```
function  e = mse_sir(in)
    % This function evaluates the Mean Squared Error in an SIRD Model
    % given a variable transmission rate 'r0' and mortality rate 'd'.
    % The MSE is measured between predicted deaths and recorded deaths
 due
    % to COVID-19 on each day past Day 0. Day 0 = first day at which
 there
    % were ar least 10 deaths due to COVID-19.

    % Load and format data
    r0 = in(1);
    d  = in(2);
    N  = floor(in(4));
    county = floor(in(3));

    county_data = readtable('us-county-death_2.csv');
    death_data  = county_data(2:end,:);

    deaths = death_data.(county);
    deaths(isnan(deaths)) = []; % eleminate NAN values
    days   = length(deaths);
    tspan  = linspace(0, days-1, days);

    k = 1./14;
    b = r0*(1+d)*k;

    % Set up ODE
    f = @(t,y) [-b*y(1).*y(2)./N; (b.*y(1).*y(2)./N)-(k.*(1+d).*y(2));
 k.*y(2); k.*d.*y(2)];

    Iinit = in(5);
    Rinit = 0;
    Dinit = deaths(1);
    xinit = [(N-Iinit-Rinit-Dinit) Iinit Rinit Dinit];
    [T,Y] = ode45(f, tspan, xinit);

    % Calculate MSE
    e = immse(Y(:,4), deaths);
end
```

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