Sg2 Surge Demand Calculator for COVID-19

December 15, 2020

Sg2 COVID-19 Surge Demand Calculator
v6.1 DESIGN

What does the calculator do?

The calculator is a **localized scenario planning tool** for COVID-19 hospital bed, ICU and ventilator demand. The calculator is available on the Sg2 website and a public Vizient link: https://www.vizientinc.com/covid-19/covid-19-scenario-planning

How does it do this?

1. Dynamic SIR modeling, combining local population inputs with changing infection rates over time to accurately project local market trends, allows users to estimate the impact of social distancing on mitigation of local transmission and **assess scenarios of resurgence based on different changes in social distancing measures**. SIR stands for susceptible, infected, and recovered and is an epidemiological model that incorporates the three possible states of population afflicted by a contagious disease.

2. Applies age-adjusted and market-adjusted COVID-19 hospital admission, ICU and ventilator rates to scenarios of local infection and mitigation and **calculates projections of medical-surgical, ICU and ventilator demand** specific to individual hospitals or markets

3. **Compares** this projected inpatient bed and ventilator demand over time to **existing capacity**

COVID-19 = coronavirus disease 2019; SIR = susceptible-infected-recovered; ADC = average daily census for bed utilization.

COVID-19 Continues to Impact Hospitals

Fall trends

- **Total infection/immunity rates climbing**
  - Infection rates are rising steadily across the US, though nowhere close to herd immunity (70-90% immunity rate). “Primary surge” markets are estimated to have the highest immunity rates, over 30% by October.
- **While total hospitalizations are rising, the percentage of the infected population that require hospitalization and the percentage of hospitalizations that require ICU admission continue to fall**
  - Overall hospital utilization per infected person has declined as younger, healthier populations have become infected and treatments have advanced.
- **Higher non-COVID-19 inpatient demand is exacerbating bed shortages**
  - Rising acuity for delayed care for non-COVID-19 conditions has driven inpatient bed demand and occupancy rates.
- **Staff shortages are limiting hospitals’ ability to flex for case surges**
  - Total ICU capacity is being limited by staffing shortages caused by burn-out, leaves of absence, exposure to the virus, and other unplanned absences, along with declines in available contract labor.

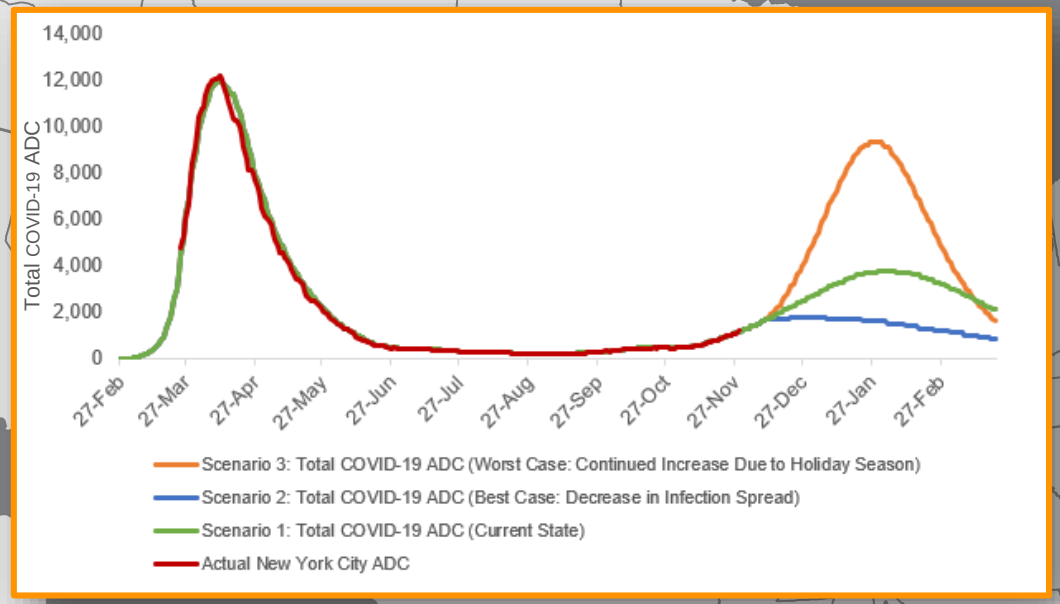
New York City – Projections and Accuracy to Date

New York City

Fall/winter Scenario Planning:

- **Current State Scenario (green):** COVID-19 ADC will slightly increase to almost 4,000 during winter (R0:1.8)
- **Best Case Scenario (blue)**: ongoing ADC increase will only slightly increase before beginning its decline from early December (R0 decreases to 1.6)
- **Worst Case Scenario (orange):** ADC may potentially increase to 9,000 if there are no mitigation strategies to stem increases due to holiday activities (R0 increases to 2.2)

Model accurate within a variance of 5% between model outputs and actual NYC COVID-19 hospitalization data from 3/25-11/29/2020



Worst Case Peak	Jan 26-31, 2021	9,300 ADC
Current State Peak	Jan 30 - Feb 6, 2021	3,800 ADC

ADC = average daily census for bed utilization

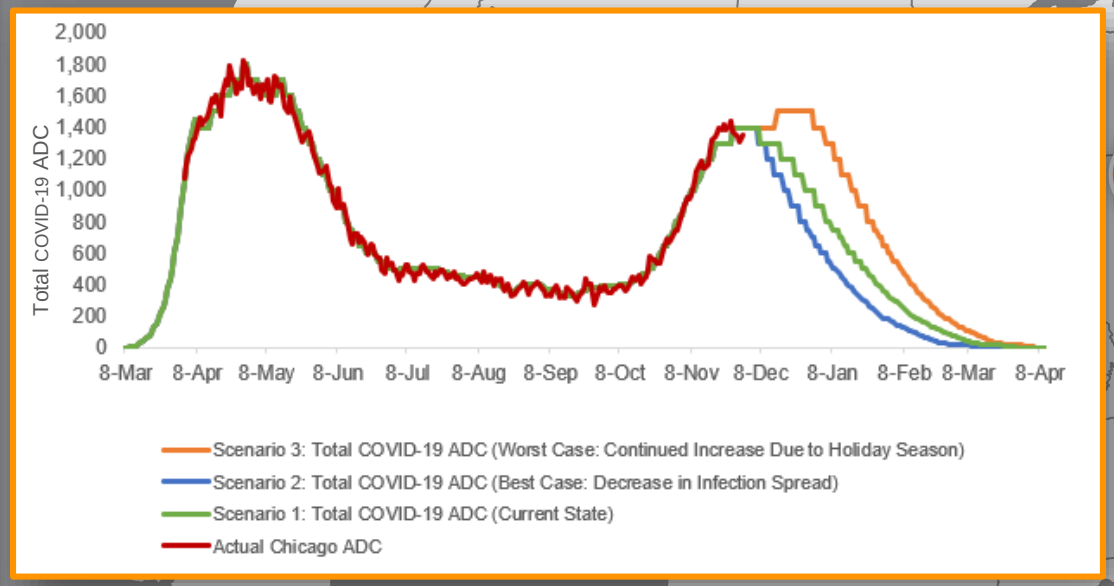
Chicago – Projections and Accuracy to Date

Chicago

Fall/winter Scenario Planning:

- **Current State Scenario (green):** COVID-19 ADC will nearly reach the spring surge in December before decreasing. (R0: 2.1)
- **Best Case Scenario (blue)**: COVID-19 ADC will decrease at a quicker rate than Scenario 1 (R0 decreases to 1.8)
- **Worst Case Scenario (orange):** Surge will last a prolonged period (peak at around 1,500) before decreasing. (R0: increases to 2.4)

Model accurate within a variance of 5% between model outputs and actual Chicago COVID-19 hospitalization data from 4/2-11/30/2020



Worst Case Peak	Dec 15-30, 2020	1,500 ADC
Current State Peak	Nov 26-Dec 7, 2020	1,400 ADC

ADC = average daily census for bed utilization

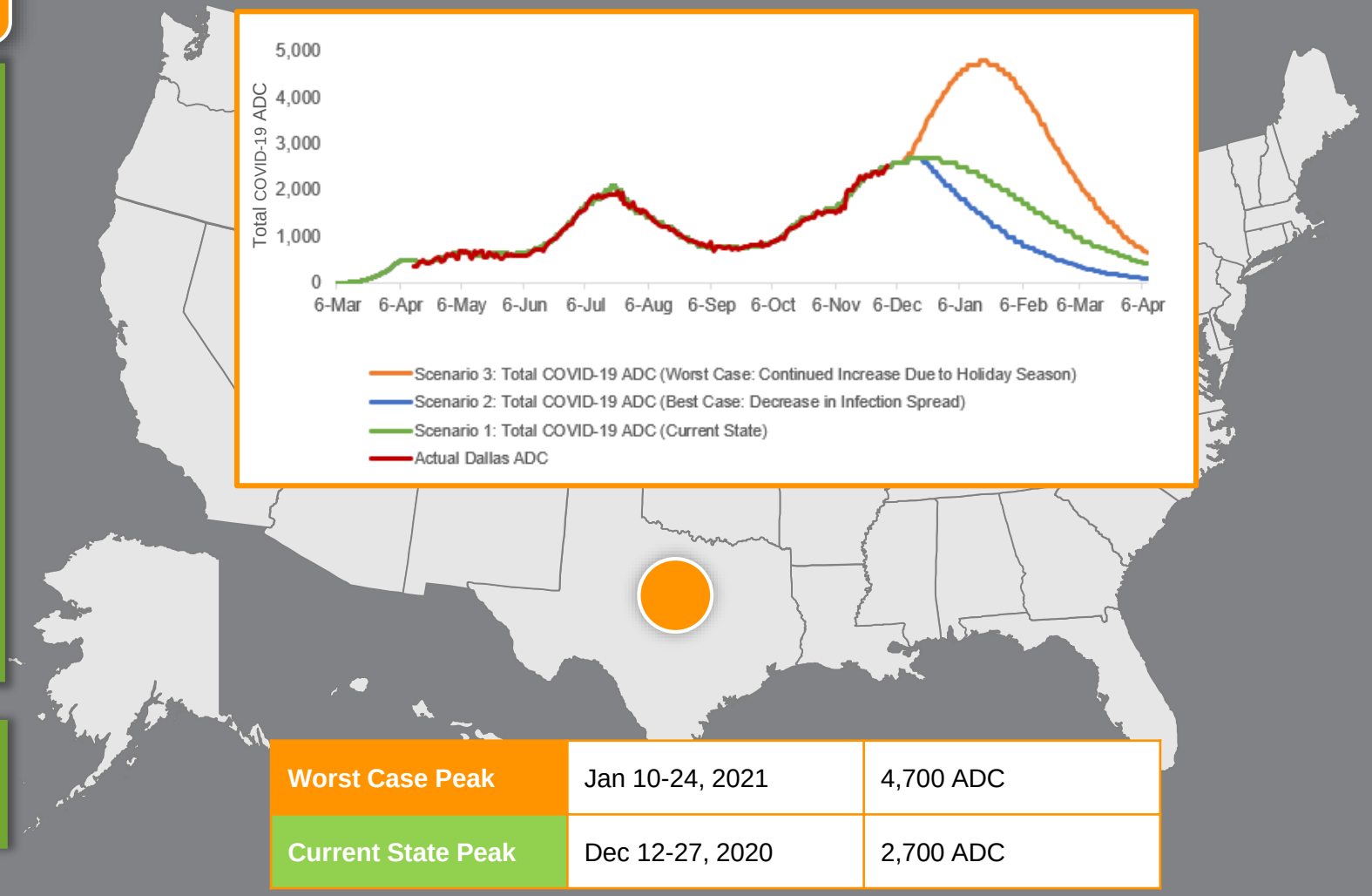
Dallas-Fort Worth Metroplex – Projections and Accuracy to Date

Dallas-Fort Worth

Fall/winter Scenario Planning:

- **Current State Scenario (green):** COVID-19 ADC will exceed the summer surge and will remain prolonged throughout December/January. (R0: 1.4)
- **Best Case Scenario (blue)**: COVID-19 ADC will exceed the summer surge, but will decline from late-January (R0 decreases to 1.2)
- **Worst Case Scenario (orange):** Surge expected to exceed summer surge and increase to about 5,000 ADC mid-late January (R0 increases to 1.7)

Model accurate within a variance of 6% between model outputs and actual Dallas COVID-19 hospitalization data from 4/12-12/1/2020



Worst Case Peak	Jan 10-24, 2021	4,700 ADC
Current State Peak	Dec 12-27, 2020	2,700 ADC

ADC = average daily census for bed utilization

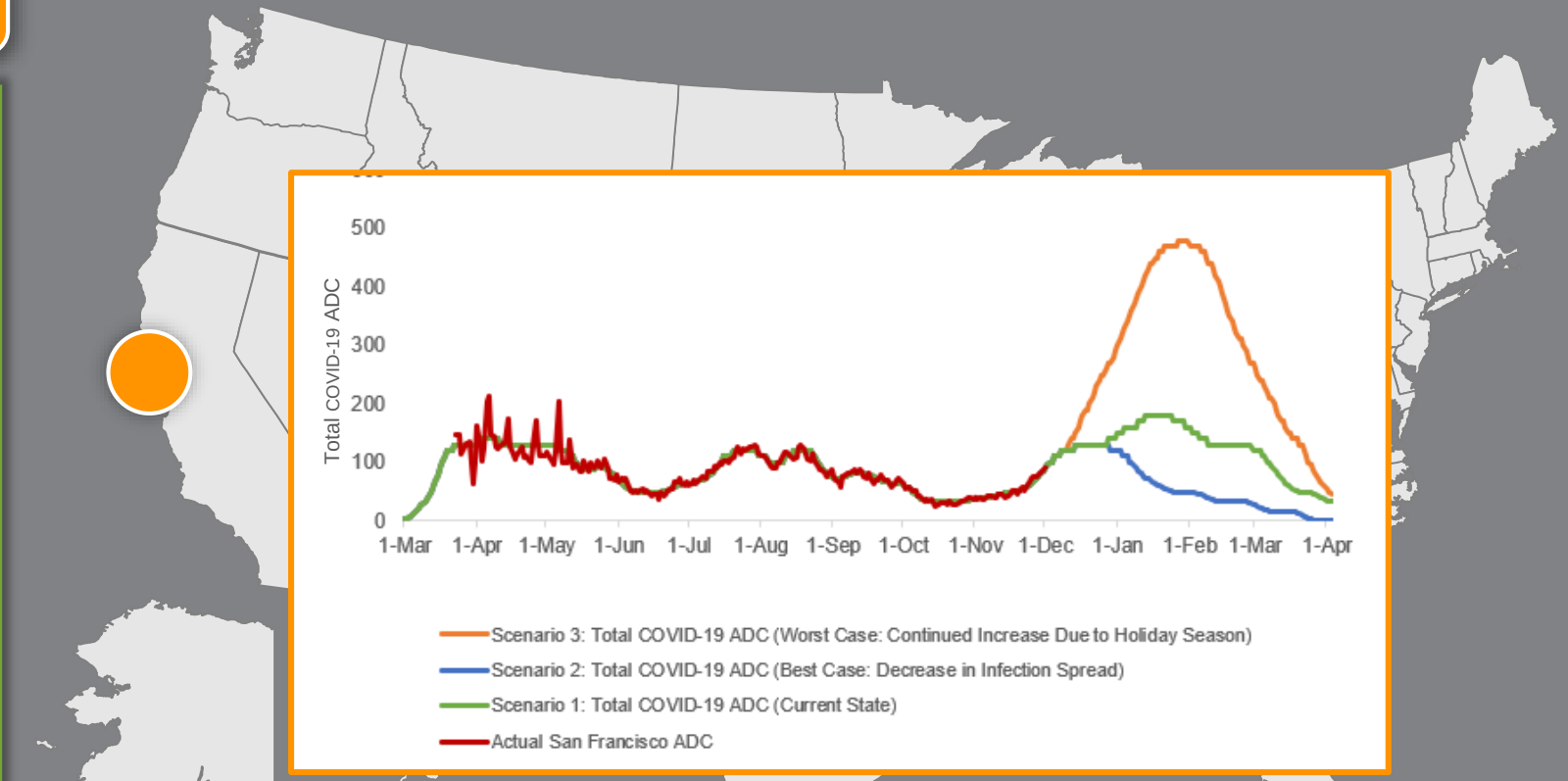
San Francisco – Projections and Accuracy to Date

San Francisco

Fall/winter Scenario Planning:

- **Current State Scenario (green):** COVID-19 ADC will reach the spring/summer surges. (R0: 1.6)
- **Best Case Scenario (blue)**: COVID-19 ADC will decrease at a quicker rate than Scenario 1. (R0 decreases to 1.4)
- **Worst Case Scenario (orange):** Surge expected to surpass previous peaks, to reach about 500 ADC without mitigation strategies. (R0 increases to 1.9)

Model accurate within a variance of 9% between model outputs and actual San Francisco COVID-19 hospitalization data from 3/23-12/1/2020



Worst Case Peak	Jan 21 – Feb 5, 2021	470 ADC
Current State Peak	Jan 13-24, 2021	180 ADC

ADC = average daily census for bed utilization

Strategic Considerations:
COVID-19 Hospital Focus for Winter

Moving Forward

- **Hospital Surges Continue:** Second/third waves drive inpatient surges, as populations move indoors.
- **Population Behavior Varies by Market:** Social distancing measures, flu vaccine adherence and rising COVID immunity levels will offset surges but will vary by market.
- **Elective Surgery Pauses:** Hospitals' ability to remain open for elective procedures will largely hinge on workforce capacity. Expect cancellations of scheduled surgeries across the US. But unlike in the spring, they will be tailored to select procedures and sites and for limited duration.
- **Inpatient Capacity Dictated by Staffing:** Staff shortages will challenge hospitals' ability to flex up during surges, particularly for ICU care. Increased ICU demand for higher acuity non-COVID-19 conditions will further strain critical nursing resources.

To Maintain Effective Operations, Focus On:

Operational Effectiveness:
- Workforce Deployment
- Safety & Infection Control
- Flex Spacing and Access

Supply Resiliency:
- PPE Procurement
- Testing
- Vaccine Distribution

Financial:
- Payment Model Evaluation
- Service Distribution
- Capital Deployment

Appendix

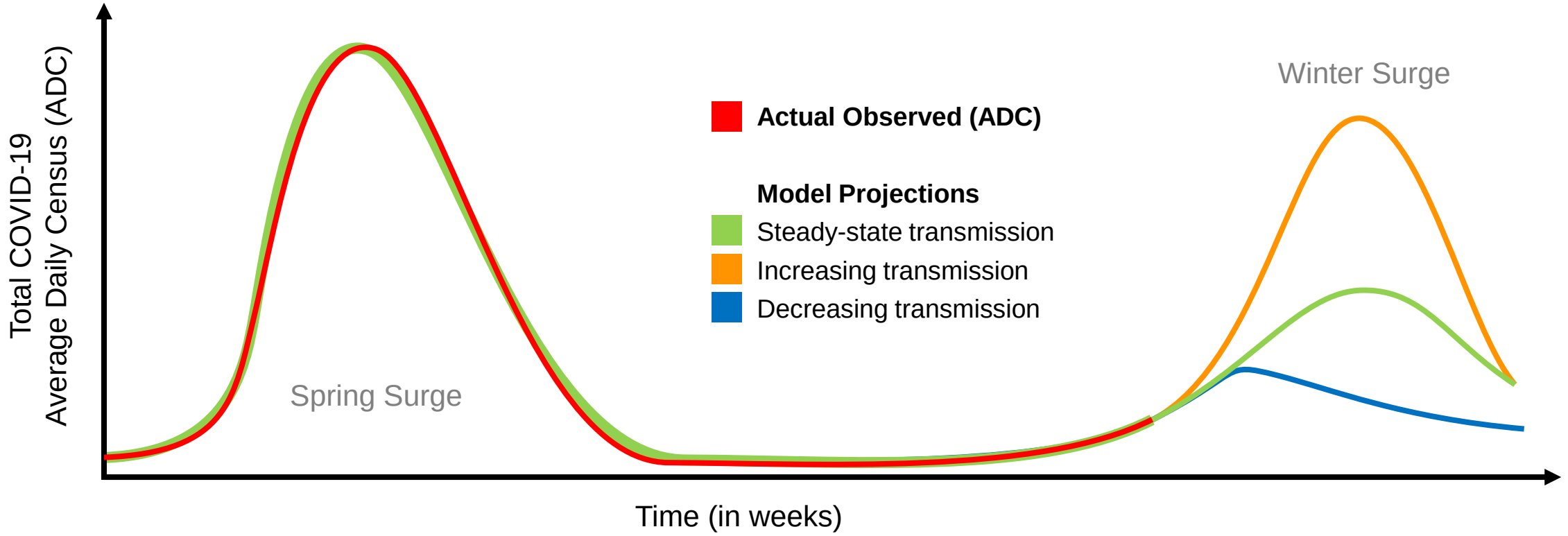
Sg2 COVID-19 Surge Demand Calculator Validation

- **Average Daily Census (ADC) Validation:**
  - Sg2's Surge Demand Modeling was able to **accurately predict and match COVID-19 ADC data** from 6 regions across the nation and **demonstrate the variance in COVID-19 potential resurgence** by region
  - Model was able to match actual COVID-19 ADC data with **less than 10% variance from April to early December** for which actual COVID-109 ADC data is available (average variance across all 6 markets: 6.0%)
- **Total Infected Population Validation:**
  - SIR calculator for running percentage of total infected population **aligns with seroprevalence data** in New York City, NY; Chicago, IL; and San Francisco, CA
  - New York City case example:
    - New York City study reports 20.0% and 22.7% antibody positivity for SARS-CoV-2 between April 19-28, 2020
    - Sg2 modeling using SIR methodology projects total running infection rate for New York City to be 21.9% on April 19 and increasing to 24.5% on April 28

Sources: Stadlbauer D et al. Repeated cross-sectional sero-monitoring of SARS-CoV-2 in New York City. Nature. November 2, 2020; Rosenberg ES et al. Cumulative incidence and diagnosis of SARS-CoV-2 infection in New York. Ann Epidemiol. 2020;48:23–29.e4; Anand S et al. Prevalence of SARS-CoV-2 antibodies in a large nationwide sample of patients on dialysis in the USA: a cross-sectional study. Lancet. 2020;396(10259):1335–1344.

Understanding the SIR Modeling

Sample Market Projections
Average Daily Census (Non-ICU and ICU Bed Utilization)



Calculator Methodology

- The calculator incorporates the reproductive rate (R_0) and adjustable variables to model multiple viral spread scenarios in order to more accurately model local market second and third waves' impact on inpatient demand.
  - Uses (susceptible, infected, recovered) SIR epidemiological model as a foundation
  - Ability to adjust SIR model to incorporate a client-input for market population by age cohort
  - Incorporates different hospitalizations rates by age cohort
  - Customized reproductive rates that vary with time based on client input for local market transmission
  - Translates SIR model to need for non-ICU beds, ICU beds, and ventilator need by applying hospitalization rates, reproductive rates, and average length of stay to the infected population