HBV in the UK: economic aspects

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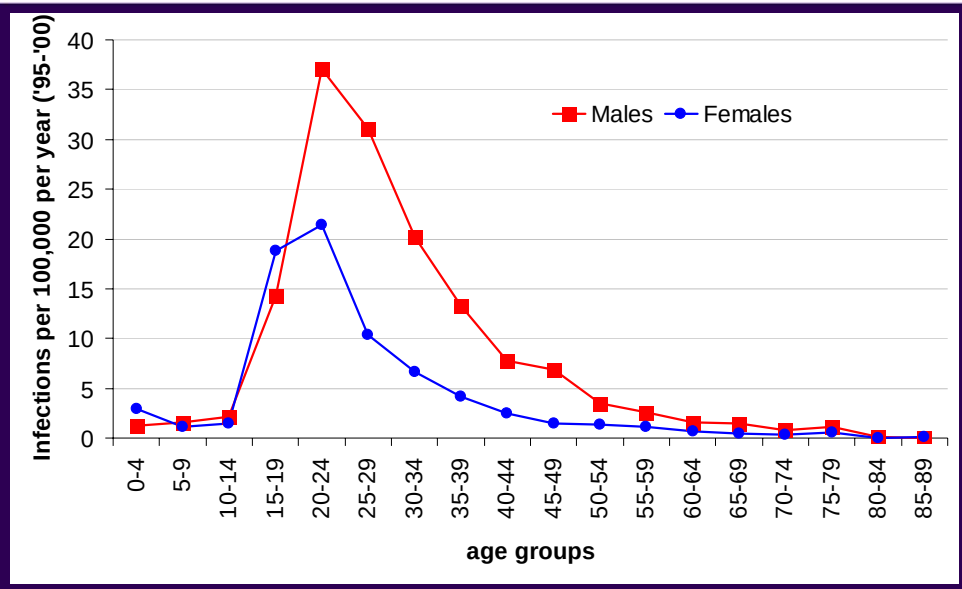
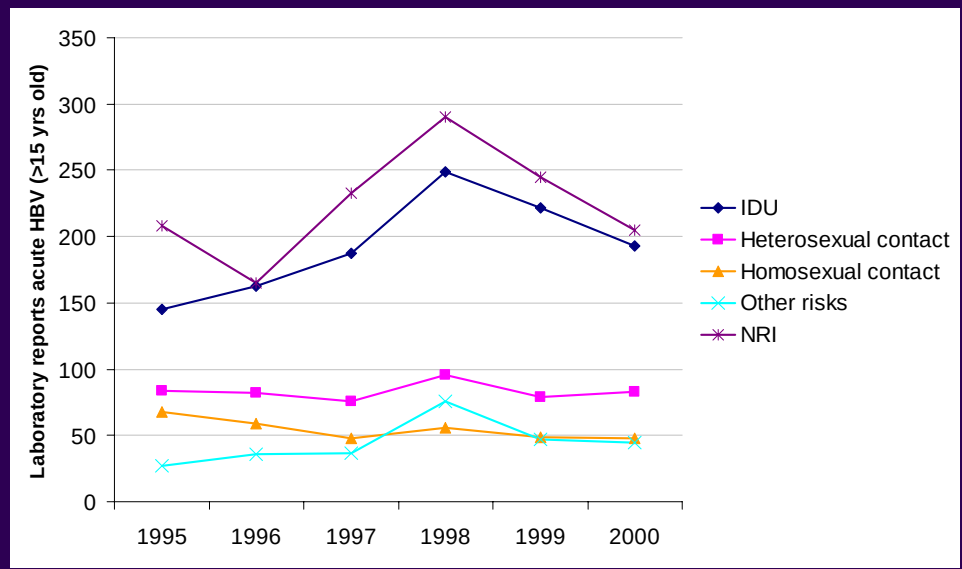
Outline

- Review epidemiology
- Universal options
  - Economic model
  - Parameterisation
  - Results & sensitivity analyses
- Alternative options
- Discussion

Review of epidemiology (Hahne et al. 2004)

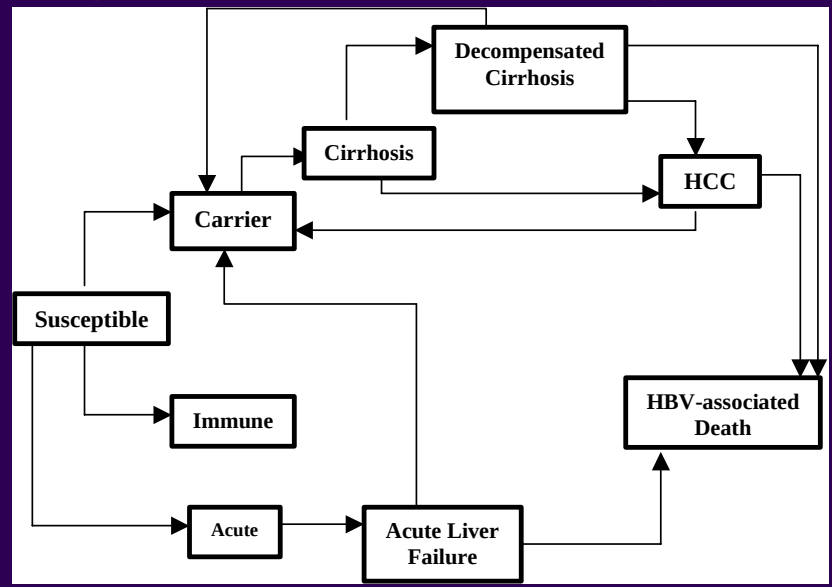
- Incidence is low in England & Wales
- ~670 laboratory reports / yr
- ~3,800 infections / yr
- ~ 280 chronic carriers / yr
- Most cases occur in risk groups
- Most (~95%) carriers living in UK acquired infection abroad
- ~6,500 new carriers immigrate
- Implications
- Vaccination of risk groups may be more cost-effective
- Universal vaccination will not lead to a significant reduction in resource use





Cohort model
from Fenn et al. 1996, & Anderson, unpublished

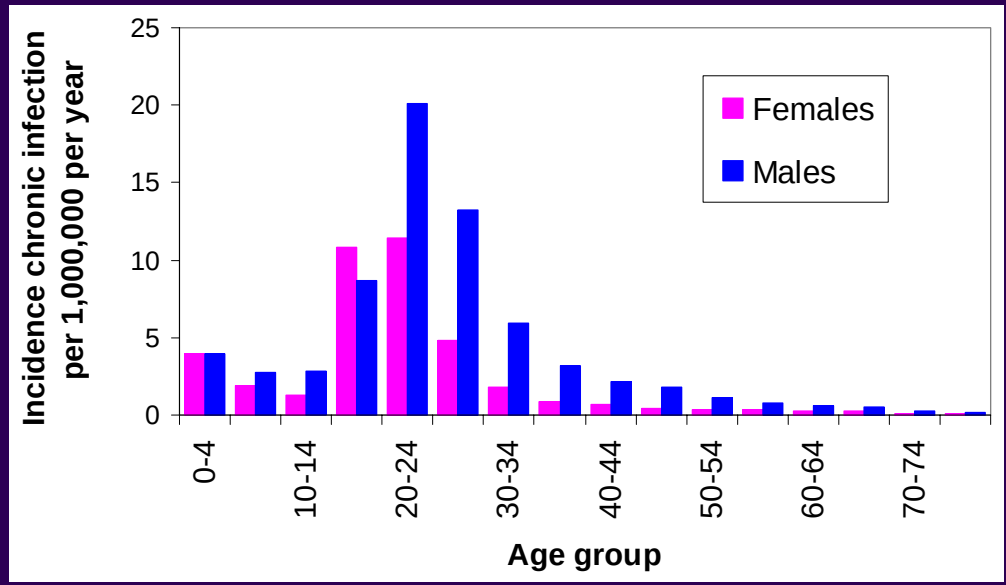
- Cohort of individuals followed from birth (either vaccinated or not)
  - Susceptible
  - Acute infection
  - Acute (fulminant) liver failure
  - Chronic carrier
  - Cirrhosis
  - Decompensated cirrhosis
  - HCC
  - Immune
  - Death



- Costs and benefits (life-years lost) compared in two cohorts
- Vaccination occurs in infancy (3 doses) or adolescence (2 doses)
- Males and females treated separately (incidence & progression differs)
- Transmission ignored (benefits underestimated)

Cohort model
epidemiological & demographic parameters

- Incidence taken from Hahne *et al.* (assume stable through time)
  - Also used South Asian estimates as part of sensitivity analysis
- Background mortality from ONS
- Most transition probabilities taken from literature
  - E.g. Cirrhosis to decomp cirrhosis and HCC from Fattovich et al. 1993



Cohort model
epidemiological & demographic parameters

•Little data on key progression

(carrier to cirrhosis)

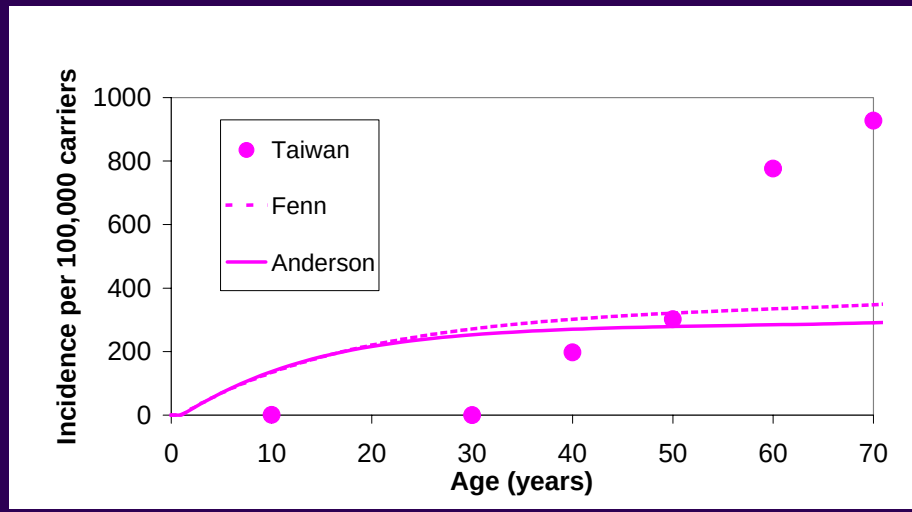
- Estimates of 0.6 – 2.1% per yr
- Progression rates chosen to give

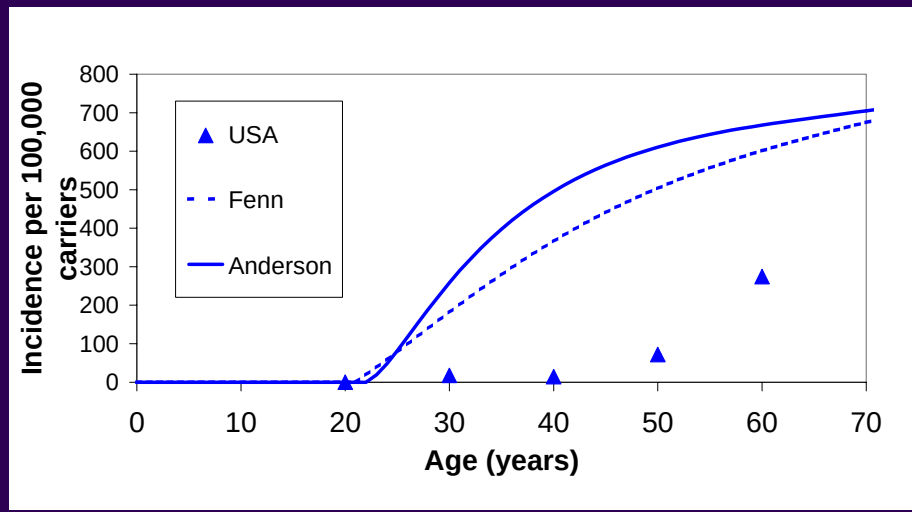
~25% developing HCC over lifetime

– Do not fit observed data on time-course of progression (data from Taiwan and US)

- Estimated transition probabilities by fitting model to (male) data

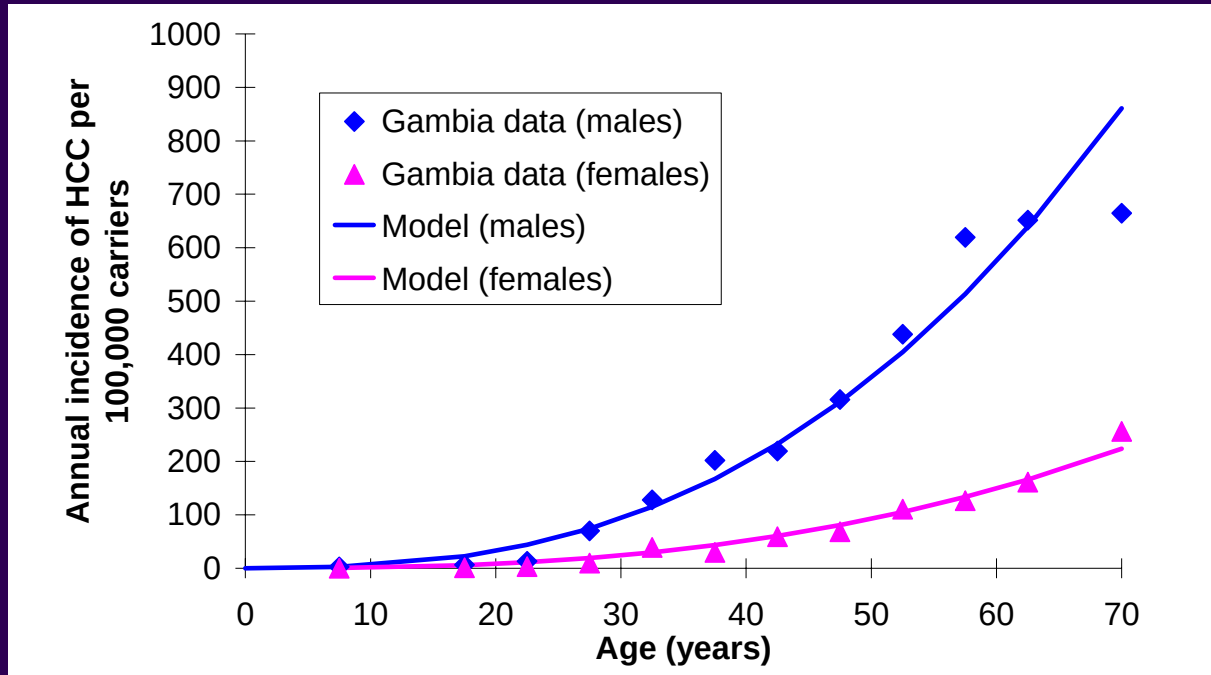
- Taiwanese (higher) estimates
- US (lower) estimates
- Estimated rates for younger & older adults & when progression rates change





Cohort model
epidemiological & demographic parameters

- Estimated lower progression rates for females
  - Based on difference in HBV mortality (HCC & cirrhosis) observed in The Gambia
  - Rates 5 times lower than for men



Cohort model
other assumptions (base-case)

- Vaccine coverage = 90%
  - Both infant and adolescent
- Vaccine efficacy = 90%
  - Both infant and adolescent
- Life-long immunity
- Adolescent vaccination given at 12 years of age

- Future costs and health benefits are discounted at 3.5% per annum (as recommended by NICE)

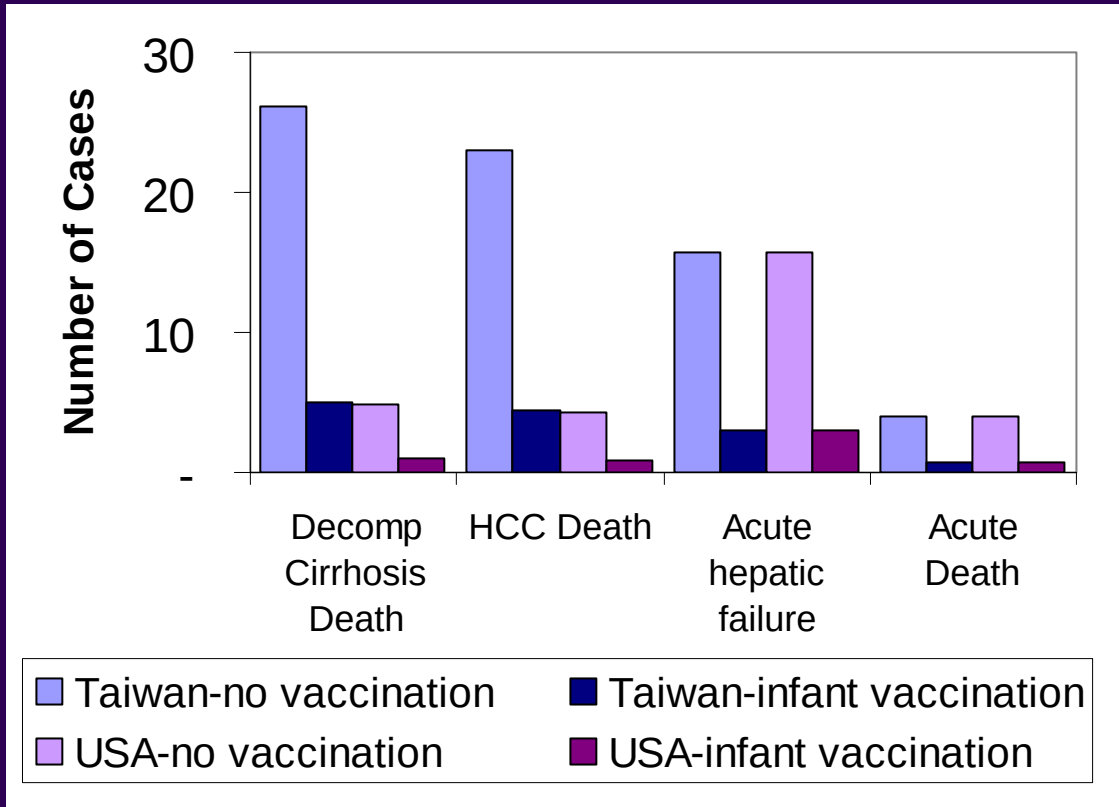
Cohort model
cost parameters

- NHS perspective
- Base-case cost per vaccine course
  - Infant = £15 (3 doses @ £5)
  - Adolescent = £15 (2 doses plus £5 administration)
- Treatment costs taken from literature & standard sources
  - often HCV
- Inflated to £2003

Item	Units (per)	Cost (£)	Source
Acute HBV (no transplant)	Episode	1,747	Struve & Giesecke (1993)
Compensated cirrhosis	Year	1,674	Grieve & Roberts (2002)
Decompensated cirrhosis	Year	10,114	Grieve & Roberts (2002)
HCC	Year	9,729	Grieve & Roberts (2002)
Fulminant hepatitis	Episode	4,401	NHS Reference Costs (2003)
Liver transplant	Episode	50,518	Grieve & Roberts (2002)

Base-case results:
universal infant vaccination

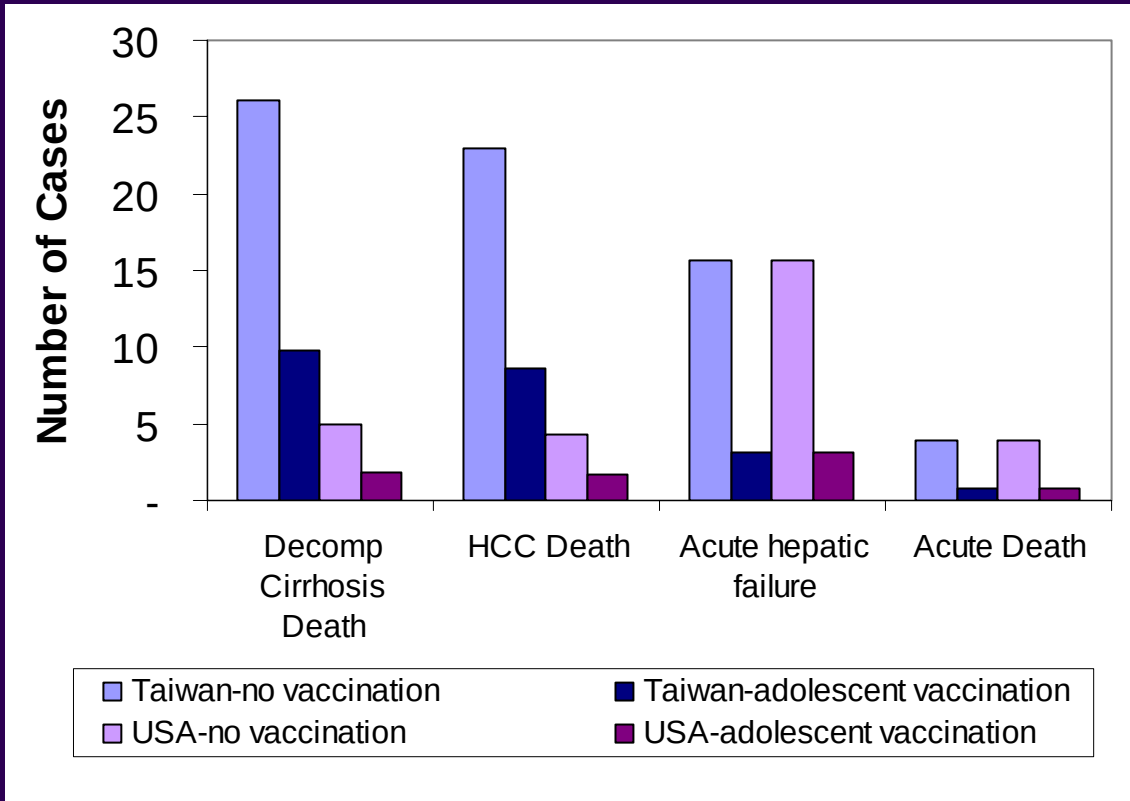
Estimated number of HBV associated deaths and acute morbidity in cohort with and without universal infant vaccination



~80 % reduction in HBV associated deaths

Base-case results:
universal adolescent vaccination

Estimated number of HBV associated deaths and acute morbidity in cohort with and without universal adolescent vaccination



~60 % reduction in HBV associated chronic deaths

Cost-effectiveness
Base-case results

Cost (£) per discounted life year gained of vaccination compared with current strategy

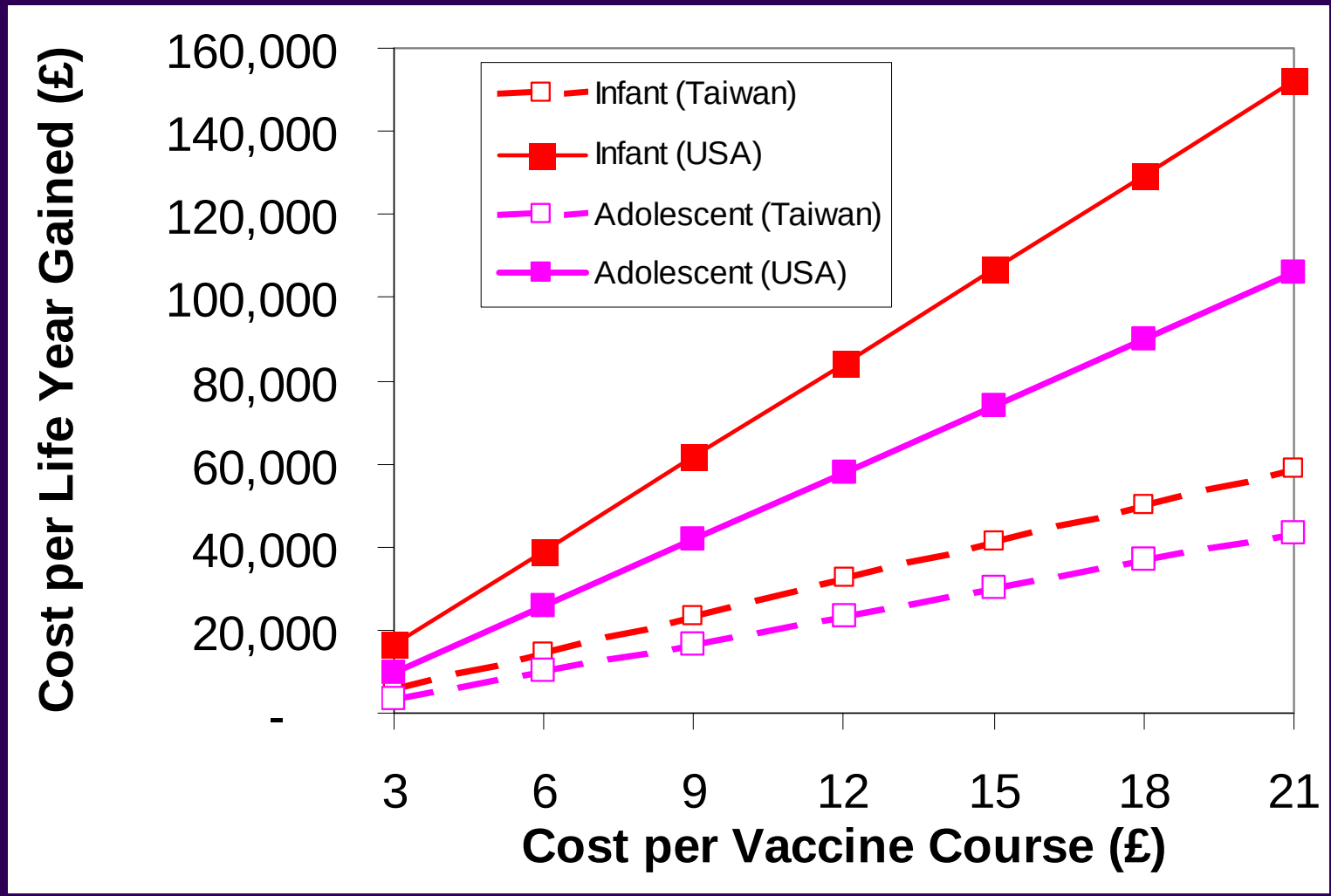
	Infant	Adolescent
Taiwan (high progression)	41,000	30,000
USA (lower progression)	106,000	73,000

Cost-effectiveness
Sensitivity to discount rate

Cost (£) per discounted life year gained of vaccination compared with current strategy. No discounting of benefits

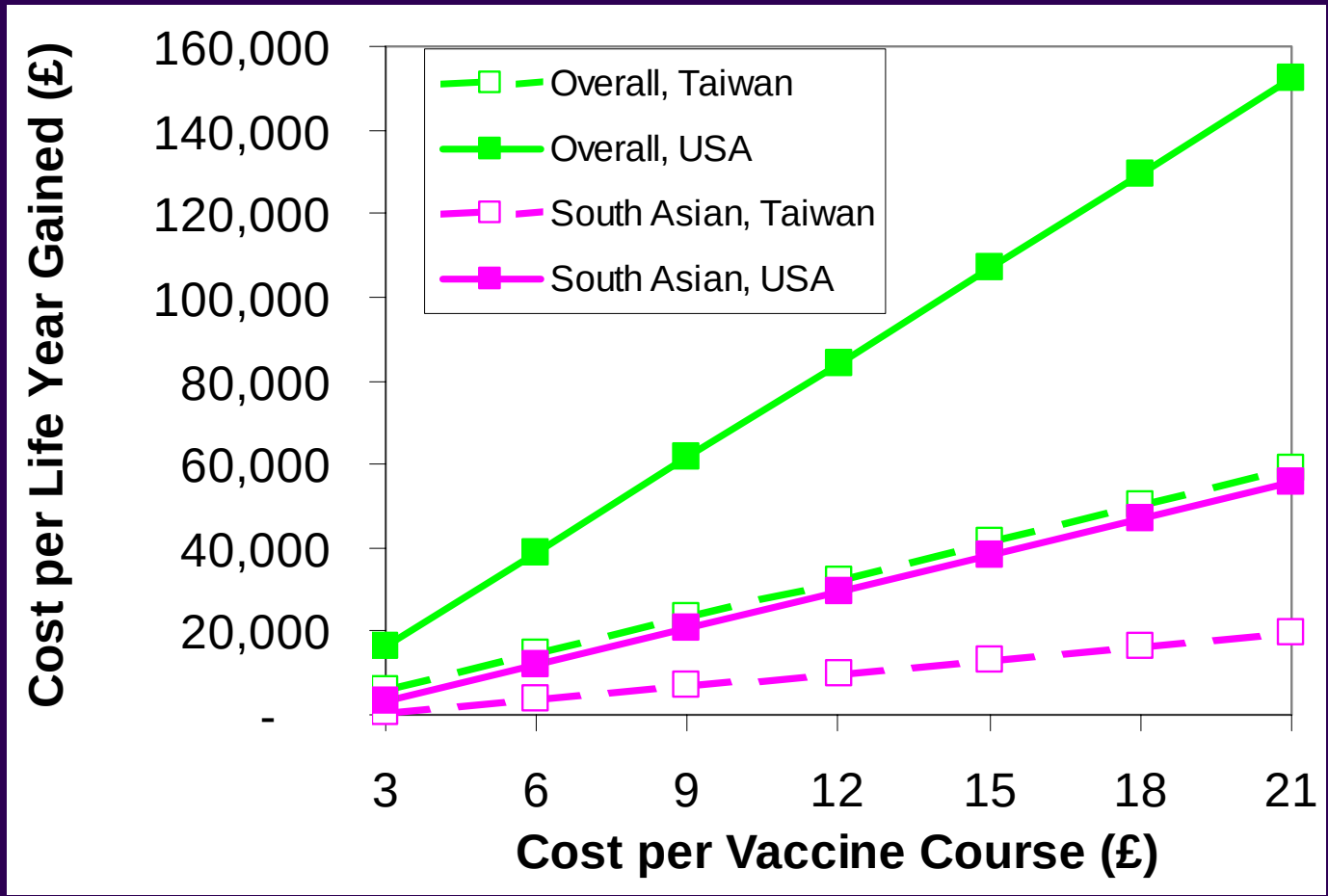
	Infant	Adolescent
Taiwan (high progression)	41,000 5,700	30,000 6,400
USA (lower progression)	106,000	73,000

Cost-effectiveness
Sensitivity to cost per course



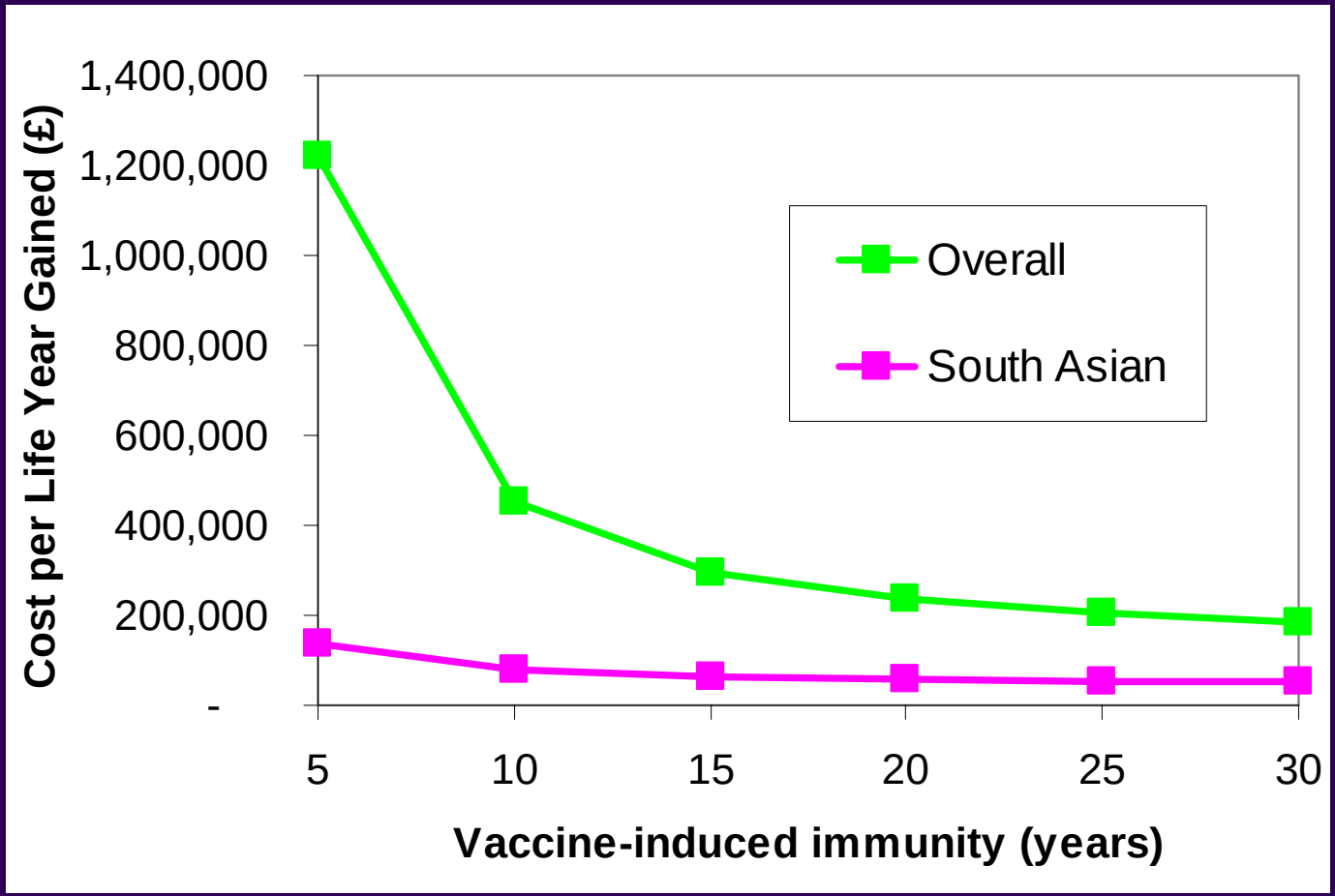
Cost-effectiveness:
Sensitivity to incidence

Cost per life-year gained of infant vaccination compared with current strategy for UK population and South Asians



Cost-effectiveness:
Length of immunity

Cost per life-year gained of infant vaccination compared with current strategy for UK population and South Asians



Cost-effectiveness

- Adolescent vaccination less effective, but more cost-effective
  - As vaccine given closer to age at which risk is highest
  - Assumes costs per course for infant & adolescent are the same
    - At £33 per course (Wallace et al.)
    - cost per LYG ~ £70,000 (base-case, Taiwan)
- South Asian incidence is higher than overall UK population
  - More cost-effective to vaccinate South Asians (& other ethnic groups)
  - If 40% of population with higher incidence (assumed = South Asians)
  - Cost per LYG (infant) = 30,000 (Taiwanese progression rates)
  - May be cost-effective to target populations with high ethnic minority population

Alternative (selective strategies)
Prison vaccination (A Sutton)

- IDUs are major risk group for HBV
- More likely to be imprisoned than others
- HBV vaccination is being offered on reception to prisons in England & Wales

–3 dose programme (0, 7, 21 days)

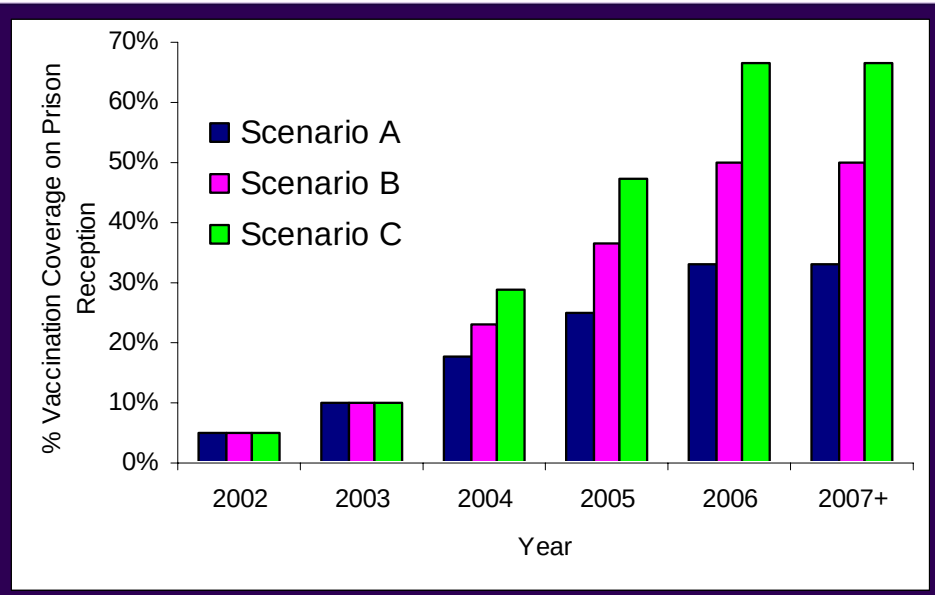
- Model developed to assess

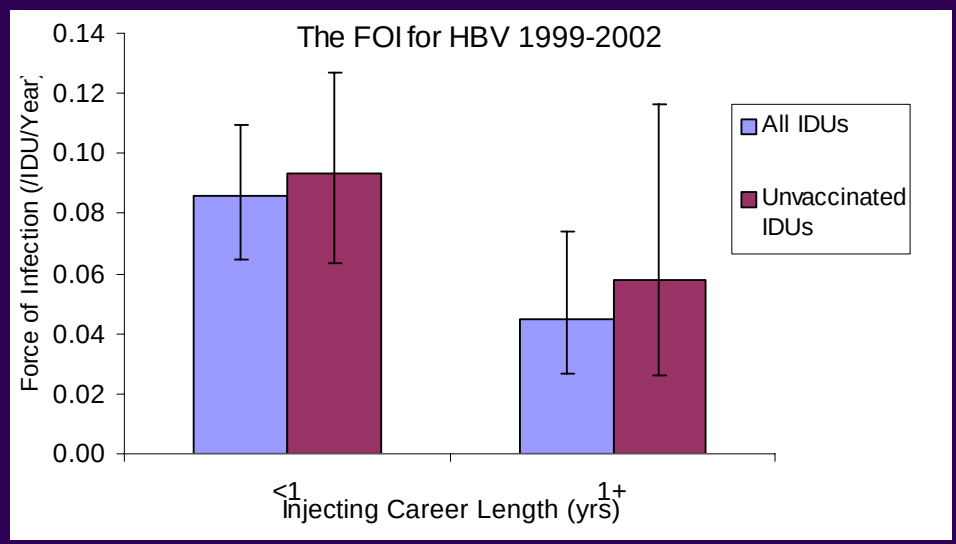
– Coverage expected in IDUs over time

– Impact on HBV transmission over time

Parameterising the models

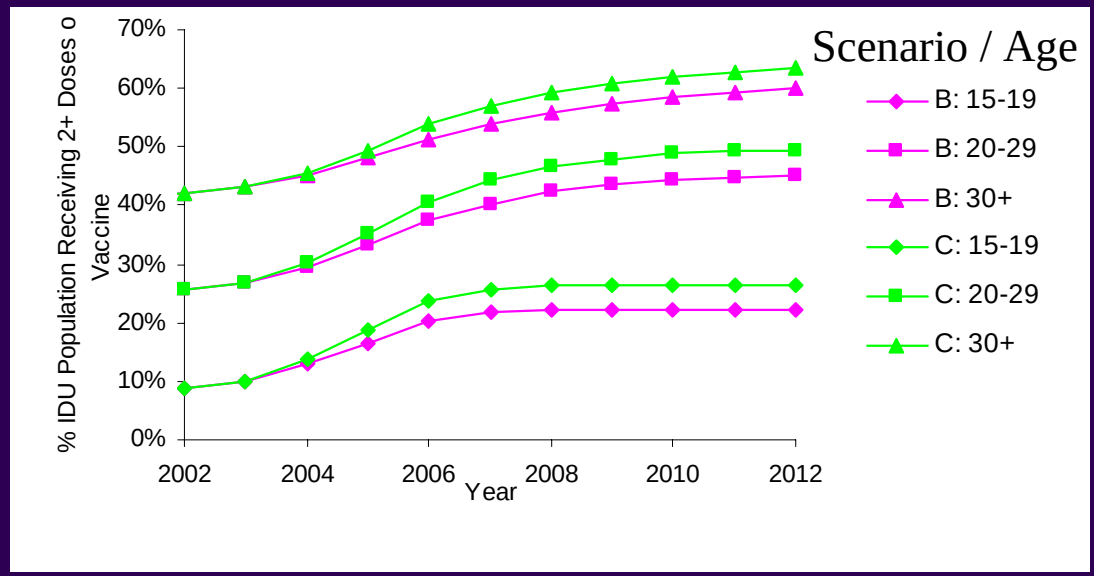
- Characteristics of IDUs
  - UA survey
- Imprisonment rates
  - Routine data, UA, Prison Survey
- Vaccine coverage
  - Scenario & routine surveillance
- Force of infection
  - UA survey



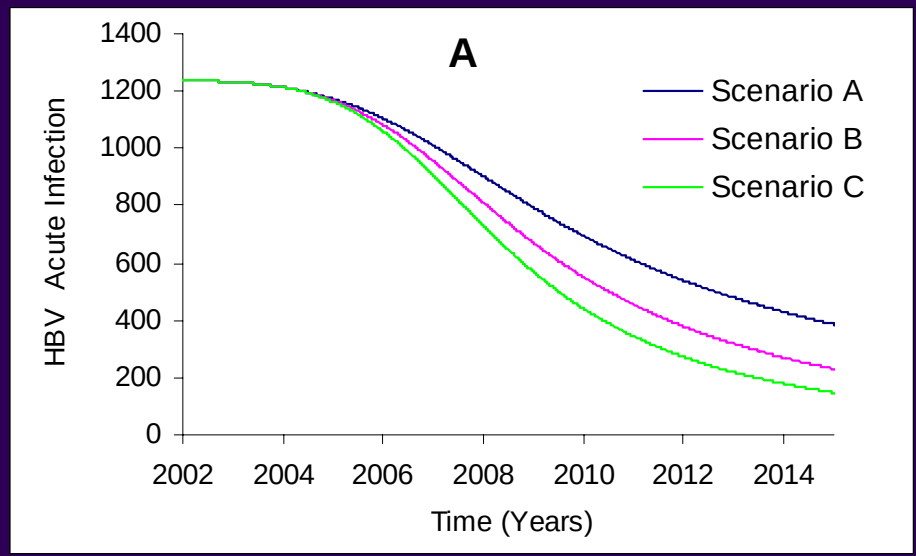


Model results

- Estimated % IDUs vaccinated through prison programme



- Estimated impact on acute HBV



Discussion

- Low incidence of HBV in the UK
- Vaccination will have little impact on burden of HBV associated chronic disease
- Universal Infant / adolescent vaccination unlikely to be cost-effective
- Vaccination by risk group more likely to be cost effective (perhaps geographically selective?)
- Improving selective programme (e.g. through prisons) has potential to reduce transmission
- Will adversely affect C/E of universal programmes