Visualization Comparisons of Weekly COVID-19 Deaths of Residents and Staff in U.S.

Nursing Homes with PPE That Would No Longer Be Available In 7 Days

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January 22, 2020, a 50-year-old male was the first confirmed U.S. death from COVID-19 in the U.S. (King County Public Health, 2021). He lived at Kirkland Lifecare Center in the suburbs of Seattle, Washington. More than two years later, February 2022, over 151, 000 residents and over 2,300 staff died from the virus nationwide (Centers for Medicare and Medicaid Services, 2022). The nursing home population represented 6% of all cases and 40% deaths (White, Wetle, Reddy, & Baier, 2020). It is unclear whether direct-care staff transmitted COVID-19 to their residents or whether the residents infected the staff, but residents and staff share a symbiotic relationship, and we may never know the specific vector. Nevertheless, we question whether there was rationing of PPE and if direct-care staff reused personal protective equipment (PPEs) among residents, further spreading the COVID-19 virus. The Centers for Medicare and Medicaid Services mandated Nursing Homes to report certain COVID-19 data to the Centers for Disease Control and Protection (CDC) on a routine basis. The purpose of this exploration was to create three data visualizations to compare residents and staff weekly COVID-19 deaths with the PPE they reported would no longer be available in seven days. Our goal was to recommend the reporting of supplies to the CDC from seven days to at least 30 days, to provide Nursing Homes more time to receive assistance if needed.

**The Visualization Story**

   White et al. (2020) described the overwhelming effects of COVID-19 on nursing homes. Some of the concerns were a shortage of PPE and staff having to use garbage bags as gowns to protect themselves. The managing leaders went through painstaking efforts to procure PPE, there were limited workers and financial assistance to help with the surge in prevention measures like quarantine. The staff were forced to reuse PPE for unrecommended extended periods of time. A nursing assistant even reported going from one patient’s room to the other wearing the same gown, and reusing a face mask for a week, due to the lack of PPE.

**Data Exploration**

            We explored a public dataset from the CDC with the latest available data as of February 6, 2022. The dataset consisted of 234 fields and 794,236 rows. We used Tableau to create three visualizations of the same data to show different points of view. Variables included dates from January 1, 2021, to December 31, 2021, face masks, gloves, gowns, N95, and eye protection which would no longer be available in seven days. The other two variables of interest were the sum of residents weekly COVID-19 deaths, the sum of staff weekly COVID-19 deaths, and Month of week ending.  Next, we prepared the data by organizing it into folders, hid all unused fields, assigned the color-blind palette, and excluded Nulls and No’s from the desired columns.

We compared three visualizations of residents and staff weekly COVID-19 deaths with their PPE that would no longer be available in seven days. In March, the first residents weekly COVID-19 deaths were nearly 11,000 deaths and staff weekly COVID-19 deaths at about 1,000 deaths. The next spike was in June with about 16, 000 residents weekly COVID-19 deaths compared to nearly 2, 000 staff weekly COVID-19 deaths. September 2021 had the highest number of residents weekly COVID-19 deaths, compared to no reported staff deaths that month.

**Visualization Critique of Figure A**

**Chart

Description automatically generated**

Design Pros: Bar charts were used to compare PPE for staff versus resident’s weekly COVID-19 deaths. Trend lines were featured, and mark labels were shown for easy visualization.

This design fits on one page, making it easier for comparison. The visualization is clean and clear with good data to ink ratio.

Design Cons: It may seem like January and February were excluded, but only relevant values for 2021 were shown. Face masks, gloves, gowns, N95, and eye protection were not differentiated, but could be drilled down if needed. The marked labelled values were not reflected in the thousands and could be misconstrued in the tenths. In other words, the numbers need context and some explanation. For instance, two does not mean two staff died in June, it means two thousand staff died in June.

**Visualization Critique of Figure B**

**Chart, line chart

Description automatically generated**

Design Pros: PPE for residents and staff weekly COVID-19 deaths were compared using lines. The larger number of residents weekly deaths were highlighted.  We maximized data-to-ink ratio and kept the visual minimal and clean.

Design Cons: There was no delineation of color between residents and staff. Also, the variable names for masks, gloves, gowns, n95, and eye protection no longer available in 7 days were too long, so some of the variable names were cut off at the top.

**Visualization Critique of Figure C**

**Chart, bar chart

Description automatically generated**

Design Pros: PPE for residents and staff were together, making it easier for the audience to view the comparisons.

Design Cons: The color scheme may make it difficult to view the numbers for staff weekly COVID-19 deaths because they were embedded.

**Limitations**

Our target audience was healthcare leaders in the Nursing Home sector, but our goal was to recommend updating the reporting of supplies to the CDC from seven days to a minimum of 30 days. Recommending a change to a government entity can be a time-consuming process and it may require Nursing Home leaders to lobby the CDC to change this reporting requirements.

Secondly, nursing home staff had extreme difficulty finding PPE in the early part of COVID-19 (White, 2020). The dataset we analyzed reported resident and staff deaths from 2021 and we theorize the dataset from the prior year would have a higher number of deaths for both staff and patients. Also, this exploration would be more substantive if demographic data and vaccination status on the residents and staff who died were reported, but federally available datasets have several gaps (Kaiser Family Foundation, 2022).

**Resolution**

 In this investigation, we explored the latest nursing home COVID-19 data from the CDC. We used Tableau to create three visualizations of the same data to show different points of view. We compared residents and staff weekly COVID-19 deaths with PPE they reported would no longer be available in seven days. We then critiqued the pros and cons of the visualizations.

The COVID-19 pandemic cascaded the nursing home population into a whirlwind of challenges and complexities that were unprecedented. This includes the voracious worldwide demand for PPE, supply chain issues, resident and staff deaths, and the emotional toll of moving on. Notwithstanding, Nursing Homes commonly operate with a shortage of staff and when the staff gets around to inventory their supplies and report their final week of PPE to the CDC, it may be too late to realize their inventory is low or depleted. Nursing Homes may not get the help they need in a timely manner. We recommend updating the federal government mandate of reporting PPE to the CDC from seven days to a minimum of 30 days, to give Nursing Homes more time to receive support.

References

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