

# Understanding Covid-19 Impact on Adults Over 50 and How to Reduce Disease Spread among Vulnerable Populations

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## Abstract

COVID-19 has impacted millions, and populations over 50 have experienced the most significant level of impact resulting in death. A non-experimental longitudinal design examines preexisting data from multiple public databases. A multivariate regression model is used to survey the factors influencing COVID-19 outcomes. A cluster sampling of four regions within the United States is used to collect data relating to population count, age-based demographics, and COVID-19 impact and consequences. As a result, in reducing disease spread, adherence to interventions strategies is essential. The response time, ability to reduce susceptibility and manage through underlying conditions (i.e., psycho-social-medical conditions) influence the disproportionate effect on disease impact. Thus, level and ability to engage safety precautions is a vital public health measure, and effective for disease management.

**Keywords:** Covid-19, Vulnerable Aging Populations, Disease Strategies, Public Health

## 1. Introduction

The COVID-19 pandemic was an alarming event to many within the United States. Its presence led to a significant number of cases and deaths. At the height of its disease impact, a new strain developed, the Delta Variant [31]. The severity of both strains challenged the United States' ability to manage and address disease outbreak [29, 24]. The level of cases, deaths, and survival outcomes was influenced by the swiftness of pandemic response and preparedness to manage through the factors influencing disease spread. [32, 34].

### 1.1 Disease Prevalence

Within the first cycle (2019-2020) of COVID-19, the United States (U.S.) investigated 179 million cases, 4.1 million deaths, and 164 million recoveries worldwide. By the end of 2021, there had been over 219 million cases and over 4.5 million deaths worldwide [18, 19, 31]. The Centers for Disease Control and Prevention [9] also reported over 39 million total cases, over 161,387 new cases, and over 643,405 deaths, with 1,514 new deaths as of September 3rd, 2021, within the United States [10].

With more than 71 million doses of the covid-19 vaccine administered, the number of new cases of covid-19 continued to rise in mid-2020, exceeding 1000 cases daily [9]. In 2021, with the ease of social distancing and mask-wearing restrictions, new COVID-19 cases were anticipated. A new variant, the Delta, complicated the issue of disease management [21]The new strain

of COVID-19 was identified in December 2020, impacting 30,000 within three months. Highlighting, new variants as potentially being more transmissible despite vaccination, creating concerns about ability to evade immunity and manage social distancing needs. Variants can create uncertainty in disease management (i.e., the delta variant made up 90% of reported infections, with an estimated 60% more transmissibility than the Alpha variant [1, 19, 10].

### 1.2 Factors Influencing Disease Spread

The perpetuation of COVID-19 is influenced by several factors such as living conditions, disease response, infectious control, and treatment availability. Living conditions influence situations that perpetuate disease risk [25]. Factors impacting living conditions are poor housing, crowding, economic position, and an unsanitary environment. These examples influence health and inflame the COVID-19 incident rate [1]. Among disease impact, there is a risk and concern for individuals with co-occurring illnesses dying from COVID-19. When considering disease management factors, age and health factors influence contraction rate, hospitalizations, health rate, and survival rate [26].

### 1.3 Societal and Population Based Impact

While attempting to problem solve the epidemic, the effect of COVID-19 led to the economic downturn [8], housing instability [3], social isolation [12], hospitalization [17], and death of many [11]. Based on age demographics, COVID-19 mortality risk and

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the death rate are higher among populations over 50 than those under 49 [34, 35]. Factors impacting disease susceptibility based on age are affected by multiple health vulnerabilities [7]. The risk factors and level of disease impact are different due to multiple medical and health concerns [35].

#### 1.4 Approaches to Disease Management

From 2019 through 2021, as COVID-19 circulated throughout society, many engaged safety precautions: physical distancing, wearing personal protection equipment, testing, quarantine, and vaccination [3,8]. Engaging safety precautions was an attempt to reduce the social aftermath of disease spread, meet medical treatment demands, and to maintain the security and safety for everyone [29, 24, 28]. Secondary to getting everyone to follow precautionary behavior strategies was identifying policy changes on a federal and organizational level [33] that help promote safeguards to disease spread.

In addition, there is a multipronged effect of the pandemic and engaging mitigating strategies [15]. This effect is influenced by the length of physical distancing and the ability to manage other significant mental, medical, and financial issues (23, 25, 22). The staggering death toll, high number of cases reflect the persistent structural preparedness to address an impending pandemic. Lack of readiness and a timed response impact the increase or decrease in risk exposure to COVID-19 [2]. Part of mitigating strategies is isolating disease spread while ensuring access to treatment and care [28]. For example, according to Rooij et al. (2020), engaging mitigation measures creates a shift in human behavior. Essential to a plan of action is also the level of compliance, ability to follow the rules, display self-control, and support social norms. Likewise, similar to engaging human behavior is addressing structural health inequalities. Addressing structural issues relates to the ability to access help promptly to address health symptomology (pneumonia, acute respiratory distress syndrome, and other health problems) [22]. Finally, addressing the ecological factors among aging populations; their unique risks (age, level of access, underlying conditions, economic status, and social resources) influence disease impact. [16].

## 2. Methodology

This is a correlational non-experimental research project. This research aims to examine the lessons learned and utilization of mitigating COVID-19 strategies while addressing the Delta Variant on populations over 50 and identifying the relationship between response to COVID-19 and the impact of the Delta Variant. Archival/Pre-existing data will be collected comparing the time frames between March 31st to August 31st of 2020 and the same months of 2021 to identify a correlation or difference in the level of outbreak. This study engages in collecting data from health organizations that have developed data based on age-related demographics, specifically among populations over 50. This research is helpful in identifying

1. The percentage of the populations impacted by COVID-19.
2. The percentage of the populations vaccinated versus not vaccinated.
3. Identifying the rate of hospitalization, death, and survival of

populations based on age.

4. Assessing disease impact while engaging targeted strategies based on populations.

5. Highlighting and identifying other factors influencing the impact of COVID-19? Specifically, other mediators such as vaccinations, age, and precautionary behavior.

In addition to recognizing and assessing any other variables impacting vulnerable populations, this research provides opportunity to engage the following hypothesis

(1) Among populations over 50, there is a reduction in deaths from Delta Variant due to mitigating strategies applied from COVID-19.

(2) Among populations over 50, there is an increase in vaccinations to reduce outbreak impact.

(3) There is a connection between multiple biological, medical, and social factors influencing disease impact.

## 2.2 Sample and design

Preexisting data is collected from the CDC, world health organization, worldometer, and health department on age-related statistics regarding the impact of COVID-19 and the Delta Variant. Specific data related to the number of the reported daily count, vaccines, number of deaths, number of cases, number hospitalized, number of survivors for both COVID-19 and the Delta Variant will be identified. Information will be specific to the US. Populations and the total impact of COVID-19 will be identified by obtaining a single count based on specific regions.

Throughout the US, there is an overall death rate for populations over 50; this data will be obtained through a cluster sampling based on regional information on heavily populated states. The sampling will be specified by states within the Southern, Western, Northeast, and Midwest regions of the country. At least 3 states are identified within each region. States engaged in data collection are Southern States (Florida, Texas, and North Carolina); Midwest States (California, Utah, and Idaho); Northern states (Ohio, Indiana, and Missouri); and Northeast States (Massachusetts, Maine, and Rhode Island). This is used as preliminary identification of the response to COVID-19 and will help point out measures taken that impact Delta Variant spread compared to COVID-19 spread [29-35].

## 2.3 Data Analysis

A regression analysis will be used to run the correlation coefficient to assess impact value. As a result of the pandemic, multivariate regression factors impact the spread of COVID-19 [17]. Factors impacting disease influence relate to behavior practices such as vaccination, masks, and social distancing. Factors of impact are also influenced by health relating to pre-existing conditions and access to resources. Assessing and examining these multivariate factors is essential to disease management.

The emergence of COVID-19 has inflamed several impact factors (exacerbated social determinants of health, such as access to care, socio-economic status, and mental health condition) placing many individuals at high-risk for severe sickness, leading to quarantine hospitalization or death. Examining disease impact among populations above 50 can assist in establishing

lessons learned and identifying effective responses that impact disease spread and continuation. Identifying co-occurring and intersecting factors impacting the spread or reduction of a public health outbreak is vital. Teasing out what mitigating strategies minimize the rate of spread is significant to identifying, how behavior adherence impacts disease spread, survival rates, helping highlight lessons learned to inform disease prevention strategies.

### 3. Results

During 2019 and 2021, data collected on the pandemic in the United States (U.S.) identifies a population of 335.1 million as the minimal U.S. population total, with populations over 50 representing 108.7 million of the general population [31]. Throughout COVID-19 and Delta Variant, two types of outcomes to COVID-19 exposure can be identified. One where roughly 445,000 adults over 50 are impacted or die directly from COVID-19 and Delta. And a disease impact based on the number of people impacted or dying from co-occurring factors combined with COVID-19 or Delta alone (646,800). Based on the established death incidence rate, overall disease impact among older populations is identified as 79.7% among individuals 65-85 plus, 15.3% among 50-64, and 4.46% among 0 and 49 years old (10).

Among COVID-19 data tracking reports are demographic statistics about disease impact that identify many influencing factors, such as age, race, rural/urban status, and sex. Based on age, data tracking reports highlight the number of cases/influences of COVID-19 and overall impact among U.S. population groups per 100,000 population (10). Highlighting how COVID-19 exposure rate can fluctuate between population

groups, however, establishing death incident rate as remaining high for aging populations. Within the multiple regions of the United States (Southern, Western, Midwest, and Northeast), there is a similarity within the COVID-19 outbreak among age demographics. For example, in North Carolina, within the first year of COVID-19, over 1 million COVID-19 cases were reported. Of those reported, 13,533 were deaths and 27,172 recoveries of cases and outcomes were contributing factors related to individuals having underlying health conditions (64.7% of North Carolinians have underlying health conditions, and 70.4% of adults are at high risk of illness) [14 10].

Likewise, other Southern states such as Florida and Texas report similar death outcomes based on age. Texas reports deaths impacting 86% of populations above 50 within the first year of COVID-19. Florida reports deaths impacting 68% of individuals over 50. Within the Midwestern States such as California, Utah, and Idaho, California reports deaths affecting 88% of populations over 50. Utah reports deaths impacting 71% of populations over 50. In Idaho, 39% of deaths were of those above 50. Among Northern states, Ohio, Indiana, and Missouri, Indiana, reports 83% of deaths were of those over the age of 50. Ohio identifies deaths impacting 71% of adults over 50. And in Missouri, 76% of deaths were among populations 50 and above. Lastly, among Northeastern States, Massachusetts, Main, and Rhode Island, Massachusetts identifies 41% of older adults were impacted. Maine identifies a death impact of 93% of adults over 50, and Rhode Island reports 30% older adults impacted by COVID-19. Within the identified sample, roughly 77% of adults over the age of 50 experienced an identified death impact from COVID-19 (see table 4).

	Total Deaths	50+pop impacted	Impact %
Florida	55,000	37,664	68%
Texas	66,000	57,000	86%
N. Carolina	16,000	13,533	85%
Cali	69,000	61,000	88%
Utah	2,943	2,052	70%
Idaho	2,936	1,145	39%
Ohio	22,000	15,622	71%
Indiana	15,700	13,000	83%
Missouri	12,000	9,083	76%
Massach.	18,600	7,603	41%
Maine	1,109	1,026	93%
Rhode Is.	2,838	842	30%
Total:	284,126	219,570	77%

**Table 4: Impact on 50 Plus Population Specifically (2019-2021)**

From the region cluster sample, an estimated percentage of deaths is identified. For populations over 50, the region impact among Southern states is 24% (106,197), for Northern states it is 8% (37,705), for Midwest states it is 14% (64,197), and for Northeast states it is 2% (9,471). Each statistic represents the death impact among populations over 50, estimating a minimal

impact of .50% of the total U.S. deaths within the cluster sample due to the recent pandemic (see table 1). Among the total U.S. population groups vaccinated, 42.7 million adults over 50 are fully vaccinated, whereas 47.94 million have received only one dose, and roughly over 5.24 million are unknown (see table 3).

	Total Population	50+pop	Total Cases	Total Deaths	Total Tested	Total Vaccines	<49*	50 plus*
Florida	21,500,000	---	3,500,000	1,850,000	1,850,000	12,300,000	3,766	49,800
Texas	29,100,000	---	4,070,000	66,000	42,400,000	14,800,000	6,450	61,500
N. Carolina	10,400,000	---	1,400,000	16,000	17,800,000	5,200,000	851	11,500
Cali	39,500,000	---	4,750,000	69,000	2,400,000	23,200,000	5,458	65,900
Utah	3,200,000	---	510,000	2,943	1,700,000	1,600,000	287	2,052
Idaho	18,300,000	---	259,000	2,936	1,900,000	745,000	59	1,145
Ohio	11,800,000	---	1,420,000	22,000	1,400,000	5,870,000	716	15,600
Indiana	6,800,000	---	969,000	15,700	2,020,000	3,260,000	98	1,802
Missouri	6,200,000	---	840,000	12,000	1,640,000	2,940,000	651	9,083
Massach.	7,000,00	---	813,000	18,600	1,170,000	4,680,000	307	7,603
Maine	1,400,000	---	91,000	1,026	991,000	922,500	23	1,109
Rhode Is.	1,100,000.00	---	173,000	2,838	5,230,000	723,900	12	842
Total:								227,636
US Total	335,100,000	108,700,000	44,000,000	706,000	1,946,000,000	76,200,000	40,353	455,400

**Table 1: Covid-19 Regional State Impact and Response (2019-2021)**

\* a close estimate is provided of statistics specific to cases impacted by COVID-19 solely, whereas the total number of identified as impacted by COVID-19 not influenced by other factors. Data for population 50 and above show individuals based on data for fully vaccinated persons.

	Cases	Deaths	Vaccinations	Cases	Deaths	Vaccinations	Case % (+/-)	Death % (+/-)
April 6 <sup>th</sup> 2020	815k	41k	April 5 <sup>th</sup> 2021	April 5 <sup>th</sup> 2021	1.7M	19.3K	109%	-53%
May 4 <sup>th</sup> 2020	641k	37.4k	May 3 <sup>th</sup> 2021	May 3 <sup>th</sup> 2021	974K	20.1K	52%	-46%
June 1 <sup>st</sup> 2020	744k	26.7k	June 7 <sup>th</sup> 2021	June 7 <sup>th</sup> 2021	363K	8.8K	-51%	-67%
July 6 <sup>th</sup> 2020	1,74M	32.7k	July 5 <sup>th</sup> 2021	July 5 <sup>th</sup> 2021	1.387M	7.6K	-20%	-77%
Aug 3 <sup>rd</sup> 2020	1.7M	32.7K	Aug 1 <sup>st</sup> 2021	Aug 1 <sup>st</sup> 2021	4.872M	11.9K	187%	-64%
Sept 7 <sup>th</sup> 2020	817K	15.2K	Sept 6 <sup>th</sup> 2021	Sept 6 <sup>th</sup> 2021	2.927M	39.7K	-64%	161%

**Table 2: Us Covid-19 Impact time frame for 50 Plus (2019-2021)**

Age	One Does	Two Doses	< 49 Two Dose
50-64	48,600 (77.32%)	42,900 (68.2%)	
65-74	28,500,000 (90.48%)	25,500,000 (80.37%)	
75 and Older	19,400,000 (86.55%)	17,200,000 (76.72)	
Age based Total	96,500,000	85,600,000	83,900,000
Overall US total	214,600,000 or 65%;	184,800,000 or 56%	

**Table 3: Overall us Vaccinations Based on Age (2019-2021)**

### 3.1 Lessons Learned

COVID-19 has a global impact forcing small communities and societies to identify effective ways to reduce the overall death and case impact. There are multiple overlapping factors that compound the issues of disease control such as, the cycle-threshold or factors amplifying the impact of and the ability of a disease or virus to reproduce or evolve is a concern. Factors

influencing contraction rate, exposure, and susceptibility are amplified by living conditions, access to health and resources, and other high-risk factors based on age and susceptibility. Identifying the level of effectiveness behind mitigating strategies or effective interventions are impacted by these intersecting factors. Nonetheless, common pandemic-related interventions relate to following personal protection guidelines, wearing protective gear,

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physical distancing, obtaining testing, medication adherence, quarantining, and receiving vaccination. Level of engaging these secondary factors impact level of exposure, contraction rate, survival rate, and overall impact rate.

### 3.2 Limitations

Establishing a timeline of the overall impact from the origination of COVID-19 and the emergence of Delta Variant was difficult. Relevant information and data on tracking disease impact are constantly being changed and sources updated, preventing some data from being collected, such as identifying a clear picture of an overall number of hospitalizations and survival rate within the US and across the States.

In examining the impact of vaccination on populations over 50, several factors were difficult to track. It is not easy identifying how accessible vaccinations were to aging adults and how that impacted any change in disease exposure. Data within the US identifying the specific cycle threshold of the Delta Variant is limited. It was also difficult being able to identify the significance of being fully vaccinated compared to having one dose or obtaining a booster or second round of vaccinations.

Likewise, tracking all the specific occurrences that influence the difference or change in a number of COVID-19 and Delta cases and death from April to September of 2020 and 2021 was difficult. It was also hard conceptualizing additional statistically vital factors such as weekly and daily counts. In addition, measuring the exact death rate reduction due to vaccination or other contributing factors was challenging.

### 4. Discussion

While COVID-19 is not just isolated to the US, its impact on the US and distinct population groups need to be measured. Based on data collected, a third of the US population impacted by COVID-19 is over 50. As a new virus, COVID-19 is curtailed by ensuring social distancing, setting up testing, quarantining, contact tracing, ensuring proper medical treatment and vaccination. Deaths were high initially because of learning how to respond and determining to what level and the degree to engage mitigating strategies to a pandemic.

After the first year of COVID-19, the virus may have evolved, however, established mitigating strategies are identified as an effective method. Also, maintaining certain restrictions such as a physical distancing and addressing structural issues such as access to health, housing, and treatment are equally important.

From the data collected, being aware of essential disease aggravators and mitigators impacts the ability to contain, control, reduce and address disease impact. For example, having mindfulness of policy level influencers (laws or legal mandates) and social-influences (individual and collective behavior response) impact cycle threshold and disease prevalence.

As this study reviewed regional data based on a three-stage cluster sample on the impact of COVID-19, from April to August 2020 and from April to August 2021, there is an overall decrease in number of deaths. This is notable decrease can be attributed

to multiple outlying interventions, physical distancing, mask wearing, vaccination, testing quarantining, adapting response timing, and addressing underlying health issues effectively.

Likewise, in reducing the impact of disease, the cycle threshold plays a role in the amplification and detection of disease. Identifying the reproductive number and range of a disease is significant in managing its effect. Reducing the circulation and ensuring treatment effectiveness reduces disease risk and severity. In addition to strengthening ability to combat emerging concerns about disease spread.

### 5. Conclusion

The extent to which society (individuals and communities) can control outbreaks hinges on the behavior of society and its members. When addressing infectious disease or public health emergencies due to communicable disease concerns, multiple factors impact the ability to lower disease risk. Disease reduction is precipitated by the ability to lower social risk factors, increase vaccination, and safety behavior. Engaging mitigating strategies such as testing, quarantining, and vaccinations are also impacted by biodemographic factors such as age, level of medical concern, and susceptibility. While mitigating strategies disrupt the rate of disease spread, being aware of intersecting factors and disease vulnerabilities is an essential component of disease management. Approaches taken to respond to disease outbreak is influenced by strategic management during disease discovery, outcome, and mutation. To reduce future impact of infectious and communicable disease, it is essential to identify, list, and follow strategic approaches during COVID-19 to help reduce overall disease impact among vulnerable populations.

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