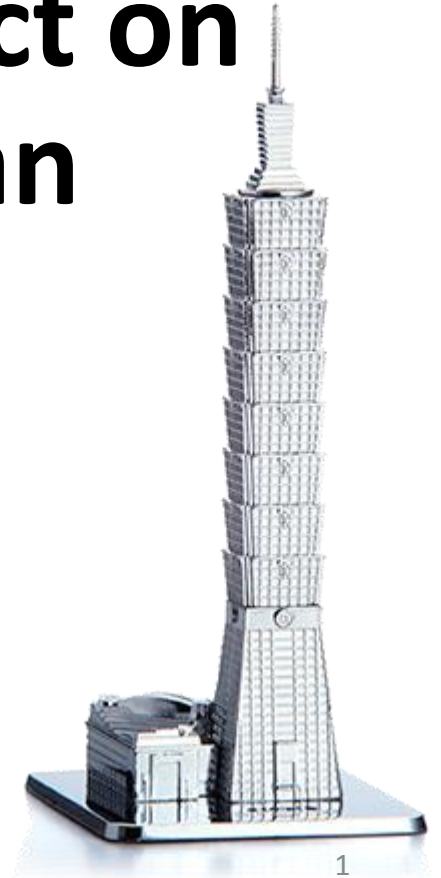


Overview of population epidemiology and impact on blood safety in Taiwan

Yun-Yuan Chen, PhD

Taiwan Blood Services Foundation



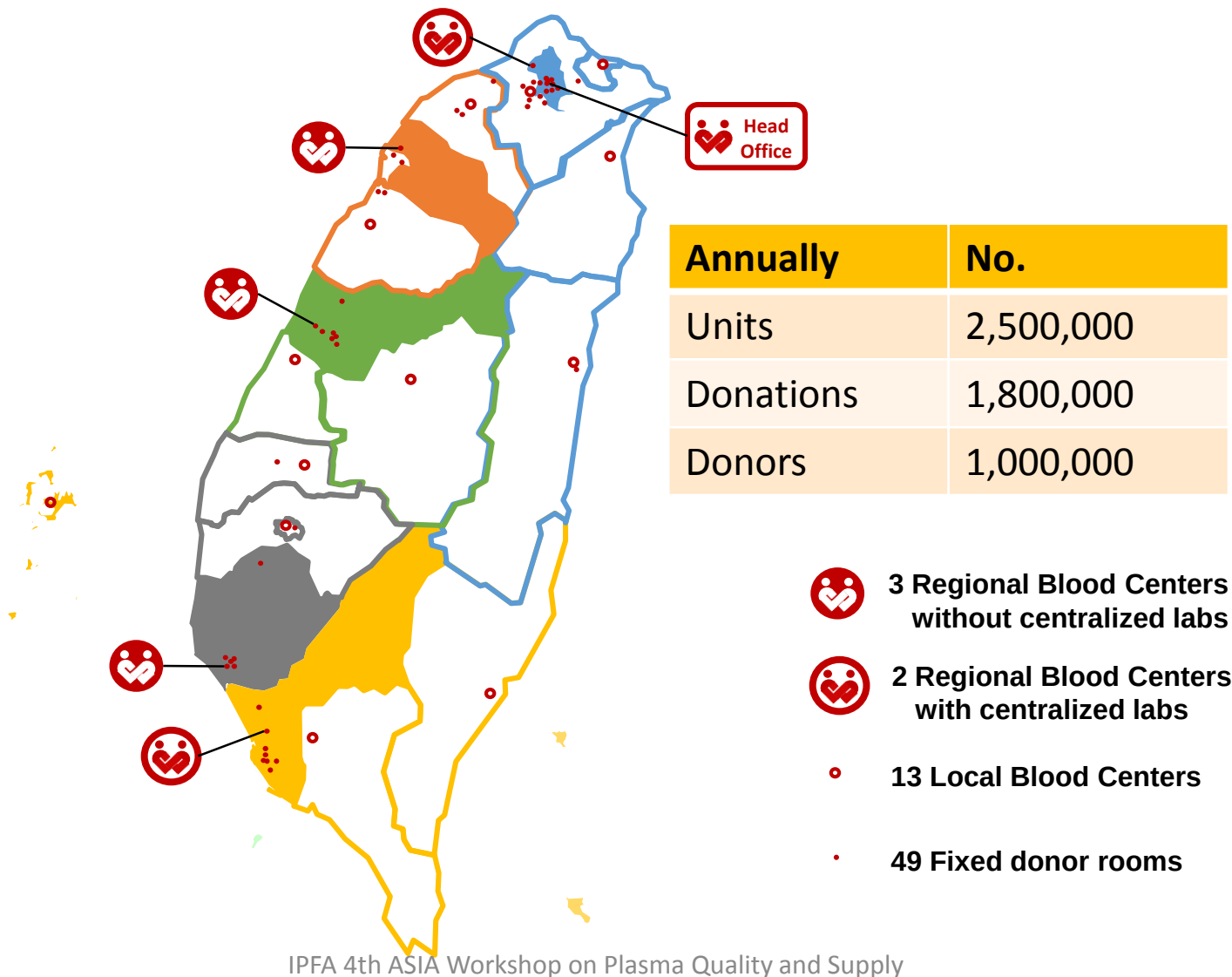
Outline

Brief introduction of the Taiwan Blood Services Foundation

Major threats of infectious agents in Taiwan

Knowing population epidemiology brings impact on blood safety: Examples

Taiwan Blood Services Foundation



The blood screening tests

Conducted in TBSF

Transfusion-transmitted infection risk mitigation

Serology tests

HBsAg

Anti-HCV

Anti-HIV

Anti-HTLV

TPPA

(Confirmed by RPR)

NAT (MP-8)

HBV

HCV

HIV

Culture

Bacteria

(Platelet donations)

Surrogate

ALT

(>100 IU/L)

Surveillance system

for bloodborne pathogens



National surveillance system

Notifiable disease

Nosocomial

School-based

Emergency department-based



捐血救人

臺灣血液基金會 Taiwan Blood Services Foundation

台灣血液基金會

Blood surveillance system

Routine blood screening

Selective and active surveillance for certain agents

Hospital-based reporting for TTI

Major Threats to Our Blood Safety

HBV

Major cause of hepatocellular carcinoma and cirrhosis, which was the previous leading cause of death.

B carriers (HBsAg+) were observed in **15-20% of unvaccinated population**, and in <1% of universally vaccinated population.

HCV

The second common cause of hepatocellular carcinoma and cirrhosis. Also related to other malignancies.

The prevalence of anti-HCV in the general population varied geographically from **0.4-57.9%**.

Threats to Our Blood Safety

Cases reported to the surveillance system after 2014

TCDC website: <https://nidss.cdc.gov.tw/ch/Default.aspx>

Infectious disease	No. of reported case during 2014-2018	
	Domestic	Imported
Hepatitis A	1,630	260
HIV infection	11,799	NA
Acute hepatitis B	641	34
Acute hepatitis C	1,516	15
Acute hepatitis D	5	0
Acute hepatitis E	44	14
Syphilis	44,154	27
Gonorrhea	20,146	4
vCJD	0	0

Threats from vector-borne disease

Clinical cases reported to the surveillance system after 2014

TCDC website: <https://nidss.cdc.gov.tw/ch/Default.aspx>



Infectious disease	No. of reported case	
	Domestic	Imported
West Nile fever	0	0
Dengue	59,487	1,718
Malaria	0	55
Japanese encephalitis	133	0
Yellow fever	0	0
Zika virus infection(after 2016)	0	21

Actions to mitigate the risk



Public health policies

- Prevention strategies
- Health education
- Population screening & efficient treatment
- National health insurance



Donor selection

- Donor interview
- Post-donation concerns
- Post-donation screenings



Donor behavior

- Healthy lifestyle
- Health awareness

Examples

Public health actions secure blood safety

HBV

Universal vaccination program since 1986

HCV

Widely used sterilized or disposable medical equipment since 1980

HIV

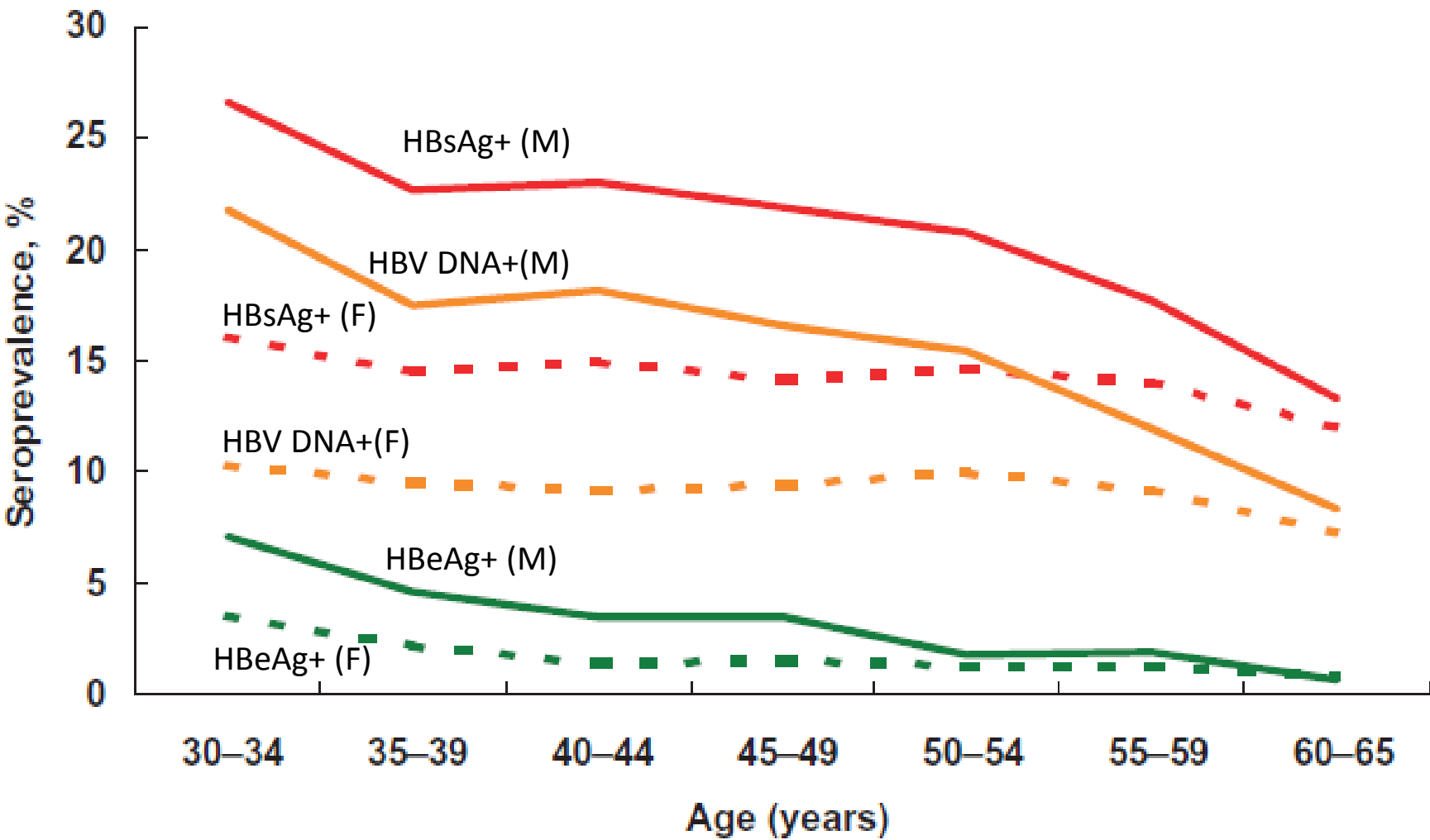
**Harm reduction program
Easily accessible of screening test**

DENV

**Surveillance for disease epidemic
Risk assessment**

HBV infection in general population

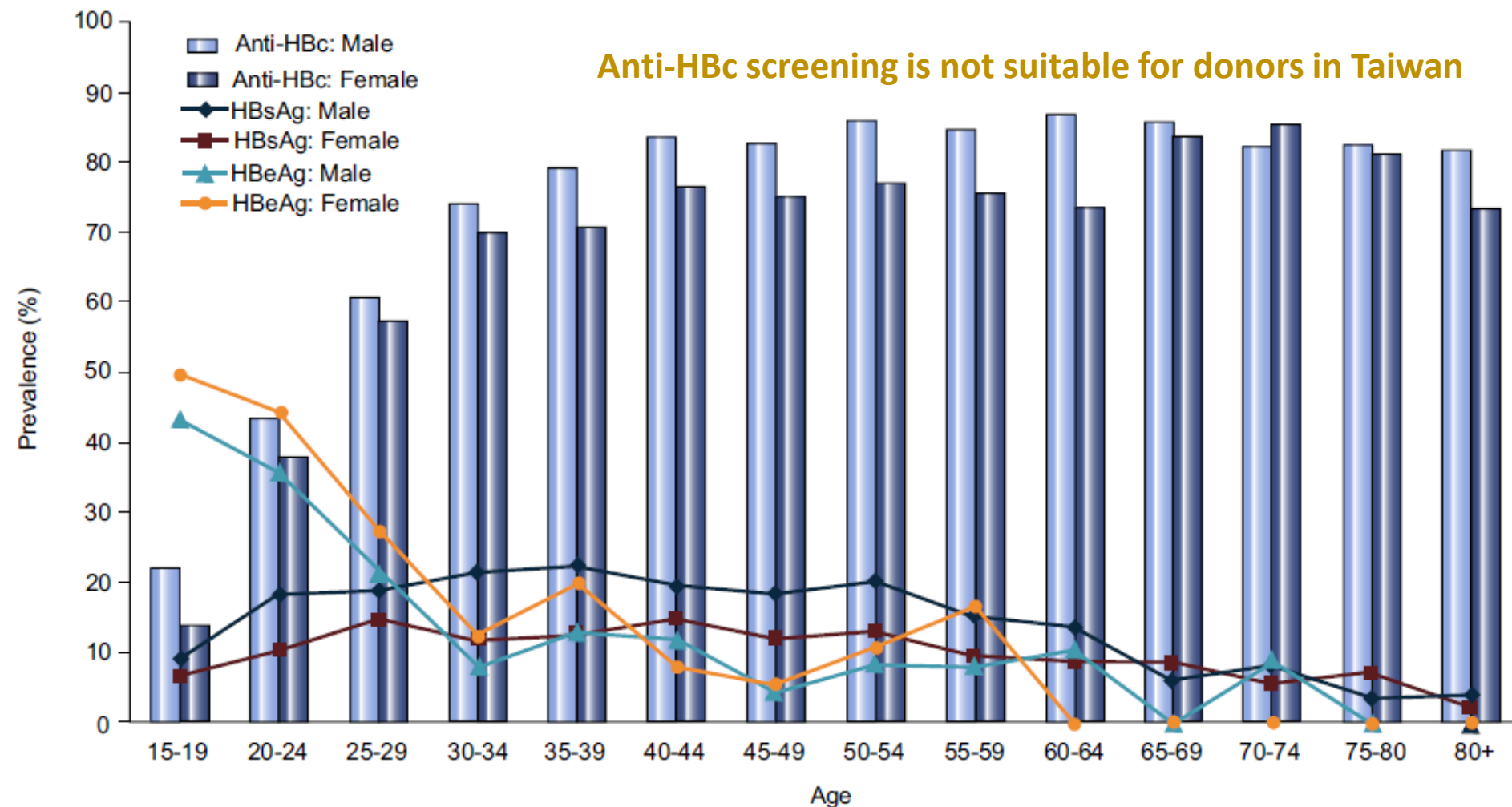
1991-1992 *Chen et al. J Gastroenterol Hepatol 2011;26:628-38*



Anti-HBc was positive in most of the population

Population survey in 2002

Anti-HBc screening is not suitable for donors in Taiwan



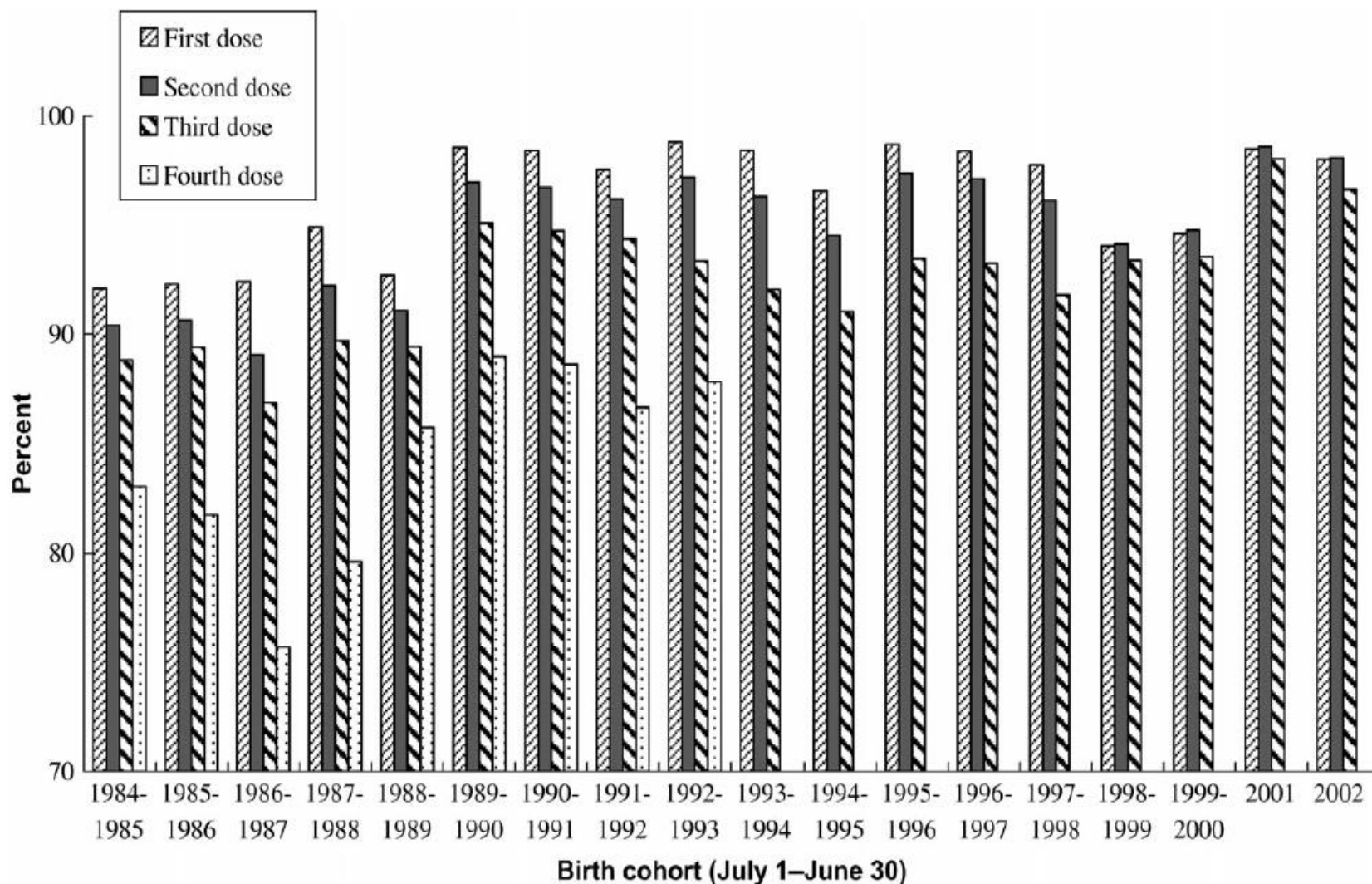
Chen et al. J Hepatol 2015;63:354-63

The nationwide HBV vaccination program

Time period	Target cohorts	Events and target population
Jul 1984-Jun 1986	Jul 1984-Jun 1986	Newborns of HBsAg-positive mothers. (Electively vaccinated cohort)
Jul 1986 – now	Jul 1986 – now	All newborns. (Universally vaccinated cohort)
1987 – 1989	1981 – Jun 1986	Preschool children who did not receive vaccination at the neonatal stage, and susceptible medical personnel.
1988 – 1990	1975 – 1983	All elementary school children.
Jul 1991		Vaccine records checked for all elementary school entrants.
1992		Vaccination of teenagers and adults on a fee-for-service basis.

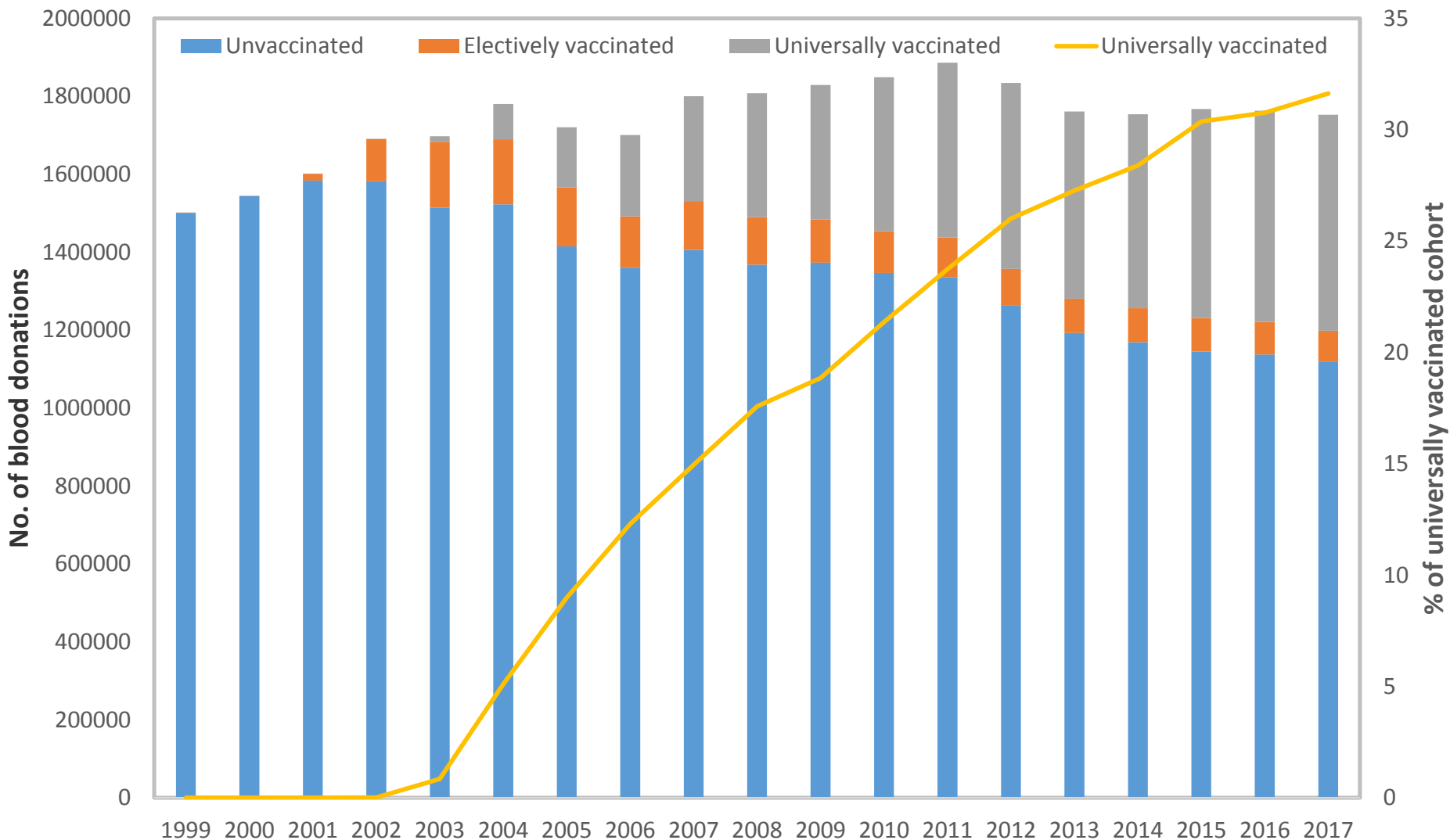
Chien et al. Epidemiol Rev 2006;28:126-35

More than 90% of newborns complete immunization

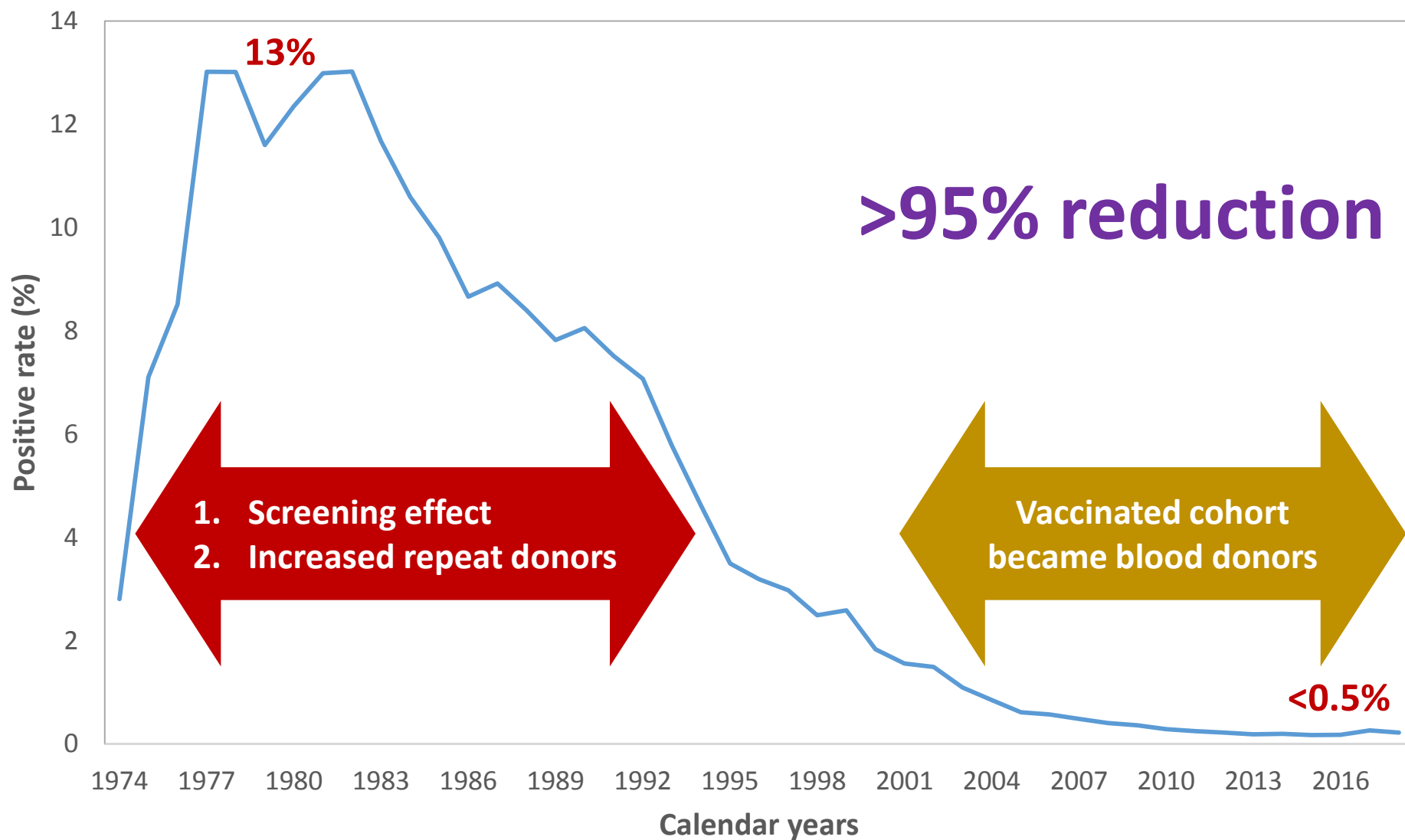


Chien et al. Epidemiol Rev 2006;28:126-35

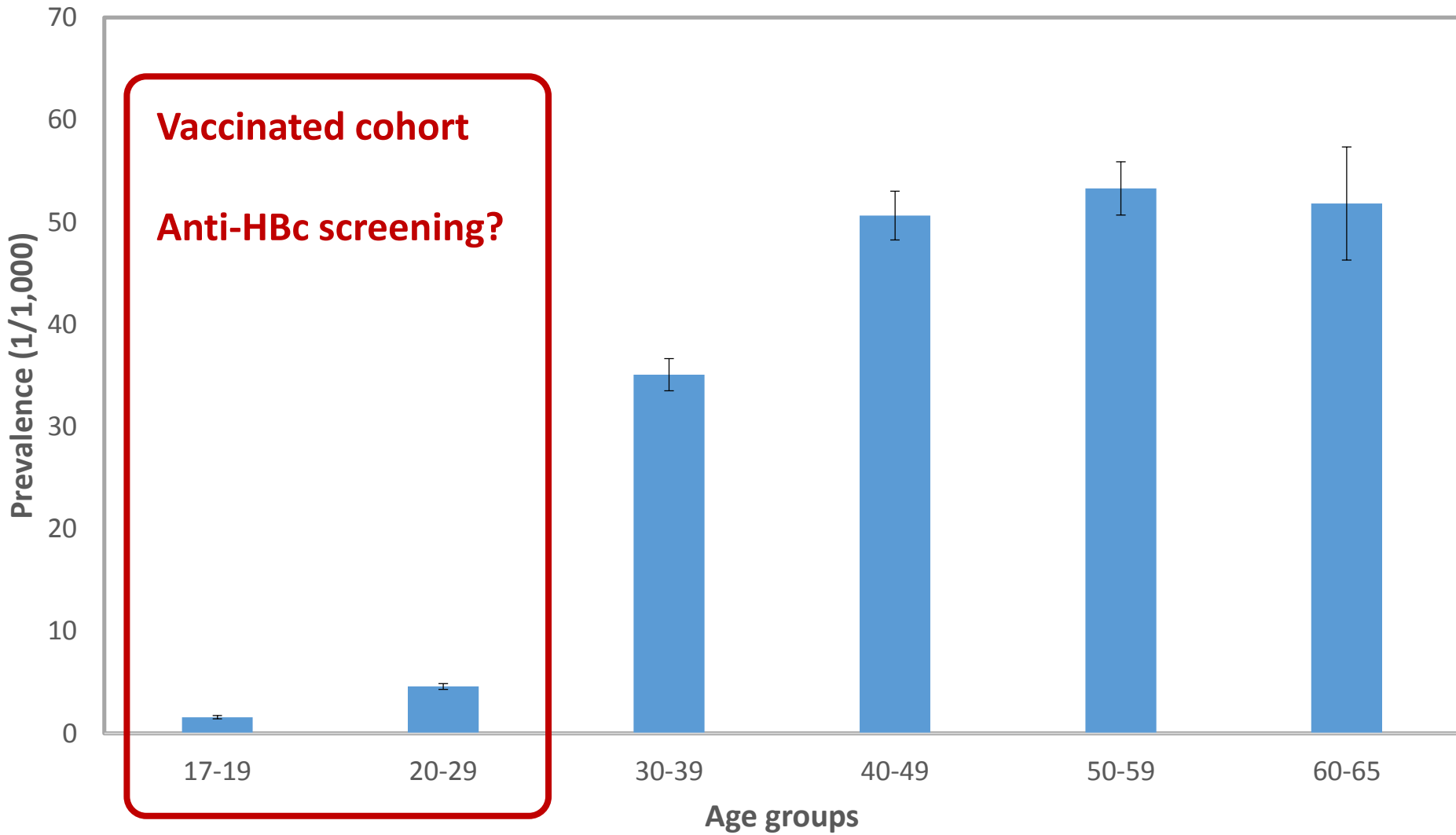
Vaccinated cohort increased in blood donors



HBsAg positivity of blood donations



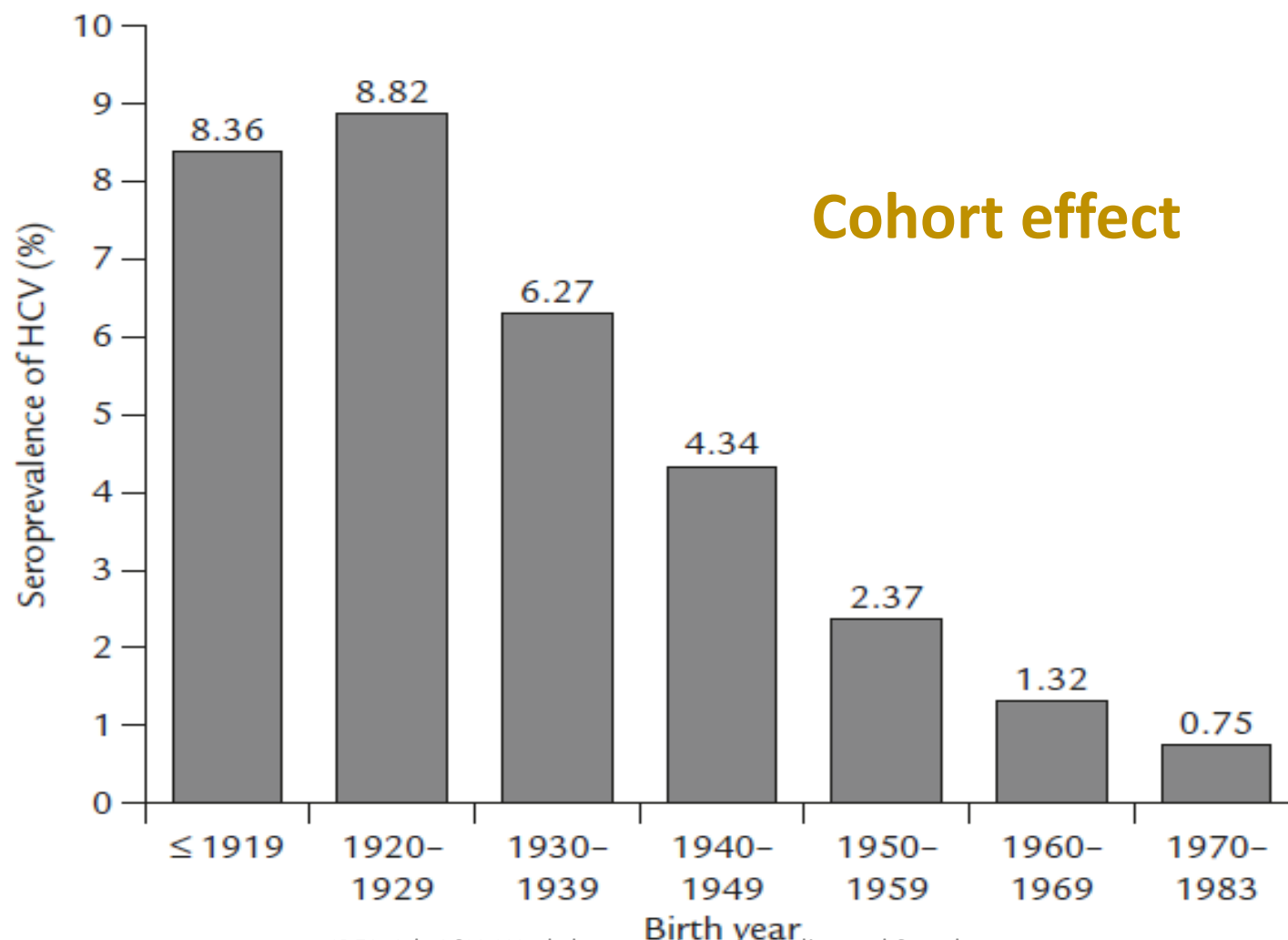
Prevalence of HBV DNA among first-time donors during 2013-2016



Seroprevalence of HCV

A large-scale survey among general population in Taiwan

Chen et al. J Formos Med Assoc 2007;106(2):148-55



Transmission of Hepatitis C Virus in Taiwan: Prevalence and Risk Factors Based on a Nationwide Survey

Sun et al. J Med Virol 1999;59:290-6

TABLE IV. Multivariate Adjusted Odds Ratios and Population Attributable Risk Fraction of Iatrogenic Risk Factors and Tattooing in Relation to Hepatitis C Virus Infection

Risk factor ^a	Comparison	Multivariate-adjusted ^b odds ratio (95%CI)	Population attributable risk fraction
Blood transfusion	Ever vs. never	8.6 (4.3–16.9)*	25.3%
Medical injection	Ever vs. never	2.4 (1.6–3.5)*	57.3%
Acupuncture	Ever vs. never	2.4 (1.4–4.2)*	15.7%
Tattooing	Ever vs. never	3.1 (0.7–13.3)	3.2%

^aHemodialysis not included in the regression model due to no controls had the history.

^bOdds ratios were also adjusted for residential township, age, and years of schooling.

**P* < 0.05.

Disposable medical equipment was not commonly used throughout Taiwan before 1980, when the glucose-based nutrient or vitamin injections were frequently prescribed to sick people.

Lee et al. Gut 2011;60:688-94

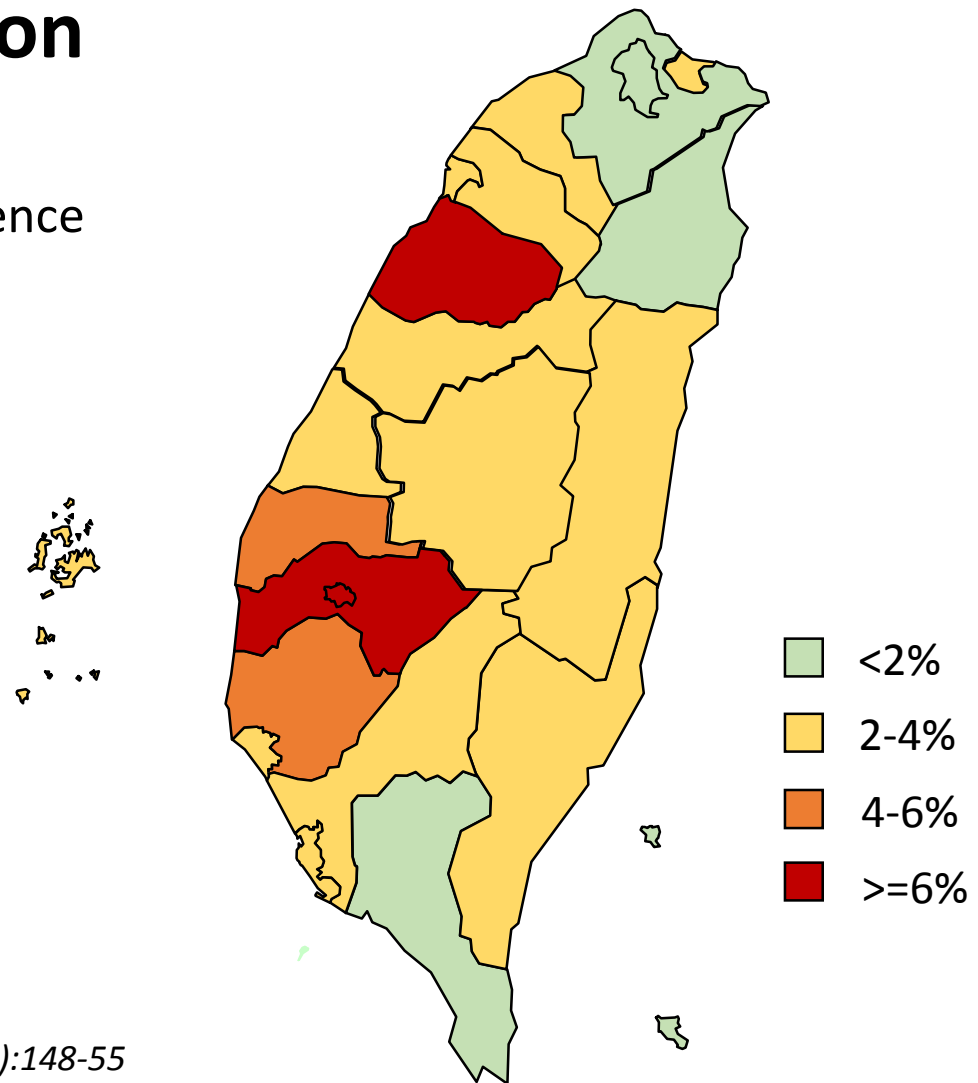
Geographic variation of HCV infection

Age-adjusted anti-HCV prevalence at 1996-2005

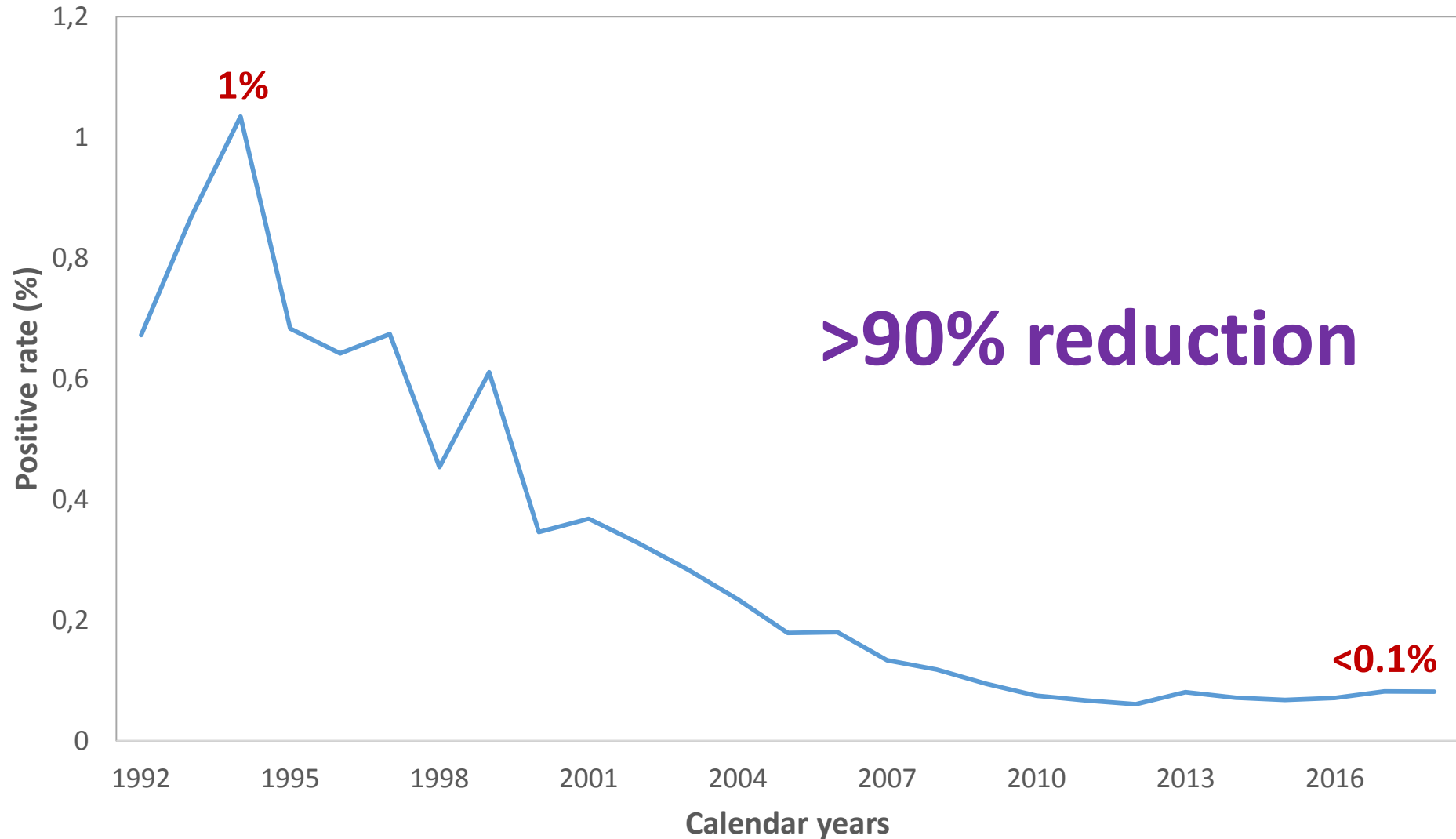
The HCV hyperendemic areas might be related to the **iatrogenic routes**.

Frequent intravenous injection for minor diseases or incomplete disinfection of medical equipment in the past might contribute to the high HCV prevalence.

Chen et al. J Formos Med Assoc 2007;106(2):148-55

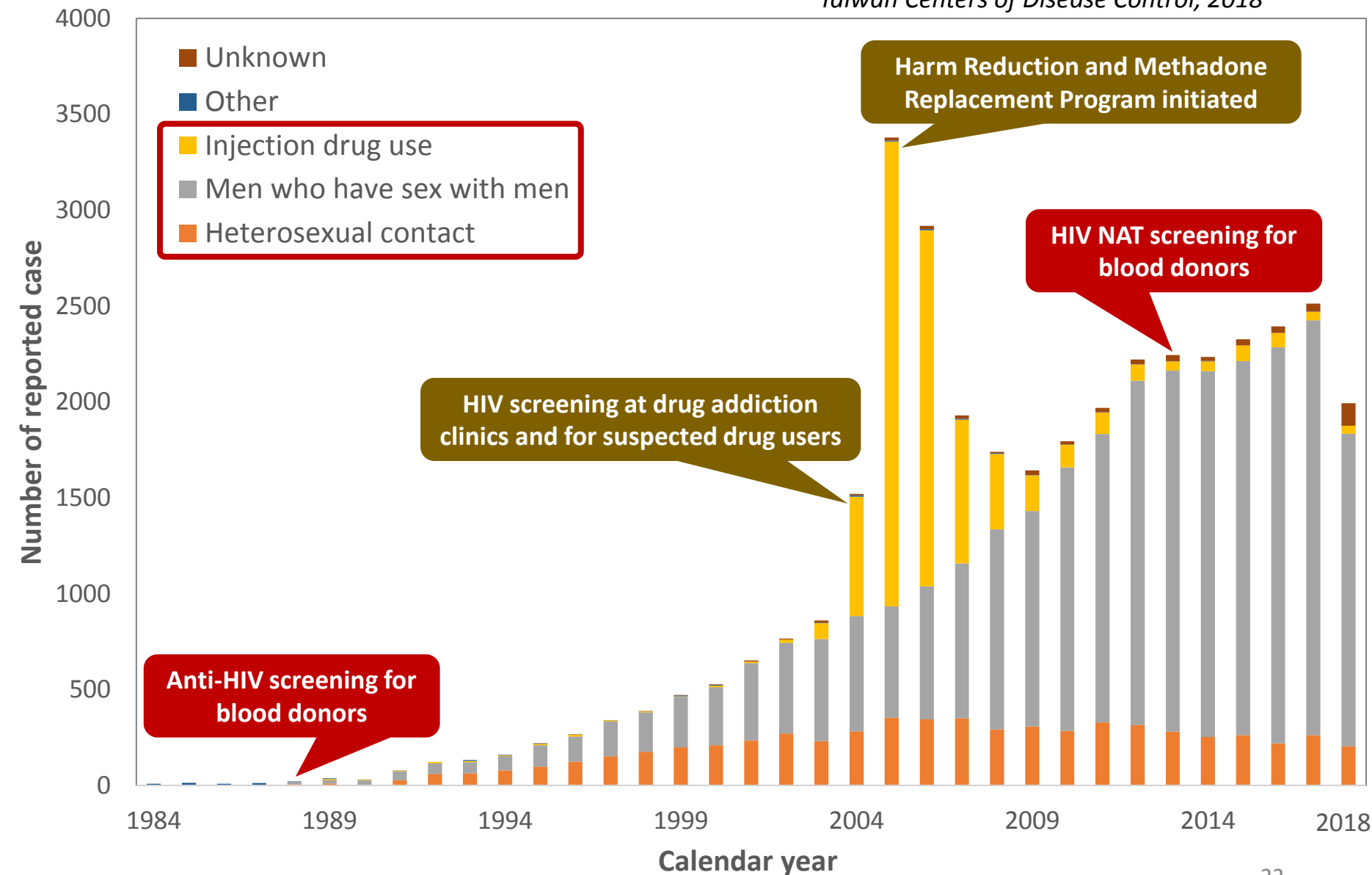


Anti-HCV positivity of blood donations



Risk factors of reported HIV cases in Taiwan

Taiwan Centers of Disease Control, 2018



Actions to defer high-risk groups

Fewer and fewer HIV cases identified at blood centers

Action 1

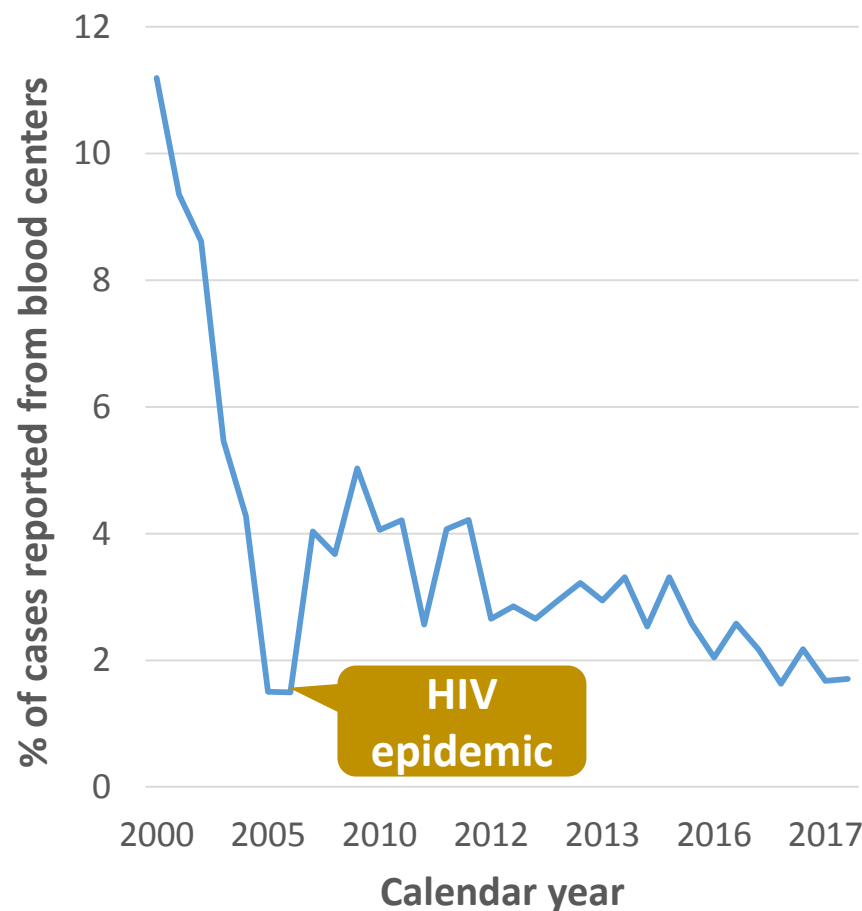
Blood centers **do not inform** blood donors their **testing results** of HIV-related markers. (Since 1994)

Action 2

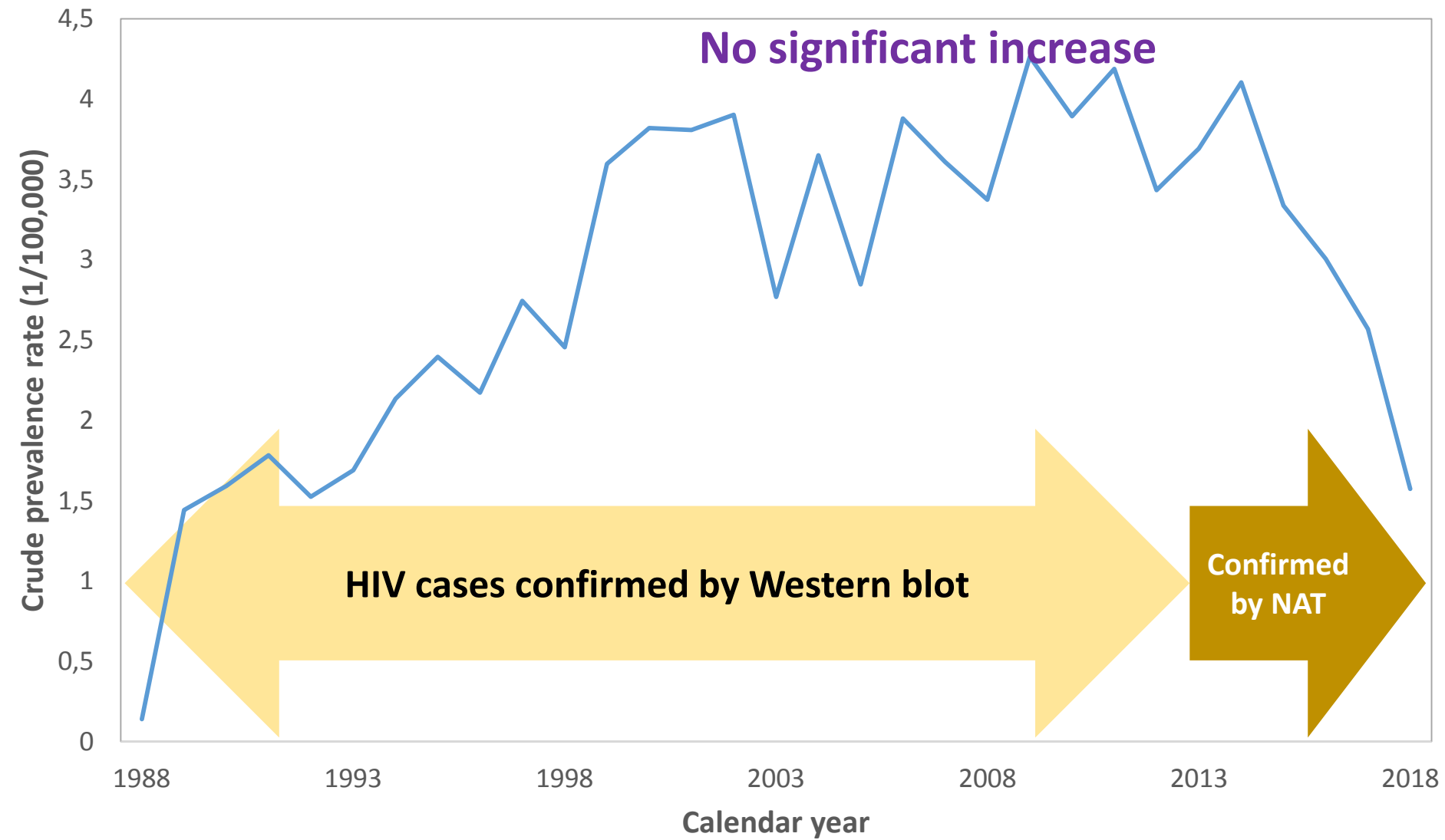
Defer donors with high-risk behaviors (MSM, IV drug use, unsafe sex, received transfusion, STI, etc.) identified at **pre-donation questionnaire**.

Action 3

Health authority **share** the surveillance data of HIV, syphilis, gonorrhea, and list of IV drug users to exclude ineligible donors. (Since 1994)

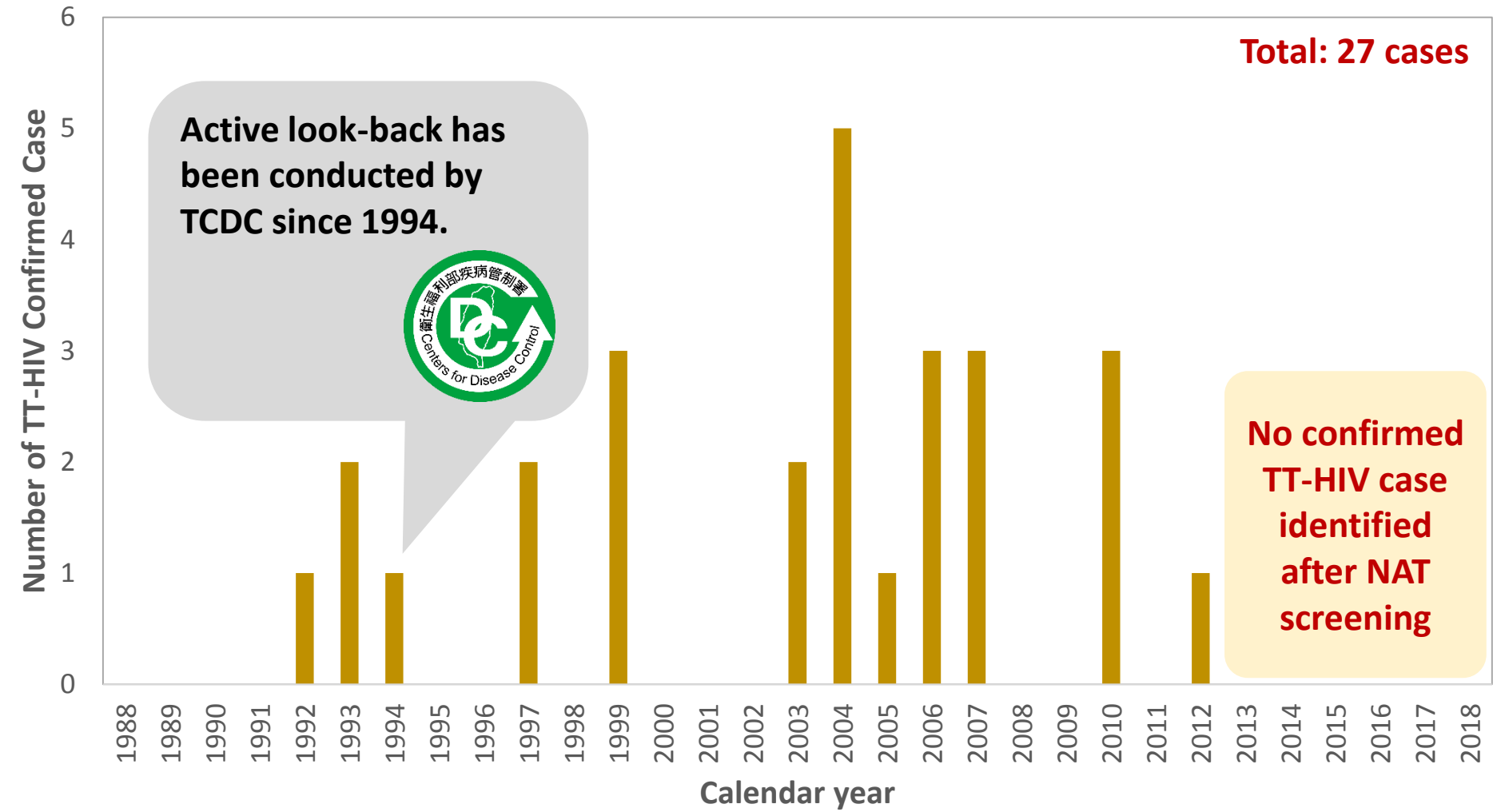


HIV prevalence among blood donors



Transfusion-Transmitted HIV Cases in Taiwan

1984-2015



Prevalence of Parvovirus B19 in Taiwan

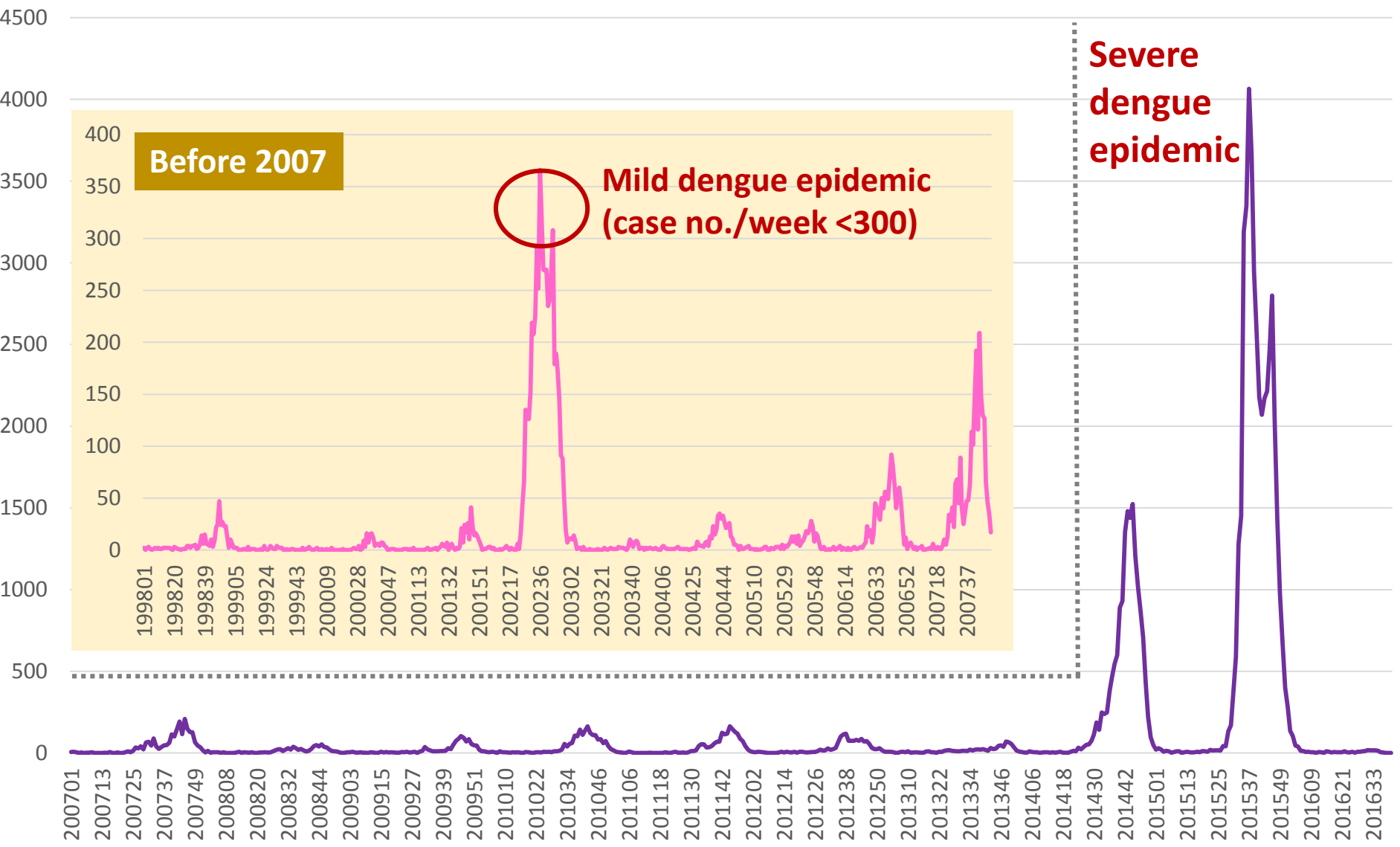
Age (General population)	Parvovirus B19 IgG prevalence (%)	
	1986	2004
1-14	10.3	20.0
15-19	15.9	22.2
20-29	23.5	28.3
30-39	36.0	Not include in this survey
40-49	47.7	
50-59	44.2	
>60	51.3	

Seroprevalence in 1986: Lin et al. J Med Virol 1999;57:169-73

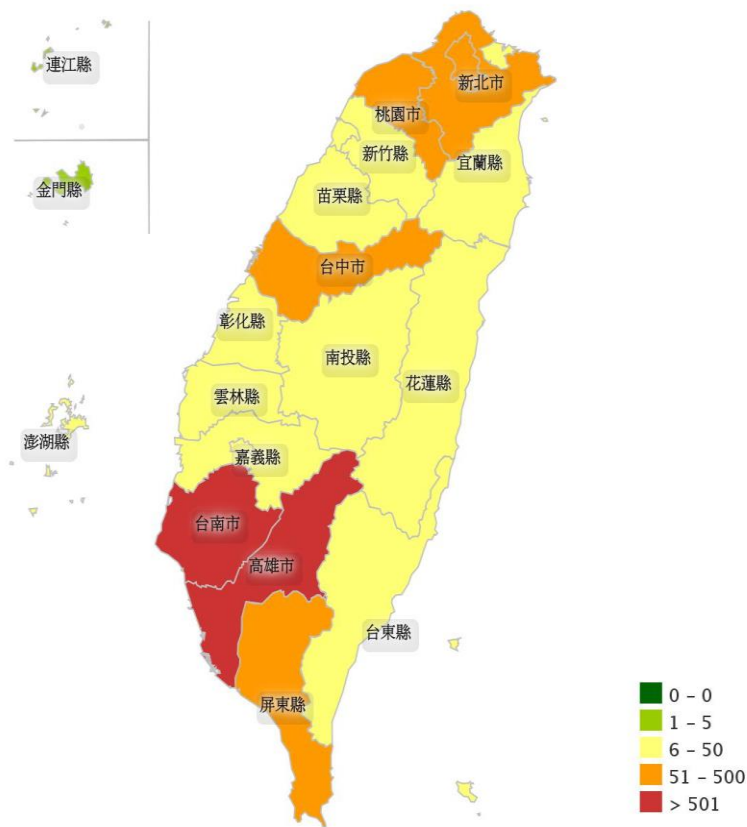
Seroprevalence in 2004: Su et al. Pediatr Neonatol 2010;51:265-8

Period (Blood donor)	No. of whole blood donations tested	NAT positive rate (1/10,000)
2007-2018	1,317,924	1.11

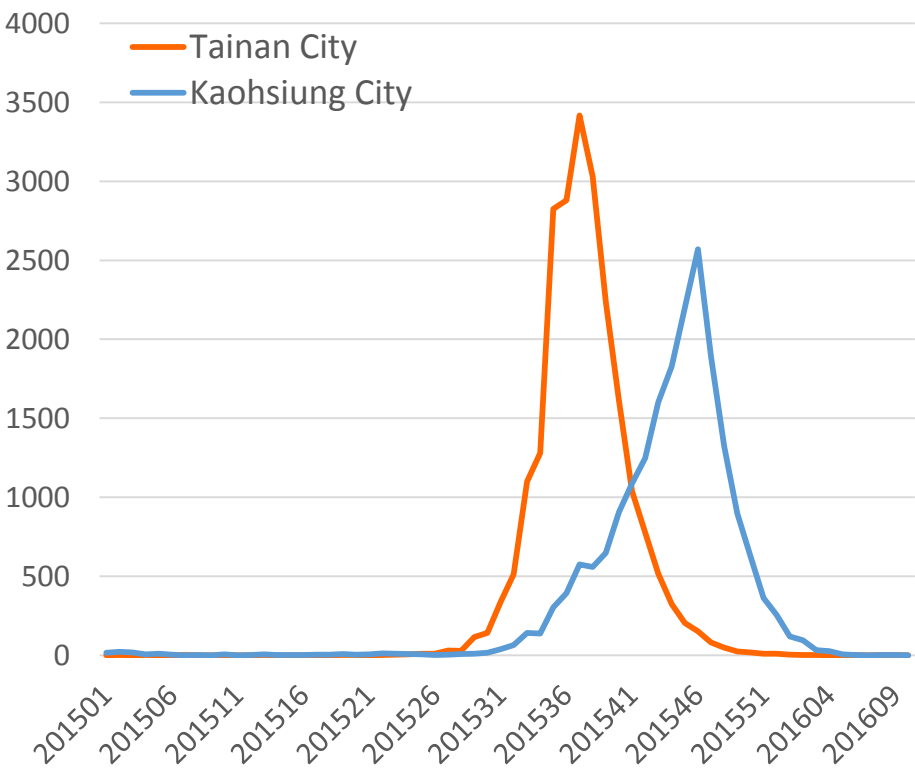
Dengue epidemic in Taiwan after 1998



全國登革熱本土病例及境外移入病例地理分佈(2015年20週-2016年10週)



2015 dengue epidemic curve in Tainan and Kaohsiung Cities





If blood centers deferred donors from epidemic area

Proportion of blood lose at affected center

Situation in 2015 sever dengue epidemic

Def. of epidemic Incidence (1/10 ⁵)	Tainan City		Kaohsiung City	
	Whole blood	Platelets	Whole blood	Platelets
>=5	31.5%	34.6%	49.0%	54.5%
>=10	27.7%	31.1%	42.4%	47.4%
>=50	14.2%	17.1%	16.4%	17.5%
>=100	11.5%	15.1%	7.7%	8.7%
>=200	8.2%	11.4%	1.0%	0.9%

Viremia of DENV may occurred in >0.5% of blood donors.

Chen et al. unpublished data, a retrospective survey conducted in 2017-2019.

Actions during 2015 dengue epidemic



Collection

Stop collect blood at highest risk area. (All mobiles and one fix site)



Interview

Defer donors who had fever, were affected by dengue or whose family member or neighbor was dengue cases.



Registration

To check whether the donor had been reported as a dengue confirmed case. (List provided by TCDC)



Post donation concerns

If donors had dengue-like symptoms in 7 days of blood donation. (Special remind in high risk area)

Summary

Surveillance system identify TTI threats

- Cooperate with health authorities
- Establish own surveillance system is critical

Successful public health actions secured blood safety

- Universal HBV vaccination program
- Widely use sterilized or disposable medical equipment
- Harm reduction program

Donor selection policy lower the TTI risk

- Surveillance data sharing to defer high risk donors

Taipei 101

New Year's Eve
Fireworks Show

