

Prevention of CMV infections during pregnancy by behavior modification

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CMV Transmission

TRANSPLACENTAL

- Primary maternal (50%)
- Recurrent maternal (0.5-1%)

PERINATAL

- Breast milk
- Cervical Secretion

POSTNATAL

- Day care
- Intrafamilial

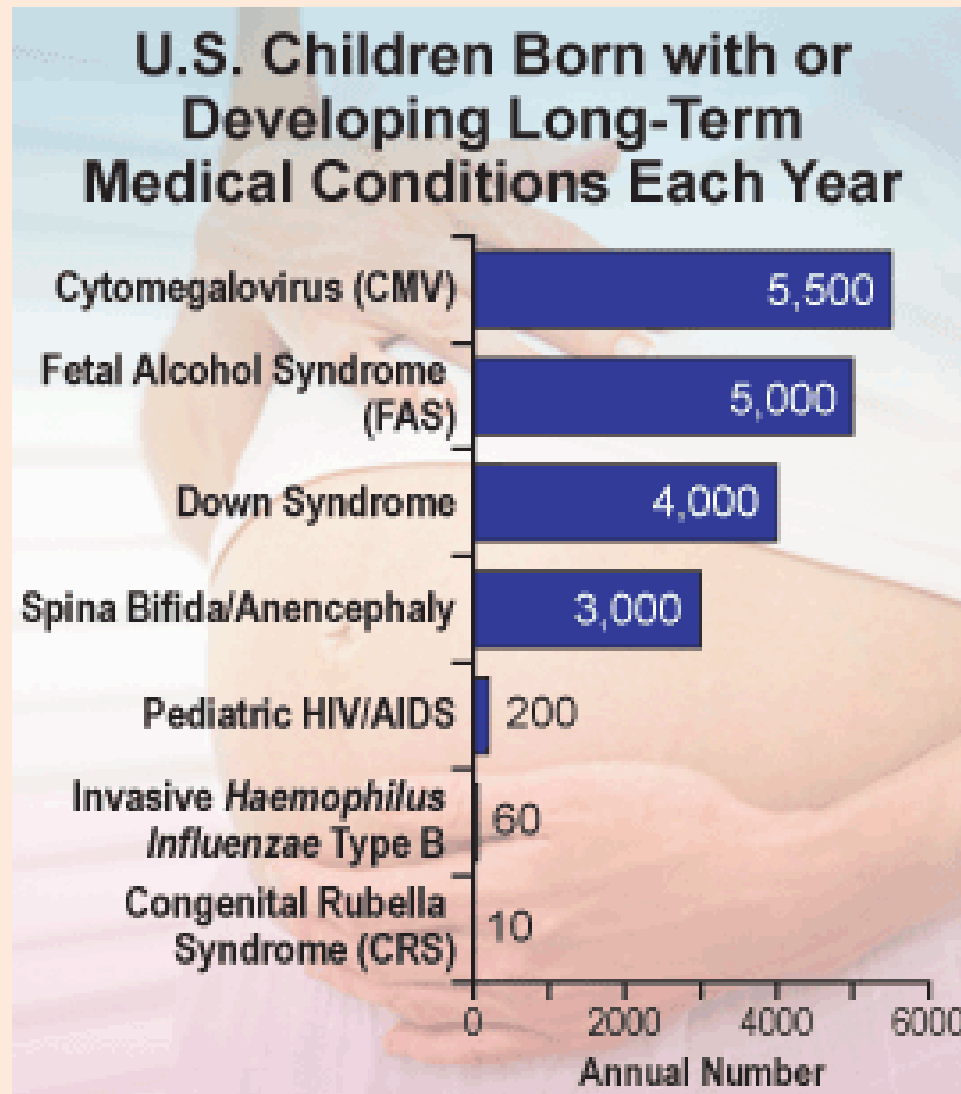
SEXUAL

- Oral
- Genital

NOSCOMIAL

- Transfusion
- Hospital Personnel

Putting it in perspective



Signs and symptoms of congenital CMV

Common:

Small for gestation age

Microcephaly

Hepatosplenomegaly

Elevated direct (conjugated) bilirubin

Thrombocytopenia

Neurosensory hearing deficit

Unusual

Retinitis (rare)

Blueberry muffin rash (rare)

CNS periventricular calcifications

Serious effects of congenital CMV infections

- Hearing deficit
- Mental retardation and development delay
- Death (10%)

Age related changes in the causes of deafness – W. Nance

Incidence at birth
(186 per 100,000)

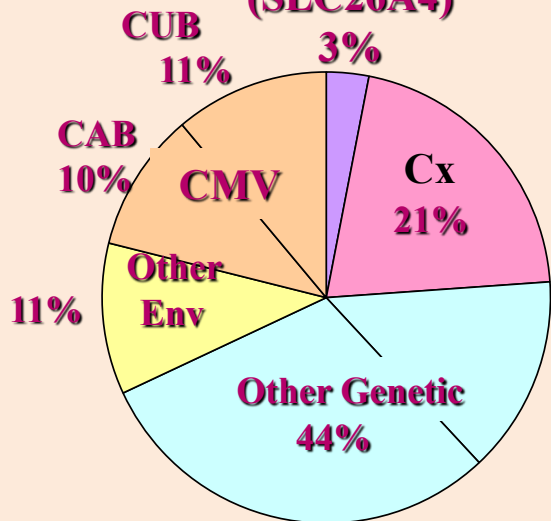
Prevalence at 4 years
(270 per 100,000)

TOTAL
GENETIC

68%

55%

Pendred Syndrome
(SLC26A4)



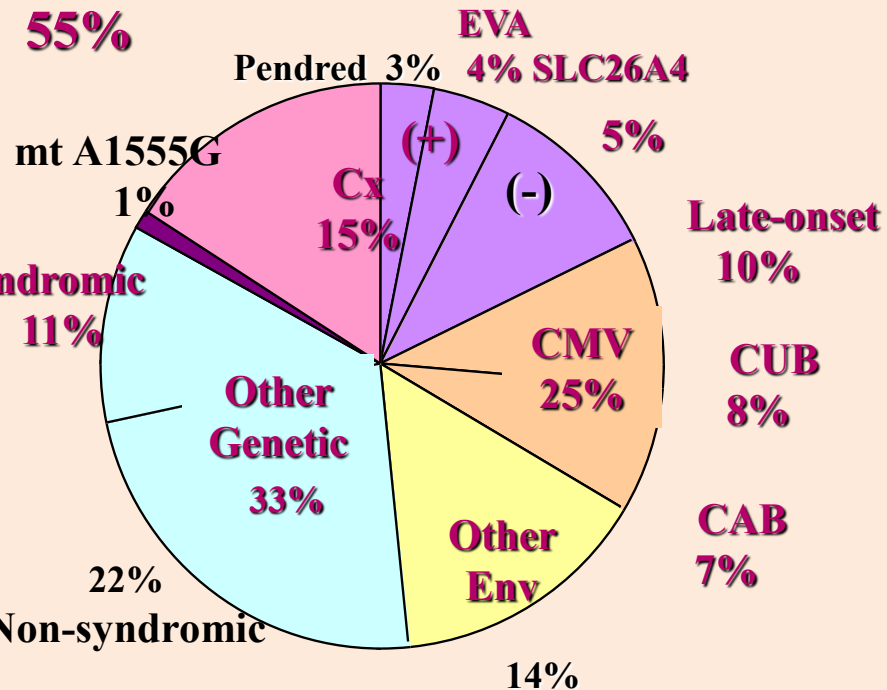
Syndromic
14%

Non-syndromic
30%

Syndromic
11%

Non-syndromic
22%

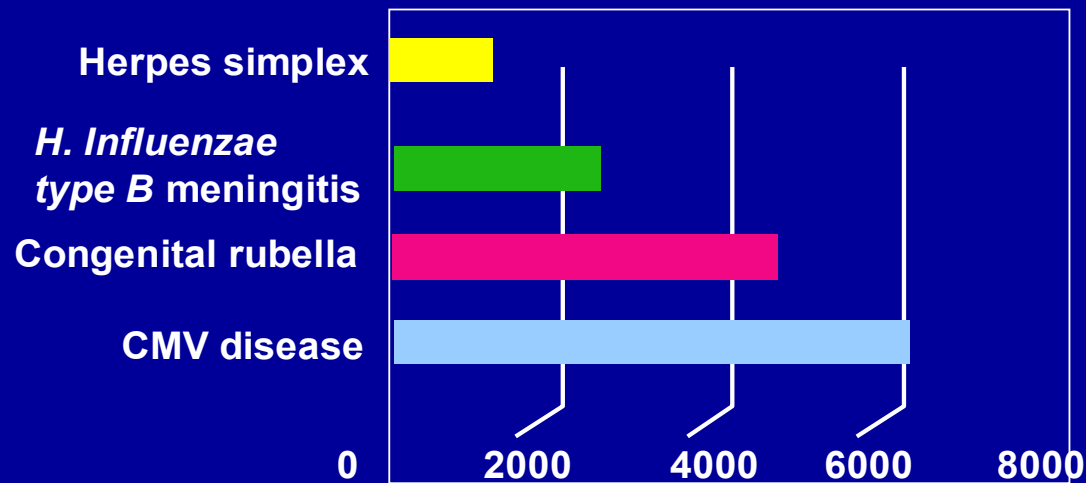
Non-syndromic
14%



CAB = clinically apparent EVA = enlarged vestibular aqueduct
CUB = clinically unapparent Cx = connexin

Infectious Causes of Neurologic Damage in Infancy

Annualized Cases Per Year (US) Pre-vaccine



High risk pregnant women

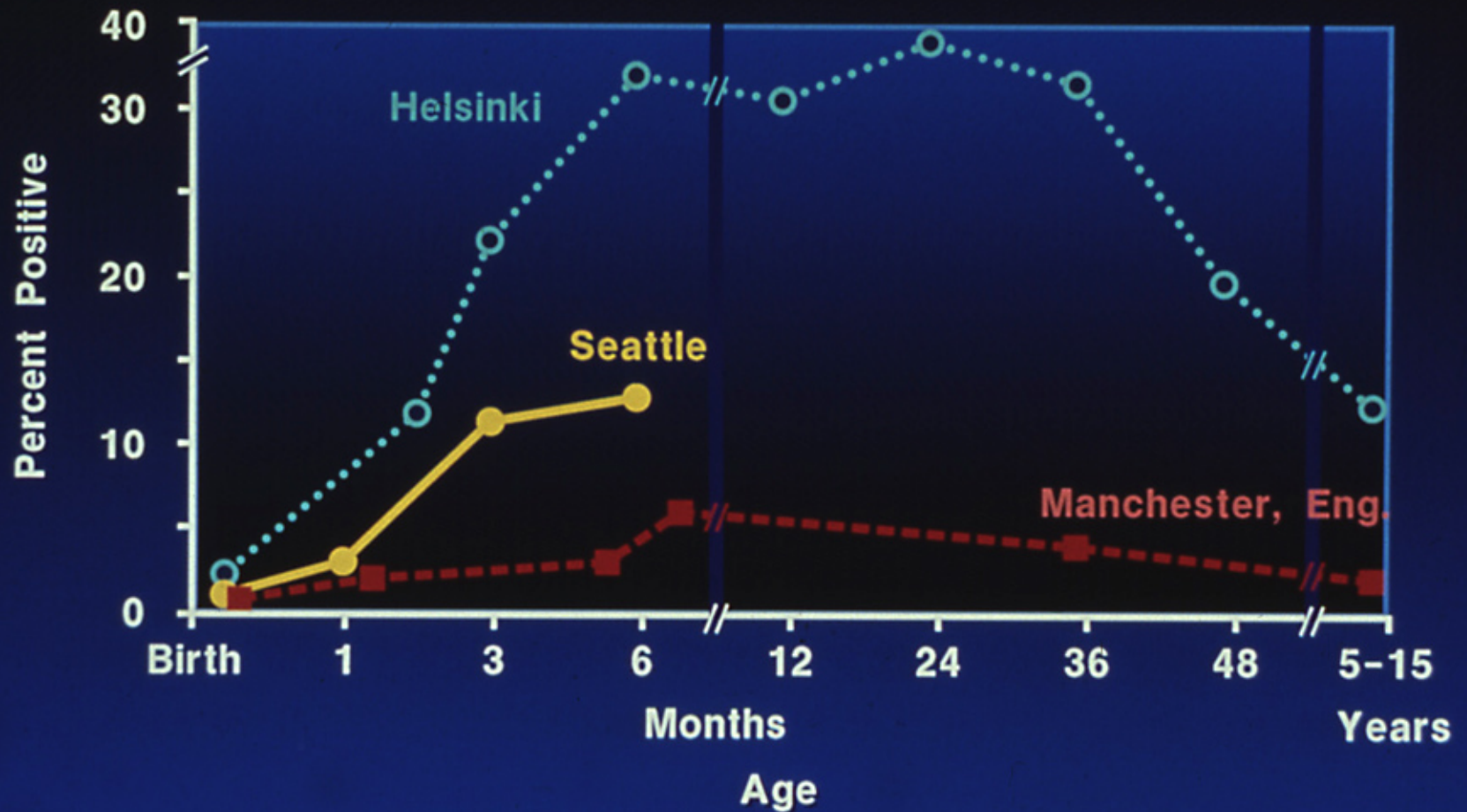
Exposure to young children

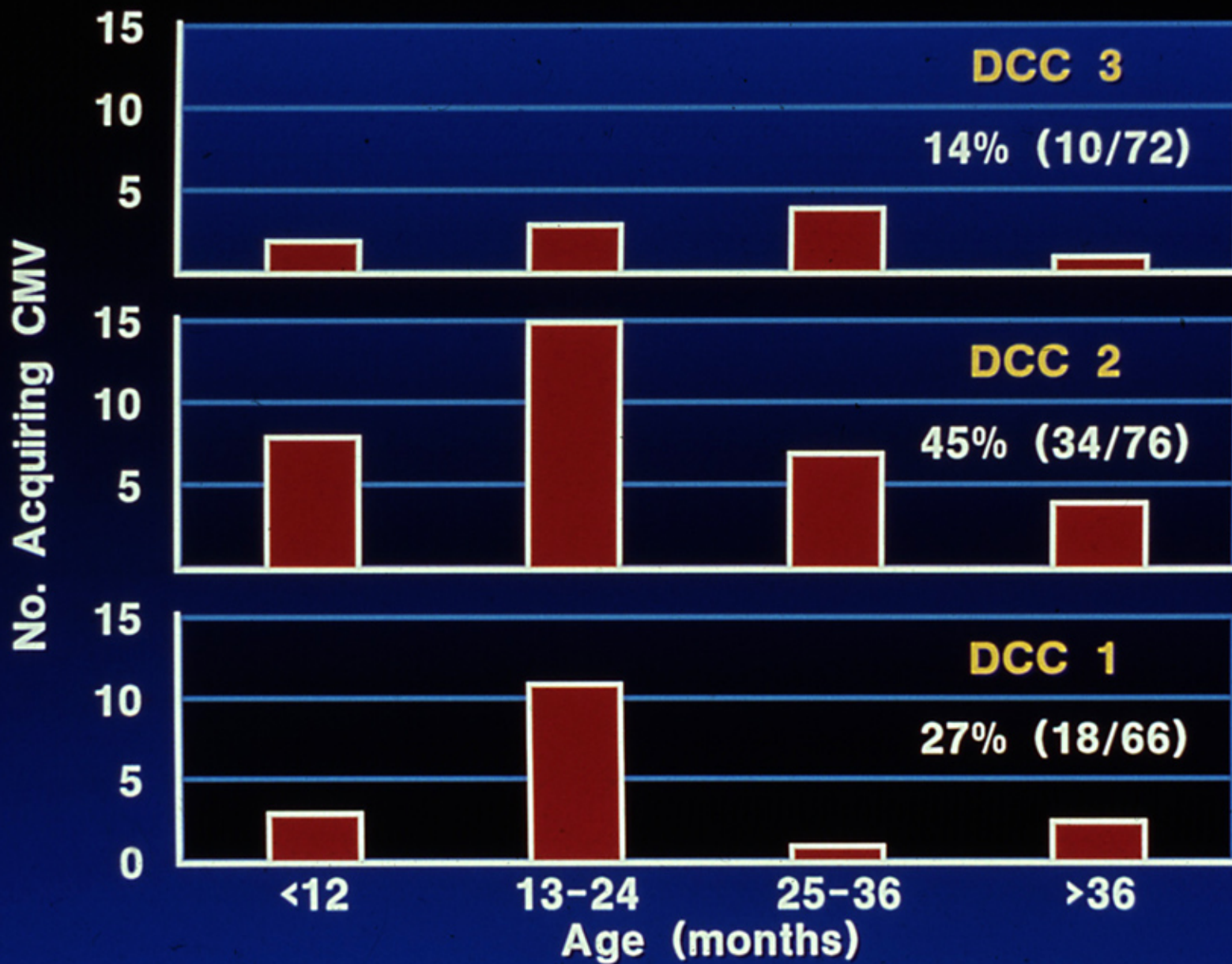
- Children ≤ 3 years who acquire CMV postnatally excrete CMV in urine and saliva for between 6 to 42 months (mean = 18 months).
- Seronegative mothers with infected children acquire CMV infections at rates 10 to 25 times higher than other women.

Women with multiple sex partners;

- Sexual transmission should be easily prevented by barrier methods.

Prevalence of CMV Excretion in Infants and Children



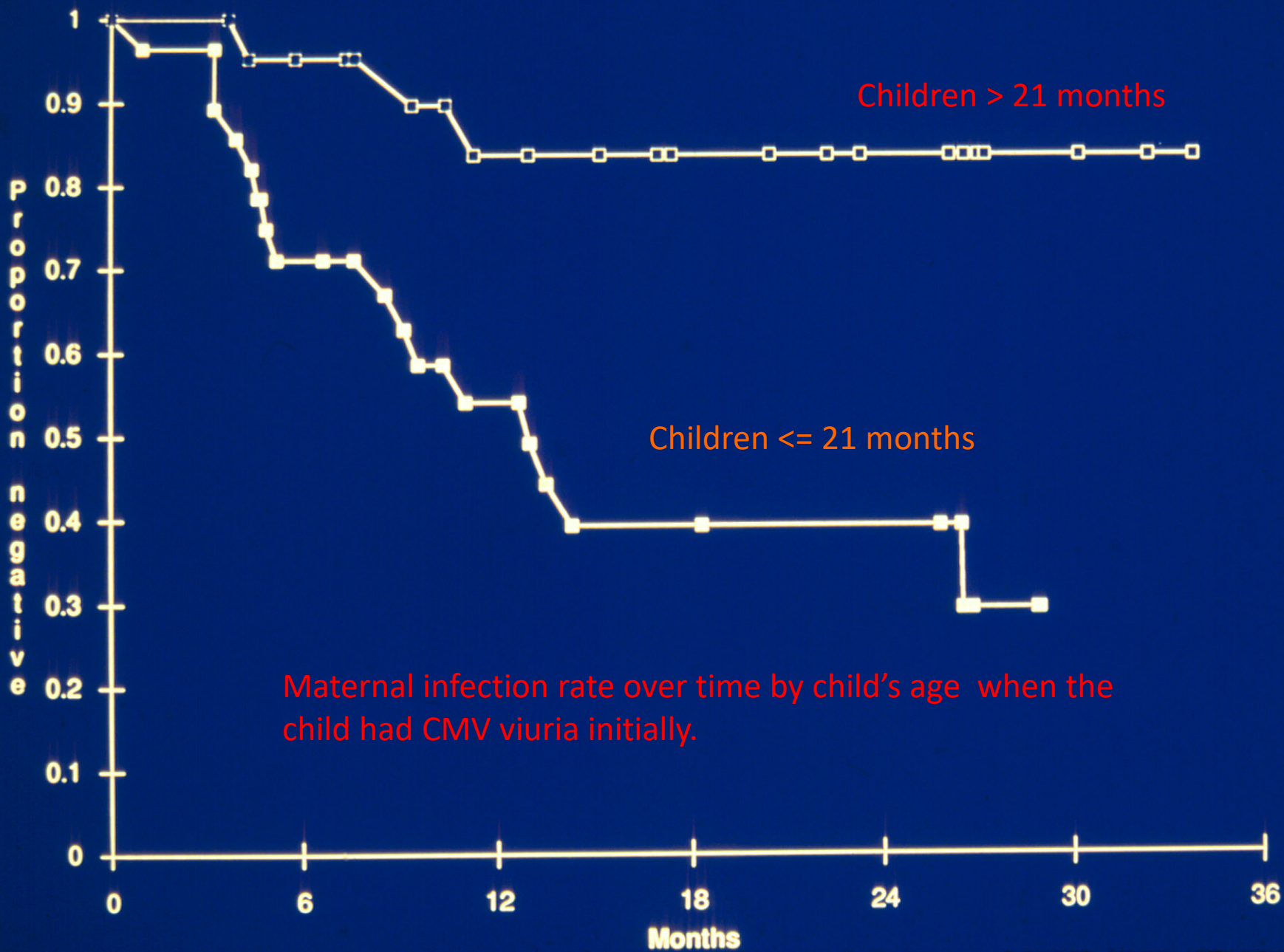


The Prevalence of CMV Excretion (urine or saliva) Among Children Attending Daycare

Ages of children tested	≤36 months of age	≤30 months of age
Year	1992	1999
Number of centers tested	40	9
Total number of children enrolled	953	304
Average number of children/center	24	33
Total number tested	507	146
Number excreting CMV (%)	137 (27%)	37 (25%)

Rates of Seroconversion Among Day Care Workers in Three Locations

SITE	# of Seronegative Workers	# Seroconverting	Annual Rate
Richmond, VA	202	19	11%
Birmingham, AL	82	19	20%
Iowa City, IA	82	7	8%



The Prevalence of CMV Infection among the Daycare Children of CMV seronegative Pregnant Women 1998-2001

Number of mother-infant pairs tested	151
Average age of the mother \pm S.D.	32 \pm 6 years
Average age of the child \pm S.D	20 \pm 6 months
Number of pregnant seronegative mothers with a child shedding CMV (%)	37 (25%)

Prevention practices for seronegative pregnant women to reduce risk of CMV infection.

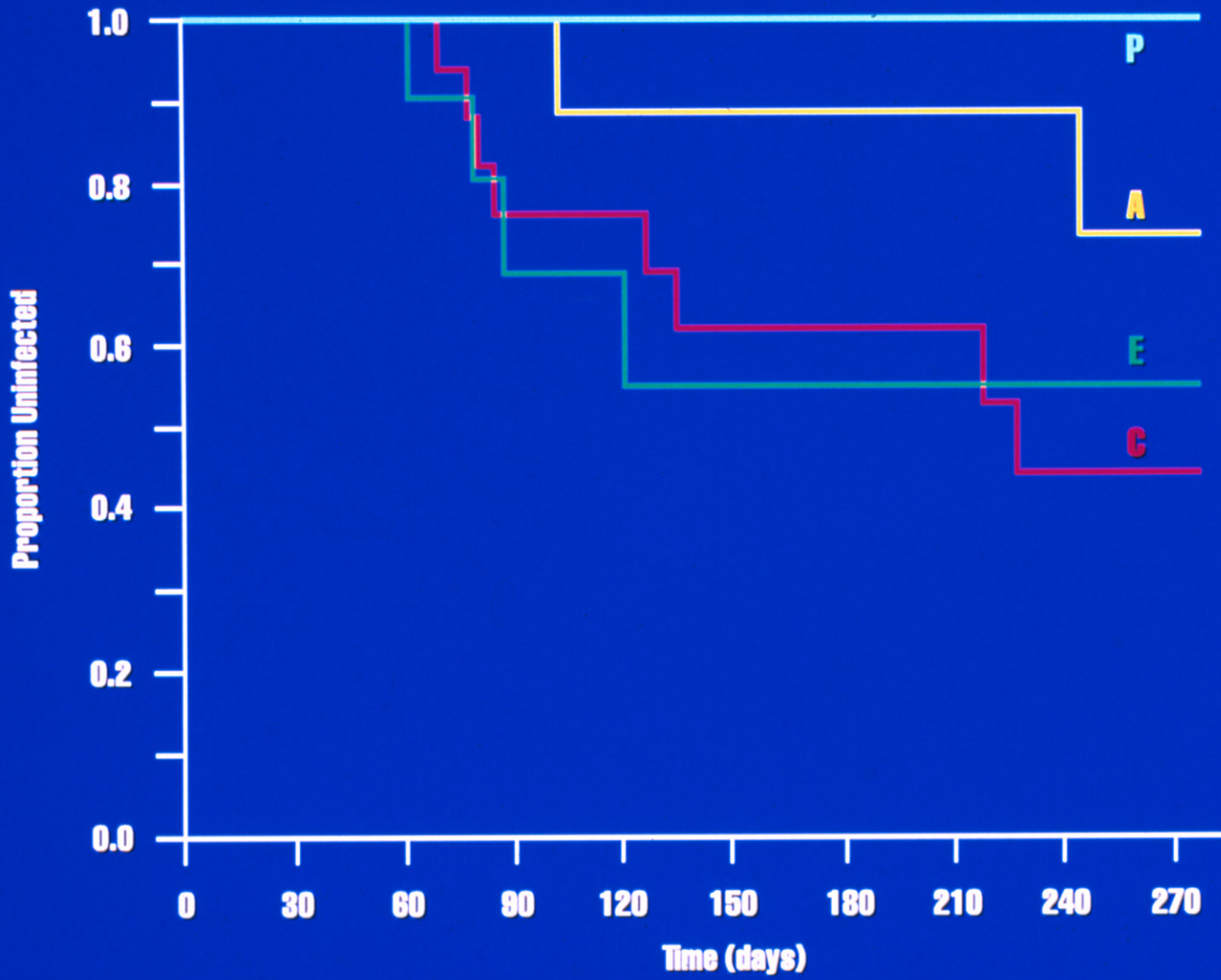
1. Assume children under age 3 years in your care has CMV in their urine and saliva.
2. Thoroughly wash hands with soap and warm water after:
 - diaper changes and handling child's dirty laundry
 - feeding or bathing child
 - wiping child's runny nose or drool
 - handling child's toys, pacifiers, or toothbrushes
3. Do not:
 - share cups, plates, utensils, toothbrushes, or food
 - kiss your child on or near the mouth
 - share towels or washcloths with your child
 - sleep in the same bed with your child

Three studies on behavioral modification

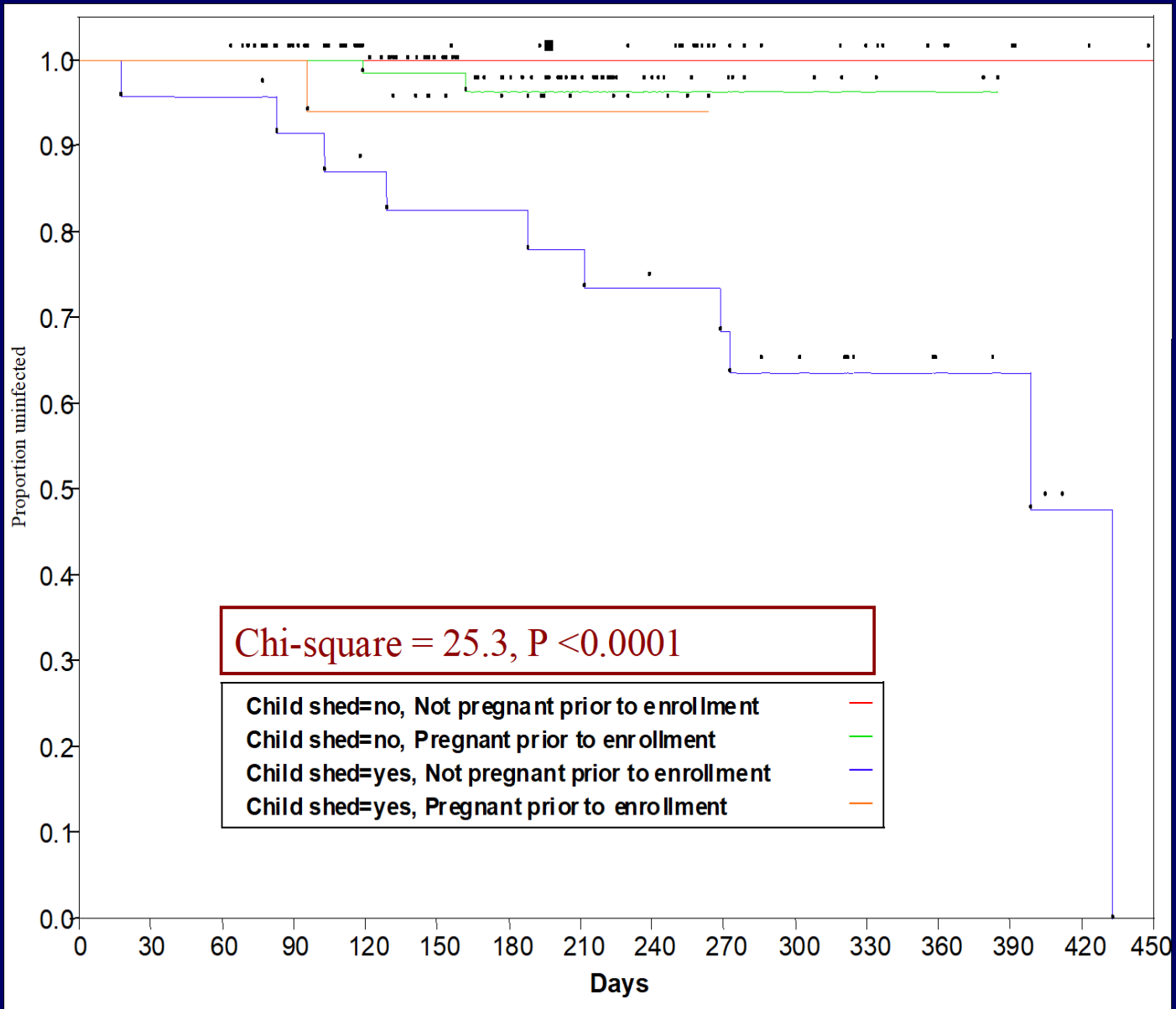
- Adler 2004 – 180 seronegative pregnant women –94% effective.
- C. Vauloup-Fellous et al. Journal of Clinical Virology 46S (2009) S49–S53.
2529 seronegative pregnant women 80% effective
- Revello 2015 – 646 seronegative pregnant women 84% effective.

Two clinical trials have failed due to the effectiveness of behavior modification:

Biotest and NIH-MFMU studies of passive immunization.



Adler figure 1 05719gh



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Two clinical trials have failed due to the ineffectiveness of behavior modification:

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Prevention of primary HCMV infection in pregnancy by hygienic measures: a prospective, observational study in a high risk population

Revello, et al. EBioMedicine, 2015

- Infection rate control group = 24/315 (7.6%)
- Infection rate hygiene group = 4/331 (1.2%).
- $P < 0.001$ (Fisher's exact test).

Overall CMV serological results of the 5312 pregnant women included in the study, and the outcome of pregnancy of those who demonstrated CMV primary infection or seroconversion

For 2595 seronegative women:
seroconversion

< 12 weeks = 0.42%,

12 to 36 weeks, rate = 0.19% .

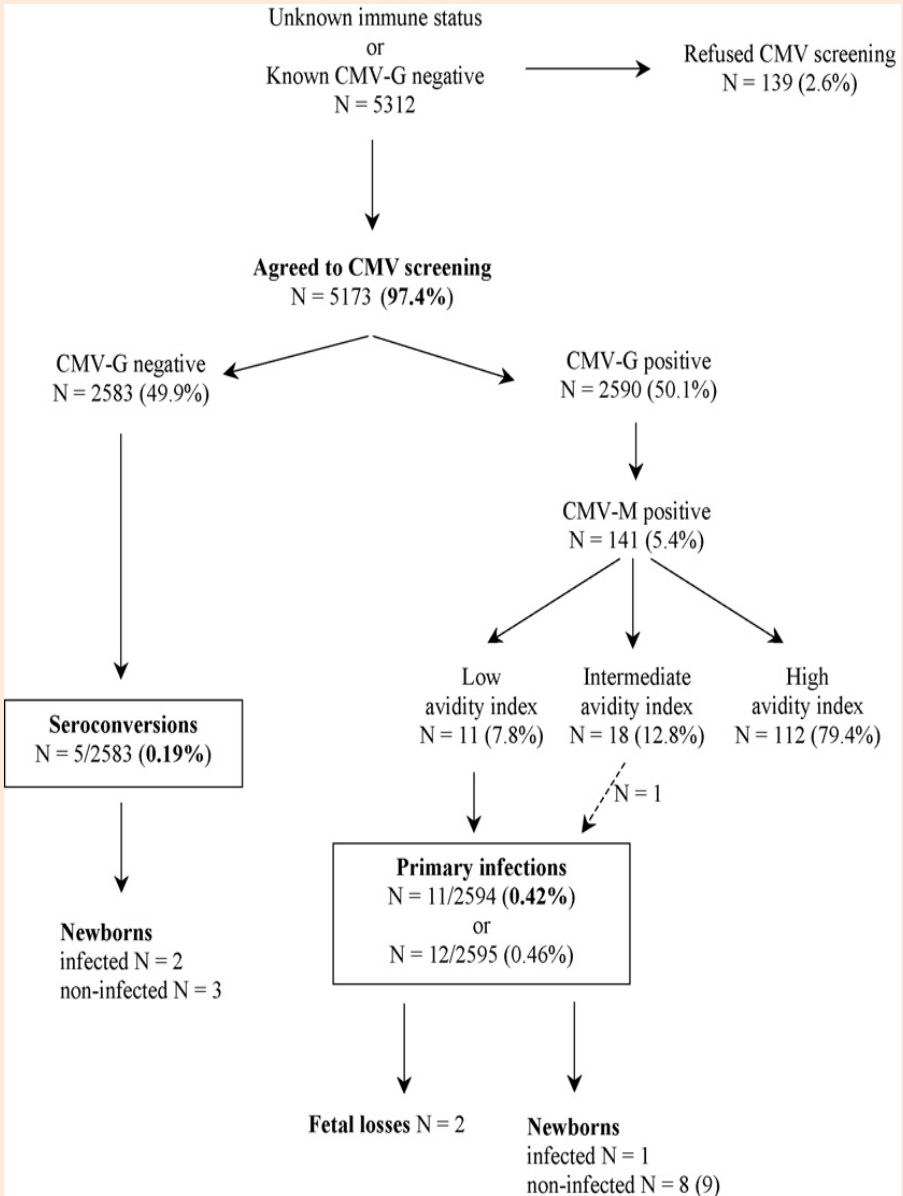
Adjusted for the number of
woman-weeks observed:

< 12 weeks = 0.035%,

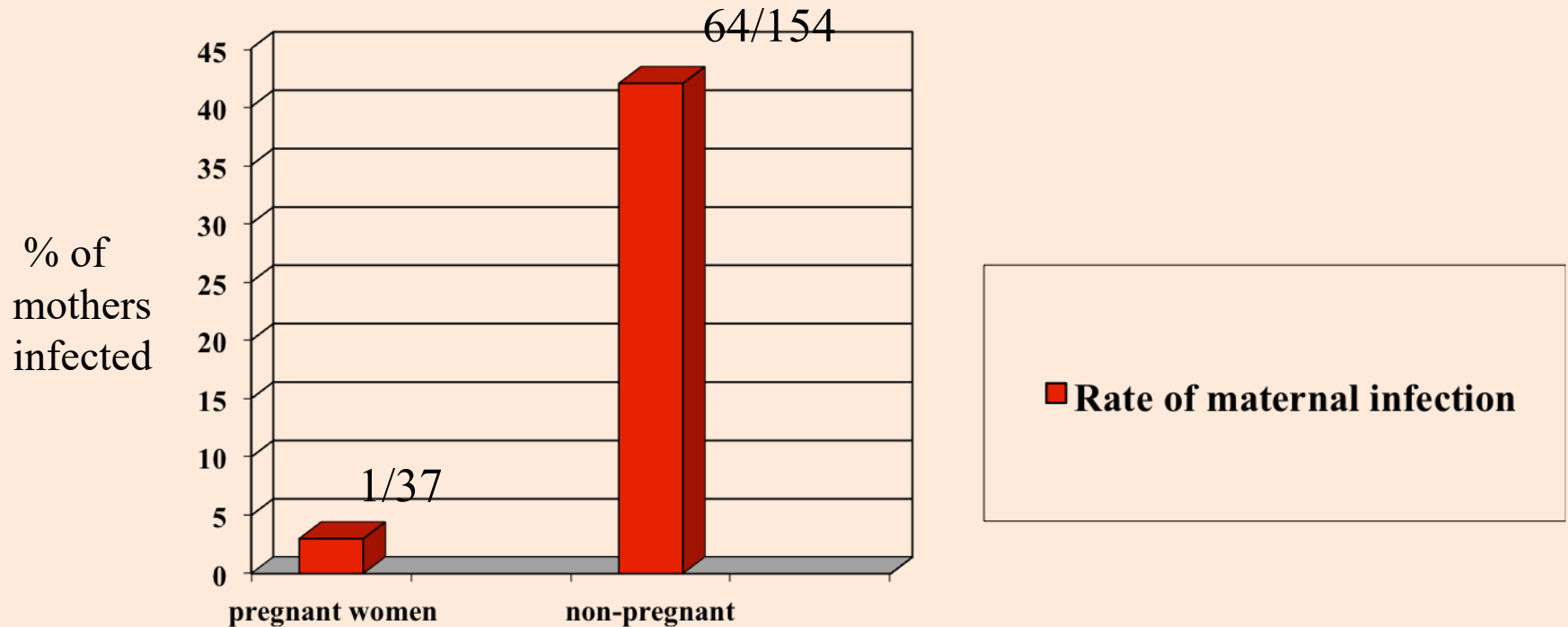
12 to 36 weeks, rate = 0.008%
(P= 0.0005).

Infections and seroconversions
were distributed evenly
throughout gestation

C. Vauloup-Fellous et al. Journal of
Clinical Virology 46S (2009) S49–S53



Maternal infection rates for women with infected children



Conclusions

- Intervention during pregnancy is highly effective.
- Intervention prior to pregnancy appears ineffective and thus unnecessary.
- Pregnant mothers with children in child care could be given the option for serologic testing.