```
In[ ]:= data0 = Import["C:\\Users\\thatj\\Desktop\\ECONDATA\\state_of_industry_data.xls"][[1]];

In[ ]:= data0[[1, 3]]

Out[ ]= Tue 18 Feb 2020 00:00:00 GMT-7.

In[ ]:= lengthYear = 365.2425;

In[ ]:= Cases[data0, x_ /; x[[2]] == "Seattle"][[1]]
        data = {((1900 + FromDate[DateList[#[[1]]]]/(lengthYear*3600*24)) - 2020)*lengthYear, #[[2]]} & /@ Drop[Transpose[{Take[data0[[1, All]], Length[%]], %}], 2]

Out[ ]= {city, Seattle, 8., 11., 6., 1., 1., 12., 1., 0., 3., 5., 7., 0., -18., -29., -31., -31., -36., -34., -35., -25., -47.,
  -49., -54., -58., -63., -63., -62., -83., -100., -100., -100., -100., -100., -100., -100., -100., -100., -100., -100.,
  -100., -100., -100., -100., -100., -100., -100., -100., -100., -100., -100., -100., -100., -100., -100., -100., -100.}

Out[ ]= {{47.9, 8.}, {48.9, 11.}, {49.9, 6.}, {50.9, 1.}, {51.9, 1.}, {52.9, 12.}, {53.9, 1.}, {54.9, 0.}, {55.9, 3.}, {56.9, 5.}, {57.9, 7.}, {58.9, 0.},
  {59.9, -18.}, {60.9, -29.}, {61.9, -31.}, {62.9, -31.}, {63.9, -36.}, {64.9, -34.}, {65.9, -35.}, {66.9, -25.}, {67.9, -47.}, {68.9, -49.},
  {69.9, -54.}, {70.9, -58.}, {71.9, -63.}, {72.9, -63.}, {73.9, -62.}, {74.9, -83.}, {75.9, -100.}, {76.9, -100.}, {77.9, -100.},
  {78.9, -100.}, {79.9, -100.}, {80.9, -100.}, {81.9, -100.}, {82.9, -100.}, {83.9, -100.}, {84.9, -100.}, {85.9, -100.}, {86.9, -100.},
  {87.9, -100.}, {88.9, -100.}, {89.9, -100.}, {90.9, -100.}, {91.9, -100.}, {92.9, -100.}, {93.9, -100.}, {94.9, -100.}, {95.9, -100.},
  {96.9, -100.}, {97.9, -100.}, {98.9, -100.}, {99.9, -100.}, {100.9, -100.}, {101.9, -100.}, {102.9, -100.}, {103.9, -100.}, {104.9, -100.}}
```

fit to data

```
In[ ]:= fitFunc = a0/(1 + Exp[(t - t0)/b0]) + a1/(1 + Exp[(t - t1)/b1]) - 100

Out[ ]= -100 + a0/(1 + E^((t - t0)/b0)) + a1/(1 + E^((t - t1)/b1))

In[ ]:= nlm = NonlinearModelFit[data, fitFunc,
        {
         {a0, 60}, {b0, 4.}, {t0, 65.},
         {a1, 40.}, {b1, 0.5}, {t1, 70.}
        },
        t]

Out[ ]= FittedModel[-100 + 34.7134/(1 + e^(5.68135 (-<<18>>+t))) + 75.4817/(1 + e^(0.256269 (-63.2208+t)))]

In[ ]:= transitions = {t0, t1} /. nlm["BestFitParameters"]
        widths = {b0, b1} /. nlm["BestFitParameters"]

Out[ ]= {63.2208, 74.8171}

Out[ ]= {3.90215, 0.176015}

In[ ]:= levels = {a0 + a1 - 100, a1 - 100} /. nlm["BestFitParameters"]

Out[ ]= {10.1951, -65.2866}

In[ ]:= Show[Plot[{Normal[nlm]}, {t, 0, 120}], Plot[a0/(1 + Exp[(t - t0)/b0]) + a1/1 - 100 /. nlm["BestFitParameters"], {t, 0, 120}, PlotStyle -> Dashed],
        ListPlot[data], PlotRange -> {-93.4, 30}, GridLines -> {Join[transitions], levels}, ImageSize -> 11*72, AspectRatio -> 1/2,
        Frame -> {True, True, False, False}, Axes -> False,
        Epilog -> {
          Text["'Voluntary' shutdown level", {100, a1 - 100 /. nlm["BestFitParameters"]}, {0, -1}],
          Text["\nShutdown\n↓", {((1900 + FromDate[{2020, 3, 15, 0, 0, 0}]/(lengthYear*3600*24)) - 2020)*lengthYear, 20}],
          Text["First\nDeath\n↓", {((1900 + FromDate[{2020, 2, 29, 0, 0, 0}]/(lengthYear*3600*24)) - 2020)*lengthYear, 20}],
          Opacity[0.1], MapThread[Rectangle[{#1 + Log[3 + 2 Sqrt[2]] #2, -150}, {#1 - Log[3 + 2 Sqrt[2]] #2, 50}] &, {transitions, widths}]},
        BaseStyle -> FontSize -> 15, FrameLabel -> {"Day in 2020\n", "\nOpen Table Reservations [% of 1 year ago]"}, PlotLabel -> "\nSeattle"]
```

Out[ ]=