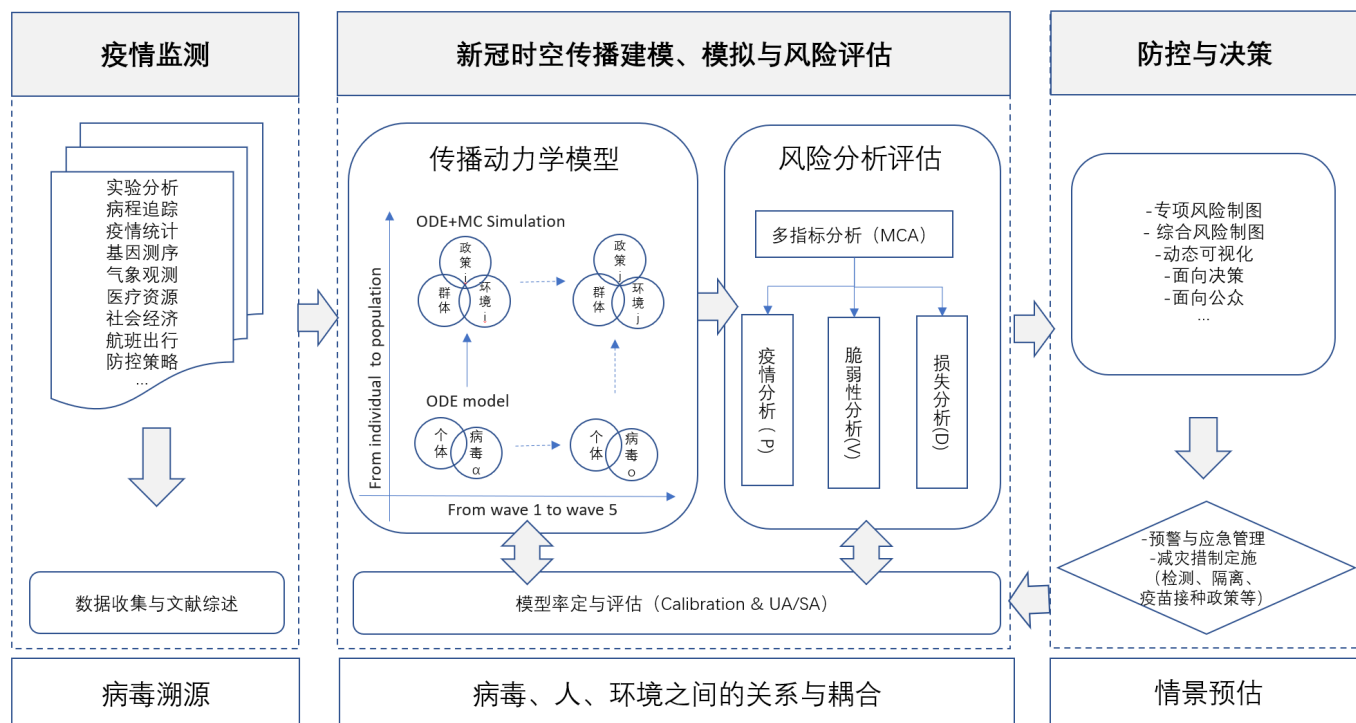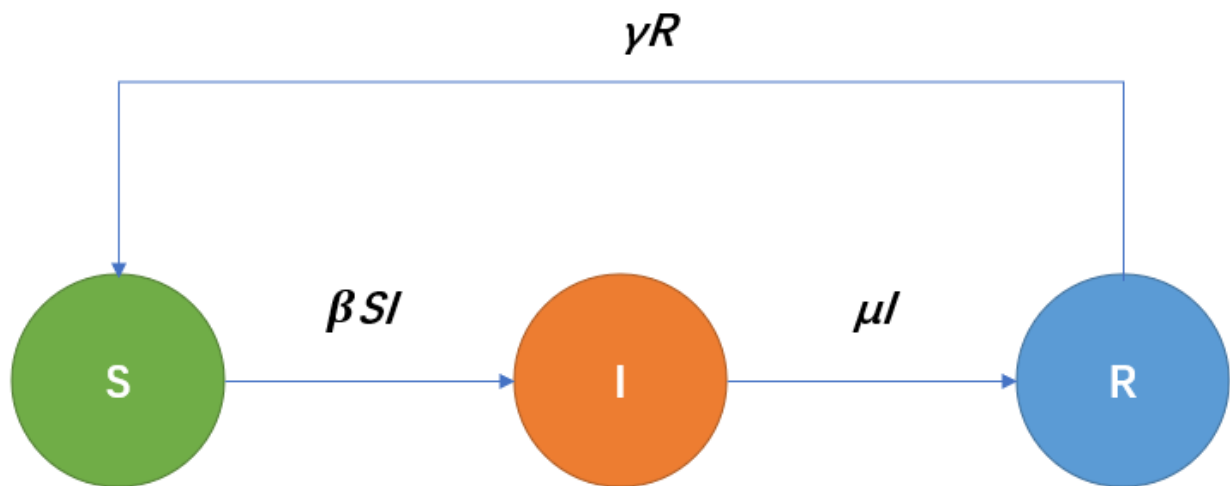# 1 项目框架

COVID-19 研究框架

2 传播动力学模型

2.1 群体模型：SIRS[1]

$$\frac{dS}{dt} = -\beta SI + \gamma R$$

$$\frac{dI}{dt} = \beta SI - \mu I$$

$$\frac{dR}{dt} = \mu I - \gamma R$$

变量	说明	备注
β	有效接触感染率	
μ	治愈率	
γ	丧失免疫力率	

2.1.1 Social contact[2] [3] [4]

(1) location catagories

Home,Work,School,Others

$\beta_i = \Sigma(\alpha^{sc}(1-\rho_j) + \alpha^c \rho_j)\frac{I_j}{N_j}C_{ij}^l$

其中$(1 - \rho_j)$ 对应asymptomatic group，ρ_j 对应sub-clinical group

$$C = \beta_h C^h + \beta_w C^w + \beta_w C^w + \beta_o C^o$$

2.2 个体免疫应答模型
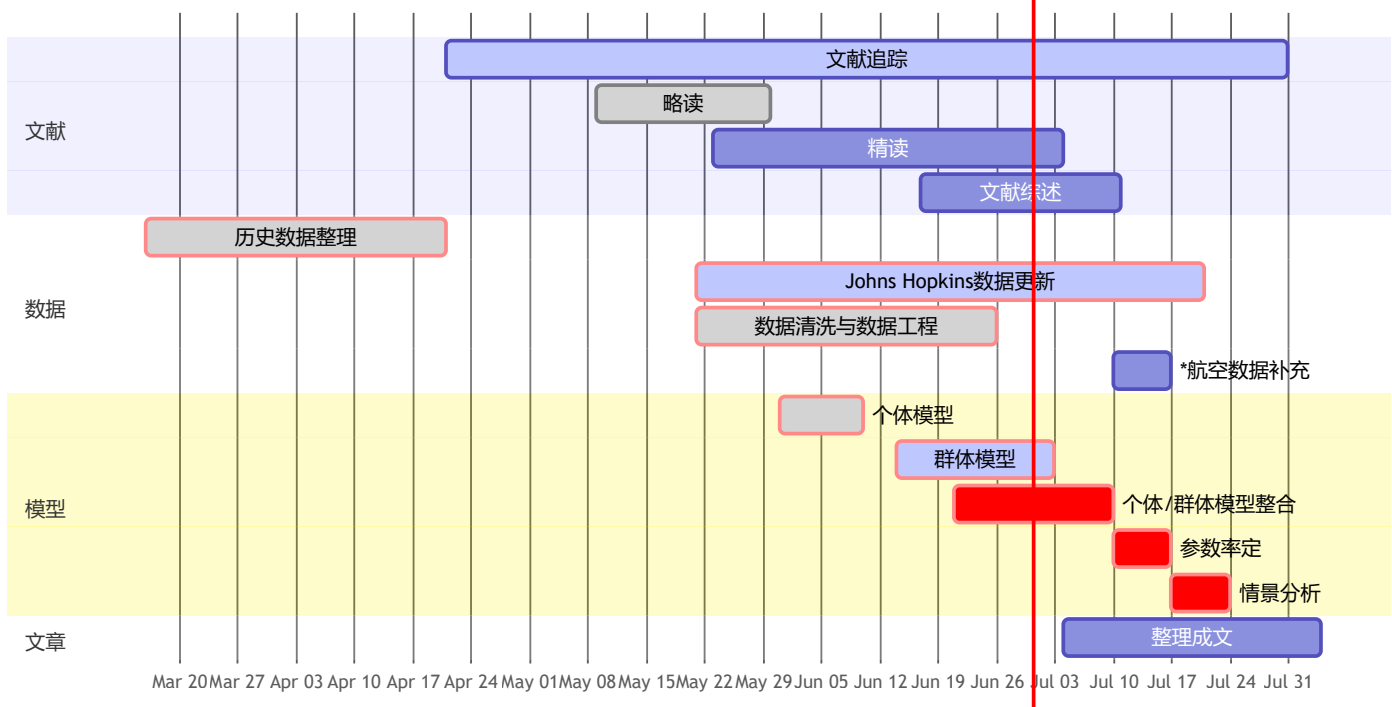
$$\frac{dT}{dt} = d(T_0 - T) - \frac{k}{A\alpha}VT$$

$$\frac{dI}{dt} = \frac{k}{A\alpha}VT - \delta I$$

$$\frac{dV}{dt} = pI - cV$$

变量	说明	备注
T	T细胞数量	
T_0	T细胞初始量	
V	病毒量	
I	被感染的T细胞	
…	…	…

进度计划

Covid-19讨论小组计划

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[2] Mossong J, Hens N, Jit M, Beutels P, Auranen K, Mikolajczyk R, et al. (2008) Social Contacts and Mixing Patterns Relevant to the Spread of Infectious Diseases. PLoS Med 5(3): e74. https://doi.org/10.1371/journal.pmed.0050074

[3] Du SQ, Yuan W. Mathematical modeling of interaction between innate and adaptive immune responses in COVID-19 and implications for viral pathogenesis. J Med Virol. 2020;1–14. 10.1002/jmv.25866

[4] Prem K, Cook AR, Jit M (2017) Projecting social contact matrices in 152 countries using contact surveys and demographic data. PLoS Comput Biol 13(9): e1005697. https://doi.org/10.1371/journal.pcbi.1005697

1. 1 ↵

2. 2 ↵

3. 3 ↵
4. 4 ↵