Epidemiology of HBV Infection and Prevention Programs

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Outline

- Clinical features
- Screening and diagnostic markers
- Epidemiology
- Progress in prevention

Features of Hepatitis B Virus Infection

Incubation period	Average 8-12 weeks Range 6-26 weeks
Acute illness (jaundice)	10% <5 yrs old 30%-50% ≥5 yrs old
Case fatality rate	0.5%-1%
Chronic infection	30%-90% <5 yrs old 2%-6% ≥5 yrs old
Chronic hepatitis	66%
Premature mortality from CLD	15%-25%

CDC

Markers of HBV Infection

- **Serologic**
  - **HBsAg and anti-HBs**
  - **Anti-HBc (HBcAg does not circulate in serum)**
  - **HBeAg and anti-HBe**
- **Nucleic acid**
  - **HBV DNA**

Course of HBV Infection
HBsAg

- Appears average of 6-8 weeks after exposure
  - 1-3 weeks before ALT becomes abnormal
  - 3-5 weeks before onset of symptoms or jaundice
- Reaches peak during acute stage of infection
- Declines to undetectable levels within 4-6 months indicating recovery
- Usually remains detectable in chronically infected persons
- Marker for transmission studies

CDC

Course of HBV Infection
HBV DNA

- Detected 2-5 weeks after infection and up to 40 days before HBsAg (mean of 6-15 days)
- Rises slowly at relatively low levels during seronegative period
- Also detected during chronic infection

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Course of HBV Infection
Anti-HBc

- Appears after HBsAg, at onset of ALT abnormality
  - Predominantly IgM class
- Remains detectable lifelong
  - Predominantly IgG after 6 months
- Present in both resolved and chronic infections
- Isolated anti-HBc
  - 2% of asymptomatic persons tested for HBV
    - Frequency directly related to frequency of infection
  - HBV DNA detected in <10%

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Course of HBV Infection
Anti-HBs

- Neutralizing antibody
- Develops during recovery
  - Detectable along with anti-HBc
  - May become undetectable in up to 20% of patients after several years
- Detected alone after immunization
  - Becomes undetectable in 40% of persons by 5 years after vaccination, but protection continues

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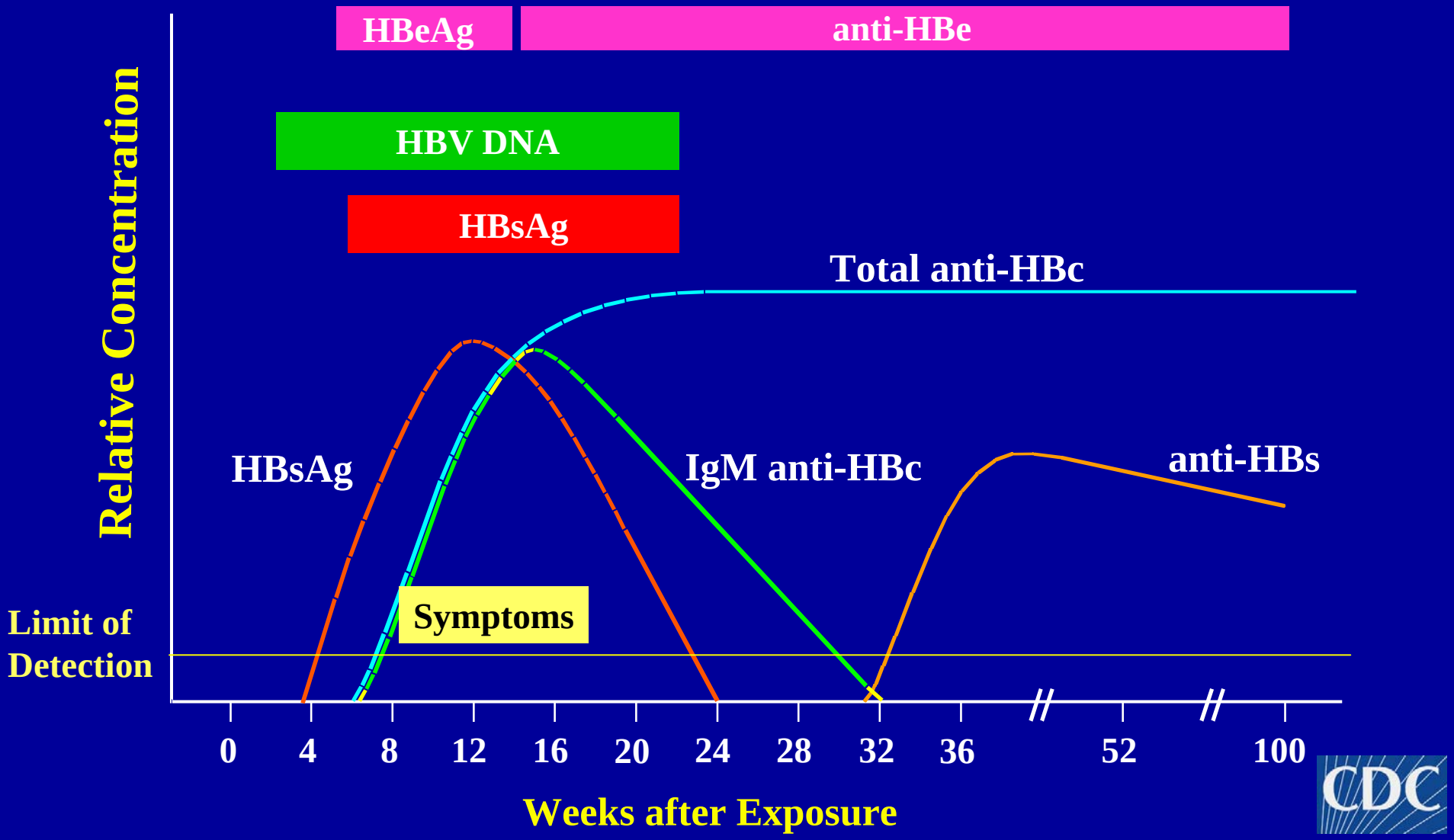
Interpretation of HBV Serologic Tests

HBV DNA	HBsAg	Anti-HBc	Anti-HBs	Interpretation
-	-	-	-	Susceptible
+	-	-	-	Early acute, pre-seroconversion
+	+	-	-	Early acute infection
+	+	+	-	Acute or chronic infection
-	-	+	+	Recovered/immune
+	+	+	-	Chronic infection

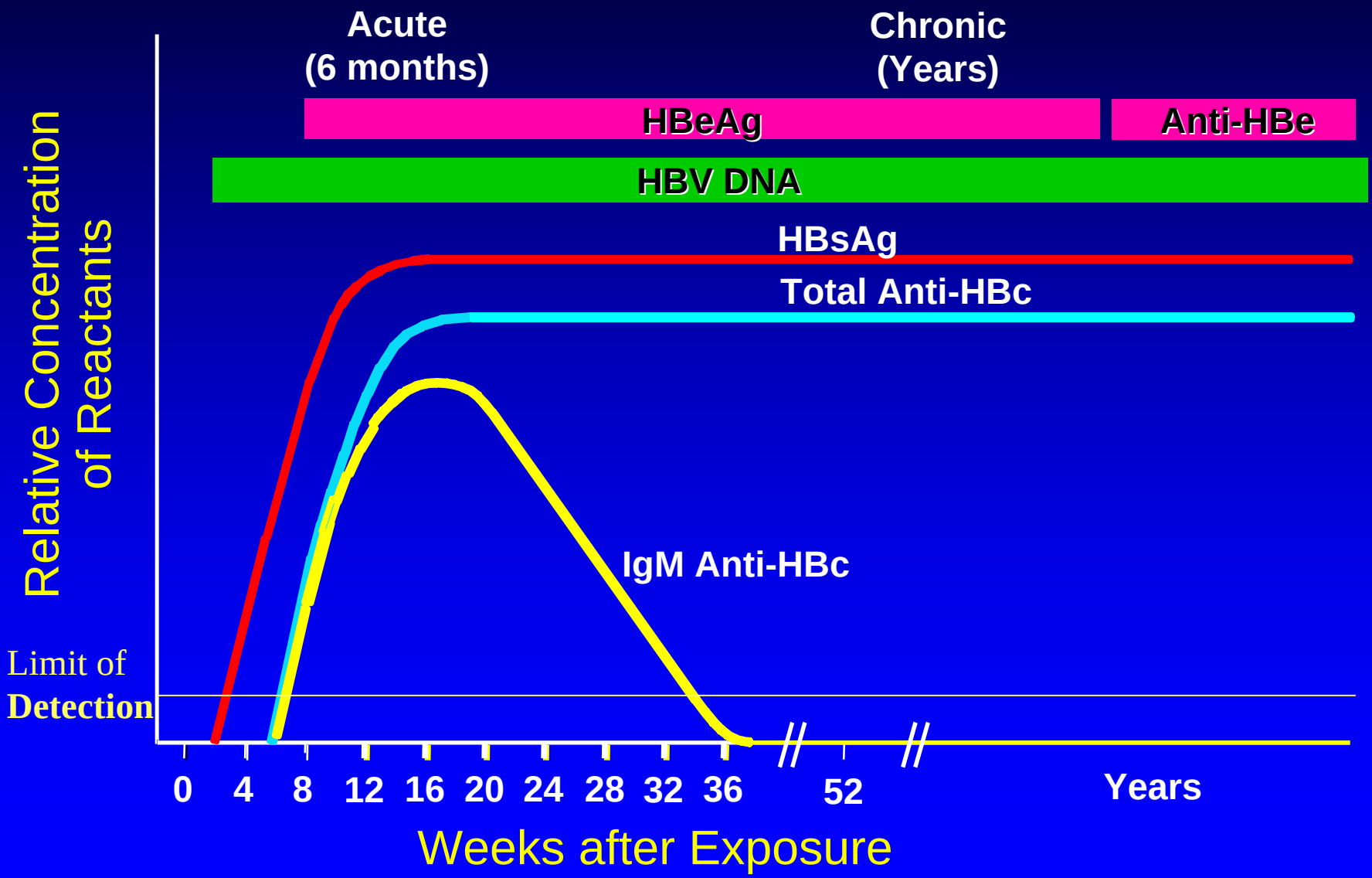
Interpretation of HBV Serologic Tests

HBV DNA	HBsAg	Anti-HBc	Anti-HBs	Interpretation
+/-	-	+	-	Resolving infection, past infection, "low- level" chronic infection, or false positive
-	-	-	+	Immune if >10 mIU/mL
-	+	-	-	Transient (<21 days) during vaccination

Acute HBV Infection with Recovery



Progression to Chronic Hepatitis B Virus Infection



Hepatitis B Virus Infection, United States

Newly acquired infections	73,000
Acute cases	21,000
Deaths from acute liver failure	290
Chronic infections	4,400
Persons ever infected (1990)	4.9%
Persons with chronic infection	1.25 million
HBV-related chronic liver disease	4% - 14%
Deaths from chronic disease/year	3,000-5000

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Modes of HBV Transmission

Exposure to Blood or Body Fluids Containing Blood

- **Percutaneous**
  - Injecting drug use
  - Occupational, household (needle stick, non-intact skin)
  - Therapeutic (contaminated equip, unsafe injections)
  - Transfusions and transplants from infectious donors
- **Permucosal**
  - Sex with infected partner
  - Birth to infected mother (perinatal)
  - Household (exposure to infected contact)

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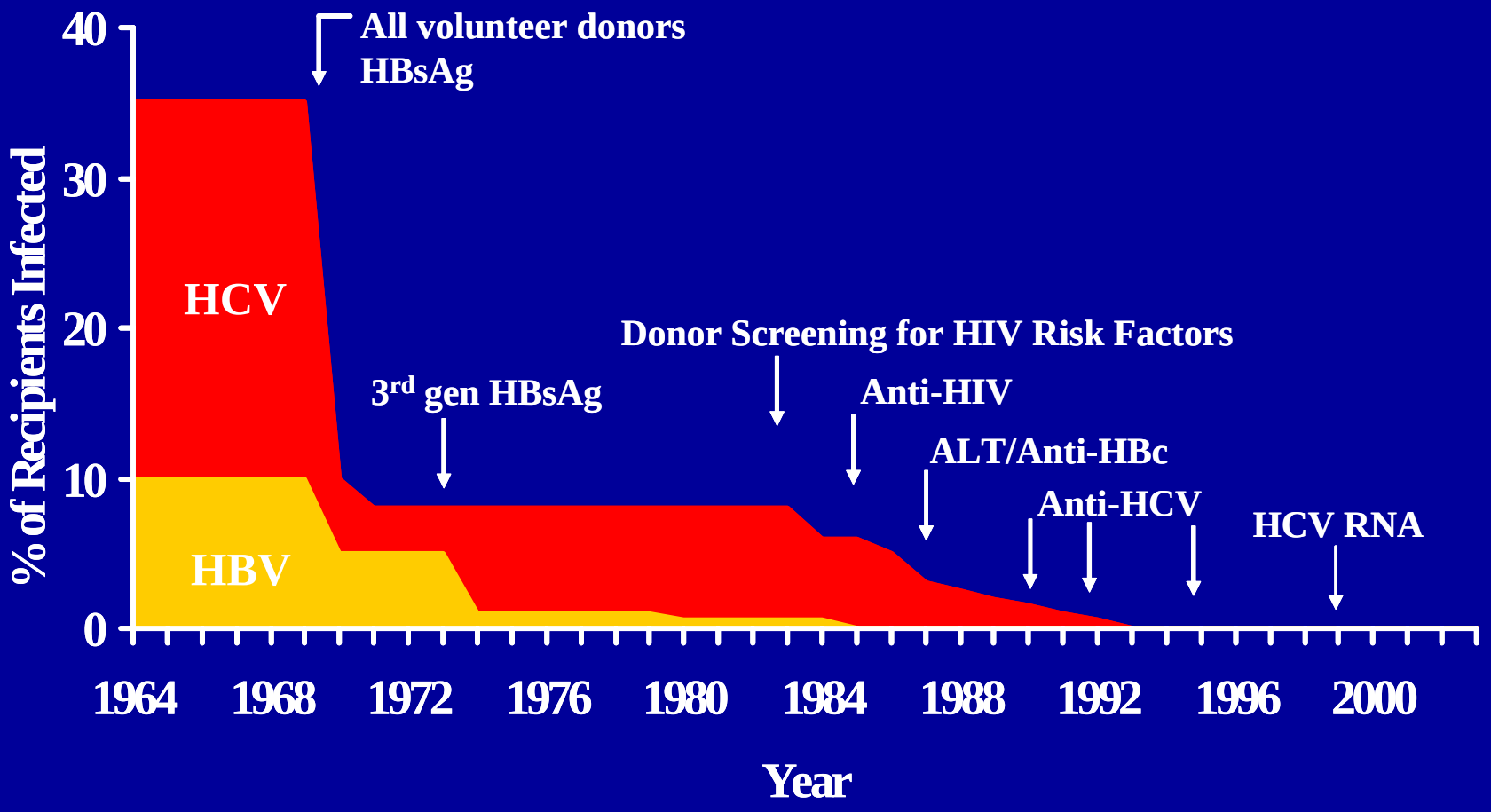
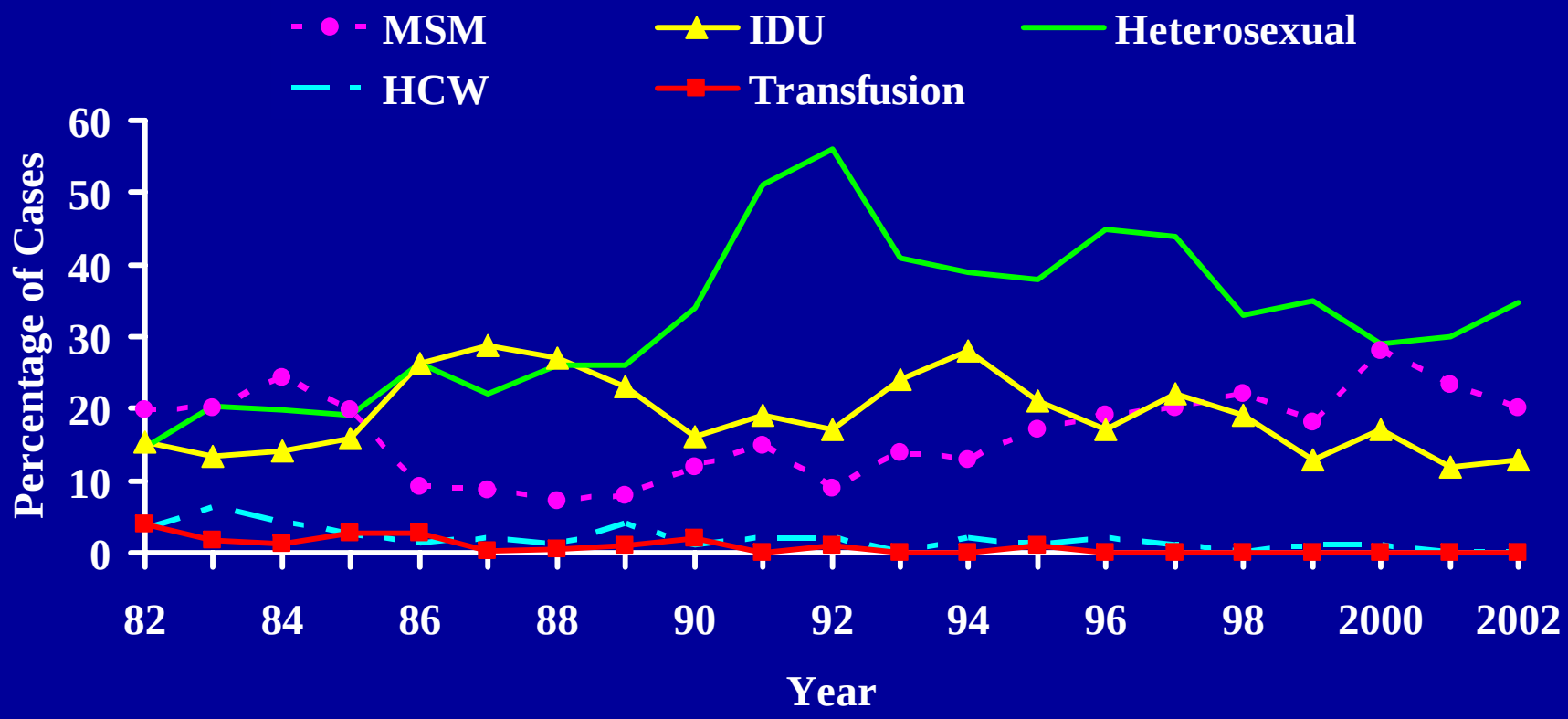
Posttransfusion Hepatitis



Adapted from HJ Alter

Reported Cases of Acute Hepatitis B by Selected Risk Factors, Sentinel Counties, United States, 1982-2002



Source: Goldstein S et al. JID 2001; 185:713-719 and CDC, unpublished data

CDC

Patients with Acute Hepatitis B Transfused During Exposure Period, 1982-2003, Sentinel Counties

- 51 reported - 8 with other risk factors
  - 2 IDUs, 3 infected sex partners, 3 multiple partners
- 43 reported no other risk factors
  - 34 (79%) 1982-1988
  - 6 (14%) 1989-1993
  - 3 (7%) 1994-1998
    - Follow-up testing of donors – HBV seronegative
    - All 3 cases hospitalized during incubation period
      - 1 for entire 6 months prior to onset of illness

Source: Goldstein S et al. JID 2001; 185:713-719 and CDC, unpublished data.

CDC

Nosocomial Transmission of HBV

- **Rare relative to other sources for infection**
  - **Recognized primarily in context of outbreaks**
- **Unsafe injection practices**
  - **Spring loaded finger stick devices**
  - **Multiple dose medication vials**
  - **Therapeutic injections**
    - **Contaminated jet injector**
    - **Re-use of needles and syringes**
    - **Contaminated medication preparation area**

CDC

Cases of Acute Hepatitis B Reporting Transfusion Enhanced Surveillance, NNDSS, 2003

Total cases reported	7, 381	
Reported transfusion	49	
Not acute hepatitis		(15)
Never transfused		(13)
Transfused >6 months ago		(11)
Acute cases transfused	10	
Donor infected	1*	

*Single donor pre-seroconversion

Source: National Notifiable Diseases Surveillance System, CDC, unpublished

CDC

HBV Prevention and Control

- **Donor screening and testing**
  - At least 50% of acute HBV infections have histories deferred by screening
- **Infection control**
- **Preexposure vaccination**
  - Infants, children, adolescents
  - Adults at high-risk
- **Postexposure prophylaxis (vaccine, HBIG)**
  - Infants born to infected mothers
    - Screen all pregnant women for HBV
    - Ensure all newborns receive first vaccine dose
  - Occupational exposures
  - Sex and household contacts of HBsAg-positives
- **Harm reduction counseling and services**

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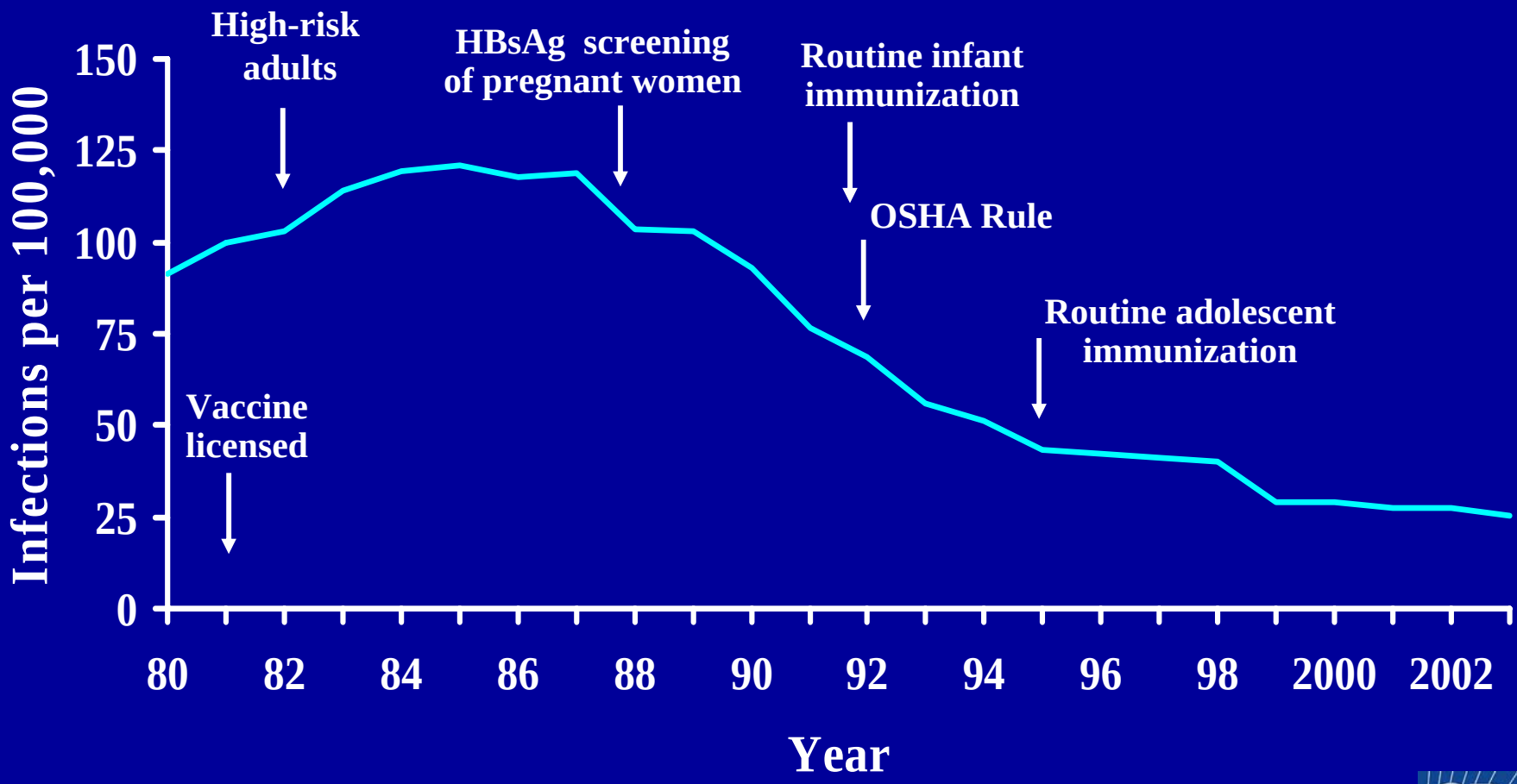
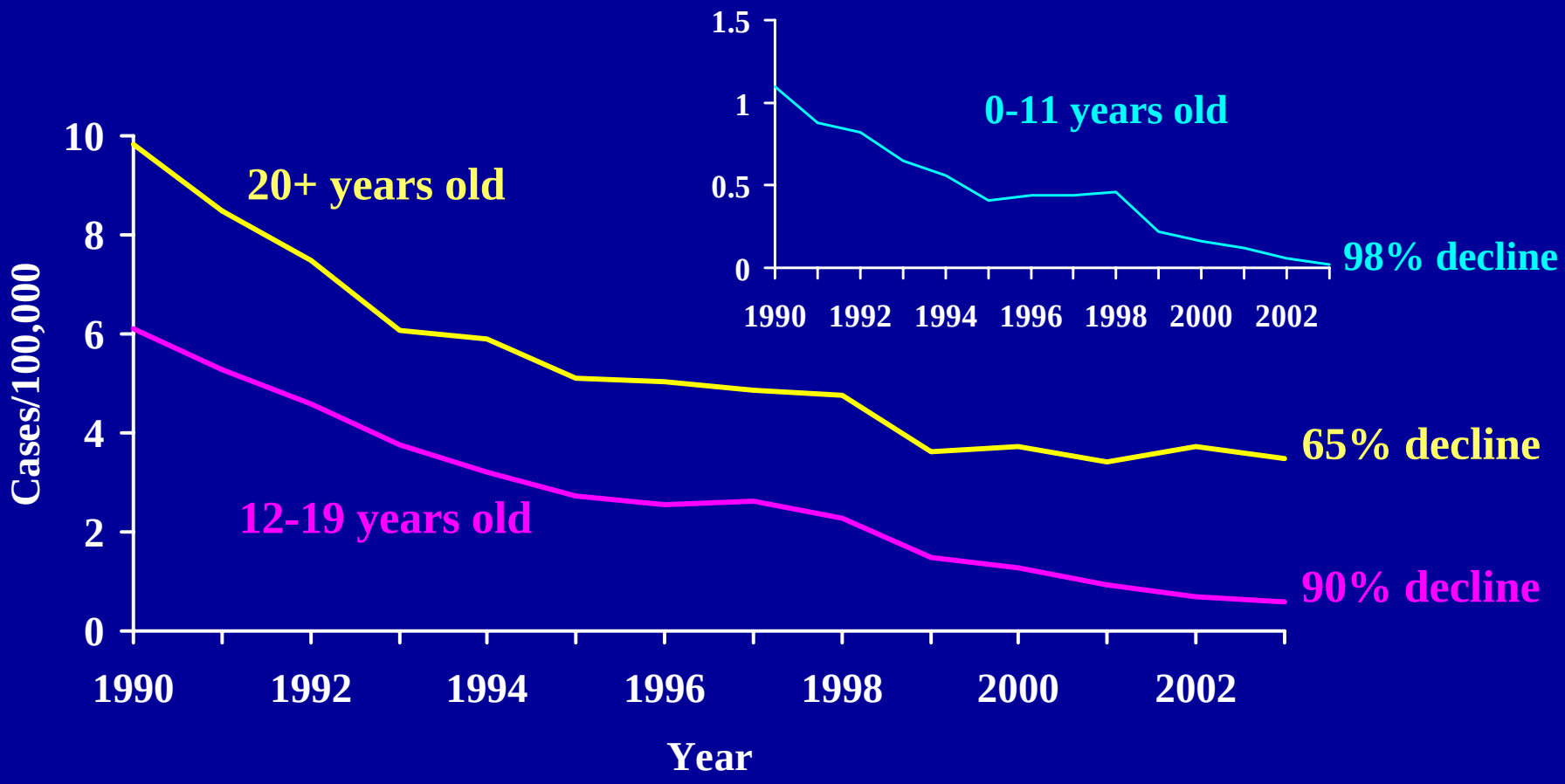
Estimated Incidence of Acute HBV Infection United States, 1980-2003



Updated 8/04

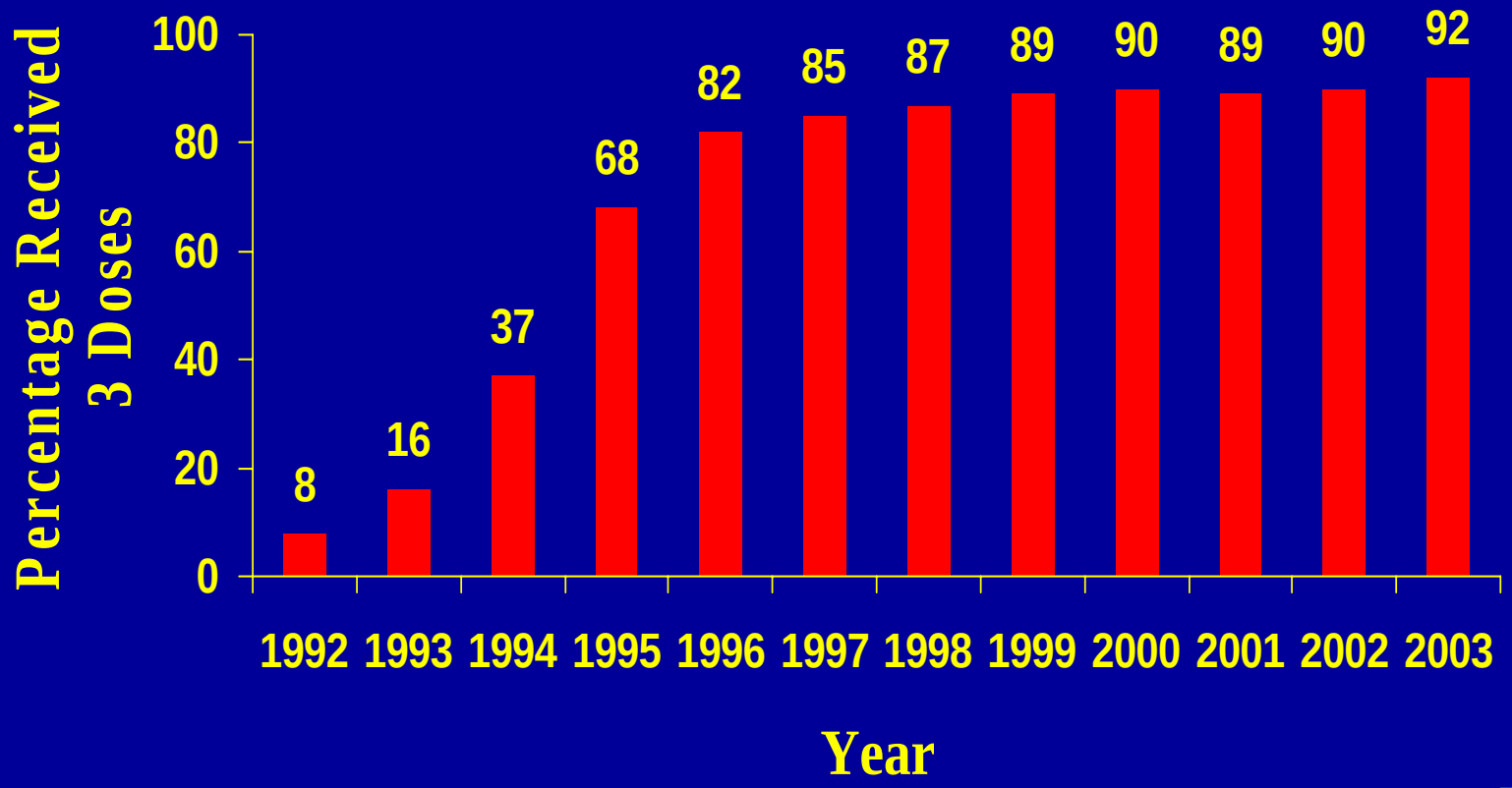
Incidence of Acute Hepatitis B by Age, United States, 1990-2003



Source: CDC, National Notifiable Diseases Surveillance System (NNDSS)

CDC

Hepatitis B Vaccine 3 Dose Coverage Among 19-35 Month Old Children, by Year of Survey, 1992-2003



*Source: National Immunization Survey, CDC

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Immunity to HBV Infection Among Adolescents and High-Risk Adults

- Adolescents 13-15 years old - 60% vaccinated
- General population adults (30-60 years old)
  - Natural immunity
    - Whites 4%
    - Blacks 15%
    - Asians 60-80%
- High-risk adults vaccinated
  - HCWs and PSWs - 70%-80%
  - IDUs, MSMs, STD clients, inmates - <10%

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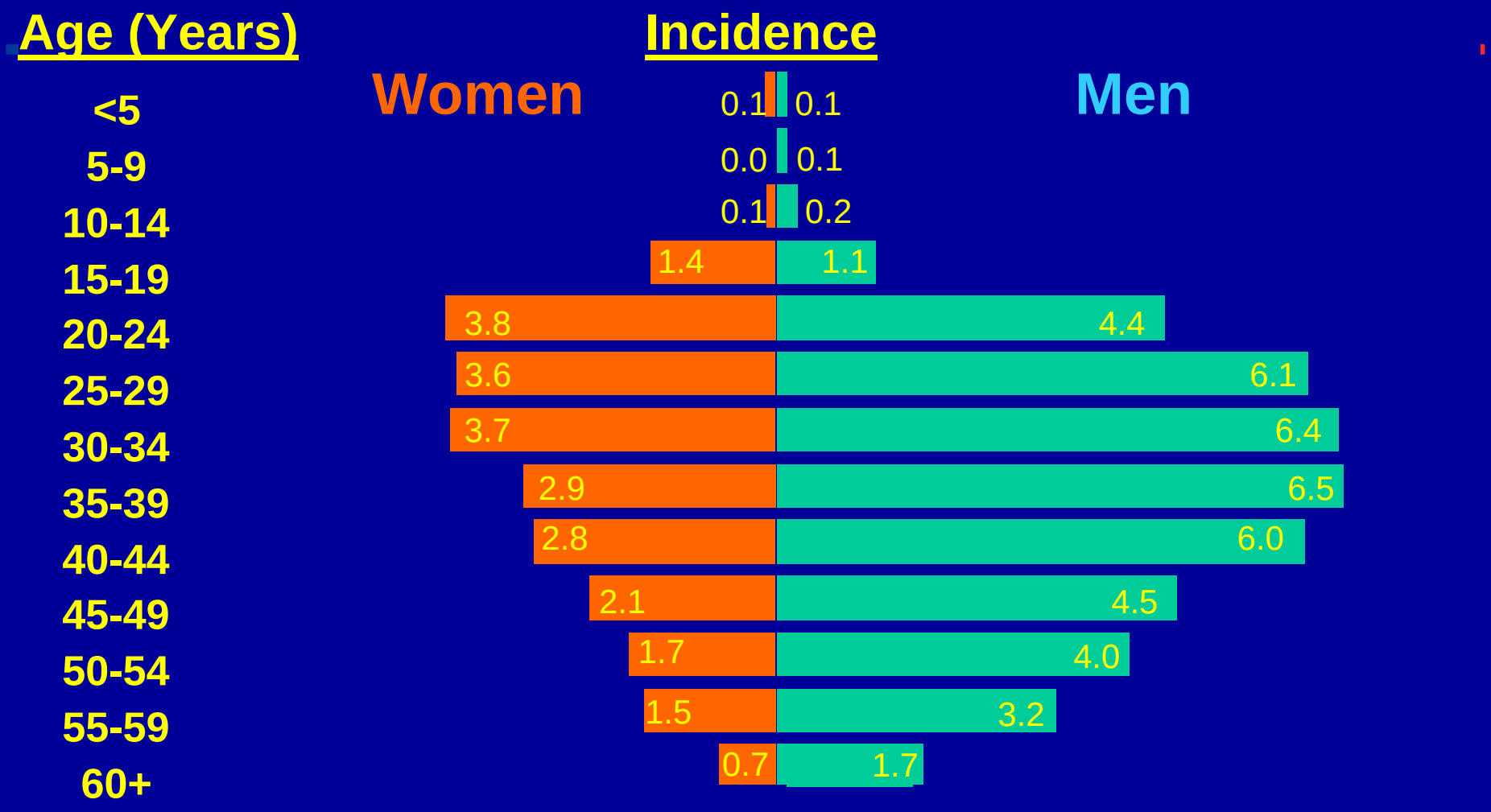
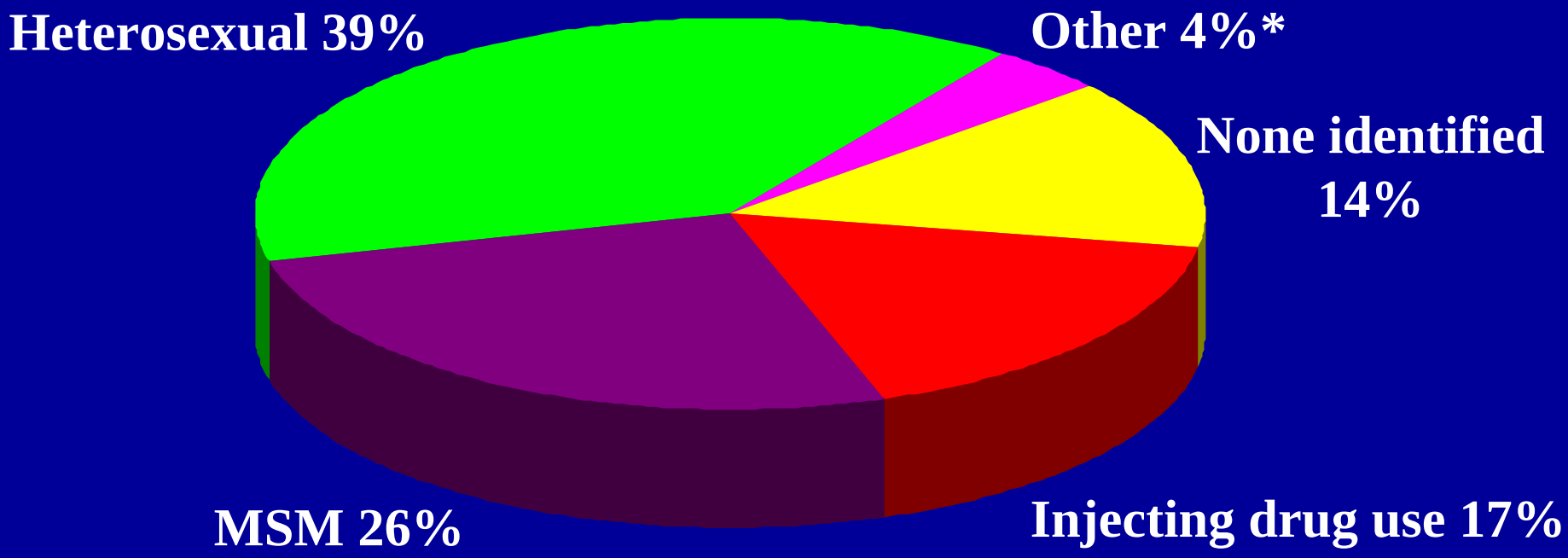
Incidence of Hepatitis B, by Age and Sex, United States



Source: National Notifiable Diseases Surveillance System (NNDSS)

CDC

Reported Risk Factors for Acute Hepatitis B United States 2000-2003



* Other - Household contact, occupational exposure, hemodialysis, institutionalization, transfusion

Source: Adapted from Sentinel Counties and NNDSS, CDC

CDC

Acute Hepatitis B Cases Which Could Have Been Prevented if Vaccination Offered as Recommended

Prior Opportunity	Percent of Cases
Known infected contact	9%
History STD rx or incarceration	55%
Total	64%

Source: Goldstein ST et.al., JID 2002;185:713-9

CDC

Elements of a Successful Vaccination Program

Elements Required for Success	Present in Childhood Program	Present in Adult Program
Evidence-based recommendations	X	X
Implementation strategy/partners	X	X
Provider/patient education	X	X
Vaccine purchase	X	
Infrastructure for vaccine delivery	X	

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A National High-Risk Adult Hepatitis B Immunization Program

- Integrate vaccination into existing public health and correctional health programs
- Strengthen infrastructure to deliver vaccine
- Purchase vaccine
- Further determine methods to improve vaccination coverage

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