Sexually transmitted and intravenous (bloodborne) infections.



Christopher Whitty Gresham College 2022

Route of transmission is key to understanding and combatting infectious diseases.

- Vector-borne (insects etc).
- Oral- food, water and other drink.
- Sexual (STI) & bloodborne.
- Respiratory.
- Touch.
- Usually one route dominant. Sometimes secondary routes.



Jean-Honoré Fragonard. The Bolt. 1777

Other infectious routes can be between strangers at a distance. STIs are transmitted by close contact with someone the infecting person knows, and often loves and cares deeply about.

- Several viruses, bacteria and parasites have evolved to take advantage of the human desire for intimacy, love and sexual contact.
- A potentially efficient transmission strategy.
- Prolonged contact, relatively less defended parts of the body.



Gustav Klimt. The Kiss. 1907. Til Krech.

It is often assumed STIs are medically trivial- and some are.

- But several major diseases transmitted mainly via the sexual route. Includes:
- HIV- the last really major pandemic, killed over 36 million people to date.
- Syphilis- a major, multisystem disease.
- Several infections which cause cancer including HPV and Hepatitis B.
- Causes of infertility, stillbirth, neonatal damage.
- Can cause stress, relationship damage.



Medicine's ability to intervene between an infectious person and the person potentially infected different from other routes.

- For STIs (and IVDU) the contact is direct, and personal.
- Greater reliance on case finding and early treatment.
- Embarrassment or shame a major reason people do not seek help. For medical staff diagnosing and treating STIs is common, and normal business.
- Stigma is a major barrier to diagnosing and treating STIs.
- Useful behaviour change is possible (eg condoms).
- For some important STIs we now have vaccines.
- Treatment remains the mainstay for most.



STIs are (unsurprisingly) mainly diseases of sexually active adults.

- Most infectious diseases have their greatest impact in the very young and old.
- STIs however generally occur, if at all, after sexual debut so are usually diseases of adults.
- Most commonly acquired before people have formed long-term partnership- so younger adults.
- Many if untreated can remain infectious for years, or life.
- People often unaware they are infected until a new sexual partner gets symptoms.



The Kiss. A. Rodin 1903. (P Weissenbacher)

Rate of new STI diagnosis by gender and age, England 2019. PHE 2020.



STIs, pregnancy and childbirth.

- It is particularly important to identify STIs before or during pregnancy.
- Some major STIs can be passed vertically from mother to baby including HIV, syphilis.
- Some can be passed to the baby in the birth canal during labour.
- Checking for STIs and treating them before or during pregnancy should be seen as normal good care.





Bloodborne infections.

- Bloodborne infections are transmitted blood-toblood.
- Historically medical practice- using the same needle or knife on more than one person.
- Blood products before effective screening. \bullet
- Now mainly intravenous drug users (IVDUs), sharing needles.
- Major bloodborne infections from intravenous drug use and STIs overlap: HIV, Hepatitis B and C.
- Needle exchanges useful for IVDU.



CALL 1-800 662 HELP.

You can't tell if someone has the AIDS virus just by looking You can't tell if needles or works are infected just by looking. When you shoot drugs and share needles or ment. It's the best way to make sure you don't works you could get AIDS. Even if you think

your drug-sharing partners are clean, if the AIDS virus is present, it could be passed to you. AIDS is not pretty. It's a long, slow, painful way to die. Do the right thing. Get into treat-

shoot up AIDS STOP SHOOTING UP AIDS

Blood transfusion and blood products.

- An extraordinary gift from one person to another they (usually) do not know.
- Life saving.
- But can transmit infections.
- To reduce risk some temporary exclusions including for illness, some travel (eg malaria, Chagas disease).
- HIV, Hepatitis B, C and others screened for.
- Infection rate now very low indeed.



Syphilis.

- Syphilis was a new disease to Europe in the 1490s. It swept through the continent in a few years. Probably more severe early in the first wave.
- It was realised fairly early on it was sexually transmitted. And quicky blamed on foreigners.
- As a disease which caused serious illness, visible scars and stigma, it was widely feared.
- It had a profound effect on the practice of medicine.



Syphilis- the great mimic.

- Primary syphilis. Chancre (painless ulcer) lasting 3-6 weeks.
- Secondary syphilis. Fever, generalised rash, various ulcers.
- Tertiary syphilis- 10-30 years later. Includes:
- -Brain, nerves, eye. Including general paresis of the insane (GPI), dementia, tabes dorsalis.

-Bones, joints, skin.

-Heart, great blood vessels, liver.



Syphilis treatment, Vienna 1498.

Initial treatment and impact on medicine and society.

- Initial treatment of syphilis included herbs, mercury, various woods (eg guaiacum).
- As a new disease not known to Galen and Hippocrates it allowed a major rethink of medical theory and practice.
- Made chemical drugs semi-respectable.
- Allowed surgeons to start to use drugs and substantially expanded their practices.
- Conversion of leprosy hospitals (lazar houses) to syphilis hospitals (lock hospitals) and wards (eg The Dorter at St. Bartholomew's).
- Substantial impact on society and literature.



Syphilis by the end of the pre-antibiotic era.

- Around 10% of adult male Londoners in 1919 had it.
- In US army of WWI the second most common cause of illness leading to loss of duty (1918 'flu pandemic No 1).
- Was one of the commonest causes of dementia.
- Salvarsan, an arsenic-based drug, the first really effective treatment (1910).
- Penicillin largely collapsed the epidemic in high income countries, and prevents late complications.
- Needed case finding, contact tracing.



Syphilis diagnoses 1922-2019 in England by gender. PHE 2020.



Year

Between the 1980s and 2020s HIV/AIDS one of the most severe new threats to health in our lifetime. Over 36M deaths to date.



Wikimedia.



From *The Ward* by Gideon Mendel. Broderip ward, London.

The early years of HIV.

- Initially a variety of simian (monkey/ape) viruses (SIV) in Africa it crossed multiple times to humans, leading to HIV-1 (prob DRC from chimpanzees) and HIV-2 (West Africa). Probably from 1920s.
- 1981 gay men in California developed a rare lung disease PCP, gay men in New York a cancer Kaposi's sarcoma.
- 1981 intravenous drug users in USA.
- 1982 'Slim' disease described Uganda.
- Extremely high mortality (almost 100% untreated mortality eventually). AIDS.



Charles J Sharp. Chimpanzee, Uganda.

HIV destroys key parts of the immune system especially CD4 cell mediated. Takes many years.

- Some common infections much more dangerous including TB, pneumococcal pneumonia, some salmonella, pneumococcal meningitis.
- Several fungal diseases including PCP in lungs, cryptococcal meningitis, penicillium.
- Several cancers including Kaposi's sarcoma, lymphoma.



Multiple epidemics initially occurred as part of the pandemic.

- Largely heterosexual STI in Africa, parts of Asia. The largest. Many children from infected mothers.
- Much of the epidemic in Europe and North America STI in MSM.
- Intravenous drug users globally.
- Some blood products- eg haemophilia sufferers.



Spread of HIV: sub-Saharan Africa, 1984-99. Essentially 100% mortality in this period.



Estimated percentage of adults (15–49) infected with HIV.



In the absence of medical countermeasures (drugs, vaccines) initial response had to be trying to change social behaviour.



Probably the most important early initiative was the promotion of condoms and other barrier methods of contraception.

- No good evidence that abstinence-only campaigns had a major impact on HIV.
- No good evidence condom promotion increased sexual activity.
- Condoms, female condoms and diaphragms reduce risk of HIV and other STIs (but certainly not to zero).
- Circumcision also reduces risk of HIV.



Drugs to treat HIV- the HAART era.

- No effective vaccine (yet) available.
- First serious antiretrovirals from mid 1990s (HAART).
- Initially moderately effective, significant side effects, very expensive, complex.
- Steady improvement. Became available in lower income countries.
- Life expectancy of HIV infected now broadly similar to non-infected IF rapidly diagnosed and treated.



NIAID

HIV/AIDS deaths by age 1990-2017.

(UNAIDS/IHME/Our World in Data)



Treatment as prevention.

 The chances of someone with HIV who is well controlled on HAART passing HIV on to a partner is close to nil.

 PrEP: pre-exposure prophylaxis. If taken as advised reduces sexual transmission by up to 99%.



Terence Higgins Trust.

Projected population structure with and without the AIDS epidemic, Botswana, 2020



Population (thousands)

Mother-to-child transmission of HIV.

- In the early HIV epidemic 15-45% of children of HIV+ women infected.
- 65% of these were infected at birth; during pregnancy and breastfeeding the remainder.
- In high income settings this is now <1%. Depends on antenatal screening. UK <0.5% transmission.
- Effective antiretrovirals in pregnancy, occasionally caesarean section.



Mother-to-child rates in UK and Ireland (2000 to 2014). <10 yr UK. н Peters 2016.

Global prevalence of HIV



Source: UNAIDS.





HIV prevalence 2017 (L) and change 2000-17.

Dwyer-Lindgren L et al GBD Nature 2019.



In high-income countries HIV new cases dropping, deaths rare. UK experience.



*Adjusted for missing route of exposure

PHE 2018.

Cervical cancer caused by HPV.

- Human papilloma viruses exceptionally common. Sexually transmitted at an early age.
- Some HPV cause warts, others (esp HPV 16 and 18) cancer.
- Globally around half a million women affected. Around 3000 cases a year in UK.
- 1 in 142 UK females will be diagnosed with cervical cancer in their lifetime.
- Often young.
- Now almost 100% preventable.
- HPV vaccine and screening.



CRUK

UK vaccine for girls against HPV 16, 18 introduced in 2008.

- Prevalence of HPV16/18 decreased between 2010/2011 and 2016 from 14.0% to 1.6% in 19–21 year olds attending chlamydia screening.
- Vaccine effectiveness for HPV16/18 82%.



Mesher D et al JID 2018. In girls/women for chlamydia screening.

Substantial reduction in cervical cancer risk in England.

Falcaro M et al. Lancet 2021.

- Of 13.7 million-years of follow-up of women younger than 30 years the estimated relative reduction in cervical cancer rates by age at vaccine offer were:
- 34% (95% CI 25–41) for age 16–18 years (school year 12–13)
- 62% (52–71) for age 14–16 years (school year 10–11)
- 87% (72–94) for age 12–13 years (school year 8).



Improvements in combatting HPV driven cancer are continuing.

- Vaccines covering a wider range of HPV viruses developed.
- Robust data on safety continues to accumulate.
- Extension of vaccination to boys.
- Most vulval, penile, anal cancers caused by HPV, and some mouth tongue and throat cancers: HPV vaccines also protects against these.
- And genital warts.



Liver cancer and hepatitis.

- Around 10% of primary liver cancer in the UK due to Hepatitis B or C.
- Up to 90% of liver cancer (hepatoma) in developing countries and 40% in developed countries due to Hepatitis B and C.
- In some countries hepatoma the most common major cancer.
- High mortality.



Hepatitis B- bloodborne and sexual.

- Hepatitis B common, easy to catch.
- WHO estimates over 250 million infected.
- Sexual / IVDU transmission in adults.
- Vertical transmission mother-to-child.
- Horizontal transmission between children. Most infection is before 5 y.
- Drugs to suppress, but not yet cure, available.



Prevention by vaccination: Hepatitis B and hepatocellular carcinoma (liver cancer, HCC).

- Taiwan Hep B vaccination programme for infants 1984. Reduced cancer incidence by 80%, mortality by over 90%.
- Most children globally, including in the UK, are now vaccinated with combined
 Diphtheria, tetanus, pertussis, Hib, Hepatitis
 B (+/- polio). 84% coverage.
- Provides 95-100% Hepatitis B protection.



C. Chaing et al JAMA 2013

Hepatitis C. Largely bloodborne, some sexual.

- Great majority acquired in adults, mainly unsafe medical practice and IVDU.
- Some sexual spread- low risk.
- >1.5M new cases a year (WHO).
- No vaccine.
- In the last 10 years several highly effective oral drugs.
- Up to 90% cure rate.



Gonorrhoea

- Much less serious than HIV or untreated syphilis. But unpleasant, occasionally serious.
- Especially in pregnancy.
- Quite common; around 35,000 cases a year in UK, 2nd most common reported STI.
- We have a serious problem with multi-drug resistant gonorrhoea.



Gonorrhoea complications before and in pregnancy.

- Can cause pelvic inflammatory disease and reduced fertility.
- Preventable miscarriage.
- Premature labour.
- Potentially blinding conjunctivitis of babies at birth (28% of births to infected mothers).



Gonococcal ophthalmia neonatorum. CDC

Gonorrhoea diagnoses 2015-19 by main sexual risk in England. PHE 2020.



Chlamydia.

- Very common bacterial STI.
- Treatable with antibiotics (both partners at the same time).
- >70% notice no symptoms. Those that do include:
- -Pain on urinating.
- -Pain during sex or bleeding after.
- -Bleeding between periods.
- -Lower abdominal pain.



US data showing age distribution (CDC 2019)

Important to identify and treat chlamydia.

- In women a risk of pelvic inflammatory disease.
- Can cause infertility or ectopic pregnancy.
- If infected during childbirth can cause problems in the eyes of the baby, or a pneumonia.



- In men a risk of inflammation of the epydidimis, testicular pain.
- Can affect fertility.
- In men (and a smaller number of women) reactive arthritis for weeks to months.

Trichomonas.

- A very common, treatable, parasitic STI.
- Only about 30% of people have symptoms.
- In those that do- itching, inflammation, discharge, pain on having sex.
- Can cause preterm birth in infected pregnant women.
- Increases risk of HIV being spread.



Herpes (HSV).

- Herpes Simplex Virus (HSV).
- HSV-1 normally oral-, causes cold sores.
- Exceptionally common- most people.
- HSV-1 usually acquired in childhood, recurrent, lifelong. Can be genital but much rarer.
- HSV-2 is a STI. WHO estimate 491 million people aged 15-49 (13%) worldwide have HSV-2 infection. UK rate lower than USA.



HSV-1 coldsore. NHS.

HSV-2.

- Similar to coldsore but of the genitals.
- First (primary) infection can be very painful.
- Often no symptoms, or itching/painful ulcer.
- Recurrent through life. Most infectious when symptomatic.
- No complete cure, although drugs can reduce frequency and severity.
- As lifelong can cause relationship concerns.



PHE 2020, first infection anogenital herpes.

Pubic lice ('crabs').

- Not dangerous- do not spread disease. Can cause itching (generally allergy to louse saliva).
- Evolved to live in pubic hair, and occasionally other hair on the body (but not scalp hair).
- Spread person-to-person. Condoms do not protect.
- Only able to live for short times off a human.
- Easy to treat once diagnosed.



Some diseases have sexual spread as a potentially important secondary route. Two recent examples Ebola and Zika.

- Prolonged persistence of virus for months in male reproductive tract and seminal fluid for Ebola (touch) and Zika (vector).
- After they have fully recovered and infection has left blood.
- Allows infection to be reintroduced long after initial infection, even if rare.
- May help spread over time and space.



Rates of new STI diagnosis by local authority of residence 2019. PHE 2020.



Common STIs diagnosed in men (L) and women (R) England 2010-19. PHE 2020.



Sexually transmitted and bloodborne infections.

- Some are common.
- Some are life threatening.
- Early diagnosis and treatment essential.
- Reducing stigma and contact tracing key.
- HIV, syphilis and Hep C transformed by treatment.
- Vaccines for HPV and Hep B will have a major impact on cancers.
- Safe blood products, medical practice and IVDU needle exchange central to reducing bloodborne infections.

