Athens Journal of Health and Medical Sciences 2021, 9: 1-21
https://doi.org/10.30958/ajhms.X-Y-Z

The Economic Effect of the COVID-19 Lockdown in the United States: Was the Cure Worse than the Disease?

By Jan L. Reid[*]

COVID-19 is an ongoing global outbreak of coronavirus disease 2019, an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The World Health Organization (WHO) declared the outbreak a Public Health Emergency of International Concern on January 30, 2020; and a pandemic on March 11, 2020. Several mitigation measures have been used in attempts to limit the spread of the virus, including mandatory wearing of masks in public; bans on unnecessary travel; and the closure of non-essential businesses. This paper defines a lockdown as the closure of non-essential businesses combined with requirements that all citizens stay at home except for grocery shopping, trips to a pharmacy, and medical appointments. The effectiveness of lockdowns is controversial. Proponents tend to argue that lockdowns would have been more effective if enforcement had been increased and if lockdowns had been extended for a longer period of time. Opponents have argued that lockdowns hurt the economy, hurt children, and have had little positive effect on public health. The paper addresses the economic effect of COVID-19 lockdowns in the United States using a Benefit/Cost Analysis (BCA) framework. Two separate analyses are provided: a traditional BCA analysis, which assumes that the value of life is constant regardless of age; and a Preferred Analysis, which adjusts the number of deaths, and values the economic cost of the deaths based on the age of the deceased.

Keywords: *benefit/cost analysis, COVID-19, GDP, lockdowns, unemployment*

Introduction

On March 11, 2020, the World Health Organization declared COVID-19 a pandemic[1]. At a media briefing, WHO director-general Dr. Tedros Adhanom Ghebreyesus stated that "This is not just a public health crisis, it is a crisis that will touch every sector" (Ducharme 2020).

The first lockdown in the United States (U.S.) occurred in the territory of Puerto Rico on March 15, 2020. By the time of that first lockdown, only 102 people had died of COVID-19 in the United States. Lockdowns were fully implemented in most U.S. states by April 7, 2020. The number of deaths rose to a total of 167,558 by August 22, 2020 (National Center for Health Statistics 2020)[2].

This paper performs two Benefit/Cost Analyses (Traditional and Preferred) in order to estimate whether the economic cost of the lockdowns exceeded the economic benefits. The results indicate that the economic cost of the lockdowns was up to ten times greater than the economic benefits of the lockdowns.

[*]President, Coast Economic Consulting, USA.

[1]The WHO defines a pandemic as the global spread of a new disease.

[2]The National Center for Health Statistics (NCHS) is a division of the Centers for Disease Control and Prevention (CDC), which is a division of the United States Department of Health and Human Services (HHS).

A Benefit/Cost Analysis is composed of two sections: a Base Case Analysis and a Sensitivity Analysis. The author's assumptions are those assumptions used in the Base Case Analysis. The Sensitivity Analysis consists of a "what if analysis". For example, a researcher might perform an economic analysis on the effect of the construction of a new highway. The Base Analysis might assume that the speed limit would be set at its current level of 70 miles per hour (mph) which is approximately 112 kilometers per hour (kph). The Sensitivity Analysis might assume that the speed limit would be changed to 55 mph (88 kph), resulting in fewer deaths. This does not mean that the author is assuming that the speed limit will be changed if a new highway is constructed.

Hypothesis

The paper hypothesizes that the economic cost of the lockdowns exceeded the economic benefits. The paper addresses the economic effect of COVID-19 lockdowns in the United States using a Benefit/Cost Analysis (BCA) framework. Two separate analyses are provided: a traditional BCA analysis, which assumes that the value of life is constant regardless of age; and a Preferred Analysis, which adjusts the number of lives saved, and values the economic cost of the lives saved based on the expected ages of the number of lives saved.

The goal of the lockdowns was to reduce the number of COVID-19 deaths and to ensure that Intensive Care Unit (ICU) capacity was sufficient to treat patients in critical condition. The paper finds that the lockdowns saved lives, but that the economic cost of the lockdowns was up to ten times greater than the economic benefits of the lockdowns.

Literature Review

The literature review explored the eight subjects discussed below. These subject areas were chosen because, taken together, they help explain much of the successes and failures of the economic lockdowns during the period of the study. The eight subjects are:

1. Coronaviruses
2. COVID-19 Cases and Deaths
3. Health-Care Spending
4. Macroeconomic Effects
5. Stimulus Programs
6. Benefit/Cost Analyses
7. Value of Life
8. Decline in Student Deaths

Coronaviruses

Coronaviruses are a class of ribonucleic acid (RNA) viruses that cause diseases in mammals and birds. In humans and birds, they cause respiratory-tract infections that can range from mild to lethal. Mild coronavirus illnesses in humans include some cases of the common cold (which is also caused by rhinoviruses). More lethal illnesses include Influenza, Severe Acute Respiratory Syndrome (SARS), Middle East Respiratory Syndrome (MERS), and COVID-19 (CDC 2019).

According to the Centers for Disease Control and Prevention (CDC), influenza, commonly called "the flu," is an infectious disease caused by influenza viruses. Influenza may progress to pneumonia, which can be caused by the primary viral infection or by a secondary bacterial infection. Other complications of influenza infection include acute respiratory distress syndrome, meningitis, encephalitis, and worsening of pre-existing health problems such as asthma and cardiovascular disease. In healthy individuals, influenza is rarely fatal, but it can be deadly in high-risk groups (CDC 2019).

Influenza deaths most commonly occur in high-risk groups, including young children, the elderly, and people with chronic health conditions. Since the late 1800s, worldwide outbreaks (pandemics) of novel influenza strains have occurred every 10-40 years. Five flu pandemics have occurred since 1900: the Spanish flu in 1918–1920, which was the most severe flu pandemic; the Asian flu in 1957; the Hong Kong flu in 1968; the Russian flu in 1977; and the 2009 swine flu pandemic. (CDC 2019) Worldwide mortalities were 20-50 million from the Spanish flu; 1.1 million from the Asian flu; 700,000 from the Russian flu; and 284,000 from the swine flu.

There have been over 4.9 million deaths worldwide from COVID-19 since October, 2019.

<u>Cases and Deaths</u>

The CDC has explained that "While seasonal influenza (flu) viruses are detected year-round in the United States, flu viruses are most common during the fall and winter. The exact timing and duration of flu seasons can vary, but influenza activity often begins to increase in October. Most of the time, flu activity peaks between December and February, although activity can last as late as May" (CDC 2018).

For the period 2010-2011 through 2019-2020, annual estimates of death from influenza in the United States have ranged from a low of 12,000 in 2011-2012 to a high of 61,000 in 2017-2018. In the last full influenza season (2018-2019) before the pandemic, 34,157 people died of influenza. (CDC 2021a) For the period January 4, 2020 through May 1, 2021, 493,985 people died of pneumonia; 276,282 people died of COVID-19 and pneumonia; and 9,273 people died of influenza (CDC 2021b). Thus, deaths from influenza declined by 24,884 (34,157 – 9,273 = 24,884), or 4.40% of the total number of official COVID-19 deaths.

The change in official influenza deaths indicates that at least 24,884 influenza deaths may have been misclassified as COVID-19. Therefore, I have reduced the number of lives saved by 4.40% in the Sensitivity Analysis to the Preferred Analysis (see Table 7).

At the date of this writing, COVID-19 cases from 2020-2021 have exhibited the same seasonal pattern as the historic data of influenza in the United States. On March 7, 2021, the COVID Tracking Project (2021) found that the seven-day average of COVID-19 cases peaked on January 13, 2021 at 244,551 cases. The number of cases declined to 54,762 on March 7, 2021. (COVID Tracking Project 2021) This suggests that COVID-19 is a seasonal virus.

In an interview with NPR, Chris Murray of IHME said: “When you look at the huge [COVID-19] epidemics that unfolded in Argentina … in Chile … in Southern Brazil, South Africa, and … the Northern hemisphere, . . . — … in the statistical analysis, we see a very strong correlation with seasonality” (Aizenman 2020).

The CDC has reported that weekly provisional death counts for patients with COVID-19 rose from zero on January 4, 2020 to a high of 24,942 on January 9, 2021, and then fell to a low of 1,729 on May 1, 2021. The CDC has noted that: “COVID-19 death counts shown here may differ from other published sources, as data currently are lagged by an average of 1–2 weeks” (CDC 2021b).

Science, Public Health Policy and the Law published a paper which found that “Data from the CDC shows that only 6% of 161,392 COVID fatalities had no mention of any comorbidity. For deaths with conditions or causes in addition to COVID-19, on average, there were 2.6 additional conditions or causes per death” (Ealy et al. 2020).

On March 24, 2020, the CDC changed the guidelines for how cause of death from COVID-19 is recorded and reported. The new reporting guidelines substantially increased the number of deaths from COVID-19 (Ealy et al. 2020, p. 2).

Accurate reporting of deaths from COVID-19 is dependent upon test reliability. Lee (2020) examined the reliability of the PCR (polymerase chain reaction) test for detecting COVID-19 infection. (A PCR test is performed to detect genetic material from a specific organism, such as a virus or a bacterium.) Dr. Lee evaluated 20 test results from the Connecticut State Department of Health using a nested PCR amplification method. Dr. Lee found that the standard PCR test produced a false positive of 30% and a false negative of 20%.

Although Lee’s study does not contain enough observations to definitively find that PCR test kits produce biased results, it does suggest that the number of COVID-19 cases (and therefore deaths) might have been overestimated by 10%. As mentioned previously, influenza deaths declined by 24,946 (over 4% of official COVID-19 deaths). The decline in influenza deaths adds credibility to Lee’s finding that COVID-19 deaths might have been over counted by 10%.

As of April 14, 2021, a total of 563,440 individuals have died from COVID-19 in the United States (Yahoo News 2021). The CDC has reported that 4,270,407 people have died from all causes during the same period. (CDC 2021b) Thus, over 13% of U.S. deaths during that period were caused by COVID-19.

The Associated Press (2020) has reported that (Marchione 2021):

> Life expectancy in the United States dropped a staggering one year during the first half of 2020 as the coronavirus pandemic caused its first wave of deaths, health officials are reporting.
> Minorities suffered the biggest impact, with Black Americans losing nearly three years and Hispanics, nearly two years, according to preliminary estimates [on February 11, 2021] from the Centers for Disease Control and Prevention.

Forecasts of COVID-19 Deaths

On June 15, 2020, Reuters reported that "A new forecast projects 201,129 deaths due to COVID-19 in the United States through the beginning of October mainly due to reopening measures under way, the Institute for Health Metrics and Evaluation (IHME) at the University of Washington said on Monday" (Reuters 2020).

In September 2020, the University of Washington's Institute for Health Metrics and Evaluation (IHME), headed by Chris Murray, forecast that 410,000 people would die of COVID-19 by January 1, 2021. Ashish Jha, dean of Brown University's School of Public Health, said that IHME's forecast is highly implausible — particularly when it comes to the projected 410,000 death toll in the U.S. by Jan. 1. "I think that's completely unrealistic. I see no basis for that," says Jha. (Aizenman 2020) The CDC reported that 389,371 people had died with COVID-19 by January 1, 2021 (CDC 2021b).

The September 2020 IHME forecast was much more optimistic than their forecast released in March 2021. In the March forecast, the IHME predicted that 598,521 Americans would die of COVID-19 by July 1, 2021. IHME also forecast that 655,566 people would die if the mobility of the U.S. population returns to 2019 levels (McIntyre 2021).

On April 21, 2021, the CDC reported the COVID-19 death forecasts of 36 modelers for the period April 19 to May 15, 2021. The average estimate of the models was that total deaths would rise to 595,522 by May 15, 2021 (CDC 2021c).

Table 1 compares the four mortality forecasts discussed above to the actual number of deaths in the time period predicted by the studies. The forecasts constitute a trend analysis in which the biggest driver of forecasted deaths is the number of deaths at the time the forecast was released.

Table 1. *COVID-19 Mortality Forecasts*

Source	**Forecast Date**	**Ending Time Period**	**Mortality Forecast**	**Actual Deaths**	**Forecast Error (%)**
IHME	June 2020	October 1, 2020	201,129	210,190	4.51%
CDC	June 2020	July 11, 2020	145,000	137,049	5.80%
IHME	September 2020	January 1, 2021	410,000	389,371	5.30%
CDC	April 2021	May 15, 2021	595,522	570,003*	4.29%*

As of May 8, 2021.

Lockdowns

On March 15, 2020, Puerto Rico governor Wanda Vázquez Garced signed an executive order ordering all citizens to stay at home starting at 9:00 p.m., with exceptions in limited circumstances between 5:00 a.m. and 9:00 p.m. Governmental operations and non-essential businesses were to be closed until March 30, 2020. On March 16, 2020, U.S. President Trump recommended that residents avoid discretionary travel, shopping trips, and social visits (Kelleher 2020).

On March 19, 2020, California governor Gavin Newsom issued a statewide lockdown order. By April 7, 2020, 43 of the 50 U.S. states had issued lockdown orders. The lockdown orders ("stay-at-home orders") affected approximately 320 million people, about 96% of all U.S. residents.

On March 17, 2020, the first lockdown order from within a state was imposed simultaneously by health authorities in the San Francisco Bay Area (Alameda, Contra Costa, Marin, San Mateo, and Santa Clara counties and the cities of San Francisco and Berkeley), affecting nearly 6.7 million people (Ravani 2020). Other cities and counties across the state followed suit over the next two days, until Gavin Newsom, the governor of California, issued the first statewide order, effective on March 19, 2020 (Wired 2020).

Health Care Spending

Business Economics reported that "The HSEI [Health Sector Economic Indicators] spending brief data provide an initial look at health care spending during the COVID-19 pandemic. They show that the year-over-year change in national health spending began to decline in March of 2020, fell to more than 20% below the previous year's level in April, and then began to recover. By August 2020, health spending had regained essentially all its losses compared with August 2019" (Rhyan et al. 2020).

While health care spending was falling, the price of health care was rising. The St. Louis Federal Reserve Board (FRED) has reported that the health care price index rose by 3.4% from August, 2019 to August, 2020 (FRED 2021a).

The paper did not include health care spending losses in its cost calculations because these losses are subsumed in the loss of nominal Gross Domestic Product (GDP).

Macroeconomic Effects

The official unemployment rate (U-3) as reported by the Bureau of Labor Statistics (BLS) rose from 3.5% in February, 2020 to a high of 14.8% in April, 2020 and then fell to 6.1% in April, 2021 (FRED 2021b). Cohen has found that 1.1 million workers had been misclassified by the BLS. Cohen adjusted the official unemployment rate and found that accounting for the misclassification "yields an adjusted unemployment rate of 9.1% in August [2020], which is meaningfully lower than 11.0% reading in July [2020] and a peak of 19.5% in April [2020]" (Cohen 2020).

Moutray found that "And, while the unemployment rate peaked at 14.7% in April [2020], the reality was even starker, with the "real" unemployment rate—which adds in those "marginally attached to the labor force and those employed part time for economic reasons"— at 22.8% that month" (Moutray 2020).

Stimulus Program

The United States Congress passed three separate stimulus bills: the CARES Act, the Consolidated Appropriations Act 2021, and the American Rescue Plan Act. Additionally, California Governor Gavin Newsom signed the Golden State Stimulus bill. These four bills are described below.

<u>The CARES Act</u>

The CARES Act was a $2.2 trillion economic stimulus bill signed into law by President Donald Trump on March 27, 2020. The bill included $300 billion in one-time cash payments to individuals and dependent children, $260 billion in increased unemployment benefits, $350 billion (later increased to $669 billion) in funding for the Paycheck Protection Program that provided forgivable loans to small businesses for payroll expenses, $500 billion in loans for corporations, and $339.8 billion to state and local governments (Snell 2020).

Some of the benefits (such as federal unemployment and the eviction moratorium) of the CARES Act expired in July 2020. As a result, the number of Americans living in poverty increased dramatically. On October 15, 2020, the New York Times reported that "The number of poor people has grown by 8 million since May, according to researchers at Columbia University, after falling by 4 million at the pandemic's start as a result of a $2 trillion emergency package known as the Cares Act" (DeParle 2020).

Yahoo News reported that "Without the additional $600 per week under the CARES Act — which expired at the end of July — local consumer spending will drop by an estimated 44%, according to a new paper from the National Bureau of Economic Research that examined how the cut in benefits will affect spending in 18 counties in Illinois" (Tsekova 2020).

<u>The Consolidated Appropriations Act 2021</u>

The Consolidated Appropriations Act 2021 (CAA) was a $2.3 trillion spending bill that combines $900 billion in stimulus relief with a $1.4 trillion omnibus spending bill for the 2021 federal fiscal year. The bill was signed into law by President Trump on December 27, 2020, thereby preventing a government shutdown (Taylor 2020).

According to the Congressional Budget Office (CBO), the CAA provided $325 billion for small businesses; $15 billion for economically endangered live venues, movie theaters, and museums; $166 billion for stimulus checks to individuals; $120 billion for an extension of federal unemployment benefits; $82 billion for public schools and universities; $69 billion for vaccines, testing, and health providers; $25 billion to state and local governments for rental assistance programs; $13 billion to increase the monthly Supplemental Nutrition Assistance

Program (SNAP/food stamp) benefit by 15%; $13 billion in direct payments to the farming and ranching industries; $60 million for small meat and poultry processors; $10 billion for child care, $10 billion for the U.S. Postal Service; and an extension of the CDC's eviction moratorium (CBO 2020a, CBO 2020b).

The American Rescue Plan Act of 2021

The American Rescue Plan Act of 2021 (ARPA) was a $1.9 trillion economic stimulus bill signed into law by President Biden on March 11, 2021. ARPA provided extended federal unemployment benefits, $1,400 direct payments to individuals, emergency paid leave for over 100 million American, a tax credit to employers who offer paid sick leave and paid family leave benefits, extended food stamp benefits, expanded the child tax credit, expanded the earned income tax credit, made forgiven student loan debt tax-free, grants to small businesses, $350 billion to state, local, and tribal governments, $130 billion for K-12 schools, $40 billion for public colleges and universities, $48.8 billion for housing assistance, $164.3 billion for healthcare programs and services, $86 billion to pension funds that are close to insolvency, $55.5 billion for transportation, $10.4 billion for agricultural programs and services, and $1.85 billion for cybersecurity funding (Zhou and Stewart 2021).

ARPA also subsidized 100% of premiums for Consolidated Omnibus Budget Reconciliation Act (COBRA)[3] recipients from April 1, 2021 to September 30, 2021, removed the income limit on premium subsidies for the ACA, increased subsidies to low-income individuals, protected Affordable Care Act (ACA) subsidy recipients from clawbacks due to income fluctuations in 2020, required private insurance companies to cover COVID-19 vaccines and treatment, allowed states to give 12 months of postpartum coverage for new mothers, and provided new incentives for states to expand Medicaid coverage (Keith 2021).

Golden State Stimulus Bill

The Valley Post has reported that "Governor Gavin Newsom signed the $9.6 billion "Golden State Stimulus" bill into law Tuesday, [February 23, 2021] which includes a $600 check for low-income Californians" (Miller 2021). The bill provides a $1,200 direct payment to up to 5.7 million tax return filers, and a $600 payment to individuals who receive an earned income tax credit.

Benefit/Cost Analyses

Benefit/Cost Analysis, also known as Cost/Benefit Analysis, is commonly used in the development of public policy, such as the choice of whether to build a new highway or to impose environmental restrictions in a transportation corridor.

[3]For individuals who experience a job loss or other qualifying event, COBRA provides the option to continue their current health insurance coverage for a limited amount of time. Employers outside the federal government with more than 20 employees are required to offer COBRA coverage to those who qualify.

Value of Life

In public policy, the most important assumption in a Benefit/Cost Analysis is the value of life chosen by the analyst. In the case of COVID-19 lockdowns, a high value of life will tend to increase aggregate benefits and show that lockdowns were a good policy. A lower value of life will do the opposite.

Sumner et al. (2020) have pointed out that "Most of the publicized cost-benefit analyses of COVID-19 lockdowns have used coarse measures like lives as units rather than life-years, which misleads politicians and the public. COVID-19 deaths disproportionately impact the oldest members of the population, whereas the economic impacts of lockdowns disproportionately harm the youngest of the working population, who have far greater life expectancies at the time of impact" (Sumner et al. 2020).

Sumner et al. (2020) conducted a study commissioned by Revolver News and found that COVID-19 lockdowns are ten times more deadly than the actual COVID-19 virus in terms of years of life lost by American citizens. This paper uses a modified form of the analytical method used by Sumner et al. (2020). An earlier study commissioned by Just Facts found that the lockdowns caused a loss of seven times more years of life than were saved by the lockdowns (Miller 2020).

Forbes Magazine has published an article by Chris Conover of The Apothecary Group. Conover provides a listing of the Value of Life (VOL) used by different researchers. The fixed-rate VOL ranges from $5 million by Aldy and Viscucchi to $10 million by Alex Nowrasteh of the Cato Institute (Conover 2020). I use the average value of these studies ($7.8 million) in my Traditional Analysis below.

Benefit/Cost Analyses

Anna Scherbina of the American Enterprise Institute estimated "a lockdown would be indeed optimal and, depending on the assumptions, it should last between two and four weeks and will generate a net benefit of up to $1.2 trillion." Scherbina employs a Quality-of-Life Year (QALY) method and assumes a value of $150,000/ QALY. She estimates that a maximum of 406,000 lives would be saved. Thus, she implicitly assumes an average of 39.6 QALYs/person (Scherbina 2021).

Broughel and Kotrous found that the benefits of COVID suppression policies would be from $605.9 billion to $841.1 billion and the costs would range from $214.2 billion to $331.5 billion. (Broughel Kotrous 2021, p. 156) Broughel and Kotrous' study is for the period March 1 - August 1, 2020. 160,766 people died of COVID-19 during the time period of their study, which is about 30% of total COVID-19 deaths for the period January 1, 2020 to May 8, 2021. They assume 1.04 million lives saved and $351.5 billion in benefits, which is an average value of life of $337,980.77/person. Their work implies a Benefit/Cost (B/C) ratio of from 2.52 to 2.83, which indicates that lockdown policies had significant net benefits.

Dr. Ari Joffe used a Wellbeing Years (WELLBY) analysis and found that the costs of lockdowns were 5.2 times greater than the benefits of lockdowns in the United States. On average, Joffe assumes a VOL of $500,000 per life (Joffe 2020, Table 8).

Hanson (2020) estimates that 3% of COVID-19 cases result in a loss of income for three weeks for those with severe cases. On October 12, 2020, Dr. David Cutler and Dr. Lawrence Summers published their estimate of the effects of lockdowns. They estimated that lockdowns would result in mental health impairment costs of $1.581 trillion (Cutler and Summers 2020, Table).

Allen (2021) an economics professor at Simon Fraser University in Canada, states:

> The term "lockdown" is used to generically refer to state actions that imposed various forms of non-pharmaceutical interventions. That is, the term will be used to include mandatory state-enforced closing of non-essential business, education, recreation, and spiritual facilities; mask and social distancing orders; stay-in-place orders; and restrictions on private social gatherings.

I adopt Dr. Allen's definition of the term "lockdown". Dr. Allen reviewed over 80 different academic studies and related COVID-19 data sites. He found that "All estimates of costs and benefits depend on various assumptions of parameters and structural model forms, and many of the studies examined (especially the early ones) relied on assumptions that were false, and which tended to over-estimate the benefits and under-estimate the costs of lockdown" (Allen 2021).

Allen issued a report and provided an alternative Cost/Benefit methodology. (Allen 2021, Section III) I adopt some of his suggestions in my Preferred Analysis given below.

School Shootings

The vast majority of schools were closed in 2020 due to COVID-19. This resulted in a decline in the number of student deaths in school shootings. In 2019, eight students were killed and 43 were injured in 25 shooting incidents that occurred on school grounds or during school-sponsored events, according to Education Week's school shooting tracker (Education Week 2020). The paper includes the decline in student deaths as a Benefit in both the Traditional and the Preferred Analyses.

Methodology

The paper calculates a B/C ratio using the following steps for the Traditional Model:

1. Econometrically estimate the time lag between infection and death.
2. Sum the benefits of the lockdowns and the cost of the lockdowns.
3. Divide the lockdown benefits by the lockdown costs and calculate a B/C ratio.
4. If the B/C ratio is greater than 1, then the lockdown was an optimal public policy.

The paper calculates a Benefit/Cost ratio using the following additional steps for the Preferred Model:

1. Calculates an economic value of life (EVOL) for each age group.
2. Sums the individual EVOLs and includes these values as benefits in lives saved; and costs in lives lost due to suicides and to the unavailability of medical treatment for other illnesses such as heart attacks, cancer, and strokes.
3. Estimates the costs of losses in GDP due to the lockdowns.
4. Performs a sensitivity analysis incorporating the findings of Lee (2020) and Cutler and Simons (2020) and reports the modified B/C ratio.

I discuss each of these steps below.

Time Lag Regression

In order to estimate a B/C ratio, more information is required. It is necessary to estimate the time lag between COVID-19 infection and death from COVID-19. For example, COVID-19 deaths rose from 58 in the last week before the lockdown (week ending March 14, 2020) to 24,942 in the week ending on January 9, 2021. Some individuals who died after the lockdown began had COVID-19 before the lockdown. If the study did not account for the time lag between infections and deaths, one might intuitively reason that the lockdowns caused additional deaths from COVID-19. The paper estimates that the maximum lag between infection and death is two weeks and uses a two-week time lag in estimating the number of lives saved by the lockdowns.

The following methodology was used to estimate the time period between infection and death. Weekly data was collected from the CDC on COVID-19 infections and deaths for the period January 19, 2020 through May 1, 2021.

A regression equation was performed on infections and deaths, and coefficients were estimated using a first order Auto Regressive Moving Average (ARMA) regression model for the variables mentioned above.

The regression equation[4] is $D = \alpha + \beta_1 C + \beta_2 C(-1) + \beta_3 C(-2) + \beta_4 C(-3) + \beta_5 A + \beta_6 M$

where:

A is an AR(1) term.

C is the number of infections at time t

C(-1), C(-2), and C(-3) are the number of cases at time t-1, t-2, and t-3, respectively.

D is the number of deaths in a given week.

M is an MA(1) term.

α is the constant term.

$\beta_1, - \beta_6$ are the estimated coefficients.

[4]The AR(1) and MA(1) terms are used to adjust for serially correlated residuals.

The regression output is given below.

Dependent Variable: DEATHS				
Method: ARMA Maximum Likelihood (OPG - BHHH)				
Date: 05/04/21 Time: 04:22				
Sample: 4 66				
Included observations: 63				
Convergence achieved after 22 iterations				
Coefficient covariance computed using outer product of gradients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-367.3282	5839.264	-0.062907	0.9501
CASES	0.005191	0.001617	3.209260	0.0022
CASES(-1)	0.004927	0.001942	2.536575	0.0141
CASES(-2)	0.004052	0.002650	1.529123	0.1320
CASES(-3)	0.002345	0.001756	1.335314	0.1873
AR(1)	0.927199	0.053703	17.26520	0.0000
MA(1)	0.792760	0.120098	6.600917	0.0000
SIGMASQ	718352.2	79940.09	8.986132	0.0000
R-squared	0.984676	Mean dependent var		8878.540
Adjusted R-squared	0.982725	S.D. dependent var		6901.649
S.E. of regression	907.1052	Akaike info criterion		16.64094
Sum squared resid	45256190	Schwarz criterion		16.91309
Log likelihood	-516.1897	Hannan-Quinn criter.		16.74798
F-statistic	504.8674	Durbin-Watson stat		1.244990
Prob(F-statistic)	0.000000			

The model results show that only the number of cases in the current week and the number of cases in a previous week had a significant effect on the number of COVID-19 deaths. Because the paper uses weekly data, an infection could have occurred at any time during a previous week. Thus, a maximum lag of two weeks is used in calculating a B/C ratio.

Number of Lives Saved

It is not possible to accurately estimate the number of lives saved by the lockdowns because we do not know how people would have reacted to ever-increasing COVID-19 cases and deaths. People could have decreased deaths by locking themselves down, or they could have increased deaths by moving from one state to another in an attempt to escape the virus. Allen (2021) has pointed out that “Goolsbee and Syverson (J2020), using cellular phone location records, find that voluntary ‘self-lockdown’ explains most of the enormous change in behavior in the spring, and that they do not find evidence of large temporal or spatial shifting in response to shelter-in-place policies (p. 12)”.

Nevertheless, lives saved is too important a factor to be ignored in the analysis. As explained below, the paper uses the estimate for lives saved calculated by Yakusheva et al. (2020). Yakusheva et al. (2020) estimated that the 2020 COVID-19-mitigating public health measures "will save between 913,762 and 2,046,322 lives in the US; however, the economic downturn from shelter-in-place measures and other restrictions on economic activity could create an indirect collateral loss of 84,000 to 514,800 lives over the following years" (Yakusheva et al. 2020).

There is a two-week lag between cases and deaths, and lockdowns were not fully implemented until April 7, 2021. Thus, the mortality savings associated with the lockdown orders would not have become evident until the week ending April 18, 2020. The growth in COVID-19 mortality rates is given in Table 2.

Table 2. *COVID-19 Mortality Growth Rates by Week*

Week Ending	COVID-19 Deaths	Weekly Mortality Growth Rate
February 22, 2020	5	N/A
February 29, 2020	9	80%
March 7, 2020	37	311.11%
March 14, 2020	57	54.05%
March 21, 2020	577	912.28%
March 28, 2020	3,186	452.17%
April 4, 2020	10,096	216.89%
April 11, 2020	16,270	61.15%
April 18, 2020	17,136	5.32%
Average	**5,264**	**261.62%**

As shown in Table 2, the weekly mortality rate had declined from 912.28% in the week ending March 21, 2020 to 5.32% in the week ending April 18, 2020. It is reasonable to assume that the death rate would have continued to decline in the following weeks.

The Traditional Analysis adopts the high estimate of lives saved (2,046,322) and the high estimate of "indirect collateral losses" (514,800) in the "following years" as estimated by Yakusheva et al. (2020). Their estimate is reasonable given the weekly mortality growth rates calculated above.

If we assume that the weekly mortality growth rate would decline to 3.4% for the weeks after April 18, 2020, a total of 2,544,634 persons would have died of COVID-19 during this time period. This would constitute a mortality reduction of 2,032,659 over the time period given above, or l3,643 less than the estimate of Yakusheva et al. (2020).

Nominal GDP Losses

The paper calculates the effect on GDP by subtracting the expected change in nominal GDP from the actual change in nominal GDP for the period 2020 Q2 to 2021 Q1. The first quarter of 2020 is omitted from the calculation because it occurred prior to the first lockdown. The expected change in GDP is the annual growth rate of GDP for the first three years (2017-2019) that President Trump was in office multiplied by the 2019 Q4 GDP. For example, if the growth rate was 6% and 2019 GDP was $20 trillion, then expected GDP is 1.06(20) = $21.2 trillion.

GDP rose from $19.03258 trillion in 2016 to $21.74739 trillion in 2019, an annual growth rate of 4.54%. Thus, expected GDP for the period 2020 Q2 through 2021 Q1 is 1.0454(21.74739) = $22.734726 trillion. The nominal GDP in 2021 Q1 was $22.048894 trillion, for a loss of slightly over $685 billion ($685,831,687,600).

Traffic Fatalities

Traffic fatalities rose from 36,096 in 2019 to 42,060 in 2020. The National Safety Council has explained that "[this] marks an 8% increase over 2019 in a year where people drove significantly less frequently because of the pandemic. The preliminary estimated rate of death on the roads last year spiked 24% over the previous 12-month period, despite miles driven dropping 13%" (National Safety Council 2021).

For the Traditional Analysis, the paper calculates the increase in traffic fatalities as a cost of 5,964 lives multiplied by $7.8 million per life for a total cost of $46.5192 billion. For the Preferred Analysis, the paper multiplies the increase in traffic fatalities by $12.55 million for a total cost of $74.85 billion.

Stimulus Programs

A total of $6.4 trillion was spent on stimulus programs by federal and state governments[5]. Of this amount, $122.4 billion was spent on non-lockdown related programs. Thus, the cost of the lockdown-related portion of the stimulus programs was $6,177.6 billion.

Value of Life

<u>Traditional Analysis</u>

For the Traditional Analysis, the total VOL is the number of lives saved multiplied by each person's value of life. Thus, the lives saved benefit in the Traditional Analysis is $7.8 million multiplied by 2,046,322 = $15,961,311,600 (approximately $16 trillion).

<u>Preferred Analysis</u>

The Preferred Analysis uses an Economic Value of Life (EVOL). CDC data was available for the following age groups: under 1 year, 1-4 years, 5-14 years, 15-24 years, 18-29 years, 25-29 years, 30-34 years, 35-39 years, 40-44 years, 45-49 years, 50-54 years, 55-64 years, 65-74 years, 75-84 years, and 85 years and over. Because life expectancy is dependent on the age of the person, the paper uses a different life expectancy for each age group.

EVOL was calculated using an average of the age of each group. For example, the group of 30-34-year-olds was calculated using an age of 32. The formula for

[5]California is the only state that used its own funds to provide an economic stimulus to its residents.

calculation of the EVOL is EVOL = (Life Expectancy – Age)(Economic Value). Economic Value is calculated as the sum of GDP/Per Capita for each year of expected life. Expected GDP and GDP Per Capita are updated for each year of expected life.

Let us suppose that a 75-year-old died of COVID-19 whose life expectancy was 85 years. That person's EVOL would be calculated by the formula (GDP Per Capita)$_t$ + (Expected GDP Per Capita)$_{t+1}$ + (Expected GDP Per Capita)$_{t+2}$ + . . . (Expected GDP Per Capita)$_{t+10}$. The EVOL for different age groups is given in Table 5.

Traditional Analysis

The Traditional Analysis yields a B/C ratio of 1.28. As shown in Table 3, there were approximately $16 trillion in benefits and $12.5 trillion in costs. Sensitivity Analyses (see Table 4) are used to show the effect on the B/C ratio if different assumptions are used. The B/C ratios in the Sensitivity Analysis range from 0.57 to 1.64. The paper notes that three out of four sensitivities yield a B/C ratio of less than 1.00.

Table 3. *Benefit/Cost Analysis Using a VOL of $7.8 Million/Person*

Item	Benefit ($ billion)	Cost ($ billion)
Lives Saved (assumes 2,046,322 lives)	15,961.3	
GDP Loss		685.8
Cost of Federal Stimulus Programs		6,177.6
Cost of California Stimulus Program		9.6
Mental Health Impairment Costs		1,581
Increase in Traffic Fatalities		46.5
Lives lost from economic restrictions		4,015.4
Decline in student shootings	.0624	
Total	**15,961.4**	**12,515.9**

Table 4. *Sensitivity Analyses Using Different Assumptions*

Item	Total Benefits ($ billion)	Total Costs ($ billion)	Benefit/Cost Ratio
Sensitivity 1: Assumes the low estimate of lives saved	7,127.3	12,515.9	0.57
Sensitivity 2: Assumes the mean estimate of lives saved (1,023,618).	7,984.2	12,515.9	0.64
Sensitivity 3: Assumes a value of life of $5 million/person and the high-cost estimate for lives saved.	10,231.6	12,515.9	0.82
Sensitivity 4: Assumes a value of life of $10 million/person and the high-cost estimate for lives saved.	20,463.2	12,515.9	1.64
Average Sensitivity	**11,451.6**	**12,515.9**	**0.92**

Preferred Analysis

The Preferred Analysis yields a B/C ratio of 0.22. As shown in Table 3, there were approximately $2.7 trillion in benefits and $12.5 trillion in costs. Sensitivity Analyses (see Table 7) are used to show the effect on the B/C ratio if different assumptions are used. The B/C ratios in the Sensitivity Analysis range from 0.10 to 0.19. The results indicate that the cost of the lockdowns was up to ten times higher than the benefits of the lockdowns.

The Preferred Analysis uses an Economic Value of Life based on the estimated ages of the deceased. The Preferred Analysis uses the following assumptions.

1. Annual GDP per capita will increase at a rate of 3.01% per annum, which is the average annual increase in GDP per capita for the period 2011 Q1 to 2021 Q1.
2. The percent of lives saved in each age group will be identical to the percent of COVID-19 deaths in each age group.
3. The remaining life expectancy for each age group will be identical to the 2018 life expectancy as published by the National Vital Statistic Reports of the CDC (Arias and Xu 2020).
4. The average age of students killed in 2019 was from 5-14 years at an EVOL of $15,969,563.09/student.
5. An EVOL of $12.55 million/fatality was used to value the increase in traffic fatalities.

The economic value of life for each age group is given in Table 5.

Table 5. *The Economic Value of Life Assuming 1,955,465 Lives Saved*

Age Group	**EVOL/ Person ($)**	**Lives Saved**	**Age Group EVOL ($ million)**
Under 1 year	24,507,719	233	5,710.30
1-4 years	19,498,632	122	2,378.83
5-14 years	15,959,563	345	5,506.05
15-17 years	12,552,921	282	3,539.92
18-24 years	10,901,237	2,702	29,455.14
25-29 years	8,763,573	4,697	41,162.50
30-34 years	7,250,894	8,527	61,828.38
35-39 years	6,192,284	12,939	80,121.96
40-44 years	5,033,954	21,265	107,047.05
45-49 years	4,035,254	36,864	148,755.62
50-54 years	3,336,338	58,828	196,270.14
55-64 years	2,431,779	241,981	588.44
65-74 years	1,450,787	432,902	628.05
75-84 years	853,578	540,569	461.42
85 years and over	592,537	593,209	351.50
Total ($ billion)			**2,711.19**

As shown in Table 5, EVOL decreases as a person ages. The reason is that older people have fewer expected years of life remaining than do younger people. The Preferred BCA estimates a total value of lives saved in Table 6.

Table 6. *Benefit/Cost Analysis Using a Total Value of Lives Saved of $2,711 billion*

Item	**Benefit ($ billion)**	**Cost ($ billion)**
Lives Saved	2,711.19	
GDP Loss		685.8
Cost of Federal Stimulus Programs		6,177.6
Cost of California Stimulus Program		9.6
Mental Health Impairment Costs		1,581
Increase in Traffic Fatalities		74.9
Lives lost from economic restrictions		4,015.4
Decline in student shooting fatalities	0.12	
Total	**2,711.3**	**12,544.3**

Table 7. *Sensitivity Analyses Using Different Assumptions*

Item	**Total Benefits ($ billion)**	**Total Costs ($ billion)**	**Benefit/Cost Ratio**
Sensitivity 1: Assumes the low estimate of lives saved decreased by 4.44%.	1,220.9	12,544.3	0.10
Sensitivity 2: Assumes the mean estimate of lives saved.	1,966.1	12,544.3	0.16
Sensitivity 3: Reduces the number of lives saved by 10% due to testing errors.	2,440.1	12,544.3	0.19
Average Sensitivity	**1,542.4**	**12,544.3**	**0.15**

Conclusion

The paper analyzed the economic effect of the COVID-19-related lockdowns in the United States from March 15, 2020 to May 8, 2021. The author relied heavily on official CDC estimates of COVID-19 deaths. Additionally, the author reviewed news stories, academic literature, and independent reports for the period January 4, 2020 to May 8, 2021 and makes conclusions concerning the success or failure of the lockdown policies. The paper concludes that:

1. The cost of the lockdowns was up to ten times greater than the benefits of the lockdowns.
2. The economic value of life per person ranges from $592 thousand to $24.5 million, depending on the age of the individual.
3. The lockdowns have saved between 913,762 and 2,046,322 lives in the U.S.; however, the economic downturn from shelter-in-place measures and other restrictions on economic activity could create an indirect collateral loss of 84,000 to 514,800 lives in the future.

4. The lockdowns caused a loss of nominal GDP of over $685 billion.
5. The average mortality rate for COVID-19 is approximately 1.75%. There is a maximum lag of two weeks between COVID-19 infection and death.
6. Government officials and public opinion leaders underestimated the extent of the virus' spread and how long it would take to get the virus under control.
7. COVID-19 is a seasonal virus.

The paper hypothesized that the economic costs of the lockdowns exceeded their economic benefits. This hypothesis is tested empirically by analyzing the effect of the lockdowns using a Benefit/Cost framework. The paper found that the economic cost of the lockdowns exceeded the economic benefits.

Acknowledgments

Thanks to Dr. Katarzyna Romańczyk, Dr. Chrysoula Gitsoulis, Dr. Alessandra Cassar, Ron Knecht (J.D.), Martin Lyons (MBA), and Gina L. Serman Reid (B.S.), manuscript editor, for helpful comments and suggestions.

References

Aizenman N (2020, September 4) *New global coronavirus death forecast is chilling — And controversial*. National Public Radio. Retrieved from https://www.npr.org/sections/goatsandsoda/2020/09/04/909783162/new-global-coronavirus-death-forecast-is-chilling-and-controversial. [Accessed 22 April 2021]

Allen D (2021) *Covid lockdown cost/benefits: a critical assessment of the literature*. Retrieved from: https://bit.ly/2Z9gyhx. [Accessed 28 April 2021]

Arias E, Xu J (2020, November 17) *United States life tables 2018*. National Vital Statistics Reports. Retrieved from: https://www.cdc.gov/nchs/products/nvsr.htm. [Accessed 9 May 2021]

Associated Press (2020, December 21) *Highlights of $900 billion COVID-19 relief, wrapup bills*. Associated Press. Retrieved from: https://apnews.com/article/health-care-reform-health-legislation-coronavirus-pandemic-762f84e4da11d350d8b5be5680ab01c4. [Accessed 17 April 2021]

Broughel J, Kotrous M (2021) The benefits of coronavirus suppression: a cost-benefit analysis of the response to the first wave of COVID-19 in the United States. *PLoS One* 16(6): e0252729.

Centers for Disease Control and Prevention – CDC (2018) *The flu season.* Retrieved from: https://www.cdc.gov/flu/about/season/flu-season.htm. [Accessed 13 April 2021]

Centers for Disease Control and Prevention – CDC (2019) *Flu symptoms and diagnosis.* Retrieved from: https://www.cdc.gov/flu/symptoms/index.html. [Accessed 13 April 2021]

Centers for Disease Control and Prevention – CDC (2021a) *Past seasons estimated influenza disease burden*. Retrieved from: https://www.cdc.gov/flu/about/burden/past-seasons.html. [Accessed 15 April 2021]

Centers for Disease Control and Prevention – CDC (2021b) *Provisional death counts for coronavirus disease*. Retrieved from: https://www.cdc.gov/nchs/nvss/vsrr/COVID19/index.htm. [Accessed 13 April 2021]

Centers for Disease Control and Prevention – CDC (2021c) *COVID-19 forecasts: deaths*. Retrieved from: https://www.cdc.gov/coronavirus/2019-ncov/covid-data/forecasting-us.html. [Accessed 21 April 2021]

Cohen GD (2020) Measuring employment during COVID-19: challenges and opportunities. *Business Economics* 55(4): 229–239.

Congressional Budget Office – CBO (2020a) *Discretionary spending under division M, the coronavirus response and relief supplemental appropriations act, 2021*. CBO.

Congressional Budget Office – CBO (2020b) *Congressional budget office estimate for division N—Additional coronavirus response and relief H.R. 133, consolidated appropriations act, 2021 public law 116-260 enacted on December 27, 2020*. CBO.

Conover C (2020, March 27) *How economists calculate the costs and benefits of COVID-19 lockdowns*. Forbes Magazine.

Cutler D, Summers L (2020, October 12) *The COVID-19 pandemic and the $16 trillion virus*. JAMA Network.

DeParle J (2020, October 15) *8 million have slipped into poverty since May as federal aid has dried up*. New York Times.

Ducharme J. (2020, March 11) *World Health Organization declares COVID-19 a 'pandemic.' Here's what that means*. Time Magazine.

Ealy H, McEvoy M, Chong D, Nowicki J, Sava M, Gupta S, et al. (2020) COVID-19 data collection, comorbidity & federal law: a historical retrospective. *Science, Public Health Policy, and the Law* 2(Oct): 4–22.

Education Week (2020, February 28) *The school shootings of 2019: what's behind the numbers*. Education Week. Retrieved from https://www.edweek.org/leadership/the-school-shootings-of-2019-whats-behind-the-numbers/2019/12. [Accessed 7 May 2021]

FRED (2021a) *Producer price index by industry: selected health care industries*. Retrieved from: https://fred.stlouisfed.org/series/PCUASHCASHC. [Accessed 15 April 2021]

FRED (2021b) *Unemployment rate.* Retrieved from: https://fred.stlouisfed.org/series/UNRATE. [Accessed 16 April 2021]

Hanson R (2020, April 27) *2 lockdown cost-benefit analyses*. Overcoming Bias. Retrieved from: https://www.overcomingbias.com/2020/04/lockdown-cost-benefit-analyses.html. [Accessed 27 April 2021]

Joffe A (2020, February 26) *COVID-19: rethinking the lockdown groupthink*. Frontiers in Public Health. Retrieved from: https://www.frontiersin.org/articles/10.3389/fpubh.2021.625778/full. [Accessed 25 April 2021]

Keith K. (2021, March 11) *Final Coverage Provisions In The American rescue plan and what comes next*. Health Affairs. Retrieved from: https://www.healthaffairs.org/do/10.1377/hblog20210311.725837/full/. [Accessed 17 April 2021]

Kelleher SR 2020) *Trump: avoid all discretionary travel for 15 days; outbreak could stretch into summer*. Forbes Magazine.

Lee S (2020) Testing for SARS-CoV-2 in cellular components by routine nested RT-PCR followed by DNA sequencing. *International Journal of Geriatrics and Rehabilitation* 2(1): 69–96.

Marchione M (2021, February 17) *US life expectancy drops a year in pandemic, most since WWII*. Associated Press. Retrieved from: https://www.yahoo.com/news/us-life-expectancy-drops-pandemic-212603799.html. [Accessed 20 April 2021]

McIntyre D (2021, March 15) *COVID-19: new forecast shows 600,000 US deaths by July 1*. 24/7 Wall Street. Retrieved from: https://247wallst.com/healthcare-economy/2021/

03/15/covid-19-new-forecast-shows-600000-us-deaths-by-july-1/. [Accessed 22 April 2021]

Miller A (2020, May 7) *Stress from virus response will destroy 7 times more years of life than lockdowns save: study*. Washington Examiner. Retrieved from https://www. Washingtonexaminer.com/news/stress-from-virus-response-will-destroy-7-times-more-years-of-life-than-lockdowns-save-study.html. [Accessed 19 April 2021]

Miller D (2021, February 23) *Governor Newsom signs $600 check 'golden state stimulus' bill*. Valley Post. Retrieved from: https://valleypostnews.com/governor-newsom-signs -600-check-golden-state-stimulus-bill/23/02/2021/. [Accessed 7 May 2021]

Moutray C (2020) In recovery mode: manufacturers try to bounce back after COVID-19 disruptions. *Business Economics* 55: 240.

National Center for Health Statistics (2020) *Provisional death counts for coronavirus disease 2019 (COVID-19).* Retrieved from: https://www.cdc.gov/nchs/nvss/vsrr/CO VID19/index.htm. [Accessed 22 August 2020]

National Safety Council (2021, March 4) *Motor vehicle deaths in 2020 estimated to be highest in 13 years, despite dramatic drops in miles driven*. National Safety Council. Retrieved from: https://www.nsc.org/newsroom/motor-vehicle-deaths-2020-estimated -to-be-highest. [Accessed 6 May 2021]

Ravani S (2020, March 21) *Bay area coronavirus decision: behind the scenes of nation's first shelter-in-place order.* San Francisco Chronicle. Retrieved from: https://www.sf ch ronicle.com/bayarea/article/Bay-Area-coronavirus-decision-Behind-the-scenes-151 48425.php. [Accessed 14 April 2021]

Reuters (2020, June 15) *New projection puts U.S. COVID-19 deaths at over 200,000 by October*. Reuters. Retrieved from: https://www.reuters.com/article/us-health-coronavi rus-usa-deaths-idUSKBN23M32C. [Accessed 23 April 2021]

Rhyan C, Turner A, Miller G (2020) Tracking the U.S. health sector: the impact of the COVID-19 pandemic. *Business Economics* 55(4): 267–278.

Scherbina A (2021) *Could the United States benefit from a lockdown? A cost-benefit analysis.* Retrieved from: https://www.aei.org/wp-content/uploads/2021/01/Scherbi na-Lockdown-cost-benefit-WP.pdf?x91208. [Accessed 25 April 2021]

Snell K (2020, March 26) *What's inside the Senate's $2 trillion coronavirus aid package*. National Public Radio. Retrieved from: https://www.npr.org/2020/03/26/821457551/ whats-inside-the-senate-s-2-trillion-coronavirus-aid-package. [Accessed 17 April 2021]

Sumner A, Jackson J, Cage J (2020, October 31) *Revolver exclusive study: COVID-19 lockdowns over 10 times more deadly than pandemic itself*. Revolver News. Retrieved from: https://www.revolver.news/2020/08/study-covid-19-lockdowns-deadlier-than-pandemic-itself/. [Accessed April 19, 2021]

Taylor A (2020, December 22) *$900B COVID relief bill passed by Congress, sent to Trump*. Associated Press. Retrieved from: https://apnews.com/article/congress-900-billion-co ronavirus-bill-75389549d3eaf2f3828b16d45c9706e6. [Accessed 17 April 2021]

The COVID Tracking Project (2021) *US daily cases*. Retrieved from: https://covidtracking. com/data/charts/us-daily-positive. [Accessed 13 April 2021]

Tsekova D (2020, August 19) *Coronavirus stimulus: loss of extra $600 unemployment benefits leads to 44% drop in spending.* Yahoo News. Retrieved from: https://www. yahoo.com/money/coronavirus-stimulus-loss-of-extra-600-unemployment-benefits-le ads-to-44-drop-in-spending-192200590.html. [Accessed 18 April 2021]

Wired (2020). *What's a "shelter in place" order, and who's affected?* Wired. Retrieved from: https://www.wired.com/story/whats-shelter-place-order-whos-affected/. [Accessed 14 April 2021]

Yahoo News (2021) Retrieved from: https://search.yahoo.com/search?p= number+of+co vid+deaths+ in+us&fr=yfp-t-s&ei=UTF-8&fp=1. [Accessed 14 April 2021]

Yakusheva O, van den Broek-Atenburg E, Brekke G, Atherly A (2020) *The cure is not worse than the disease—A humanitarian perspective*. Retrieved from: https://ssrn.com/SSRN-id3638575.pdf. [Accessed 5 May 2021]

Zhou L, Stewart E (2021, March 6) *The Senate just passed the $1.9 trillion stimulus package. Here's what's in it.* Vox. Retrieved from: https://www.vox.com/policy-and-politics/2021/3/6/22315536/stimulus-package-passes-checks-unemployment. [Accessed 17 April 2021]