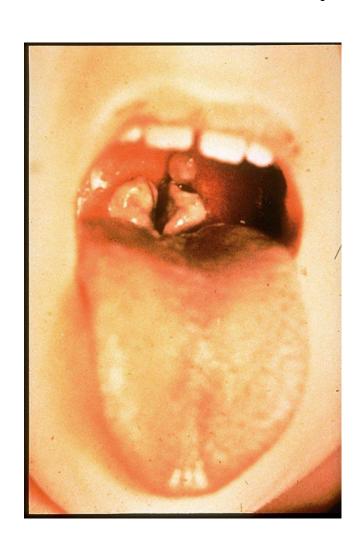
Vaccine preventable disease

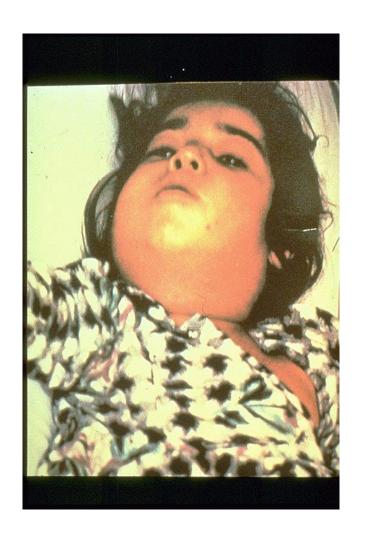
Feb 2017

Objectives

- Know for each vaccine preventable disease:
 - Signs and symptoms
 - Complications
 - Impact of immunisation

Diphtheria

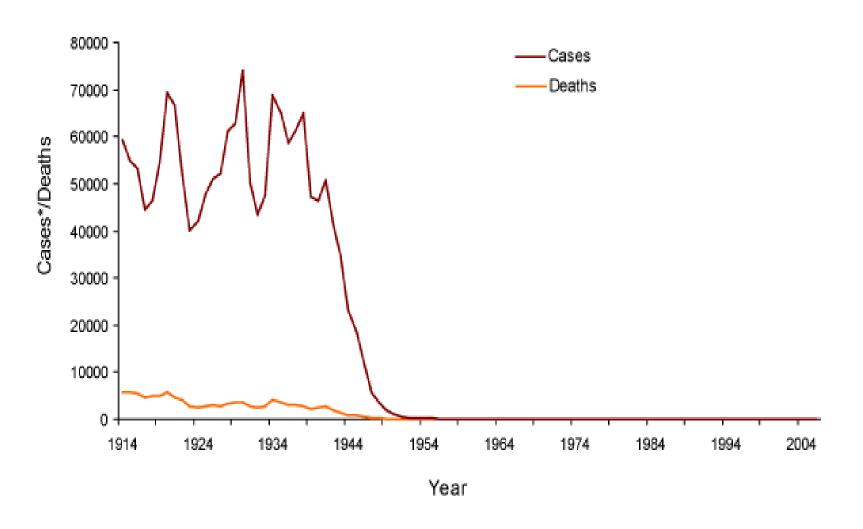






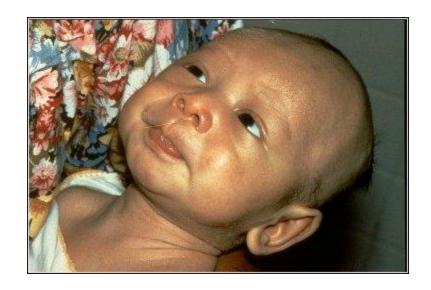


Diphtheria cases and deaths, England and Wales, 1914 - 2008



Tetanus





'It was hideous' - family's tetanus agony

By Natalie Akoorie

5:30 AM Saturday Dec 22, 2012





Seven-year-old tetanus victim Alijah Williams with his mother, Linda, at the Starship children's hospital yesterday. Photo / Sarah Ivey

Alijah Williams woke up with a sunken face. Within 36 hours, the 7-year-old Auckland boy was crippled by body spasms, unable to swallow and racked with pain.

"He was screaming in agony," mother Linda Williams said.



Son's ordeal our fault: parents

- Shelley Bridgeman: Non-vaccinators believe they're intellectually superior
- Child's horror toy meal

Related Tags

· Health



Eradication and herd immunity is not possible

Who is at risk?





Paralytic Polio

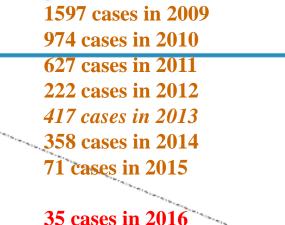


Photo courtesy of WHO





Polio Eradication Progress, 1988 – 2008



ype 2 eradicated in 1999



■ Not Certified but non-endemic (73 countries)

Endemic with wild polio virus (4 countries) 👶

The boundaries and names shown and the designations used on this map do not imply the exponence of any opinion whateover on the part of the World Health Organization concerning the legal states of any country, tentiony, dry or sees or of its attentials, or concerning the definition of its finations or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

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And

This year, as at today, 21st February 2017:

ONLY ONE CASE!

"These vaccines are meant to destroy our nation," said Khan, a 42-year-old lawyer in the city of Peshawar. "The [polio] drops make men less manly, and make women more excited and less bashful. Our enemies want to wipe us out."

20th Dec 2012 NBC News



Violence against those giving polio immunisations in Pakistan because of the belief by the Taliban that the programme is a cover for espionage

70 people have been killed in the past 4-5 years

O 17 February 2015 Asia

Bomb attack on Pakistani police guarding polio team

No one has claimed responsibility for the attack, which killed 11 officers in Khyber Pakhtunkhwa province

Associated Press, Peshawar theguardian.com, Saturday 1 March 2014 13.03 GMT



Two bombs exploded in Jamrud, in the Khyber tribal area near the Afghan border Photograph: Wali Khan Shinwari/EPA



Four kidnapped polio workers are found dead in Pakistan

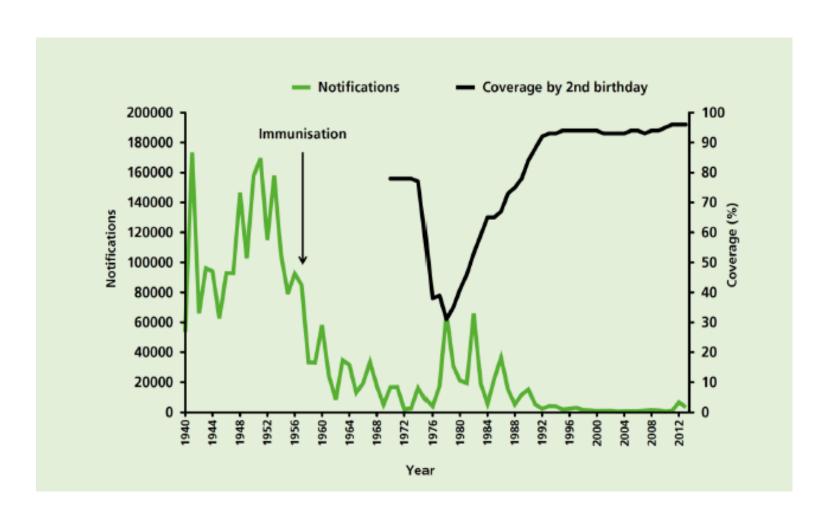
Pertussis



Photo courtesy of WHO



Pertussis cases and vaccine coverage England and Wales 1940-2012



Clinical presentation of meningococcal disease: it can be <u>difficult to recognise</u> and <u>can progress rapidly</u>

Babies and toddlers	Children and young adults
Fever with poor peripheral perfusion	Fever with poor peripheral perfusion
Poor feeding, refusing food or vomiting	Vomiting
Tense, bulging fontanelle and photophobia	Severe headache and photophobia
Fretful, unusual cry, moaning or rapid breathing	Confusion and irritability
Neck stiffness	Neck stiffness and muscle pain
Pale blotchy complexion &/or non blanching rash that does not fade when a glass is rolled over it	Pale blotchy complexion &/or non blanching rash that does not fade when a glass is rolled over it
Drowsy & loss of consciousness	Drowsy & loss of consciousness

Potential complications of meningococcal disease

- Meningococcal disease is associated with significant <u>case-fatality</u>, ranging from around 5% in infants and young children to 25% in older adults.
- Around a quarter of survivors of meningococcal disease will suffer serious long-term complications after recovering from the infection
- Complications can vary in severity and can either be temporary or permanent.
 The more severe the disease, the greater the risk of complications
- Complications can include:
 - Loss of hearing, loss of vision, loss of memory and/or concentration, difficulties in coordination and balance, epilepsy, cerebral palsy, limb amputations

Vaccines available for routine childhood immunisation

· Men C - programme started in 1999

 Men B - programme for infants started in September 2015

 Men W - programme for adolescents started in summer 2015

Men C: prior to 1999

- 1500 cases a year
- · 150 deaths

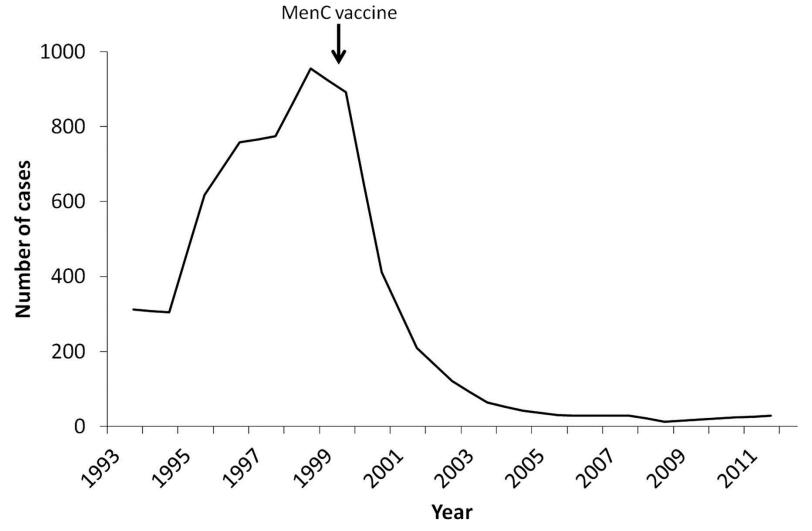
150 disabilities



Immunisation introduced in 1999

- Offered to everyone aged 2m-18y
- Since then extended to include everyone up to and including the age of 24y
- Cases fell by 90% in immunised age groups and by nearly 2/3rds in NON-immunised age groups because of reduced carriage rates

Number of laboratory confirmed cases of invasive serogroup C meningococcal disease in England and Wales between July 1993 and June 2012, before and after introduction of MenC vaccine into the UK routine immunisation schedule in 1999.

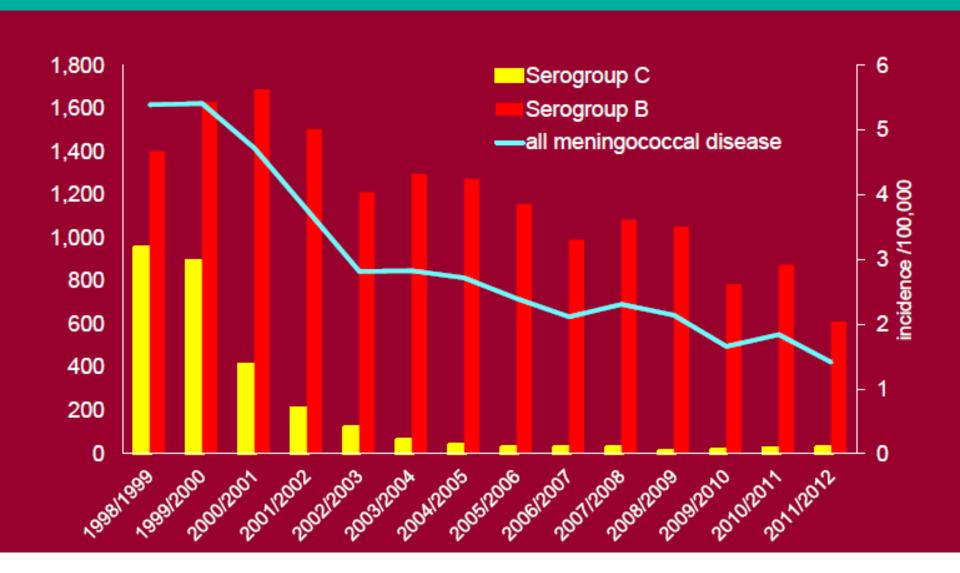


Pollard A J et al. Arch Dis Child 2013;98:248-251





Incidence of IMD and cases of group B & C England and Wales, 1998/99-2011/12



Impact of Men B and Men W programmes

· Can't be sure for some years

 Men B was expected to be effective against 88% of Men B strains

 In the 10 months since the Men B programme began - only 37 cases (42% lower than predicted from previous trends)

Haemophilus influenzae type b

Bacterium - 6 types

Droplet spread Commonest presentation (60%) is meningitis

Also

Epiglottitis (15%)
Septicaemia (10%)
Septic arthritis,
osteomyelitis, cellulitis,
pneumonia, pericarditis

Serious sequelae inc deafness, fits, brain damage (10%), death (5%)



Courtesy of Children's Immunization Project, St. Paul, Minnesota

Hib disease in England and Wales

Before 1992:

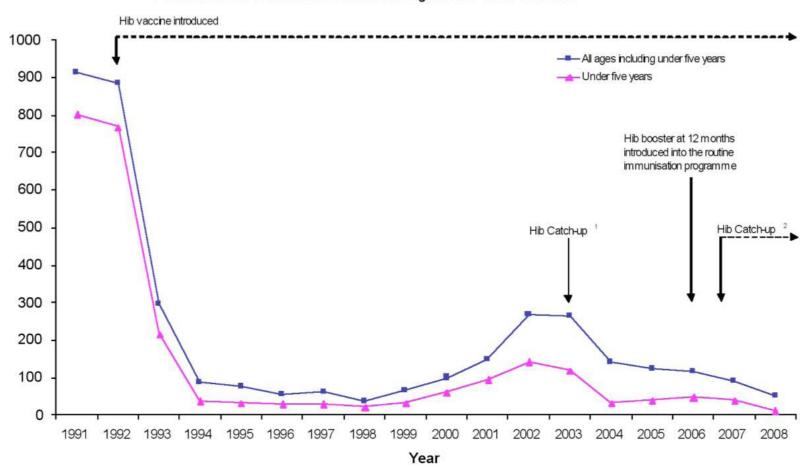
- 1 child in 600 developed some form of Hib disease by 5th birthday
- Hib meningitis caused 30 deaths each year
- Approximately 80 children a year were left with deafness or permanent brain damage

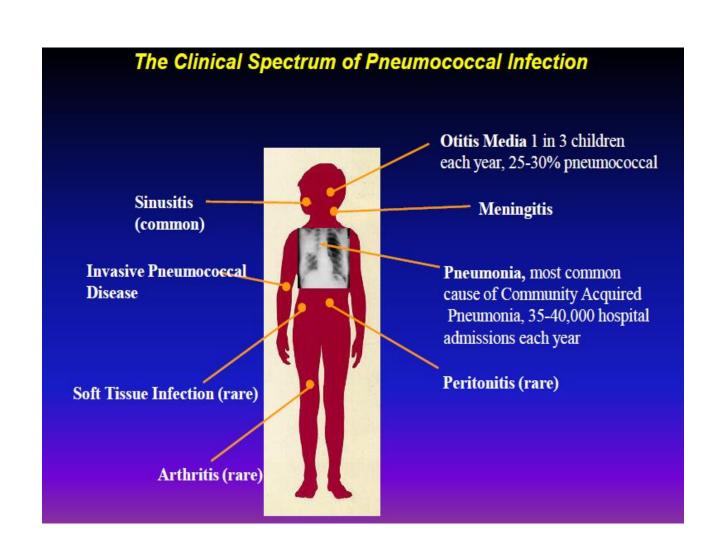
The importance of herd immunity:

 Six year old unimmunised child on holiday in Spain died in summer 2010

Impact of Hib immunisation

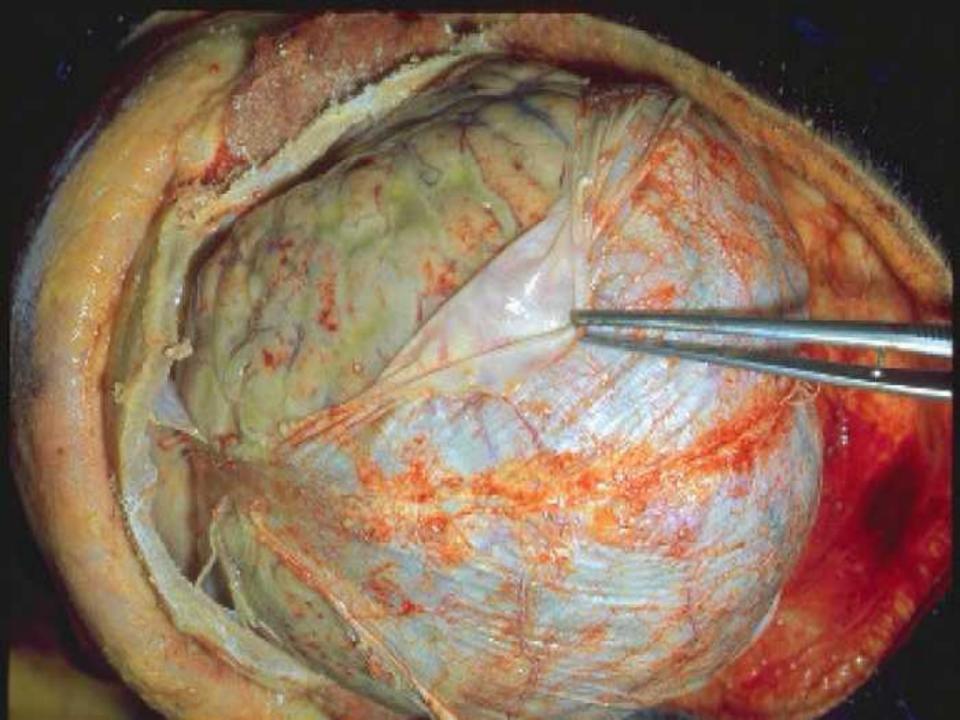
Confirmed cases of invasive Hib disease in England and Wales 1990-2008





Ear infections

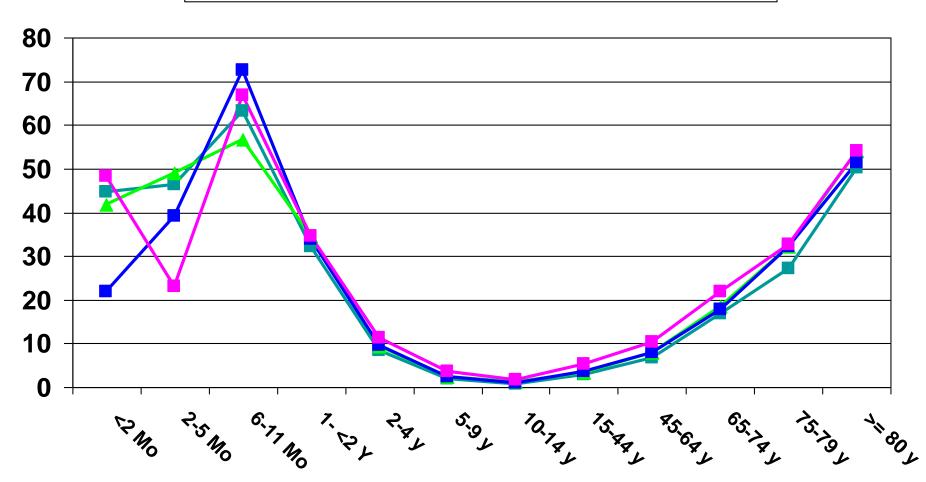




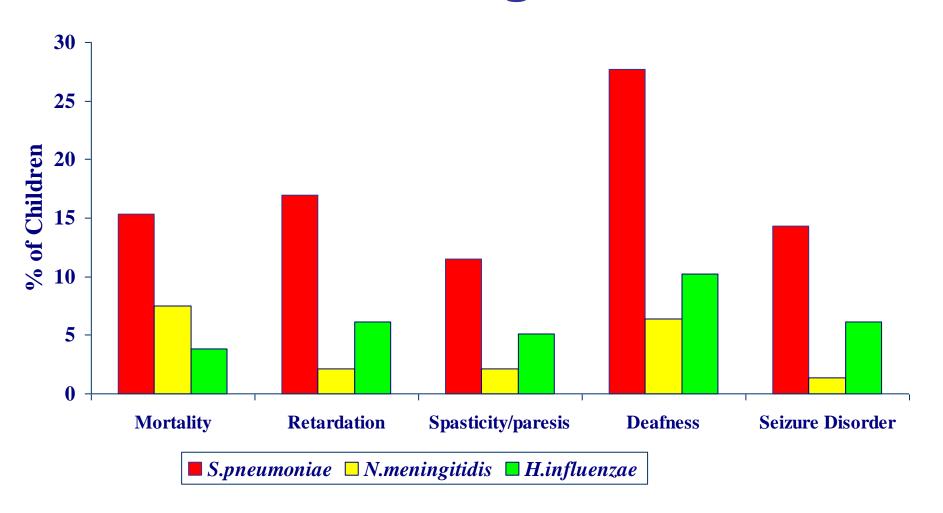
Pneumococcal disease is more common in people under the age of 2 years and over the age of 65 years

Invasive infection, England & Wales, Incidence per 100,000 by age group 2000/01 to 2004/05





Sequelae of Bacterial Meningitis



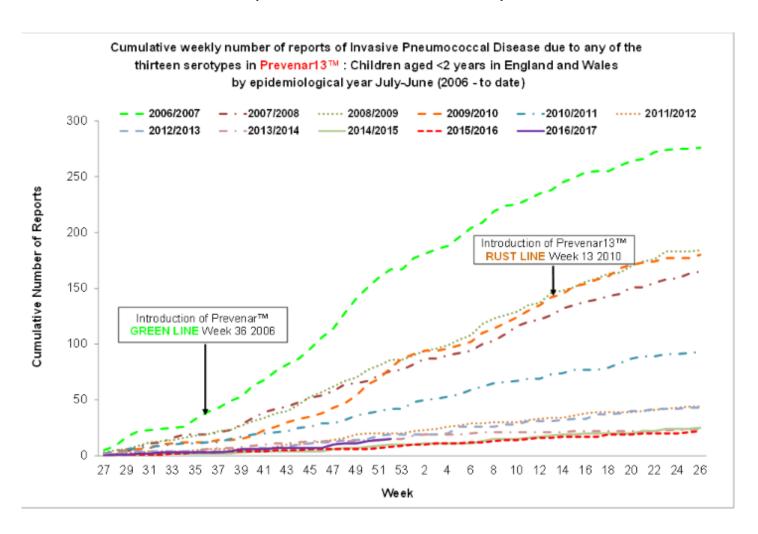
How big was the impact of pneumococcal disease?

 2nd commonest cause of bacterial meningitis in UK.

 1 in 6 of these children died (about 50 a year)

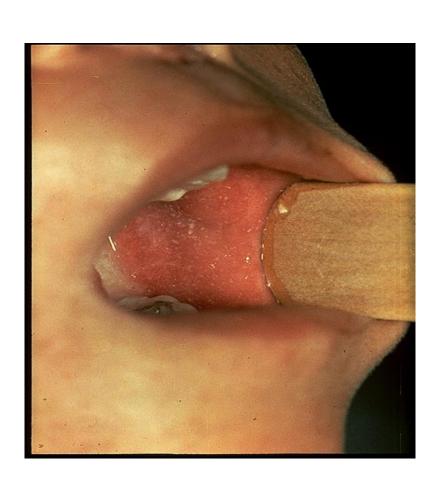
 More than half of the survivors left with a disability

Number of cases of invasive pneumococcal disease of the serotypes in PCV13 in children under 2 years (as at 13th Feb 2017)



Measles



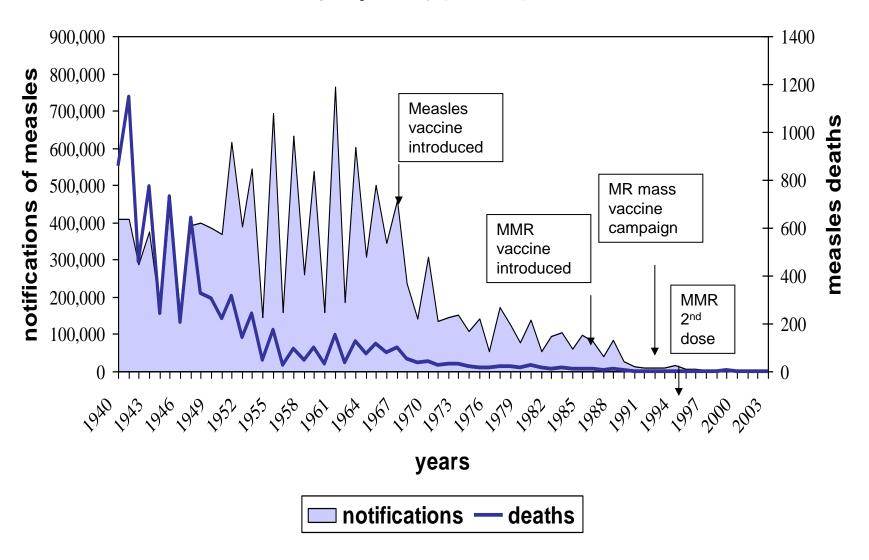


Symptoms

- Fever
- · Coryza
- · Conjunctivitis
- Malaise
- · Cough

· Then: rash

- Highly infectious: without vaccination everyone is likely to get measles (160,000-800,000 cases a year before an immunisation became available in 1968 with 100 deaths a year)
- for every 5,000 children who get measles, 1500 would develop complications, including:
 - 1-2 child will die
 - 5 will have encephalitis
 - 25 will have fits
 - 50 admitted to hospital
 - Around 400 will have diarrhoea
 - Up to 300 will have chest infections
 - Up to 500 will have ear infections
 - 1 child may develop SSPE



News Society MMR

Measles outbreaks hit 18-year high as effects of MMR scandal are felt

Many teenagers and young adults taken to hospital because they were not vaccinated as children after unfounded 1998 scare

Amelia Hill

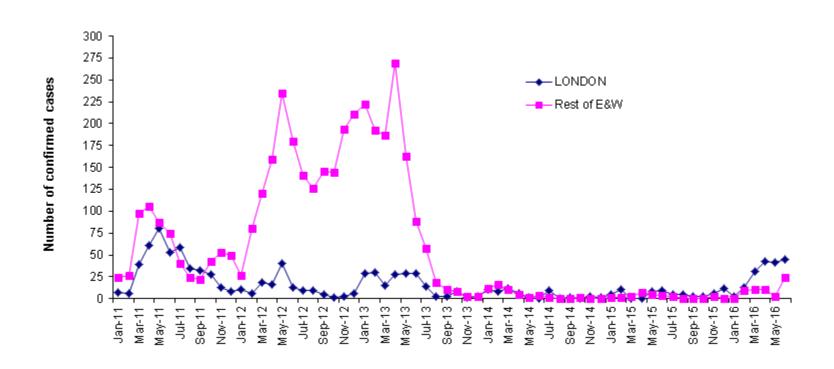
The Guardian, Friday 8 February 2013 19.49 GMT



A child with measles. There were 2,016 confirmed cases of measles in England and Wales last year, with prolonged outbreaks in Sussex and Merseyside.

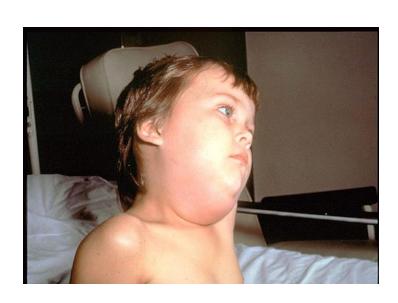
- 1087 cases in E&W in 2011
- 2030 cases in E&W in 2012
- Highest since 1994
- Especially unvaccinated individuals aged 10-19 years
- Catch-up campaign launched April 2013

Laboratory confirmed cases of measles in England by date of onset (January 2011 to June 2016)



Mumps

Fever
Headache
Malaise
Anorexia
Myalgia





Complications of mumps

- Aseptic meningitis (1 in 6)
- Inflammation of the testicles (1 in 4 males)
- · ..and of the ovaries (1 in 20 females)
- Profound deafness (1 in 15,000)
- Rare: encephalitis, death

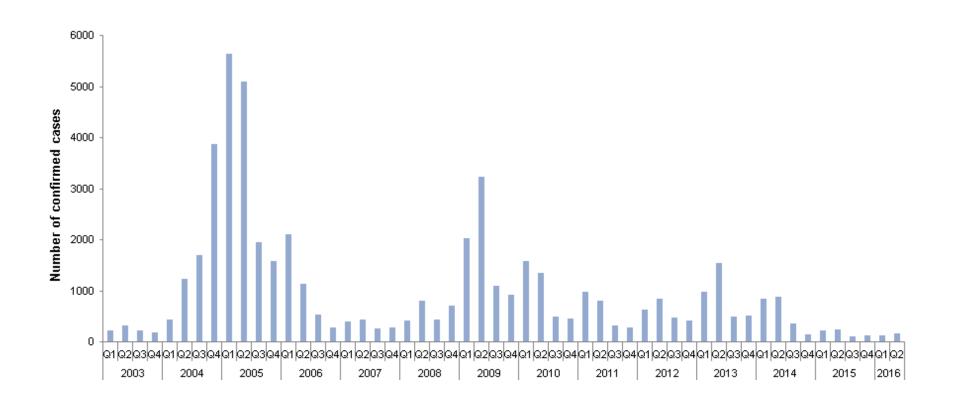
Impact of immunisation

· Before vaccine available:

- 85% adults had evidence of infection

- 1200 hospital admissions a year
- Commonest cause of viral meningitis in children

Laboratory confirmed cases of mumps by quarter, England, 2003-2016



Rubella



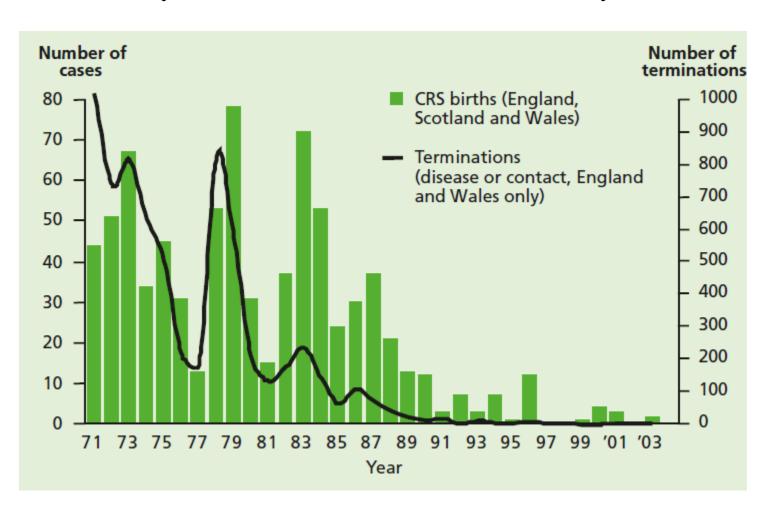
Fever Malaise Coryza Conjunctivitis Lymphadenopathy Then: rash



Complications

- Thrombocytopenia (1/3000)
- Encephalitis(1/6000)
- Congenital rubella syndrome:
 - Eye defects eg cataracts
 - Deafness
 - Cardiac defects
 - Microcephaly
 - Intra-uterine growth retardation
 - Inflammatory lesions of brain, liver, lung, bone marrow
- 90% of fetuses are affected if infection is caught in the first 10 weeks of pregnancy

Congenital rubella births and rubella associated terminations 1971-2008 (8 cases in total in 2002-11)



Human Papilloma Virus (HPV) Vaccine





What is HPV?

- Small DNA virus
- More than 100 types
- Common
- Transmitted by intimate contact
- Either
 - No risk infection is cleared by the body
 - Low risk warts
 - High risk cancer

HPV infection and cancer - how strong is the link?

Clinical studies have shown that in 99.7% of cases, cervical cancer is caused by HPV

Also linked to other cancers

Site	Percentage attributable to HPV infection	Percentage of which, HPV16 and/ or 18	Reference	
Cervix	>99	>75	Smith <i>et al.</i> , 2007, Howell-Jones <i>et al.</i> , 2010	
Penis	47	74	Miralles-Guri et al., 2009	
Vulva,vagina	42	90	Vuyst <i>et al.</i> , 2003	
Anus	84	93	Vuyst <i>et al.</i> , 2003	
Mouth	16	95	Kreimer <i>et al.</i> , 2005 (European specific)	
Oropharynx*	28	89	Kreimer <i>et al.</i> , 2005 (European specific)	

Which types of HPV cause most problems?

High risk

 Types 16 & 18 account for ~75% of cervical cancers in Europe

Low risk

 Types 6 & 11 account for 90% of genital warts



Cervical Lesions



Genital WartsImages courtesy of Dr J. Monsonego

 Takes many years for persistent infection to develop into cancer

 Cases of cervical cancer peak in women in late 30s

· 3000 cases a year in UK

· 1000 deaths a year in UK

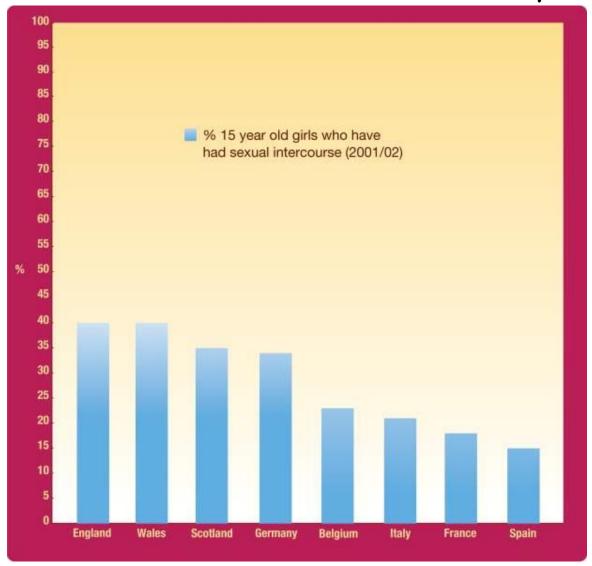
Despite the fact that:

- The NHS cervical screening programme is recognised as world leading
- Cervical cancer incidence fell by 42% between 1988 and 1997 (England and Wales). This fall is believed to be directly related to an organised cervical screening programme which was introduced in 1988

Of course:

Prevention is better than cure

Percentage of 15 year old girls who have had sexual intercourse by country



Adapted from Ross J, Godeau E, Dias S. Sexual health. In: Currie et al. Eds. Young people's health in context. Health behaviour in school-aged children study: international report from the 2001/2002 survey. WHO Europe; 2004.p. 153-160.

Impact?

- In Australia "near disappearance of genital warts in young women" 4 years after HPV programme started
- Protects heterosexual men herd immunity
- World-wide there is evidence of a fall in the incidence of pre-cancerous lesions
- Indications are that protection is long-lasting
- The vaccine provides cross-protection against some non-vaccine strains

Uptake in England

• Dose 1: over 90%

Dose 2: approx 86%

· Estimate: 400 lives saved a year

What about the boys?

 They are immunised in Australia, USA, Austria and parts of Canada

Reduction the rates of genital warts and some cancers

Decision will be based on cost-effectiveness

Pilot running in GUM clinics for MSM

The human papillomavirus (HPV) vaccine is being made available through GUM & HIV clinics as a pilot to MSM who are up to and including 45 years of age.

The vaccine will help to prevent HPV infection which can cause genital warts and HPV-associated cancers. It is especially important for those who are living with HIV, and those who have multiple sexual partners.

HPV vaccination record

Record your HPV vaccinations below to ensure that you don't miss out on protection against genital warts and HPV related cancers.

HPV vaccine dose	Date
1st dose	
2nd dose	
3rd dose	

you need all three doses

(If you are under 15 years old there is a two dose schedule)





HPV vaccination pilot for men who have sex with men (MSM)

Protecting yourself against warts and cancer

caused by human papillomavirus





Hepatitis B

 Babies born to mothers who are hepatitis B positive are at risk of developing hepatitis B themselves

- Once infected, 90% will become carriers
- A high proportion will go on to develop cirrhosis or liver cancer

50

 We identify the Hep B+ mothers antenatally

- Work out the level of risk
 - Higher risk
 - · Lower risk

· Immunise the babies appropriately

1. Standard schedule: 0 1 6 months Good levels of protection

Not fast enough to be sure of protecting the babies

Booster after 5 years if at continued risk

2. Accelerated schedule: 0 1 2 months

Protection achieved quickly

But ultimate antibody levels not as high as standard schedule

Boosters at 12 months and 3 years 4 months of age

Immunoglobulin for the higher risk babies

- These babies are exposed to a high level of rapidly replicating virus
- They received no antibodies from their mother
- So they need a dose of immunoglobulin as near to the exposure time as possible and certainly no later than 24 hours after birth
- The lower risk babies do not need immunoglobulin because they were exposed to lower levels of virus and may have got some antibody protection from their mothers

Tuberculosis



BCG vaccine

· Is TB a public health problem?

Is there a safe and effective vaccine?

Who are we going to immunise?

Reports of cases of tuberculosis to enhanced tuberculosis surveillance systems: United Kingdom, 2000 to 2015

Table 1: Number of TB case notifications, rates and annual percentage change, UK, 2000-2015

Year -		Total		Annual change in
	Number of cases	Rate per 100,000 (95% CI)	Annual change in case numbers (%)	rate (%)
2000	6,686	11.4 (11.1 - 11.6)	-	-
2001	6,760	11.4 (11.2 - 11.7)	1.1%	0.0%
2002	7,291	12.3 (12.0 - 12.6)	7.9%	7.9%
2003	7,219	12.1 (11.8 - 12.4)	-1.0%	-1.6%
2004	7,589	12.7 (12.4 - 12.9)	5.1%	5.0%
2005	8,283	13.7 (13.4 - 14.0)	9.1%	7.9%
2006	8,307	13.7 (13.4 - 14.0)	0.3%	0.0%
2007	8,260	13.5 (13.2 - 13.8)	-0.6%	-1.5%
2008	8,491	13.7 (13.4 - 14.0)	2.8%	1.5%
2009	8,870	14.2 (14.0 - 14.5)	4.5%	3.6%
2010	8,397	13.4 (13.1 - 13.7)	-5.3%	-5.6%
2011	8,919	14.1 (13.8 - 14.4)	6.2%	5.2%
2012	8,714	13.7 (13.4 - 14.0)	-2.3%	-2.8%
2013	7,866	12.3 (12.0 - 12.5)	-9.7%	-10.2%
2014	7,025	10.9 (10.6 - 11.1)	-10.7%	-11.4%
2015	6,240	9.6 (9.3 - 9.8)	-11.2%	-11.9%

Is TB a public health problem?

- Total number of cases is falling
- The majority of cases live in London
- 4.4% aged less than 15 years mostly ethnic minorities
- Three quarters born abroad (approx 70/100,000)
- Very low rates in the indigenous population (4/100,000)
- Risk factors: homelessness, drug/alcohol use, time in prison
- Commonest presentation: pulmonary

- Little transmission from immigrant to indigenous community
- Children get TB from the adults they are living with: prolonged close contact
- Children almost never transmit TB to other children: they are less infectious than adults

TB is a public health problem in <u>some</u>
<u>communities</u> by virtue of their
connections with parts of the world
where prevalence is high

AND

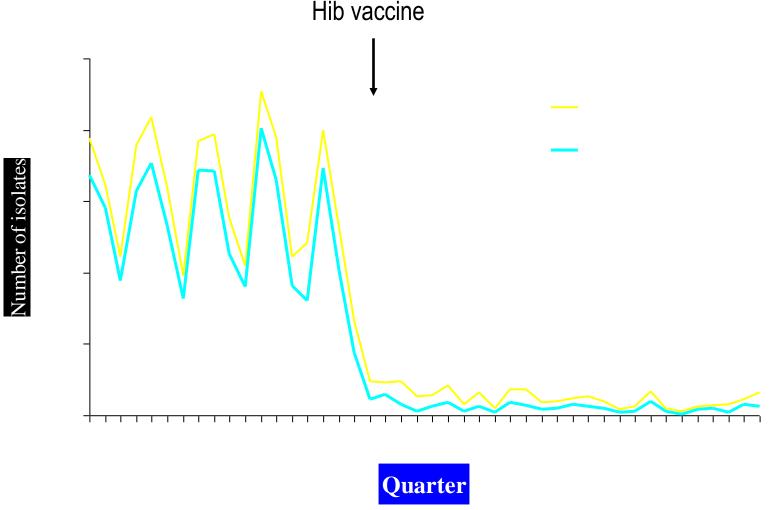
In <u>some communities</u> because of homelessness, alcohol and drug abuse, imprisonment

BCG: does it work and is it safe?

BCG: Does it work?

- MMR 2 doses 99% effective
- · BCG
 - Only one dose possible
 - Protection 0-80%
 - Less good against respiratory TB
 - Little evidence >16yo
 - Virtually no evidence >35yo
 - Length of protection no data beyond 15 years

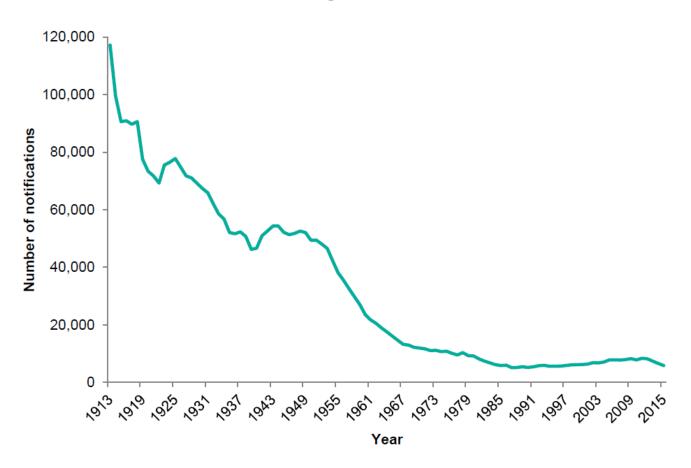
Quarterly laboratory reports of Hib CSF and blood isolates, 1989-1999*



* Provisional

Source: PHLS Communicable Disease Surveillance Centre

Number of TB case notifications, England and Wales, 1913-2015



BCG: is it safe?

 We used to do a Heaf test to screen out those who are hypersensitive

 Even so, unpleasant reactions not uncommon - ulcers, abscesses, lymphadenitis, BCG-osis

Who should be offered BCG vaccine?

 Babies whose parents or grandparents were born in a high prevalence country (>40/100,000)

 Babies of parents in another at-risk category eg homeless, travellers, drug users

Who else is offered BCG?

- Children aged less than 16 years who have a parent or grandparent born in a high prevalence country
- Contacts of cases as part of outbreak control
- New entrants from a high prevalence country aged under 16 years
- People at occupational risk aged under 35 years
- People aged under 16 years who are intending to live or work in a high prevalence country for more than 3 months

BCG is not recommended for people who do not have risk factors

This is because for them the risks outweigh the benefits

Best way to control TB

- Improve public health
- Case finding
- Treatment
- Prevent spread
- · BCG least important measure

Chicken pox

- · Malaise, fever, rash
- More serious in
 - adults (esp smokers and pregnant women pneumonia, death)
 - neonates and the immunosuppressed (disseminated varicella)
 - the fetus (long term damage, death)
- Shingles



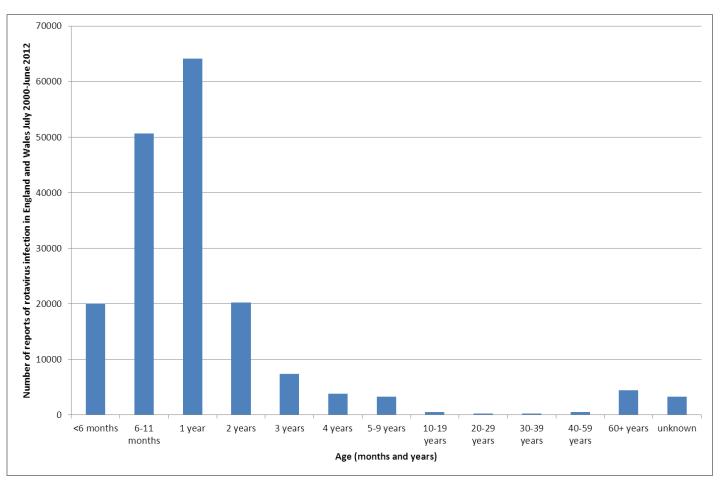
Chicken pox

- · Recommendations:
 - Aged 12 months or over : 2 doses 4-8 weeks apart
 - For non-immune healthcare workers
 - For healthy close household contacts of an immunosuppressed individual

Rotavirus

- Very robust virus and only need 10-100 virus particles to cause illness
- Can be exposed because of faeco-oral, contaminated surfaces, dirty hands, nappies as well as respiratory droplets including coughing and sneezing
- Severe diarrhoea and vomiting for 3-8 days with fever and cramps
- Can lead to dehydration and to hospitalisation for nasogastric or intravenous fluids
- The younger the child the more severe the symptoms are likely to be

Who is most at risk?



Numbers of laboratory confirmed cases of rotavirus infection in E&W July 2000-June 2012

Disease burden in England and Wales before the vaccine was available

- 130,000 children were taken to their GP
- · 12,700 children were admitted to hospital
- Very few deaths in UK tend to be in children who are already unwell
- Estimated that rotavirus caused about half the D&V seen in children under 5y

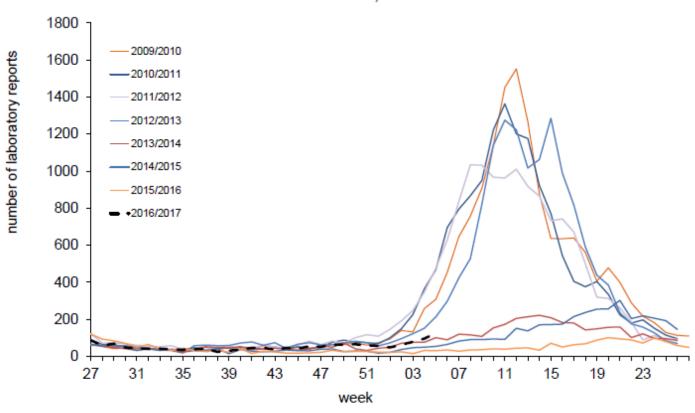
Has the vaccine worked in the UK?

94% of babies have 1 dose

90% have 2 doses

The impact of rotavirus vaccine (as at 15th February 2017)

Seasonal comparison of laboratory reports of rotavirus (England and Wales)





Indirect impact on older children

Age	Decline in rotavirus hospitalization rate (2008 vs. 2006)	Rotavirus vaccine coverage in 2008 (≥1 dose)
<1 year	66%	56%
1 - <2 years	95%	44%
2 - <3 years	85%	<1%

This age cohort was NOT eligible to receive rotavirus vaccine