



# HIV in Harare: tutorial summary and discussion

Juliet Pulliam

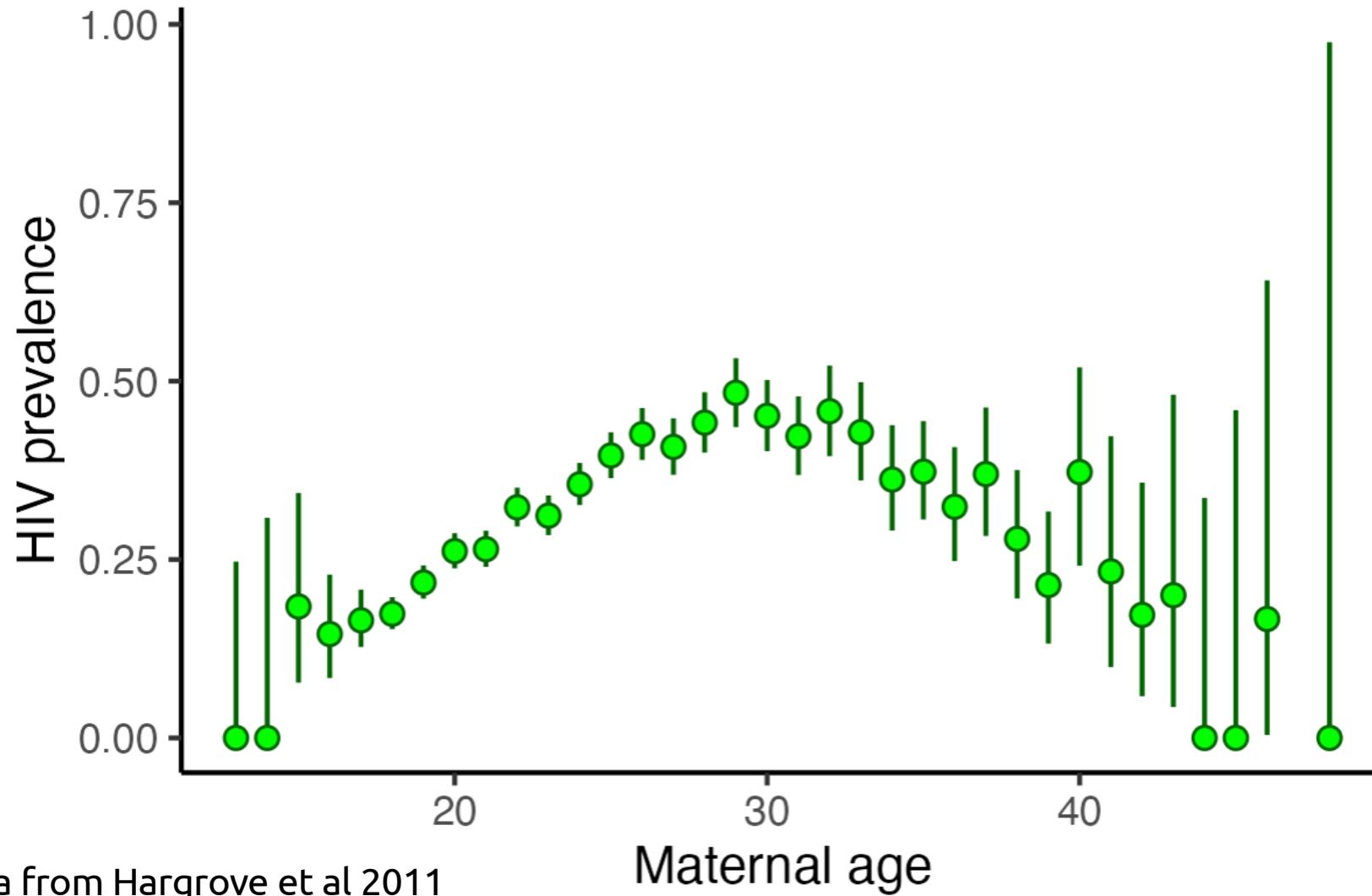
Based on work by John Hargrove & Brian Williams

MMED 2023



the ZVITAMBO study –  
carried out between  
1997 and 2000

# ZVITAMBO: Age vs prevalence



*Table II: HIV seroconversion incidence distributed by age among women negative at enrolment.*

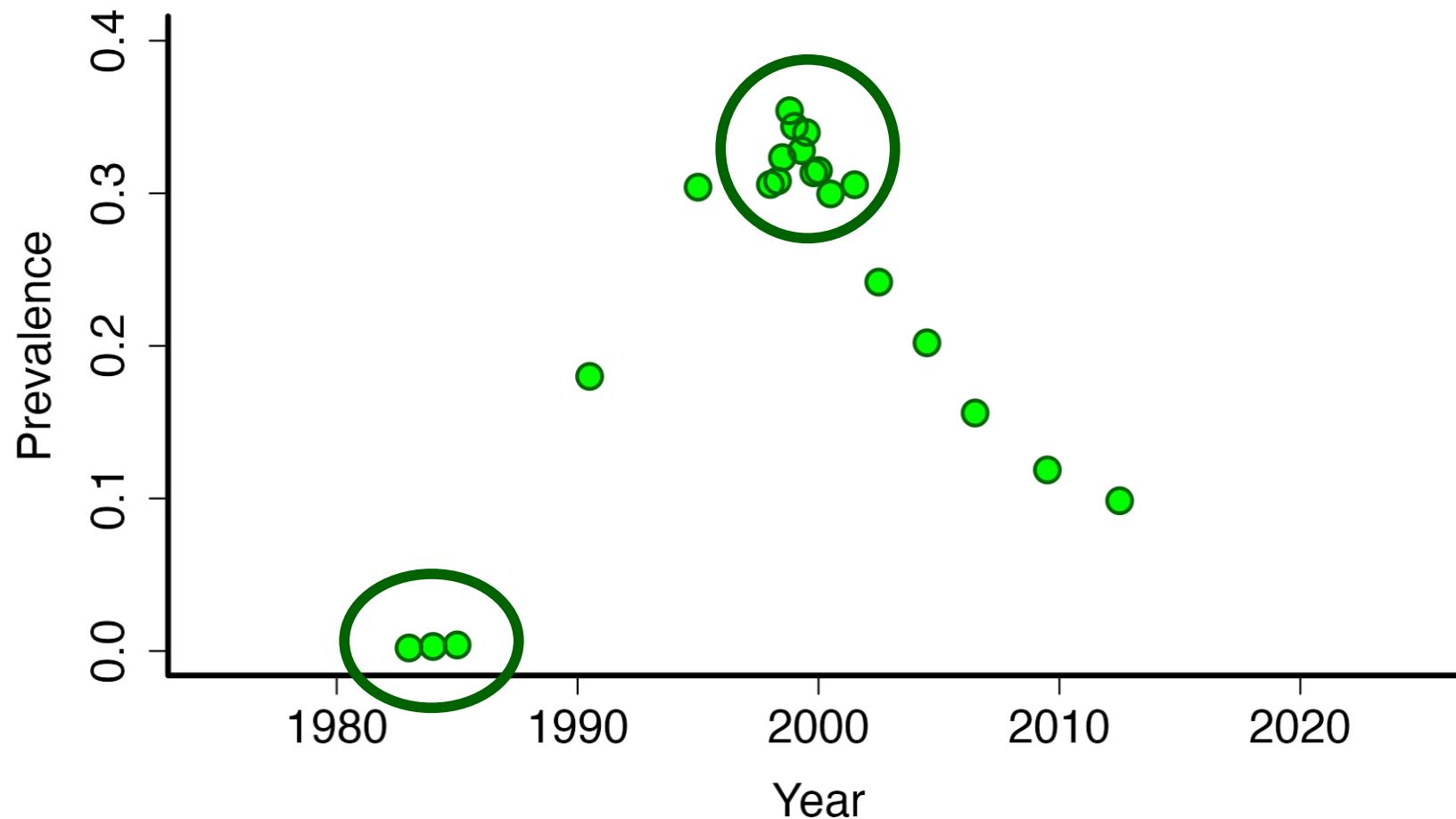
Age Group (Years)	Seroconversion (n)	HIV incidence per 100 person years
	N	%
Overall	66	100
≤17	5	7.6
18-19	7	10.6
20-21	10	15.2
22-23	8	12.1
24-25	10	15.2
26-27	5	7.6
28-29	6	9.1
30-34	5	7.6
35-39	1	1.5
≥40	1	1.5

Mbivizo et al 2001

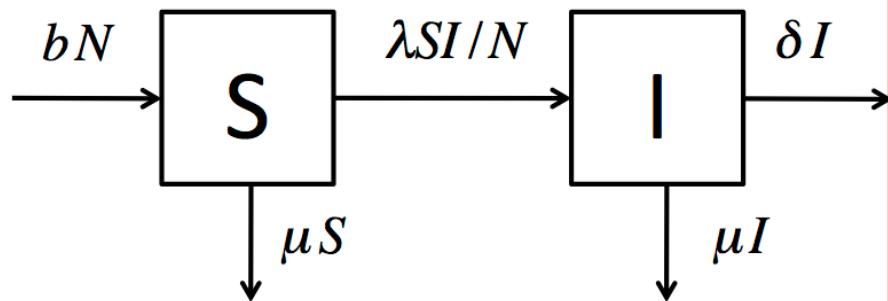
Variable	Percentage	Sero- conversions	PY	Incidence/ 100PY (95% CI)
Total	100	269	7763	3.47 (3.07–3.91)
Age (years)				
< 20	20.6	70	1841	3.80 (3.00–4.81)
20 < 25	41.0	117	3210	3.64 (3.04–4.37)
25 < 30	23.1	53	1550	3.42 (2.61–4.47)
30 < 35	9.6	21	670	3.13 (2.04–4.81)
≥ 35 (collapse?)	5.7	8	475	1.68 (0.8–3.36)

Humphries et al 2006

# HIV prevalence in Harare



## Model 1



$b$  = birth rate

$N = S + I$

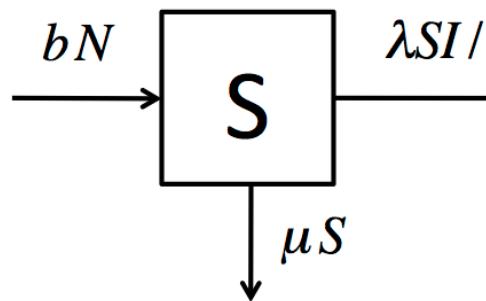
$\lambda$  = rate at which new infections occur

$\delta$  = disease induced mortality rate

$\mu$  = background mortality rate

The basic model

## Model 1



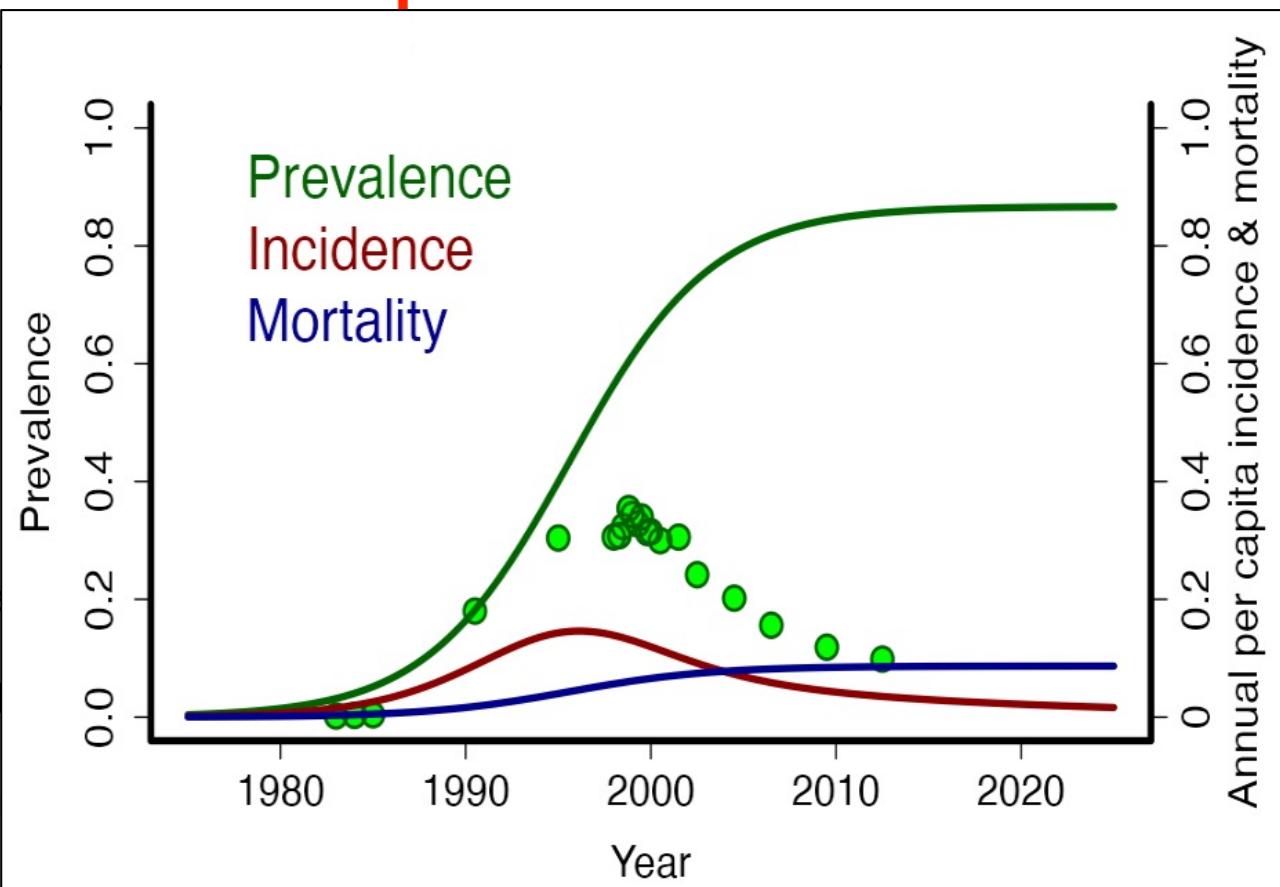
$b$  = birth rate

$N = S + I$

$\lambda$  = rate at which new infections occur

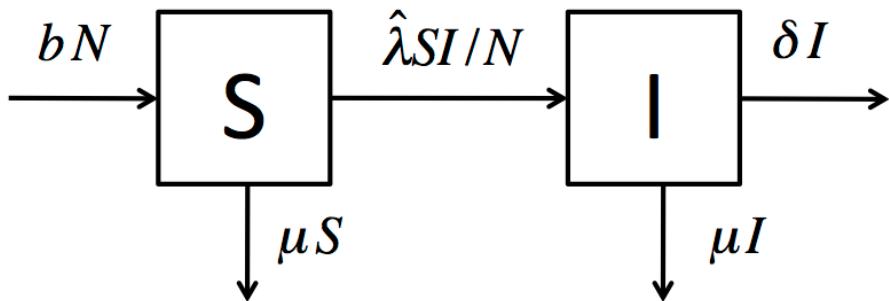
$\delta$  = disease induced mortality

$\mu$  = background mortality



The basic model

## Model 2



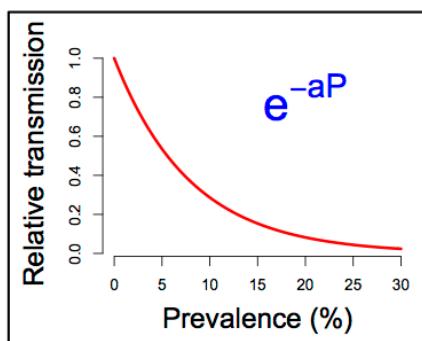
$b$  = birth rate

$N = S + I$

$\hat{\lambda} = \lambda e^{-aP}$

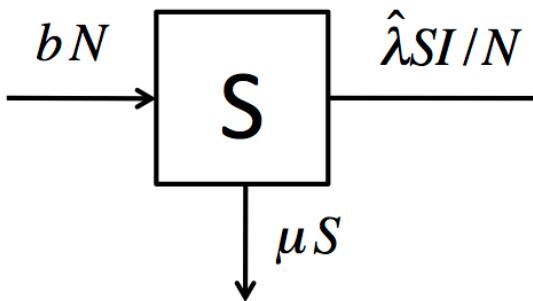
$\delta$  = disease induced mortality rate

$\mu$  = background mortality rate



Heterogeneity in sexual behaviour

Model 2



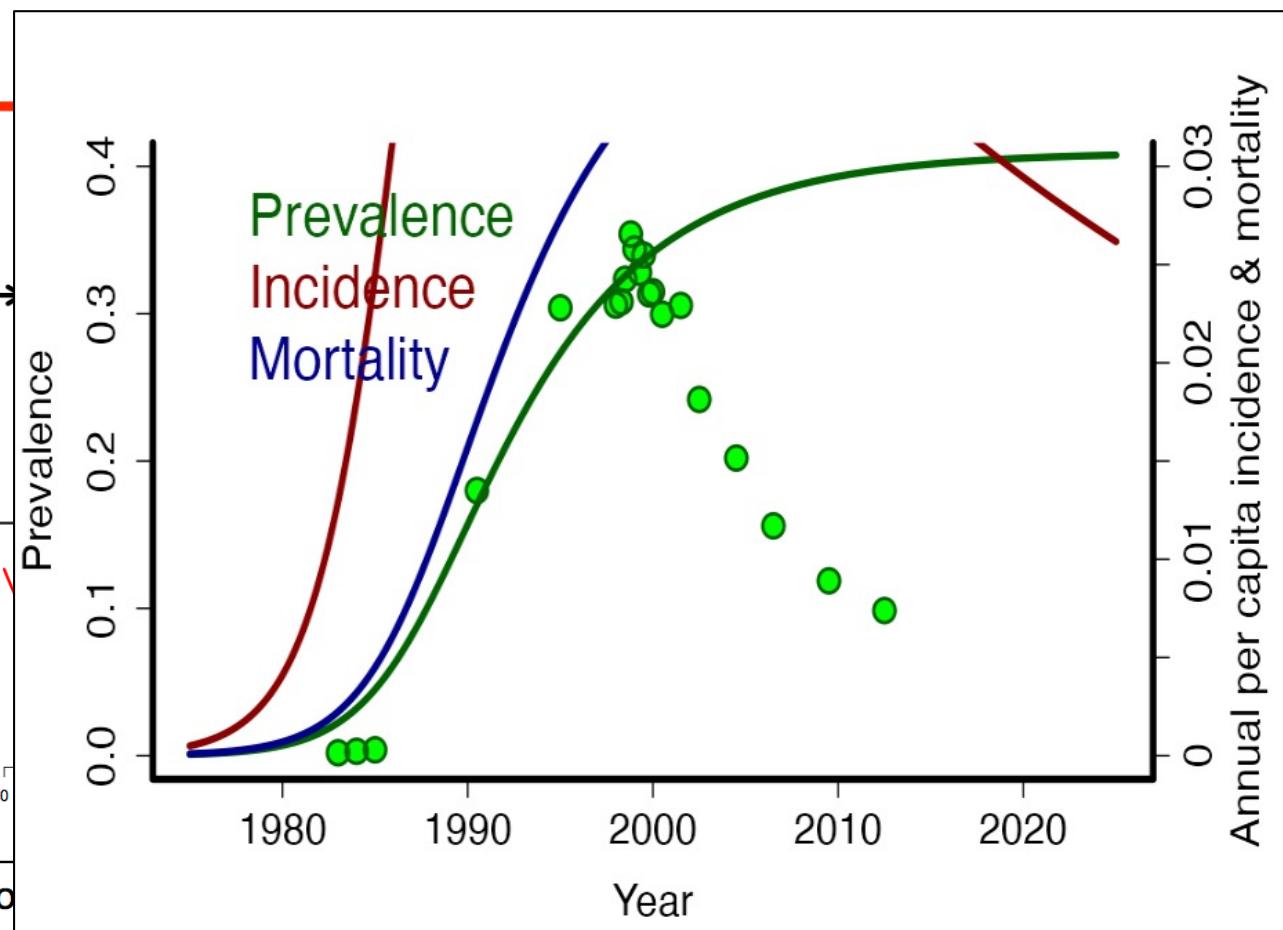
$b$  = birth rate

$$N = S + I$$

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

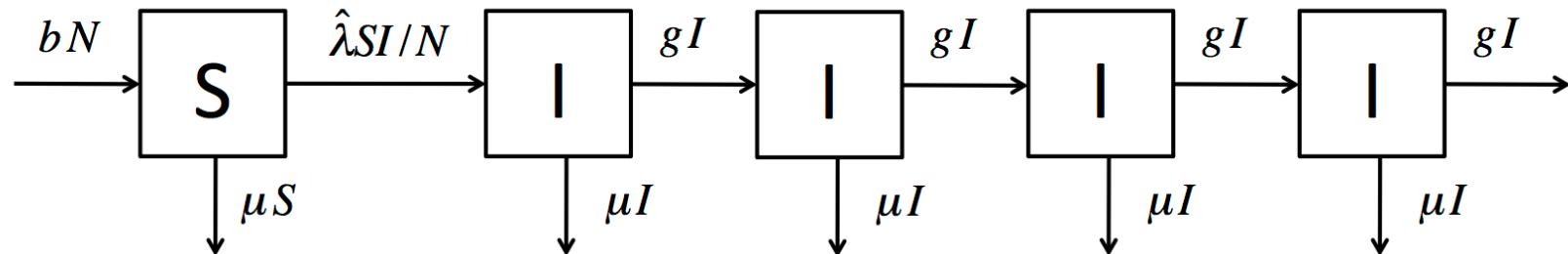
$\delta$  = disease induced mortality

$\mu$  = background mortality rate



Heterogeneity in sexual behaviour

## Model 3



$b$  = birth rate

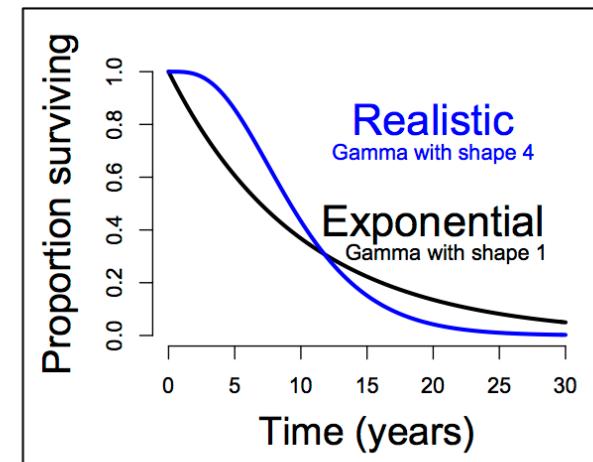
$$N = S + I$$

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

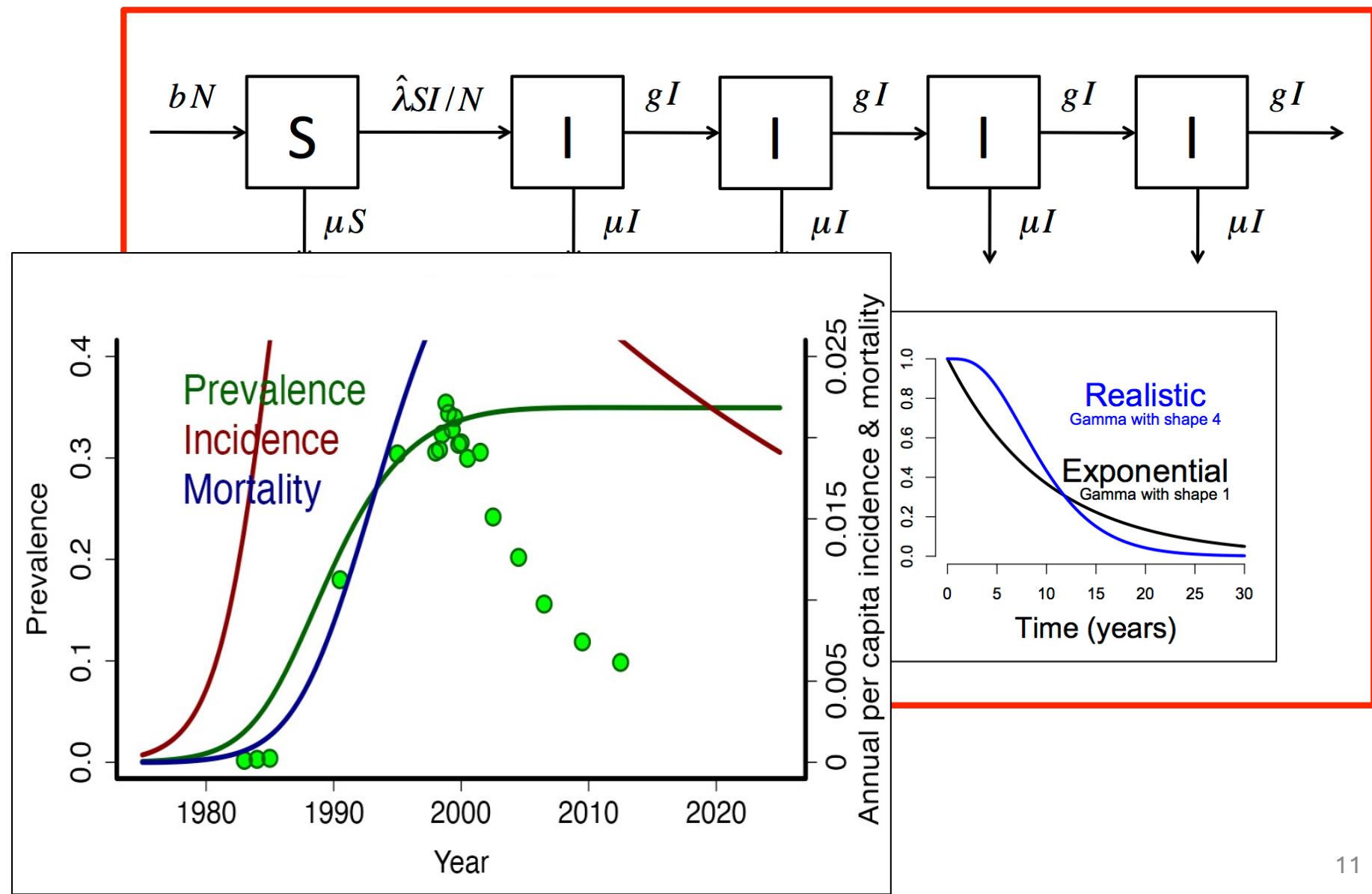
$$\delta = g/4$$

$\mu$  = background mortality rate

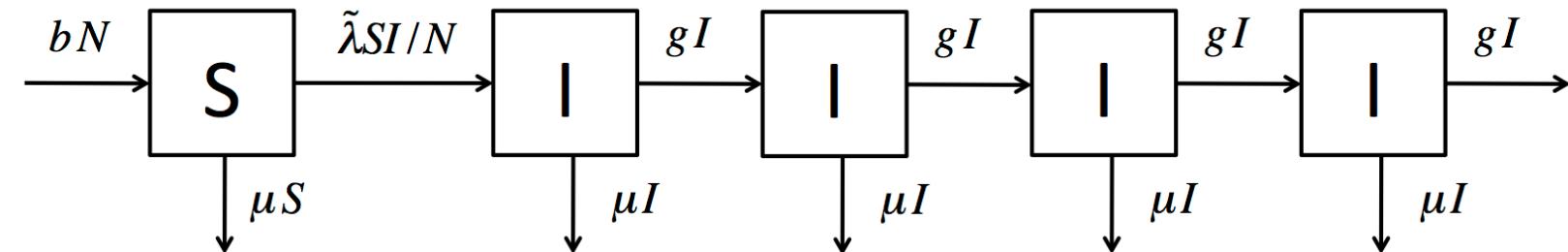
Realistic survival times



## Model 3



## Model 4



$b$  = birth rate

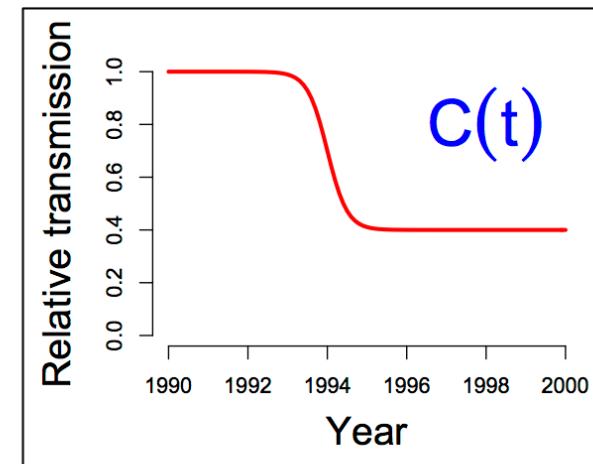
$N = S + I$

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

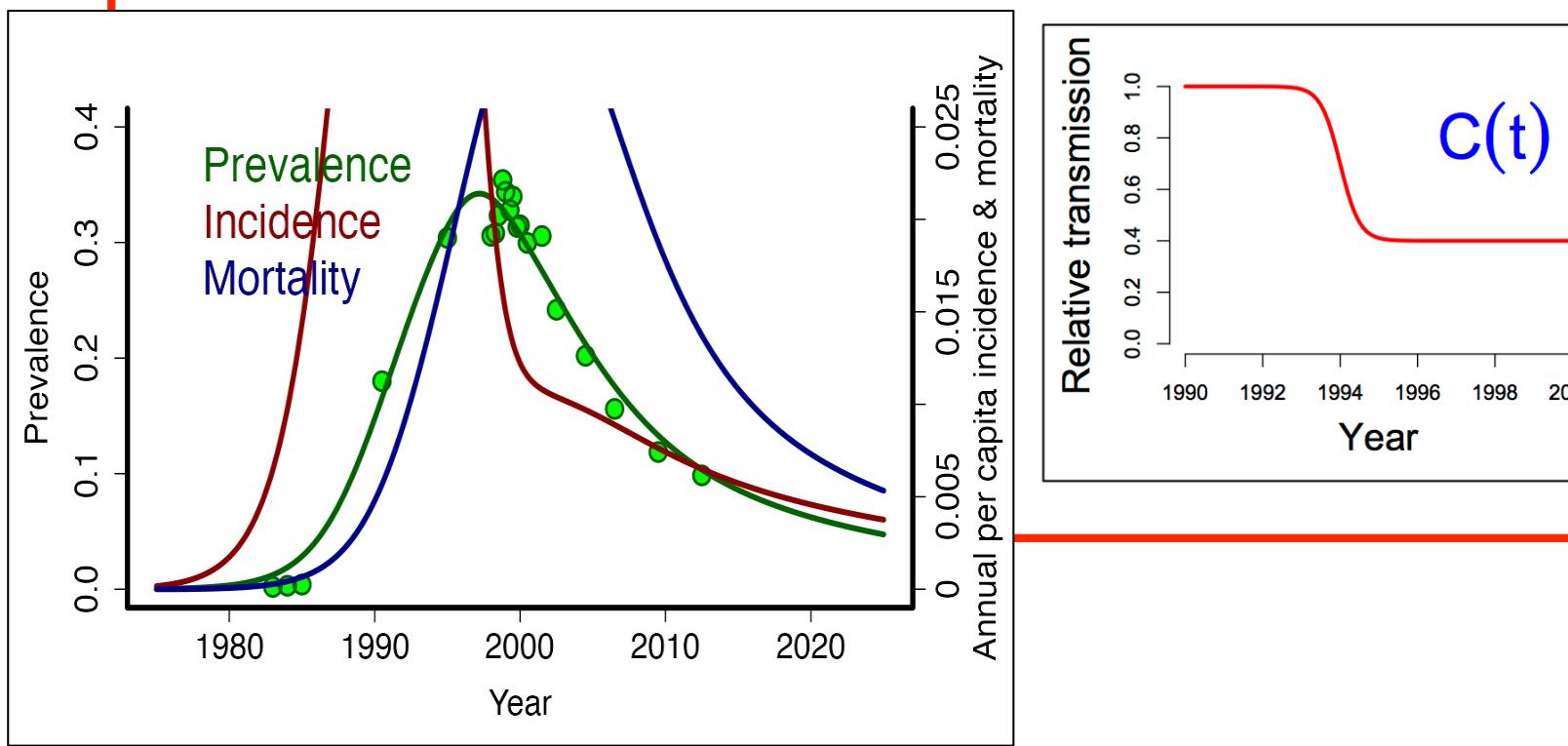
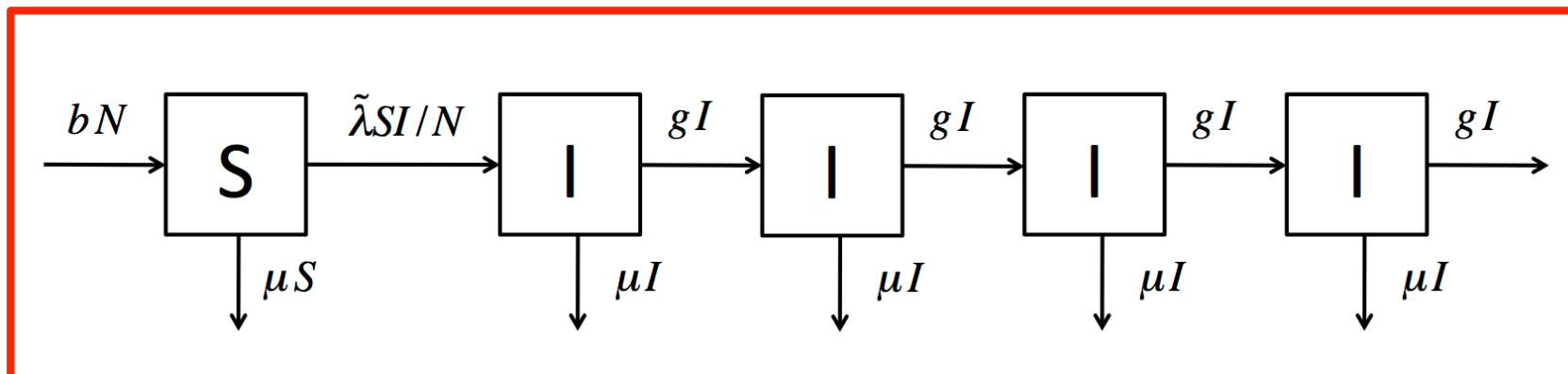
$\delta = g/4$

$\mu$  = background mortality rate

Including control



## Model 4



## Model 4

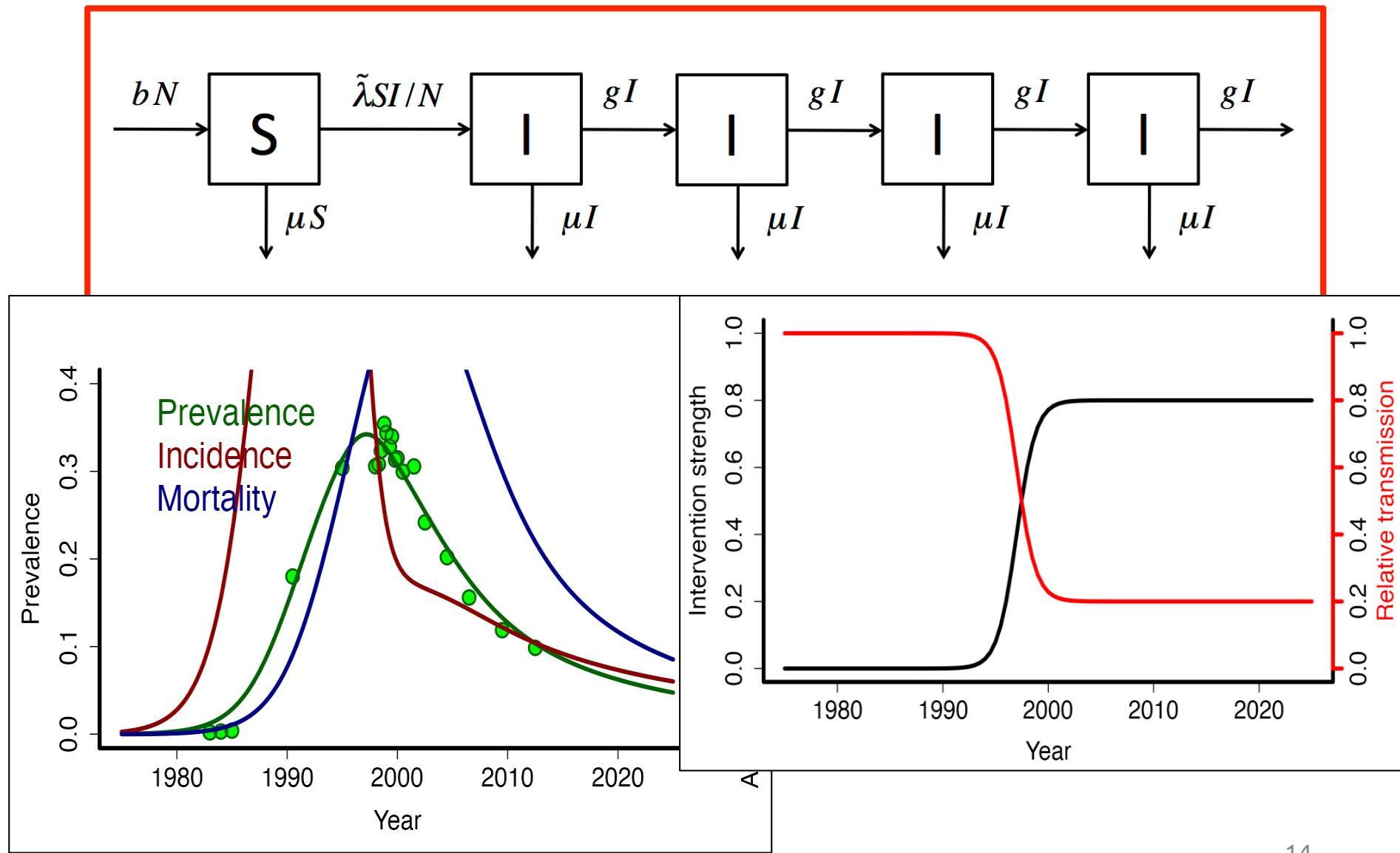




Photo by John Hargrove, Harare

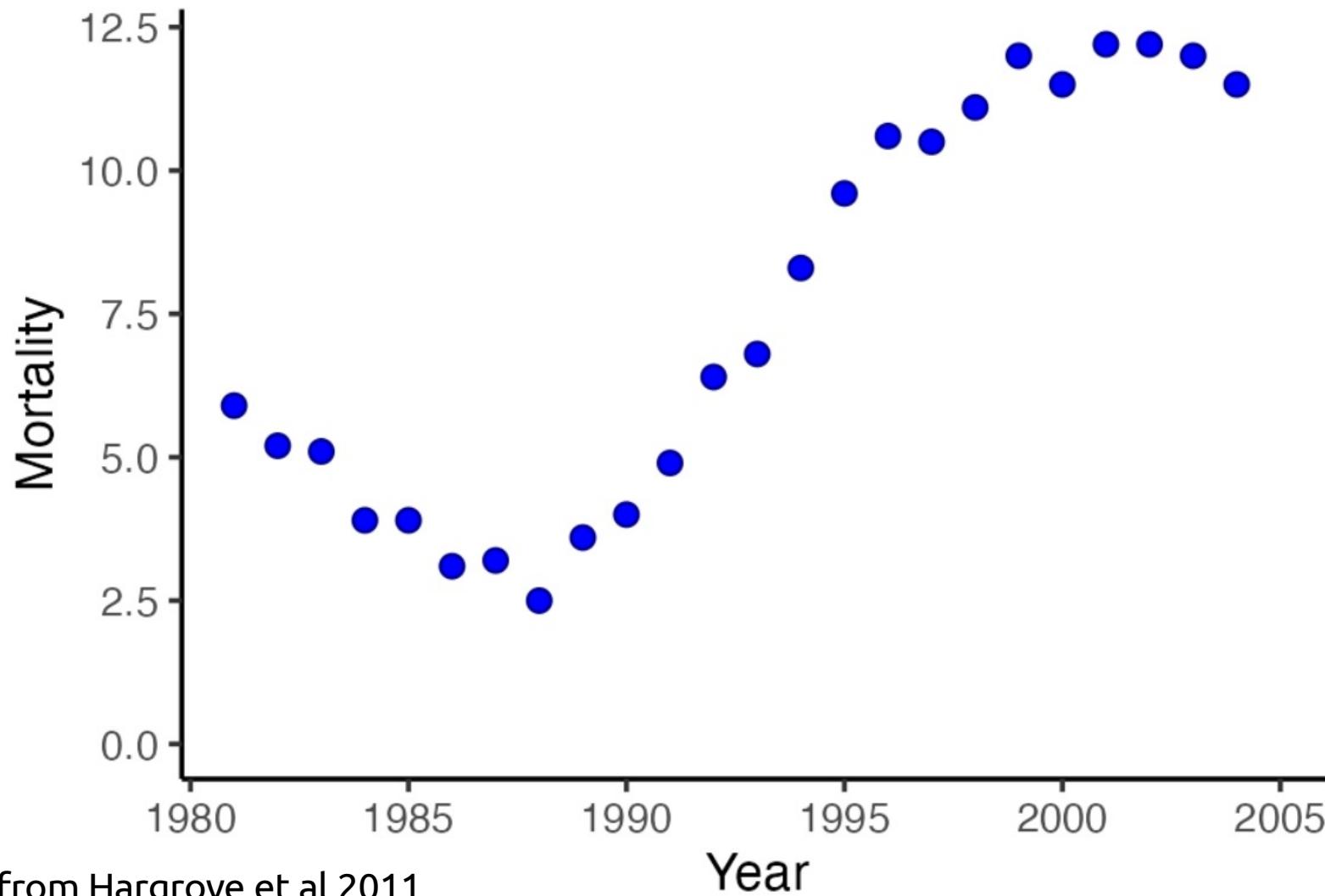


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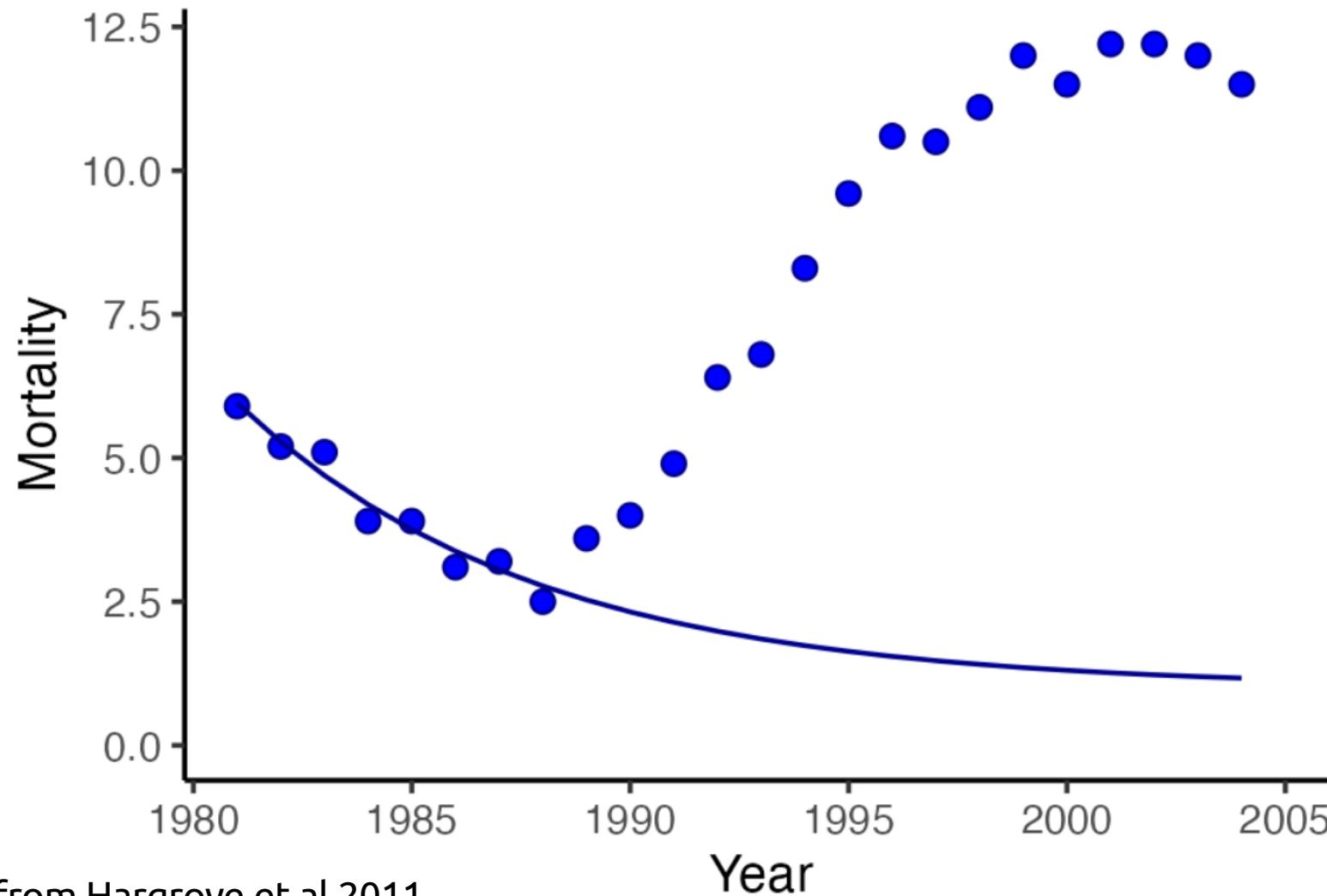
# Mortality trend in Zimbabwe



Data from Hargrove et al 2011

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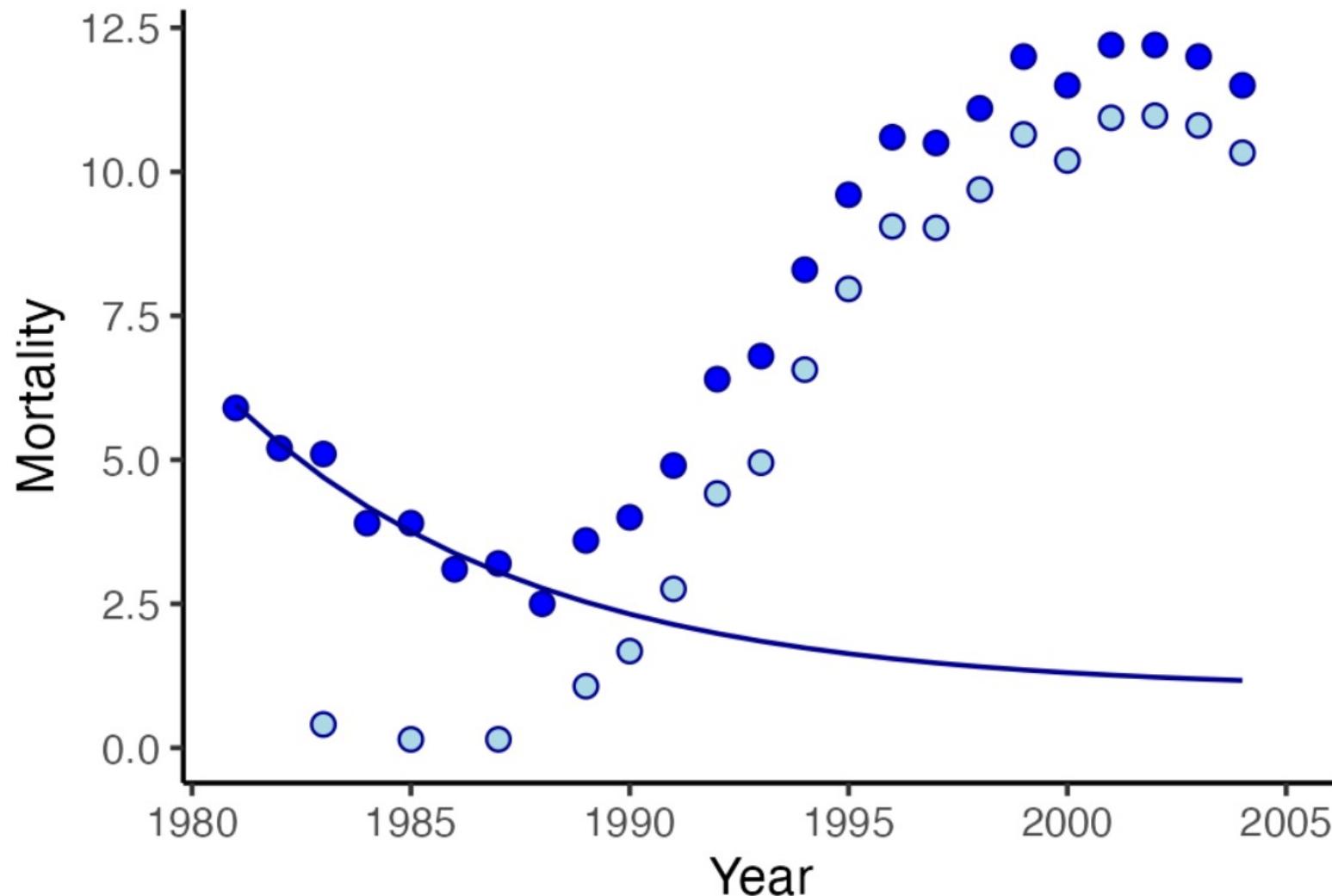
# Mortality trend in Zimbabwe



Data from Hargrove et al 2011

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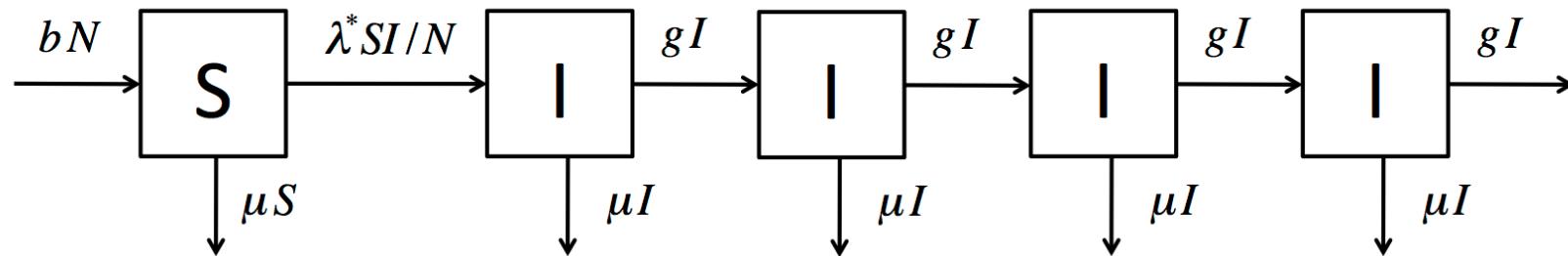
# Mortality trend in Zimbabwe



Data from Hargrove et al 2011

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## Model 5



$b$  = birth rate

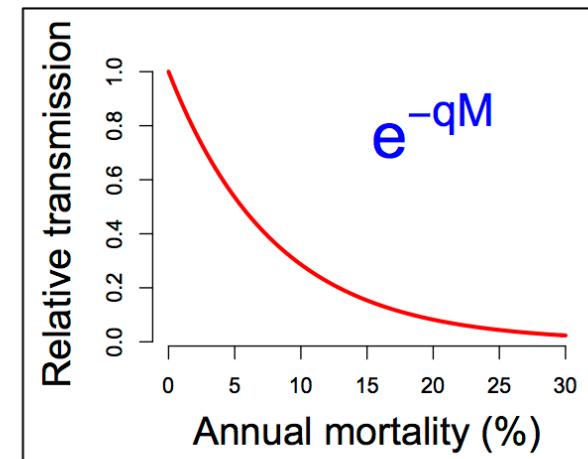
$$N = S + I$$

$$\lambda^* = \hat{\lambda} e^{-qM}$$

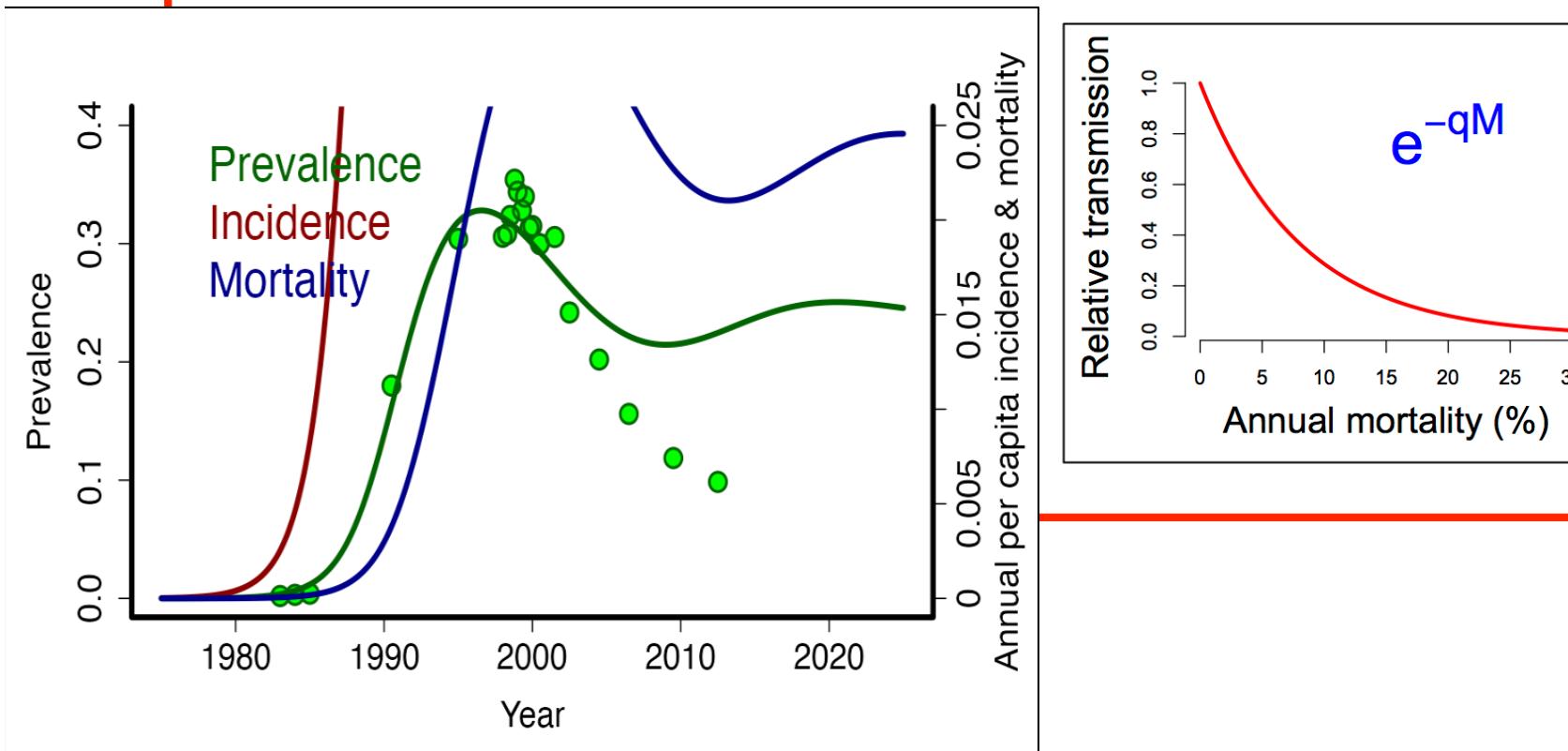
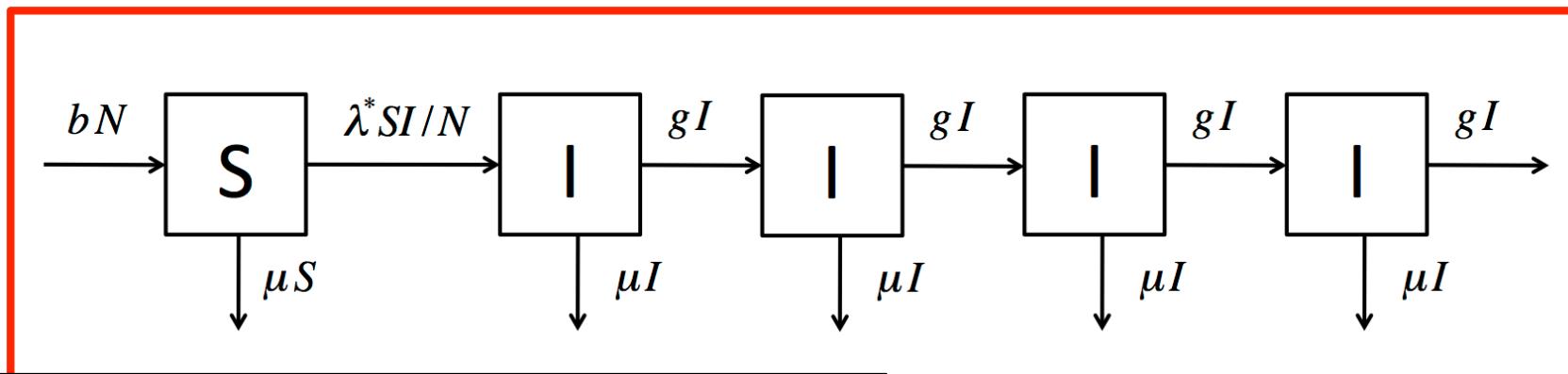
$$\delta = g/4$$

$\mu$  = background mortality rate

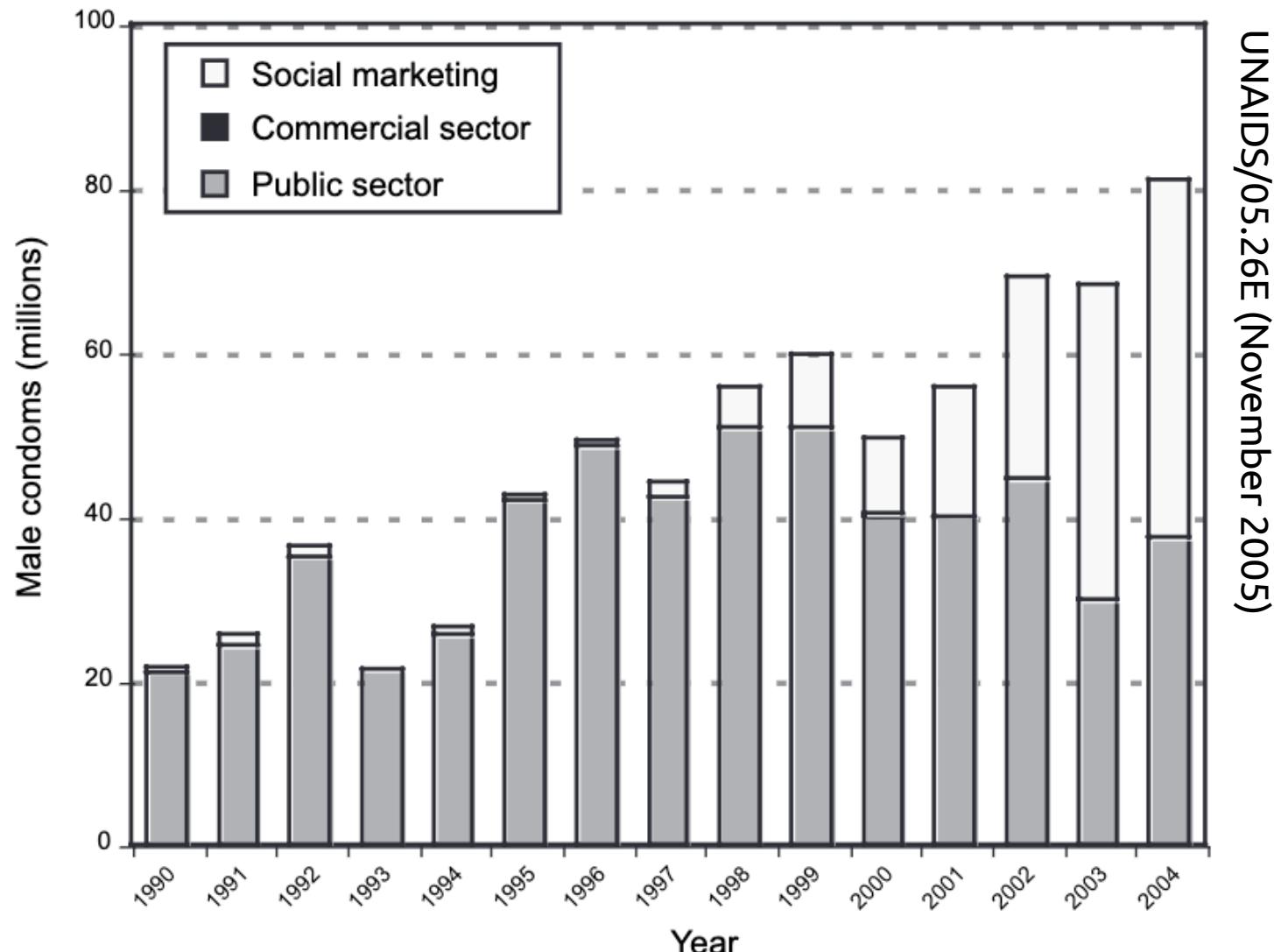
Mortality leads to behaviour change



## Model 5



## Male condom distribution, Zimbabwe, 1990-2004



UNAIDS/05.26E (November 2005)



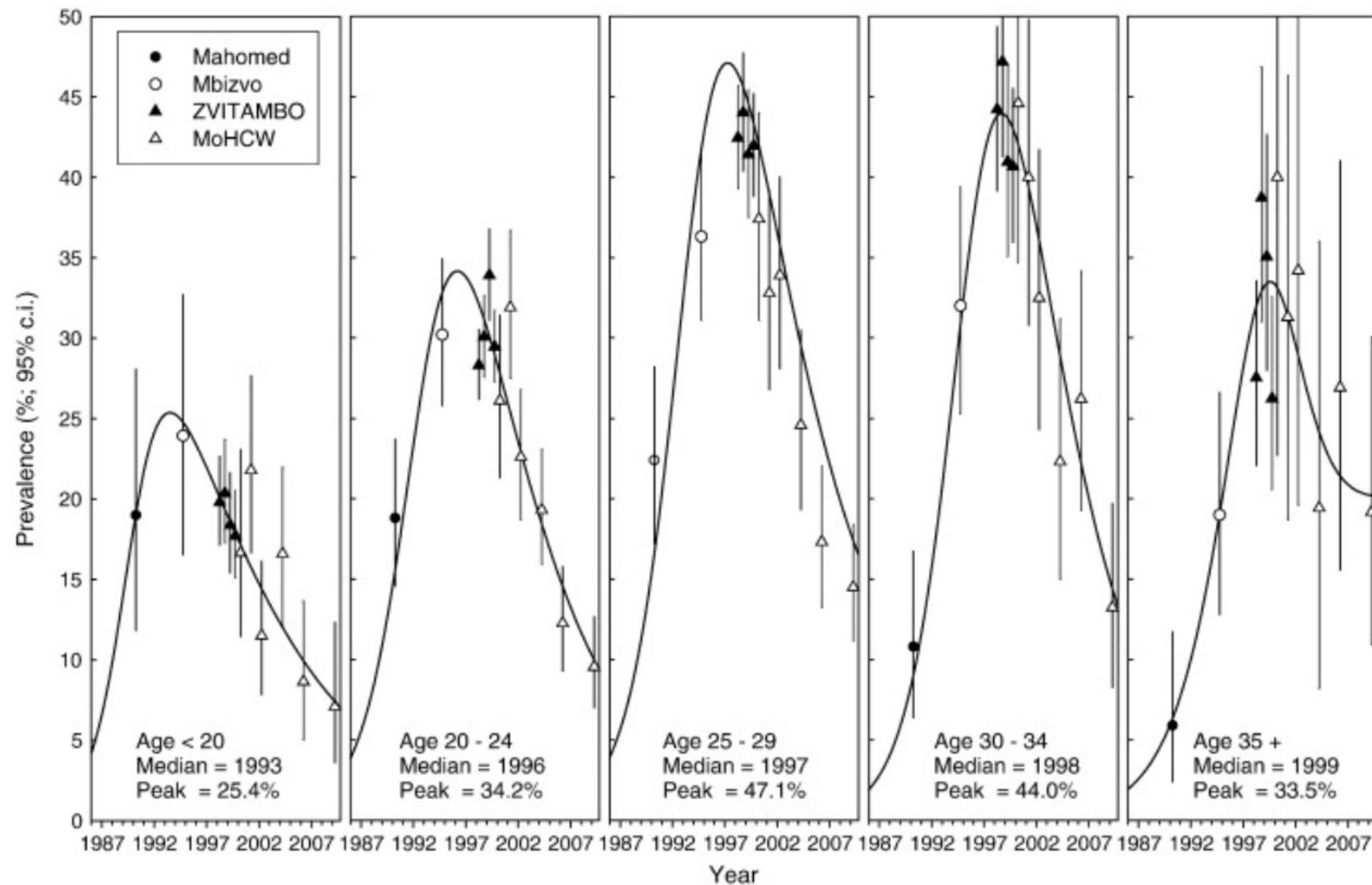
Epidemics  
Volume 3, Issue 2, June 2011, Pages 88-94



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# Declining HIV prevalence and incidence in perinatal women in Harare, Zimbabwe ☆

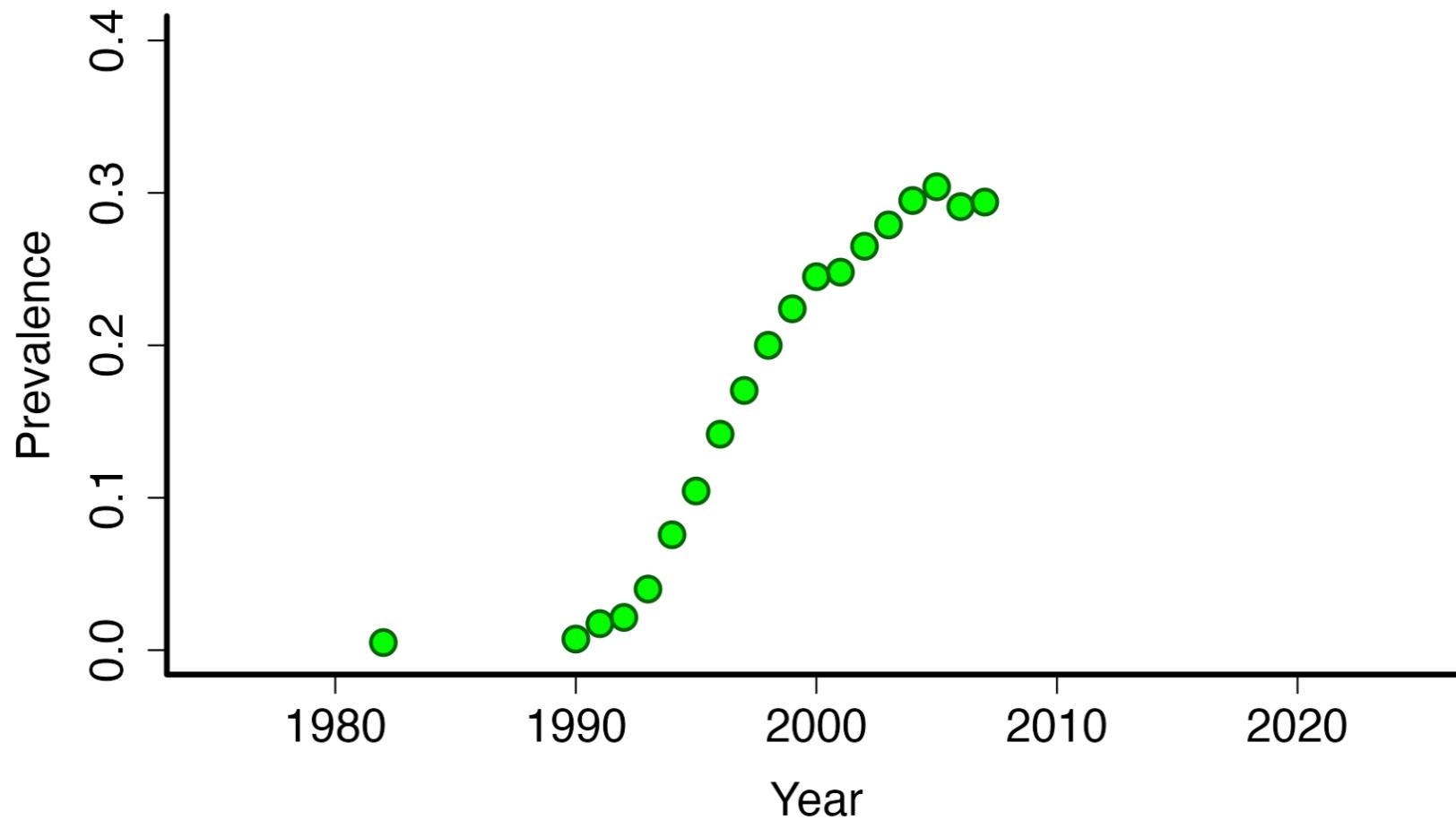
John W. Hargrove<sup>a c 1</sup>, Jean H. Humphrey<sup>a e</sup>  , Agnes Mahomva<sup>b 2</sup>, Brian G. Williams<sup>c</sup>,  
Henry Chidawanyika<sup>a</sup>, Kuda Mutasa<sup>a</sup>, Edmore Marinda<sup>a 3</sup>, Michael T. Mbizvo<sup>f</sup>,  
Kusum J. Nathoo<sup>d</sup>, Peter J. Iliff<sup>a d</sup>, Owen Mugurungi<sup>b</sup>, the ZVITAMBO Study Group



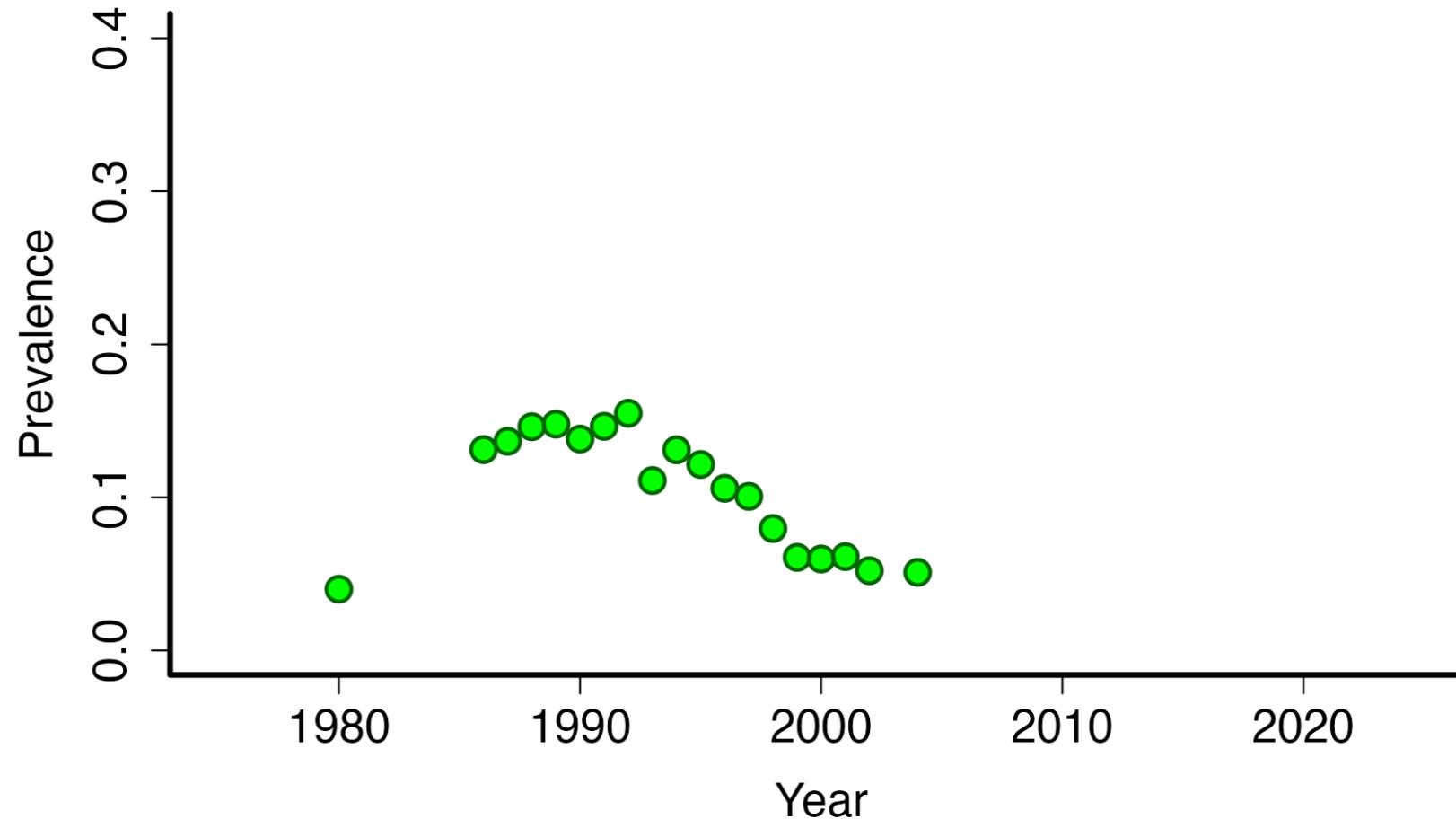
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Hargrove et al 2011

# HIV prevalence in South Africa



# HIV prevalence in Uganda





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### HIV in Harare: tutorial summary and discussion

Attribution:

John Hargrove and Brian Williams, with updates by Juliet Pulliam  
Clinic on Meaningful Modeling of Epidemiological Data

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