Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
How did “flatten the curve” become “flatten the economy?” A perspective from the United States of America

Hal B. Jenson

Department of Pediatric and Adolescent Medicine, Western Michigan University Homer Stryker M.D. School of Medicine, 1000 Oakland Drive, Kalamazoo, MI, 49009, USA

ARTICLE INFO

Keywords:
Coronavirus SARS-CoV-2
COVID-19
Flatten the curve
Pandemic response
Decision-making

ABSTRACT

The coronavirus SARS-CoV-2 (COVID-19) pandemic offers many medical, economic, societal, and cultural challenges. The response by individual states in the United States of America varies, but with the common initial impetus for all being to “flatten the curve,” which was intended to delay infections and spread the burden and impact on hospitals and medical systems. Starting with that intention, the responses by states has included many major steps not taken in prior pandemics. Those steps have significantly adversely affected hospitals rather than support them, and the overall impact has been to “flatten the economy” rather than just to “flatten the curve.” Many state governors have stated that their decisions are “science-led” and “data driven” but the reality is that there is not relevant experimental data. The progression of decisions during the early pandemic decisions is traced, and the basis of decisions based in science or herd mentality is discussed. Experiences are not experiments, and experiences are not founded in the scientific process. Medical and government leaders must be vigilant to recognize the limitations of available data in responding to unique circumstances.

The COVID-19 disease, caused by coronavirus SARS-CoV-2, is the greatest pandemic since the 1918 H1N1 influenza (Spanish flu) pandemic that infected about 500 million people worldwide, resulting in an estimated 50 million deaths worldwide with about 675,000 deaths in the United States. We have been living through the onset of the COVID-19 pandemic, which has been far more significant than the 1957–58 H2N2 influenza pandemic, the 1968 H3N2 influenza pandemic, and the 2009 H1N1pdm09 influenza pandemic. We have experienced firsthand the direct impact of the 2020 COVID-19 pandemic, the early responses taken by state and federal governments in the United States, and the initial consequences of these decisions.

During the early onset of COVID-19 in the United States, based on pandemic planning following the 2009 H1N1pdm09 influenza pandemic and also having some insights into the COVID-19 pandemic from the experiences of China and countries in Europe, there was public health guidance to take measures to “flatten the curve.” This term was applied to justify the steps necessary to spread the demands on our healthcare facilities resulting from a high incidence peak that could potentially inundate healthcare capacity. A high peak that exceeded capacity, specifically the availability of intensive care beds and ventilators, would limit access to appropriate healthcare and result in otherwise preventable deaths. The steps to “flatten the curve” are intended to slow viral transmission in order to delay the onset of enough cases to lower the peak and spread the distribution of cases over time, not specifically to prevent the overall incidence of cases during the pandemic.

“Flatten the curve” has become the defining graphic of the COVID-19 pandemic. One of the first publications incorporating this graphic came from the Centers for Disease Control and Prevention (CDC) in 2007 in which the concept of “flatten the curve” contrasted two potential courses of a pandemic (Fig. 1).

Although the principal intent of “flatten the curve” is to delay infections and diminish the health impact by spreading the burden on hospitals and infrastructure over time, not specifically to prevent infections, it could ultimately relieve the burden and impact by buying time until effective treatments were developed, and also facilitate prevention if an effective vaccine were developed, though for COVID-19 a vaccine might take months at the earliest.

To flatten the curve and reduce the demand on healthcare during the peak of the pandemic, state authorities have closed schools and universities, closed non-essential businesses, and enacted stay-at-home policies requiring sheltering-in-place of the general populace at home. These executive orders permitted onsite work only for “essential” businesses such as hospitals, grocery stores, pharmacies, gas stations, and banks. All other work had to be performed remotely, or cease altogether. Severe restrictions were broadly imposed on society limiting personal travel and activities.

How did we get to such drastic measures? On March 16, 2020, seven
public health officers from six counties in northern California and the city of Berkley implemented a stay-at-home order for nearly 7 million Bay Area residents. It was reported that the initial three public health officers leading this edict agreed that, “It wouldn’t stop the spread, but it could buy time for hospitals to gear up for the onslaught, and create hope that the number of patients each day would be manageable (The Mercury News)” (The Mercury News, 2020). From that nidus, lockdowns closing “non-essential” businesses and also stay-at-home orders moved as a wave first from California, then to northeast and Midwest states, and eventually to most states in the country.

As we have lived through the first wave of COVID-19, we have indeed seen several metropolitan areas with a great deal of stress on the healthcare system, especially intensive care. In almost all locales, actions such as canceling elective surgeries and broad implementation of telemedicine have significantly reduced overall healthcare demands. These steps to flatten the curve have been critical in those locales with high numbers of cases and undoubtedly reduced COVID-19-associated mortality. However, by applying these actions in a one-size-fits-all approach to all hospitals in all locales, the impact has been so great that even after meeting the needs for patients with COVID-19, many if not most hospitals and hospital systems are not logistically challenged for beds or ventilators but are severely challenged financially, some to the point of viability. Rather than spare healthcare facilities the adverse impact of COVID-19, our healthcare facilities have had substantial adverse impact resulting directly from actions intended to spare healthcare facilities. We have seen tens and hundreds of thousands of healthcare workers who have been furloughed or laid off. Ambulatory visits have fallen by 50 % or more, resulting in untold numbers of patients who have not had the routine or even urgent care that they would have normally accessed. Rather than help our healthcare facilities, government actions are taking a huge toll on the very health and wellbeing of healthcare, and on society itself.

The financial impact on society resulting not directly from COVID-19 but directly from government actions is staggering. This is the most dramatic economic disruption and the highest levels of unemployment since the Great Depression. Innumerable businesses have been closed, some forever. In the matter of a few weeks, the federal government has accumulated hundreds of billions of dollars of additional debt. A society that is predicated on the free exchange of goods and services has been crippled.

In addition to the societal and financial impact, citizens of the US have had significant curtailment of individual and constitutional rights—such as the right to assemble—and state-imposed restrictions on personal activities and travel. These actions have quarantined not just patients with COVID-19, which may be justified on a public health basis, but also in effect quarantined the healthy. Though the results are multifactorial and cannot be simplified, currently there is not consistent evidence that countries or states that have been strictly locked down are uniformly faring better than states that have not. Compared to the United States, Germany has a lower incidence rate (Fig. 2) despite fewer government restrictions on their economy, allowing most factories and offices to remain open (Wall Street Journal, 2020). Countries such as Sweden (Fig. 3) have fared comparably to other counties that have imposed strict restrictions even though Sweden chose a very different approach, adjusting how society functions but without an involuntary lockdown of the entire populace and closing most businesses (European Centre for Disease Prevention and Control, 2020). Even in regions where lockdowns were implemented, the additive benefits are difficult to quantitate. For
example, a preliminary analysis of cases in New York City shows that the incidence reached an inflection point around the date that the state initiated the lockdown (Harris, 2020). Some states in the United States are taking far less draconian measures and have fared better than some states taking extreme restrictions. Florida, for example, did not impose statewide closure of non-essential businesses but left early lockdown decisions to local authorities. It is unknown how much mandatory state-imposed restrictions add to the impact of voluntary actions taken by the citizenry in the face of a pandemic. The voluntary change in behavior resulting from education is a significant factor in pandemic mitigation. At this time, we are not close to understanding the outcome of the pandemic, let alone the complex interactions and impact of individual actions on the outcome.

Imposing or not imposing mandatory, involuntary restrictions is not an argument of lives vs. jobs. It is the discussion of lives vs. lives, using a broader definition of lives that are measured in multiple dimensions including the quality of life, mental and emotional wellbeing, and livelihoods and financial security.

Pandemic planning from the CDC, as outlined initially in 2007 and reiterated in updated CDC publications (Qualls et al., 2017), is founded on environmental nonpharmaceutical interventions including routine cleaning of frequently touched surfaces, and personal and community nonpharmaceutical interventions including: 1) voluntary home isolation of ill persons, and use of face masks in community settings when ill; 2) voluntary home quarantine of exposed household members; 3) dismissal of students from schools, colleges, and universities; and 4) use of social distancing measures in workplaces and postponing or cancelling mass gatherings. These guidelines framed by the CDC did not advocate for ceasing commerce and disrupting large segments of the economy. Staying at home is stipulated for those individuals with symptoms, and recommended as voluntary for individuals living in households with persons with symptoms. School closings are recommended for a severe pandemic, and the “task force found insufficient evidence to recommend for or against preemptive, coordinated school dismissals during a mild or moderate influenza pandemic.” There is not guidance in CDC recommendations for widescale closing of businesses.

Every year in the United States, influenza results in millions of infections, hundreds of thousands of hospitalizations, and tens of thousands of deaths. Every year. COVID-19 is different from influenza in many ways, and the mortality from this first wave of COVID-19 already exceeds the typical annual mortality usually associated with influenza. The medical impact of COVID-19 is different, is part because the epidemiology and spread of a new pathogen through a non-immune population is different from influenza. More striking has been the societal and governmental response to COVID-19 compared to influenza. Why has the response to COVID-19 been so different than for influenza, including the H1N1 influenza pandemic in 2009? It seems that the novelty of a new virus, with a unique name and identity, as opposed to “just the flu,” has been one factor. Another significant factor has been the attention, and sometimes hysteria, resulting from the heightened presence of social media and also the mainstream media. Many voices are heard, and not all are informed. Many media voices are unfiltered.

Within a month of the initial actions in California, there was a societal and media tsunami, and most governors enacted executive orders that closed non-essential businesses and mandated that most persons stay-at-home. With some exceptions, in general these have been one size fits all for entire states, not tuning the actions with the situation in the locale or county. The definition of “essential” and “non-essential” applied by state governments varied, and in many instances appeared arbitrary, closing outdoor parks while permitting liquor stores to remain open and lottery sales to continue. In some instances, the state orders were inappropriate, such as the New York Health Department blanket rule issued on March 25, 2020 that nursing homes must admit new or returning residents even if they were known to be infected with COVID-19, and also prohibited the facilities from testing patients before admission. Such policies and practices defy the recommended and usual precautions to best protect individuals at high risk. New Jersey and California implemented similar rules. The rule was not reversed in New York for over six weeks.

Have the decisions made by state governors been based in science or do they reflect a herd mentality? Fear is contagious. A reality is that we do not have scientific evidence as the basis for many of these actions. Twitter is not a peer-review process. We do have some experiences from past pandemics, but the government actions during those pandemics are not comparable to the current actions taken by state governors. The most serious pandemic, in 1918, was in a societal and economic environment very different from the United States in 2020, and the more recent 2009 H1N1pdm09 influenza pandemic was not as deadly. It is

Fig. 3. Coronavirus deaths in selected countries shown as weekly rolling average of fatalities since the fifth death. (Denmark and Norway initiated lockdowns before reaching five deaths) (European Centre for Disease Prevention and Control, 2020).
misleading to state that the decisions are “science-led” and “data-driven” when in fact the “data” are experiences, not experiments. Experiences are not experiments, and experiences are not founded in the scientific process.

There will be, hopefully, much reflection and analysis on how we, as a society, did what we did and are doing. The decisions that have been made and the actions taken may have been the most appropriate—or not. It will likely take years to untangle and understand the medical, psychological, financial, and societal impact of these decisions. For the present, we need to realize that what was stated in 2007 remains true today: “Evidence to determine the best strategies for protecting people during a pandemic is very limited. Retrospective data from past epidemics and the conclusions drawn from those data need to be examined and analyzed within the context of modern society” (Centers for Disease Control and Prevention). Nevertheless, we have seen numerous government leaders over the past few weeks state that their actions are based on science.

Thomas Henry Huxley advocated that we need to learn what is true in order to do what is right. All of us are learning what is true about COVID-19. During this process, we have to maintain a healthy skepticism and scientific perspective, recognizing what is known and not known, and where there is data and where there is not. With the onslaught of soundbites and opinions that are stated as facts, and actions purported to be “science led,” we must be vigilant so that we do not permit the limitations of available evidence to be ignored, do not become confused, and do not allow ourselves and others to be misled.

References

Centers for Disease Control and Prevention, 2007. Centers for Disease Control and Prevention: Interim Pre-Pandemic Planning Guidance: Community Strategy for Pandemic Influenza Mitigation in the United States—Early, Targeted, Layered Use of Nonpharmaceutical Interventions. February, European Centre for Disease Prevention and Control. April 24, 2020; published at https://www.bbc.com/news/world-europe-52395866, (Accessed 30 April 2020).

Harris, Jeffrey E., 2020. The Coronavirus Epidemic Curve is Already Flattening in New York City. NBER Working Paper 26917. http://www.nber.org/papers/w26917.

Qualls, N., Levitt, A., Kanade, N., et al., 2017. Community mitigation guidelines to prevent pandemic influenza—United States, 2017. MMWR Recomm. Rep. 66 (No. RR-1), 1-34. https://doi.org/10.15585/mmwr.rr6601a1externalicon.

The Mercury News. Published: March 29, 2020 at 6:00 am; Updated: March 29, 2020 at 3:55 pm; Accessed April 28, 2020. https://www.mercurynews.com/2020/03/29/she-shut-down-the-bay-area-to-slow-the-deadly-coronavirus-none-of-us-really-believed-we-would-do-it/.

Local, practical apolitical: Inside Germany’s successful coronavirus strategy, Wall Street J. (May) (Accessed 2 May 2020). https://www.wsj.com/articles/local-practical-apolitical-inside-germanys-successful-coronavirus-strategy-11588325403.