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Before Vaccinations

```
mockData = cat(2, newInfections', cumulativeDeaths');
mockData_before_vaccine=mockData(1:100,:);
mockData_after_vaccine=mockData(100:365,:);
t = 100;
sirafun= @(x)siroutput_part3_before(x,t,mockData_before_vaccine);

A = [0,1,1,0,0,0,0];

% A = [0,1,1,0,0,0,0;
%      1,0,0,0,0,0,0]; Do we need this second row?

b = 1;

Af = [0,0,0,1,1,1,1];
bf = 1;

ub = [1,1,1,1,1,1,1]';
lb = [0,0,0,0,0,0,0]';
x0Mock_before = [0.2,0.3,0.1,1,0,0,0];

xMock_before = fmincon(sirafun,x0Mock_before,A,b,Af,bf,lb,ub);

Y_fitMock_before = siroutput_full(xMock_before,t);
```

Local minimum possible. Constraints satisfied.

fmincon stopped because the size of the current step is less than the value of the step size tolerance and constraints are satisfied to within the value of the constraint tolerance.

After Vaccinations

```
t = 266;
sirafun= @(x)siroutput_part3_after(x,t,mockData_after_vaccine,
[Y_fitMock_before(100,:),0,0]);

% A = [0,1,1,0,0;
%      1,0,0,1,0;
```

```

%      0,0,1,1,0];
% b = [1,1,1];

A = [0,1,1,0,0;
      1,0,0,1,0];
b = [1,1];
% Af = [];
% bf = [];

Af = [];
bf = [];

ub = [1,1,1,1,1]';
lb = [0,0,0,0,0]';
x0Mock_after = [xMock_before(1:3),0.1,0];

xMock_after = fmincon(sirafun,x0Mock_after,A,b,Af,bf,lb,ub);

Y_fitMock_after = siroutput_full_part3_after(xMock_after,t,
[Y_fitMock_before(100,:),0,0]);

```

Local minimum found that satisfies the constraints.

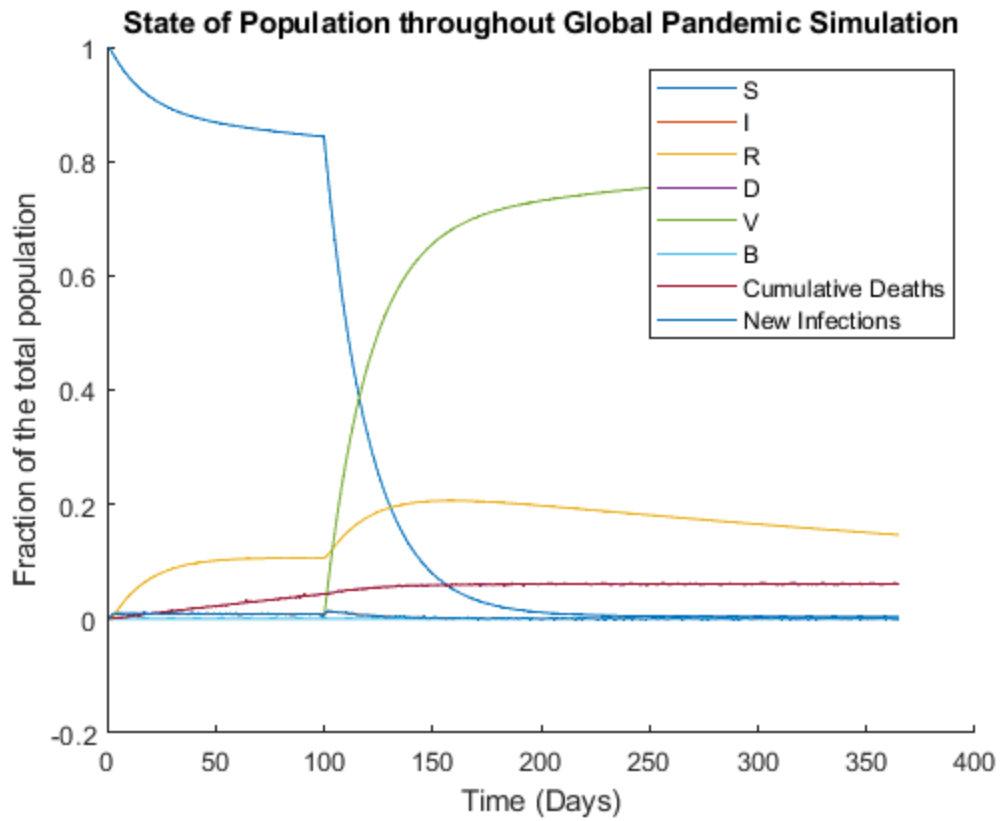
Optimization completed because the objective function is non-decreasing in feasible directions, to within the value of the optimality tolerance, and constraints are satisfied to within the value of the constraint tolerance.

Combined Data

```

Y_fitMock_before=cat(2,Y_fitMock_before,zeros(100,2));
Y_fitMock_combined=cat(1,Y_fitMock_before(1:99,:),Y_fitMock_after);
figure;
hold on;
title("State of Population throughout Global Pandemic Simulation")
xlabel("Time (Days)")
ylabel("Fraction of the total population")
plot(Y_fitMock_combined);
plot(cumulativeDeaths');
plot(newInfections');
legend('S','I','R','D','V','B','Cumulative Deaths','New Infections');
vaxpop = Y_fitMock_combined(:,5);
vaxbreak = Y_fitMock_combined(:,6);
save('competition.mat','vaxpop','vaxbreak');

```



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