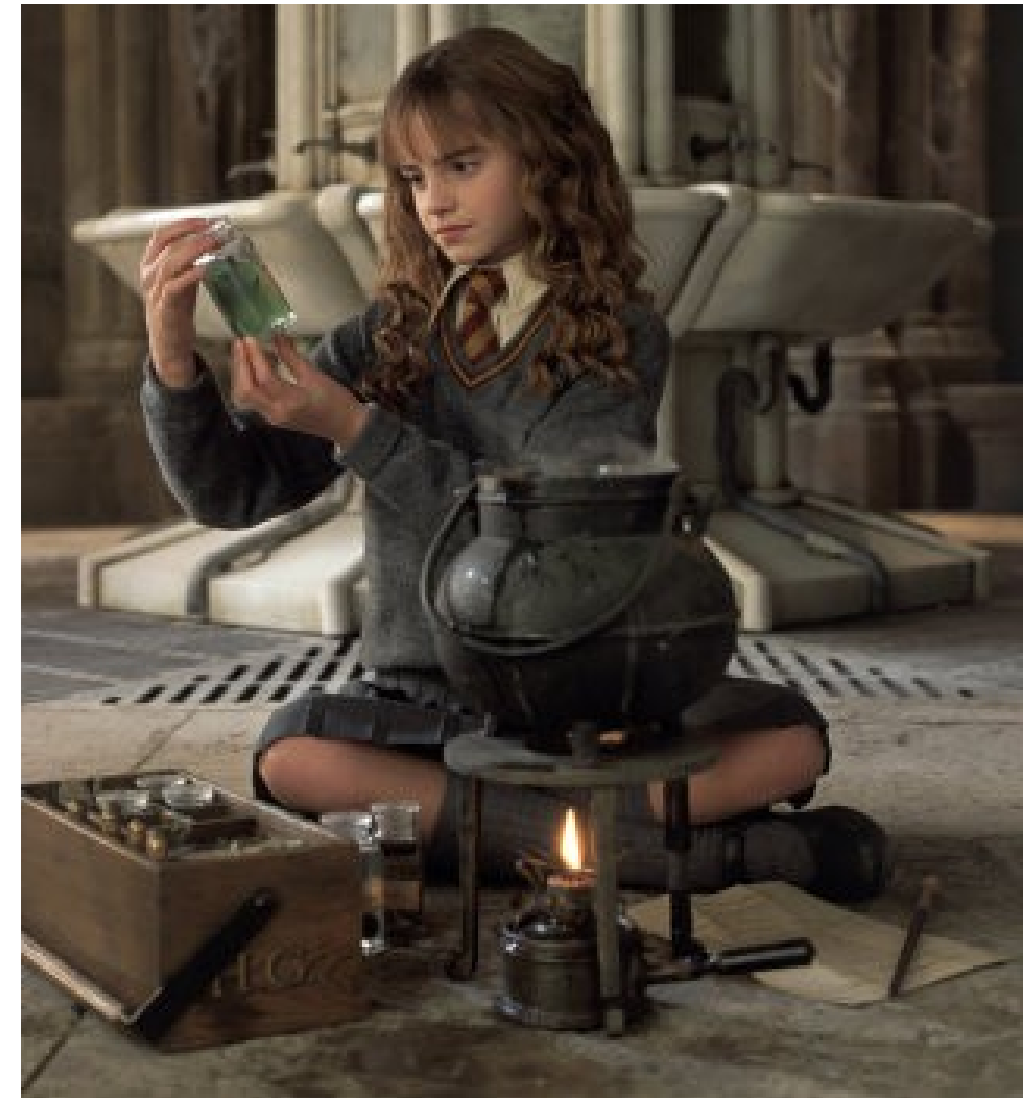
The children in
had ugly teeth



The Brothers Grimm suspected witches

evil water spirits called *fluorides*
were casting ugly spells on teeth

But a potion master found it was
evil water spirits called *fluorides*
were casting ugly spells on teeth

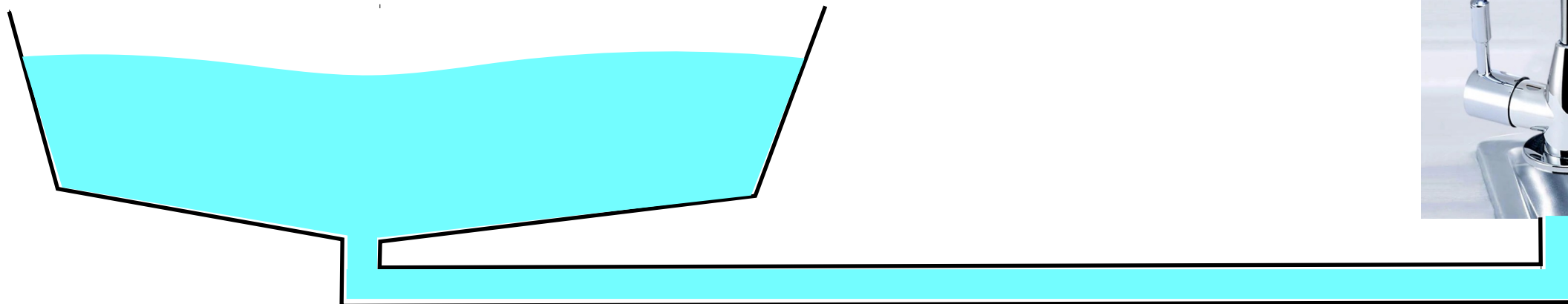


An evil wizard of Isengard heard tell of this,
and thought of his problem with toxic fluoride waste disposal





So he seized control
of the water gods
and added his fluorides to the
streams of the unwary



Such was his might that he convinced his minions
to spread his propaganda, and it was widely believed

And cavities were
reduced
with no side effects at all.
Trust me!



The inheritors of this power fought to ensure his legacy at all costs

Look at this data

**Your time
here is over!**



Fortunately for the hapless scientist, a good wizard restored his life

You must give
him back his
job!



But in the land of US
the fluorides
were still put in the water of the unwary

Hopefully not THE END

The land far, far away

Colorado Springs

Brothers Grimm

McKay and Black - fluorosis = less caries

Potion master

ALCOA scientists find fluoride = fluorosis

The evil wizard

Andrew Mellon - founder of ALCOA and
Secretary of Treasury that included USPHS

Isengard

ALCOA and Florida fertilizer industry

The water gods

USPHS

The minions

EPA, ADA etc.

Frodo

EPA scientist

The spider

EPA minions

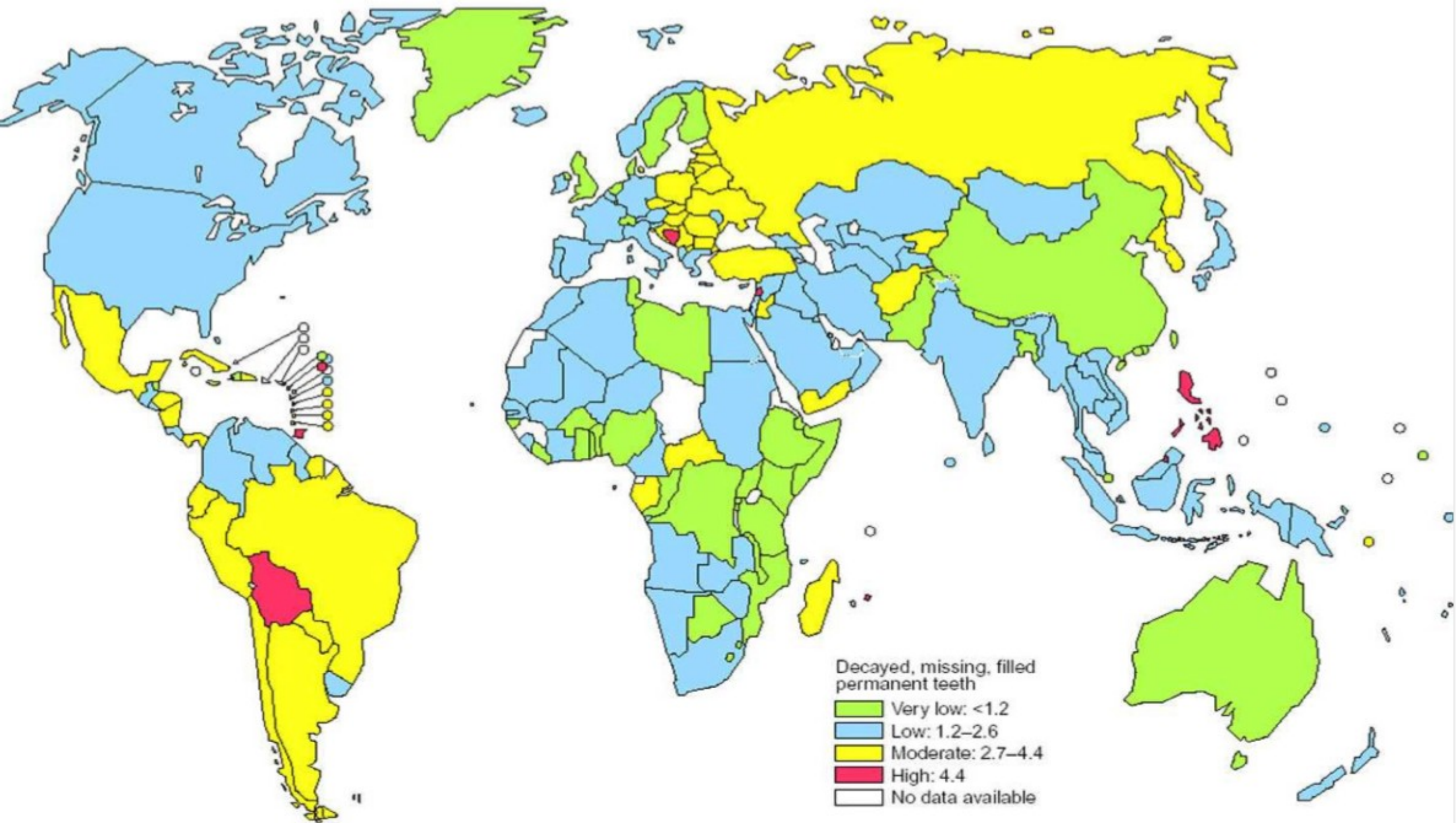
Good wizard

Robert Reich, Secretary of Labor

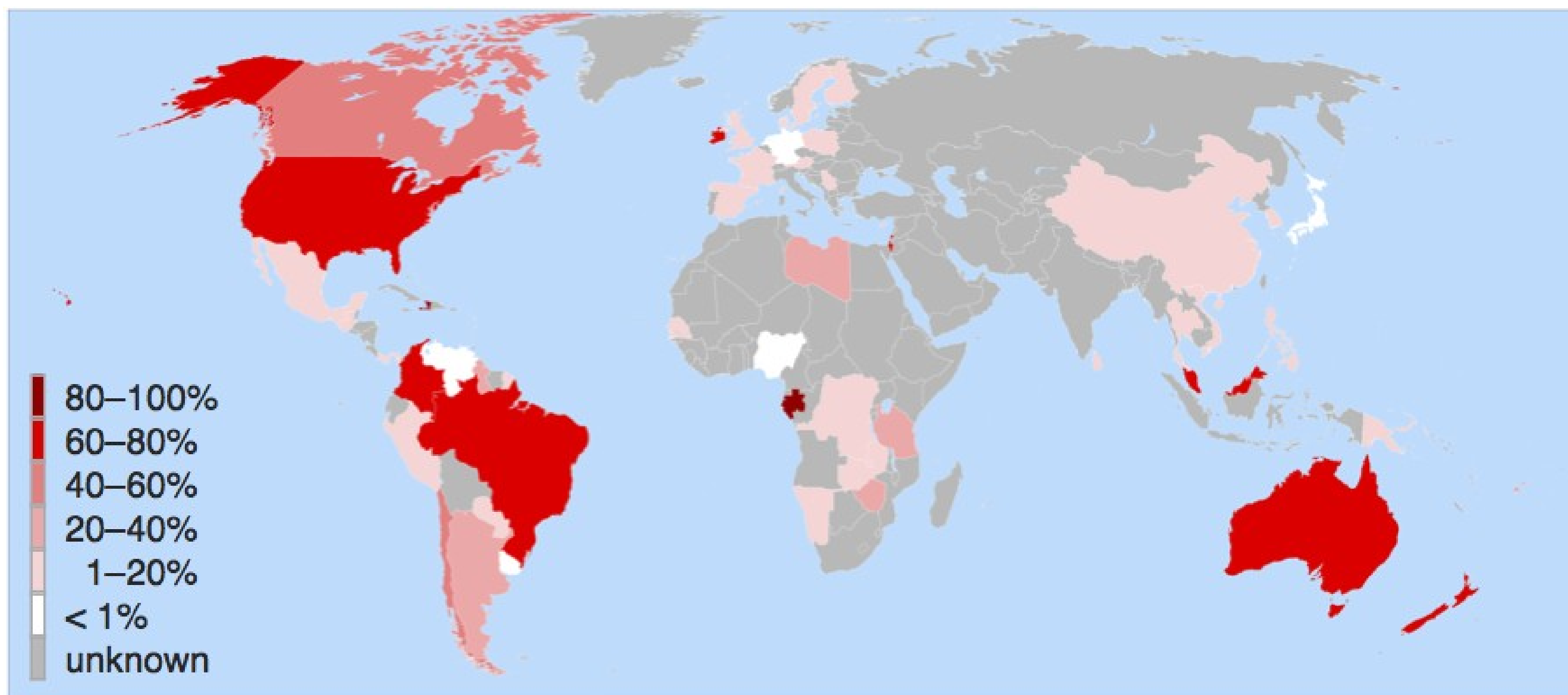


**Does fluoride in drinking water
reduce tooth decay?**

WHO map on caries incidence in children



Global % population with fluoridated water 2009



Cochrane metaanalysis - June 2015

14% increase in children with no decay
in their permanent teeth.
No evidence for a benefit in adults

However, they and others have concluded that studies had a:
“virtual absence of quantitative, statistical methods”
“nonrandom methods of selecting data”
“high sensitivity of the results to the way in which the study
populations were grouped”



Reviewers state their confidence is limited by:
the observational nature of the study designs
and
the high risk of bias within (all of) the studies

Critically they also find that any evidence
is not applicable to current lifestyles (Data is pre 1975)

Most obviously, the adoption of topical fluoride use
(toothpaste) has superseded any benefit of fluoridation

Global reaction these reviews

OK, so not enough evidence for strong conclusions

Stu interpretation = water fluoridation is not evidence based medicine.

USA reaction to review



ADA®

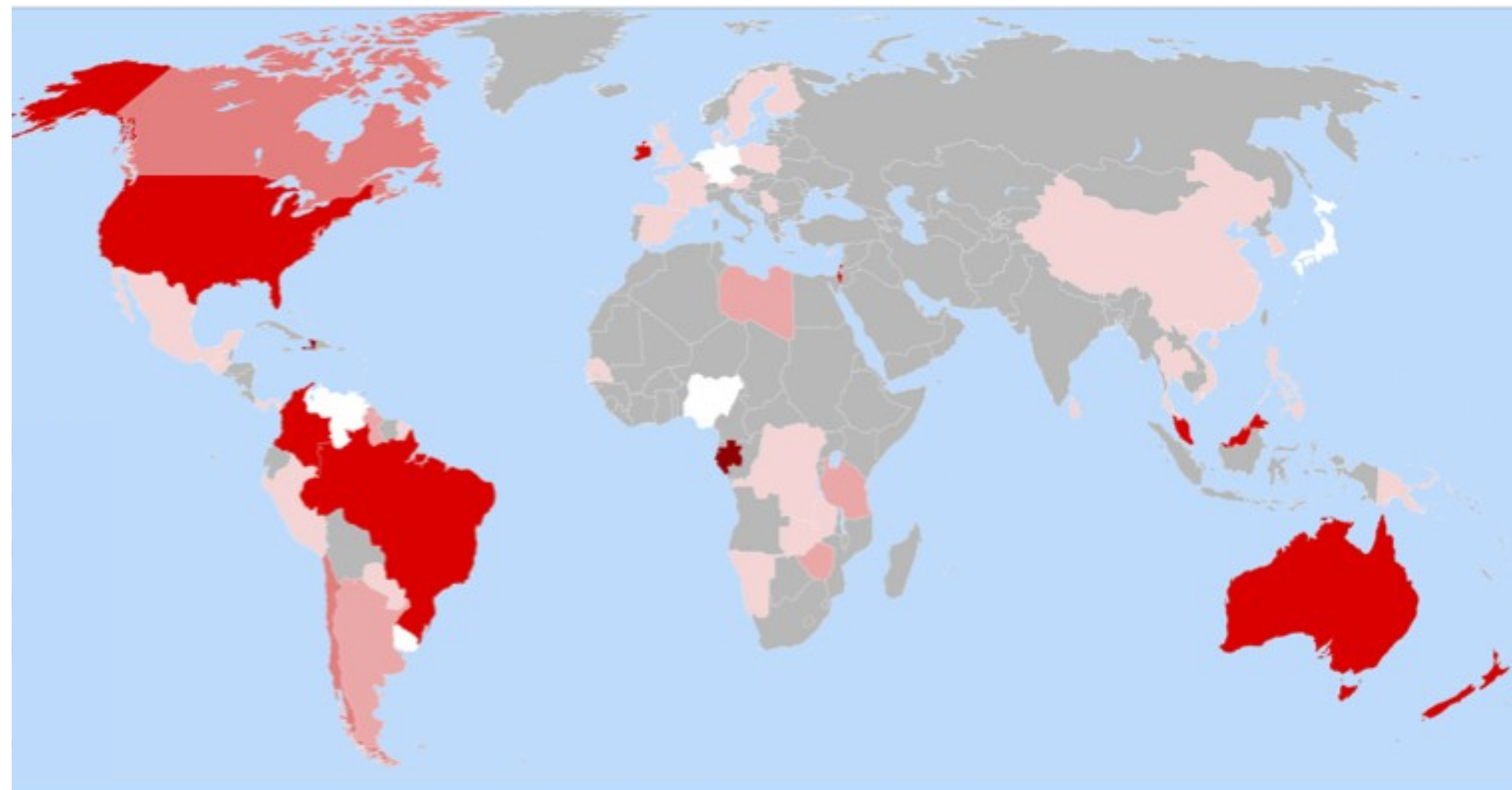
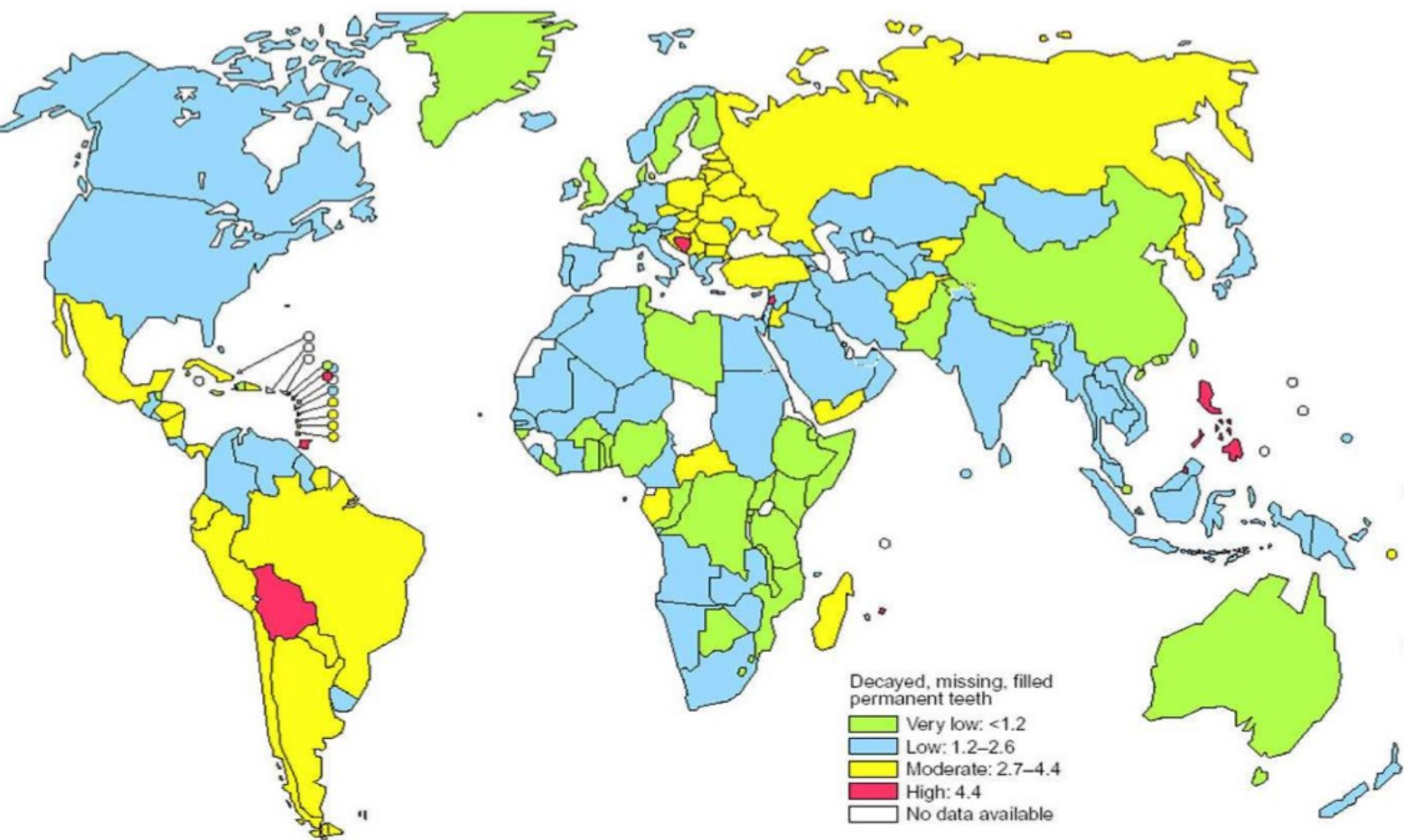
We only care/know
about teeth



We have ignored the evidence
for so long that changing our
stance will make us look bad

Other evidence

Water fluoridation does
not correlate with
reduction in caries



bad science observation by Stu

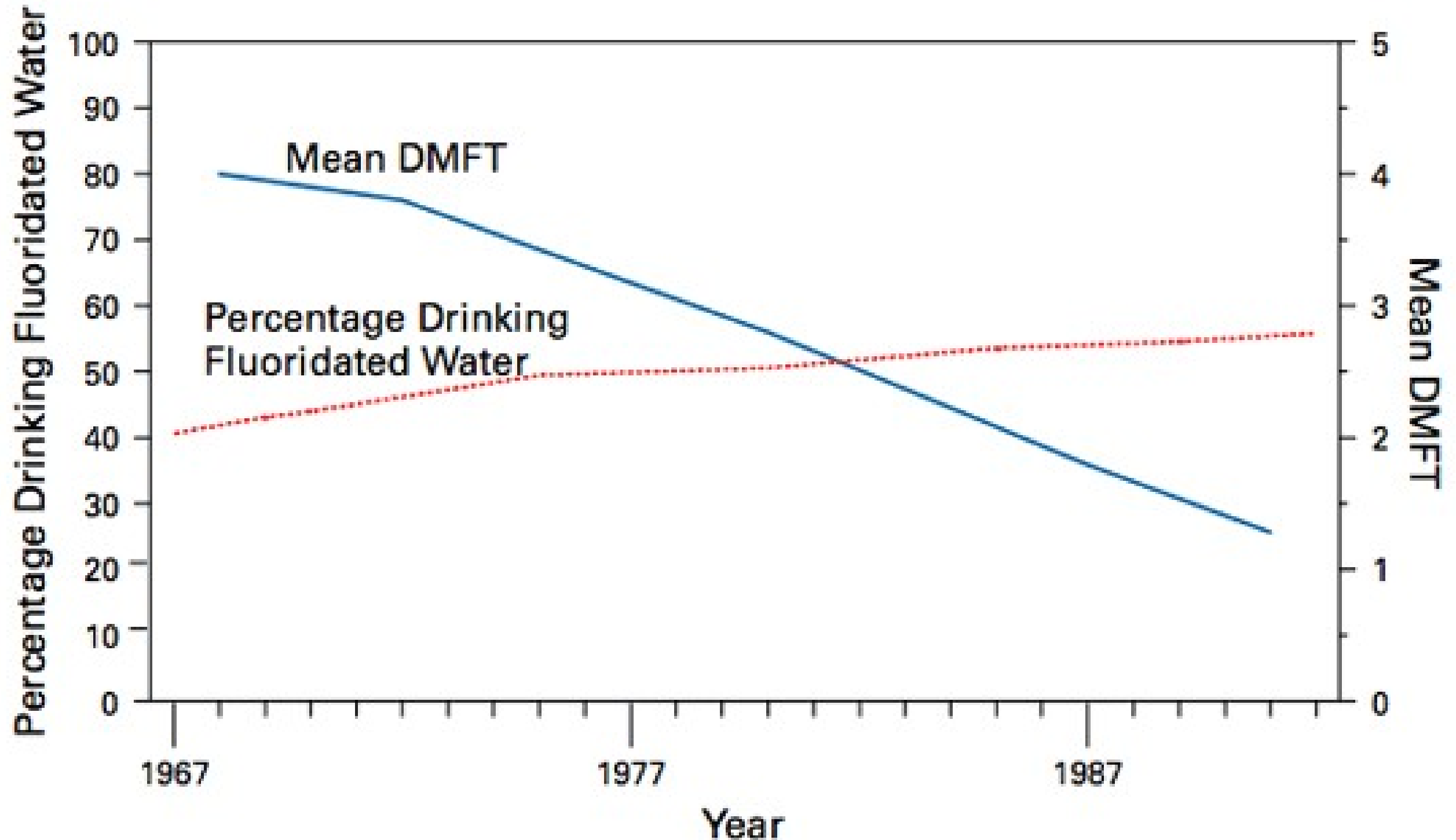
No fluoridation in Northern Ireland

Compulsory fluoridation in Ireland



Data

Water fluoridation does not correlate with reduction in caries
(DMFT = decay, missing, filled)



Data (from WHO)

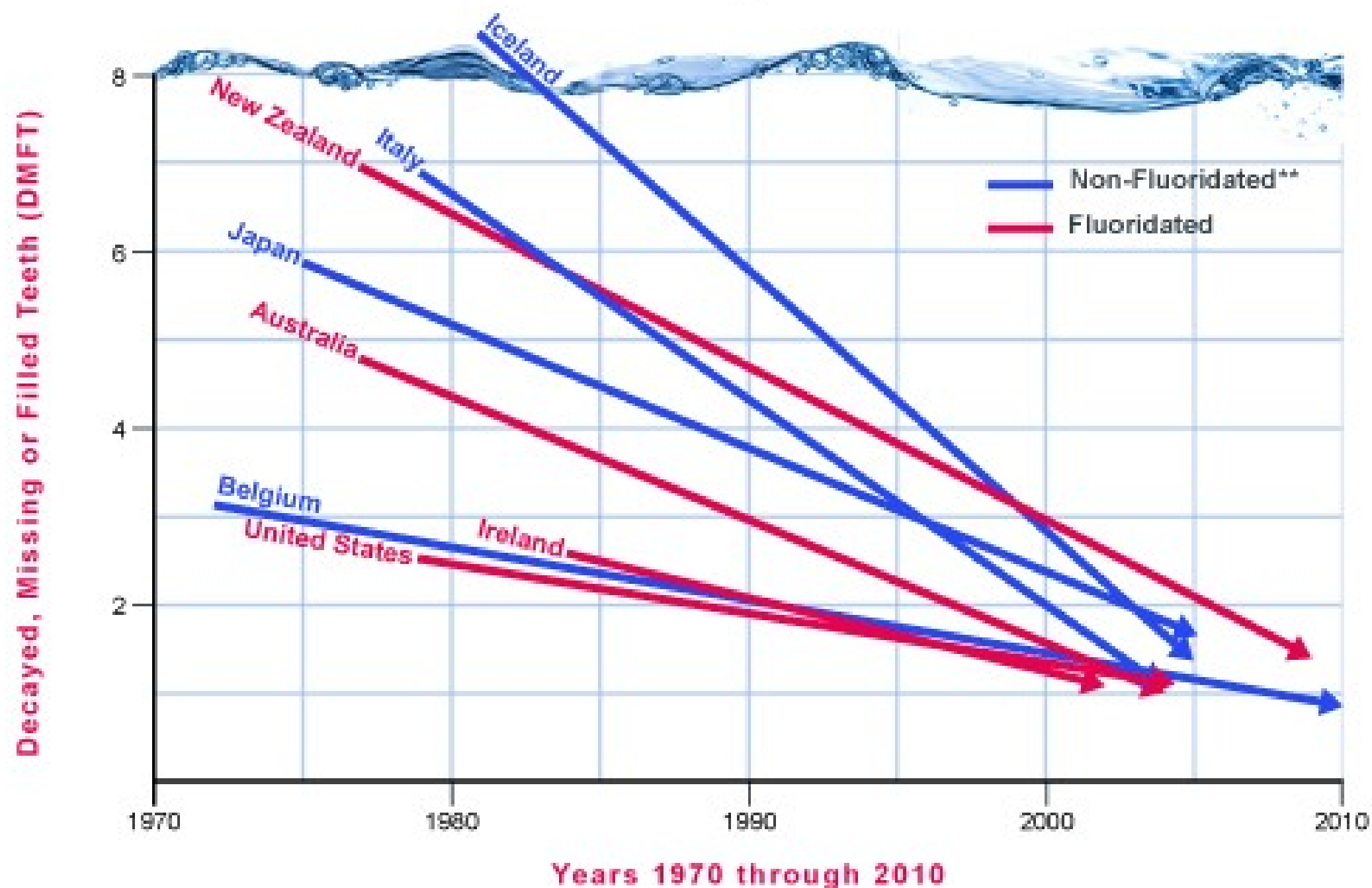
Dental decay in Western Europe (very little fluoridation)
has declined at the same rate as in the United States
over the past half century

For the seven countries with the lowest tooth decay rates,
six have no water fluoridation programs,
and England has 10% fluoridation



Tooth Decay Trends in Fluoridated and Non-Fluoridated Countries

WHO data on DMFT in 12 year olds*



* World Health Organization (WHO). Collaborating Centre for Education, Training, and Research in Oral Health, Malmö University, Sweden. <http://www.mah.se/CAPP/> (accessed June 10, 2012).

** No water or salt fluoridation.

So why the reduction in caries

Use of fluoridated toothpaste is >95% in the OECD countries

CDC since 1999

“Fluoride prevents dental caries

predominately after eruption of the tooth into the mouth,
and its actions primarily are topical for both adults and children.”

The National Research Council since 2006

“The major anticaries benefit of fluoride is topical and not systemic.”

**Does fluoride in drinking water
reduce tooth decay?**

Probably, but only when there is no toothpaste

**Does fluoride in drinking water
have negative health effects?**

Fluorine is the most electronegative and reactive element on Earth.

It is useful to human health in small/trace amounts
but **toxic at >1.5 mg/L**
(WHO, 2011).

“Airborne fluorides have caused more
worldwide damage to domestic animals
than any other air pollutant.”

USDA

WHO guideline <1.5 mg/L

The effect depends on
intake, concentration, exposure duration,
absorption capacity (nutritional status) and age.

So the standard is supposed to be modified by region/age.

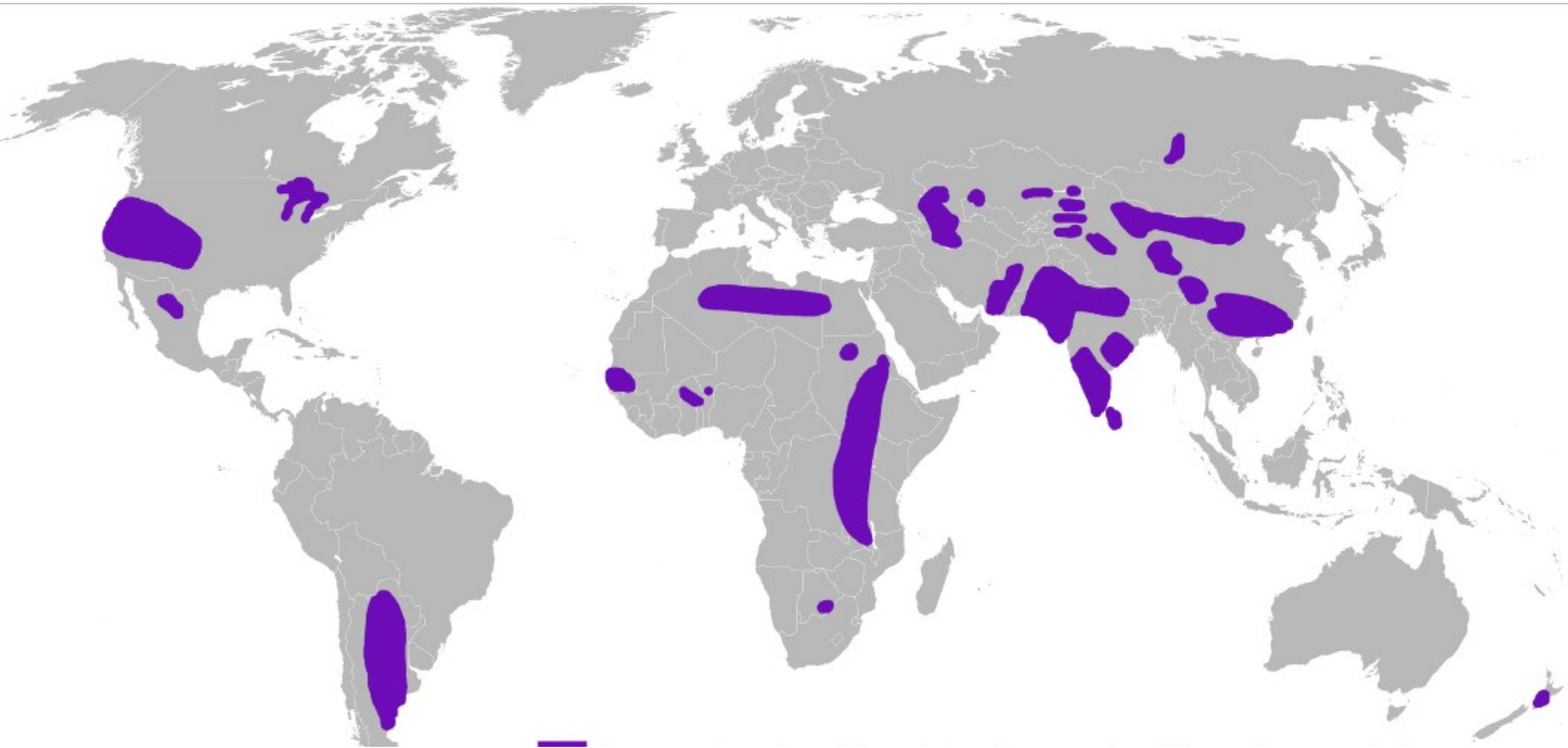
In hot dry climates, the standard should be much lower

EPA drinking water standard for fluoride pre 2015

Enforceable < 4.0 mg/L

Non-enforceable secondary standard < 2.0 mg/L

Groundwater fluoride above 1.5mg/L
is considered a major health risk by the WHO



Fluoride in things requires a poison control warning
even in the USA

TOOTHPASTE

DIRECTIONS: Do not swallow. Adults and children 2 years of age or older use a pea-sized amount twice a day after meals or as recommended by a dentist or physician. Supervise children under 6 years of age in good brushing and rinsing habits (to minimize swallowing).

WARNING: KEEP OUT OF REACH OF CHILDREN UNDER 6 YEARS OF AGE.
IF MORE THAN USED FOR BRUSHING IS ACCIDENTALLY SWALLOWED, CALL A POISON CONTROL CENTER RIGHT AWAY FOR HELP OR CONTACT A POISON CONTROL CENTER RIGHT AWAY.

ACTIVE INGREDIENT: SODIUM FLUORIDE (0.24%)

Excessive fluoride intake can cause

Acute toxic hazard, such as to people with impaired kidney function,

Chronic toxic hazards of gene mutations, cancer, reproductive effects,
neurotoxicity, bone pathology and dental fluorosis.

Neurotoxin

More than 400 peer reviewed studies find that fluoride is a neurotoxin

Anatomical effects

Neurodegeneration and neurotransmitter deficiency

200+ animal studies

Prolonged exposure is bad

especially with iodine deficiency or aluminum excess

3 human studies

Gestational exposure impairs fetal brain development

Yu Y, et al. (1996). Neurotransmitter and receptor changes in the brains of fetuses from areas of endemic fluorosis. Chinese Journal of Endemiology 15:257-259;

Du L. (1992). The effect of fluorine on the developing human brain. Chinese Journal of Pathology 21(4):218-20.

He H, et al. (1989). Effects of fluorine on the human fetus. Chinese Journal of Control of Endemic Diseases 4(3):136-138, 1989.

Functional deficits

Reduced intelligence - 53 studies in human populations

Moderately high fluoride reduces IQ by ~10 points

Fetal exposure seems to be a major factor

FDA banned fluoride supplements for expecting mothers in the 60's

Impaired learning and memory - >40 studies in animals

Rodents ingesting fluoride have impaired learning and memory

Neurobehavioral deficits - 7 human and 5 animal studies

>fluoride correlates to impaired visual-spatial organization

IQ effects

Anna L. Choi (2012)

Developmental Fluoride Neurotoxicity: A Systematic Review and Meta-Analysis. Environmental Health Perspectives

Average loss in IQ was equivalent to seven IQ points.

Same finding in a Lancet meta-analysis in 2014

Fetal development seems to be a major risk window

Barshash et al 2017

Increase in maternal urine fluoride of 0.5mg/L
predicted 2.5 point lower IQ

In Bashash et al. (2017) and Thomas et al. (2017)
the fluoride levels in the urine of the pregnant women
were similar to adults living in fluoridated communities in the U.S.

Valdez Jiménez et al. (2017)

Tested effect at higher exposures (most still <4mg/L)
IQ <90 points was 25% in control group (F urine 1.5 mg/g creatinine)
and 58% of children in the exposed group (F urine >5 mg/g creatinine)

Systemic effects

Yu Y. (2000). Effects of fluoride on the ultrastructure of glandular epithelial cells of human fetuses.

Chinese Journal of Endemiology 19(2):81-83.

Looked at ultrastructural changes of epithelial cells of liver, adrenal glands, and thyroid glands of human fetuses from a fluorosis-endemic area

Fluoride damage to cell structures was multifaceted.

Deficits in microvilli

Swollen mitochondria with absent or reduced cristae

Reduced nucleoproteins on ER

Damaged and dilated nuclei

Spleen/Immune function

Sodium fluoride impairs splenic innate immunity via inactivation of TLR2/MyD88 signaling pathway in mice.

Kuang P et al. 2019, Chemosphere: 237:124437.

Sodium fluoride induces splenocyte autophagy via the mammalian targets of rapamycin (mTOR) signaling pathway in growing mice.

Kuang P et al. 2018, Aging:10(7):1649-1665.

Sodium fluoride (NaF) causes toxic effects on splenic development in mice.

Kuang P et al. 2017, Oncotarget: 8(3):4703-4717.

Negative effects on **Kidney Function**

Sodium Fluoride Arrests Renal G2/M Phase Cell-Cycle Progression by Activating ATM-Chk2-P53/Cdc25C Signaling Pathway in Mice.

Luo Q et al. 2018, Cell Physiol Biochem.;51 (5):2421-2433.

Sodium fluoride induces renal inflammatory responses by activating NF-κB signaling pathway and reducing anti-inflammatory cytokine expression in mice.

Luo et al. 2017, Oncotarget: 8(46):80192-80207.

Negative effects on **Thyroid Function**

Fluoride is an effective reducer of thyroid function
in people with hyperthyroidism

Potential for fluoride to contribute to hypothyroidism:
fluoride can

- (1) exacerbate the anti-thyroid effect of iodine deficiency
- (2) cause goiter in some individuals
- (3) alter thyroid hormone consistent with a general thyroid suppressant

Cancer Incidence

The source of fluoride (SFA) contains arsenic,
which is a demonstrated carcinogen

in addition

National Toxicology Program (NTP),
“the preponderance of evidence”
from laboratory studies indicates that fluoride is a mutagen

Some evidence for osteosarcoma in males not females
(human and rat) (Bassin 2006)

Some evidence for bladder and lung cancer in humans (Grandjean 2004)

**Does fluoride in drinking water
have negative health effects?**

Yes, lots....

Is that going to change anything in the US?

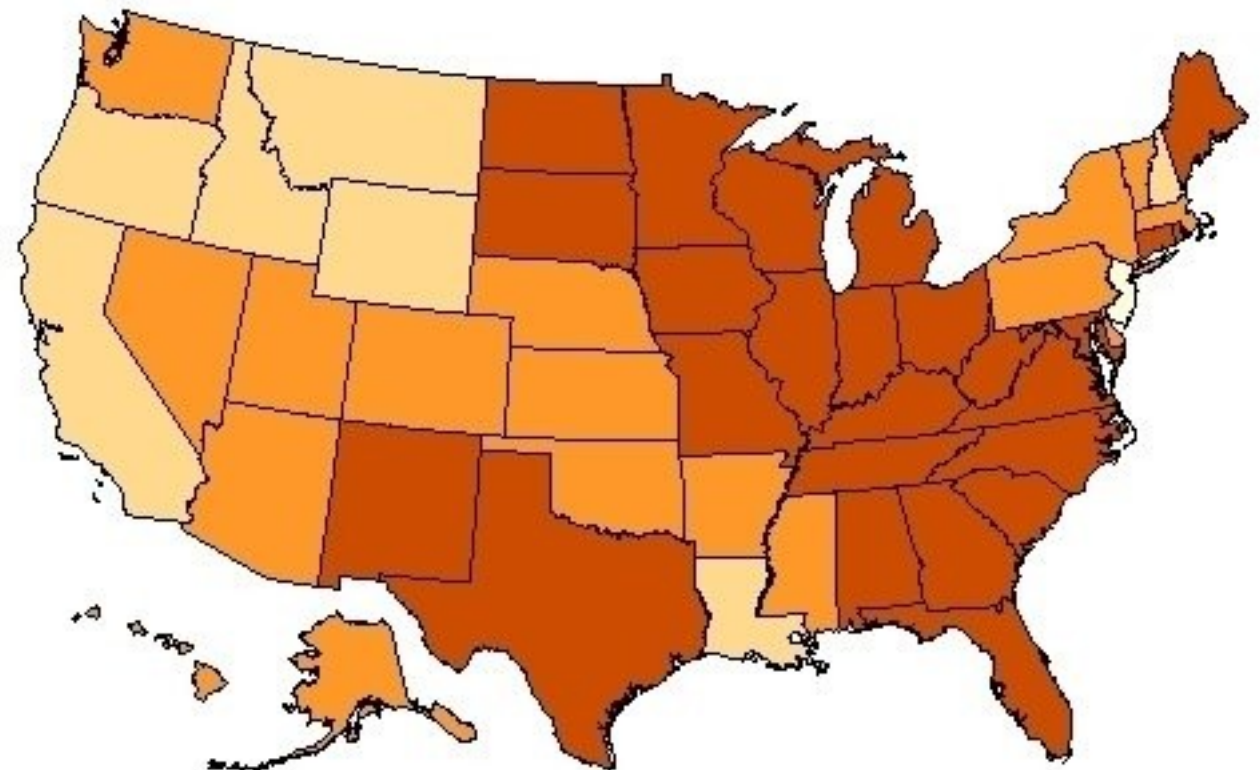
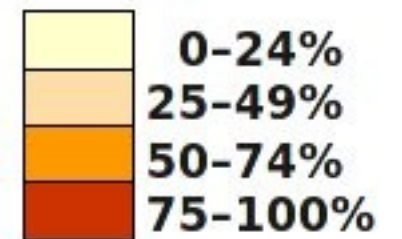
By 2012
there were more people drinking
artificially fluoridated water
in the USA
than the rest of the World combined

After evidence of
negative health effects
became convincing

fluoridation
actually increased
in the USA



1992: 62%



2006: 69%

Community water fluoridation: The top 10 and bottom 10

74 million

Americans who are on public water systems lack access to fluoridated drinking water

The CDC has recognized **water fluoridation** as one of “10 great public health achievements of the 20th century.”²

Percentage of residents on public water systems who are receiving fluoridated water in each state¹

- Top 10 states with highest percentage of fluoridation
- Bottom 10 states with lowest percentage of fluoridation

State	Percentage	Category
DC	100%	Top 10
MD	99.8%	Top 10
DE	76.8%	Other
NJ	13.6%	Bottom 10
NH	42.6%	Bottom 10
ME	79.7%	Other
MA	65.4%	Other
RI	84.6%	Other
CT	89.9%	Other
VT	58.5%	Other
NY	72.2%	Other
PA	54.3%	Other
OH	84.1%	Other
WV	90.6%	Other
VA	94.9%	Top 10
NC	85.6%	Other
SC	94.4%	Top 10
GA	95.8%	Top 10
FL	78.3%	Other
AL	82.2%	Other
MS	54.6%	Other
LA	28.3%	Bottom 10
TX	78.6%	Other
OK	75.3%	Other
AR	60.5%	Other
MO	79.8%	Other
IL	95.4%	Top 10
IN	94.5%	Top 10
MI	89.8%	Other
WI	89.7%	Other
MN	98.8%	Top 10
ND	96.4%	Top 10
SD	93.3%	Other
IA	91.8%	Other
NE	69.9%	Other
KS	44.7%	Bottom 10
CO	70.6%	Other
NM	77%	Other
AZ	52.3%	Bottom 10
UT	54.3%	Other
NV	72%	Other
CA	58.8%	Other
OR	27.4%	Bottom 10
MT	30%	Bottom 10
WY	36.8%	Bottom 10
ID	31.2%	Bottom 10
WA	62.4%	Other
AK	62.8%	Other
HI	10.8%	Bottom 10

¹ Centers for Disease Control and Prevention, “2009 Water Fluoridation Statistics”. Data covers only residents whose homes are connected to public water systems.
² Centers for Disease Control and Prevention, “Ten Great Public Health Achievements—United States, 1900–1999”, <http://www.cdc.gov/mmwr/preview/mmwrft04a01.htm>

Pew Center map from 2013

The EPA has reevaluated the current science on fluoride.

EPA will rely on these new assessments to review the existing maximum level of fluoride allowed in drinking water and determine whether drinking water regulations for fluoride should be revised.

EPA will review the drinking water standard to make sure that it continues to protect against **unwanted effects** of excessive exposure. We don't want to admit cancer and neuro-effects exist because then we look incompetent and immoral for quashing data.

EPA's examination of the fluoride drinking water public health goal and enforceable standard will be based on this **new science**, along with other information such as analytical methods and treatment feasibility.

New science = 1991

The EPA appears reluctant to use evidence to guide practice

Why? (Stu's take)

Health policy is driven by commercial vested interests in the USA

In other developed countries it is driven by government trying to minimize the cost of universal healthcare

In 1985

William Marcus PhD, an EPA scientist

objected for being forced to write into regulations
that high levels of fluoride in water
were fine despite documented negative health effects

The EPA professionals union tried to settle
the ethics issue quietly in house
but the EPA caved to external political pressure
to set the fluoride level at 4mg/L

They then fired William Marcus

The Union fought for William Marcus

Investigation identified
highly improper communications
between chemical company attorneys and EPA managers,
explicit documentation that the companies orchestrated his removal

EPA violated the subpoena - shredded embarrassing notes

Trial found for Dr. Marcus on every count
He was reinstated, with full back pay and damages.

EPA continued to harass him and he won even more 'damages'

2015

**Fluoride levels in the United States
were lowered to recommended levels of 0.7ppm**

Is that going to change anything in the US?

Not soon....

Further reading

History of discovery that fluoride affects caries
nice who did what but propaganda

<https://www.nidcr.nih.gov/health-info/fluoride/the-story-of-fluoridation>

Why the Union for EPA scientists opposes fluoridation

<https://fluoridealert.org/articles/epa-union/>

<https://www.whistleblowers.org/members/william-marcus/>

An evidence based change of heart from the Dentist
who led the drive for fluoridation in NZ

<https://fluoridealert.org/articles/colquhoun/>

Some other cool topics where evidence based medicine fails

Reducing salt intake - only the weakest evidence that it helps

Vaccines - some save lives, some are unhelpful

lack of logic in CDC policy provides ammunition to anti-vaxxers

Fetal ultrasound - it tracks with autism better than anything else

Antioxidants - supplements shorten lifespan

Sterile hospitals and clinical care - clean has better outcomes

Vaccines.

Good, bad, or....

depends on the vaccine and the patient

Ignoring data is standard in the vaccine argument

on both sides

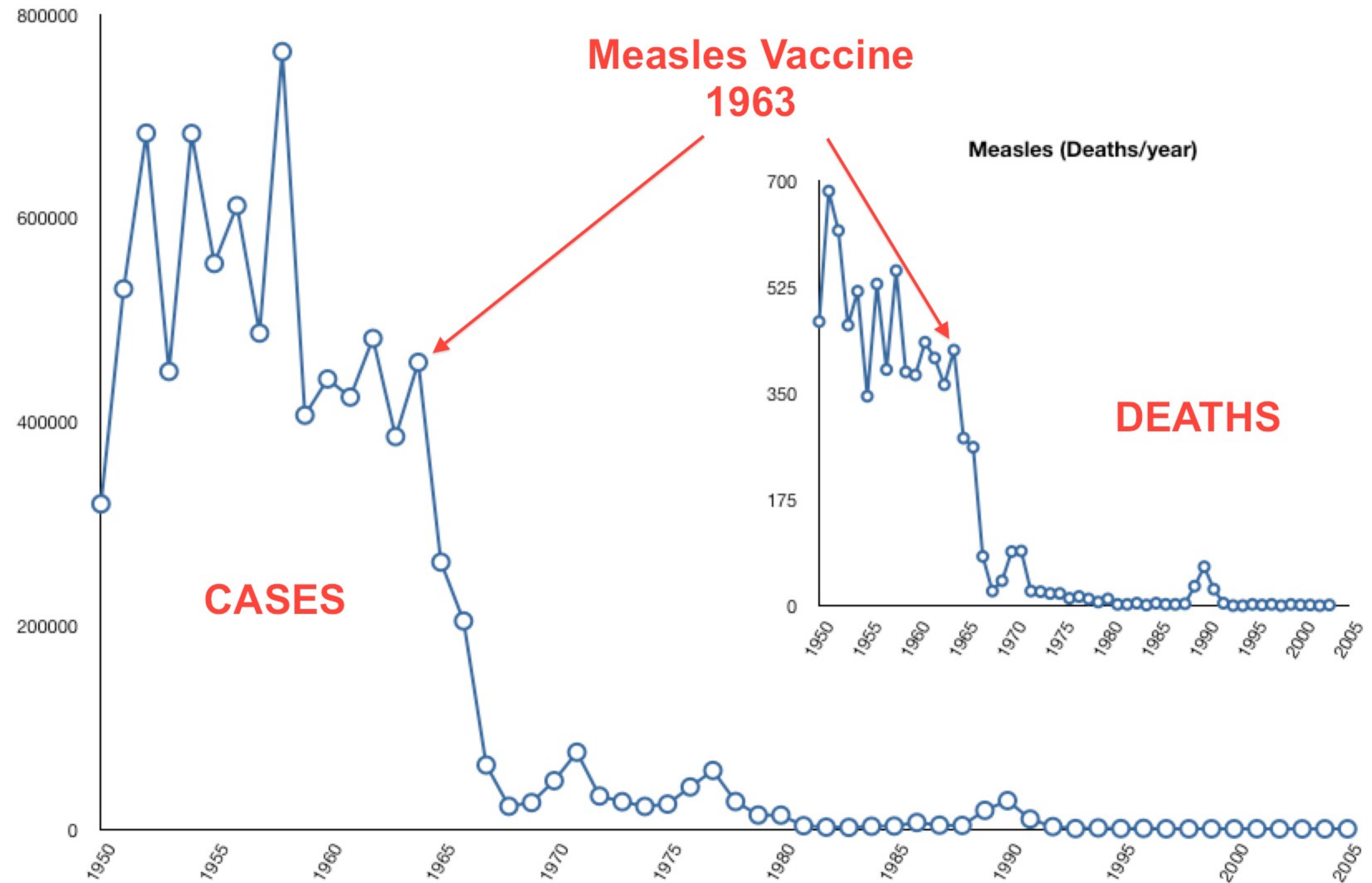
Measles (Cases/year)

**Measles Vaccine
1963**

CASES

Measles (Deaths/year)

DEATHS



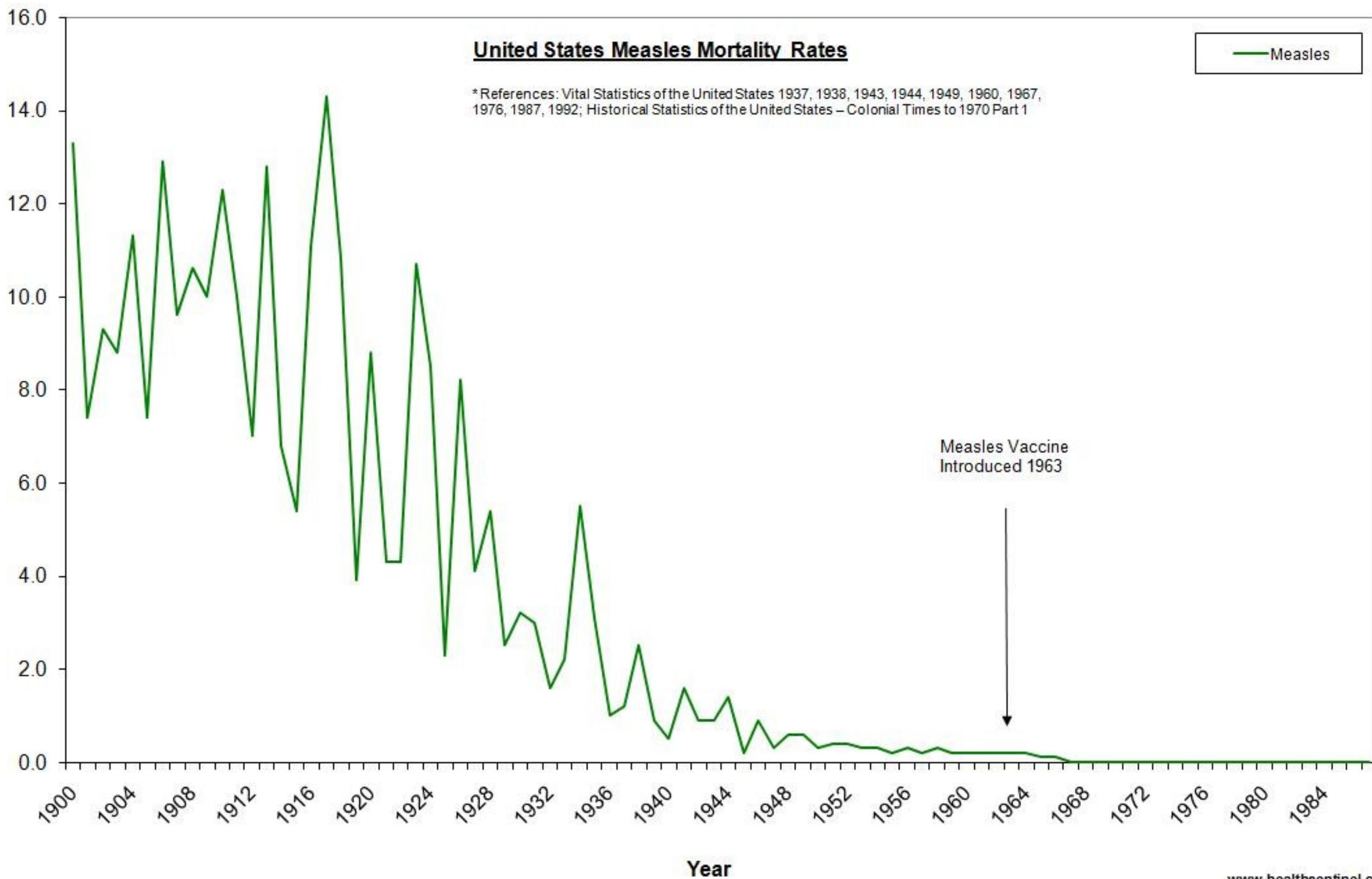
United States Measles Mortality Rates

*References: Vital Statistics of the United States 1937, 1938, 1943, 1944, 1949, 1960, 1967, 1976, 1987, 1992; Historical Statistics of the United States – Colonial Times to 1970 Part 1

Measles

Measles Vaccine
Introduced 1963

Deaths per 100,000



Measles (Cases/year)

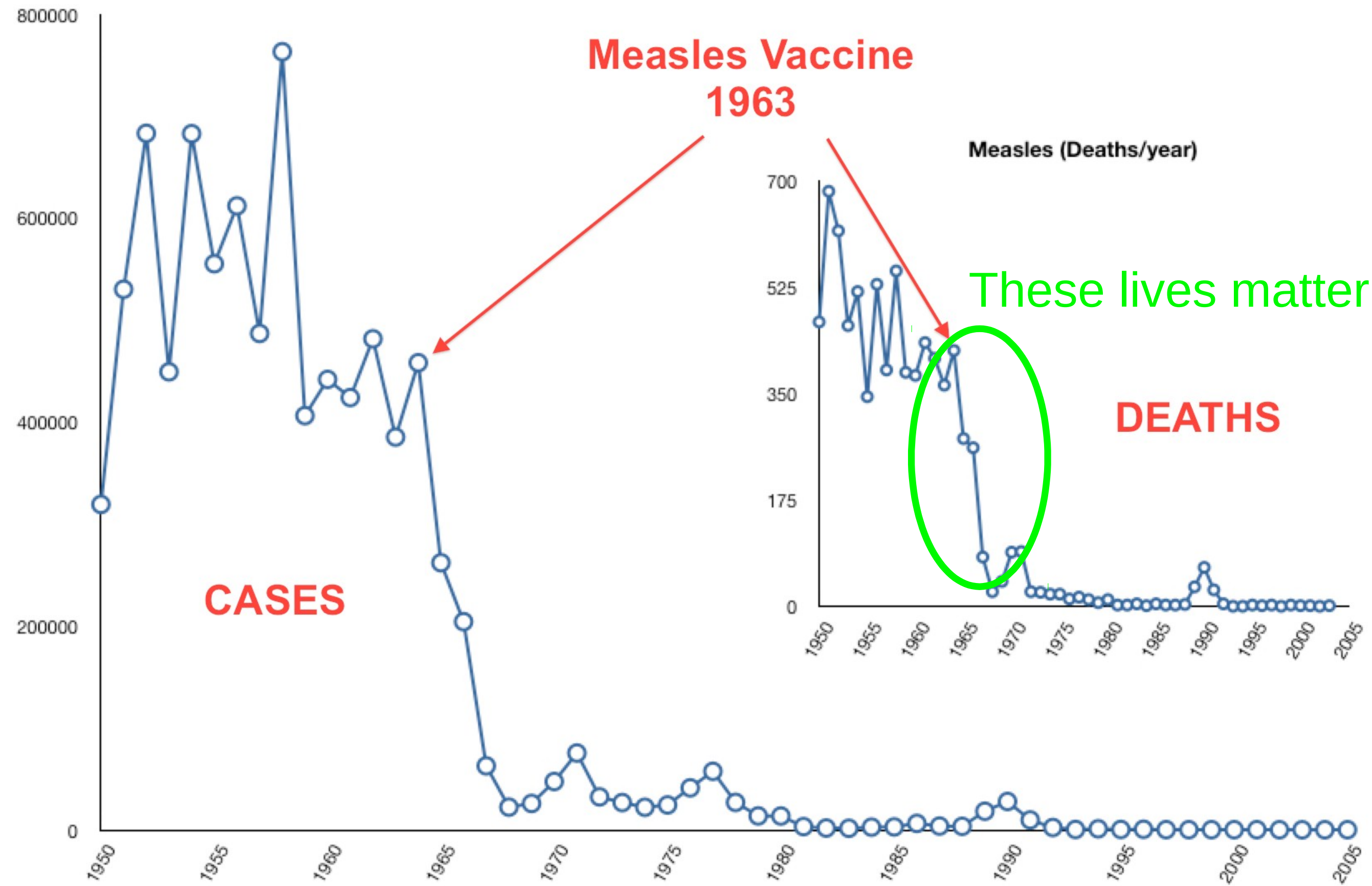
**Measles Vaccine
1963**

CASES

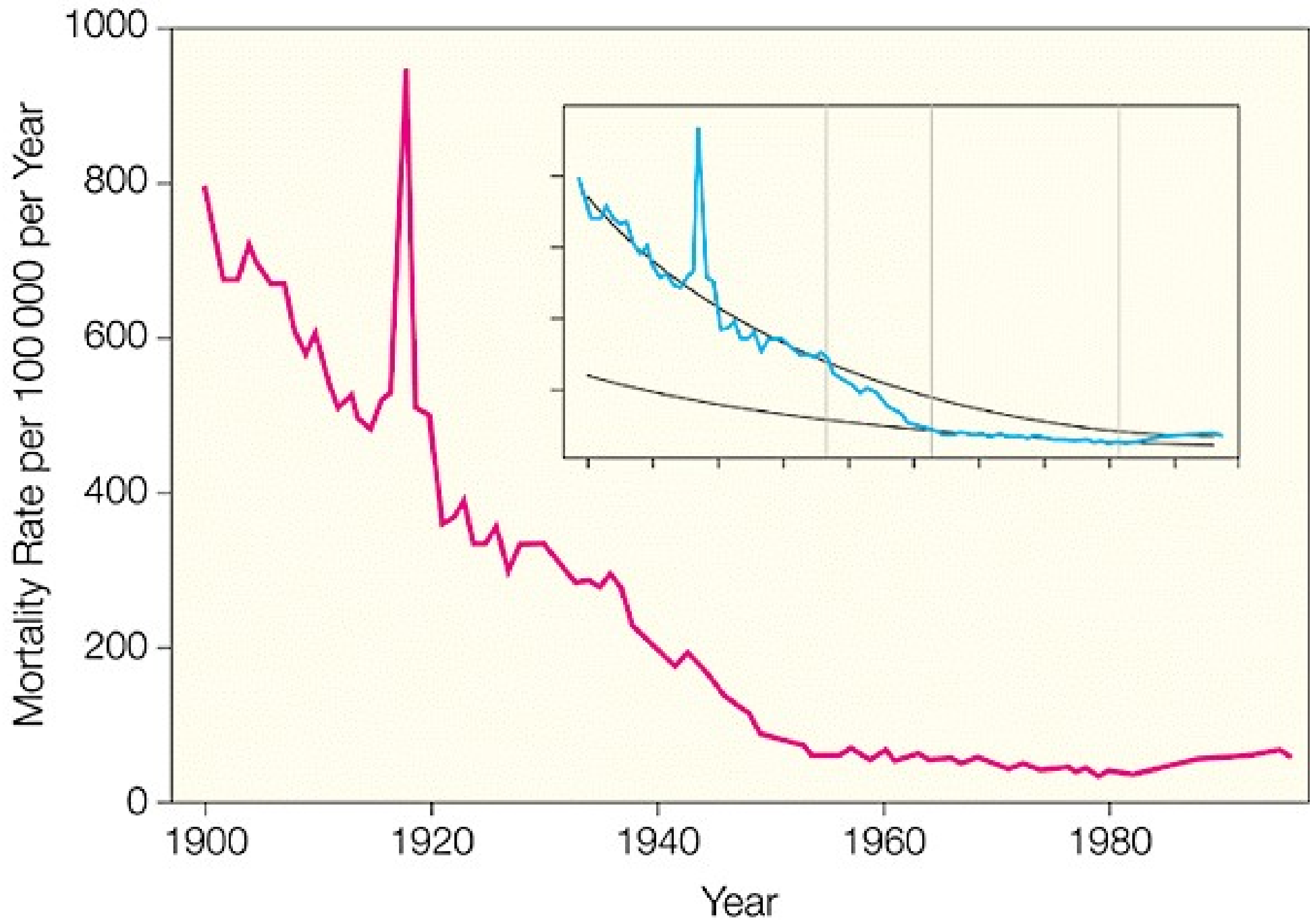
Measles (Deaths/year)

These lives matter

DEATHS



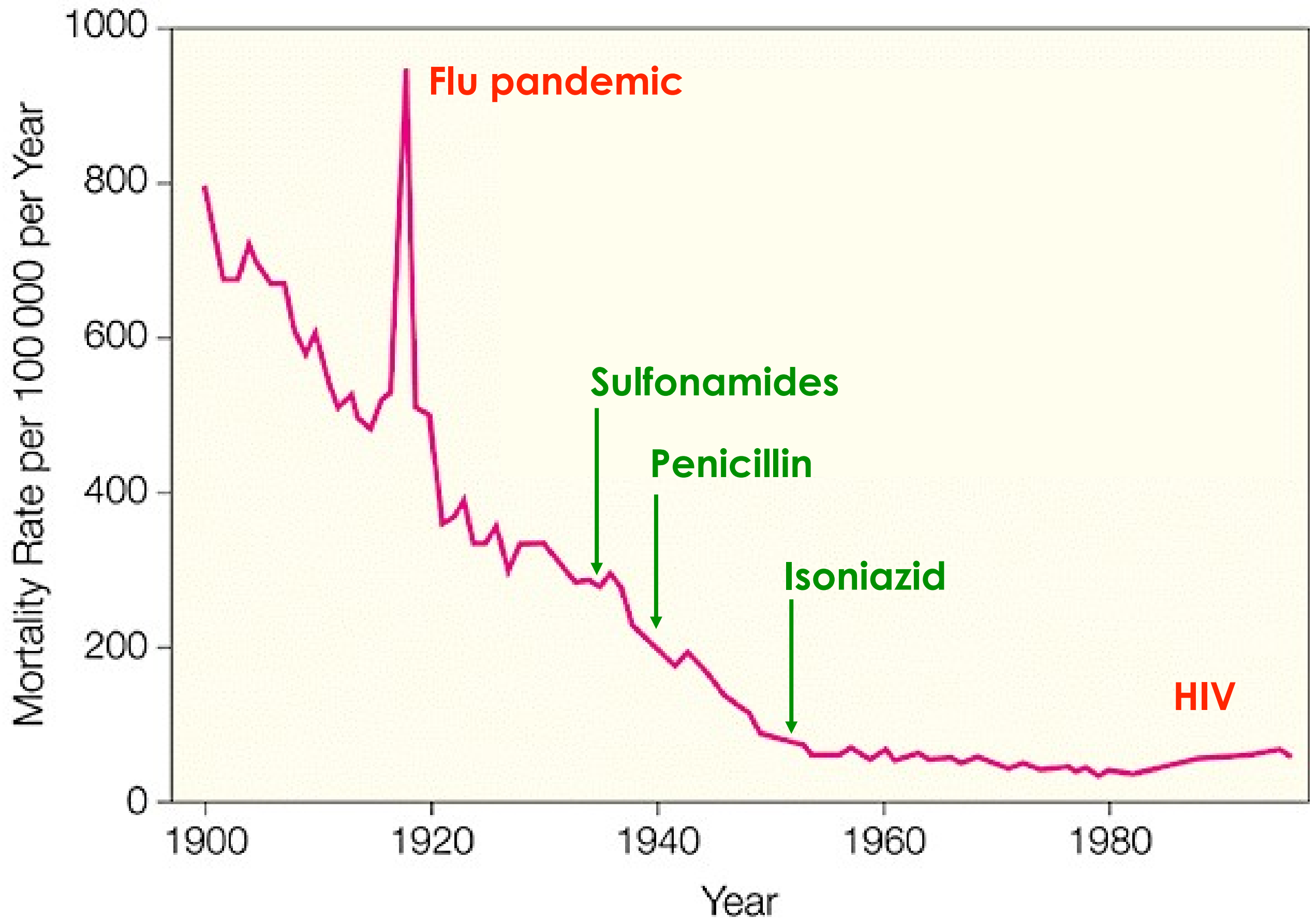
Infectious disease mortality 1900 to 1999



Mortality is not the total disease burden

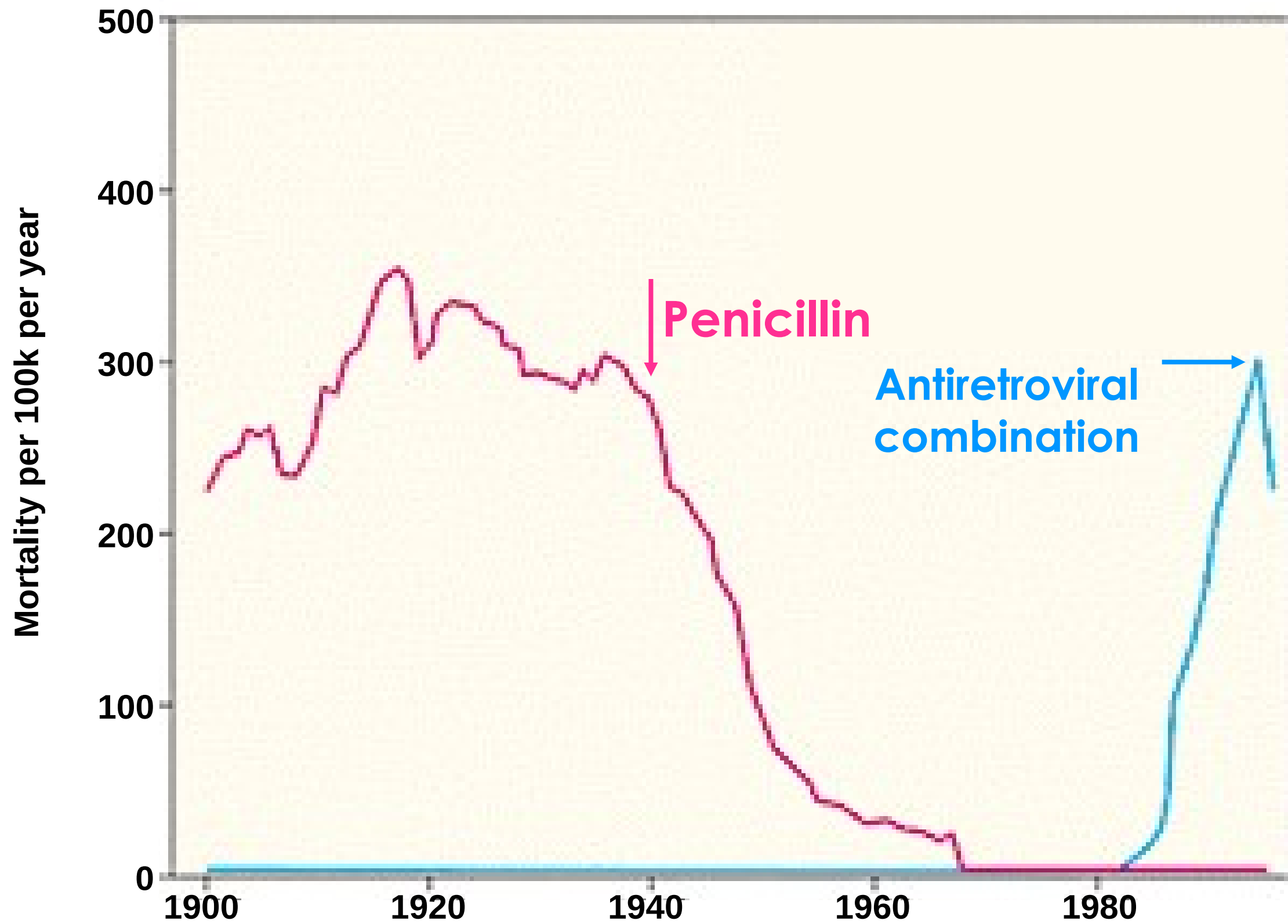


Factors in mortality 1900 to 1999



Syphilis

HIV/AIDS



Are there any useless or dangerous vaccines in use?

Cochrane Collaboration review of flu vaccines
clinical evidence concerning flu vaccines is “rubbish”
calls for placebo-controlled randomized clinical trials

Center for Infectious Disease Research and Policy

Recommends **at risk** people get the vaccine

Criticizes its over-promotion

"We have over-promoted and over-hyped this vaccine...

it does not protect as promoted.

It's all a sales job: it's all public relations".

Varicella-Zoster virus

Causes **Chickenpox** on first infection

It is the *chicken* of all 'pox' (symptoms are mild, weak)

Globally endemic with 140 million cases per year

Often asymptomatic
or

5 to 10 days of
small, itchy blisters
fever, fatigue, headache

Rarely pneumonia or encephalitis



Deaths ~1 in 60,000 documented cases
Undocumented cases not included in these stats
Deaths are almost all adult men

Other risk factors for complication are:
Immune deficiency
Non-immune pregnancy

Treatment

Calamine lotion for itching
Acetaminophen for pain/fever

*For people at increased risk of complications (i.e. < immune)
antiviral aciclovir is recommended*

Most common complication is shingles

Shingles

Caused by reactivation of the virus
decades after the initial infection



Small, itchy/painful blisters
fever, fatigue, headache

Usually in older adults

Rarely pneumonia or encephalitis

Thought to occur when specific cell mediated immunity declines

Usually only have 1 episode (episode is a booster)

Lifetime risk of shingles increases with age
~50% of people who live to 85 years have had shingles

The varicella vaccine has been used in the US since 1995

In many countries VZV vaccination is not given

Concerns are:

It may not be enough to produce herd immunity

It might increase age of infection for the non-immune

The incidence of shingles may increase

Those countries have been waiting
to see what happens in the
vaccine crazy US



Caveat

Most studies have a political stance - not unbiased

This is not enough to achieve herd immunity

Use has clearly decreased number of childhood
presenting cases by 90%

Reduction in complications and possibly in infections

but VZV is still endemic

and 30% of vaccinated individuals don't gain immunity

It might increase age of infection for the non-immune

*Overall morbidity and mortality still seems to be reduced
but the first vaccinated kids are not that old yet*

*The vaccinated individuals that didn't gain immunity (30%)
are likely to get infected at some point
(from grandma's shingles)*

Their outcomes are likely to be worse

*Some of them might be pregnant (watch the next 10 years)
congenital and neonatal chickenpox will increase*

The incidence of shingles may increase

Multiple studies have convincingly established that exposure to chickenpox temporarily boosts immunity

A child in the house delays shingles for ~20 years

less chickenpox = more shingles

Shingles has doubled in the US since VZV vaccination

Costs for shingles complications have increased
>\$700 per year per case

The most recent (*eLife* 2015) study shows that

1. Vaccinating kids doubles shingles
2. Shingles presents in younger adults when vaccine is used

We could vaccinate everyone at the same time
and boost everyone at 2 year intervals

My opinion

Only vaccinate the 'at risk' until the vaccine is more effective

How do we pick which vaccines to give?

Disease			Vaccine	
	Prevalence	Morbidity	Efficacy	Side effects
Measles	200/yr	~0.1% fatal	>96% Life	Moderate: Fever, fever seizures, rash, low platelets Severe: deafness, epilepsy, coma, CNS damage ~1 per million
Mumps	1700/yr	<1% severe rarely fatal	90% >10 years	
Rubella	<10/yr	0.05% severe fetal risk	>90% >15 years	
Diptheria	0.2/yr	>5% fatal	85% ~10 years	Moderate: Fever, vomiting, diarrhea >1% Severe: epilepsy, coma, CNS damage ~1 per million
Tetanus	30/yr	2 fatal/yr oldsters	95% 13 years	
Pertusssis	In kids 9200/yr	6 infant fatal/yr	80% ~5 years	

Disease			Vaccine	
	Prevalence	Morbidity	Efficacy	Side effects
Hep B	~40k/yr STD + IV	~2000/yr liver cancer	>90% >20 yrs	fatal ~150/yr
Polio	0 Last 1979	2 in 10k death	>99% >18 years	Rare Old vaccine was risky
Rota		30 fatal/yr	90% ?	
Pneumo- coccal	120k 1.5k meningitis		~5 years	

Most plausible ways vaccines can cause health issues

Uncontrolled fever in children

Syncope (fainting) and subsequent
traumatic brain injury (TBI)

15% of HPV recipients report syncope

Causes actual disease

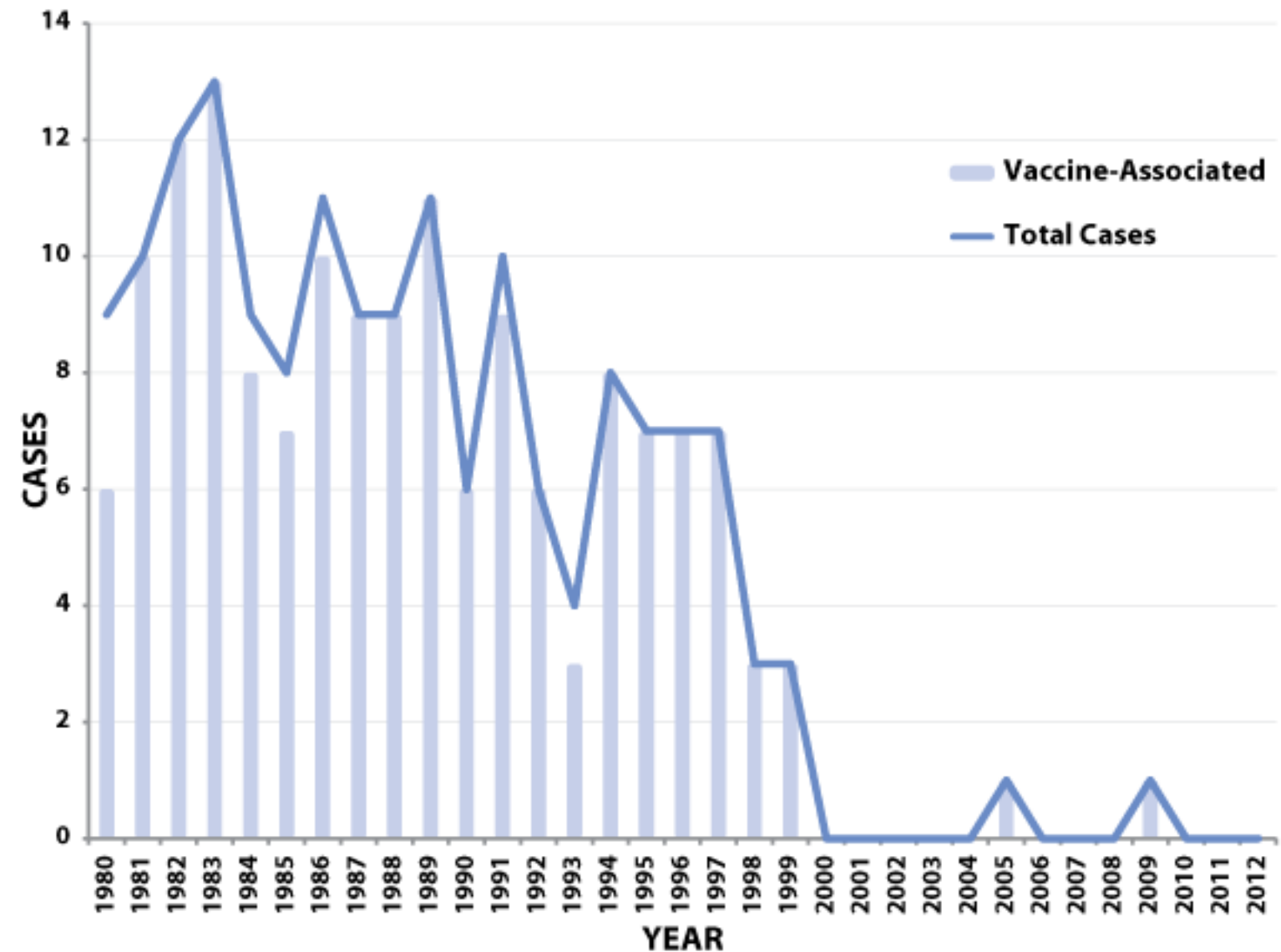
Increasing susceptibility to related disorders

Allergic reaction

Polio

0 cases per year
originating in the US
(for the last 40 years)

Why still vaccinate?

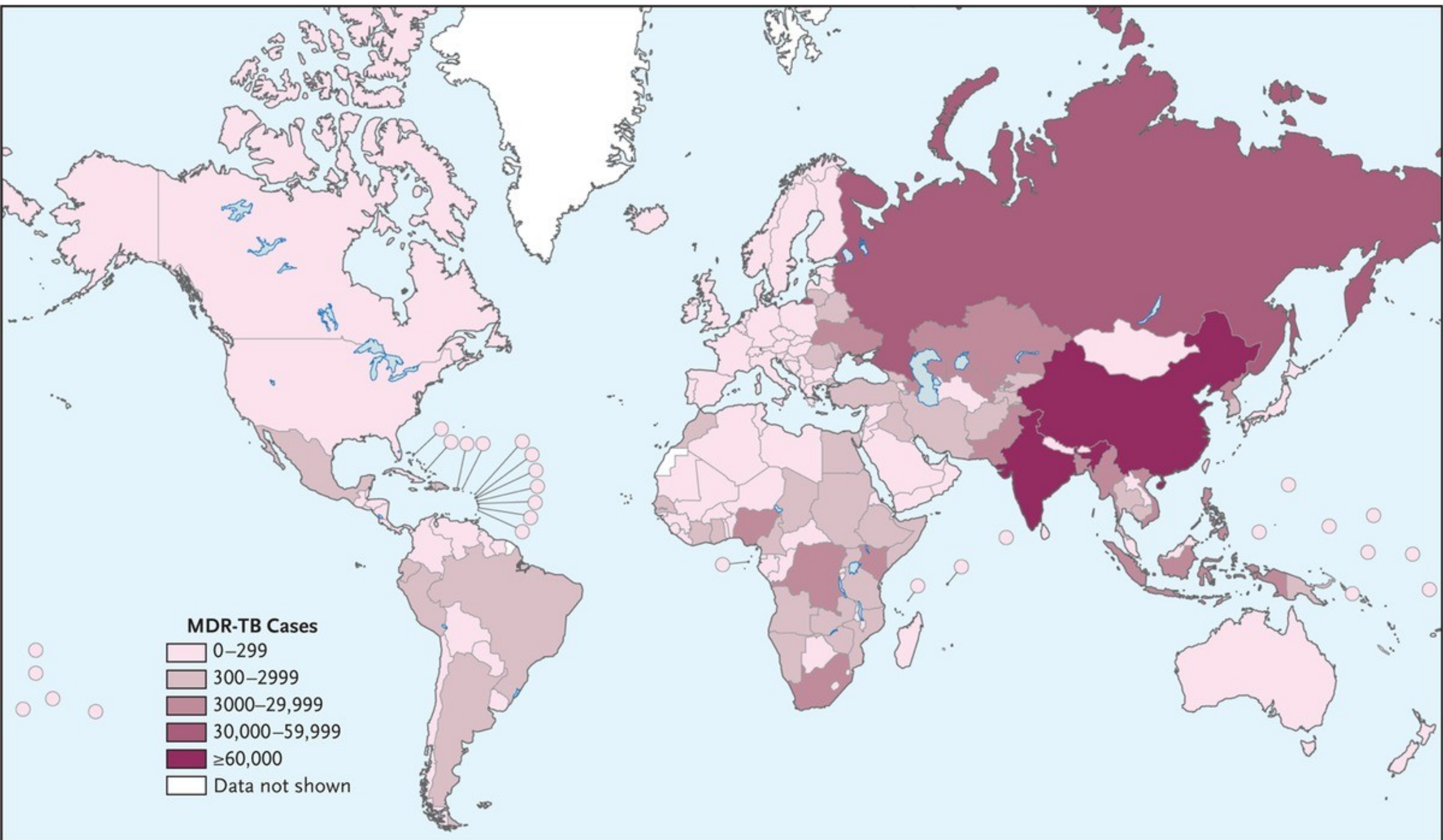


Anthrax

1 case per year
cutaneous transmission (from animals)

Why not vaccinate?

Multi-drug resistant tuberculosis



BCG in use since 1921

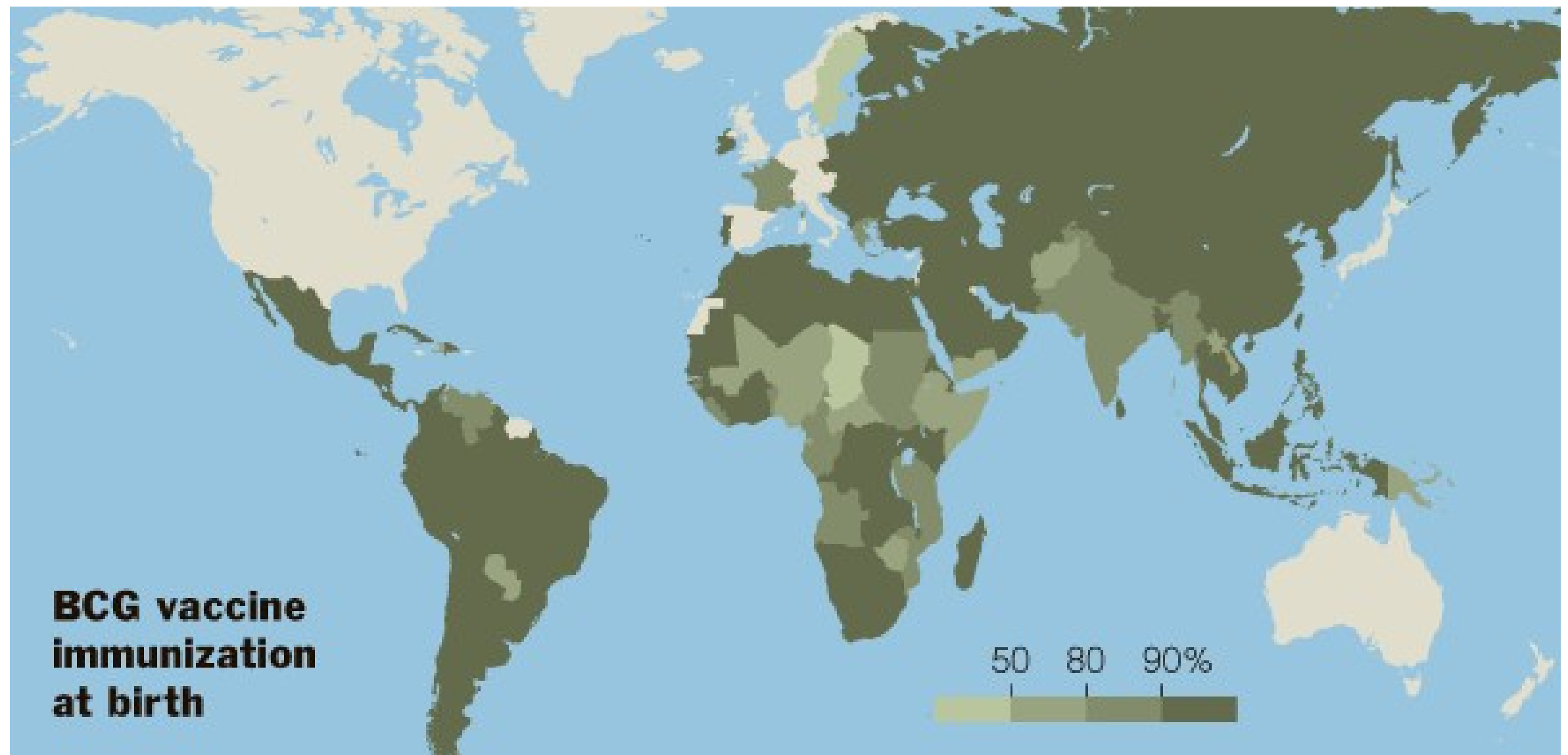
Reduces infection and inhibits disease progression

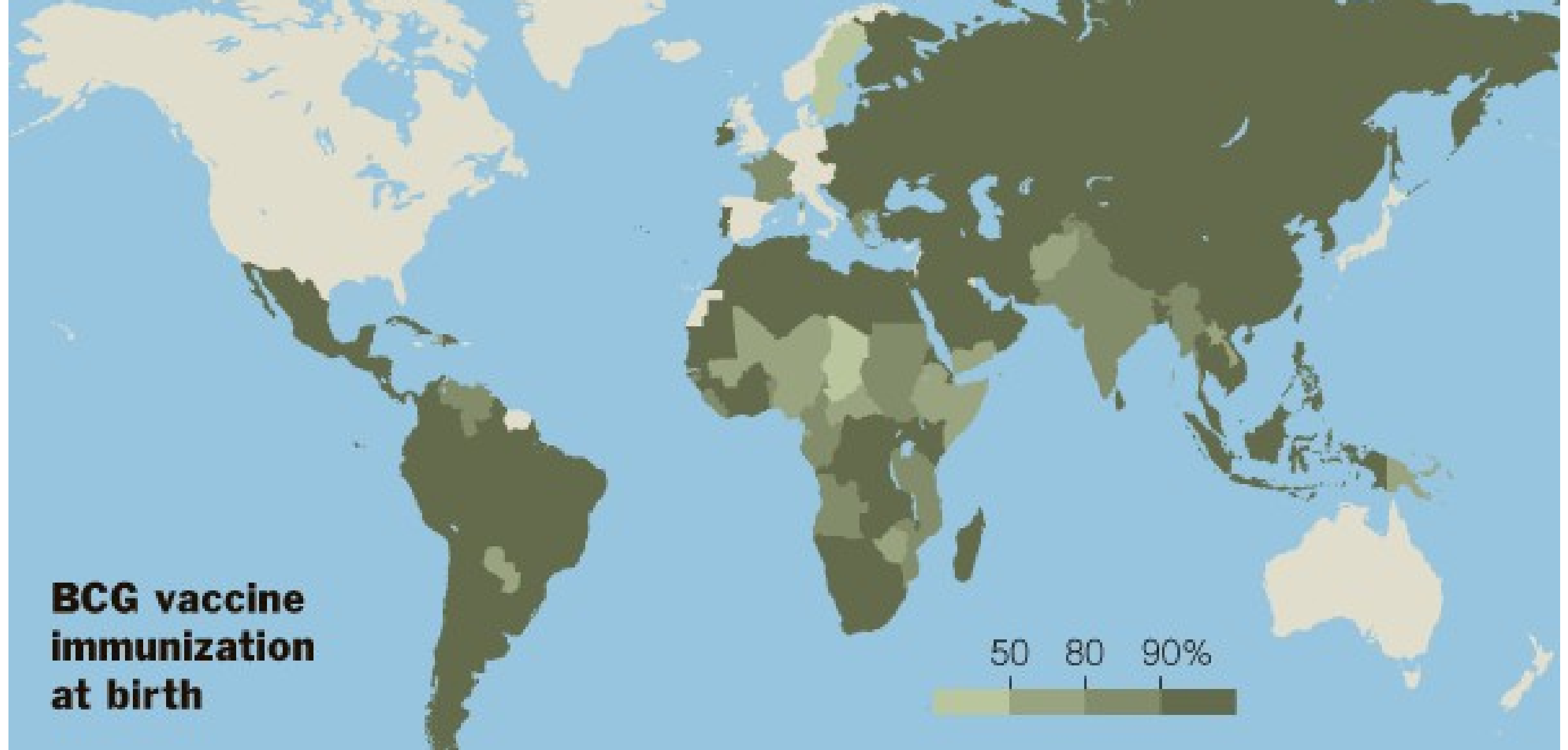
3 in 10k has swelling under the arm

Most widely used vaccine worldwide

WHO most essential and safe meds

\$0.16 most of the World - \$200 in the USA





Recently became voluntary because of reduced risk

UK in 1953 - 94 immunizations to prevent 1 case of TB

UK in 2005 - 12k immunizations to prevent 1 case of TB

US tests for and treats latent TB

Why not apply this approach to Polio?

At birth or not at birth

The immune system is immature (<5 months)

Maternal antibodies are present

T-cell populations take time to switch from
suppression of maternal immune system (CD8 suppressor)
to self defense (CD4 helper)

Takes 6 to 12 months

Vaccination during the neonatal period
must overcome these barriers

At birth or not at birth

Some vaccines are usually safe and partially effective at birth

BCG - Tuberculosis

Justification for use at birth is
need for immediate protection

in parts of the World where TB is endemic

Hepatitis B

Justification for use at birth is
*they might not see a doctor before they become an
intravenous drug user or sexually active*

At birth or not at birth

Other vaccines are ineffective and/or negatively affect the development of immunity

***Streptococcus pneumoniae* vaccine (PPV23)**

Not immunogenic <2 years

Pertussis vaccine

Not immunogenic <3 months

Earlier vaccination reduces responses to boosters
(= *decreased response to antigen*)

A similar effect is seen for *diphtheria* and *tetanus*.

In development

Development of a vaccine against Alzheimer's Disease

was stopped at phase 1 clinical trial
due to side effects in some participants

Why might a vaccine not be a good idea for AD?

