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```
%Initial Conditions:
S_0 = 1000; % Susceptible
I_0=1; % Infected
R_0=0; % Recovered
b=100; % birth rate into susceptible
D=0.1; % death rate (independent of disease)
N=1000;

detTime = 50;
endTime = 150;
T1 = 0:detTime;
T2 = detTime+1:endTime;
totalT=0:endTime;

nu=0.2; % Recovery rate
beta=0.001; % Transmission rate
```

0:50 - pre MDT: burn-in

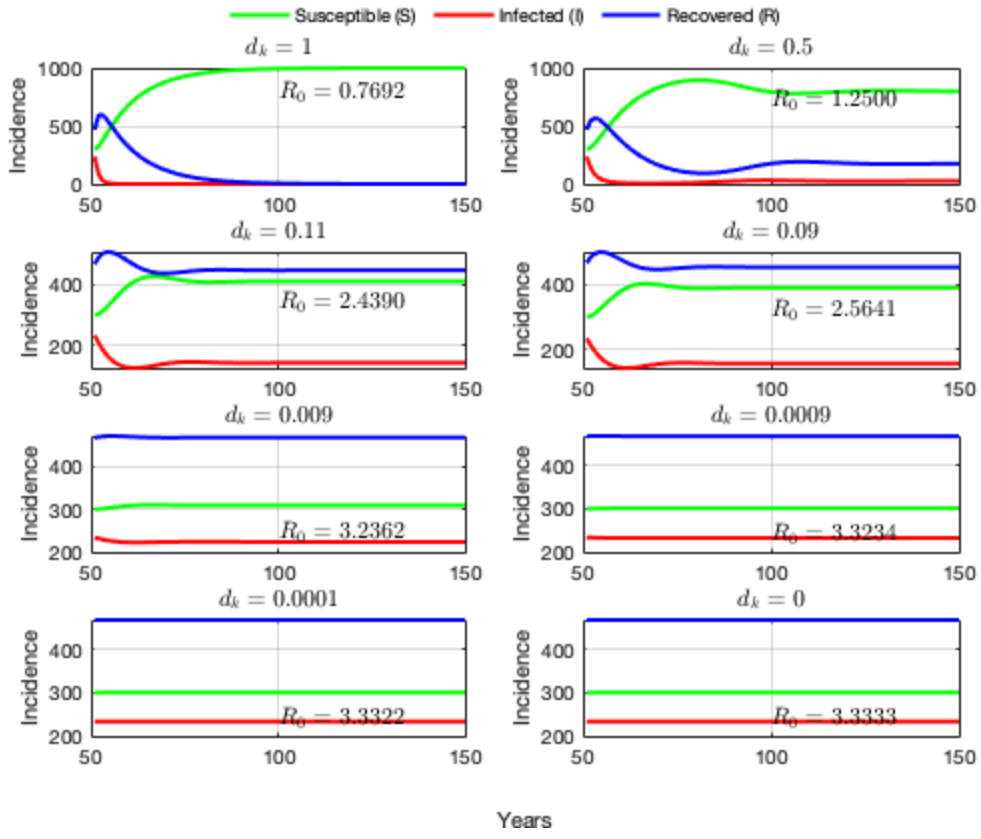
```
det=0;

[t, class]=ode45(@(t, class) simpModDet(t, class, N, beta, nu, b, D,
 det), T1,[S_0 I_0 R_0]);
S=class(:,1);
I=class(:,2);
R=class(:,3);
```

50:150 - post MDT: after burn-in

```
DetVec=[1, 0.5, 0.11, 0.09, 0.009, 0.0009,0.0001, 0];
Names=string(DetVec);
n = length(DetVec);
figure(1)
for i = 1:n
    det = DetVec(i);
    [t, class2]=ode45(@(t, class) simpModDet(t, class, N, beta, nu, b,
 D, det), T2, class(size(class,1),:) );
    S=class2(:,1);
    I=class2(:,2);
    R=class2(:,3);
```

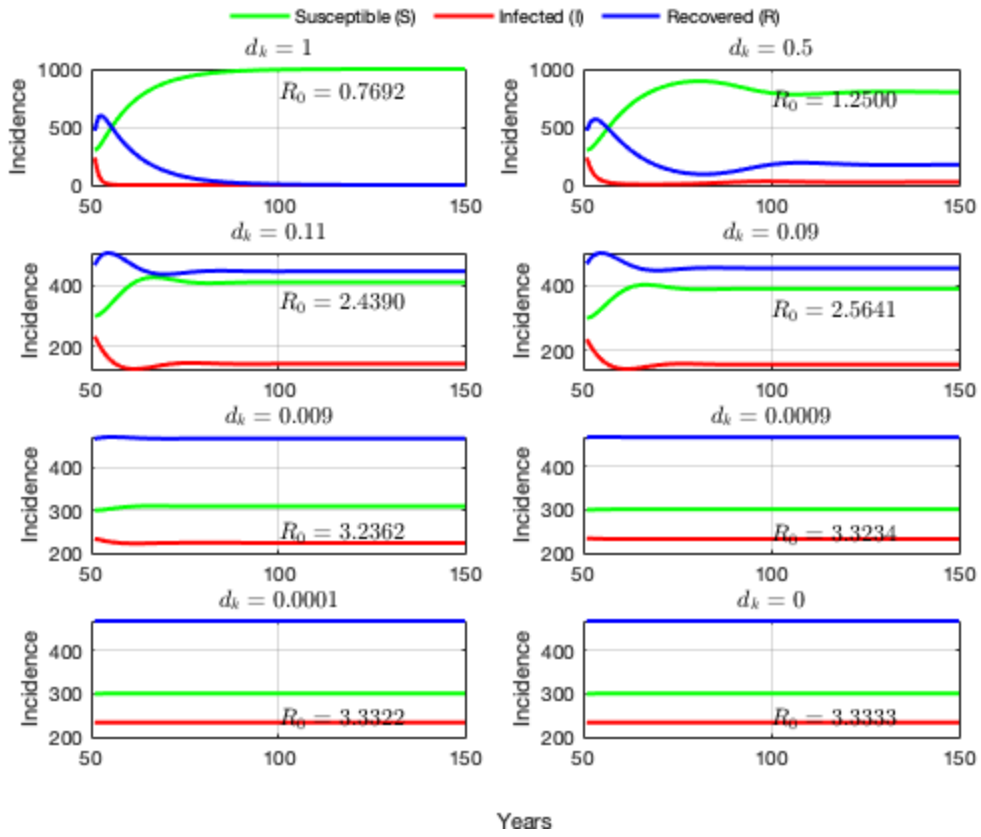
```
    subplot(0.5*n,2,i)
    p1=plot(t,S,'g','LineWidth',2); hold on
    p2=plot(t,I,'r','LineWidth',2); hold on
    p3=plot(t,R,'b','LineWidth',2); hold on
    %axis([0 150 0 3000])
    ylabel('Incidence')
    title(sprintf('$d_{k}= %s
$',Names{i}),'Interpreter','latex', 'FontSize', 12, 'FontName', 'Times
 New Roman');
    R_nought=(beta*b)/(D*(D + nu + det));
    text(100,max(S)*0.8,sprintf('$R_{0}= %.4f
$',R_nought),'Interpreter','latex', 'FontSize', 12, 'FontName', 'Times
 New Roman')
    grid on
end
suplabel('Years');
hL = legend([p1,p2,p3],{'Susceptible (S)', 'Infected (I)','Recovered
 (R)'}, 'Orientation', 'horizontal');
newPosition = [0.4 0.87 0.2 0.2];
newUnits = 'normalized';
set(hL,'Position', newPosition,'Units',
 newUnits, 'color','none','Box','off');
```

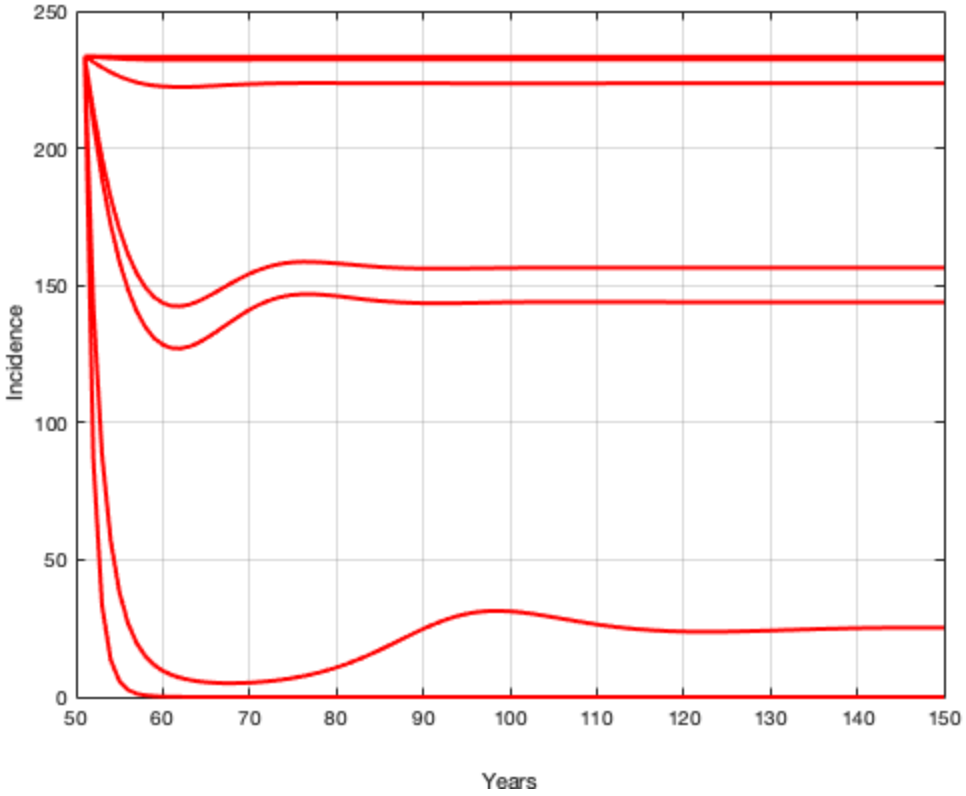



```
DetVec=[1, 0.5, 0.11, 0.09, 0.009, 0.0009,0.0001, 0];
Names=string(DetVec);
n = length(DetVec);
```

```
figure(2)
for i = 1:n
    det = DetVec(i);
    [t, class2]=ode45(@(t, class) simpModDet(t, class, N, beta, nu, b,
 D, det), T2, class(size(class,1),:) );
    S=class2(:,1);
    I=class2(:,2);
    R=class2(:,3);

    %p1=plot(t,S,'g','LineWidth',2); hold on
    p2=plot(t,I,'r','LineWidth',2); hold on
    %p3=plot(t,R,'b','LineWidth',2); hold on
    %axis([0 150 0 3000])
    ylabel('Incidence')
    grid on
end
suplabel('Years');
hL = legend([p1,p2,p3],{'Susceptible (S)', 'Infected (I)','Recovered
 (R)'}, 'Orientation', 'horizontal');
newPosition = [0.4 0.87 0.2 0.2];
newUnits = 'normalized';
set(hL,'Position', newPosition,'Units',
 newUnits, 'color','none','Box','off');
```





Plotting entire time span 0-150

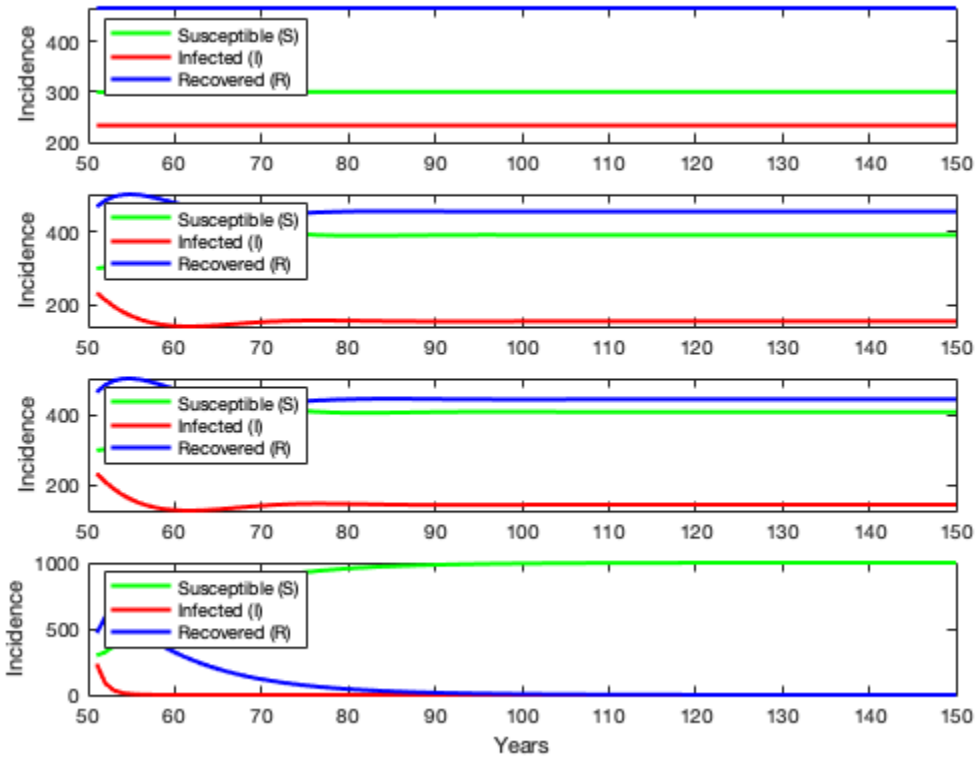
rbind class and class2 figure(4) classes=vertcat(class,class2); S=classes(:,1); I=classes(:,2); R=classes(:,3);

```
            p1=plot(totalT,S,'g','LineWidth',2); hold on
            p2=plot(totalT,I,'r','LineWidth',2); hold on
            p3=plot(totalT,R,'b','LineWidth',2); hold on

DetVec = [0, 0.09, 0.11, 1];
n = length(DetVec);
figure(3)
for i = 1:n
    det = DetVec(i);
    [t, class2]=ode45(@(t, class) simpModDet(t, class, N, beta, nu, b,
 D, det), T2, class(size(class,1),:) );
    S=class2(:,1);
    I=class2(:,2);
    R=class2(:,3);


    subplot(n,1,i)
    plot(t,S,'g','LineWidth',2); hold on
    plot(t,I,'r','LineWidth',2); hold on
    plot(t,R,'b','LineWidth',2); hold on
    %axis([0 50 0 500])
    ylabel('Incidence')
```

```
    h=legend('Susceptible (S)', 'Infected (I)','Recovered
 (R)','Location','northwest');
end
xlabel('Years')
```



50:150 - post MDT: after burn-in

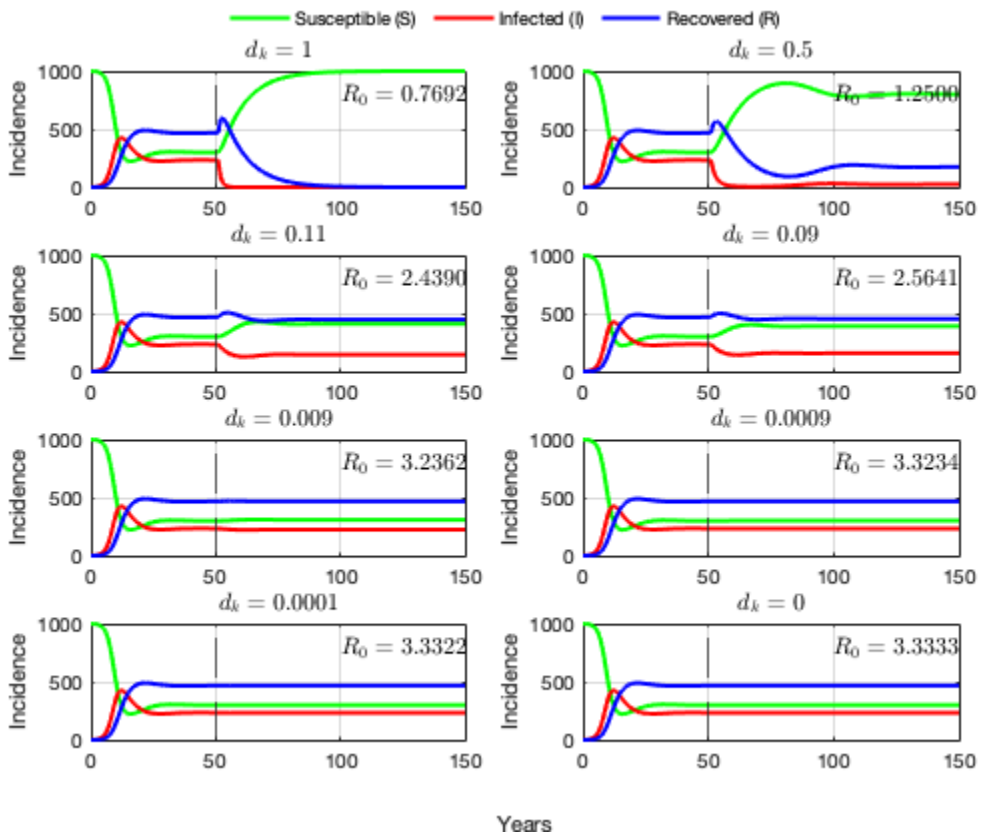
```
DetVec=[1, 0.5, 0.11, 0.09, 0.009, 0.0009,0.0001, 0];
Names=string(DetVec);
n = length(DetVec);
figure(4)
for i = 1:n
    det = DetVec(i);
    [t, class2]=ode45(@(t, class) simpModDet(t, class, N, beta, nu, b,
 D, det), T2, class(size(class,1),:) );
    classes=vertcat(class,class2);
    S=classes(:,1);
    I=classes(:,2);
    R=classes(:,3);

    subplot(0.5*n,2,i)
    p1=plot(totalT,S,'g','LineWidth',2); hold on
    p2=plot(totalT,I,'r','LineWidth',2); hold on
    p3=plot(totalT,R,'b','LineWidth',2); hold on
    x1=50;
    xline(x1,'--');
```

```
    %axis([0 150 0 3000])
    ylabel('Incidence')
    title(sprintf('$d_{k}= %s
$',Names{i}),'Interpreter','latex', 'FontSize', 12, 'FontName', 'Times
 New Roman');
    R_nought=(beta*b)/(D*(D + nu + det));
    text(100,max(S)*0.8,sprintf('$R_{0}= %.4f
$',R_nought),'Interpreter','latex', 'FontSize', 12, 'FontName', 'Times
 New Roman')
    grid on

end
suplabel('Years');
hL = legend([p1,p2,p3],{'Susceptible (S)', 'Infected (I)','Recovered
 (R)'}, 'Orientation', 'horizontal');
newPosition = [0.4 0.87 0.2 0.2];
newUnits = 'normalized';
set(hL,'Position', newPosition,'Units',
 newUnits, 'color','none','Box','off');

clear all
```



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