

Trends and Daily Case Growth Rates of COVID-19 Cases Pre- and Post- Vaccination Across Racial and Ethnic Groups in Ramsey County, Minnesota

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Introduction

Coronavirus 2019 (COVID-19) has had disproportionate effects on the morbidity, hospitalizations, and mortality of racial minorities and ethnic minorities in the United States with higher rates seen in Black, American Indian, and Hispanic communities.^{1,2} The first COVID-19 vaccine was distributed on December 14th, 2020. Different strategies and ethical frameworks were used at the state-level to address these health inequities, and it is expected that vaccines will be distributed equally among all racial and ethnic groups.³ But, the unavailability of vaccine data by race and ethnicity have made it difficult to evaluate the ongoing impacts interim vaccine allocation and distribution strategies may have had across racial and ethnic minority groups.

Our research questions are if there is a significant difference in average daily case growth rate of COVID-19 cases in all racial and ethnic groups in Ramsey County, Minnesota since the start of COVID-19 vaccine distribution, and whether these differences are equitable across the racial and ethnic groups. If health equity was adequately incorporated into allocation and distribution strategies, the average daily case growth rate of COVID-19 cases is hypothesized to decrease across all racial and ethnic groups in similar magnitude.

Methods

The Broadstreet COVID-19 Project Health Equity dataset was used for secondary data analysis.⁴ Cumulative incident COVID-19 cases by race and ethnicity for Ramsey County, Minnesota were collected daily between November 1st, 2020 through March 31st, 2021 (n = 1177 observations) from local or state department websites. Missing count data for race or ethnicity were excluded (n = 21). Race categories were re-categorized into Whites, Blacks/African-American, Asian, or Multiracial. Participants who reported other, unknown, or had missing race categories were excluded (n=282). There were case outliers reported for Whites between Nov 17th - Nov 30th and these observations were excluded (n=11). Total sample size for race trend analysis was 574 observations. Ethnicity categories were re-categorized into Non-Hispanics and Hispanics. Participants who did not specify their ethnicity or had missing ethnicity data were excluded (n=107 observations). There were case outliers for Non-Hispanics between Nov. 1st through Nov. 30th, and these dates were excluded (n=30 observations). Total sample size for ethnicity trend analysis was 244 observations.

Minnesota population data was obtained from the United States Census Bureau from the Annual Estimates of the Resident Population by Sex, Race, and Hispanic Origin for Minnesota: April 1, 2010 to July 1, 2019 (SC-EST2019-SR11H-27). We calculated crude COVID-19 case rates by race and ethnicity and overall in Ramsey County, Minnesota by standardizing to the Minnesota population. SAS University was used to perform all statistical analysis. Several independent linear regression models were performed to compare the average daily case growth rate before the COVID-19 vaccine was approved for use on Dec. 14th, 2020 and after across self-reported races and ethnicities. Piecewise linear regression was performed with a time splice function pre- and post-December 14th to determine if the time splice was a significant predictor of case growth rate shift. All reported p-values are 2-sided, and p-value <0.05 was considered statistically significant.

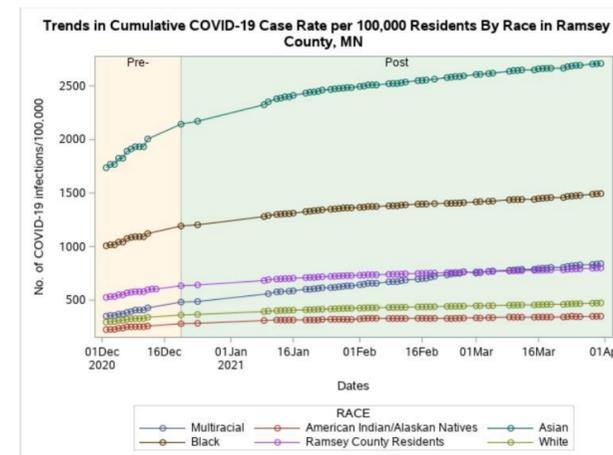
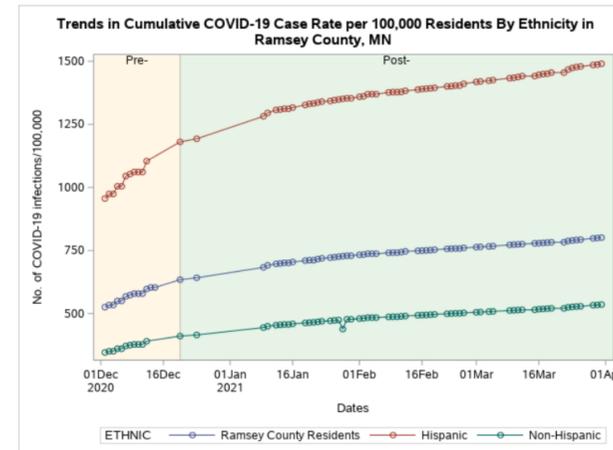


Table 1 Average Daily Case Growth Rates By Race and Ethnicity in Ramsey County, Minnesota Pre/Post December 14th, 2020

	N	Average Daily Case Growth Rate/100,000 Pre-Dec 14 th , 2020 (Standard Error)	N	Average Daily Case Growth Rate/100,000 Post-Dec 14 th , 2020 (Standard Error)	% Diff.	P-value
Hispanics	36	11.91 (0.26)	61	2.45 (0.06)	-79%	<0.0001
Non-Hispanics	11	4.20 (0.33)	61	1.07 (0.03)	-77%	<0.0001
Whites	26	5.20 (0.05)	61	0.92 (0.02)	-82%	<0.0001
Blacks/African-Americans	37	10.20 (0.11)	60	2.44 (0.07)	-76%	<0.0001
Asians	37	24.50 (0.27)	60	4.55 (0.15)	-81%	<0.0001
American Indian/Alaskan Natives	37	4.09 (0.07)	60	0.51 (0.02)	-88%	<0.0001
Multiracial	37	6.82 (0.08)	59	3.58 (0.05)	-48%	<0.0001
All Ramsey County	13	7.07 (0.37)	62	1.44 (0.05)	-80%	<0.0001

Results

The Figures displays the daily trend in rates of cumulative cases of COVID-19 by race and ethnicity in Ramsey County, MN from November 1st, 2020 to March 31st, 2021. By March 31st, 2021, there was a total of 45,188 cumulative cases of COVID-19 with a case rate of 801 per 100,000 Ramsey County residents. Only the Hispanic ethnic group had a higher crude COVID-19 case rate of 1,490 per 100,000 residents compared to the overall crude case rate of Ramsey County, MN. Both the Asian and Black racial groups had higher crude case rates of 2,710 per 100,000 Asian residents and 1,495 per 100,000 Black residents, relatively, compared to the overall crude case rate for Ramsey County, MN (Figure 1).

The Table provides the standardized calculation for crude daily case growth rate pre- and post-December 14th, 2020 which is the date the first COVID-19 vaccine was distributed for use. The mean daily case growth rate was 7.07 per 100,000 residents between December 1st to December 14th, 2020 compared to 1.44 per 100,000 residents between December 15th to March 31st, 2021. There was an 80 percentage-point decrease in case growth rate during these two period. The case growth rate for all ethnic and racial groups decreased post-December 14th. However, the percentage-point difference in mean case growth rate was lower for Blacks and Multiracial groups compared to the overall Ramsey County population. There was a 76% difference in case growth rate for Black/African American Ramsey County residents which was 10.20 per 100,000 Blacks between November 1st to December 14th, 2020 compared to 2.44 per 100,000 between December 15th to March 31st. Multiracial residents had a smaller percentage difference of 48% in case growth rate which was 6.82 per 100,000 between November 1st to December 14th, 2020 compared to 3.58 per 100,000 between December 15th to March 31st. The mean daily case growth rate for Asians, Blacks, and Hispanics remain higher following December 14th, 2020 compared to the overall crude case growth rate for Ramsey County (Table 1).

Discussion

Overall, Hispanic, Blacks/African American, and Asian Ramsey County residents had higher crude case rates and average daily case growth rates compared to the general population by March 31st, 2021. Asian Ramsey County residents had the highest crude case rate of 24.50 cases per 100,000 Asian residents pre-December 14th which suggested a need to target vaccination towards this group. The daily case growth rate decreased after Dec. 14th in all racial and ethnic groups, but Black/African-American and Multiracial residents had a smaller difference in average daily case growth rate between periods November 1st, 2020 - December 14th, 2020 and December 15th - March 31st, 2021 compared to overall in Ramsey County suggesting further efforts need to be made to decrease transmission in these populations or improve vaccine uptake. These findings are descriptive and cannot be used to assume causation and predict. Further studies need to be done to associate the difference seen in incidence across racial and ethnic groups with vaccination coverage using vaccine data.

One limitation to this data includes inaccuracies that may occur due to use of official state-reported data since there can be reporting delays or measurement error. Differences in testing rates across racial and ethnic groups can also lead to underreporting of cases which will underestimate the true incidence of COVID-19 in Ramsey County, MN.

Acknowledgments

I would like to express my thanks to Tracy Flood, MD, PhD, CEO and Co-founder of Broadstreet for her guidance during this project. I would also like to give thanks to the Research Skills program members and leads for their support in completion of this trend analysis. Lastly, I would like to thank the Emergency Relief interns on the Health Equity track for their work in data collection.

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