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## UCR Honors Capstones 2022-2023

### Title

THE ECONOMIC IMPACT OF THE COVID-19 PANDEMIC ON HEALTHCARE ADMINISTRATION AND FACILITIES

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THE ECONOMIC IMPACT OF THE COVID-19 PANDEMIC ON HEALTHCARE  
ADMINISTRATION AND FACILITIES

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## **ABSTRACT**

The emergence of the coronavirus (COVID-19) pandemic presented the entire globe with devastating challenges. Healthcare Administration, Hospitals, and facilities internationally were faced with economic struggles that resulted in obstacles in several different areas and categories of the system. This research project is a platform to better understand the implications by connecting the ideas of the healthcare industry and the business of hospitals by focusing on several areas, such as the financial, logistical, and personnel implications. Financially, hospitals around the globe lost millions of dollars of revenue, and that can impact patients' accessibility to care. There were also limitations on projects and developments, such as limiting clinical trials, which can delay any new drug treatment and medical procedures. Administrations faced increasing costs with medical equipment, supply of materials, and uninsured individuals. In addition to these financial implications for hospital administration, logistics played an integral part during the pandemic. Patient treatment no longer followed a traditional cycle due to hospital capacity and appointment availability constraints. For example, specialized patients with critical conditions and psychosocial care had difficulty receiving treatment due to the overwhelming surge of COVID cases. Furthermore, healthcare administrations were unable to retain and support staff, causing delays in the hospital environment. Overall, the capstone research will investigate how the COVID-19 pandemic influenced the healthcare and hospital industries economically within the categories of financial, logistical, and personnel implications.

## ACKNOWLEDGEMENTS

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## **INTRODUCTION**

### **(Background and Objectives)**

The COVID-19 Pandemic has resulted in massive devastation throughout the world, posing an unparalleled amount of challenges to the healthcare system, production systems, and the workforce. In December of 2019, COVID-19 (Coronavirus) emerged as a result of the SARS-CoV-2, causing a pandemic of respiratory illness including symptoms of fever, chills, difficulty breathing, fatigue, and more (Hopkins, 2022). This infectious disease spread rapidly across the globe, causing millions of deaths, hospitalizations, and high rates of cases. Research demonstrates that there are two ways COVID can be transmitted. One of the main methods that COVID can be spread through individuals is through direct contact. The primary method of transmission for COVID is through respiratory droplets, which can emerge as a result of an infected person's coughing, talking, breathing, sneezing, or other body fluids (Karia et al., 2020). Thus, when an infected person comes into direct contact with an uninfected person, there is a potential that the virus particle is released into the surroundings and can cause the uninfected person to contract COVID via direct transmission. The second method the virus may be spread is through indirect transmission. Here, an infected individual may leave virus particles on objects or fomites, and if an uninfected person comes into contact with the object, they have a chance of contracting the illness.

Tens of millions of people worldwide suffered economic and societal destruction as a result of the COVID-19 Pandemic. To this date, the epidemic has cost the globe tremendously in terms of millions of lives lost, rising levels of poverty, and adverse economic consequences. The global workforce was at risk of losing their jobs, but they also lacked social safety, access to quality health care, and basic housing and nutrition necessities (Grimm, 2021). Millions of families were left struggling to make ends meet in the absence of sufficient income, leaving

many of them unable to provide for their own needs. The World Health Organization reported that "COVID-19 has infected over 82 million individuals and killed over 1.8 million as of December 31, 2020" (WHO, 2020). Because of instabilities in the healthcare industry, vaccine delays may have caused fewer individuals to seek medical treatment. Budget constraints due to treating fewer individuals could transition into the entire hospital system and have negative consequences for non-COVID patients.

Because of the disease's widespread development, healthcare and medical attention are required to be more robust than before. Organizations in the healthcare industry provide medical services and create and construct medical equipment and pharmaceuticals, as well as offer medical insurance and specialized care to patients (Grimm, 2021). Government rules and directions during the Pandemic changed how people used traditional healthcare services. There were other new transitions for healthcare delivery that needed to be undertaken, such as a greater need for telemedicine and fewer emergency department visits. Ultimately, there were several obstacles inside the system as a result of supply chain concerns and overall operation and maintenance during a pandemic.

### **Project Objectives**

This capstone proposed study examines how the COVID-19 Pandemic affected the healthcare and hospital industries economically in terms of financial, logistical, and personnel effects. The financial implications will focus on the attributes of Net Income, a hospital's total operating expenses, and Daily Hospital Service Expenses. Logistical attributes include Supplies, Outpatient visits to a hospital, and Visits to the E.R. Lastly; the personnel category will emphasize salaries and wages, Employee Benefits, and the Number of Active Medical Staff.

This specific study will focus on only hospitals and healthcare facilities in California. The data will then be reduced to a comparison in between both Los Angeles County and Mendocino County. Los Angeles has an estimated population of 3.9 million individuals, and Mendocino County has around 87,000 individuals. When compared to Mendocino County, Los Angeles County has a higher population density, making it easier to comprehend the significance of population density and its impact on the healthcare sector. The data will compare the cycle year 2018-2019, the pre-COVID-19 Pandemic, with data in those counties during the 2020-2021 peak COVID-19 period. This will help evaluate the extent to which the Pandemic may have changed the structures of financial, logistical, and personnel implications.

## **METHODS**

The study sample consists of hospitals and healthcare facilities from two areas within California: Los Angeles County and Mendocino County. For my capstone project, I analyzed data from a total of 113 hospital and healthcare facility locations: 110 from Los Angeles County and three from Mendocino County. The nine attributes I compared were Net Income, Total operating expenses of a hospital, Expenses of Daily Hospital Service, Supplies, Outpatient visits to a hospital, Visits to the E.R, Salaries and wages, Employee Benefits, and Number of Active Medical Staff.

### **Data Collection**

Data was collected from the California Health and Human Services Agency (CHHS), which has administrative control over federal and state medical services, community programs, government benefits, and treatment programs. The data from CHHS is collected from individual hospitals and medical providers that disclose specific facility-level statistics relating to numerous



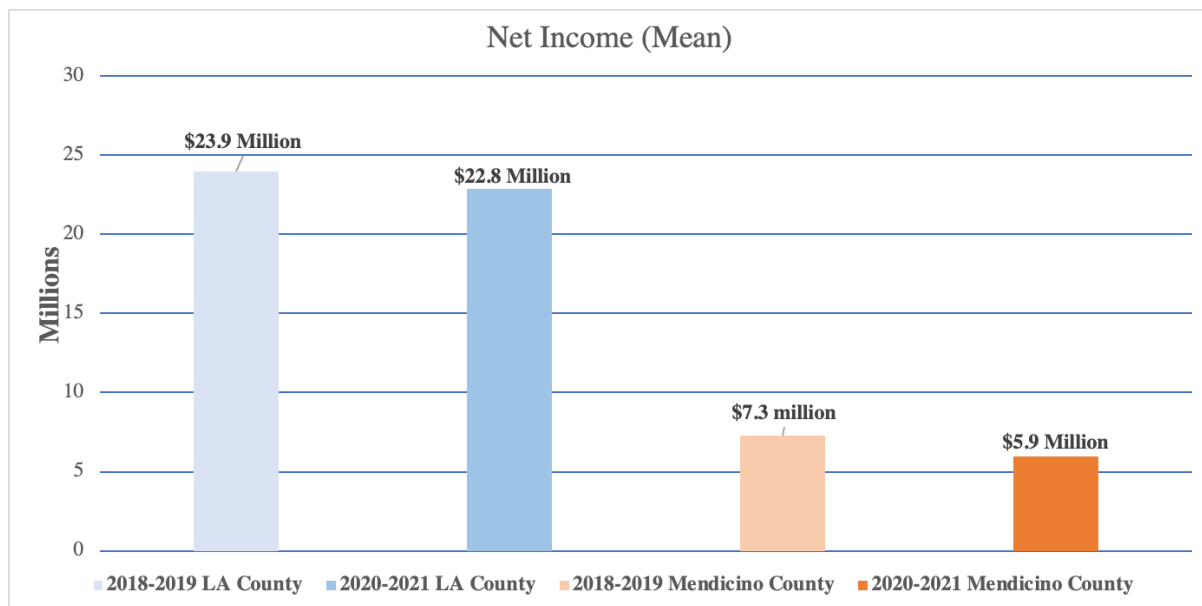
distinct categories on an annual basis, dependent on the fiscal year of the respective institution. The Hospital Annual Financial Data report was analyzed for the capstone project for the 2018-2019 and 2020-2021 years, specifically under the Department of Health Care Access and Information. Using the datasets, data values for the nine total attributes selected were uploaded to an excel spreadsheet categorized by Financial, Logistical, and Personnel. Then, the FILTER function on the column titled "County," enabled access to select only Los Angeles and Mendocino County from the comprehensive list of California Counties. The data was separated by year and the specific variable that needed to be analyzed by highlighting the values and using the "Descriptive Statistics" analysis tool on the Data tab. This tool was able to calculate statistics such as the mean, standard error, range, median, and sum for the values. Using the same highlighted data, bar graphs were created to get in-depth visualization of data to interpret.

## RESULTS

The full data set of the Hospital Annual Data for the 2018-2019 and 2020-2021 years was separated and analyzed based on the categories of Financial, Logistical, and Personnel implications within the subcategories of the attributes that were selected.

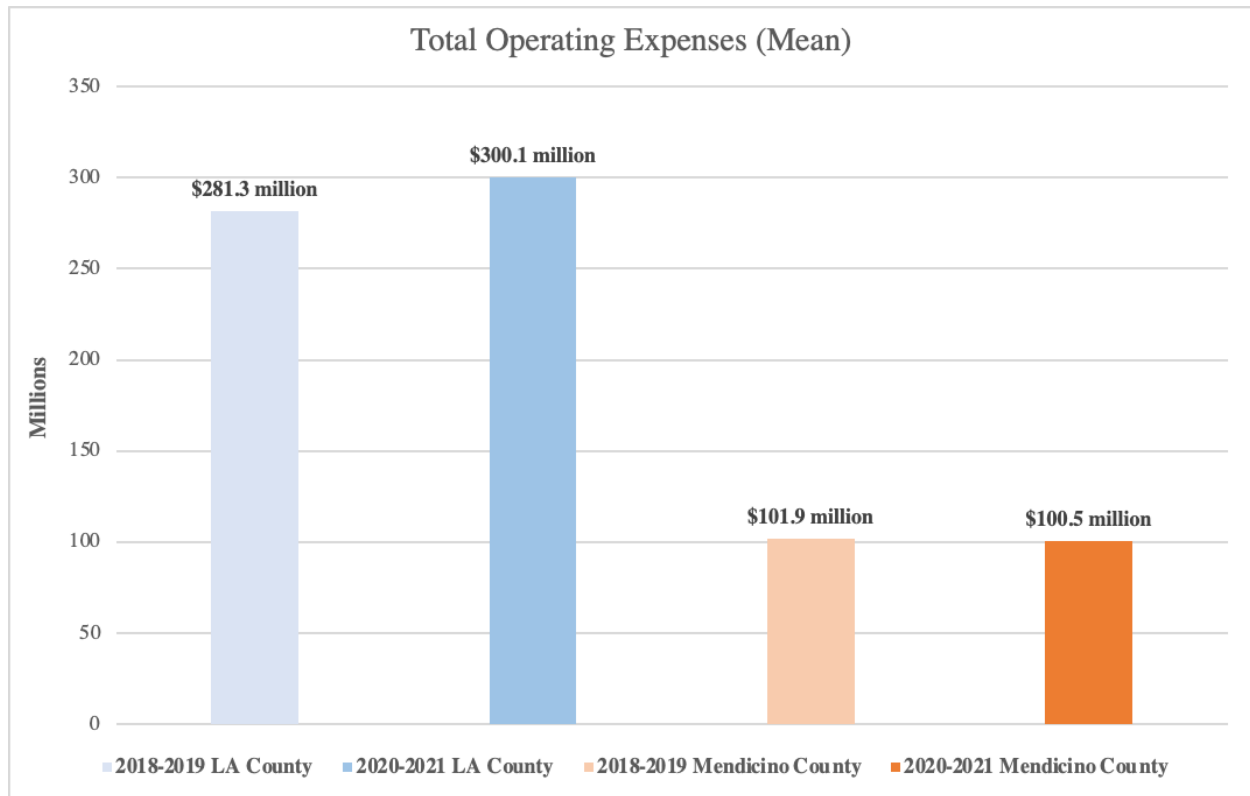
### Financial

#### 1. Net Income



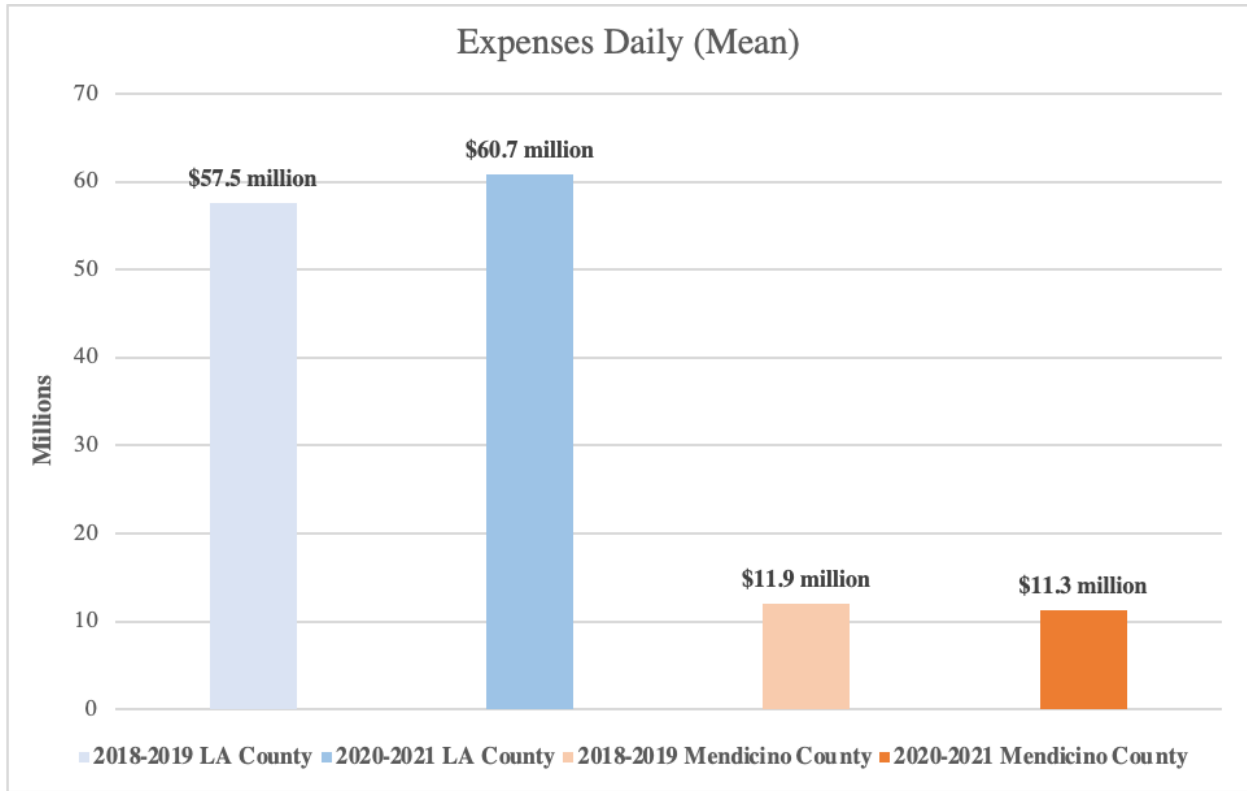
For the Net Income category, hospital data was used for the total income of all hospitals for both LA County and Mendocino County during (2018-2019) and (2020-2021). In the 2018-2019 year, LA County had an average of \$23.9 million in net income, and Mendocino County with an average of \$7.3 million. When comparing the 2020-2021 year, LA County averaged a net income of \$22.8 million and Mendocino County with \$5.9 million. LA County faced a decrease of \$1.1 million, and Mendocino County had a difference of \$1.4 million. LA County itself saw a 4.6% decrease from 2018-2019 to 2020-2021, and Mendocino county with a 19.2% decrease in Net Income.

## 2. Total Operating Expenses



Data for Total Operating Expenses of all hospitals for both LA County and Mendocino County during (2018-2019) and (2020-2021) was analyzed for this evaluation. In the 2018-2019 year, LA County had an average of \$281.3 million in operating expenses. During that time frame, Mendocino County averaged \$101.9 million in expenses. Then comparing both counties to the 2020-2021 year, LA County saw an increase in total operating expenses to \$300.1 million. On the other hand, during the 2020-2021 year, Mendocino County observed a decrease in expenses to \$100.5 million. Overall, LA County increased by 7.03% from 2018-2019 to 2020-2021, and Mendocino county with a 1.37% decrease in Total Operating Expenses.

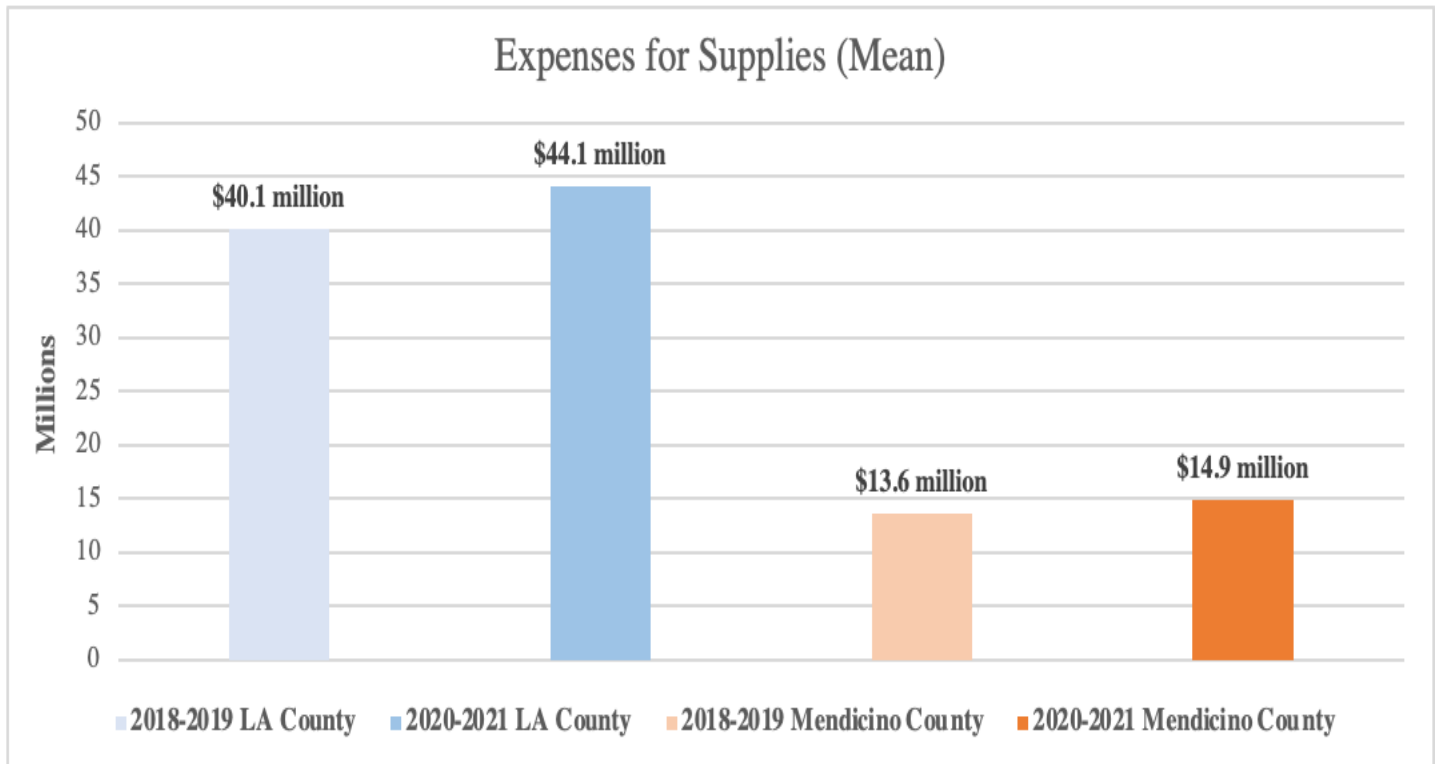
### 3. Expenses Daily



The Expenses Daily Hospital Services data describes the average expenses and costs that are needed on a day-to-day basis to maintain the operation of a hospital. In the 2018-2019 year, LA County spent an average of \$57.5 million in expenses daily. Mendocino County averaged expenses daily of \$11.9 million during the 2018-2019 year. However, during the 2020-2021 year, LA County experienced an increase in expenses to \$60.7 million, whereas Mendocino County decreased the costs to \$11.3 million. Additionally, LA County increased by 5.6% from 2018-2019 to 2020-2021, and Mendocino county with a 5.0% decrease in Expenses Daily.

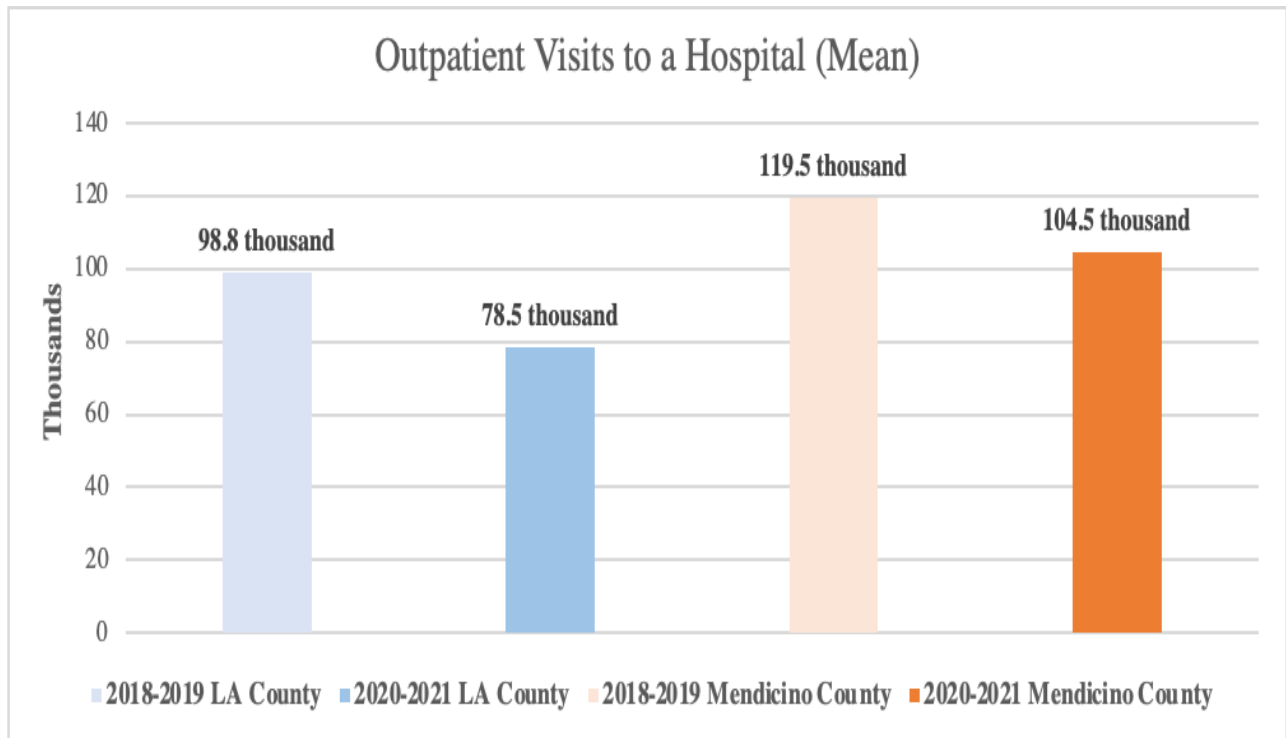
## Logistical

### 1. Expenses for Supplies



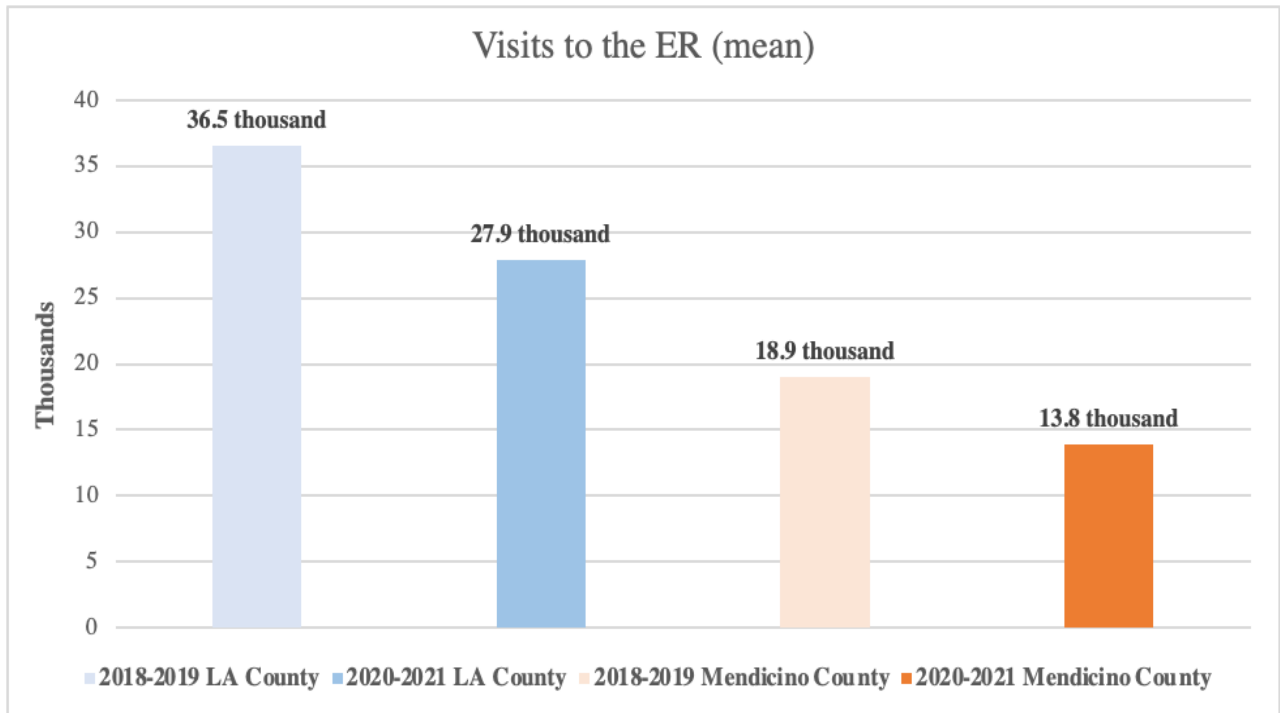
For the expenses for supplies category, this attribute focuses on the logistical costs of a hospital, including medical supplies. For LA County, in the 2018-2019 year, \$40.1 million was spent annually. Then during the 2020-2021 year, there was an increase to \$44.1 million. On the other hand, Mendocino County had an average expense for supplies of \$13.6 million during the 2018-2019 year, but then costs also increased to \$14.9 million during the 2020-2021 time period. For LA County, expenses for supplies increased by 9.97% from 2018-2019 to 2020-2021, and Mendocino County also increased by 9.5% from 2018-2019 to 2020-2021.

## 2. Outpatient Visits to a Hospital



Outpatient visits to a hospital represent the average number of visits during the time period. Based on the previous categorizations that were analyzed, the data for this section specifically is in the thousands. In the 2018-2019 year, LA County observed an average of 98.8 thousand visits, and Mendocino County with 119.5 thousand visits. Then, in the 2020-2021 year, both counties experienced decreases in the number of visits. LA county went down to 78.5 thousand visits, and Mendocino County went down to 104.5 thousand visits. Despite being the smaller county, Mendocino County overall had a more significant number of outpatient visits compared to LA County. Outpatient visits in LA County decreased by 20.5% between 2018-2019 to 2020-2021. For Mendocino County, visits decreased by 12.5% between 2018-2019 to 2020-2021.

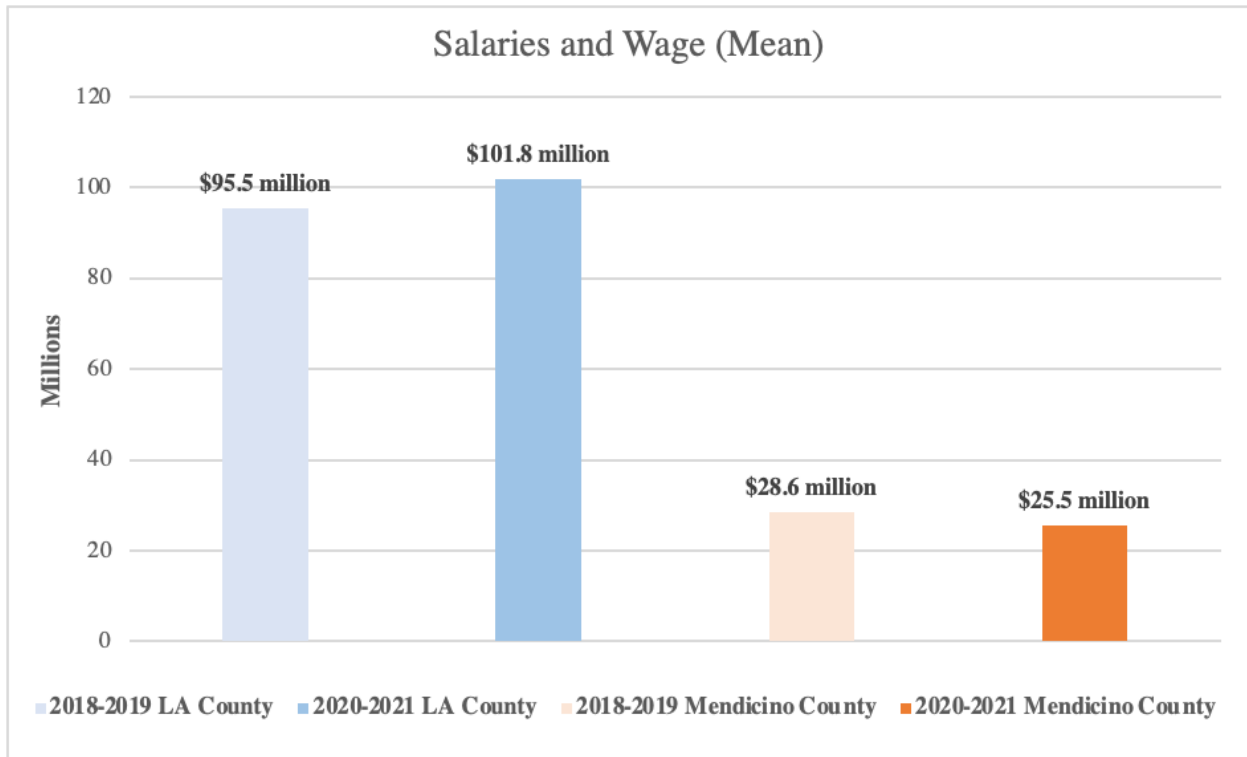
### 3. Visits to the E.R



This attribute is focused on outpatient visits to the hospital in the Emergency Room. The data values for this graph are also in the thousands. During the 2018-2019 year, LA County observed 36.5 thousand outpatient visits. Mendocino County experienced 18.9 thousand visits during 2018-2019. During 2020-2021, both counties faced a significant decline in outpatient visit numbers. LA County dropped down to 27.9 thousand, and Mendocino County decreased to 13.8 thousand. Overall, LA County decreased by 23.6% from 2018-2019 to 2020-2021, and Mendocino county with a 26.9% decrease in Visits to the ER.

## Personnel

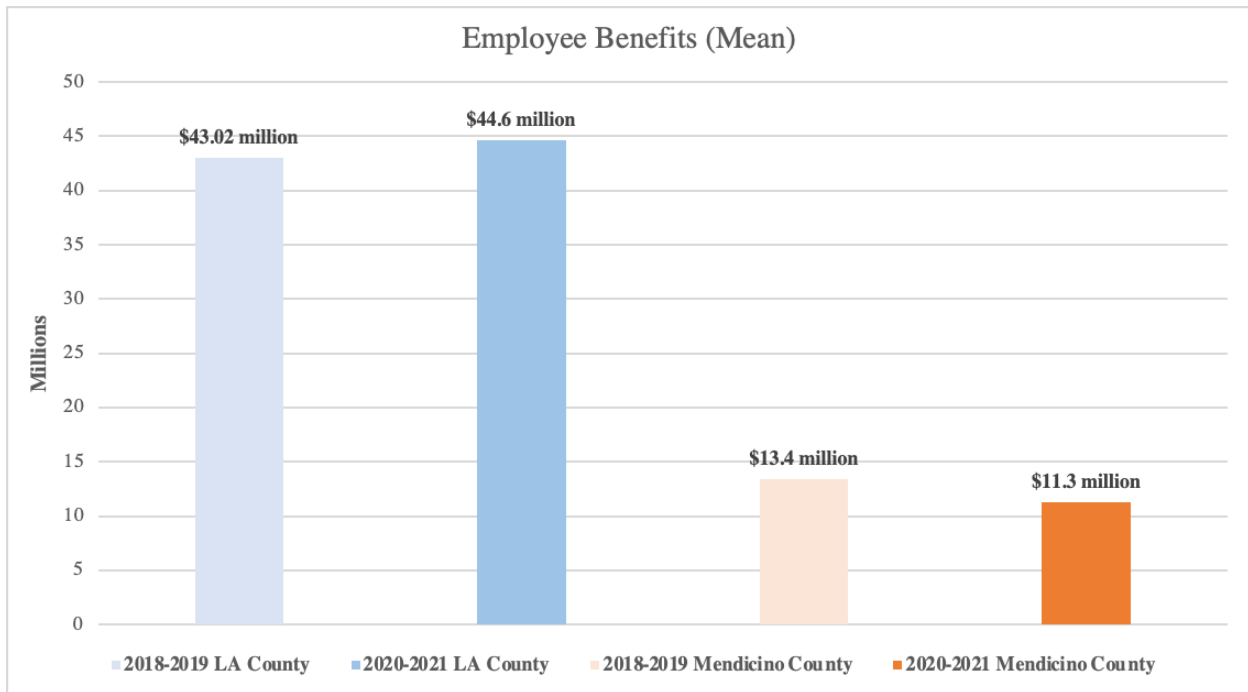
### 1. Salaries and Wages



Salaries and Wages data is defined as the monetary remuneration for services rendered by an employee, as well as the reasonable market value of services contributed to the hospital by those acting under a work engagement force. The values represent the average cost the county spent on those salaries and wages. LA County faced an increase in value from \$95.5 million in 2018-2019 to \$101.8 million in 2020-2021. In contrast, Mendocino County observed a decrease in the amount from 28.6 million in 2018-2019 to \$25.5 million in 2019-2020. For LA County, salaries and wages increased by 6.5% from 2018-2019 to 2020-202. However, Mendocino County decreased by 10.8% from 2018-2019 to 2020-2021.

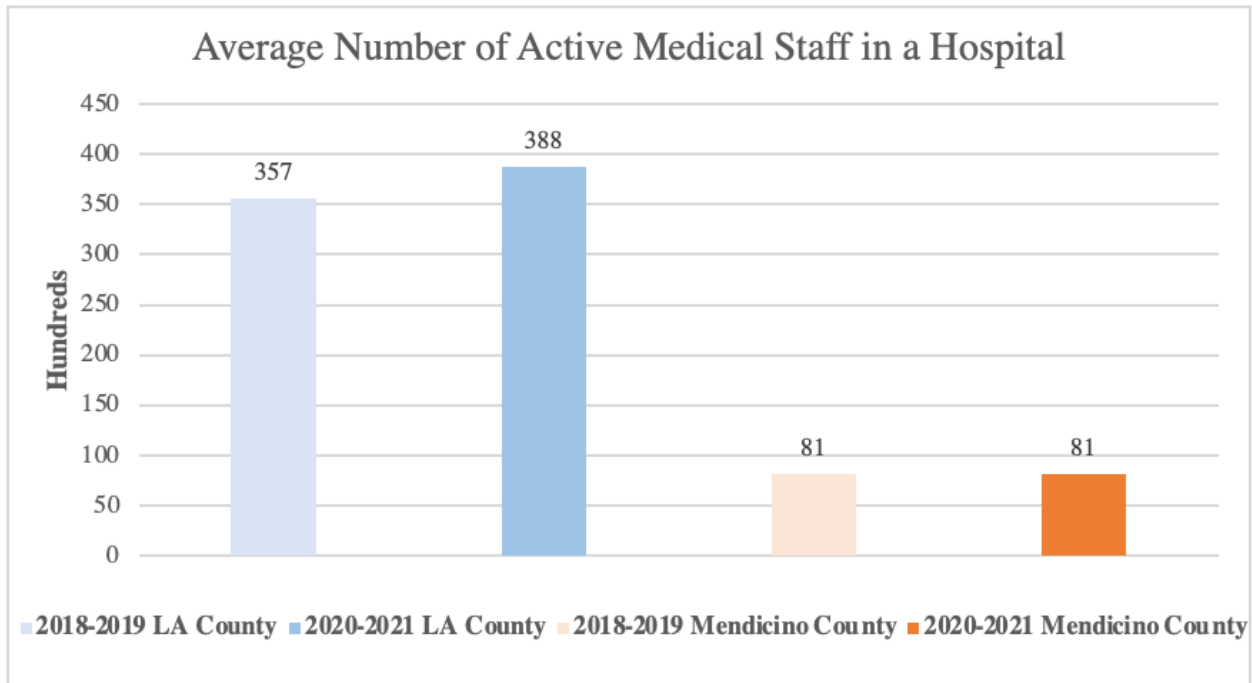


## 2. Employee Benefits



Employee benefits describe the expenses that are considered for paid vacation, sick leave, holiday time off, many types of insurance plans, and more. During the 2018-2019 year, LA County spent \$43.02 million on benefit expenses. Mendocino County spent an average of \$13.4 million during the 2018-2019 year. For LA County in the 2020-2021 year, there was an increase in expenses to \$44.6 million. Nevertheless, for Mendocino County, employee benefit costs decreased to \$11.3 million. Additionally, LA County increased by 3.7% from 2018-2019 to 2020-2021, and Mendocino county with a 15.7% decrease in Employee Benefits.

### 3. Number of Active Medical Staff



The average number of Active Medical Staff in a Hospital represents the amount in hundreds within each county. LA County started with an average of 357,000 staff members during 2018-2019. In 2020-2021, that number increased to about 388,000 staff members. Mendocino County during both time frames remained constant and did not have significant changes in numbers. Mendocino County remained at an average of 81,000 staff members. The number of Active Medical Staff increased for LA County by 8.7% from 2018-2019 to 2020-2021. For Mendocino County, there was no percentage change. In larger counties, there have been varied employee shortages that forced even physicians and nurses to work overtime for strenuous hours. Additionally, administrations made an effort to find replacements like military medical specialists and traveling nurses (USC Price, 2021). Staff, meanwhile, had difficulties since they had to place themselves in quarantine after contracting COVID-19.

## ANALYSIS

**Summary Table** (\* in millions unless specified)

<b>Attributes</b>	<b>LA County 2018-2019</b>	<b>LA County 2020-2021</b>	<b>Mendocino County 2018-2019</b>	<b>Mendocino County 2020-2021</b>	<b>Percent Change from 2018-2019 to 2020-2021</b>
Net Income	\$23.9	\$22.8	\$7.3	\$5.9	<b>LA:</b> -4.6% <b>Mendocino:</b> -19.2%
Total Operating Expenses	\$281.3	\$300.1	\$101.9	\$100.5	<b>LA:</b> 7.03% <b>Mendocino:</b> -1.37%
Expenses Daily	\$57.5	\$60.7	\$11.9	\$11.3	<b>LA:</b> 5.57% <b>Mendocino:</b> -5.04%
Expenses for Supplies	\$40.1	\$44.1	\$13.6	\$14.9	<b>LA:</b> 9.97% <b>Mendocino:</b> 9.56%
Outpatient Visits to a Hospital * (in thousands)	98.8	78.5	119.5	104.5	<b>LA:</b> -20.54% <b>Mendocino:</b> -12.55%
Visits to the E.R * (in thousands)	36.5	27.9	18.9	13.8	<b>LA:</b> -23.56% <b>Mendocino:</b> -26.98%
Salaries and Wages	\$95.5	\$101.8	\$28.6	\$25.5	<b>LA:</b> 6.59% <b>Mendocino:</b> -10.83%
Employee Benefits	\$43.02	\$44.6	\$13.4	\$11.3	<b>LA:</b> 3.67% <b>Mendocino:</b> -15.67%
Number of Active Medical Staff * (in hundreds)	357	388	81	81	<b>LA:</b> 8.68% <b>Mendocino:</b> 0%

The Economic Impact of the COVID-19 Pandemic on Healthcare Administration and Facilities in California was analyzed under the following categories: Financial, Logistical, and Personnel. Based on the data analysis, several observations were made to determine the various impacts.

Starting with the Financial category, Net Income for both Los Angeles (LA) and Mendocino County decreased during the peak COVID-19 period 2020-2021. The California Health Care Foundation reported that the leading cause of decreased Net Income resulted from increased operating expenses explained by the greater hospital and medical complexity and overall duration of stay, including COVID-19 patients who stayed longer (CHCF, 2021). The Total Operating Expenses showed an increase for LA County but a decrease for Mendocino County. This is due to the fact that rural hospitals cost less than metropolitan ones since higher operating expenses are primarily driven by increased use of technological medical innovations and increasing medical costs. However, for LA County, extra expenditures are associated with planning for and executing new COVID-19-related processes to guarantee both patient and employee safety while supporting all patients.

Similarly, for Expenses Daily, LA County saw a 5.2% increase from 2018-2019 to 2020-2021, whereas Mendocino County experienced a decrease of 5%. Because of the greater population density in LA County, administrations and hospitals created new COVID-19 surge facilities on primary care and emergency room floors, as well as in dining facilities and parking structures. To further promote infectious illness control, ICU capacity was enhanced.

The daily operations of hospitals and their administration were influenced by a number of logistical issues during the COVID-19 Pandemic. Both Mendocino County and LA saw a rise in supply costs from 2020 to 2021. Ventilators and other personal protective equipment (PPE) were

critically needed in order to combat and strengthen protection from the infectious disease. PPE gear included items such as masks, gowns, gloves, and face shields. The requirement and need for COVID testing also necessitated additional expenses for laboratory supplies as well. Both counties saw a significant reduction in hospital outpatient visits. The number of patient visits in LA County fell by 20% and the percentage of patients that visited the county of Mendocino decreased by 12.5%. One key reason for this is that medical providers themselves deferred elective and preventive visits, such as yearly physicals, that were not considered emergencies (CHCF, 2021). This was intended to reduce the likelihood of disease transmission even further. Similar results were observed for Emergency Room (ER) visits, as both counties again experienced declining numbers. During the peak pandemic 2020-2021, LA County ER visits decreased by 23.5% and Mendocino County by 27%. As prevention techniques persisted, many patients avoided ER examinations because they did not want to leave their residences due to potential exposure. The medical needs of patients could be fulfilled by health professionals using options like telemedicine visits, which allowed them to receive medical assistance and advice while remaining in the comfort of their own homes.

Additional difficulties with personnel-related expenses were also observed by hospital and healthcare administrations. In the two-year period from 2020 to 2021, LA County's earnings and wages showed an increase in value of 6.6%. At the same period, Mendocino County's salary and pay expenditures fell by 10.8%. Since hospitals serving smaller populations no longer handled as many in-person visits, some areas of expertise, such as surgical specializations, suffered a decline in care. Smaller counties have to make adjustments to their budgets to cut down on these costs. Similar trends were observed in employee benefits, with Mendocino

County experiencing modifications and decreased costs there while LA County had seen an increase in spending overall.

### **CONTINUED IMPACT AND SOLUTIONS**

COVID-19 was detrimental not only to individuals but to healthcare providers and the industry in its entirety. These outcomes have produced a broader viewpoint to take into account while making future plans to safeguard against a pandemic. The healthcare administration sector continues to be impacted by COVID-19's both continued and long-term implications. According to the Centers for Disease Control and Prevention (CDC, 2022), COVID-19 new cases in 2022 still exist and there is still risk potential for infection during this time. Every additional increase of patients puts incredible burden on already overworked and exhausted employees, depletes resources, lowers hospital income, and has a damaging effect on many other aspects of the healthcare system. Healthcare organizations must offer stability and possibilities for growth while they make adjustments to the current circumstance because the pandemic's longevity is unpredictable and ambiguous.

Collaboration and effective partnerships between organizations may maximize the number of casualties that may be spared and the number of communities that can be protected when possible risks are highly prevalent. The first step in forging partnerships within healthcare administration and facilities is to be proactive in communicating and planning with partners at the local, state, and national levels before emergency situations arise. Then, these approaches should be enforced by being transformed into policies and procedures, but also making sure to put those systems within administration practices. For instance, the US Department of Health and Human Services has developed plans where hospital administrators may outline options for federal assistance in developing emergency preparation (HHS, 2021). These targeted areas

include overseeing national supply chains for medical goods, analyzing data reports to evaluate for prospective threats, and regional hospitals coordinating collaborations. Healthcare facilities and administrations may build a better framework for reducing the ongoing and long-term consequences by cooperating at all levels of government.

Developing a more robust administrative system within hospitals and the healthcare industry itself as a whole is another way to address persistent problems brought on by the pandemic. By creating committees to focus on the many areas of financial, logistical, and personnel necessities of administrations, executives should decide how best to incorporate leaders in the facility or system. Due to patient infection peaks and staffing constraints, certain leadership may be solely focused on resuming hospital staff rotation to help patients. However, recruiting new executives who have a track record of bolstering financial situations should be given priority by healthcare administrations (HHS, 2021). This implies that setting apart individuals for finances could concentrate on details like monitoring the progress of expenditures, making preparations for disaster recovery, and other operational concerns.

Given the continuing pandemic, many hospitals and health systems are experiencing growing financial difficulties. Some examples include lost income from canceled operations and expensive and prolonged COVID-19 patient treatments to those severely infected. Consequently, designating specialized leaders for finances to make timely strategic decisions in order to recover some of those resources lost in the last few years. In order to prepare financially in the long run, there should be an expansion in financial requirements for facility capacity growth, PPE-related equipment and supplies, and salary implementation. To mitigate the financial repercussions of the pandemic, modifying labor parameters, reducing capital expenditures for both new and existing developments, and canceling contractual arrangements have already started to be

implemented by administrations (HHS, 2021). These implementations represent one milestone in identifying solutions to the long-term and ongoing issues of COVID-19.

During the pandemic, performance measures for leadership have transformed, thus it is critical to immediately integrate initiatives for personnel into current procedures and develop new key performance indicators. The US Department of Health and Human Services' Healthcare Emergency Preparedness Gateway highlights crucial leadership imperatives for health and community health professionals in administrations to follow in the ongoing post-emergency stage of the COVID-19 pandemic. This involves supporting employee well-being, putting plans in place for catastrophic events, enhancing team and organizational performance, and developing new ways to improve learning experiences (HHS, 2021). Such practices help alleviate the extreme amounts of stress that healthcare personnel went through during hard times, and help those that are still facing challenges within their administrations. Simple efforts may be taken, such as simply acknowledging employees and acknowledging accomplishments inside medical facilities and healthcare organizations.

Another area where the COVID-19 pandemic's ongoing and long-term effects might be alleviated is through the augmentation and transformation of the application of technological advancements in healthcare. Investments can also be budgeted to include some spending on accelerated digital transformations. Forecasting and predictive modeling can benefit from the use of sophisticated analytics with current data. A number of healthcare systems used telemedicine platforms during the pandemic; some of them could have been implemented too quickly given the dire situation (HHS, 2021). To find any vulnerabilities, healthcare executives need to examine the infrastructure of such telehealth systems. Additionally, a more effective program for



providing virtual care at home is a crucial delivery model when providing in-person care may not be practical.

The COVID-19 pandemic will continue to provide difficulties for administrators of the healthcare sector. Increased patient volume strains the already overburdened workforce, but measures can be taken to create some relief. However, as healthcare faces every difficulty, leadership has increased, pioneered, and collaborated in previously unheard-of ways with relationships in the healthcare, disaster prevention, supply-chain management, and other industries. These are crucial factors to take into account while healthcare administration and facilities recover from surges and become ready for potential viral outbreaks.

## **CONCLUSION**

Healthcare administrations and institutions should employ, educate, and prioritize healthcare personnel, improve logistics and supplies, and set up more robust response mechanisms in order to be better prepared for a future pandemic.

During the COVID-19 Pandemic, Labor investments and supply expenditures increased hospitals' already-existing financial difficulties, particularly in less-populated areas. A stronger workforce was needed in order to sustain and accommodate the growing demand for healthcare services. The number of active medical staff for LA County grew during the peak COVID period, whereas Mendocino County remained constant. Larger counties experienced an influx of patients and a higher demand for healthcare. As the number of cases increased, administrations were compelled to recruit additional employees. Therefore, a proactive strategy should be used to address future difficulties with a particular focus on protecting the most vulnerable communities.

Moreover, it is essential to transform logistical and supply-related defenses that are readily available before a pandemic event occurs. This means widely available Personal Protective Equipment, Medical Supplies, and Vaccinations. Also, it is necessary to strengthen healthcare administration systems through infrastructure at local, state, and national levels, including those vulnerable communities such as Mendocino County. Responses within these healthcare systems can be reinforced with situational awareness. Implementing warning systems with potential early outbreaks and monitoring can prevent large-scale economic disruption.

### **PROJECT LIMITATIONS**

The Hospital Annual Financial Data from the California Health and Human Services Agency (CHHS) includes reports from hospitals within all counties throughout California. Therefore, to narrow down the broad results, this Capstone Project only focused on hospitals in the specific counties of Los Angeles and Mendocino. Therefore, this project does not give an overall representation of the State of California; instead, it compares two counties: one with a large population and a small population. Impacts inside healthcare administrations and institutions do not encompass the total representation of the United States because this study is focused on a single state. Various states have a vast range of demographics, including population and income distribution. In comparison to a smaller state, a state with a higher population density like California could have higher revenues and budgets. There are variations in how healthcare institutions and administrations operate since each state has its unique health-related elements and legislation. Each state had an unique number of positive COVID-19 instances, which is also tied to state disparities. Other states had far lower percentages compared to California. The reduced number of COVID-19 cases may have resulted in fewer hospital admissions in that state, which would have a different number of expenses.

Another limiting factor is to account for other externalities in financial factors, such as the rate of inflation. Inflation describes a period when prices of goods and services in an economy generally rise in all industry areas. Increasing inflation rates can alter and can create an impact on hospital infrastructure and expenses. This entails rising expenditures for employee compensation, medical equipment supply, and other charges, such as a significant increase in the number of maintenance costs. This means that COVID-19 would not be the direct result of the changes in the values of the data. Market trends can impact the supply and demand for commodities in hospitals. COVID-19 may not always be the primary explanation for shortages of medical supplies and equipment. Rather, it can be due to external factors that healthcare facilities and administrations cannot control.

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