

High Levels of Social Distancing Lower the Projected Impact of COVID-19 in Missouri

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May 1, 2020

Introduction

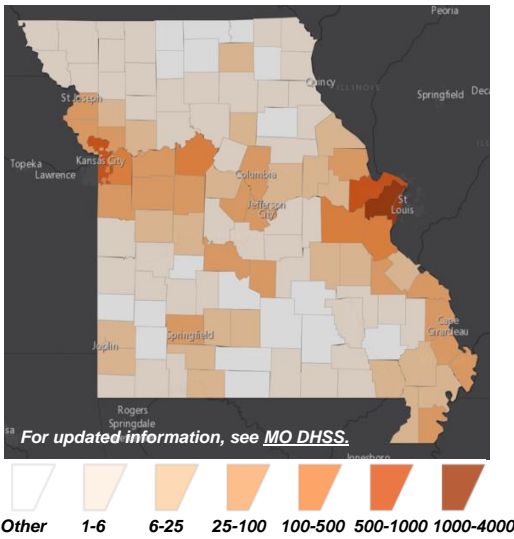
On January 22, 2020, the first documented coronavirus disease 2019 (COVID-19) case was reported to the Centers for Disease Control and Prevention (CDC) in the United States.¹ As of April 30, 2020, 1,031,659 cases have been reported in the U.S., of which 7,562 are in Missouri.² The CDC and the White House have recommended social distancing orders to slow the spread of COVID-19, but no federal order has been issued.^{3,4} A substantial majority of states, including Missouri, issued state-wide stay-at-home orders to protect public health and prevent further spread.⁵ Modeling studies suggest that social distancing and quarantine-like measures will help decrease the spread of COVID-19.^{6,7} Evidence from some areas of the U.S. shows that these measures have had a significant effect on controlling the spread of the virus. Understanding the effects of social distancing could inform policy interventions targeted at slowing the spread of COVID-19 across Missouri.

This brief, along with an accompanying [interactive data visualization](#) online, describes the potential effects of different levels of social distancing on the COVID-19 infection, hospitalization, and death rates in Missouri.

Data and Methods

The approach taken to estimate the potential spread of the virus is based upon a standard susceptible, exposed, infected, and recovered (SEIR) epidemiologic model,⁸ in which a key variable is the disease's reproductive rate. The reproductive rate captures how many new individuals are likely to become infected in the future from each individual infected now. Without social distancing, it was estimated that the reproductive rate of COVID-19 in the St. Louis region – the most populous part of the state – was about 3.3. To illustrate the effect of social distancing, “low” and “moderate” levels were selected with reproductive rates of 2.5 and 1.5. “High” levels were defined as a reproductive rate of 0.9, which empirically corresponds to the combined impact in St. Louis of stay-at-home orders at the county and state levels.^a The models were also adjusted based on population density, with lower density counties assumed to have a degree of naturally occurring social distancing compared to St. Louis data based on prior research in the setting of other infectious diseases. Hospitalization and death projections are based upon each county's age distribution and data from the Centers for Disease Control and Prevention (CDC).⁹⁻¹¹

Figure 1: Number of COVID-19 Cases by County as of April 30, 2020



Current Status in Missouri

On April 4, 2020, the Missouri Department of Health and Senior Services (MO DHSS) issued a “Stay Home Missouri” order for the state through April 30, 2020.¹² Prior to this statewide order the Missouri Department of Health and Senior Services directed Missourians to stay in their residences and practice social distancing of maintaining at least 6 feet distance from others starting on March 6th.¹²

As of April 30, 2020, there were 7,562 cases in Missouri and 329 deaths (Figure 1).¹³

^a Estimates based upon regional modeling by Washington University epidemiologists.

KEY FINDINGS

- High levels of social distancing are projected to lower the COVID-19 infection, hospitalization, and death rates over the next six months in Missouri.
- Rural areas will likely see lower infection rates in part due to lower population density; however, they will still see significant hospitalization and death rates from COVID-19, which will be impacted by the level of social distancing practiced in these areas.
- Certain regions of Missouri are particularly vulnerable to COVID-19 due to greater proportions of people with chronic conditions and/or poor health.

POLICY BRIEF

Social Distancing Effects

This analysis adjusted the infection rate in Missouri for population density, given evidence that high population density areas experience greater rates of communicable disease spread than areas of low population density.^{14,15} Using these adjusted rates, we project the impact of low, moderate, and high levels of social distancing policies and behaviors among the population and predict the infection rate by county in Missouri (Figure 2a). Hospitalization and death rates were predicted based on age distribution and CDC data (Figures 2b,c).

For more detailed information including counts by county, see our [Interactive Data Visualization](#).

Figure 2a: Projected COVID-19 Infection Rate Over the Next 6 Months by Social Distancing Level

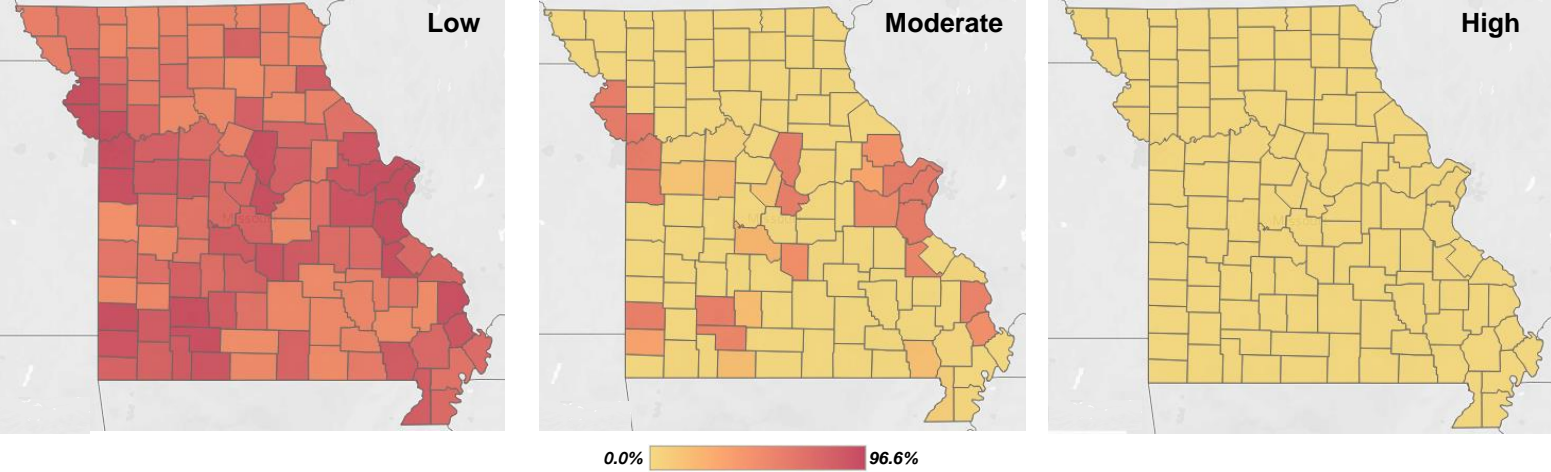


Figure 2b: Projected COVID-19 Hospitalization Rate Over the Next 6 Months by Social Distancing Level

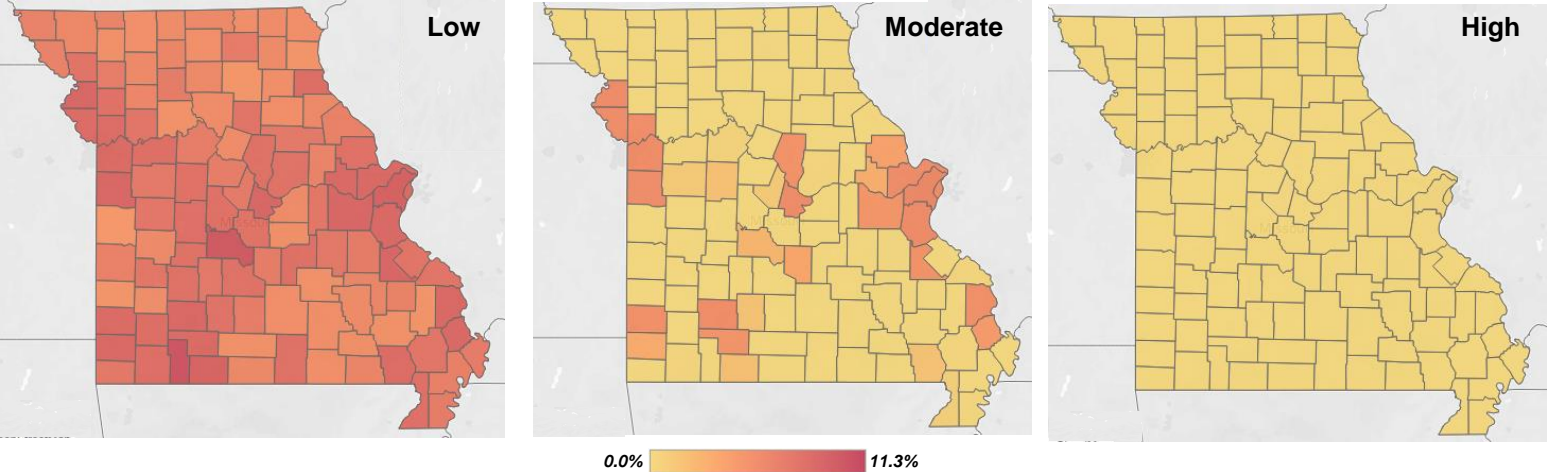
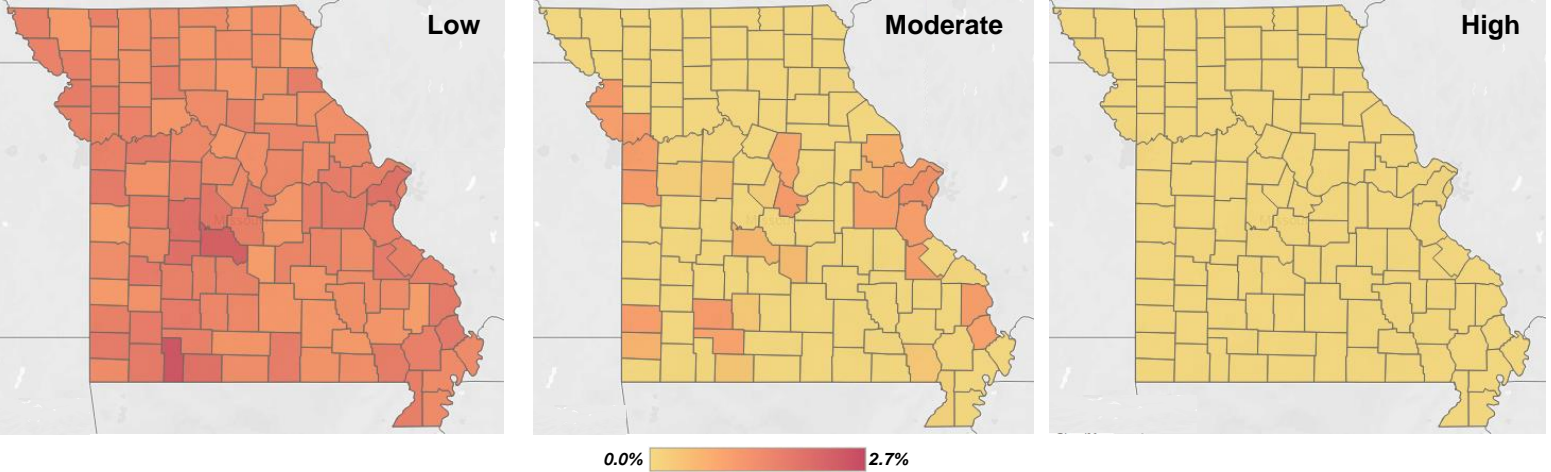


Figure 2c: Projected COVID-19 Death Rate Over the Next 6 Months by Social Distancing Level



Social Distancing Effects (cont'd)

Our analysis illustrates that greater levels of social distancing will lead to lower rates of COVID-19 infection, hospitalization, and death over the next six months throughout Missouri. For example, with low social distancing St. Louis County, with a population of 998,684 people, is projected to have 901,386 infections over the next six months (90.2% infection rate). However, that number is reduced dramatically to 8,481 infections with high social distancing (0.8% infection rate).

Comparing Urban and Rural Counties

Our model predicts that the overall rates of COVID-19 infection, hospitalization, and death will be lower for rural areas than for urban areas over the next six months; however, we expect to see higher rates of hospitalization and deaths in rural areas among those infected, based on the age distribution of health of rural Missouri residents. Table 1 shows the impact of COVID-19 for St. Louis, Jackson, Scott, and Atchison Counties to represent a variety of locations and population sizes. Regardless of population size, all counties will see significant drops in the number of infections, hospitalizations, and deaths when social distancing is high. Net changes in numbers will be larger for urban areas due to higher population counts, but rural areas may see higher relative decreases. Further, unlike urban areas, rural areas' projections suggest cases could drop to zero with robust social distancing measures, due to the lower baseline spread of disease in the setting of lower population density.

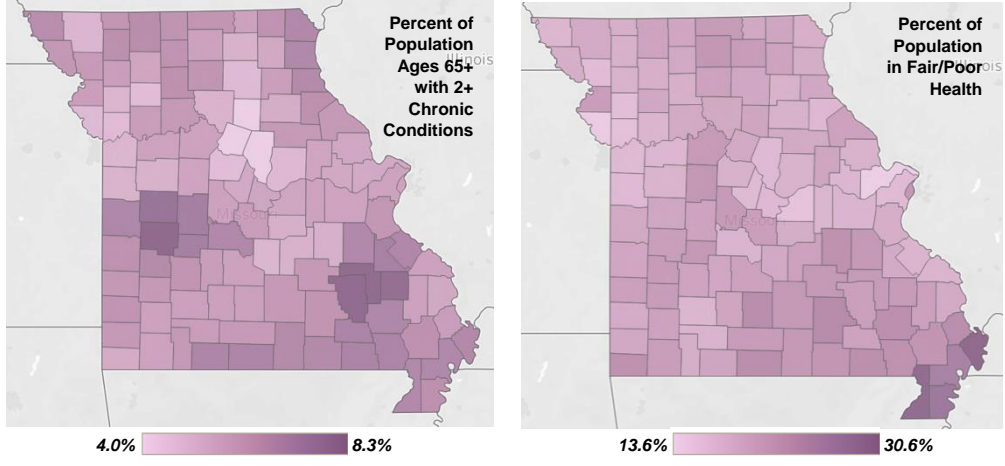
Table 1: Projected Rates of Infection, Hospitalization, and Deaths Over the Next 6 Months by County and Social Distancing

	Low Social Distancing	Moderate Social Distancing	High Social Distancing
Projected Infections			
St. Louis County (Urban)	901,386	586,897	8,481
Jackson County (Urban)	624,310	402,333	1729
Scott County (Suburban)	33,321	16,309	110
Atchison County (Rural)	2,714	3	2
Projected Hospitalizations			
St. Louis County	83,617	54,432	786
Jackson County	54,064	34,818	150
Scott County	3,073	1,498	10
Atchison County	286	0	0
Projected Deaths			
St. Louis County	23,505	15,325	290
Jackson County	13,793	8,886	48
Scott County	843	411	3
Atchison County	94	0	0

Vulnerable Populations

According to the CDC, older populations and people with serious medical conditions are at greater risk of severe illness from COVID-19.¹⁶ To better understand risk levels in Missouri, we created county-level maps of these populations using information from the Dartmouth Atlas¹⁷ and County Health Rankings¹⁸ (Figure 4 and on the [Center for Health Economics and Policy Website](#)).

Figure 4: Missourians' Underlying Health Risks



For more detailed information including counts by county, see our [Interactive Data Visualization](#).

Social Distancing Effects (cont'd)

As of April 30, 2020, 2,134 out of 7,562 total cases occurred in people ages 65 or older in Missouri.¹³ The majority of deaths occur in older populations, with 164 out of 329 total deaths among Missourians ages 65 or older. The corresponding mortality rate of 7.6% is lower than the national COVID-19 mortality rate of 14.6% for this group.⁹ Areas in Missouri with an older population or more individuals with chronic conditions could expect higher rates of hospitalizations and deaths among those with infections. Specifically, the City of St. Louis and the rural counties of Southeast Missouri are particularly vulnerable based on the age and health of their populations.

Policy Implications

The findings presented here support the conclusion that social distancing in all areas of Missouri during the current COVID-19 outbreak will minimize the negative health impacts of the virus, particularly on vulnerable populations. While it certainly is true that higher levels of social distancing exact other costs on society (e.g. economic costs, social costs), high participation in social distancing behaviors should lower the infection rate, hospitalizations and deaths across all counties in Missouri. At this time, it is unclear what amount of time this high level of social distancing will be needed to protect the health of Missourians. Areas with greater proportions of older individuals and people with chronic conditions face greater risks due to COVID-19 – and benefit more from social distancing – than other areas. Rural areas are likely to see somewhat lower rates of infection overall due to lower population density; however, high participation in social distancing will further decrease the impact of the virus on these areas.

High levels of social distancing will lower the projected number of infections and hospitalizations, preventing hospitals from exceeding their maximum capacity, which would affect their ability to care for patients. In particular, this could help reduce the burden in rural areas, which have fewer hospital beds and other resources,¹⁹ and would therefore be disproportionately burdened by an uncontrolled COVID-19 caseload. A recent study reported that non-metro areas have fewer ICU beds per age-adjusted 10,000 population compared to metro areas (1.6 beds vs 2.9).²⁰

Social distancing policies should be reinforced by other preventative measures as well, including mask wearing. Multiple studies illustrate that wearing a mask or facial covering in public can lower the transmission of coronaviruses.^{21,22} Specifically for COVID-19, widespread mask use in Taiwan and South Korea have likely contributed to the slow spread in these areas.²³

Overall, these findings have implications for Missouri policymakers and concerned citizens seeking to slow the spread of COVID-19 and protect public health. The tradeoffs of social distancing, particularly in terms of its economic impacts exist across all counties of Missouri, and should be considered by policymakers seeking a balanced solution. However, maintaining a high level of social distancing through a combination of policies and individual behaviors will likely minimize the spread of the disease, lower the risk of exceeding capacity in the healthcare systems, and reduce the adverse health outcomes of this pandemic across all communities in Missouri

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