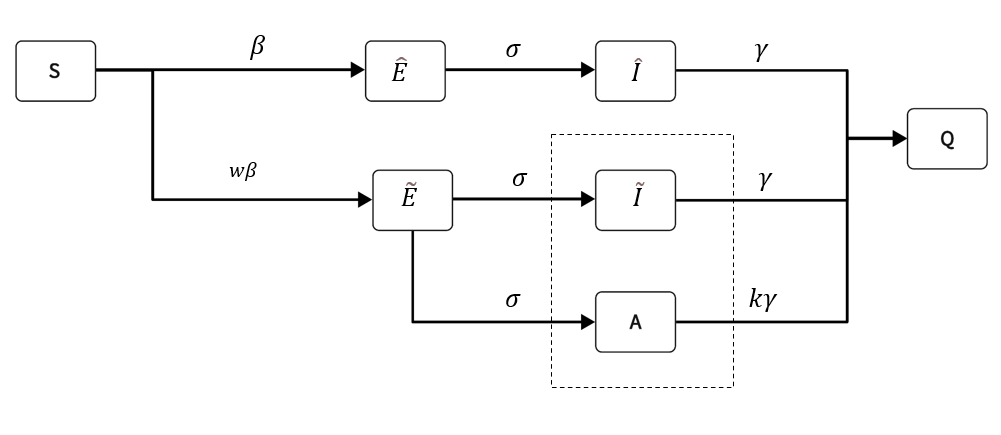
疫苗分配

## 模型



### 传染病方程

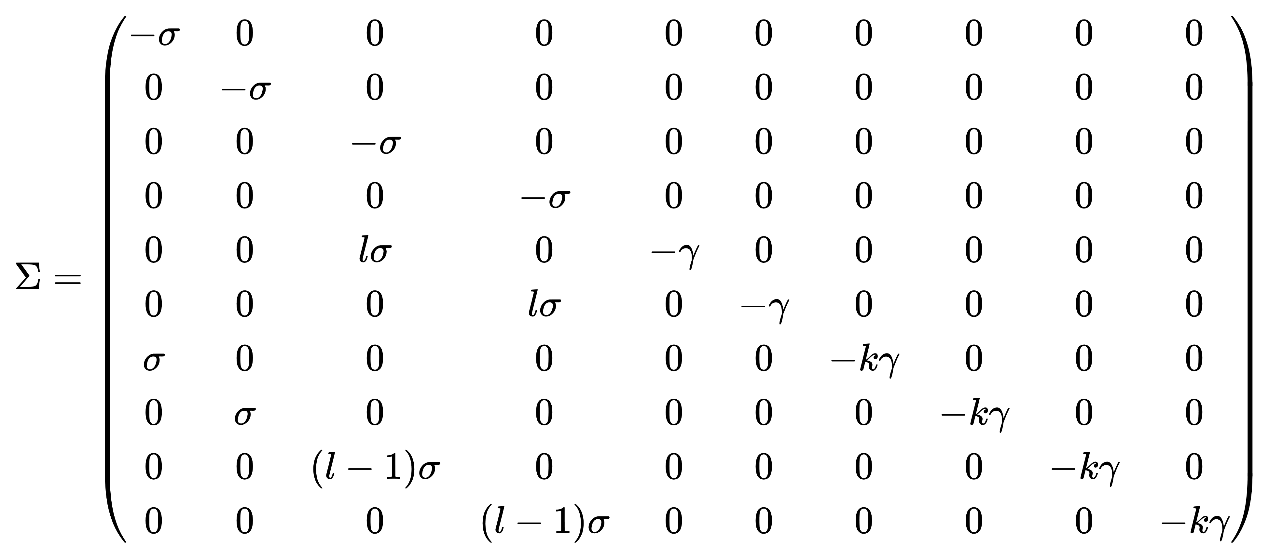
### 加入年龄结构计算两个group之间的再生数[7]

设，将该感染系统写成一下形式：

则传播部分T

其中

是转移矩阵



\Sigma=

\begin{pmatrix}

-\sigma & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\

0 & -\sigma & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\

0 & 0 & -\sigma & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\

0 & 0 & 0 & -\sigma & 0 & 0 & 0 & 0 & 0 & 0 \\

0 & 0 & l \sigma & 0 & -\gamma & 0 & 0 & 0 & 0 & 0 \\

0 & 0 & 0 & l \sigma & 0 & -\gamma & 0 & 0 & 0 & 0 \\

\sigma & 0 & 0 & 0 & 0 & 0 & -k \gamma & 0 & 0 & 0 \\

0 & \sigma & 0 & 0 & 0 & 0 & 0 & -k \gamma & 0 & 0 \\

0 & 0 & (l-1) \sigma & 0 & 0 & 0 & 0 & 0 & -k \gamma & 0 \\

0 & 0 & 0 & (l -1) \sigma & 0 & 0 & 0 & 0 & 0 & -k \gamma \\

\end{pmatrix}

所以i和j的R就是

如果i年龄段p变化，用表示此次分配给i组的疫苗量。所以 ,新的, 发生扰动，则导致发生变化，所以i年龄段势必会引起总体传播的变化，量化为如下：

#### 药物干预-疫苗分配算法[6]

1. Divide the vaccine stock into units as.
2. For each group ***i*** {

For each group ***j*** {

Calculate

}

Calculate

}

1. For each unit of vaccine to :

Find max ;

Allocate vaccine to group ***i*** ;

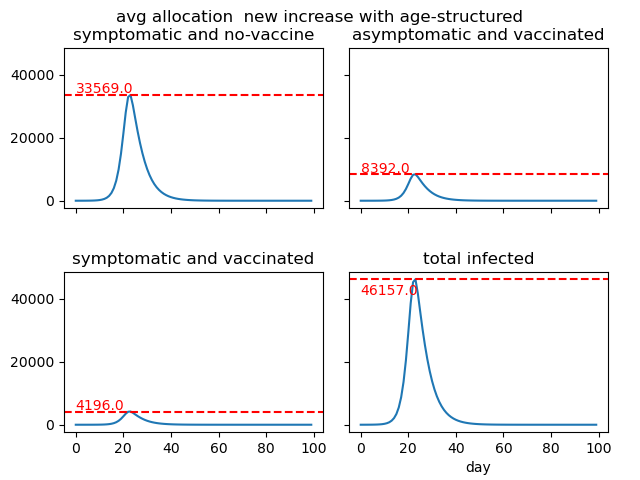
Calculate and update the vaccinate proportion of group i;

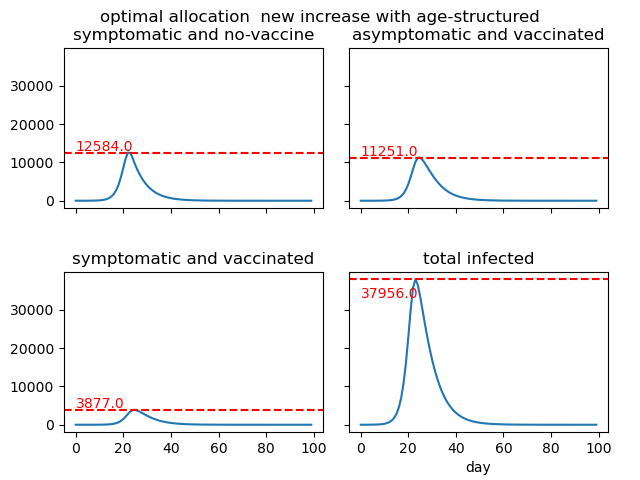
Calculate the new of group ***i*** and update;

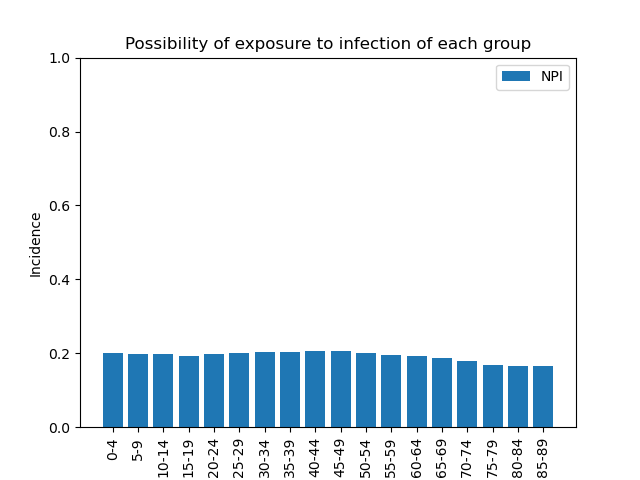
计算0.1人口数疫苗至0.5人口数疫苗对总感染数的影响：avg为之前的平均分配方式，optimal为上述算法后的最佳分配方式



下面两张图分别是疫苗为总人口数的一半,即Stockplie size=0.5时候平均分配疫苗和最优分配法的各种感染人数。







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对参数进行分析，固定参数，分析参数

W固定，q和l分析，p分析，k分析

分析不同的情况下无症状感染者，打了疫苗的无症状感染者和没打疫苗的无症状感染者

1nature那片在NPI期间就是对其进行SEIR模型的参数进行改动