HIV prevalence and incidence in Zimbabwe.

What on earth is going on?

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MMED Workshop

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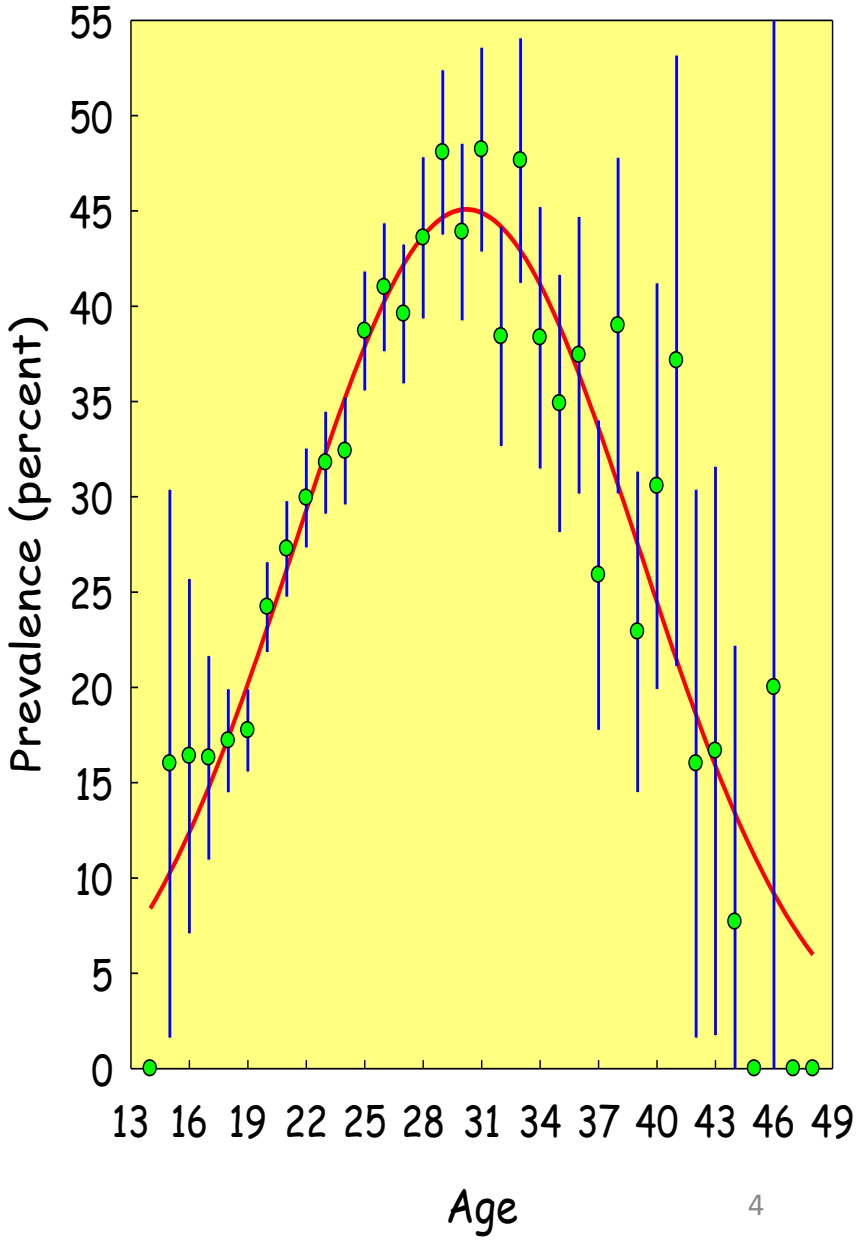
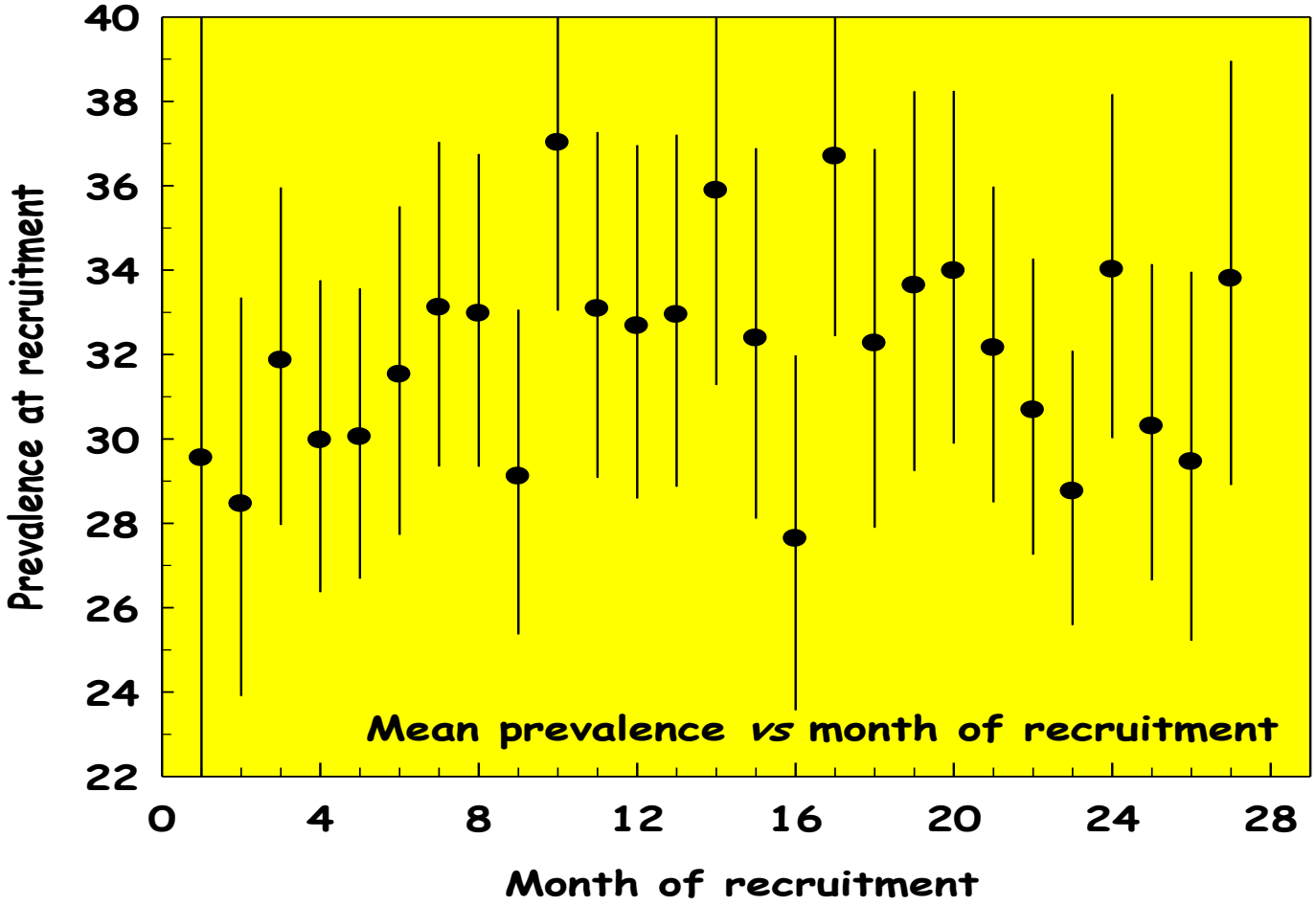
The first indication that something strange was happening with the HIV epidemic in Harare came from the ZVITAMBO study – carried out between 1997 and 2000.

Over this time >14,000 women and their new-born babies were recruited into the study and followed up for up to 2 yeras

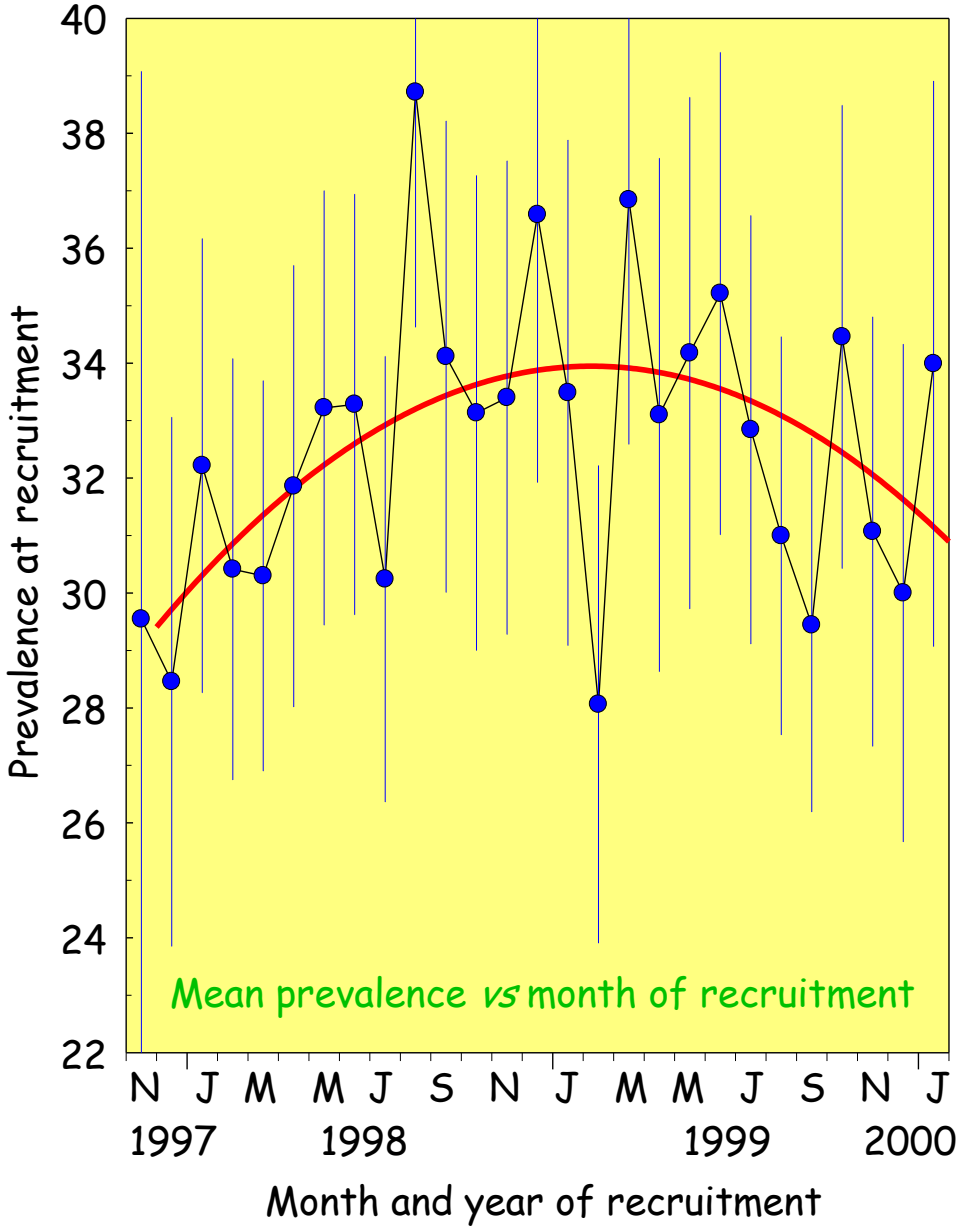
The study produced a huge amount of information on HIV prevalence, incidence and mortality – which helped us to understand what was go

- In the ZVITAMBO Trial, women and their babies were recruited over a 27-mo period between Oct 1997 and Jan 2000.
- HIV prevalence initially increases with age – peaking at a horrendous level of 50% for women aged about 30. Then declines sharply..
- Why the decline?





- Now pool on age and see whether there is any relationship between HIV prevalence and time.
- Is there any trend in the prevalence with date of recruitment??



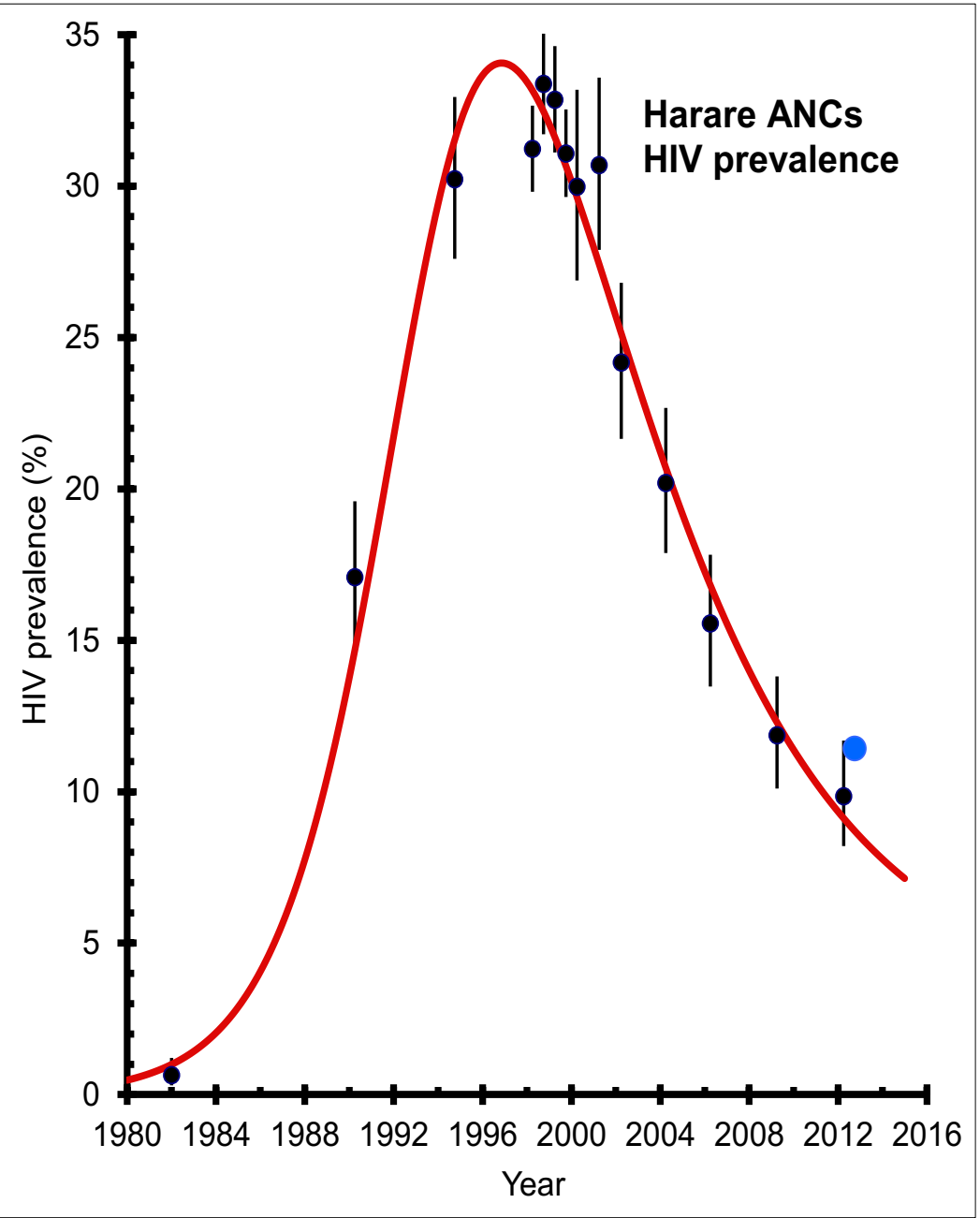
- For the ZVITAMBO Trial, HIV prevalence ***increased*** significantly during 1998, thereafter it ***declined*** significantly.

- Prevalence

  Nov 1997 29%.

  Dec 1998 34%.

  Jan 2000 31%.



When the ZVITAMBO data are amalgamated with other data from Harare ANC sites, prevalence appears to have peaked at the end of 1998 and seems to have been declining ever since.

Can we model these changes?

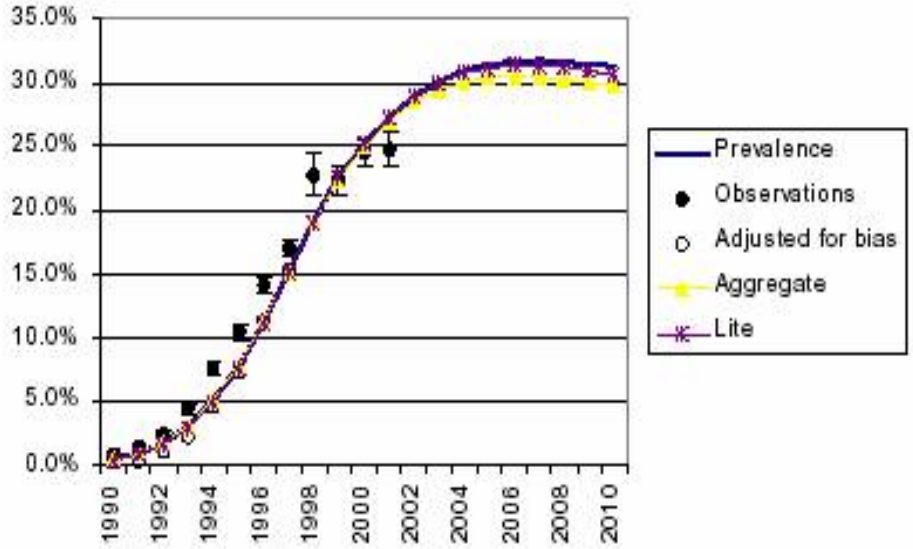
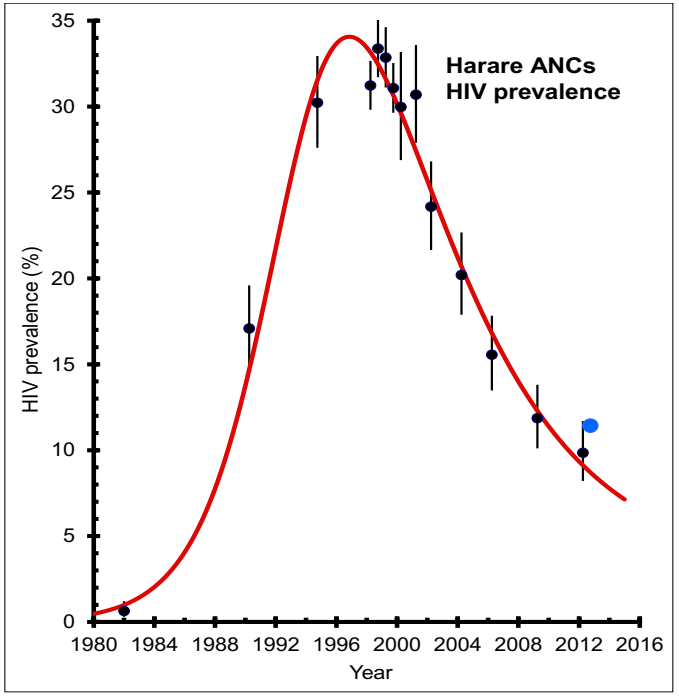


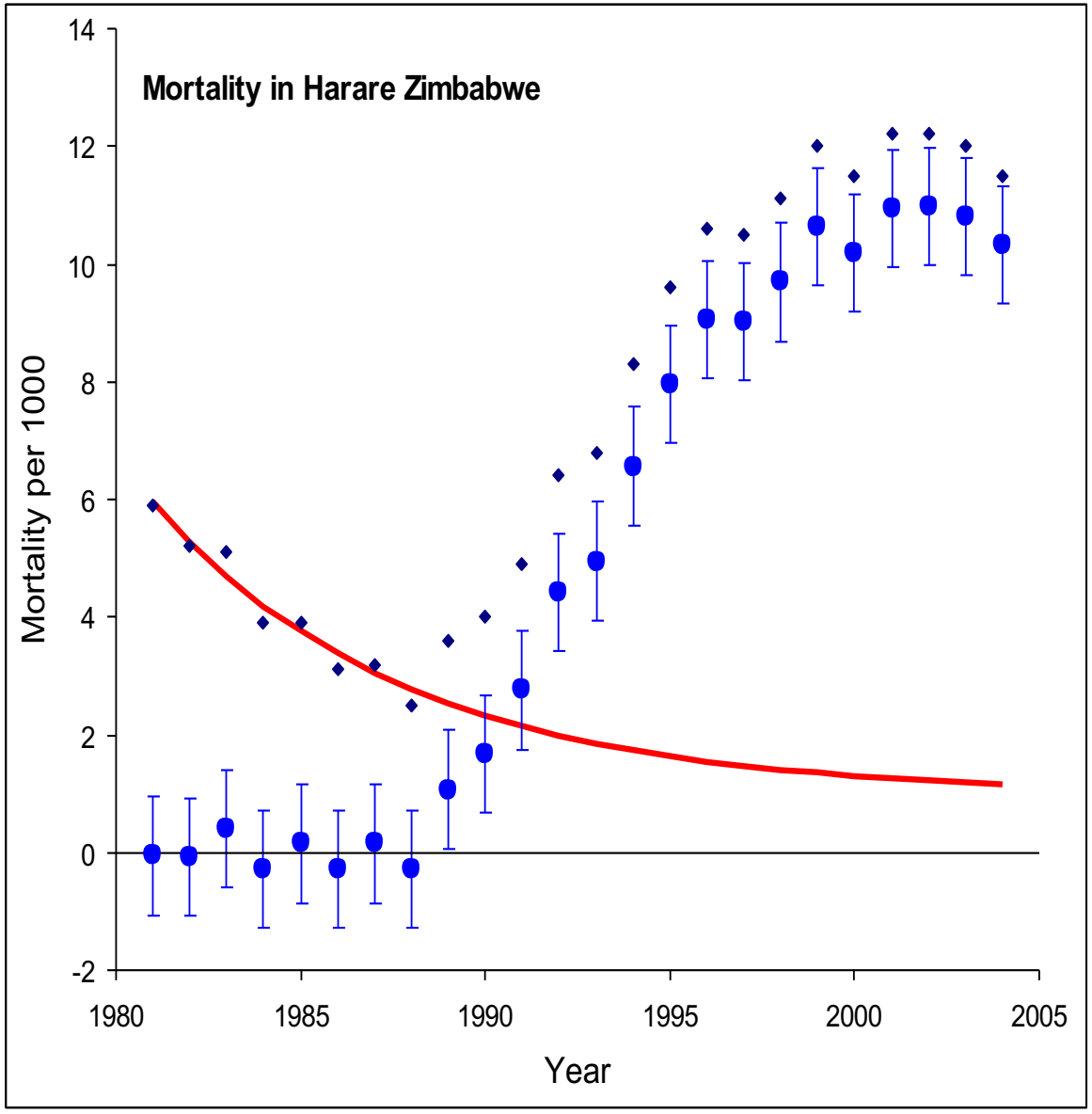
Figure 1. Comparison of ASSA2000 with antenatal prevalence rates



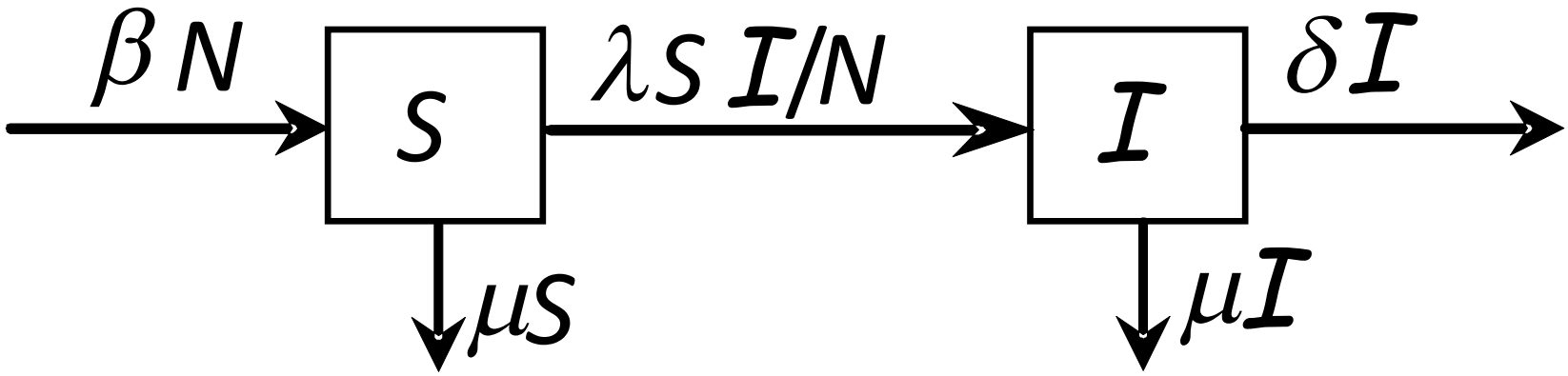
Things look quite different in South Africa ....

Why the difference?

We will try to answer that question later ...



- Mortality in Harare.
- With the end of the war in Zimbabwe in 1980 there was a large influx of foreign aid, jobs were created, and health and education services were improved.
- Mortality in Harare declined – until the effects of the HIV-AIDS epidemic made themselves felt.



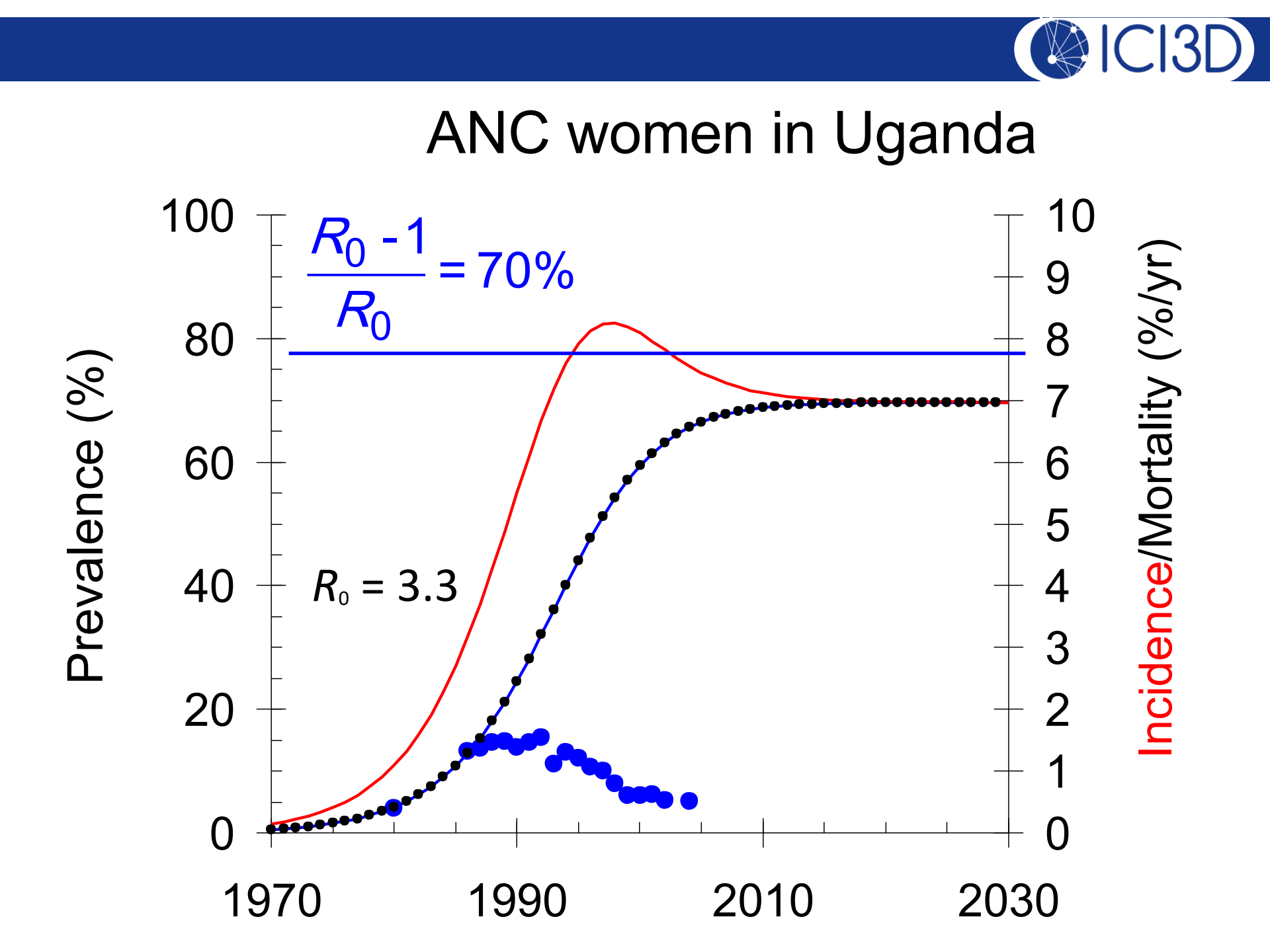
β = birth rate

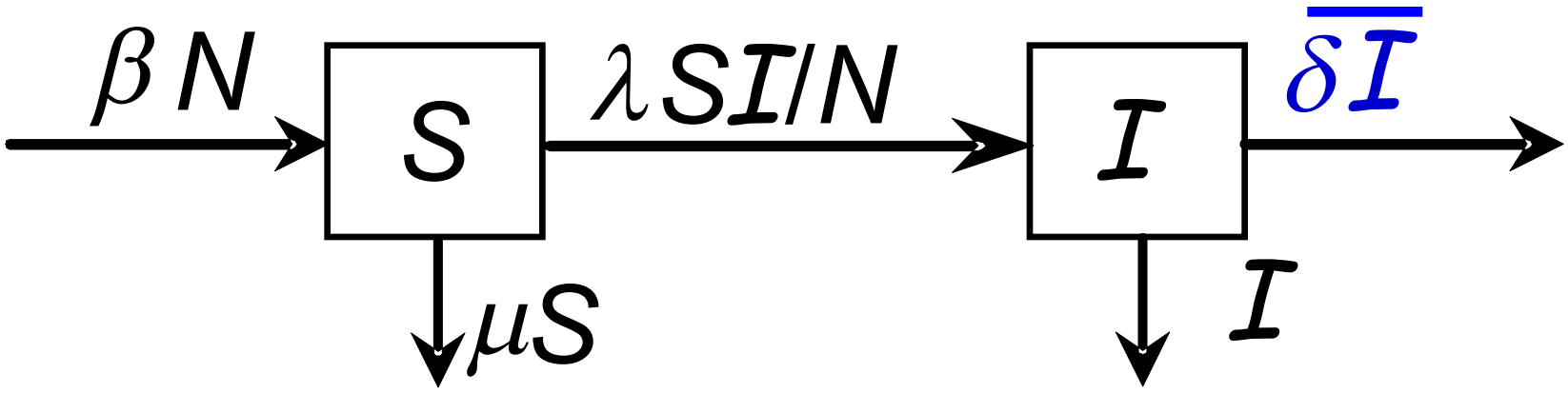
N = $S + I$

λ = rate at which new infections occur

δ = mortality

The basic model


ANC women in Uganda
$\frac{R_0 - 1}{R_0} = 70\%$
$R_0 = 3.3$
Prevalence (%)
Incidence/Mortality (%/yr)
100
80
60
40
20
0
10
9
8
7
6
5
4
3
2
1
0
1970
1990
2010
2030

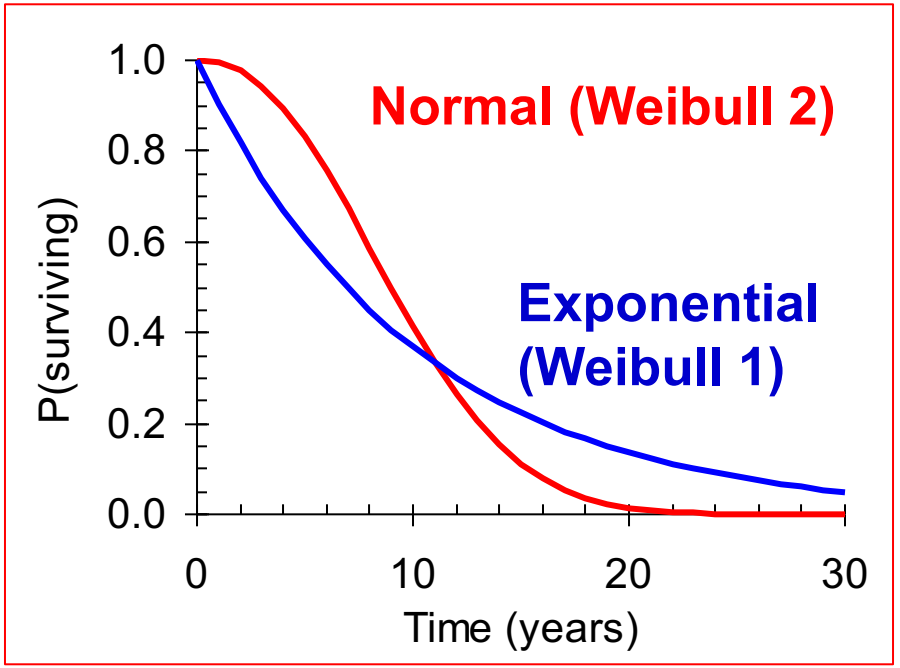


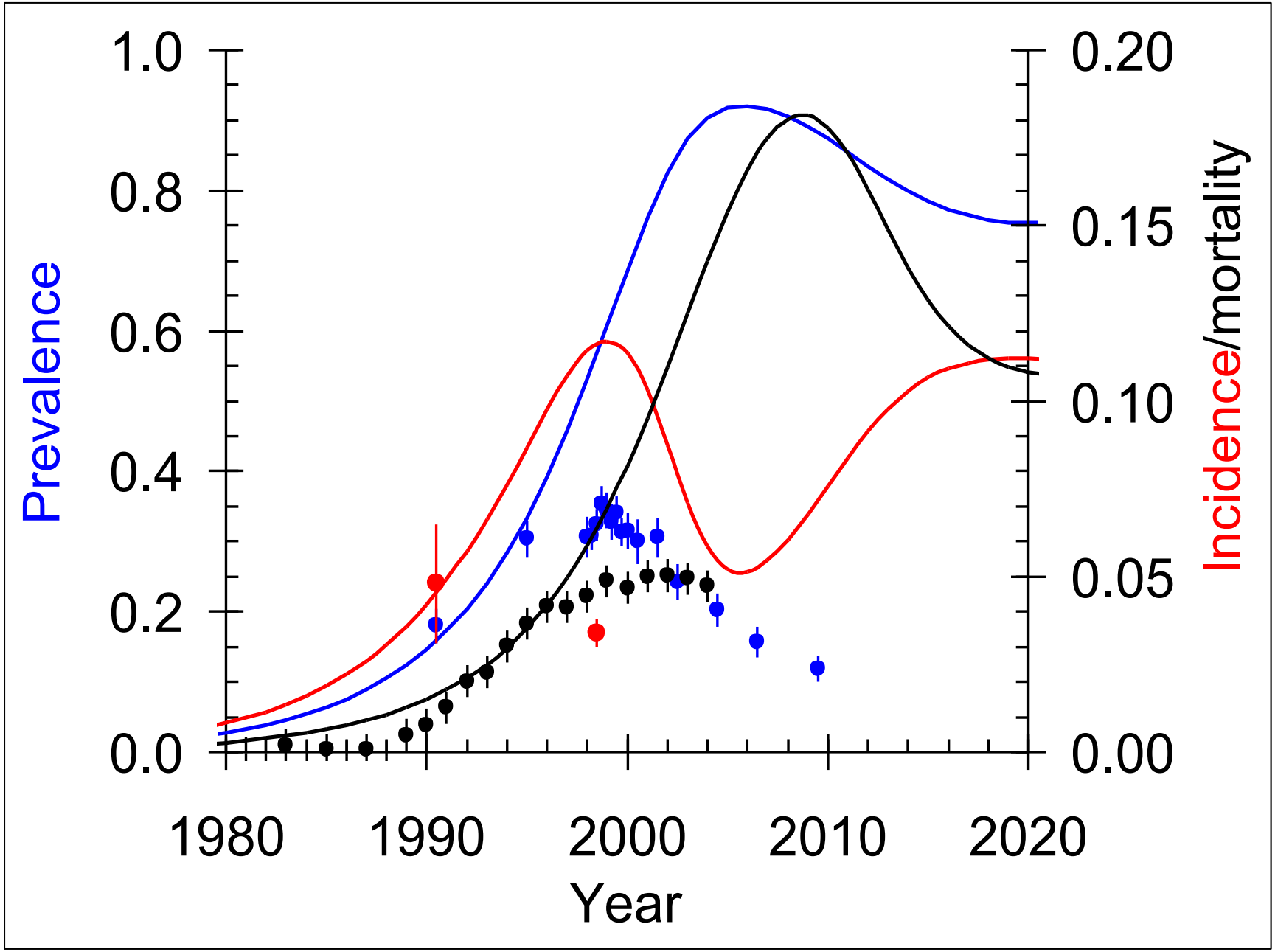
β = birth rate

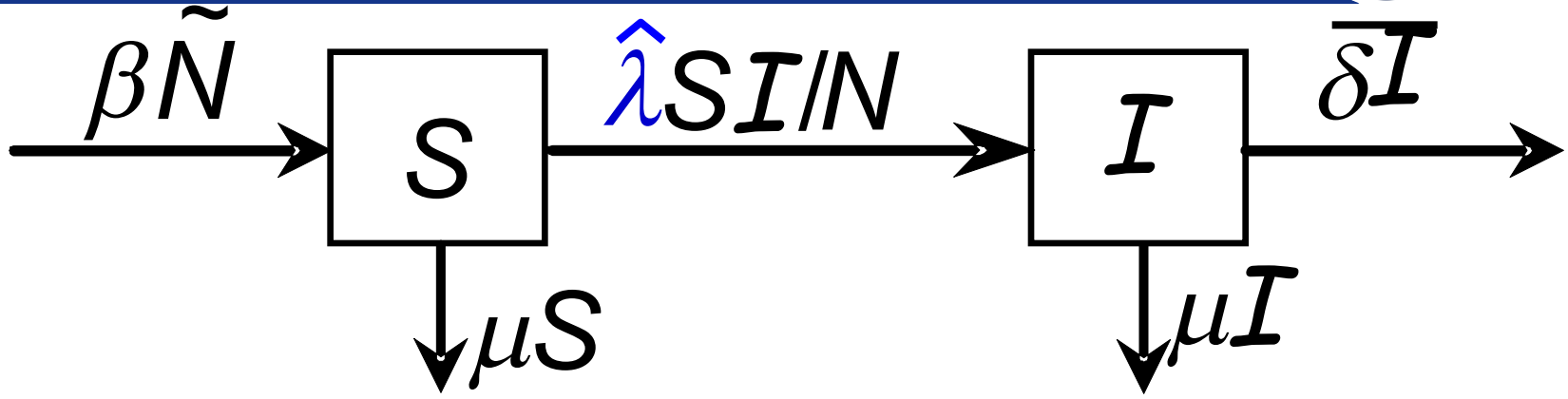
$N = S + I$

λ = infection rate

$\overline{\delta I}$ = Weibull mortality




Prevalence
Incidence/mortality
1.0
0.8
0.6
0.4
0.2
0.0
0.20
0.15
0.10
0.05
0.00
1980
1990
2000
2010
2020
Year

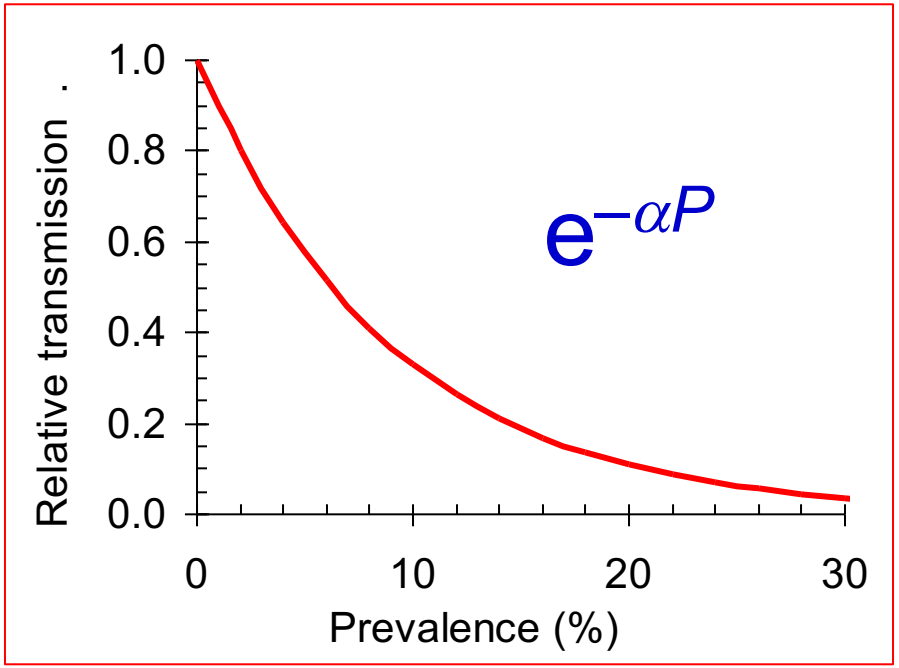


β = birth rate

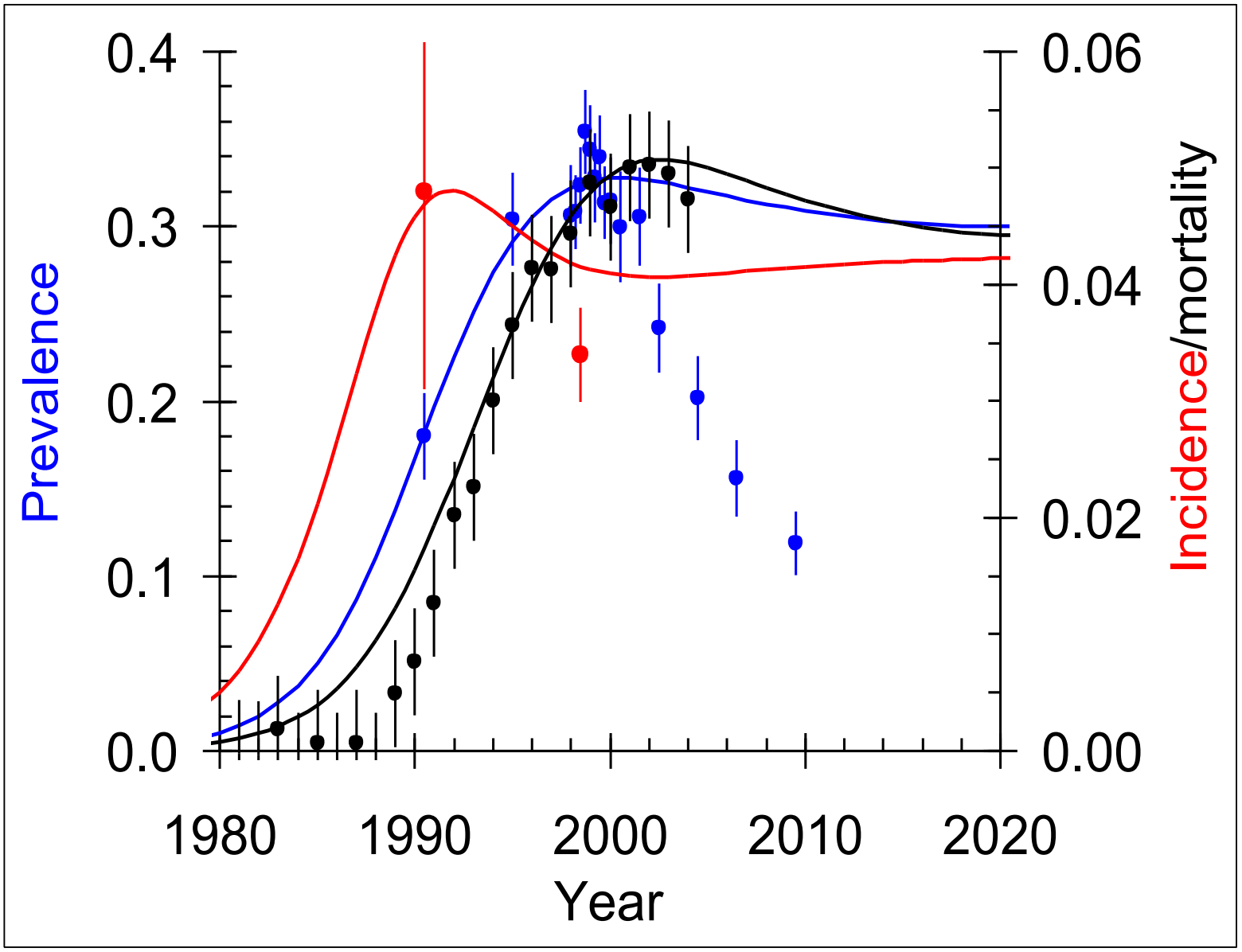
$\tilde{N}$ = population

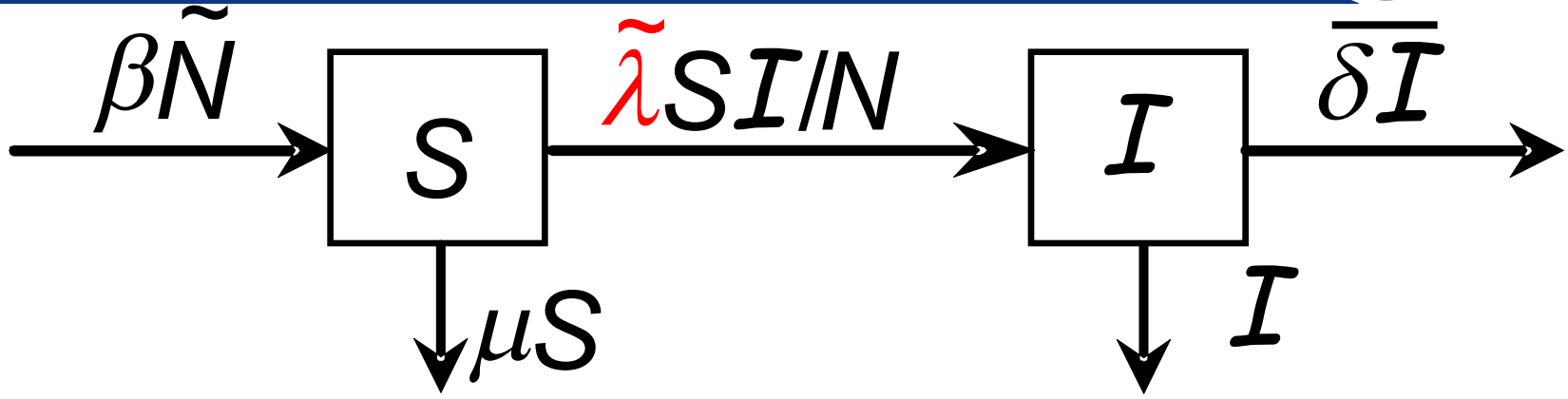
$\hat{\lambda} = \lambda e^{-\alpha P}$

$\overline{\delta I}$ = Weibull mort.



Heterogeneity in sexual behaviour


0.4
0.3
0.2
0.1
0.0
Prevalence
0.06
0.04
0.02
0.00
Incidence/mortality
1980
1990
2000
2010
2020
Year

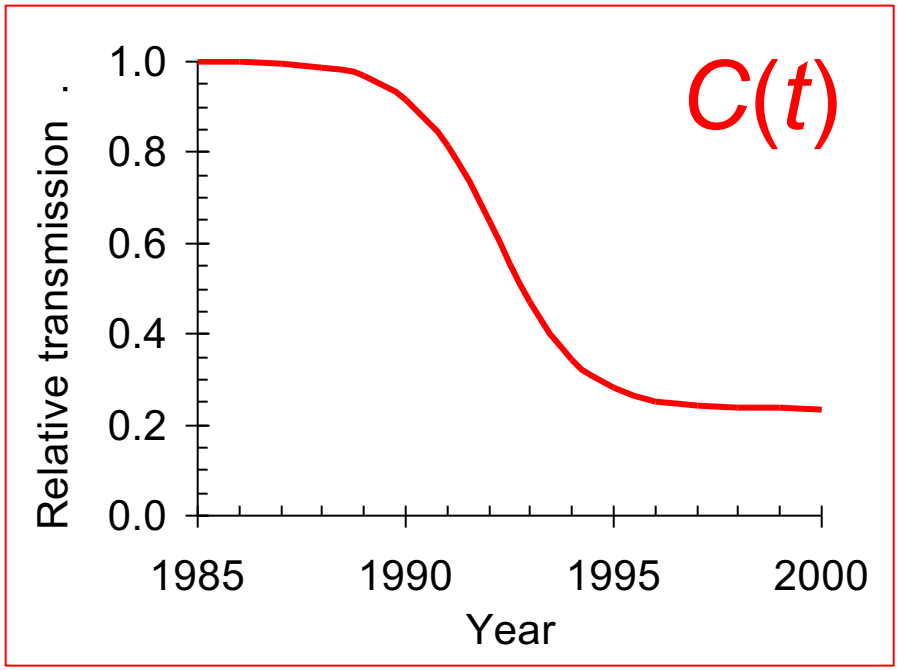


β = birth rate

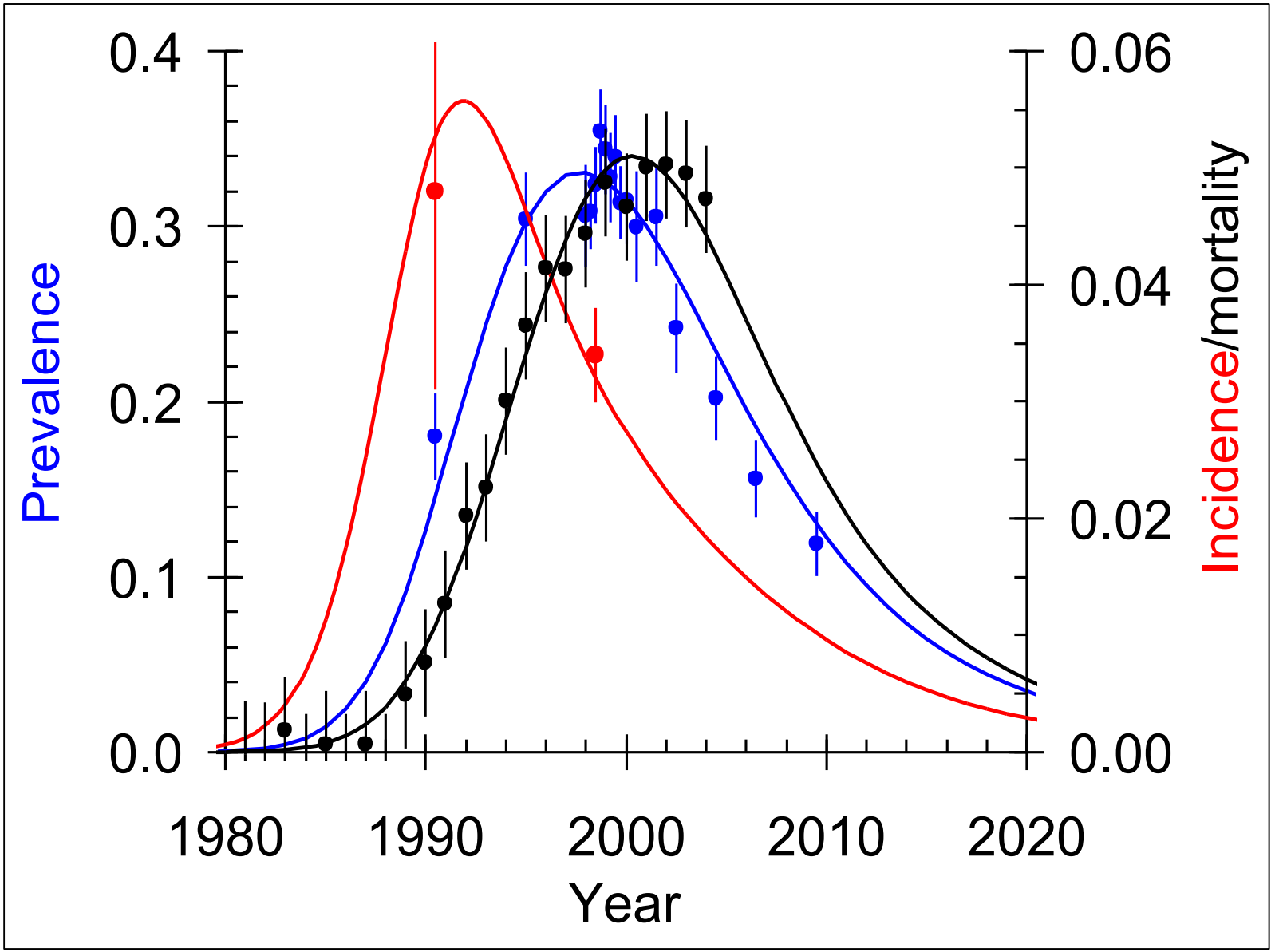
$\tilde{N}$ = population

$\tilde{\lambda}$ = $\hat{\lambda}C(t)$

$\overline{\delta I}$ = mortality



Including control


0.4
0.3
0.2
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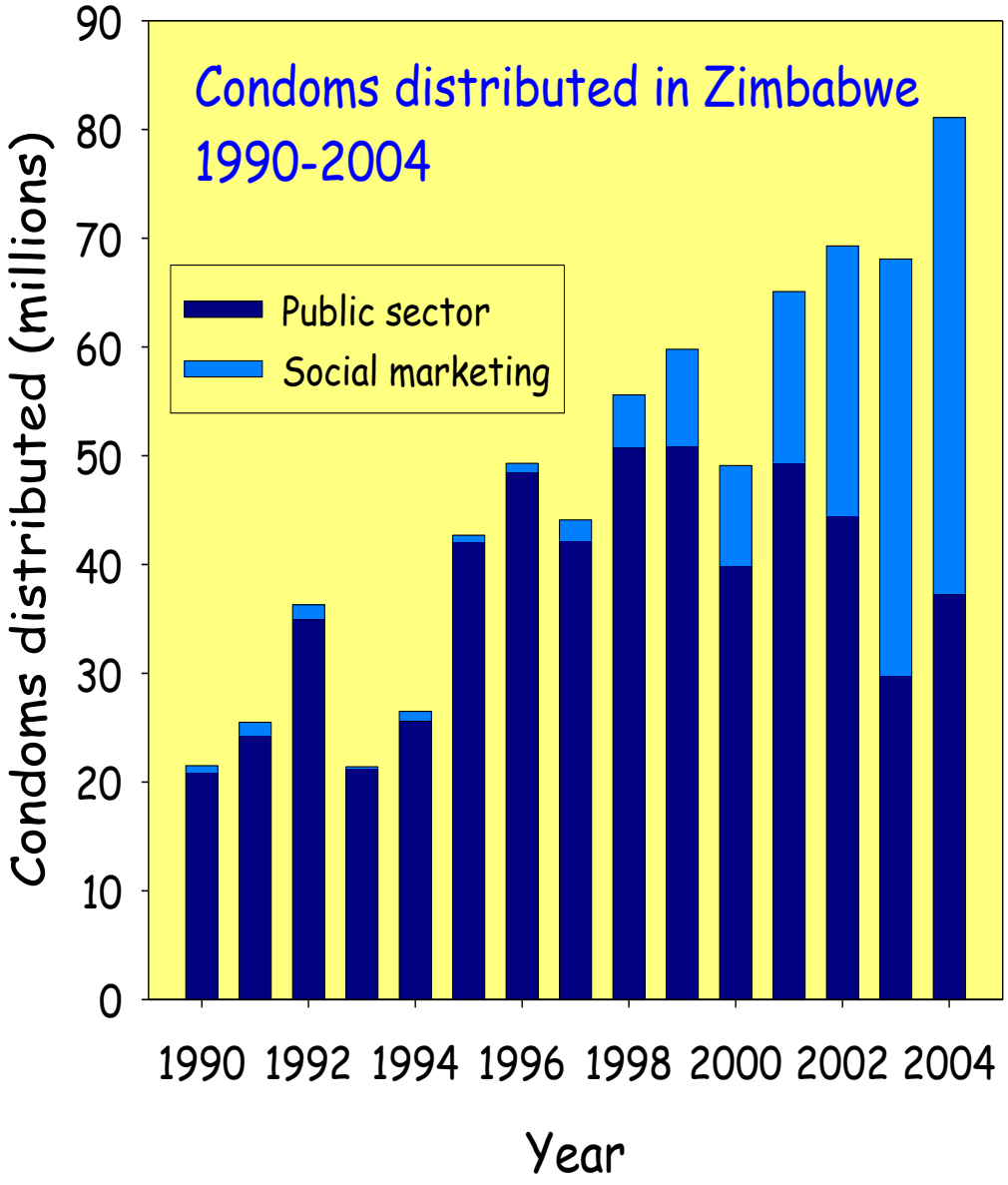

The number of condoms distributed in Zimbabwe has risen steadily since 1994 – as has the proportion purchased rather than donated.

N
© 2007 Europa Technologies
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Pointer 18°00'08.56" S 30°57'40.88" E elev 4650 ft
Streaming 100%
Eye alt 9662 ft

N
© 2007 Europa Technologies
Image © 2007 DigitalGlobe
©2006 Google™
Pointer 17°57'22.99" S 30°58'40.22" E elev 4615 ft
Streaming 100%
Eye alt 9357 ft

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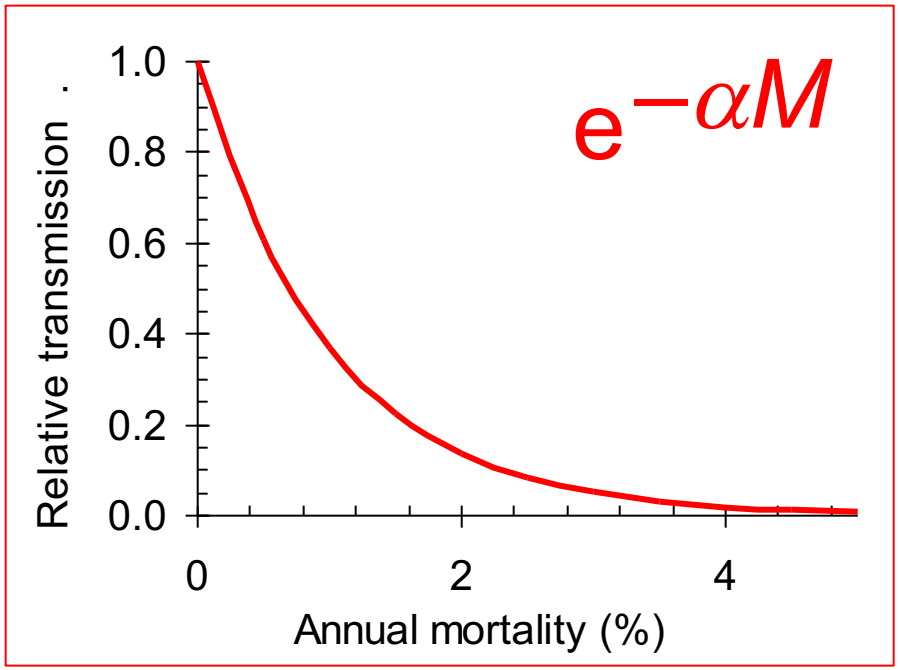
β = birth rate

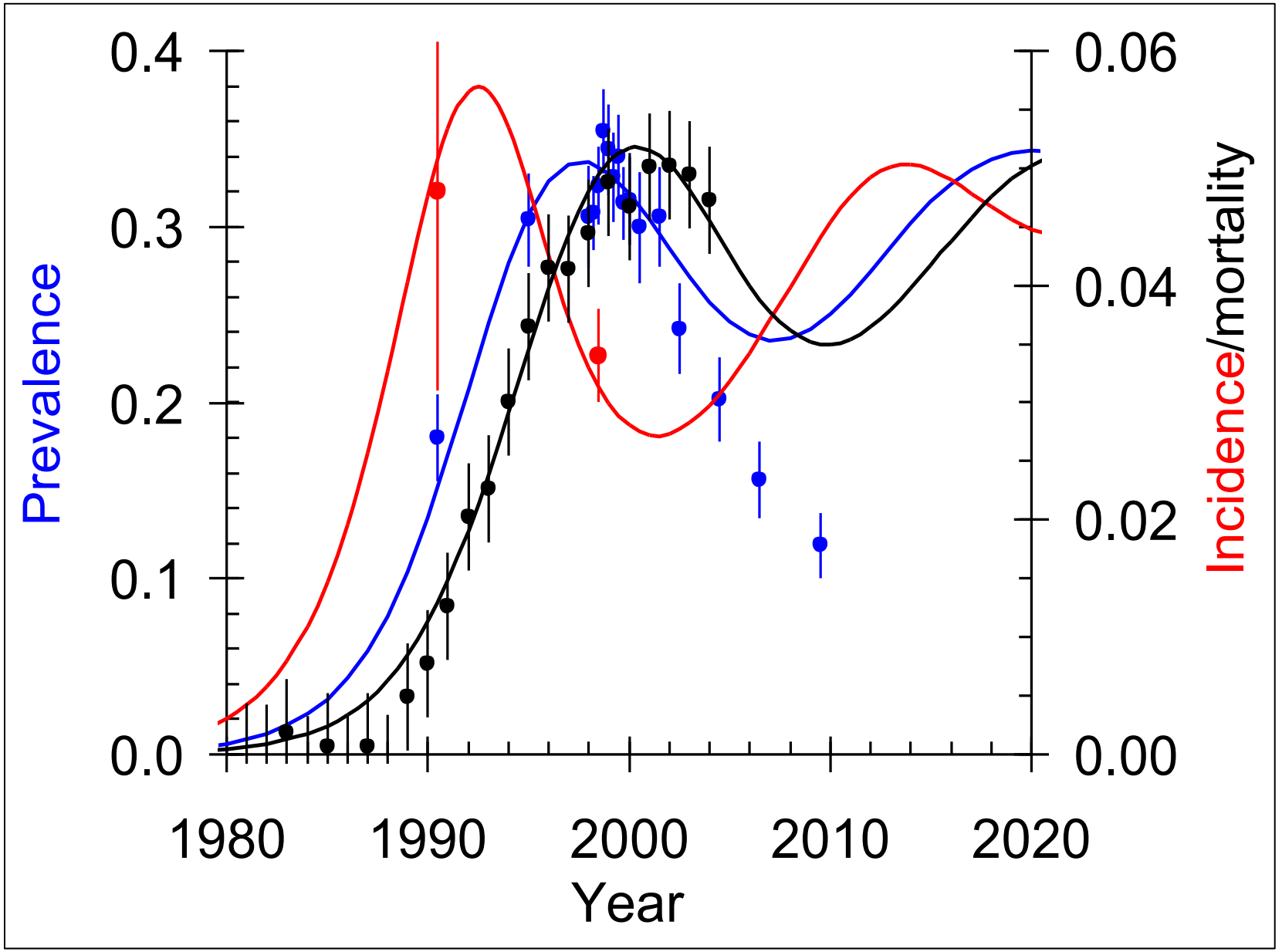
$\tilde{N}$ = population

λ^* = $\hat{\lambda} e^{-\alpha M}$

$\overline{\delta I}$ = mortality



Mortality leads to behaviour change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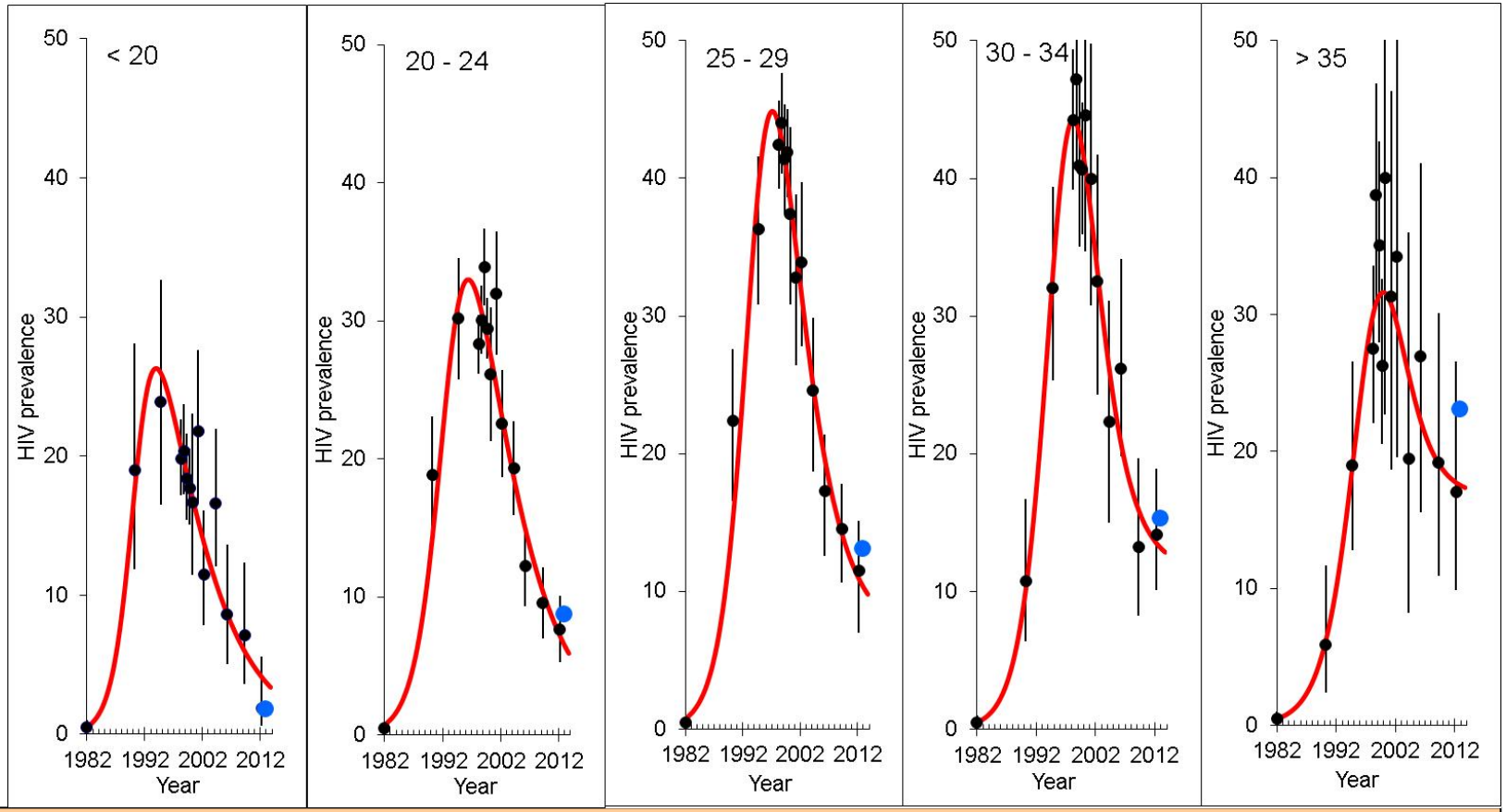

- When we plot HIV prevalence vs date for women of different ages we see some interesting patterns.
- What can we tell from the changes in prevalence among teenage mothers?