SOCIETY OF ACTUARIES

COVID-19 Mitigations in the U.S. September to December 2020

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COVID-19 Mitigations in the U.S.

September – December, 2020

AUTHORS David Ingram, CERA, FSA, MAAA
Daniel Ingram, MBA
Thomas McAndrew, PhD

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COVID-19 Mitigations in the U.S.

September – December 2020

This report provides highlights of a weekly survey of practices regarding the mitigation of the spread of COVID-19 in the U.S. during the final four months of. The survey asks about the degree to which the respondents perceive that people in their community are following 21 common mitigation practices. The responses are separated by state and compared to state level statistics regarding the level of COVID-19 infections from the Johns Hopkins COVID database for the same time period.

Executive Summary

Over the four months there was a small but steady decrease in community mitigation practices across the country from 64.8% in September to 64.4% in October, 62.9% in November and 62.7% in December. This trend took place as fall and winter weather forced much activity indoors where virus transmission is expected to be stronger than outdoors and as COVID-19 infection levels skyrocketed. These observations of mitigation practices are based upon 4487 surveys that were collected on a weekly basis. During that four-month period, the average level of active infections rose from 171 in September to 859 in December. New COVID-19 infections for December totaled 6.5 million. This is more than 5 times the 1.2 million new cases reported in September.

Additional findings from the four months:

- The daily New Infection Rate (NIR) rose and fell over the four months, starting around 8% in early September, reaching a peak of over 10% in mid-November ending the year below the No Growth level of 7.14%
- Restaurants to have reduced seating and Hairdresser/barber open with restrictions where the two mitigations that had the largest drop in compliance, both falling by 8.6% over the four months. Getting tested for antibodies and Colleges closed or holding only remote classes were the two mitigations with the largest increases in compliance (4.8% and 7.8% respectively)
- At the state level, Rhode Island reported the highest average compliance over all mitigation practices while Oklahoma reported the lowest with 50.2% average compliance. Oklahoma also reported the largest increase in average compliance over the four months with a 20% improvement, more than twice the second largest improvement in Missouri of 9%. Nevada reported an almost 20% decline in compliance, ending the four-month period with the third lowest average monthly compliance.
- COVID spread faster in New Jersey than in Texas over the four months, but both experienced a massive increase in infections that has put a huge strain on their healthcare facilities and caused tens of thousands of deaths. In Texas, most mitigations fell during this time, with a few key exceptions. In New Jersey, mitigations increased from their summertime lows when COVID was largely under control in that state.
- Adherence to two of the mitigation strategies is shown to be predictive of changes in one week ahead incident cases of COVID-19 as measured by the crowdsourcing approach.

The full set of mitigations surveyed are included in the appendix to this report.

Project Overview

This report follows the mitigations that are the practices in the U.S. to slow the spread of COVID-19 over the final four months of 2020. The information about the behavior of people in various states is captured through a crowdsourcing approach via a survey instrument. Over this four-month period, 4487 surveys were collected from people in all 50 states. Throughout the four-month period, we have collected observations about the degree of compliance with 21 specific mitigation practices on a weekly basis.

In addition, we look at the ups and downs of the course of the COVID-19 pandemic in the U.S. based upon data from the John Hopkins COVID-19 database.

The primary objective of this report and of the entire COVID Mitigation Monitoring Project is to produce information about actual community practices. Most information that was available at the outset of the project looked primarily at whether or not officials in various jurisdictions were requiring or recommending particular mitigation practices. This report and the CMMP takes that at least one step further to pay attention to the degree to which people are actually following the requirements and recommendations, which we refer to as Compliance.

Survey Details

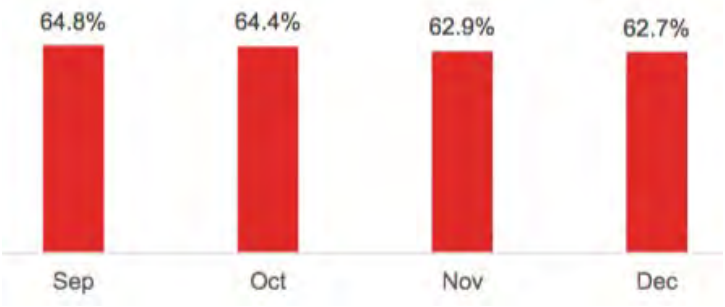
Collects information from volunteers on perceptions of community compliance with 21 COVID Mitigation strategies.
Participants answer between 0% and 100% that they see the strategy in use in their area.
Participants are asked to fill out survey every week.

Over the four-month period aggregate compliance with the 21 practices has stayed fairly flat and in the range of 62% to 65%. However, there were significant changes in compliance across the 21 practices as well as by state.

U.S. Mitigation Practices

National average mitigation compliance fell slowly but steadily through the four-month period.

Figure 1. Weighted-Average mitigation – U.S. All states



This, however, is a net result of larger and smaller changes in compliance levels both up and down for different mitigation practices. While the weighted average fell by 2.1% from September to December, compliance for many individual practices changed by much more or much less than that.

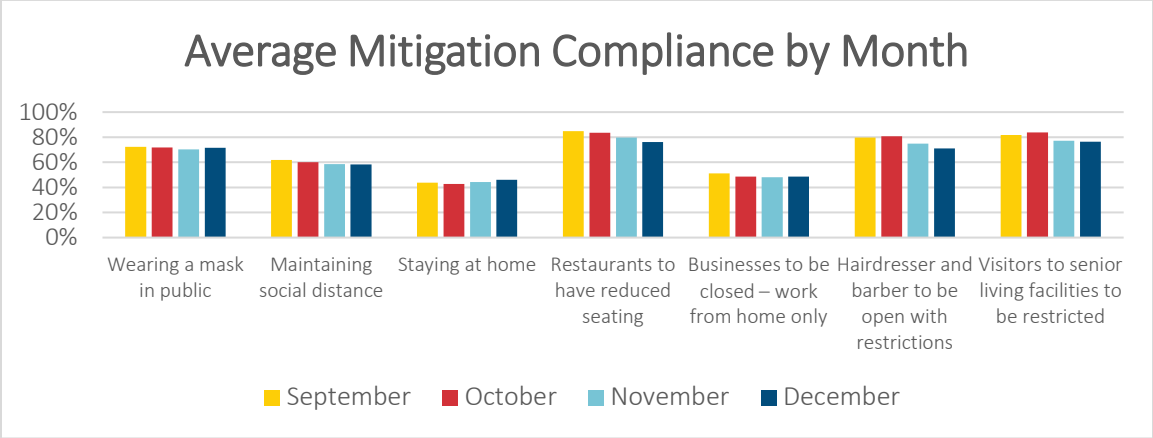
Table 1 Net change in percent compliance for 21 Mitigations from September to December 2020

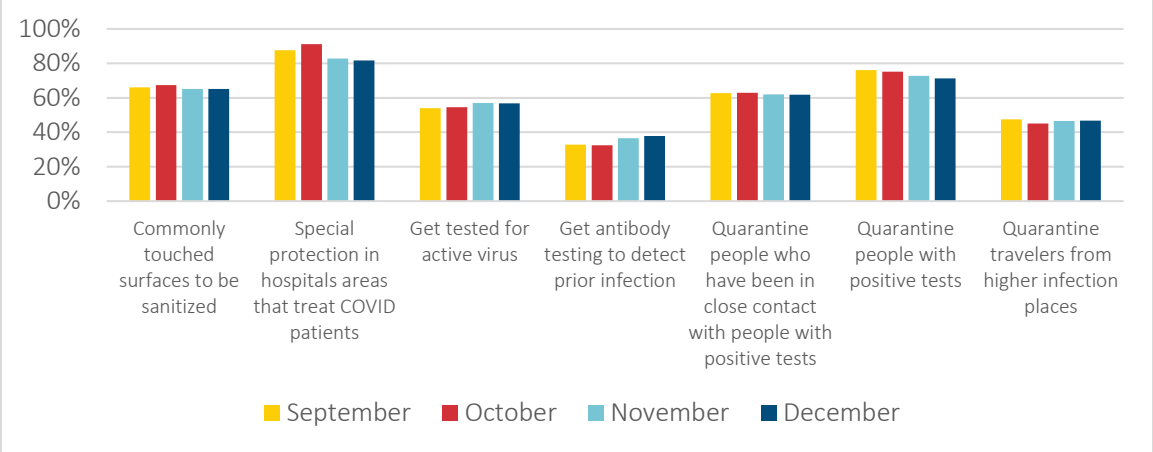
Restaurants to have reduced seating	-8.6%
Hairdresser and barber to be open with restrictions	-8.6%
Limit large gatherings of people	-6.4%
Special protection in hospitals areas that treat COVID patients	-6.0%

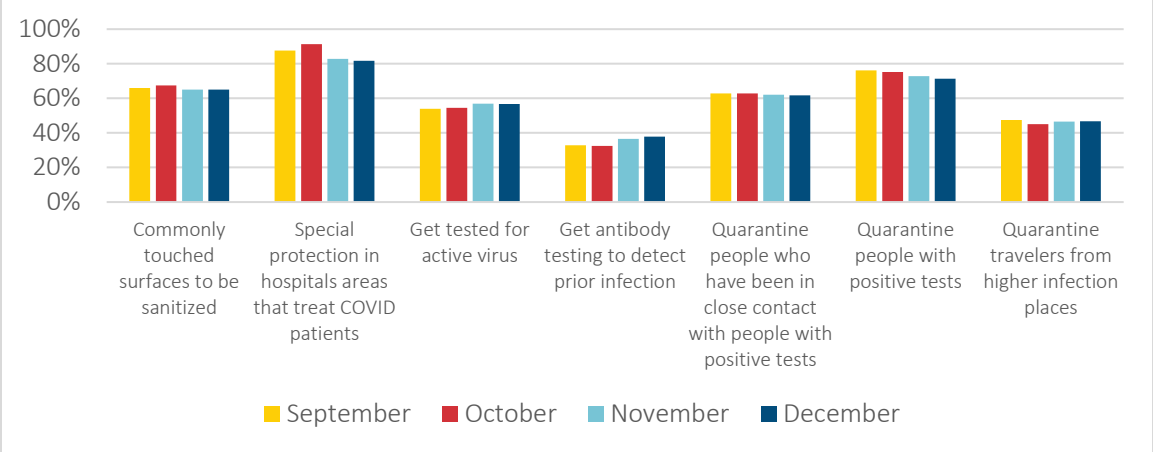
Visitors to senior living facilities to be restricted	-5.4%
Quarantine people with positive tests	-4.9%
Maintaining social distance	-3.6%
Local approach to limiting COVID spread	-3.5%
Businesses to be closed – work from home only	-2.7%
Quarantine people who have been in close contact with people with positive tests	-1.0%
Commonly touched surfaces to be sanitized	-1.0%
Wearing a mask in public	-0.8%
Quarantine travelers from higher infection places	-0.8%
Violations of COVID restrictions result in fines or police enforcement	2.0%
Local level of COVID infections	2.1%
Statewide targets for reducing COVID spread	2.2%
Staying at home	2.5%
Schools (K-12) are closed or holding only remote classes	2.6%
Get tested for active virus	2.8%
Get antibody testing to detect prior infection	4.8%
Colleges are closed or holding only remote classes	7.8%

This overall pattern, of decreasing compliance, indicates that in general, communities (or a significant minority of people within U.S. communities) have chosen to allow the spread of COVID-19 rather than continue with practices that might slow the spread.

The following graphs show the path of compliance over the four months and the level for each of the 21 mitigations.

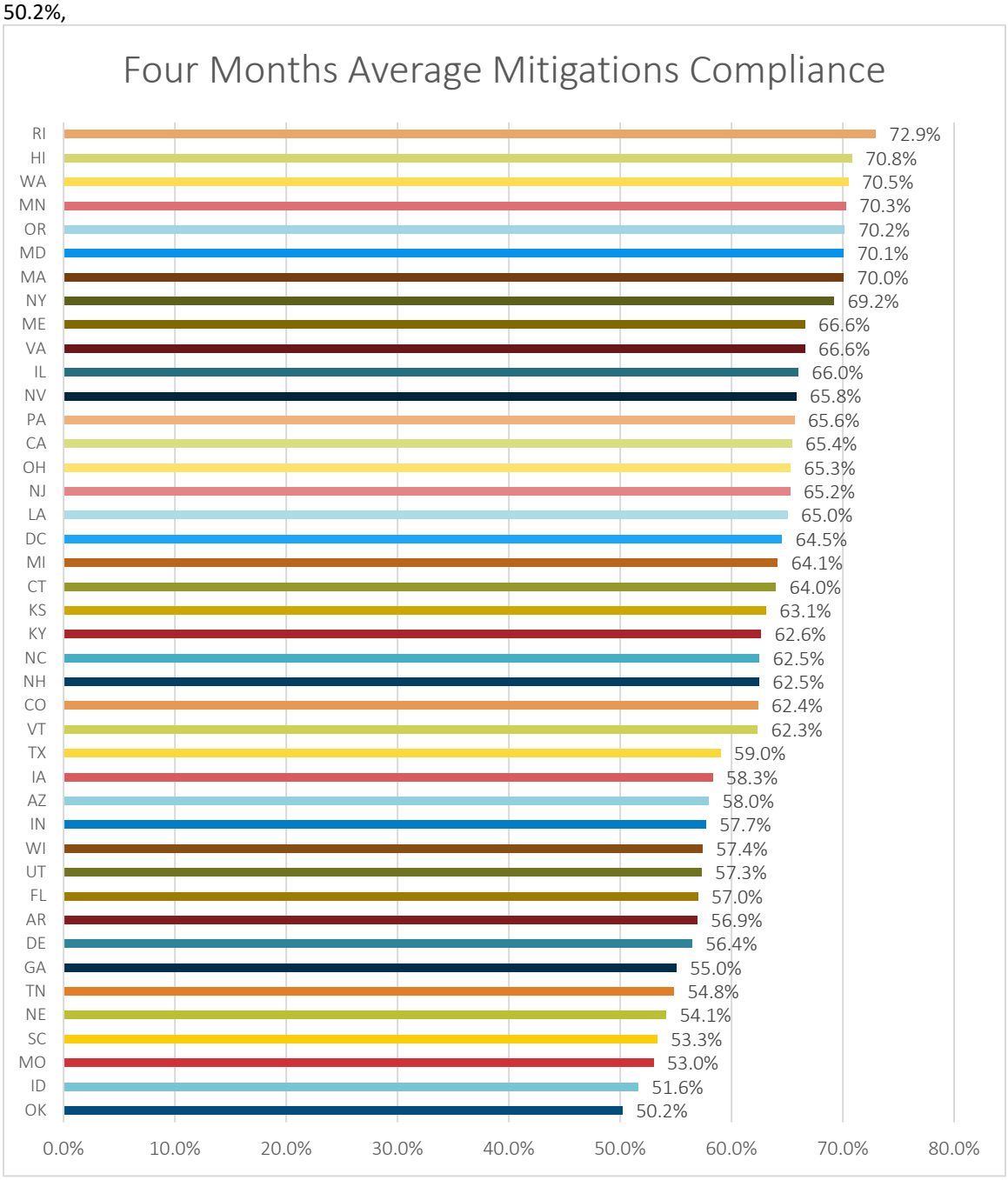






Mitigation Practices – State Level

There was data to calculate average mitigation compliance over the four-month period for 36 states. This shows the highest average compliance for Rhode Island with 72.9% and the lowest for Oklahoma with 50.2%,

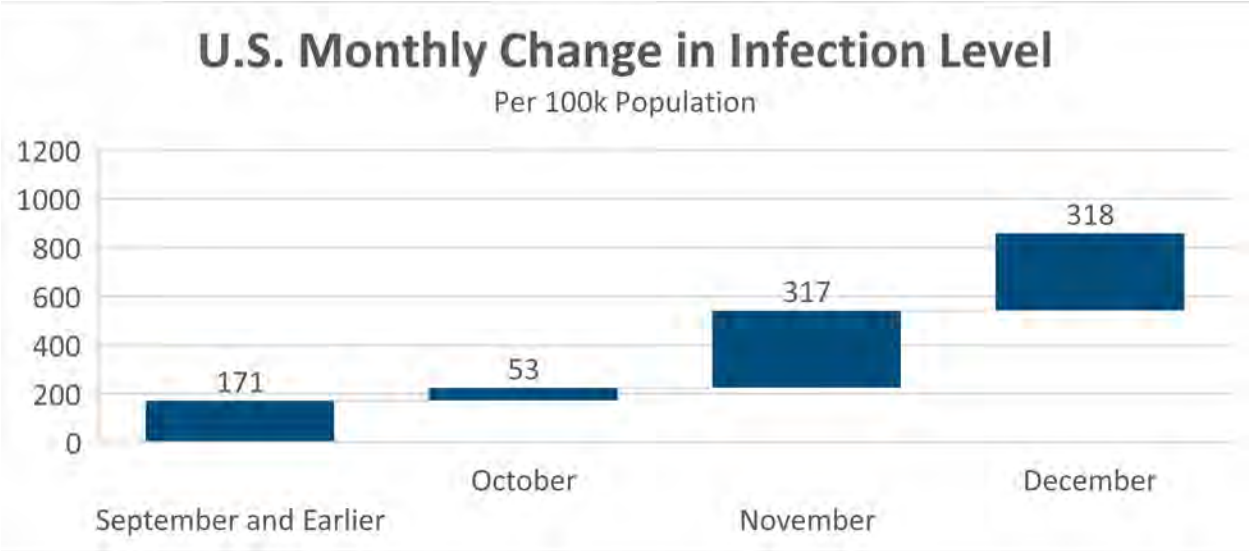


In the following 14 states, the average mitigation compliance changed by 5% or more from September to December. Oklahoma was especially notable with a 20% increase in average compliance, even though Oklahoma ended December as the lowest average compliance state.

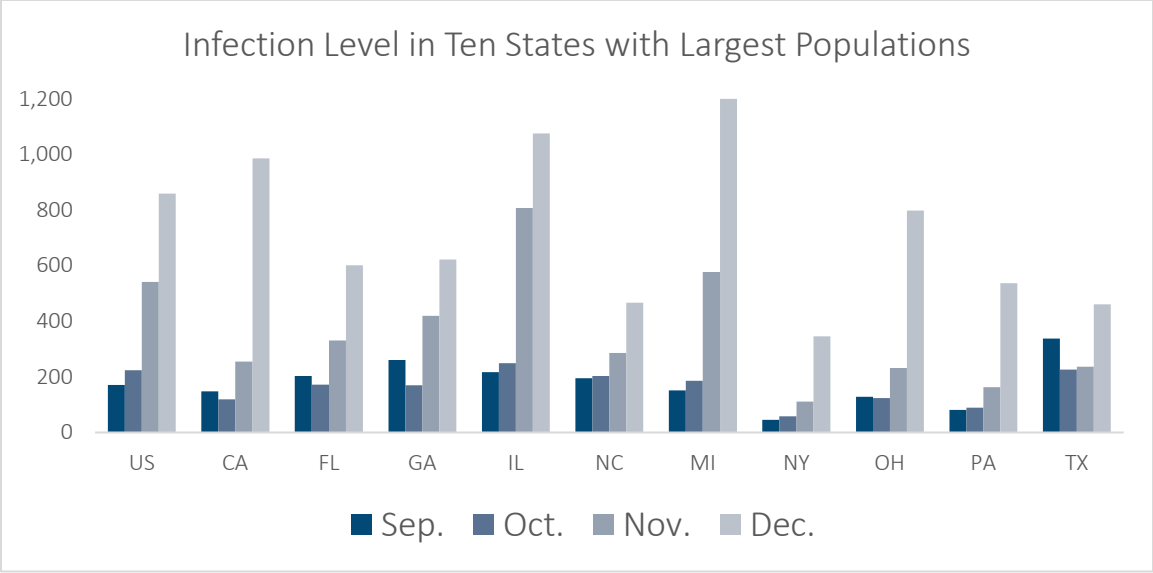
	Four Month Average	Sep	Oct	Nov	Dec	Change from September to December
Oklahoma	50.2%	36%	53%	56%	56%	20%
Missouri	53.0%	46%	56%	56%	54%	9%
Rhode Island	72.9%	70%	66%	78%	78%	9%
Indiana	57.7%	56%	56%	55%	63%	7%
Nebraska	54.1%	48%	52%	62%	54%	7%
Tennessee	54.8%	51%	60%	52%	57%	6%
Iowa	58.3%	56%	54%	62%	61%	5%
Florida	57.0%	60%	56%	57%	55%	-5%
North Carolina	62.5%	66%	64%	60%	60%	-6%
Illinois	66.0%	67%	69%	67%	61%	-7%
Idaho	51.6%	57%	45%	55%	49%	-8%
Virginia	66.6%	71%	68%	63%	63%	-8%
Oregon	70.2%	76%	64%	78%	63%	-13%
Nevada	65.8%	77%	61%	67%	58%	-19%

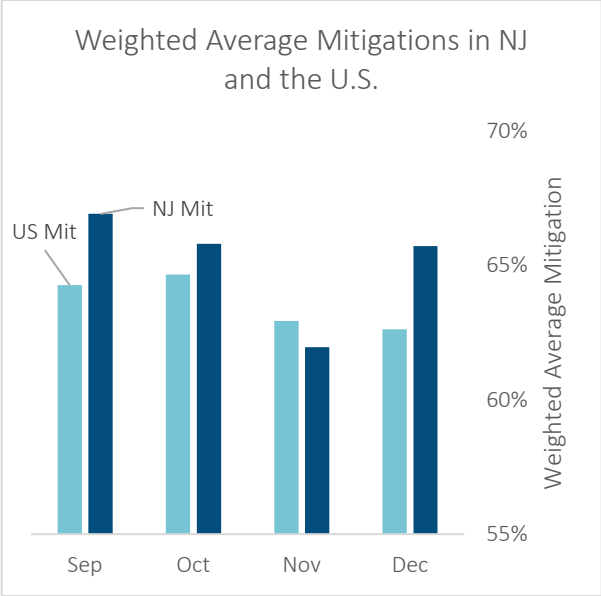
COVID-19 Spread of Infections – National

In September the national infection level per 100,000 of population averaged under 200. In October there was a small increase in average infection level which brought the national figure up to 224. Much larger increases were experienced in November and December with the infection level doubling in November and further increasing by over 50% in December.



Focusing in on the infection levels for the ten most populous states, a similar but somewhat less severe pattern emerges in many of those states. In September, the average infection level of the 10 most populous states was 177, quite close to the national average of 171. But by December, the national average infection level was 859, while the ten largest states averaged only 728. The average rose by 311% in the largest states, but rose by 402% nationally. However, several of the largest states did much worse than the national average. The most severe examples were California, Michigan, and New York. California was well below the national average at 148 in September but was higher than the national average by 127 per 100,000 by December. Michigan and New York had even higher percentage increases (811% and 652% vs. 565%) than California over the last quarter.

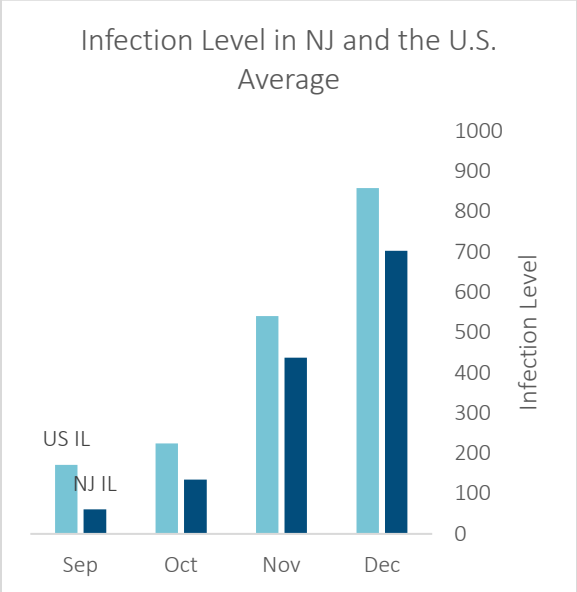




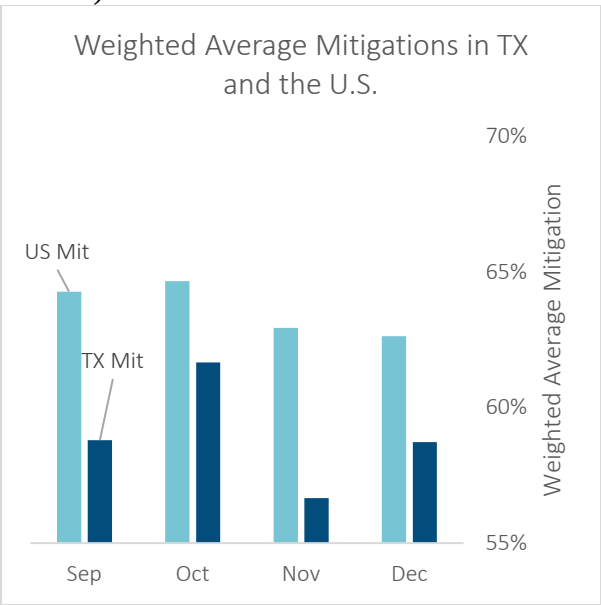
Mitigation vs. COVID Spread in New Jersey and Texas

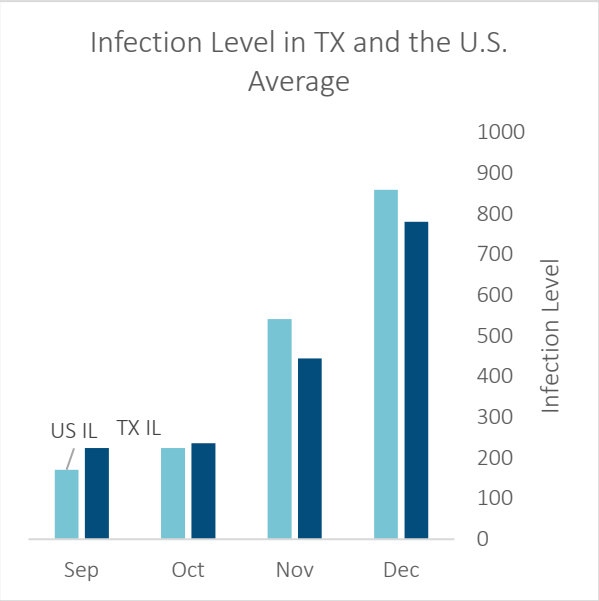
In this section the mitigations in Texas and New Jersey are examined over the last four months to show how those changes have compared to the spread of COVID within those states. These states were chosen for several reasons. The first and most important reason was that they have more observations during the four months than almost any other state. During the last four months, there were 304 observations from Texas, including 11 different weeks where the data we collected was statistically significant. For New Jersey we had 207 observations, including 13 weeks with statistical significance. We had 316 observations, including 11 weeks of statistically significant data from New York and 334 observations from Pennsylvania including 12 weeks of significant data. The second reason that New Jersey and Texas were chosen is because of the varied picture they provide of how COVID is being handled in different states.

In New Jersey, the average mitigation level has been above that of the country consistently. At the same time, the Infection Level in New Jersey has been far lower than that of the country as a whole . Mitigations in New Jersey fellprecipituously between October and November, but recovered and once again surpassed the national average in December. The fall in Complianec in New Jersey coincided with the large outbreak in COVID as the infection level went from an average of 135 in October to 438 in November.



Texas' situation has been very different. Though Texas has had a lower average mitigation throughout the last four months, its infection level rose less in the last two months than the national average. While in September Texas' Infection Level (224) was over four times higher than New Jersey's (61), it has since reached near parity (TX:781, NJ:703).

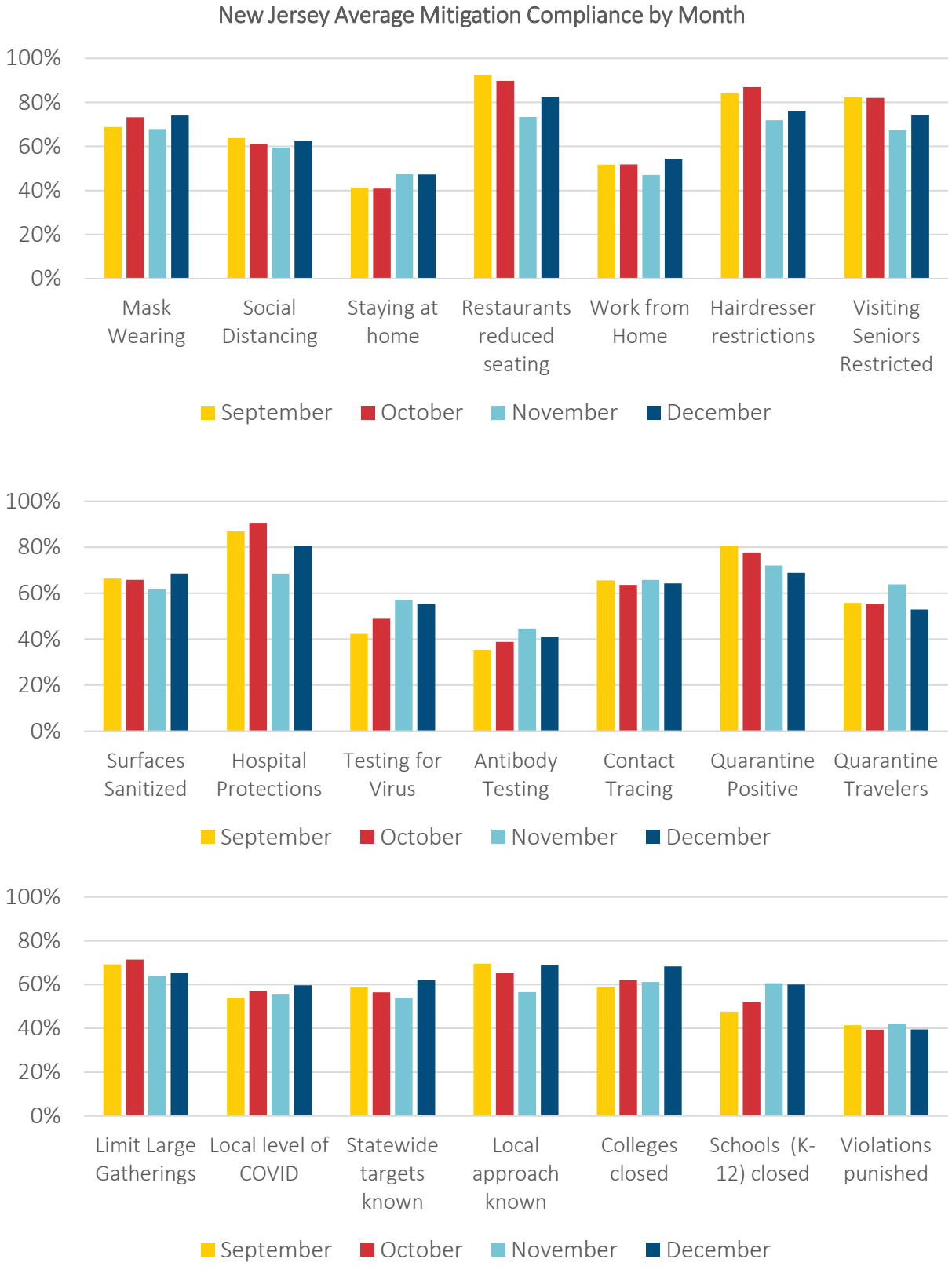




There are so many factors determining the spread of COVID, both the 21 mitigation strategies covered by the survey and exogenous factors outside the scope of this report. As a result, it is difficult to ascertain why Texas' infection level rose by less than New Jersey's, and to understand sufficiently what actions were most important that were taken by individuals, businesses, and political leaders in Texas and New Jersey. Despite this difficulty, we believe that investigating the changing compliance with the 21 surveyed mitigations tells a compelling narrative about why COVID spreads at different rates in different states and helps explain ways that states can organize their actions to reduce the spread.

The next section tells the story of how Texas and New Jersey have changed their mitigation strategies over the last four months, and how those changes have altered the spread of COVID within those states. We take a look at how each state's individual mitigations have changed over the last four months and compare those changes to each other and the national average.

Changing Mitigations in Texas and New Jersey



Within these 21 practices that are surveyed, New Jersey had considerable movememt among its mitigations during the four months. The mitigation with the largest variation within those months was Special Protections in Hospitals that Treat COVID Patients. In November, this practice fell from 90% to 68% on average. We believe this was as a result of hospitals being overwhelmed and unable to provide as stringent of protections as they had previously been doing, as that number once again rose to 80% in December.

The mitigations with the largest decline during the four months were Restaurants to Have Reduced Seating (-10%) and Quarantining of People who Have Tested Positive (-12%). The reopening of restaurants and removal of restrictions on Hairdressers and Barbershops (-8%) seem to reflect a growing exaustion among some people of keeping their lives restricted during the pandemic. Despite this trend for those practices, there were quite a few similar mitigations which increased. More people wore masks (+5%) and stayed at home (+6%). The mitigations which rose the most were Testing for the Virus (+13%), Schools K-12 Closed or Remote Only (+12%), and Colleges Closed or Remote Only (+9%).

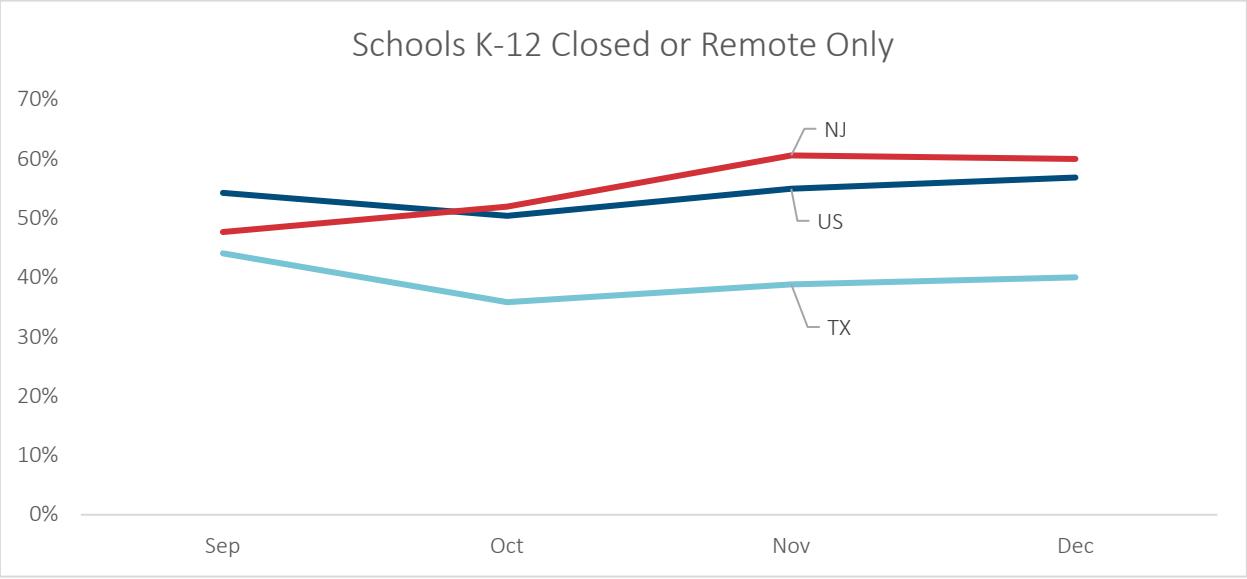
Taken in concert, these changes show in small scale in New Jersey what we have witnessed across the country – the patchwork mitigations against COVID adopted at the state level are not working and make it difficult for people to understand what they should and should not be doing to stop the spread of COVID. While Good Communication of the Local Level of COVID Infections increased in New Jersey (+6%, up to 60% by December), Communication of Statewide Targets rose less (+3%, to 62%), and Communication of the local approach did not change (-1%, to 69%). While these were all higher than the national averages (57%, 58%, and 63% for the U.S., respectively), they still show that at least a third of people do not know what the local and state targets are for containing COVID nearly a year into the pandemic.

The changing mitigations in Texas tell a completely different story than mitigations do in New Jersey. There was less variation in mitigations in Texas during the four months. Overall Texas had only 89% of the variation that New Jersey did, and saw a decline in mitigations almost across the board. On average, mitigations in Texas fell by 2% during the four months, with some notable exceptions.

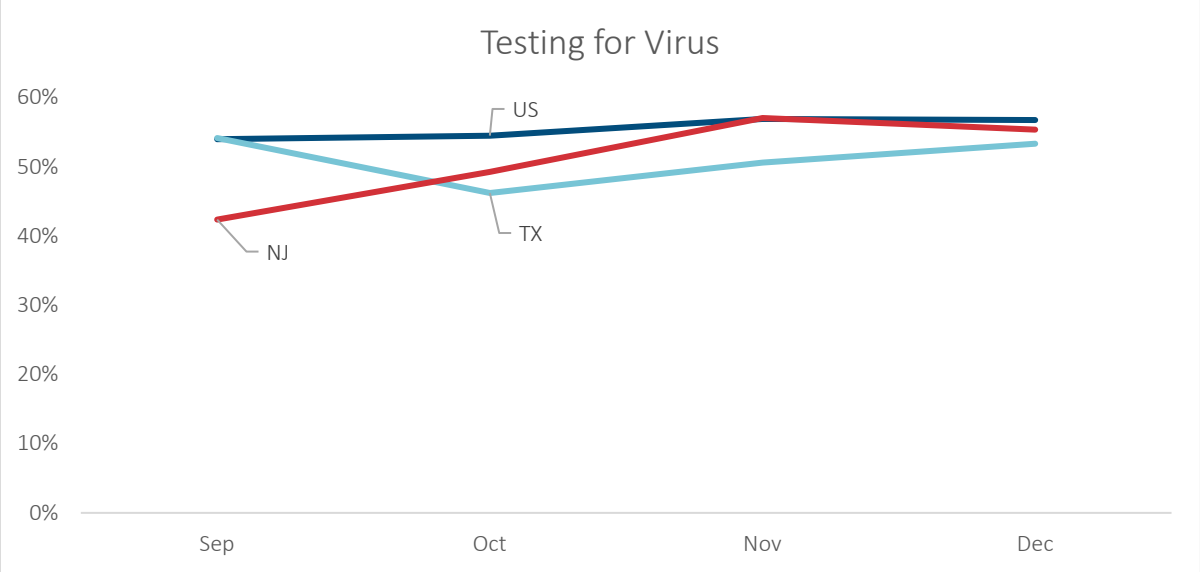
Over the four months, punishment of violations grew substantially in Texas (+10%). While most violations still go unpunished (31% enforcement), this large growth represented a meaningful change in a state that prides individualism so strongly. Colleges Closed or Remote Only increased in Texas (+11%, to 50%) similarly to New Jersey (+9%, to 68%) and the U.S. (+8%, to 61%). However, fewer K-12 schools in Texas were closed or remote only (-4%, to 40%), while more schools closed in New Jersey (+12%, to 60%) and the U.S. (+3%, to 57%). This highlights some of the unique facets of Texas' approach to COVID over the last four months.

Businesses and group activities have soared in Texas over the last four months. There is less Mask Wearing in Public (-4%, to 70%), less Social Distancing (-6%, to 58%), less Restaurants with Reduced Seating (-11%, to 67%), less restrictions on Hairdressers and Barbers (-9%, to 70%), less restrictions on Visiting Senior Living Facilities (-7%, to 74%), and less Limiting Large Gatherings (-8%, to 54%). Overall this paints a picture of a state in which a section of the population has decided it will no longer adhere to COVID restrictions and is returning to life as normal – resulting in the increase in enforcement discussed above.

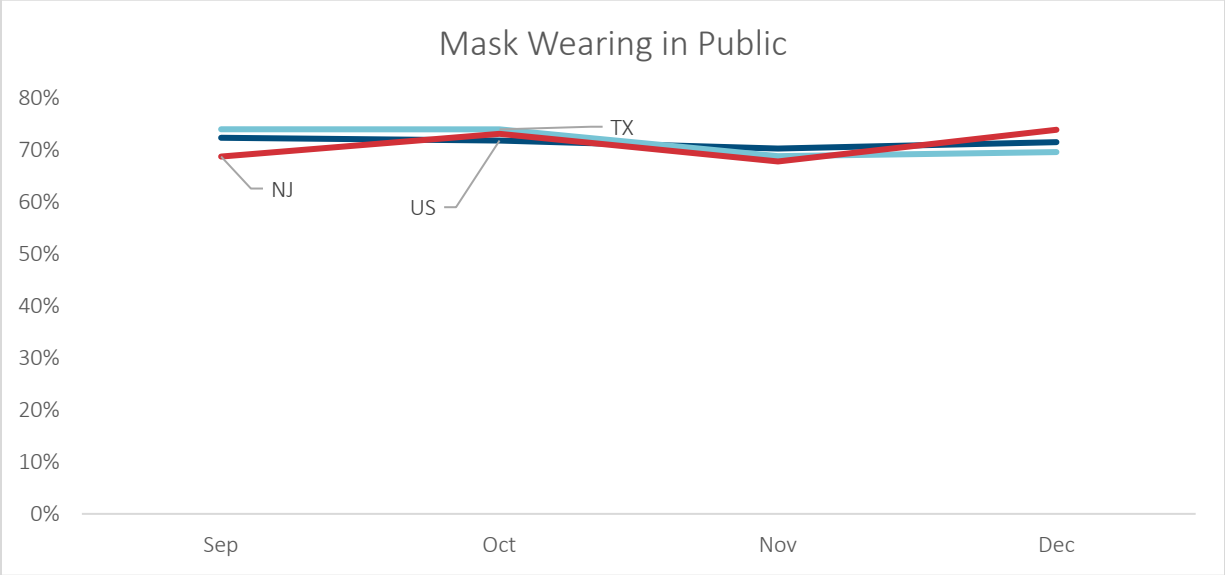
It is unclear how Texas has managed to see COVID spread slightly less over the last few months than in other states. One explanation might be that it is such a large state that localized outbreaks have been contained to specific areas, like the surge in El Paso, while much of the more rural areas have remained mostly safe. More data would need to be gathered to understand why and if this might be true. Another explanation is that the majority of people are adhering to the mitigations consistently, and those who are not adhering are consistent, so that while there is change and reduction in mitigations, those who are following are keeping social distancing and removing themselves from the pool of possible infections so as people reduce their mitigations, they are the ones getting sick and the number of possible infections is shrinking over time from among that pool. More data would need to be collected to look at the stratification of populations into those following mitigations and those not to see if this kind of separate risk pools exist.



Looking a little more in depth at some specific mitigations reveals just how different Texas, New Jersey, and the U.S. overall have approached COVID in the last four months. At the start of the school year, about half of schools were closed or remote only across the country (51%). In a few states, we had reports of as few as 20% of schools doing this and as high as 90%. The standard deviation among states at that time was 22%. During December we averaged slightly more schools closed (56%) but had a far lower standard deviation of only 16%. This tightening of state practices overall and small but significant rise in school closures in the U.S. concurrent with Texas' decrease leads Texas to be a full standard deviation below the national average in school closures.



Four months ago, New Jersey was testing for the virus far less than either Texas or the national average. During September, the standard deviation for testing across the country was 13% and has fallen to 11% in December, a minor difference that is significant given the large sample sizes involved. The average has risen over this time from 52% to 57%. While testing in Texas fell between September and October, it has since risen to come close to the national average. Likewise, New Jersey had relaxed its testing during the summer as the infection level there was far less than in most states. After the sharp increase in cases started this fall, New Jersey has since brought its testing in line with the national average. These large changes show how independent state legislatures executing policies independently can lead to lag times that reduce the effectiveness of their policies overall. While the virus was surging, Texas struggled to keep up its testing while New Jersey was able to increase it dramatically.

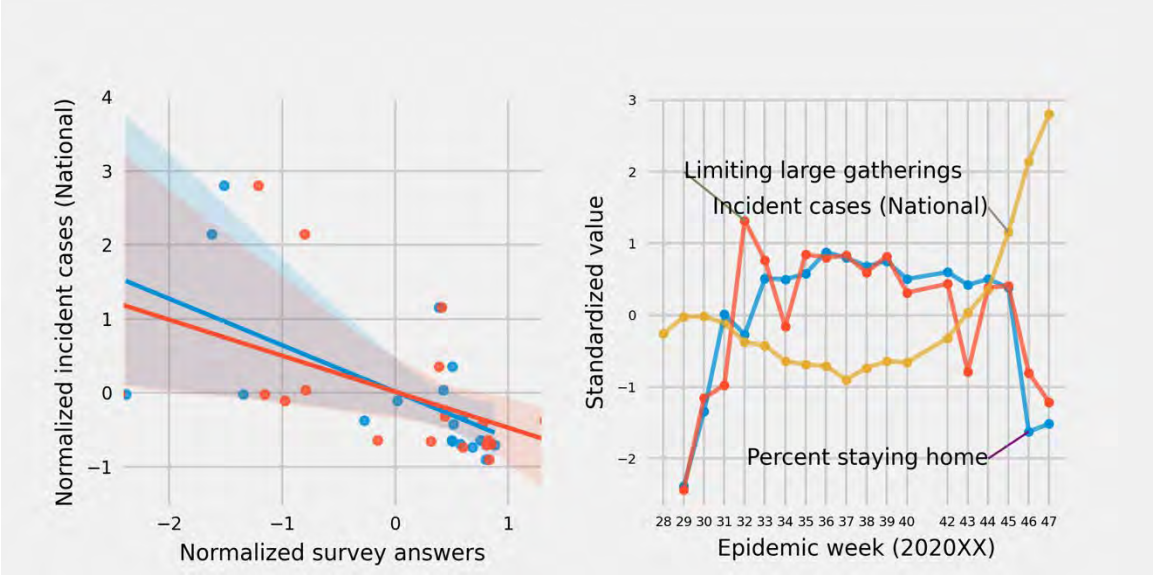


When it comes to mask wearing, New Jersey and Texas have stayed extremely close to the national average across the last four months. For the U.S. the average has risen from 69% in September to 71% in December, while the standard deviation has fallen significantly from 14% to only 8%. This puts the changes in Texas and New Jersey during that time well within a standard deviation and suggests that policies and practices in this mitigation have only gotten more consistent across time. This tightening suggests that the focus of recent executive orders by the incoming administration on mask wearing are somewhat unnecessary. Building a groundwork for a nationwide response to COVID makes sense, but it seems focusing on this mitigation may not be the best strategy given that there is far less deviation across the country in this practice than there is in many others.

Concluding thoughts on New Jersey and Texas

Over the last four months we have witnessed a drastic increase in COVID across the country. During that time COVID spread faster in New Jersey than in Texas, but both experienced a massive increase in infections that has put a huge strain on their healthcare facilities and caused tens of thousands of deaths. In Texas, most mitigations fell during this time, with a few key exceptions. In New Jersey, mitigations increased from their summertime lows when COVID was largely under control in that state. The differences in approaches and lack of comprehensive planning across many states has led to a patchwork approach to limiting the spread of COVID. Communities in Texas and New Jersey are still unaware of their local and statewide approach at a high level, and changing policies have limited the ability of people to make consistently safe decisions. People in Texas exhibited an apparent exhaustion with following many social-related mitigations like going to restaurants and limiting large gatherings, while in New Jersey we saw a sharp decline in quarantining people with positive tests, likely leading to those people infecting far more individuals than would be possible with more stringent mitigations in place.

Correlations between Mitigations and Infection Levels



Caption: (Left) the number of incident confirmed cases of COVID-19 at the US national level as reported by the Johns Hopkins Center for Systems Science and Engineering plotted against the previous week's average survey response values. Respondents could answer None (0%), Few (20%), Some (40%), Many (60%), Most (80%), and All (100%) and answers were assigned values from 0 (0%) to 5 (100%). Answers for two questions are shown: "What percent of people in your community do you notice are usually staying at home" in red and "In your community, how common is it for people to follow recommendations to limit gatherings" in blue. Incident cases and survey responses were normalized by subtracting their means and dividing by their standard deviation. A linear regression was fit. (Right) The normalized number of incident cases at the US national level, and the previous week's average survey response for both questions by epidemic week. Surveys and incident cases data was collected from July 2020 to Nov. 2020. The previous week's average response was correlated with incident cases. The percent staying home question has a reported correlation of 61% and the question that asked whether respondents are limiting large gatherings was 47% correlated with week ahead cases. Adherence to mitigation strategies is predictive of changes in one week ahead incident cases of COVID-19 and can be measured with a crowdsourcing approach.

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Project Working Group members:

Max Rudolph, FSA, CFA, CERA
Kailan Shang, FSA, CFA, PRM, SCJP
Robert Wolf, FCAS, CERA
John Stark, FSA, CERA

At the Society of Actuaries:

R. Dale Hall, FSA, MAAA, CFA, CERA

Note on Mitigation Compliance Observations

The COVID mitigation information is collected via a SurveyMonkey survey. In that survey, observers are asked to say what they are seeing in their community regarding the percentage compliance with 21 specific mitigation activities. The observers are volunteers who were either recruited personally by the project team or who responded to a variety of solicitations for observers via Twitter, Facebook, LinkedIn, and SurveyMonkey. This data is subject to self-selection and other biases. No adjustments have been made to the data that we have collected in order to respond to possible biases. Responses are aggregated and the average of multiple views are treated as true information about the mitigation activity in a state. The variance of the responses in a state has been examined and targets are set for a higher number of responses in states where there is a higher variance of responses.

Appendix List of Mitigations under Study

- Wearing a mask in public
- Maintaining social distance
- Staying at home
- Restaurants to have reduced seating
- Businesses to be closed – work from home only
- Hairdresser and barber to be open with restrictions
- Visitors to senior living facilities to be restricted
- Commonly touched surfaces to be sanitized
- Special protection in hospitals areas that treat COVID patients
- Get tested for active virus
- Get antibody testing to detect prior infection
- Quarantine people who have been in close contact with people with positive tests
- Quarantine people with positive tests
- Quarantine travelers from higher infection places
- Limit large gatherings of people
- Local level of COVID infections
- Statewide targets for reducing COVID spread
- Local approach to limiting COVID spread
- Colleges are closed or holding only remote classes
- Schools (K-12) are closed or holding only remote classes
- Violations of COVID restrictions result in fines or police enforcement

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Society of Actuaries
475 N. Martingale Road, Suite 600
Schaumburg, Illinois 60173
www.SOA.org