

# Neglected Tropical Diseases

*Infection, modelling and control*



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The University of Ottawa



# NTDs

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  - environmental contamination
  - poor standards of living
  - lack of hygiene.



# The diseases

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	Roundworm	604	3.2 billion
	Whipworm	576	3.2 billion

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Schistosomiasis		207	779 million
Elephantitis		120	1.3 billion
Trachoma		84	590 million
River blindness		37	90 million

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River blindness		37	90 million
Leishmaniasis		12	350 million
Chagas' Disease		8-9	25 million
Leprosy		0.4	N/A
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Guinea Worm Disease		0.01	N/A
Buruli ulcer		N/A	N/A.

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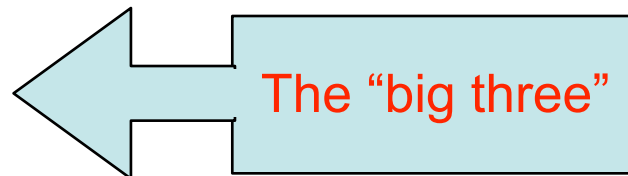
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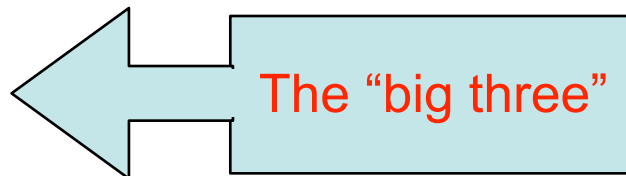
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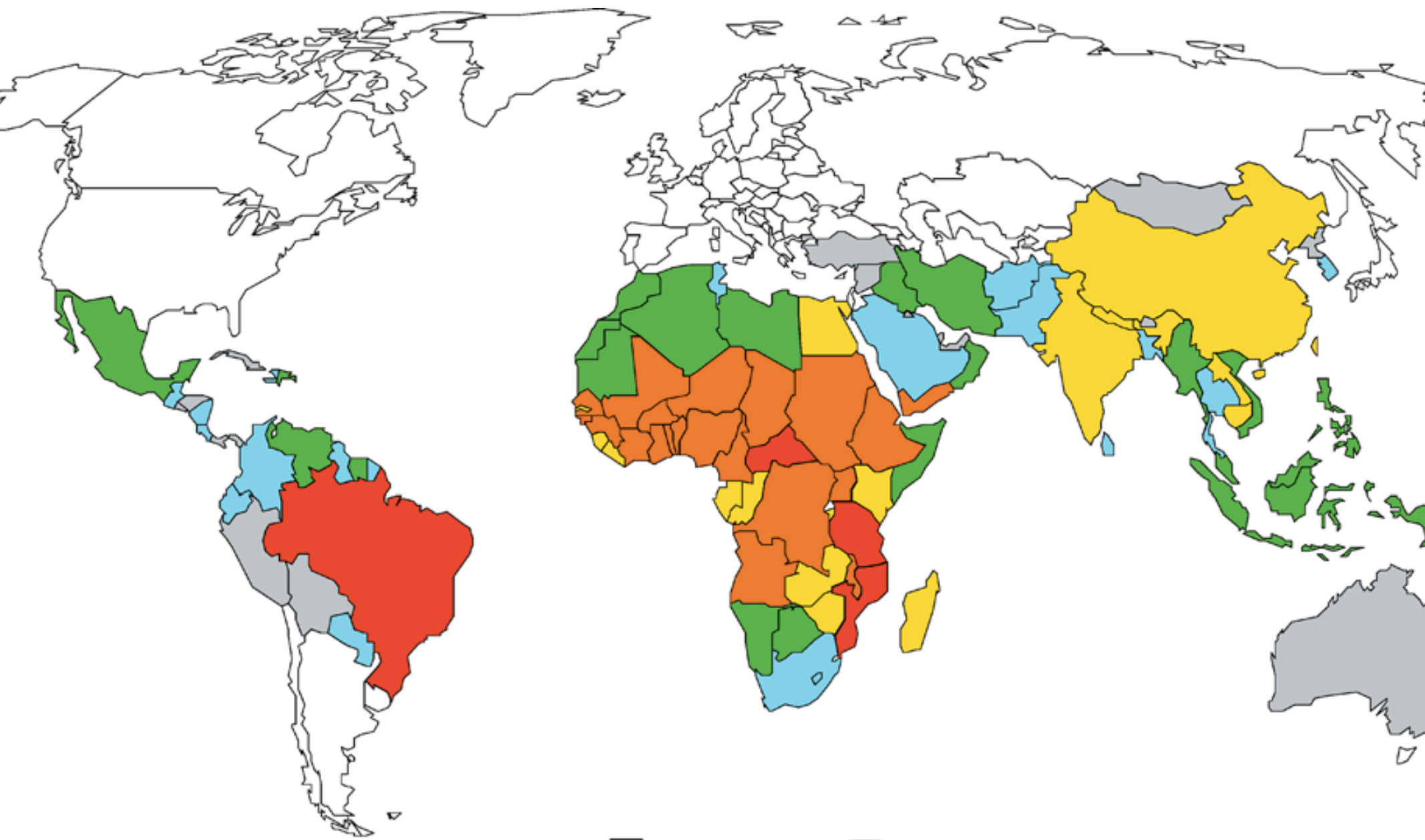


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- Large socioeconomic effect
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- Reduce economic productivity
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- High disease burden, low mortality (530,000 per year).

# Measuring the impact

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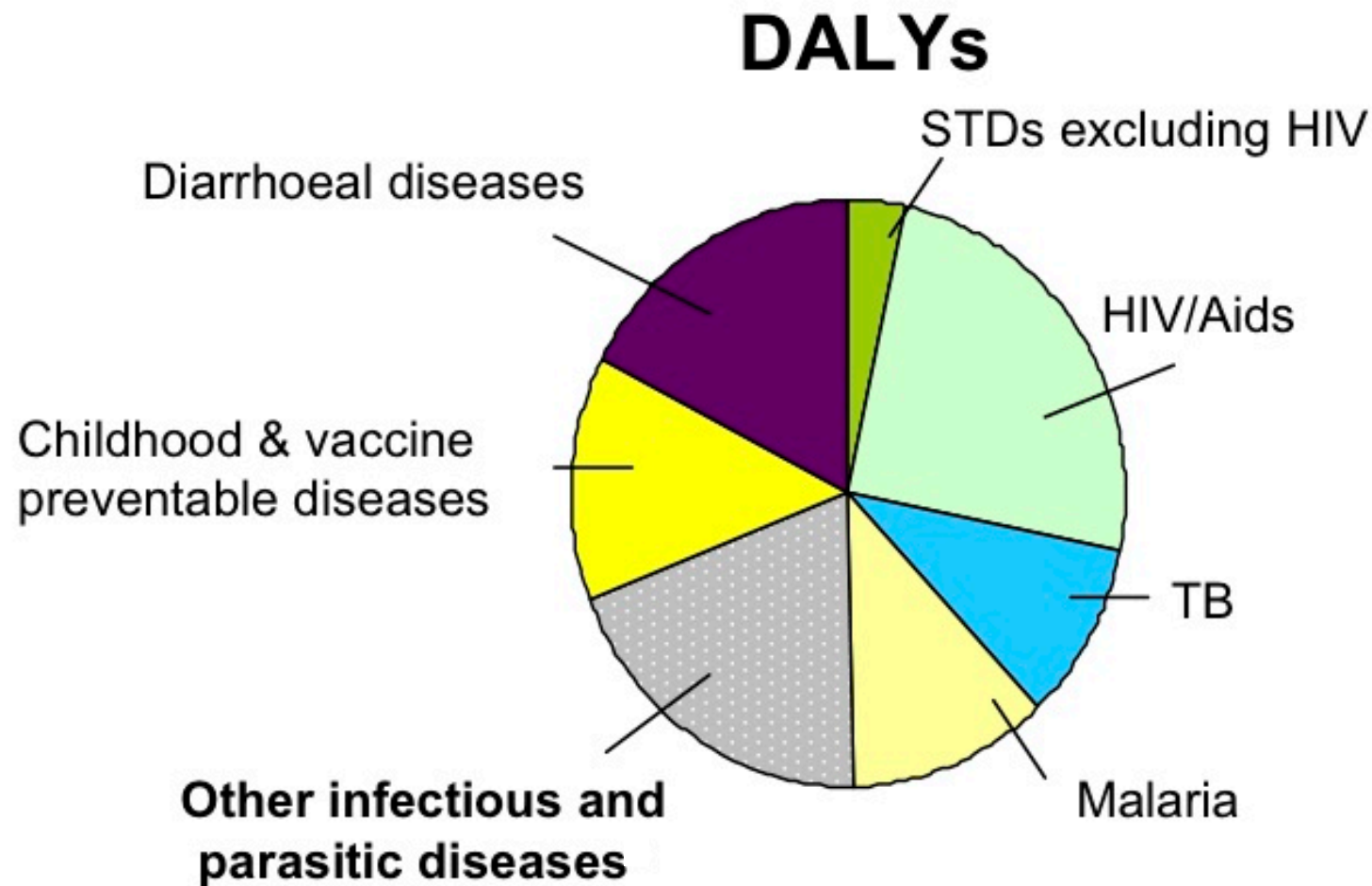
- DALYs (Disability-Adjusted Life Years)
  - measure the number years of life lost from premature death/disability
- These are likely underestimates, especially for NTDs.

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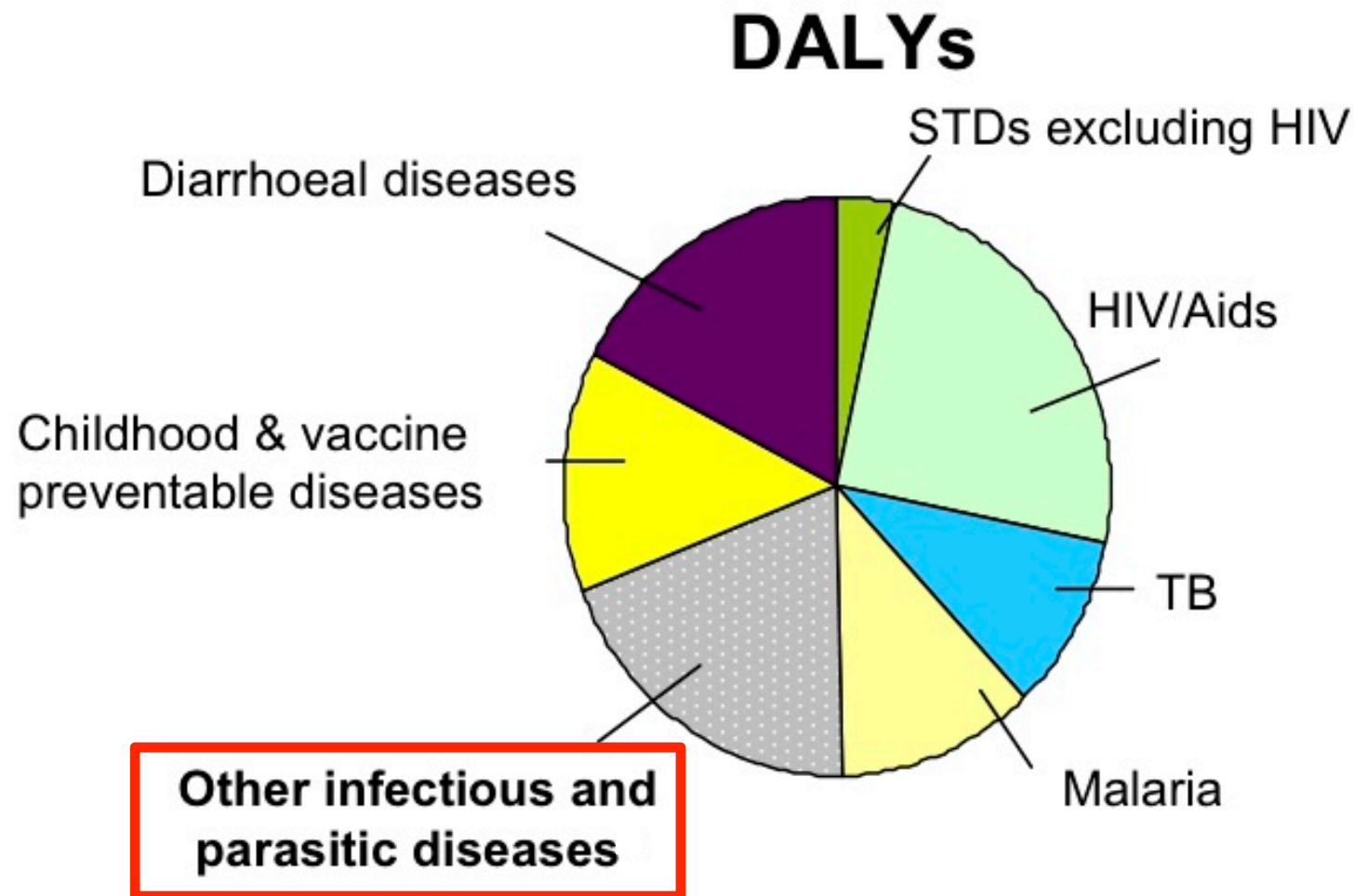
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# Proportion of DALYs

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# Categories

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# Soil-transmitted helminths

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Clinical manifestation/impairment	Anemia: impairs growth and development in children		
	Intestinal obstruction	Inflammation, dystentry	Iron deficiency, malnutrition
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Control	Mass dewormings, drugs.		

# Other helminths

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<b>Disease</b>	Elephantitis	River blindness	Guinea worm	Schistosomiasis
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<b>Disease</b>	Elephantitis	River blindness	Guinea worm	Schistosomiasis
<b>Target</b>	Lymphatic system, genitals	Subcutaneous tissue	Subcutaneous tissue, legs	Urinary tract, liver, intestines





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<b>Disease</b>	Elephantitis	River blindness	Guinea worm	Schistosomiasis
<b>Target</b>	Lymphatic system, genitals	Subcutaneous tissue	Subcutaneous tissue, legs	Urinary tract, liver, intestines
<b>Transmission</b>	Mosquitoes	Blackflies	Water fleas in drinking water	Larvae in freshwater





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Transmission	Mosquitoes	Blackflies	Water fleas in drinking water	Larvae in freshwater
Clinical manifestation/impairment	Filarial fever, swelling, disfigurement	Malnutrition, developmental/educational impairment		
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Treatment	Diethylcarbamazine, ivermectin, albendazole	Ivermectin	Extract worm on stick	Praziquantel
Control	Interrupt transmission cycle, yearly mass drug admin	Vector control, yearly mass drug admin	Safe water, health education	Molluscicide, yearly mass drug admin.

# Protozoans

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<b>Disease</b>	Leishmaniasis		Chagas' Disease	Sleeping sickness	
	<i>Visceral</i>	<i>Cutaneous</i>		<i>T.b.g.</i>	<i>T.b.r.</i>




# Protozoans

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Control	Case detection & management, vector control		Case detection & management, vector control	Case detection & management.	

# Bacterial

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<b>Disease</b>	Buruli ulcer	Leprosy	Trachoma
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# Bacterial

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<b>Disease</b>	Buruli ulcer	Leprosy	Trachoma
<b>Transmission</b>	Unknown	Unknown	Direct contact with discharge

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Disease	Buruli ulcer	Leprosy		Trachoma
Transmission	Unknown	Unknown		Direct contact with discharge
Clinical manifestation/impairment	Disfiguring skin infection, amputation	<i>Tuberculoid</i>	<i>Lepromatous</i>	Irreversible visual impairment, blindness
		Loss of sensation, skin lesions	Disfigurement, bone invasion	
				

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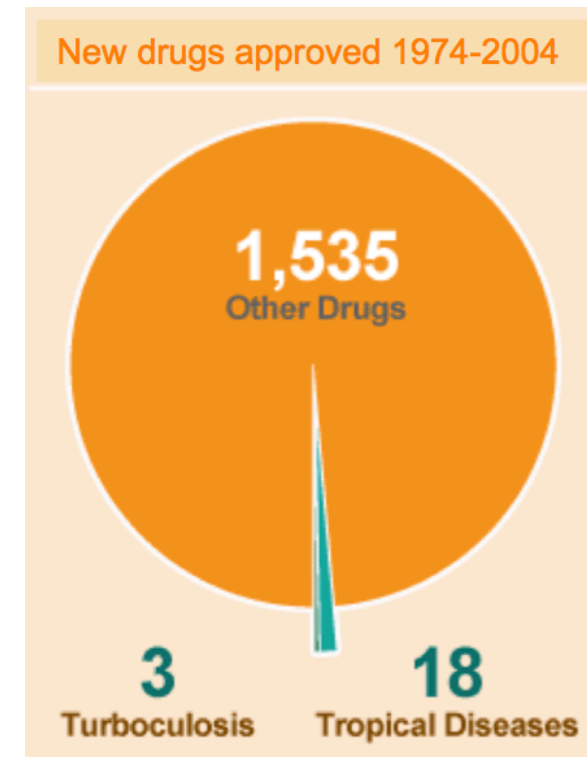
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Control	Amputation	Multidrug treatment		facial hygiene, surgery



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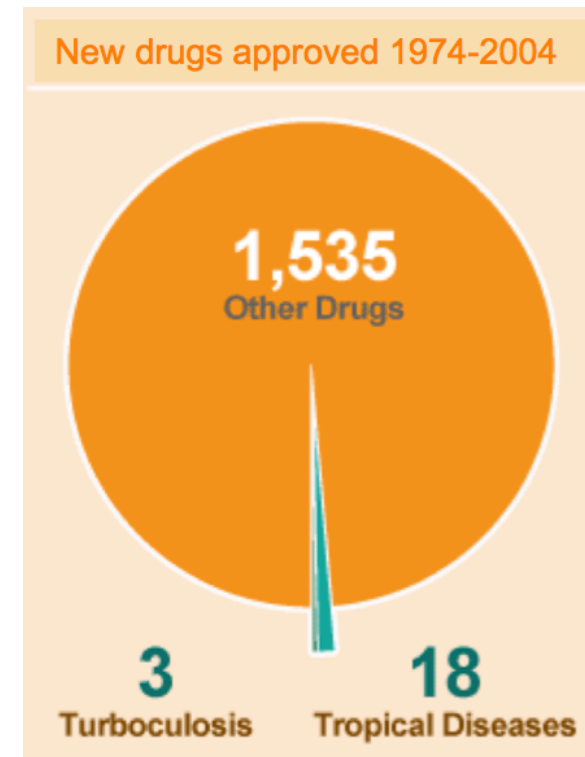
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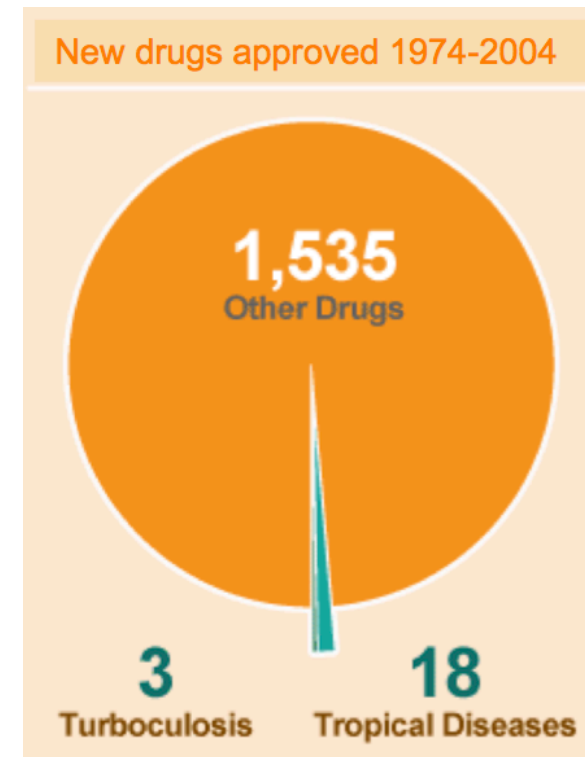
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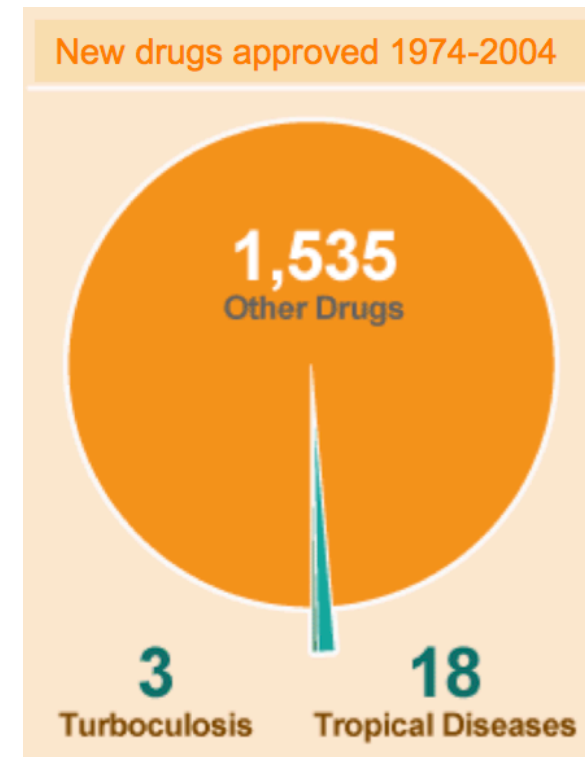
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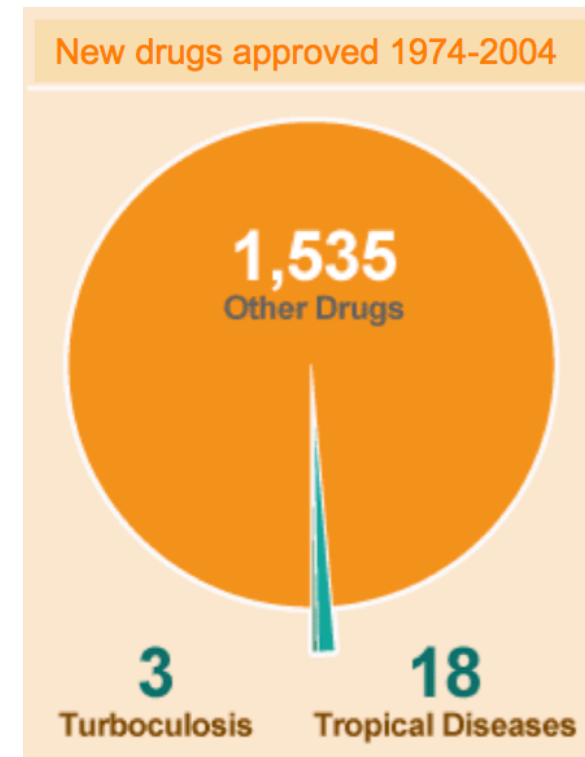
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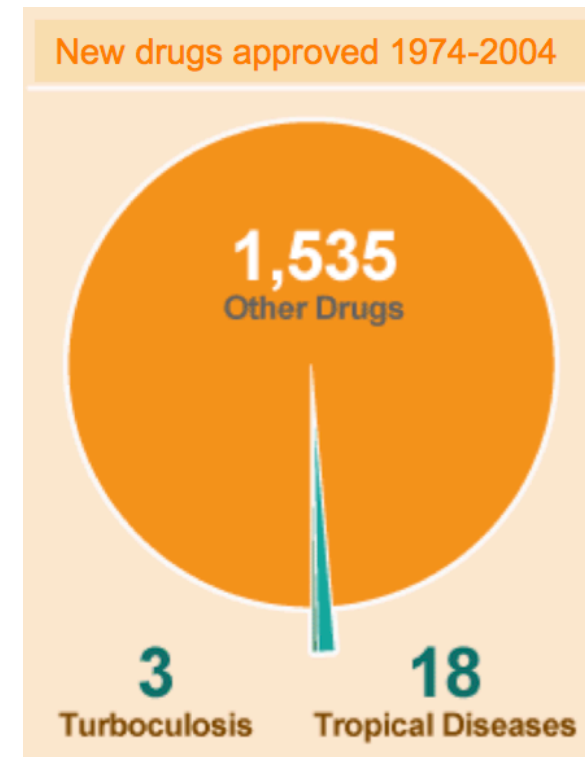
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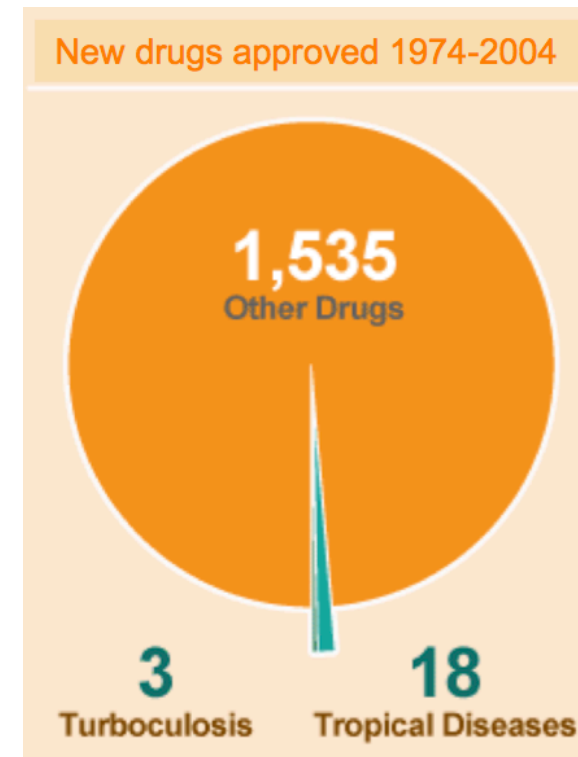
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- Lack of healthcare infrastructure
  - lack of R&D for existing and novel pharmaceuticals



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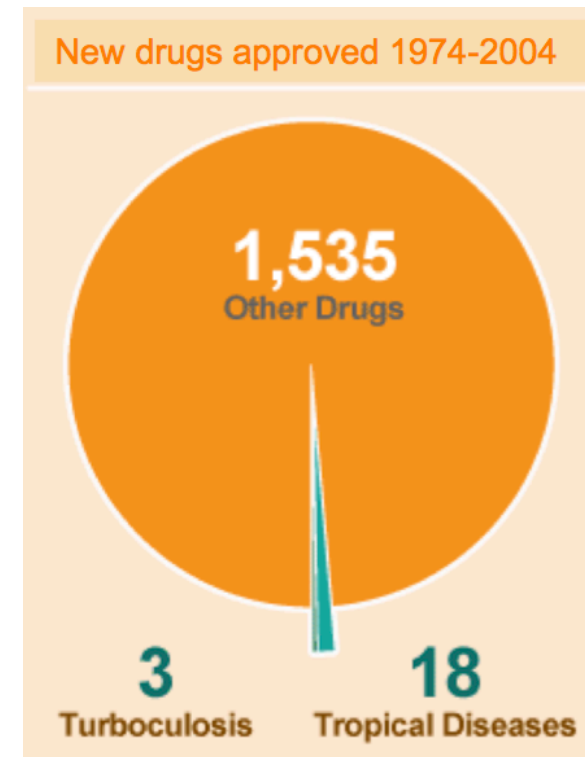
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- Lack of healthcare infrastructure
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  - treatments may be toxic
- Inadequate funding.



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- Clean living conditions
- Clean drinking water
- Adequate nutrition
- Education
- Gender equality
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- Pharmaceutical research and development
- Overhaul of drug patent systems
- Identification/targeting of vulnerable groups.



# Organisation

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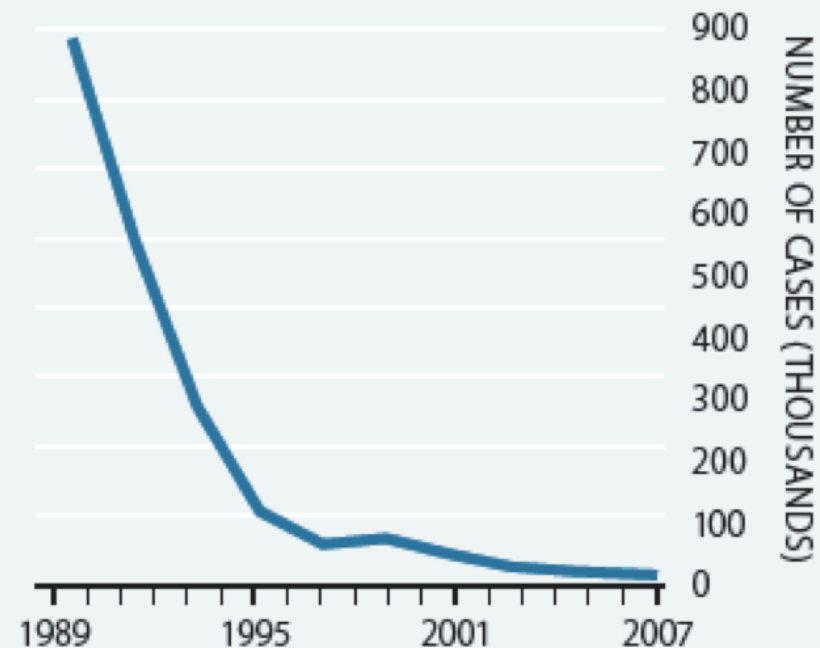
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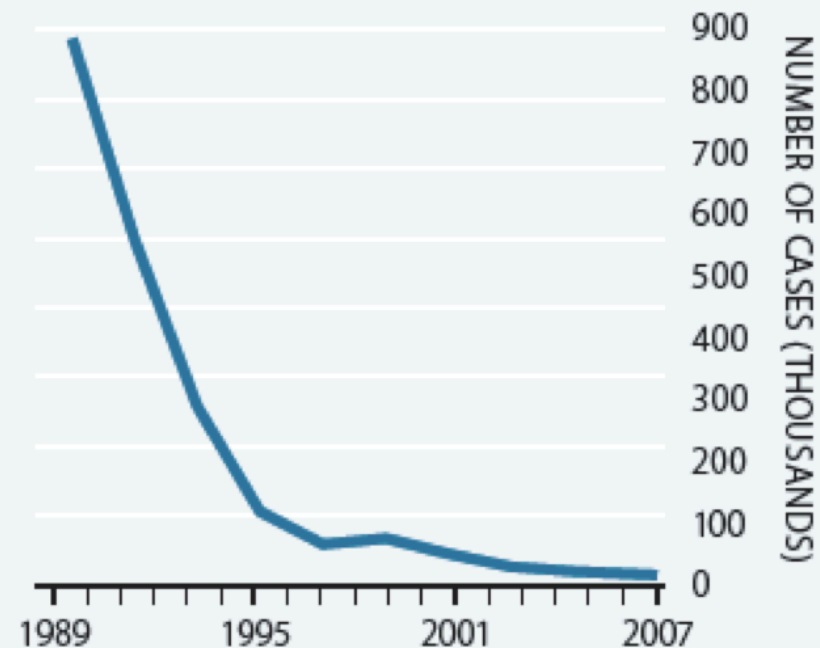
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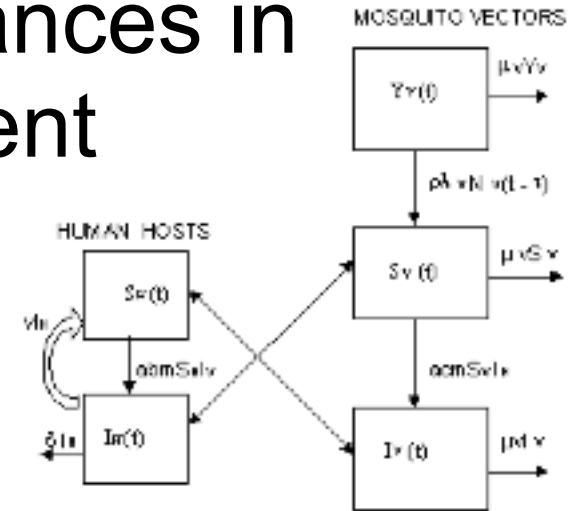
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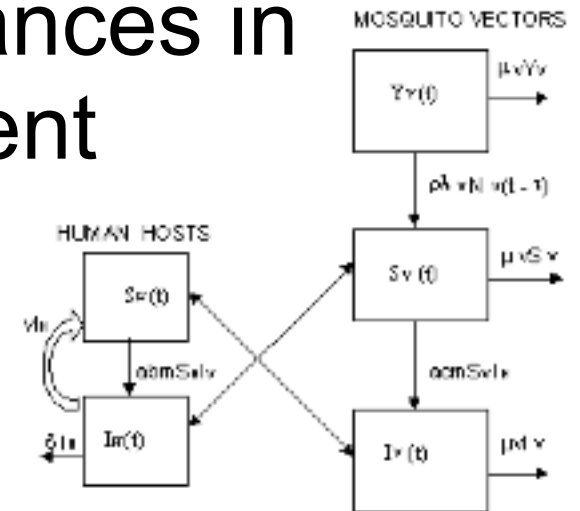
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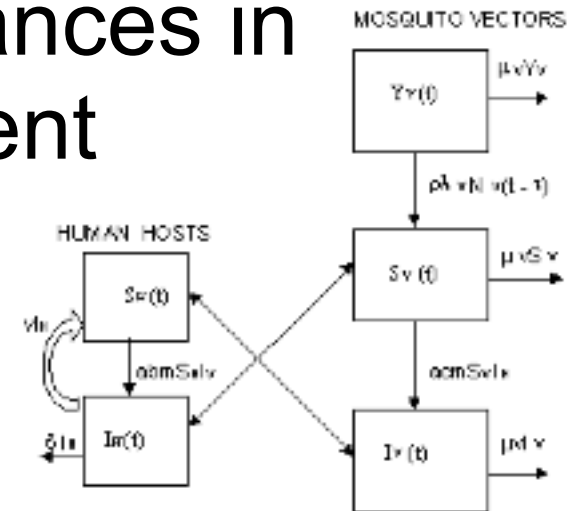
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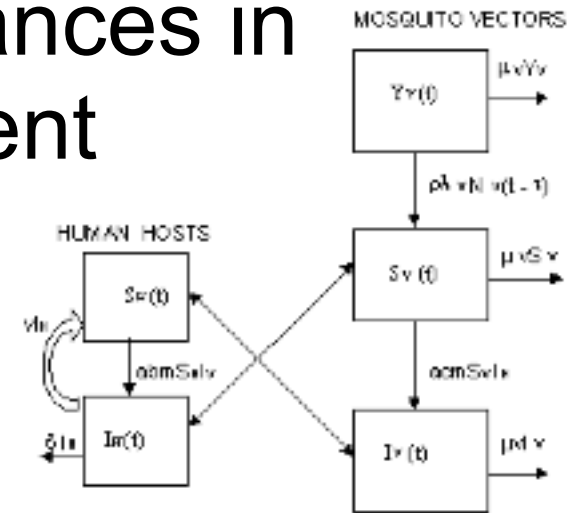
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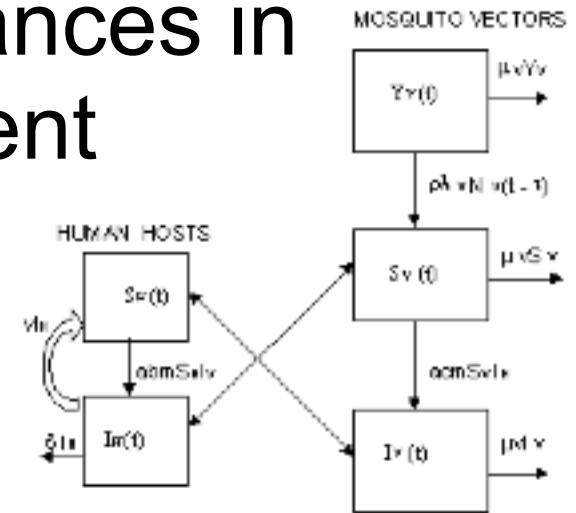
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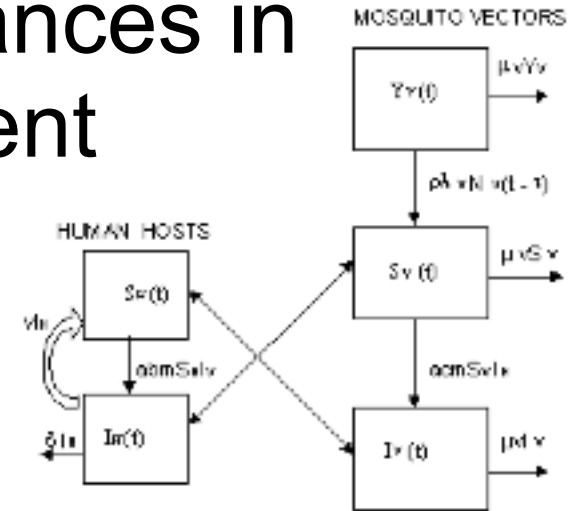
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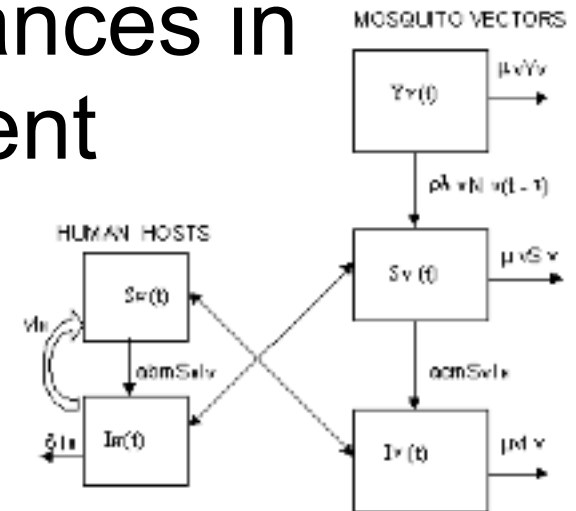
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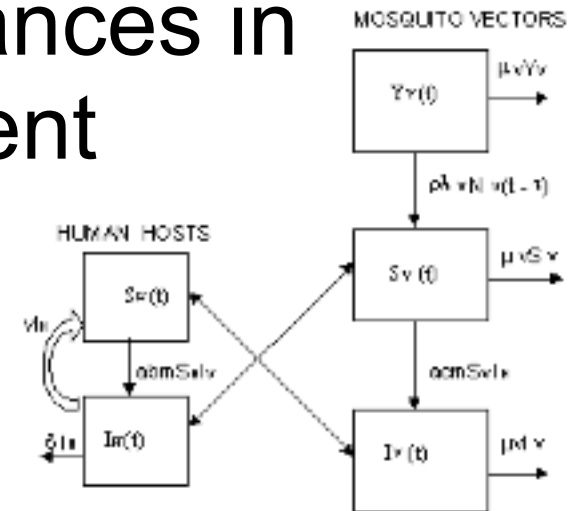
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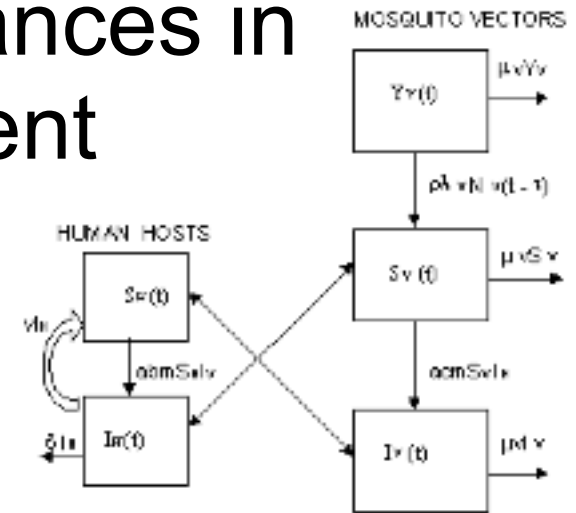
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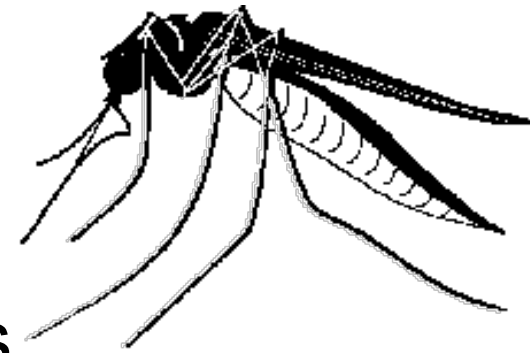
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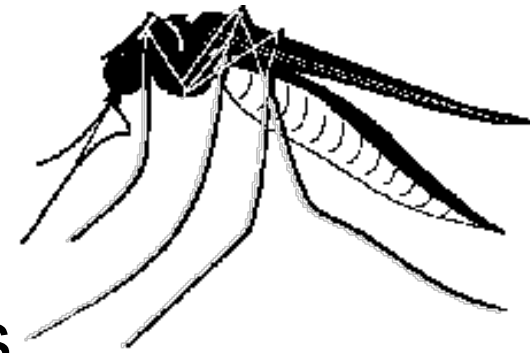
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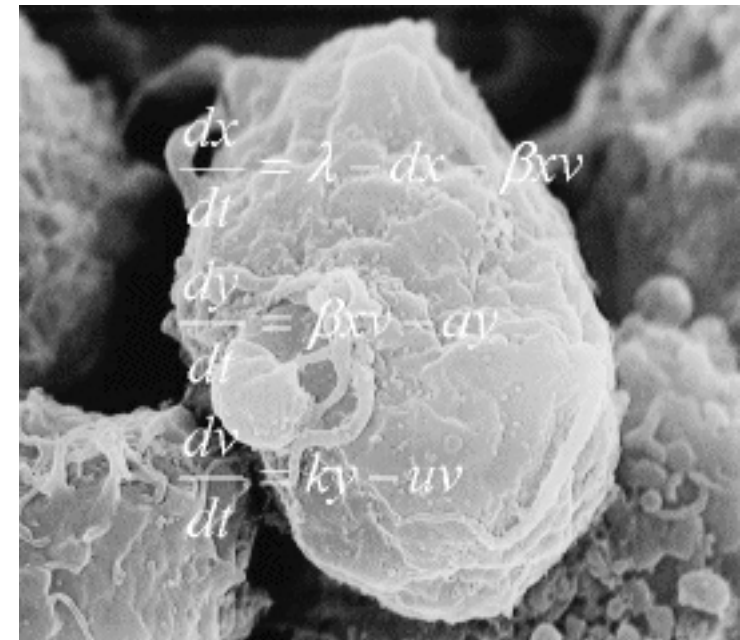
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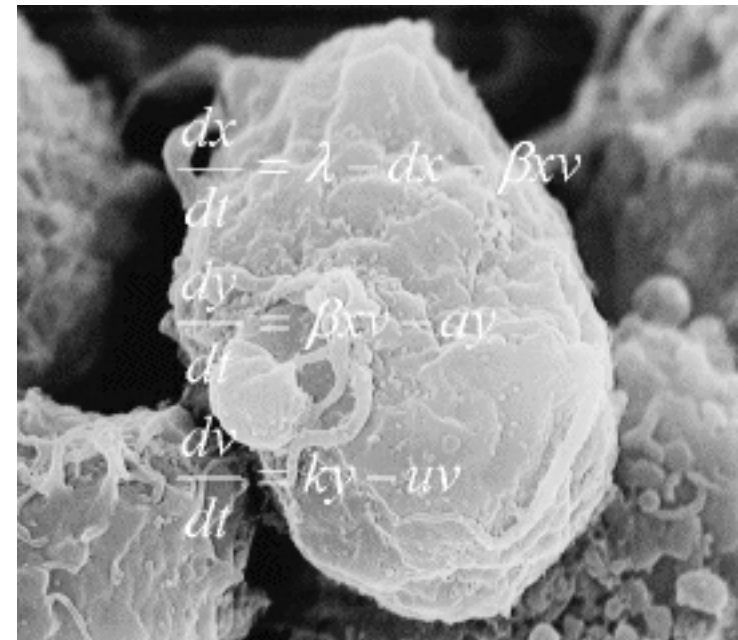
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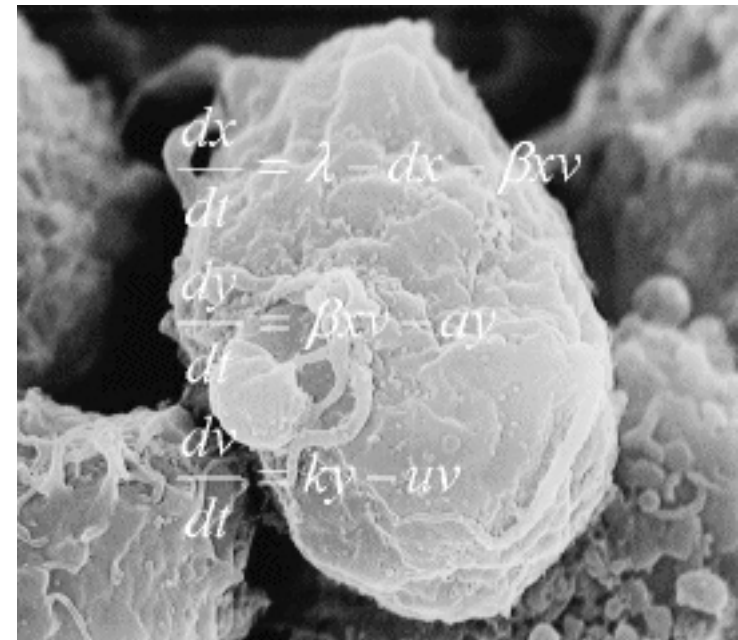
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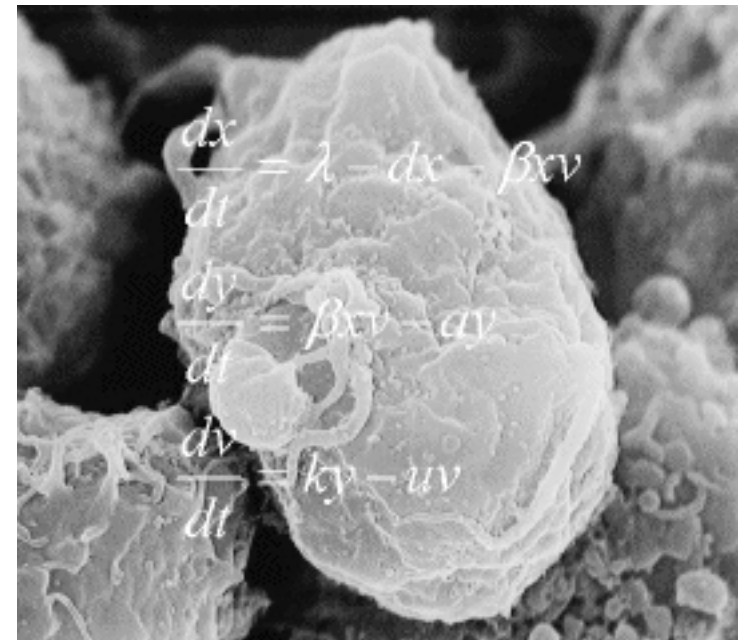
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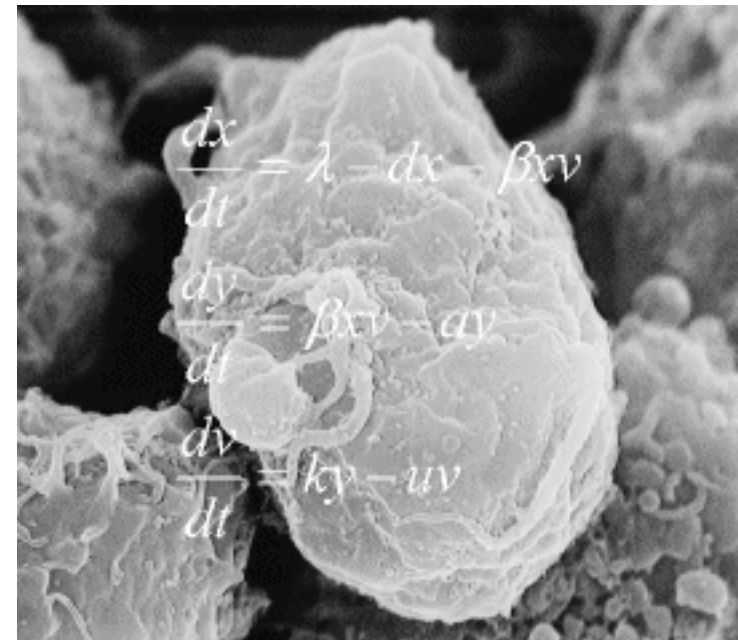
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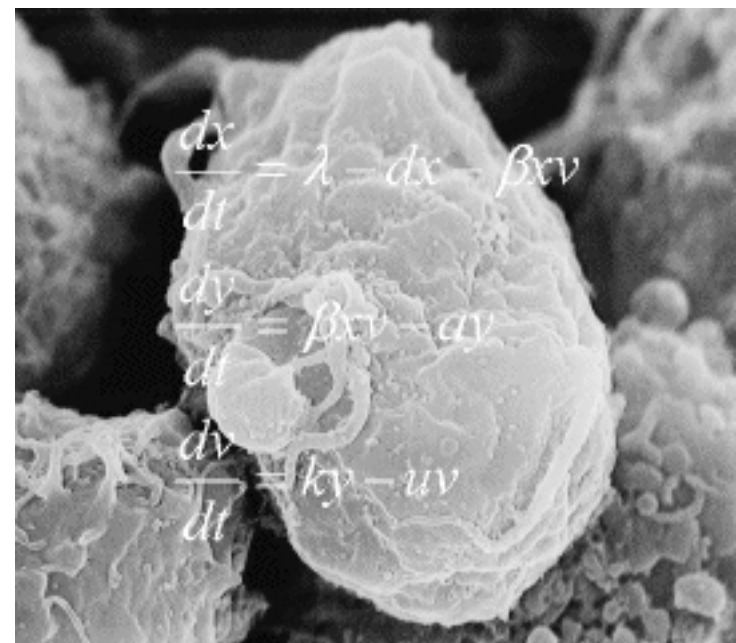
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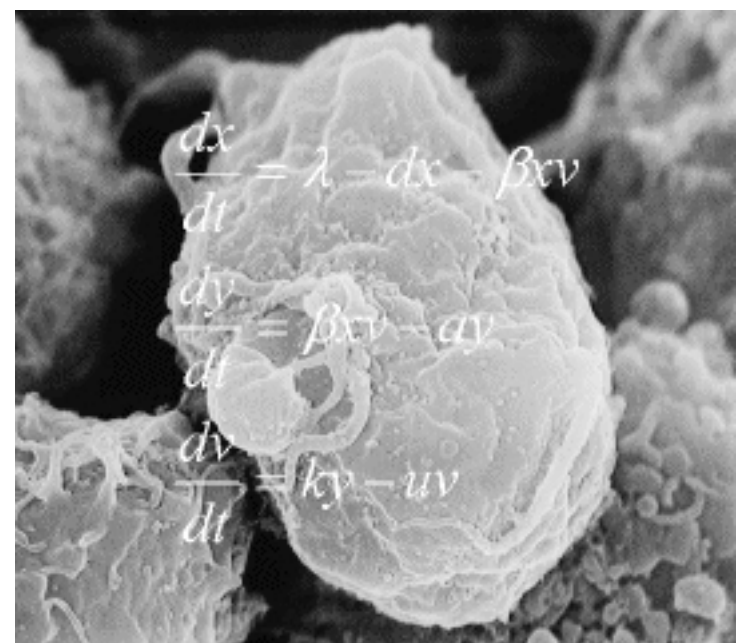
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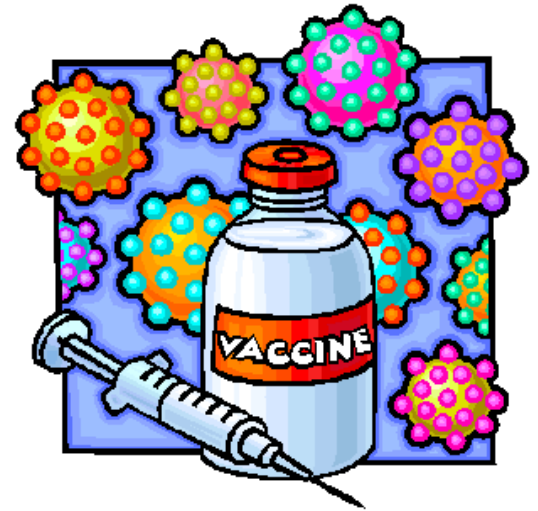
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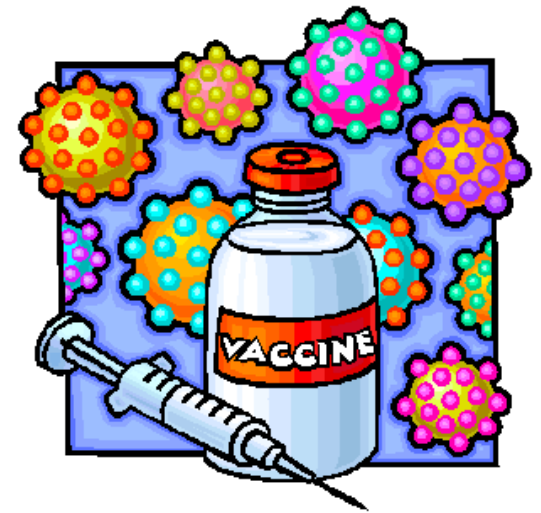
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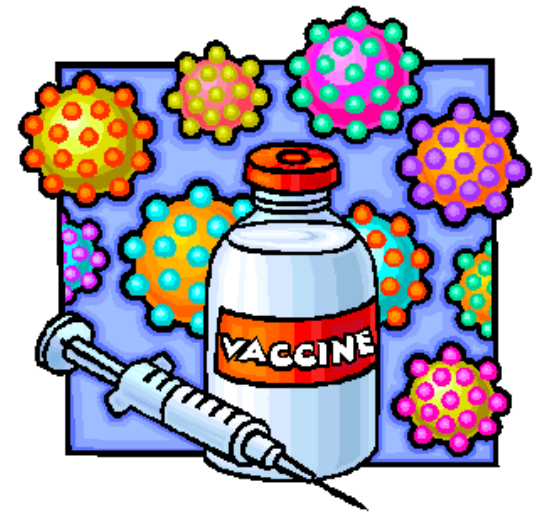
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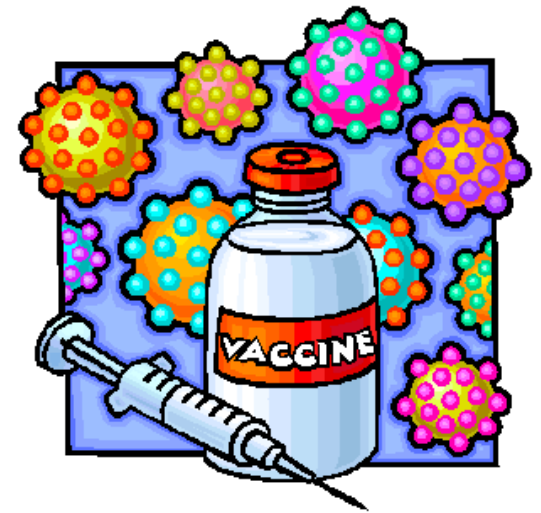
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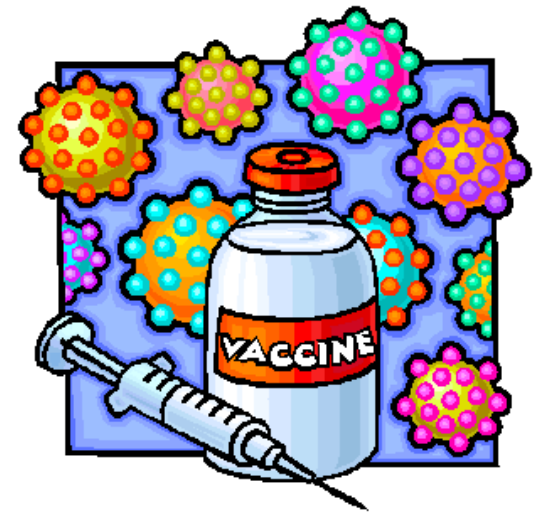
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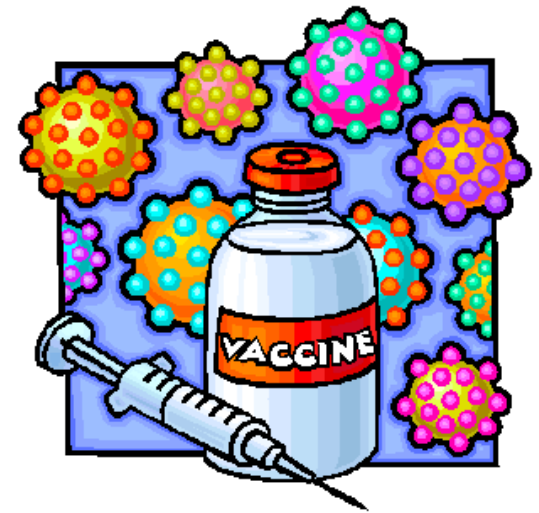
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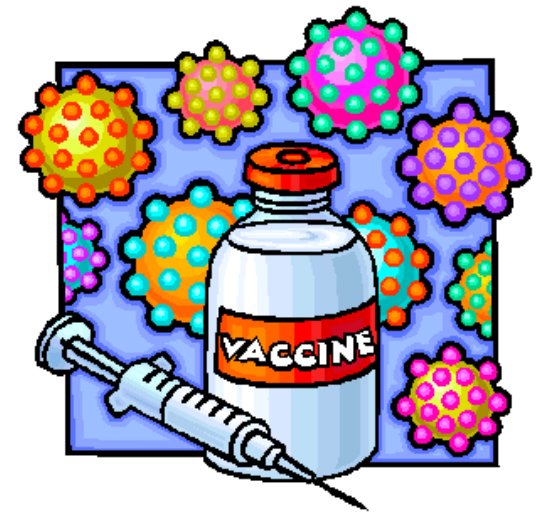
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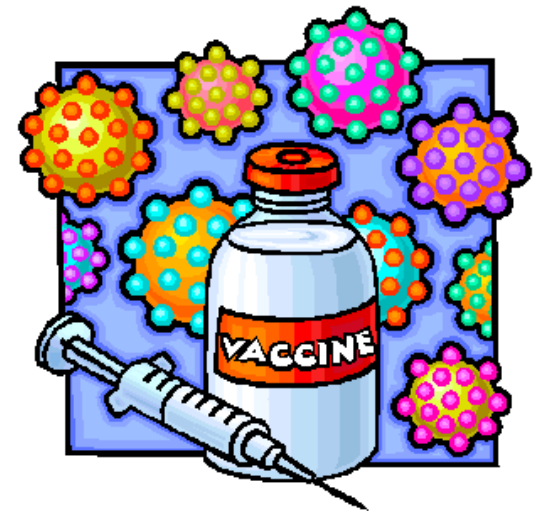
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- A great many problems could be solved, relatively easily, by harnessing the power of mathematical modelling
- The price — political and otherwise — for such a huge improvement in the quality of life for 1/6 of the world's population is tiny.



# Key References

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- P.J. Hotez (2008) *Forgotten People, Forgotten Diseases: The Neglected Tropical Diseases and Their Impact on Global Health and Development*, ASM press
- A.D. Kealey and R.J. Smith? (2010) *Neglected Tropical Diseases: Infection, Modeling, and Control*. *Journal of Health Care for the Poor and Underserved* 21, 53-69.

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