# The Impacts of the "Hunker Down" order in Anchorage

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## Abstract

This brief models the COVID-19 epidemic in Anchorage Alaska to better understand the impact of the Municipality of Anchorage (MOA) “Hunker Down” order and provide insight into the potential benefit of the State of Alaska (SOA) “Stay at Home” order. The economic benefits of the hunker down order are measured in avoided mortality, based on the EPA value of a statistical life of $7.5 million. The benefits are for the epidemic to date based on confirmed cases and a simulation of an Anchorage epidemic based on epidemiological parameters from the scientific literature. Modeling suggests ~5400 deaths were avoided to date. Using a value of a statistical life of $7.5 million, the hunker down order is estimated to have avoided $40.5 billion in mortality due to COVID-19 to date. The economic costs of the shutdown are estimated based on the expected loss of GDP in Alaska, at roughly $4 billion to date. The long run economic costs are not estimated in this report, and will be heavily influenced by efforts by individuals to avoid infection. The estimates of the economic cost are also an upper bound estimate, as many of the costs may have happened regardless of the hunker down order as individuals avoided public spaces to protect themselves.

## General Overview

The novel SARS-CoV-2 virus strain and associated COVID-19 respiratory illness first emerged in Wuhan, China, with a reported cluster of cases reported to the World Health Organization (WHO) on December 31, 2019. The WHO set up an Incident Management Support Team on January 1 and the US Centers for Disease Control and Prevention (CDC) activated its Emergency Operations Center by January 21. By January 31st the WHO declared the outbreak a Public Health Emergency of International Concern, the 6th since the International Health Regulations (IHR) came into force in 2005. The US government has banned foreign nationals who have been to China, Iran, the UK, Ireland, or the European Union in the last 14 days from entering the country, required health monitoring and potential quarantine for citizens and residents who have been to those countries upon reentry to the United States, issued a Travel Health notice and advised against cruise travel, and issued both travel and clinical guidance related to the outbreak.

## Current Status in Anchorage

An abbreviated timeline of key events in the Municipality of Anchorage (MOA) and state of Alaska (SOA)

**March 2** First COVID-19 case in Alaska (not detected until March 12)
**March 9** Anchorage School District began Spring Break (last day of school)
**March 10** SOA encourages social distancing
**March 11** SOA Emergency Declaration
**March 12** First confirmed COVID-19 case in Anchorage
**March 12** MOA Emergency Declaration
**March 14** First SOA Health Mandate
**March 16** MOA closed bars and entertainment centers and limited gatherings
**March 17** Drive through testing begins
**March 22** MOA "Hunker Down" Order
**March 28** SOA statewide "Stay at Home" order
**April 24** SOA begins to reopen
**April 27** MOA loosens "Hunker Down" order

Individuals in Anchorage, Alaska began to social distance and limit personal contacts after the first case of COVID-19 arrived in the city, roughly the same time the first case was confirmed in Anchorage. As of April 29, 2020, there were 179 confirmed cases and 4 deaths in the Anchorage Municipality, 49 days since the first confirmed case of COVID-19. COVID-19 has an average latency period of 5 days, and an average infectious period of 7.4 days[1]. The proportion of asymptomatic cases has been estimated from 50% to 80% of cases [2], implying true case counts are up to 5 times the reported amount. Case data below are gathered from the NY Times[3] while Figure 1 and Figure 2 are based on Google mobility data for Anchorage, AK[4]. Mobility data show a significant drop in time spent at retail and recreation locations, transit stations, grocery and pharmacy, and workplaces post hunker down order. Time spent at park and residential locations increased.

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[1] Wu, J.T., Leung, K., Leung, G.M., 2020. Nowcasting and forecasting the potential domestic and international spread of the 2019-nCoV outbreak originating in Wuhan, China: a modelling study. The Lancet 395, 689-697.

[2] Day, "Covid-19"; Mizumoto et al., "Estimating the Asymptomatic Proportion of Coronavirus Disease 2019 (COVID-19) Cases on Board the Diamond Princess Cruise Ship, Yokohama, Japan, 2020."

[3] https://developer.nytimes.com/covid

[4] Google LLC *"Google COVID-19 Community Mobility Reports."* https://www.google.com/covid19/mobility/ Accessed: 5/4/2020.

*Figure 1. Anchorage change in behavior compared to baseline behavior (Jan 3- Feb 6) for periods before hunker down order (Feb 15 to Mar 21) and after hunker down order (Mar 22 to Apr 11) using Google Mobility Data. Over this period Anchorage saw a 41% decline in retail & recreation, 52% decline in transit station use, and 32% decline in workplace time. Trends pre-date the hunker down order, however there were also various health mandates, school closures, and other declarations. Time in parks on weekends increased dramatically as well.*

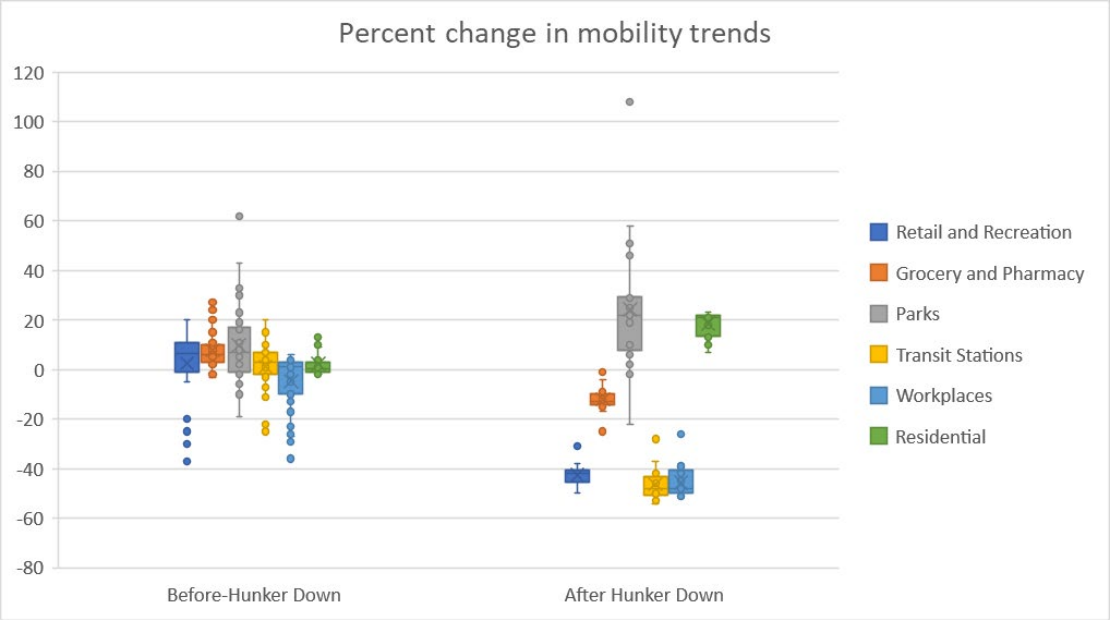
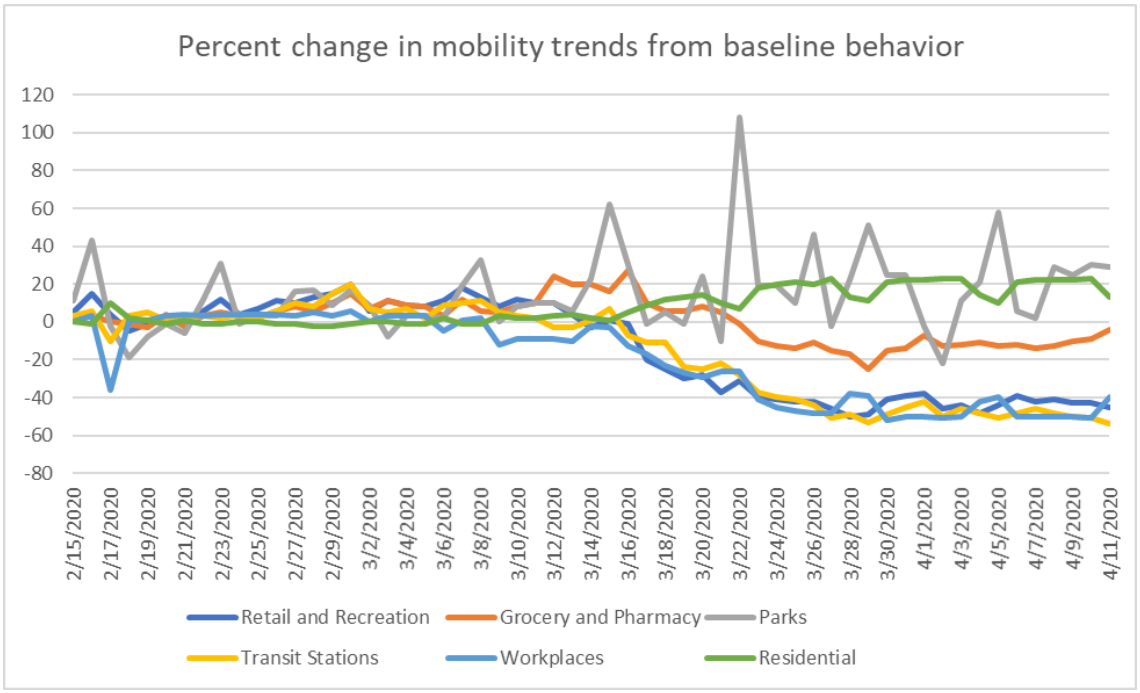



*Figure 2. Anchorage time spent at Retail and Recreation, Grocery and Pharmacy, Parks, Transit Stations, Workplaces and Residential locations from February 15, 2020 to April 11, 2020 in Anchorage, Alaska relative to a January 3 to February 6 baseline.*



## Modelling the epidemic and avoided fatalities to date

Estimated benefits of the hunker down order to date are based on the epidemic's trajectory after the first case in Anchorage was confirmed on March 12, 2020. Three scenarios are used. The "Baseline" scenario assumes the hunker down order never occurs. The "Hunker Down" scenario deviates from the baseline scenario on March 22, and assumes that the hunker down order never ends. The "End Hunker Down" scenario is the same as the "Hunker Down" scenario, except it assumes that behavior reverts to the same as the "Baseline" scenario on April 27. The "Hunker Down" scenario potentially over estimates the benefits of the order, as individuals would likely have social distanced without the order to protect themselves from the virus. Additionally, the "End Hunker Down" scenario likely over estimates the number of cases resulting from relaxing the order for the same reason. However, if the behavioral impact of the order is over estimated the associated costs in the economic impacts section would be overestimated by the same magnitude.

An SIR model (susceptible, infected, resistant) of epidemic was built in R. Case numbers were compiled by the New York Times and retrieved from their database[5]. The model assumes infectious period of 7.4 days based on data from Wuhan China[6] and a lag of 7 days between changes in policy and observations in observed case counts. The model assumed a 2% fatality rate for confirmed cases, and does not include hospital capacity or the increase in mortality rate from a potential overwhelming of the healthcare system. The transmission coefficient is calibrated by minimizing the squared error between the number of cumulative cases the model predicts and observed cumulative cases. The model is then simulated for 120 days from the confirmation of the first case to project the course of the pandemic, holding the transmission coefficient constant under three scenarios.

The model calibrates the rate of transmission based on observed cases in Anchorage from the first confirmed case reported on March 12 to March 29, 7 days after the hunker down order. From the Anchorage data, the estimated average number of new cases caused by an infected individual in a community with no resistance to the disease (R0) is 3.33, which is consistent with estimates in the literature for COVID-19. This observed R0 is used to find the corresponding probability an infected individual infects a susceptible individual. This estimated probability of infection is then used to estimate how much the hunker down order and associated behavior changes have reduced individual contacts, using observed case data from March 29 to May 4, seven days after the loosening of the hunker down order. This implies  a contact rate reduction of 69% within the city of Anchorage while the hunker down order was in effect. This measure likely overstates the order's impact slightly, as individuals began to reduce their contact rate and "social distance" before the order.

The model results are summarized in Figure 3 and Figure 4. Figure 3 shows cumulative case number, for the three scenarios as well as the observed cumulative case numbers from the NY Times. To date, the model predicts there would be 279,500 cumulative cases without the hunker down order and related social distancing, resulting in 5,400 more fatalities. Using the EPA estimate of the value of a statistical life (VSL[7][8])of $7.5 million per person, this would imply benefits of $40.5 billion in avoided mortality to date.

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[5] https://github.com/nytimes/covid-19-data

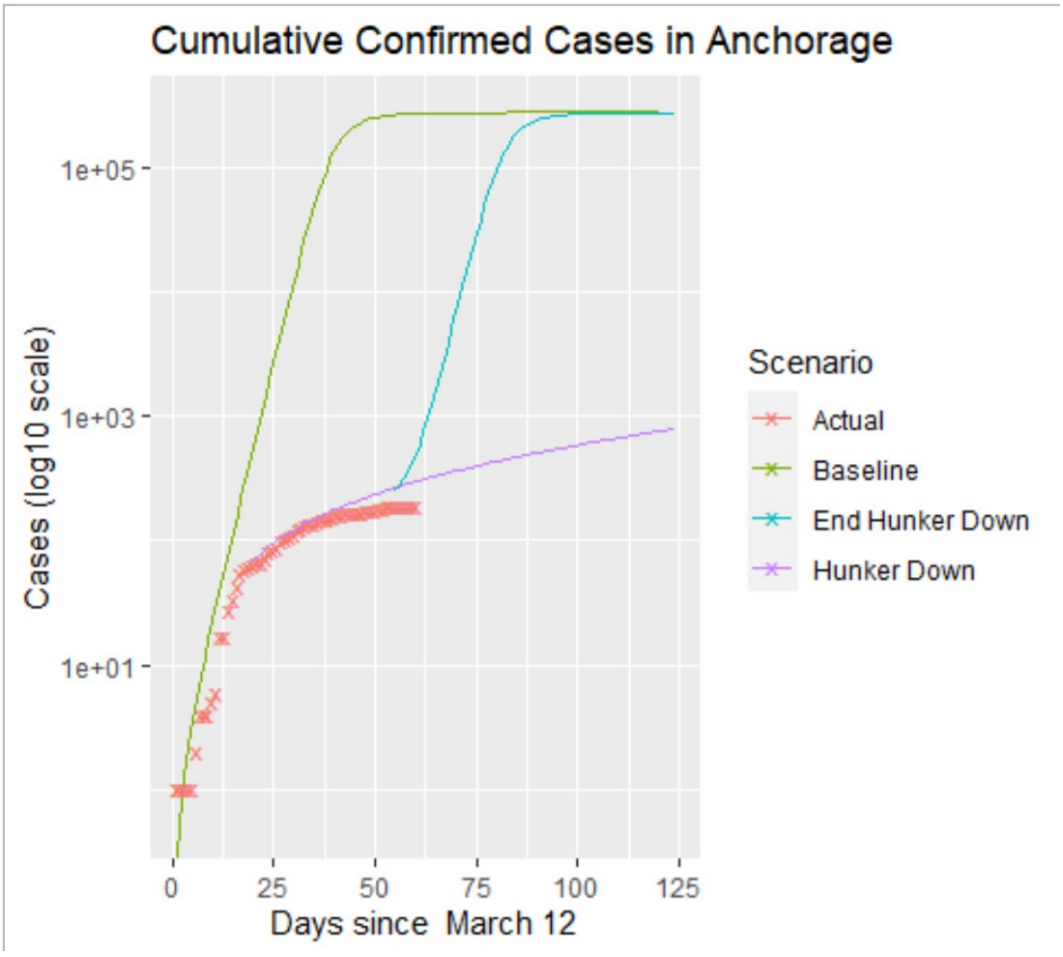
[6] Wu, J.T., Leung, K., Leung, G.M., 2020. Nowcasting and forecasting the potential domestic and international spread of the 2019-nCoV outbreak originating in Wuhan, China: a modelling study. The Lancet 395, 689-697.

[7] This is an estimate of the rate at which individuals would trade money for a reduced risk of death. There are alternative measures such as Quality Adjusted Life Years are relevant, but would depend upon the age structure of the infected population and require a more detailed model. We use an estimate of $7.5 million to be consistent with EPA practice https://www.epa.gov/environmental-economics/mortality-risk-valuation#whatisvsl

[8] There are technical concerns with using the VSL to value life in this context, discussed in the citation below. The VSL reflects individual preferences, not the preferences of society. A suggested alternative measure in Pindyck (2020) of $1 million per life would result in benefits of $5.4 billion.

These avoided fatalities are conditional on the end of hunker down not resulting in a second wave of infection. If behavior returns to normal and Anchorage faces a second outbreak with the baseline R0, then there is not meaningful difference in mortality predicted in the model. Any observed differences in mortality due to increases in healthcare capacity during the time gained by the hunker down order are not included in the model. The benefits of the hunker down order in this model depend critically on how behavior changes after the lifting of the order, and the ability to reduce the long-run mortality rate from COVID-19.

*Figure 3. Cumulative confirmed cases in Anchorage, AK starting at March 12, 2020 with fitted models both before and after "hunker down" order. The included models include a business as usual scenario (Baseline), a scenario where individuals stop social distancing and behavior reverts to the baseline after the hunker down order was relaxed (End Hunker Down) and a scenario where individuals continue to behave the same way after the hunker down order is relaxed (Hunker Down). The model is recalibrated starting after the hunker down order is initiated in reflect the delay between individuals being infected and displaying symptoms.*

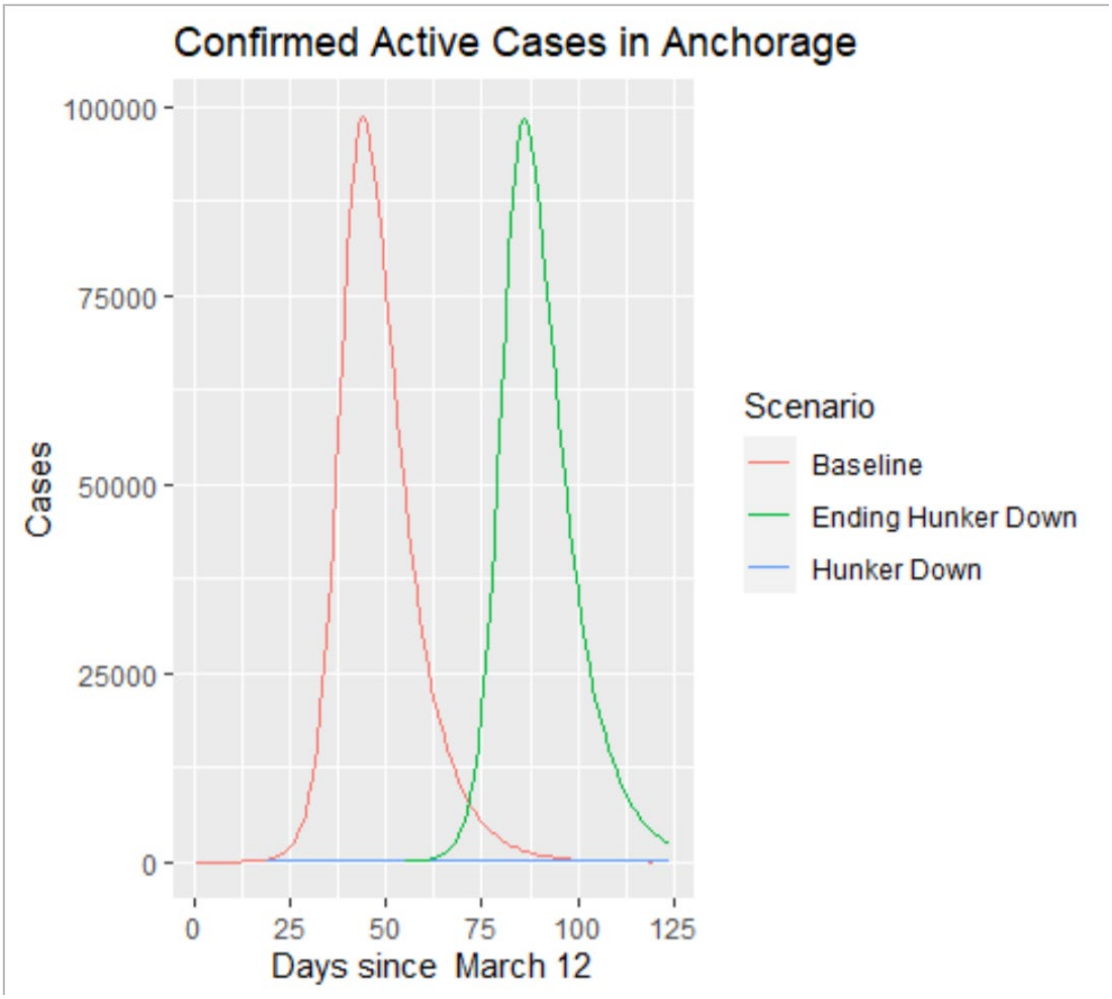



This is also shown in Figure 4, which plots the predicted active cases in Anchorage under the Baseline, Hunker Down, and End Hunker Down scenarios. While the Hunker Down scenario delays the peak of

Pindyck, Robert S. "COVID-19 AND THE WELFARE EFFECTS OF REDUCING CONTAGION." (2020).

active cases until after the time period simulated, a return to baseline behavior leads to a rapid increase in cases, and a peak number of active cases comparable to the Baseline scenario.

*Figure 4. Predicted active confirmed cases in Anchorage, AK starting at March 12, 2020 with fitted models both before and after "hunker down" order. The model is recalibrated starting after the hunker down order is initiated in reflect the delay between individuals being infected and displaying symptoms.*




## Modeling entire epidemic using cell phone data

Based on recent modelling efforts that incorporated anonymized cellphone foot traffic data[9] from SafeGraph[10], a model of the COVID-19 outbreak was developed for every county in the United States. This work incorporated contact patterns based on cell phone data to estimate the impact of changes in behavior in every "county-sized" government in the United States, including the MOA. This allows the model to reflect changes in human behavior and associated changes in the COVID-19 epidemic. The model focuses on two measures of time in public "*median home time*" and "*median non home time*" from SafeGraph to measure the amount of time people are exposed to the disease in public. Details are

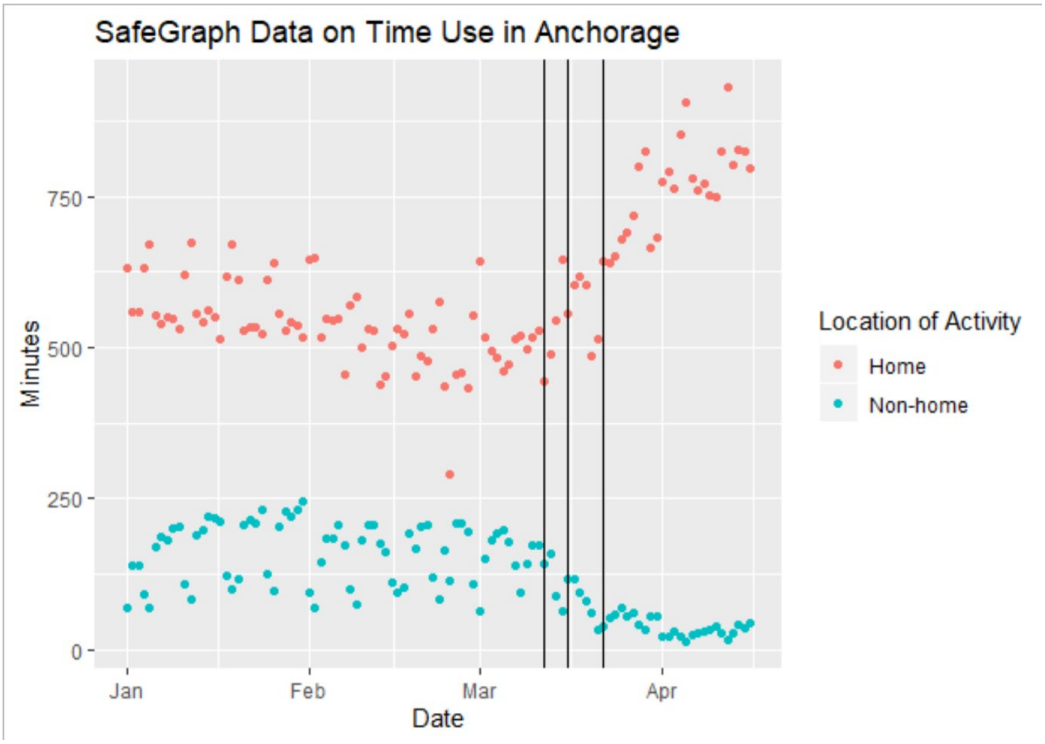
[9] A cell phone data driven time use analysis of the COVID-19 epidemic Eli P. Fenichel[1], Kevin Berry[2], Jude Bayham[3], Gregg Gonsalves[1]

[10] Safe Graph, 2020, www.safegraph.com

available in the working paper cited in footnote 6. The paper includes simulations of the entire epidemic in 5 scenarios:

1. No change in behavior from the January 1to February 15 baseline
2. Using cell phone mobility data from after the start of the outbreak to model behavior change and reverting to baseline behavior as of April 26, 2020
3. Using cell phone mobility data after the start of the outbreak to model behavior change, and having individuals continuing social distancing
4. Same as #3, but individuals who have had COVID-19 and recovered are returned to pre-COVID behavior
5. same as #4, but individuals who have not been exposed to COVID-19 return to pre-Covid behavior

*Figure 5. Safe Graph time-use data for the Anchorage Municipality, January-April 2020. Minutes home are assumed waking moments spent at home, while non-home minutes are those spent outside the household. MOA declared a state of emergency Mar 12, closed restaurants and bars Mar 16, and issued the hunker down order Mar 22 (vertical lines).*




In the simulations the peak prevalence of COVID-19 in Anchorage is the same both without any social distancing, and if social distancing is completely removed and all Anchorage residents return to normal life before a vaccine, herd immunity, or the virus is eradicated. In this scenario, the hunker-down order delayed the arrival of the peak prevalence, however the course of the epidemic is not significantly changed. If social distancing is continued at its current effectiveness indefinitely, the peak of the epidemic is both delayed and significantly reduced. Deaths are not extrapolated from this model, as they depend upon the age structure the population and their behavior, which cannot be tracked with the available data.

The key insight from the model is that allowing recovered individuals who have immunity to return to work can help to reduce the peak prevalence and mitigate economic and social damage from social distancing policies as discussed in Fenichel et al. (2020). As resistant people return to normal life, it reduces the probability that the average social contact is with an infected person. Allowing everyone who is uninfected

to return to normal, however, increases peak prevalence relative to continuing social distancing and the total number of deaths because there are more susceptible people available to become infected. Additionally, the impact of allowing resistant people to return to normal life will likely not meaningfully speed movement to herd immunity.

## Economic Impact of COVID-19 and "Hunker Down"

The hunker down order on March 22 undoubtably had negative economic consequences. Based on mobility data, Anchorage residents have reduced their mobility by roughly 45%[11] and are avoiding unnecessary trips, as shown in Figure 1 and Figure 2 and various mobility datasets that have become available in response to COVID-19. Recent work by Mouhcine Guettabi[12] has explored how the Alaskan economy as a whole has effectively been shut-down for roughly a month since the Governor's statewide stay at home order on March 28. Over 5 weeks roughly 62,000 people filed for unemployment, or 17% of the statewide labor force and 4,842 firms in Alaska received an average amount of $190,000 from the Payment Protection Plan (22% of Alaska firms). Guettabi predicts maintaining the closures for the first 2 months of the second quarter (April-June) will result in 2020 GDP losses of $2 billion, a $4.1 billion reduction include the associated multiplier effects. Within Anchorage and the Mat-Su, unemployment claims are up 1,345% with the greatest impacts in food service, healthcare, accommodation, and face-to-face services.[13]

Data from Opportunity Insights (OI)[14] shows that consumer spending began to decline coinciding with the closure of public schools and detection of the first case of COVID-19, predating the stay at home order and closures of non-essential businesses. Statewide the percent change in hours worked in small businesses and percent change in hourly employees at small businesses have already reached their bottom and recovered slightly. Impacts are disproportionately in the Entertainment & Recreation and Leisure & Hospitality sectors, as well as a steep decline in spending on elective healthcare.

Within Alaska, OI data shows consumer spending in Anchorage has fallen by 22.5% (compared with 24.8% in the Mat-Su,35.3% in Juneau and 22.2% statewide) and the percentage of small businesses open has declined by 48.5% in Anchorage (compared with 22.5% in the Mat-Su,39.9% in Juneau and 40.4% statewide). The percent change in hours worked in small businesses in Anchorage reached a bottom of -53.1% (49.6% in the Mat-Su and 52.3% statewide) on April 7, and has recovered to 36% in Anchorage (31.1% in the Mat-Su and 34.8% statewide) with upward trends that predate both the end of the stay at home order ending April 21 and select businesses reopening April 24.

The COVID-19 epidemic is occurring simultaneously with other economic headwinds. Oil prices have collapsed, and there is considerable uncertainty around the tourism and fishing seasons. As of April 29, 70% of cruises have already been cancelled, with an expected loss of 800,000 tourists[15]. Further cruise schedules and other tourism related activities are expected to face cancellation. In the long-run, it is possible that the avoided damages from social distancing could be lost if Anchorage opens too quickly, allowing an uncontrolled "second wave" of COVID-19 that also requires a second lockdown or causes individuals to remain home. It is also possible to face the entire economic cost of social distancing without the associated benefits if individuals do not follow social distancing guidelines after "reopening".

There are also potential economic consequences of reversing social distancing policies before other effective interventions are available. Evidence from the 1918 Influenza pandemic suggests cities that

[11] https://www.unacast.com/covid19/social-distancing-scoreboard?view=county&fips=02020
[12] https://iseralaska.org/publications/?id=1801 and https://iseralaska.org/2020/04/presentations-to-alaska-legislature-impact-of-covid-19-restrictions-on-alaska-economy/
[13] May 2020 Alaska Economic Trends https://labor.alaska.gov/trends/may20.pdf
[14] An interactive and up to date dashboard of economic impacts is available at https://tracker.opportunityinsights.org/
[15] https://www.adn.com/business-economy/2020/05/01/almost-70-of-alaskas-summer-cruises-have-been-canceled-so-far/

intervened earlier and more aggressively performed better economically than those that remained open[16]. Workers becoming sick or dying could contribute to the economic headwinds facing Anchorage, as other individuals decide to stay home to care for loved ones or out of fear of getting sick. Anchorage has 92,000 workers of which 71,000 are potentially at-risk of having a medical complication with average weekly earnings of $1,171 of which 10,800 are potentially at risk due to being over 60 years of age[17].

No evidence suggests reductions in consumption due to the social distancing mandates can be rapidly reversed entirely. There is well documented evidence that people attempt to avoid getting sick during pandemics and other large disease outbreaks. During the 2009 H1N1 outbreak, individuals spent 2.4 minutes more at home per 1,000 cases confirmed[18]. During the current outbreak Malik et al[19] found a 3.4% reduction in city mobility per day controlling for implementation of social distancing policies. Reductions in unique human encounters, non-essential visits, and distance travelled declined in all states before hunker down or stay at home orders were initiated. In Anchorage this decline coincides with the first case being discovered and the closure of public schools. Additionally, stay at home orders appear to be widely popular[20]. Nationally, 81% of people supported a stay at home order despite 64% saying their lives had been impacted in a major way (90% in some way). Individuals seem to be mainly complying with the mandates; in the same survey 93% said they were going out only when necessary.

The mandates encourage greater responses to the risk of infection. Residents in mandate states increase social distancing behavior above steps they already took to avoid infection. Once a mandate is implemented, individuals reduce their distance travelled and non-essential visits relative to non-mandate states by 29% to 37% more. Estimates of unique human encounters suggest an additional decline of 300% in unique human encounters.

## Takeaways

- A conservative (upper bound) estimate of the cost of social distancing policies is $4 billion in lost GDP. This is because much of the lost economic activity likely would have also been lost during an uncontrolled epidemic.
- The  benefits of the hunker down order are an estimated $40.5 billion in avoided deaths to date. The overall change in mortality depends on the long-run death rate from COVID-19, and how Anchorage residents respond to a loosening of restrictions. The estimate of these benefits depends critically on the infectivity of COVID-19 and the mortality rate. If the true R0 is higher, these benefits could be substantially larger .
- Given the widespread nature of social distancing mandates and efforts to reduce the spread of COVID-19, it is unlikely that things would return to normal, even if the hunker down order was lifted.
- Alaskans changed their behavior considerably, and as a result fewer Alaskans were infected with COVID-19. This also means that there are many susceptible individuals who could be infected, and we are far from herd immunity.
- Many cases are asymptomatic or not serious enough for individuals to seek medical care, so confirmed cases will undercount the true number of cases until testing is more widespread.
- Several impacted industries would not recover rapidly, even if mandates were immediately and completely lifted, or had never been put in place.

[16] Correia, Luck, and Verner, "Pandemics Depress the Economy, Public Health Interventions Do Not."
[17] Maher et al., "A COVID-19 Risk Assessment for the US Labor Force." Available at https://foodsystems.colostate.edu/covid19/county-labor-force-risk/
[18] Bayham et al., "Measured Voluntary Avoidance Behaviour during the 2009 A/H1N1 Epidemic."
[19] Aa, C, and Sb, "COVID-19 Related Social Distancing Measures and Reduction in City Mobility."
[20] https://poll.qu.edu/national/release-detail?ReleaseID=3658

- Cruise ship operators have cancelled the majority of their cruises, with some companies cancelling their entire season and additional cancelations are anticipated as the CDC continues to discourage cruise travel.
- The oil industry is primarily impacted by a surplus of supply and a global economic slowdown reducing demand.
- The fishing season is dependent on state government decisions to open or close the fisheries.

If Anchorage is going to reopen, Alaskans need to be responsible, and continue to socially distance, limit unnecessary contacts with others, and avoid infecting and endangering themselves and their neighbors. Sick people need to stay home, and susceptible people need to avoid contact with others. Reopening will not return the economy to normal. Economic recovery will not occur until the underlying problem, COVID-19, has been mitigated. At its core this is a public health crisis.