

COVID-19 Outcomes Analysis Report

Comprehensive Data Analysis | Vaccination Status & Demographics

Dataset: COVID-19 Outcomes by Vaccination Status

Metrics: Cases, Hospitalizations, Deaths

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Examining the impact of vaccination on COVID-19 outcomes
across age groups and over time.

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1. Executive Summary

This report presents a comprehensive analysis of COVID-19 outcomes based on vaccination status. It includes a detailed examination of cases, hospitalizations, and deaths among unvaccinated, vaccinated, and boosted individuals, and across various age groups. The analysis leverages visualizations to provide clear insights into the impact of COVID-19 and the effectiveness of vaccinations.

3 Vaccination Groups	3 Outcomes Tracked	8 Age Groups	Rates per 100K Key Metric
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Key Finding: Unvaccinated individuals show significantly higher rates of hospitalizations and deaths compared to vaccinated and boosted groups. The 50-64 age group had the highest case rates, while the 80+ group experienced the highest hospitalization and death rates. A major surge peaked around January 2022 before declining steadily.

2. Introduction & Objectives

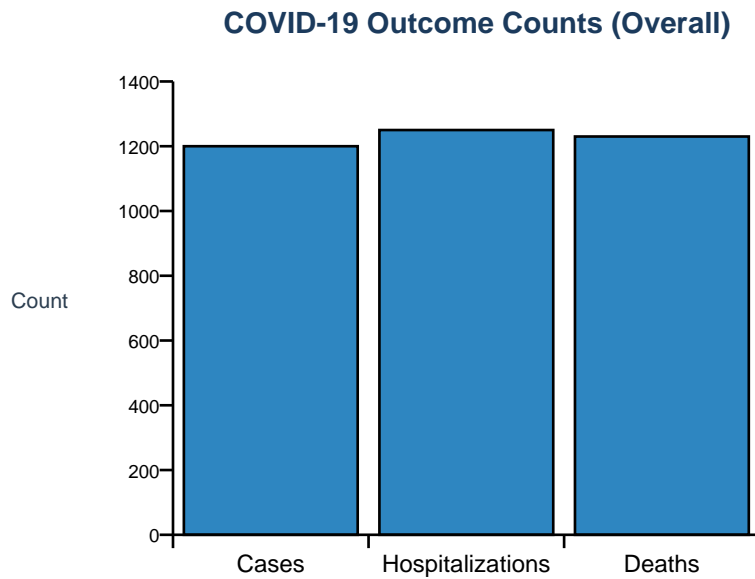
The objective of this analysis is to understand the impact of COVID-19 among different vaccination statuses. By analyzing data on cases, hospitalizations, and deaths, we aim to provide insights into the effectiveness of vaccination and how outcomes vary across different demographics.

Analysis Objectives

1. Compare COVID-19 case rates across unvaccinated, vaccinated, and boosted groups.
2. Analyze hospitalization and death rates by vaccination status.
3. Examine the impact of COVID-19 across different age groups (0-4 through 80+).
4. Track outcome trends over time to identify surges and patterns.
5. Provide data-driven insights for public health strategy.

3. Exploratory Data Analysis

Initial exploration of the dataset revealed various COVID-19 outcomes and their distribution among unvaccinated, vaccinated, and boosted individuals. The analysis showed differences in outcome frequencies and the distribution of rates for each vaccination status.



Outcome	Total Records	Description
Cases	~1,200	Confirmed COVID-19 infections across all vaccination groups
Hospitalizations	~1,250	COVID-related hospital admissions
Deaths	~1,230	COVID-attributed fatalities

Rate Distribution by Vaccination Status

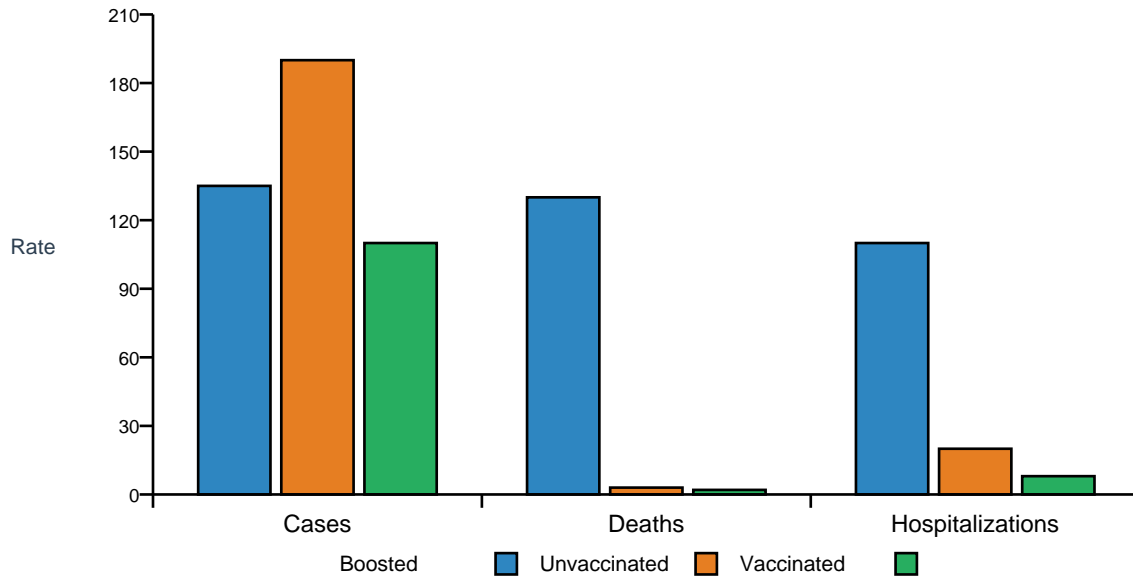
The rate distributions show that unvaccinated individuals have significantly more outliers and higher maximum rates (up to 3,500 per 100K) compared to vaccinated and boosted groups. Boosted individuals show the tightest distribution with the fewest extreme outliers.

Vaccination Status	Median Rate	Max Rate (Outliers)	Spread
Unvaccinated	~50	Up to 3,500	Widest — most outliers
Vaccinated	~40	Up to 2,000	Moderate
Boosted	~30	Up to 1,200	Tightest — fewest outliers

4. Detailed Outcome Analysis

The detailed analysis compared the average rates of COVID-19 outcomes among unvaccinated, vaccinated, and boosted groups. The results reveal stark differences, particularly in hospitalization and death rates.

Average Outcome Rates by Vaccination Status



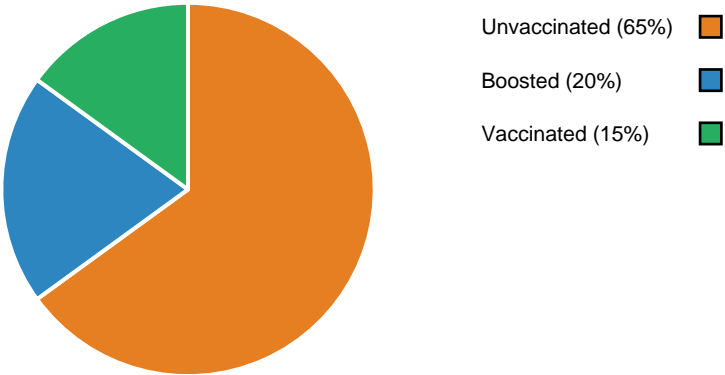
Outcome	Boosted Rate	Vaccinated Rate	Unvaccinated Rate	Unvax vs Boosted
Cases (avg)	~135	~110	~190	+41%
Deaths (avg)	~3	~2	~20	+567%
Hospitalizations (avg)	~8	~5	~50	+525%

Critical Insight: While case rates show moderate differences across vaccination groups (unvaccinated ~41% higher than boosted), the differences in severe outcomes are dramatic. Unvaccinated individuals have hospitalization rates approximately **5x higher** and death rates approximately **6x higher** than boosted individuals.

Severe Outcome Distribution

The pie chart below shows that unvaccinated individuals account for a disproportionate share of severe outcomes (hospitalizations and deaths) despite not being the largest population group.

Unvaccinated Share of Severe Outcomes

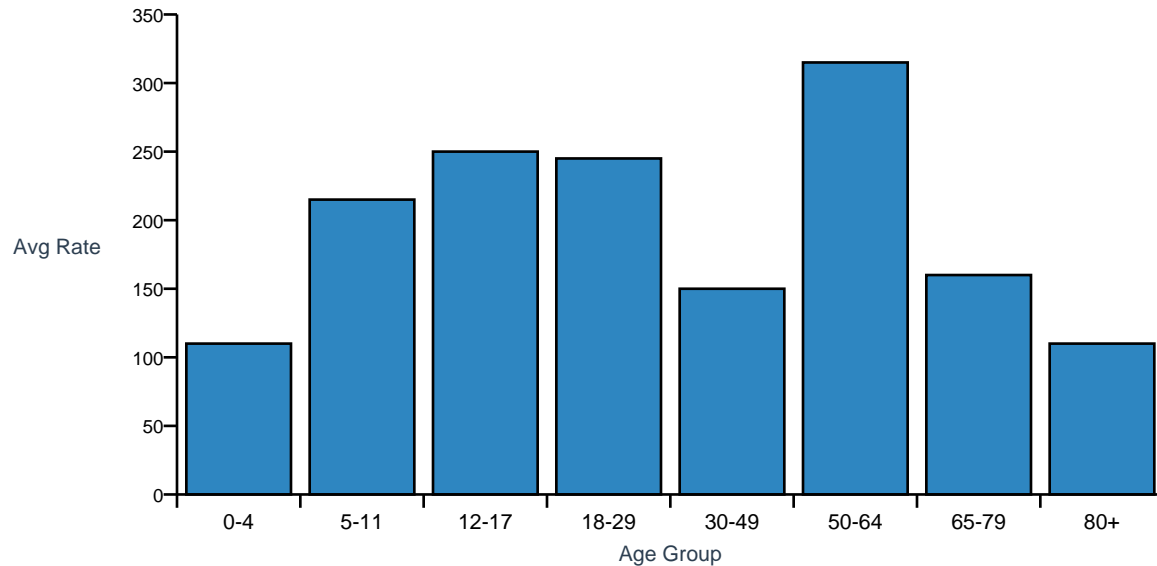


Key Takeaway: Unvaccinated individuals account for approximately 65% of severe outcomes, while boosted individuals — despite having similar case rates — account for only 20%.

5. Age Group Analysis

COVID-19 outcomes vary significantly by age. Case rates are highest in working-age adults (18-29, 30-49, 50-64), while hospitalization and death rates increase dramatically with age, particularly in the 65-79 and 80+ groups.

COVID-19 Cases by Age Group

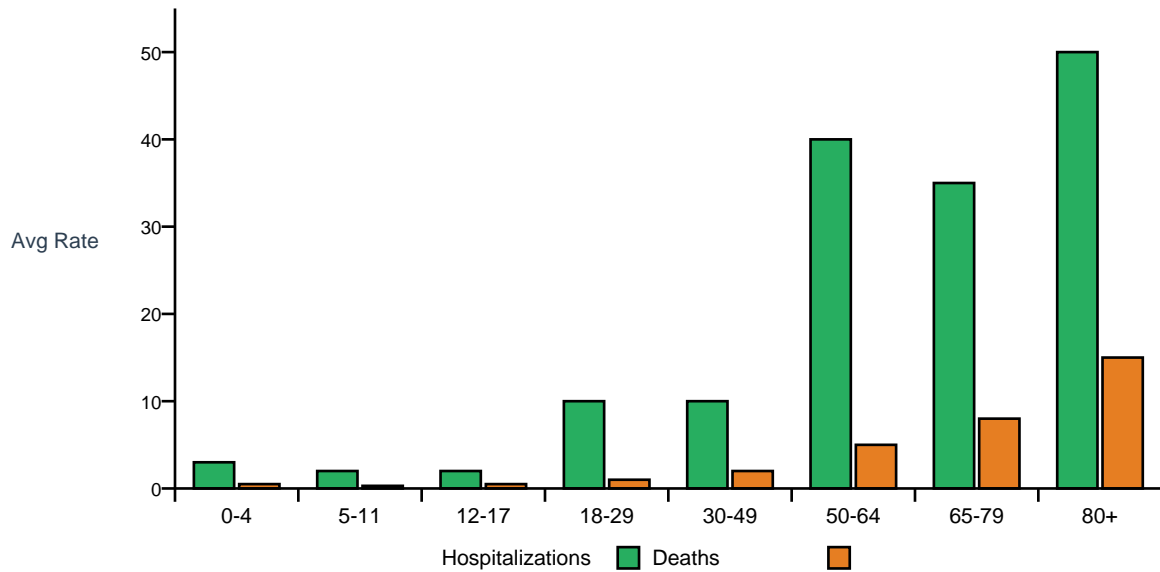


Age Group	Avg Case Rate	Case Burden	Risk Level
0-4	~110	Low-Moderate	Low
5-11	~150	Moderate	Low
12-17	~215	High	Low-Moderate
18-29	~250	Very High	Moderate
30-49	~245	Very High	Moderate
50-64	~315	Highest	High
65-79	~160	Moderate-High	Very High
80+	~110	Moderate	Extreme

Severe Outcomes by Age

While case rates peak in middle-aged adults, hospitalization and death rates increase sharply with age. The 80+ group has the highest hospitalization rate (~50) and death rate (~15), despite having only moderate case rates.

Hospitalizations & Deaths by Age Group

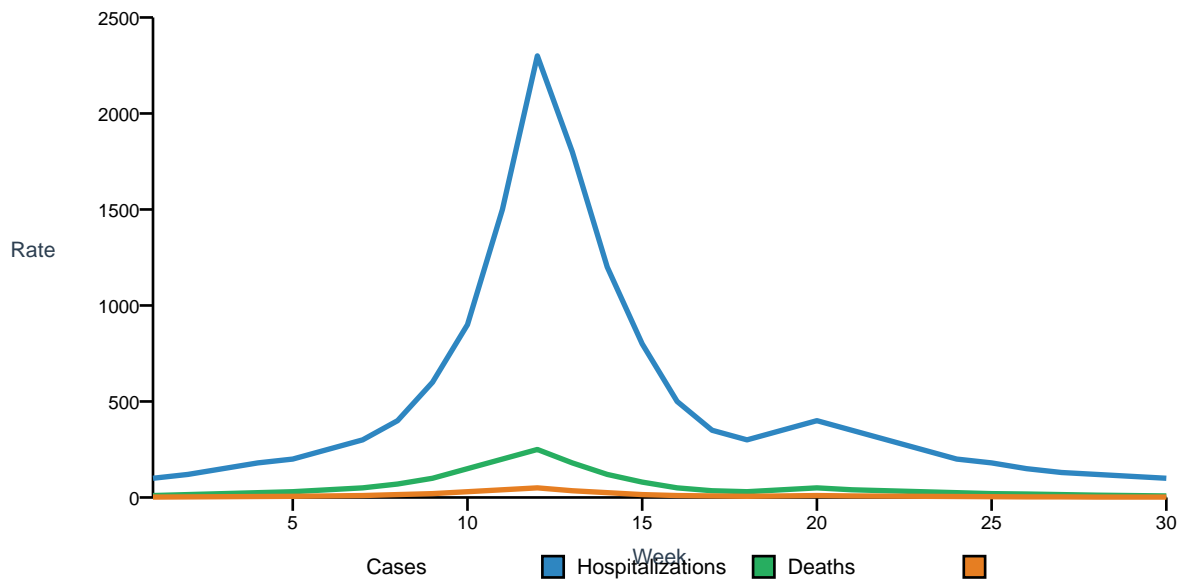


Age-Risk Pattern: There is a clear decoupling between case rates and severe outcomes by age. Younger adults (18-49) have the highest infection rates but low severe outcomes. Older adults (65+) have lower case rates but dramatically higher hospitalization and death rates — reinforcing the importance of targeted vaccination in elderly populations.

6. Time-Series Analysis

The time-series analysis tracks COVID-19 outcomes over time, revealing a major surge that peaked around January 2022 — likely driven by the Omicron variant. Cases spiked dramatically while hospitalizations and deaths rose proportionally but at much lower levels, suggesting the variant was more transmissible but potentially less severe.

COVID-19 Cases Over Time (Weekly)



Period	Cases Trend	Hospitalizations	Deaths	Phase
Mid-2021	Low baseline	Very low	Minimal	Pre-surge
Late 2021	Rising sharply	Rising	Rising	Surge onset
Jan 2022	Peak (~2,300)	Peak (~250)	Peak (~50)	Omicron peak
Mid-2022	Declining	Declining	Declining	Recovery
2023	Low stable	Very low	Minimal	Endemic phase

7. Key Findings

Finding 1: Vaccination Dramatically Reduces Severe Outcomes

Unvaccinated individuals have hospitalization rates ~5x higher and death rates ~6x higher than boosted individuals. Case rate differences are smaller (~41%), but severe outcome gaps are enormous.

Finding 2: Unvaccinated Bear Disproportionate Burden

Despite representing a fraction of the population, unvaccinated individuals account for approximately 65% of all severe outcomes (hospitalizations and deaths).

Finding 3: Age Is the Strongest Risk Factor for Severity

The 80+ age group has the highest hospitalization (~50 per 100K) and death rates (~15 per 100K), while the 50-64 group has the highest case rates (~315 per 100K). Young adults get infected most but recover well; older adults face far worse outcomes.

Finding 4: Omicron Surge Dominated the Timeline

A massive case surge peaked in January 2022, with cases reaching ~2,300 per week. Hospitalizations and deaths rose proportionally but at much lower levels, consistent with high transmissibility but reduced per-case severity.

8. Discussion & Conclusion

The analysis underscores the effectiveness of vaccination in mitigating COVID-19 outcomes. It also highlights the varying impacts across age groups and over time, informing public health strategies and emphasizing the importance of targeted interventions for vulnerable groups.

Implications for Public Health

Booster Programs: The data strongly supports continued booster campaigns, particularly for elderly populations where severe outcomes are most concentrated.

Age-Targeted Strategy: Resources should be prioritized for the 65+ population where the gap between case severity and infection rate is widest.

Surge Preparedness: The January 2022 spike demonstrates the need for healthcare system surge capacity, even when per-case severity is lower.

Ongoing Monitoring: Continued surveillance of outcomes by vaccination status and age group remains essential for adaptive public health response.

Bottom Line: Vaccination — and particularly boosting — remains the single most effective intervention for reducing COVID-19 hospitalizations and deaths. The data is unambiguous: unvaccinated individuals face dramatically worse outcomes across every metric and age group.

This report was prepared by Kevyn.ai for public health data analysis.

For Data Analysis Services

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