

The Healthcare Industry's Ongoing Great Reshuffle

Project Goal

Our goal was to create a narrative visualization that tells the story of how the healthcare workforce has been impacted by the COVID-19 pandemic. To do this we looked into three specific objectives. Namely, we wanted to explain:

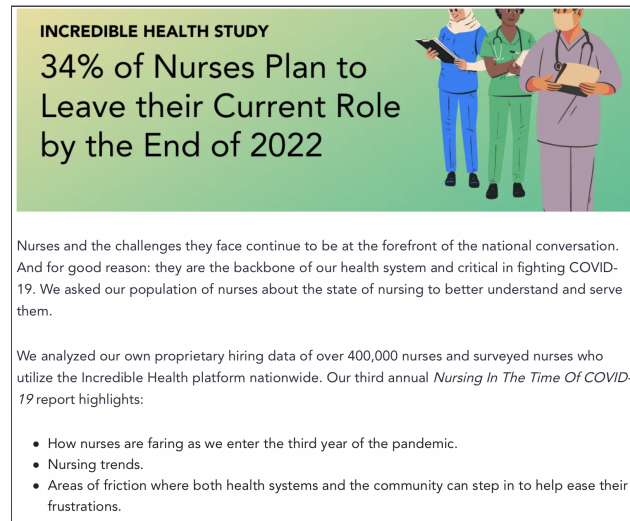
- the “great reshuffle” and what it constitutes (in terms of the nature and volume of changes to employment)
- the impact of this phenomenon on the healthcare industry and its workers
- possible causes and solutions of this effect

We designed this visualization with a lay audience in mind i.e., non-expert users who have little or no knowledge of the “great reshuffle” or the impact of the pandemic on healthcare workers.

Related Work

1. **Incredible Health (2022) Survey Report:** This report discusses the results of a survey conducted with nurses in the United States. It was relevant for our project because it shed light on the factors impacting the nursing workforce. These cannot be currently found in other official sources. We also used the data from this report on our website.

The main highlights from this report is that 34% of nurses plan to resign by 2022 and that many of them cite burnout or benefits and pay as reasons behind this. The report delves deeper into sub-reasons in these two categories such as feelings of not being appreciated by their communities contributing to burnout and wanting to leave given the possibility of higher pay.



INCREDIBLE HEALTH STUDY
34% of Nurses Plan to Leave their Current Role by the End of 2022

Nurses and the challenges they face continue to be at the forefront of the national conversation. And for good reason: they are the backbone of our health system and critical in fighting COVID-19. We asked our population of nurses about the state of nursing to better understand and serve them.

We analyzed our own proprietary hiring data of over 400,000 nurses and surveyed nurses who utilize the Incredible Health platform nationwide. Our third annual *Nursing In The Time Of COVID-19* report highlights:

- How nurses are faring as we enter the third year of the pandemic.
- Nursing trends.
- Areas of friction where both health systems and the community can step in to help ease their frustrations.

<https://www.incrediblehealth.com/blog/nursing-report-covid-19-2022/>

2. **Prasad, P. et al. (2022) Research Paper:** This research paper helped inform our point of view in this project at the start. It provided us with context and scientific evidence that backed claims made by other articles and surveys. We made the decision of not using the data directly to prevent redundancies.

The main highlights we obtained from this paper are that a high percentage of healthcare workers are experiencing stress, depression and burnout as a result of the COVID-19 pandemic.

Abstract

Background

COVID-19 has put extraordinary stress on healthcare workers. Few studies have evaluated stress by worker role, or focused on experiences of women and people of color.

Methods

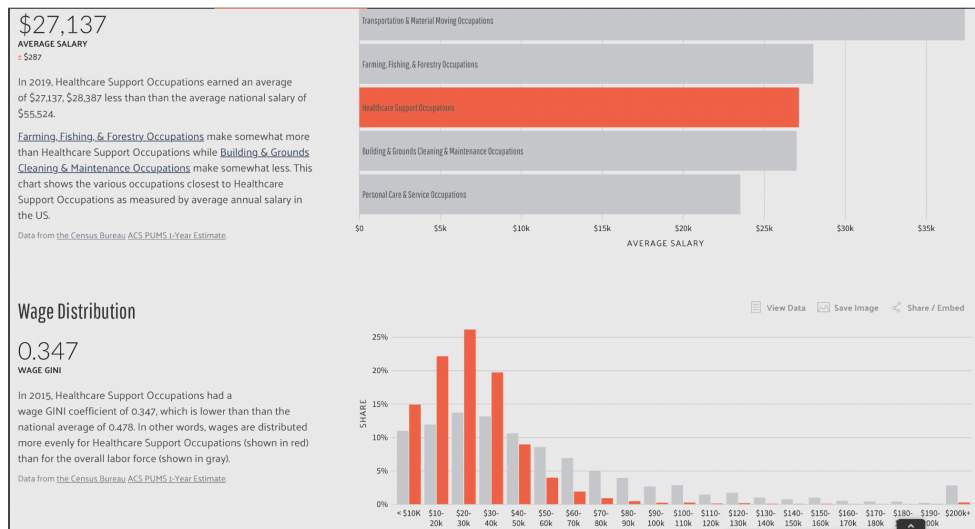
The “Coping with COVID” survey assessed US healthcare worker stress. A stress summary score (SSS) incorporated stress, fear of exposure, anxiety/depression and workload (Omega 0.78). Differences from mean were expressed as Cohen's d Effect Sizes (ESs). Regression analyses tested associations with stress and burnout.

[https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370\(21\)00159-0/fulltext](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(21)00159-0/fulltext)

- 3. Datausa.io Healthcare website:** This scrolling website is aimed at showing, through text and visualization, trends and data on the healthcare industry. It uses information from official sources like the Census and the Bureau of Labor Statistics (BLS) but summarizes it in a more lay-audience friendly manner.

This provided us with the inspiration for our design and made Exploratory Data Analysis on raw data from the BLS easier.

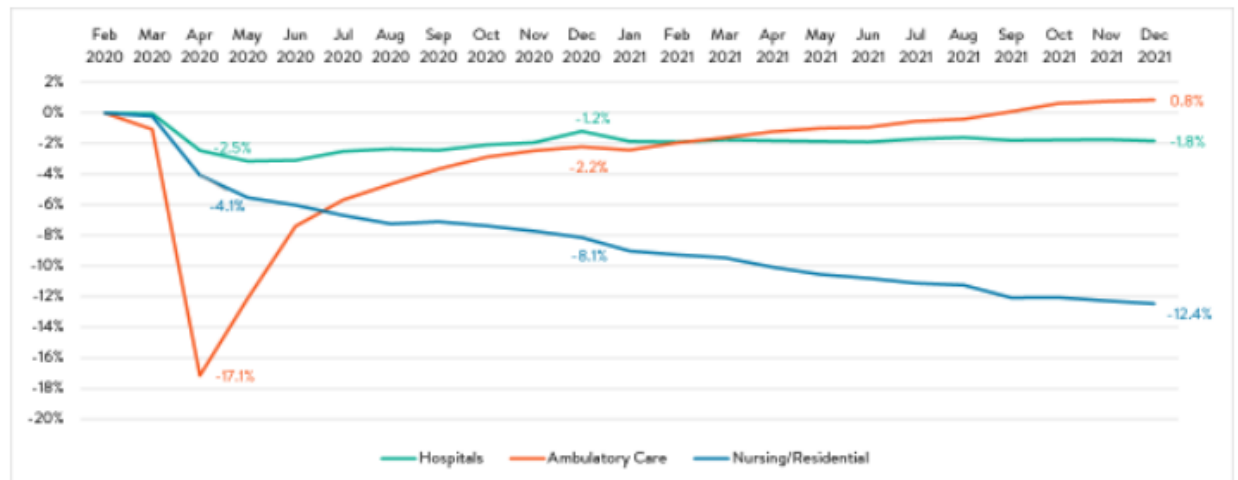
The main highlights that we borrowed from here concern the distribution of wages in the sector and how they compare to other industries.



<https://datausa.io/profile/soc/healthcare-support-occupations>

- 4. Perspective: 2021 Health Employment—A Tale of Three Settings:** this analysis forms the basis for our first graph showing employment trends over time; they had used data from the BLS and showed percentage change in employment over time. They had also homed in on three subsectors (not just the overall healthcare sector): ambulatory care, hospitals and nursing and residential care. Based on this design, we re-computed the values for those subsectors using seasonally adjusted data from BLS' Current Employment Statistics (CES), National Data Tool (see: <https://www.bls.gov/ces/data/>) for the entire economy (logged in the data under "total private") and the healthcare sector. The values we present in our graph are percentages relative to the January 2020 level in each category. This approach gave slightly different values from Altarum's, but shows the same trends.

Figure 3. Cumulative Job Growth Since February 2020 (pre-pandemic peak)



<https://altarum.org/news/2021-health-employment-tale-three-settings>

- Morning Consult Survey:** This was a reference piece for the narrative infographic assignment and showed some reasons for healthcare workers leaving their jobs or overall profession as a whole. We ended up replacing this information with the Incredible Health (2022) Survey Report, but it helped inform our thinking about the reasons behind the trends we observe.

<https://morningconsult.com/2021/10/04/health-care-workers-series-part-2-workforce>

- American Association of Critical-Care Nurses:** A background piece on the “Hear Us Out” Campaign which tells stories of frontline nurses and urges people to get vaccinated. It includes information on stress by workers and cataloged their desire to leave the profession. We did not use the numbers from this piece but they helped inform our storyline.

<https://www.aacn.org/newsroom/hear-us-out-campaign-reports-nurses-covid-19-reality>

- Protecting Seniors by Improving Safety and Quality of Care in the Nation’s Nursing Homes (The White House):** This fact sheet, dated February 2022, gave us a glimpse into the government’s thinking about the nursing sector’s “great reshuffle.” It included background information on the impact COVID-19 has wrought on nurses. Most importantly, it included specific policy measures that the Biden administration plans to use to mitigate the impact of COVID-19—and of future pandemics—on nurses and healthcare workers. We pick a handful of suggested policy measures most relevant to nursing staff and reproduce these in our story as means for creating a more sustainable healthcare workforce.

<https://www.whitehouse.gov/briefing-room/statements-releases/2022/02/28/fact-sheet-protecting-seniors-and-people-with-disabilities-by-improving-safety-and-quality-of-care-in-the-nations-nursing-homes/>

8. **'Nurses Have Finally Learned What They're Worth':** This very recent piece by the *New York Times* offered us more insight into the nursing profession's struggles during COVID-19 and the chronic labor shortage being faced. It detailed the phenomenon of 'traveling nurses'--whereby nurses travel multiple hours to offer their services in exchange for unprecedented payouts. We quoted from this piece in our story when discussing possible solutions.

<https://www.nytimes.com/2022/02/15/magazine/traveling-nurses.html>

9. **CDC's Nursing Home Covid-19 Data Dashboard:** We saw some discussion online of as many as 200,000 individuals associated with the nursing industry having lost their lives to COVID-19. We wanted to isolate casualties among staff to quote this number when discussing the pandemic's toll on nursing staff. We eventually chose against presenting this number because we did not have an appropriate basis of comparison (i.e., is that a high or low level)

https://www.cdc.gov/nhsn/covid19/ltc-report-overview.html#anchor_1594393305

Visualization Description

Our project is presented as a single page scrolly-telly with animated graphs and visualizations alongside explanatory text. We make use of the scrolling format to progressively disclose information as a narrative and support it with animations to keep the users engaged. Our use and choice of animation was guided by the trends in the data: e.g., we make generous use of line charts given the sudden drops in the data induced by COVID-19.

The following link leads to a video that better illustrates the animations and scrolling design of the website: [Scrolling Video](#)

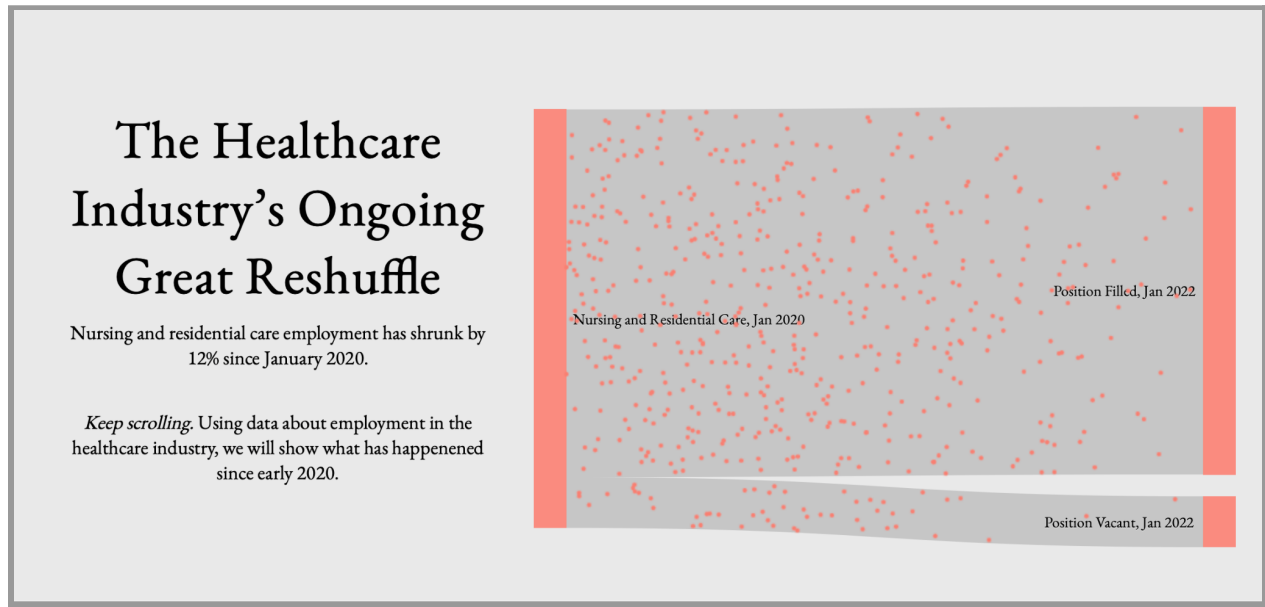
Header and title:

The website starts with the title, some key data to keep the user interested in the information that the website will provide and brief instructions to guide them on how to explore the visualizations.

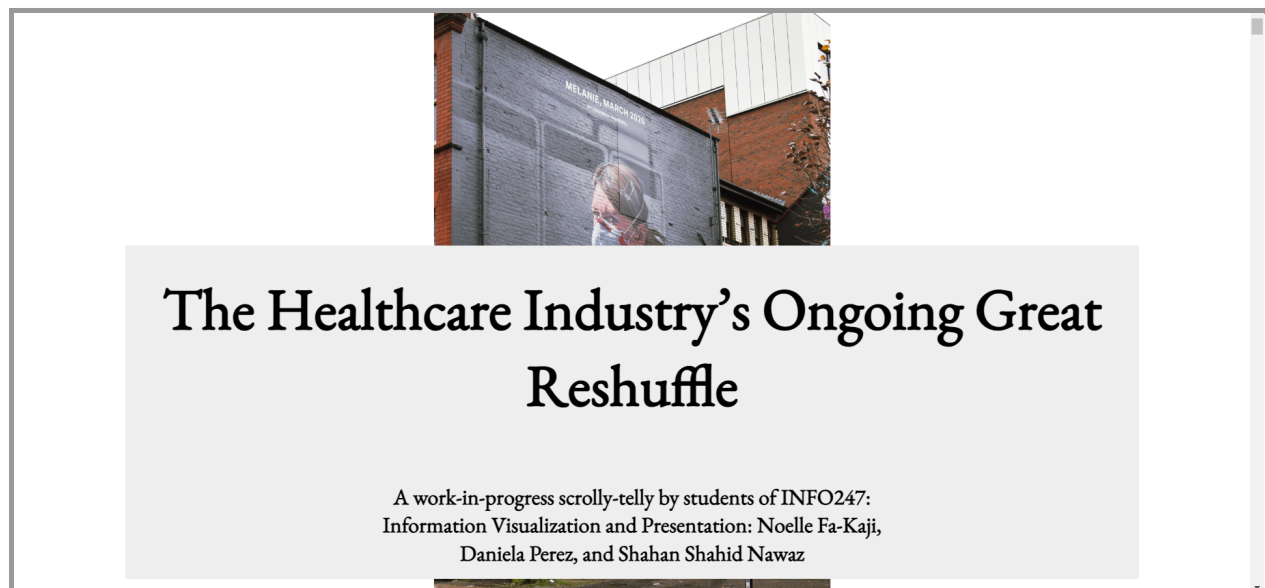
The Sankey diagram on the right visualizes a top-line finding: that employment in the nursing and residential care sector has continued to decline since the onset of COVID-19. This replaces a previous background image that can be seen below. We

decided to replace it based on comments from users during our mid project usability study. Users had opined it was not clear how they should have read the image especially given that we establish context through a simple title.

Current version:



Previous version:



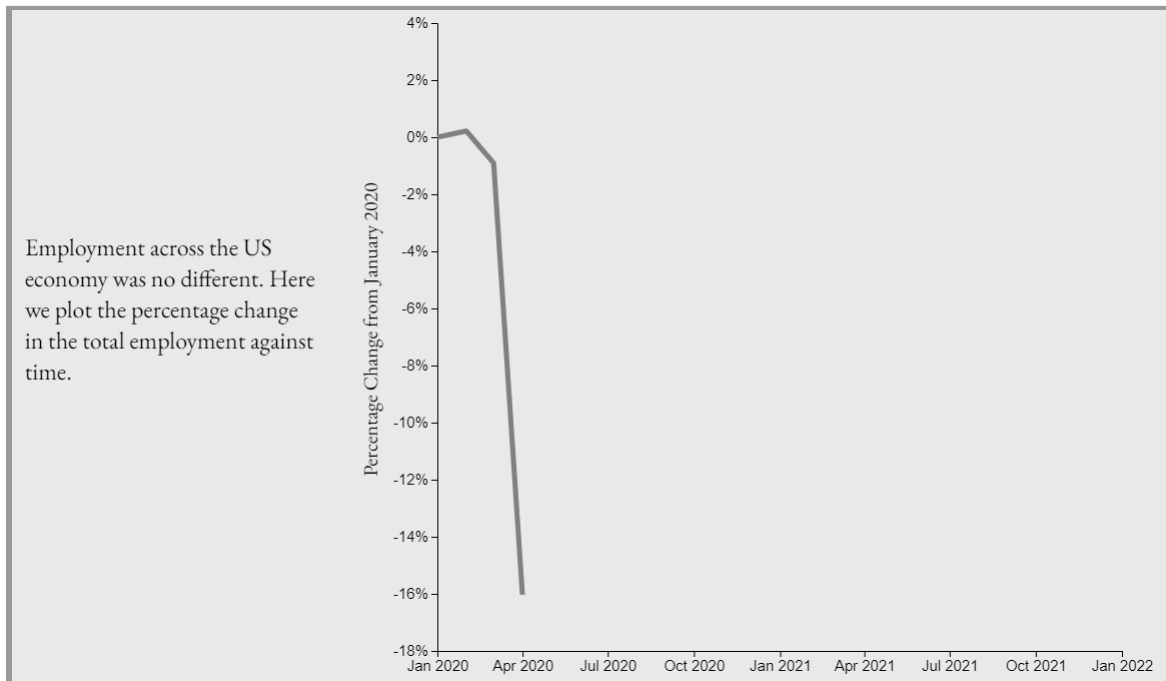
Setting up the narrative:

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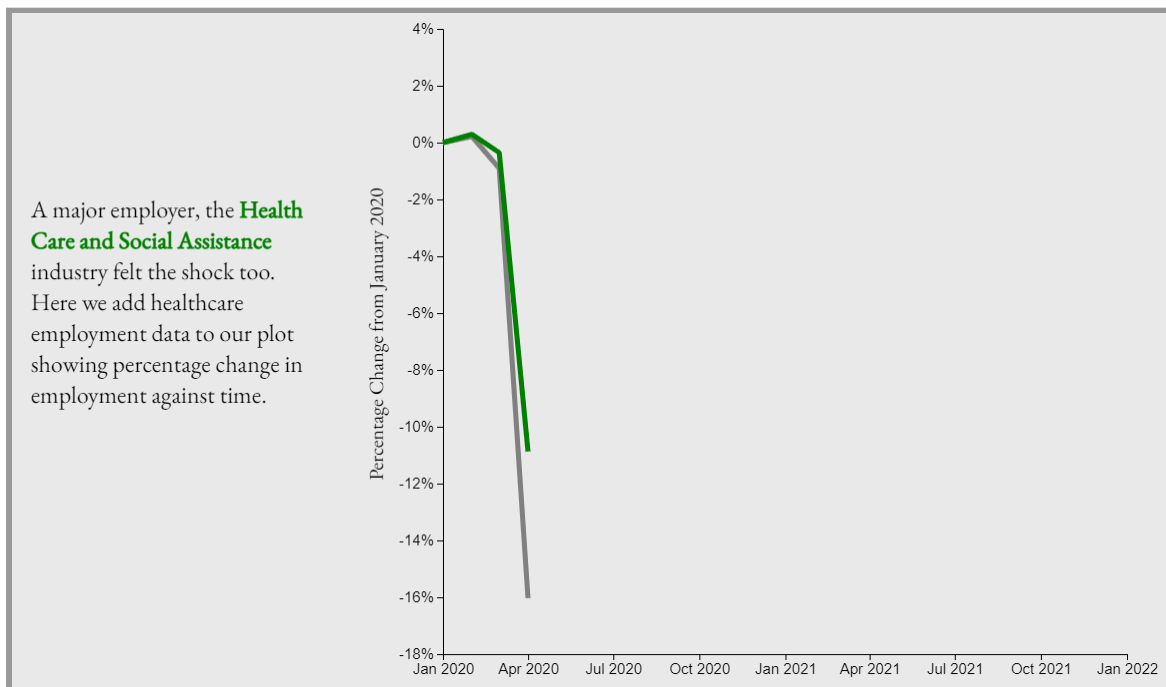
Noelle Fa-Kaji, Daniela Perez, Shahan Shahid Nawaz

The first paragraph after the header sets up the narrative by highlighting an important historic moment and placing the user at a familiar moment in time: the dramatic drop in employment after the March 13th declaration of a national emergency.

First visual of a line graph:



We add in the healthcare and social assistance sector as well:

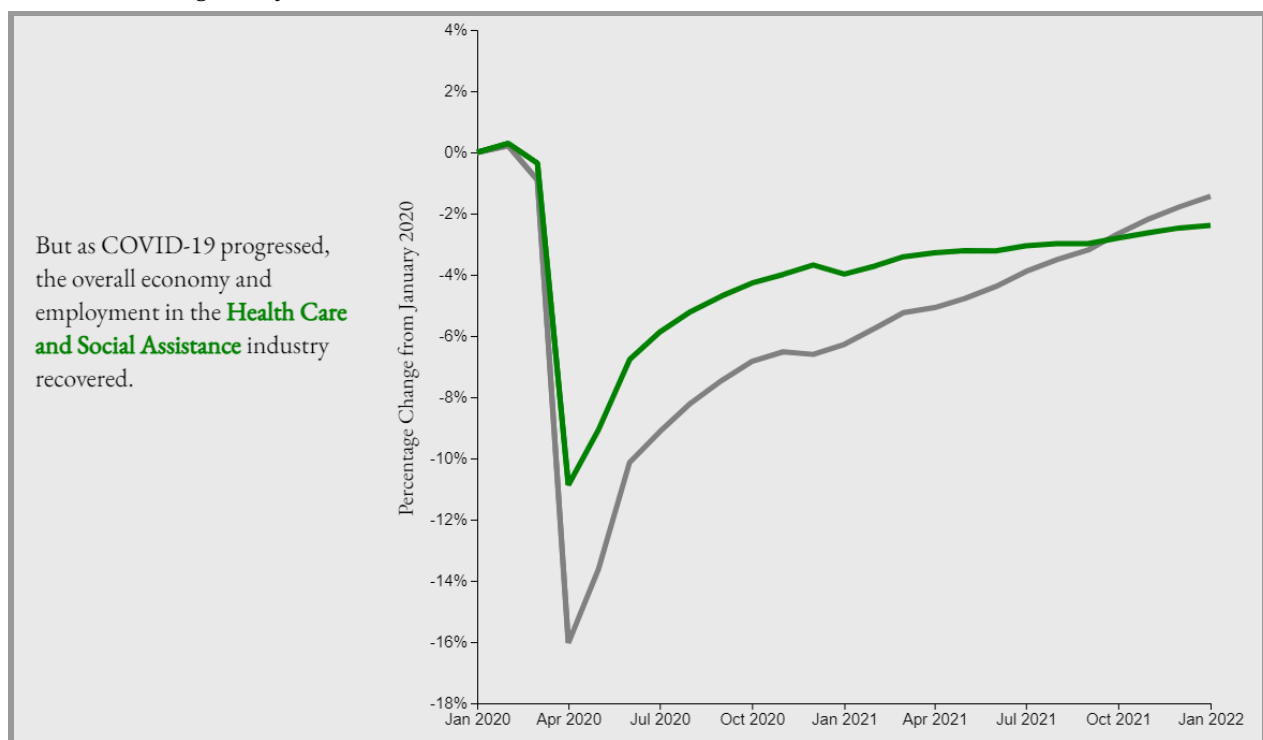


Main body and line graphs:

We build our story progressively going from changes in employment across the US economy to those in the healthcare and finally the nursing sector. These changes are presented as animated line graphs which allow the user to see the progression graphically and make time-wise comparisons easily (i.e., how much did nursing employment drop as a result of COVID-19 and what is the level of this change vis-a-vis total employment).

As shown in the first image below, we provide carefully curated text alongside the graphs to provide supporting context and description.

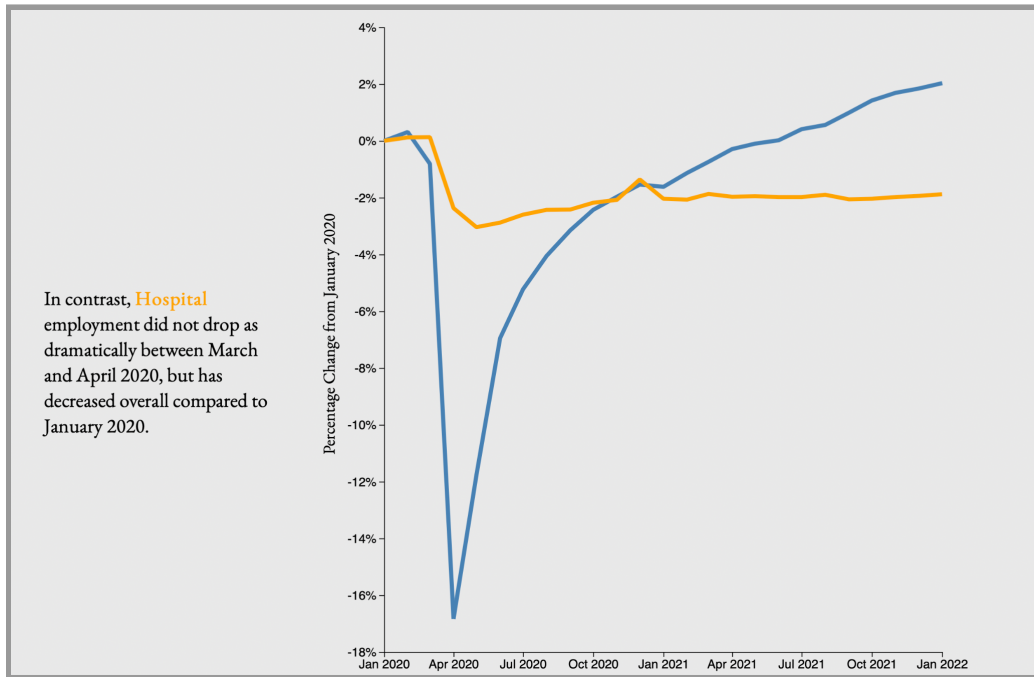
From that first dramatic drop in March 2020, we show how employment has mostly recovered in the following two years:



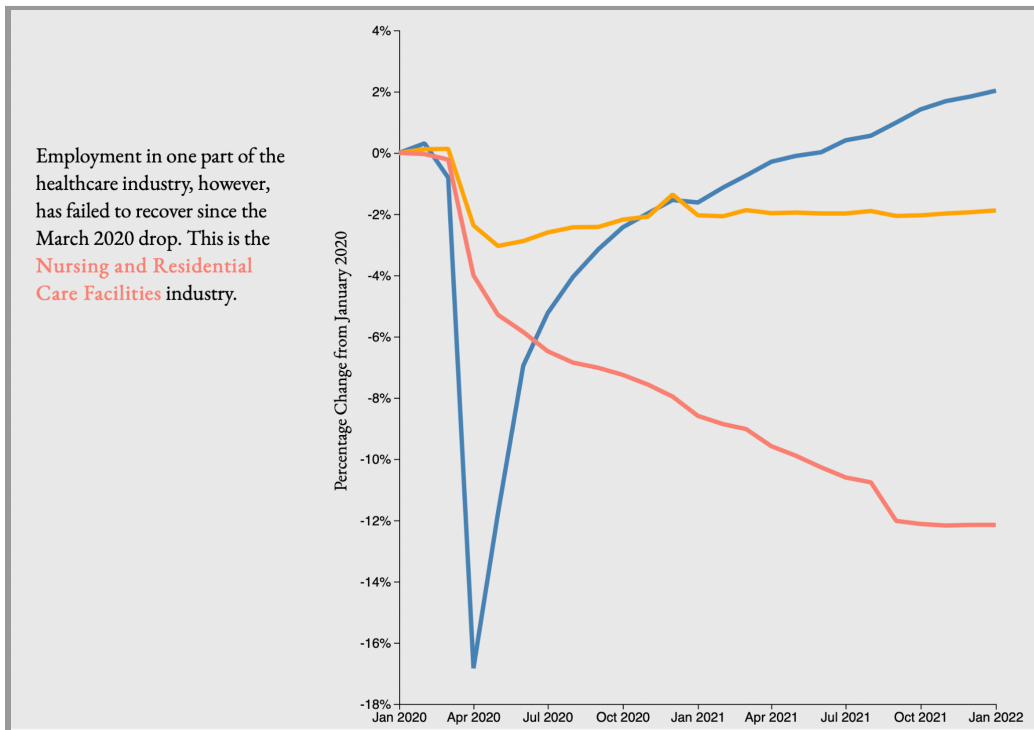
Another relevant aspect of this part of the design is that the color of the line matches the text to the left removing the need for a legend (as shown in the images below). We chose this design to prevent unnecessary information and to aid the user in seeing the graphs and the text as part of one uniform experience. This design choice was supported by the comments received during the usability study.

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Line graph comparing change in employment in the “Hospital” sector in yellow to “Ambulatory care” in blue.



Line graph comparing change in employment in “Nursing and Residential Care Facilities” in salmon to “Hospital” in yellow and “Ambulatory Care” in blue.

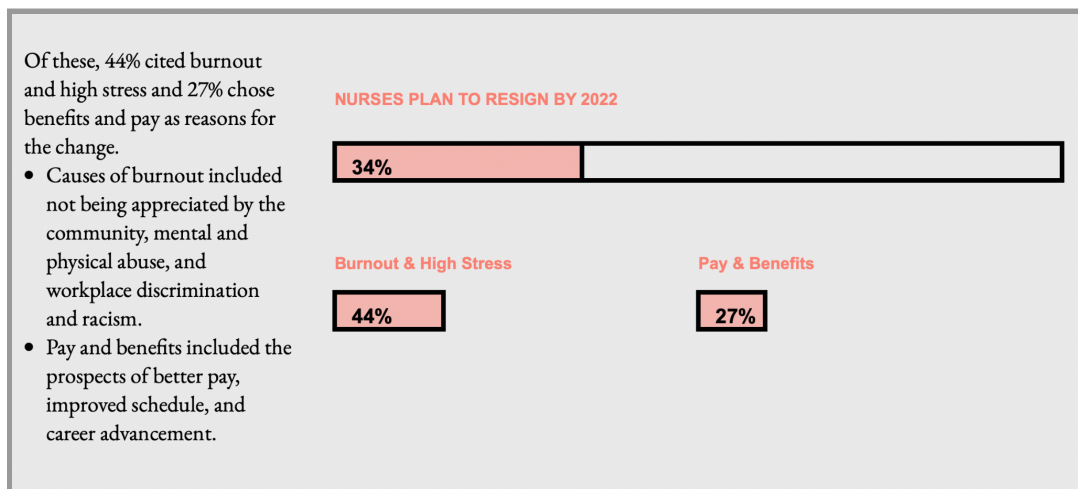


Survey data:

To dig deeper into the reasons for the sustained drop in employment levels in the nursing sector, we made use of survey data that provided key insights. To portray it, it didn't make sense to use complex graphs so instead our design employs a simple animation that highlights key percentages.

We iterated over this design based on Prof. Hearst's feedback and that received during user testing. The challenge we faced was that the data was a percentage of a percentage, i.e., of the 34% nurses who want to quit, 44% cite burnout and high stress as a cause. We leveraged animation whereby the 34% served as the canvas—or 100%—and the 44% and 27% were shown as being drawn out of this canvas.

Final view of bar visualization after animations.



Transition and conclusion:

We show the text that follows this graph on the entire screen against a gray background to highlight the transition from the problem as it is today to the future and potential solutions.

The future and potential solutions:

With no sign of the "Great Reshuffle" abating or of labor shortages being mitigated, where does the Healthcare industry go from here?

The healthcare industry is counting on a few measures to attract labor: handsome pay and seeking freelance "traveling" nurses. For example, the [New York Times](#) reports:

"In New York, travelers could make \$10,000 or more. The average salary of a staff nurse in Texas is about \$75,000; a traveler could make that in months."

Despite momentary high earnings for some travelling nurses, the future is not bright because this freelance model is unsustainable—it places additional burdens on nursing staff and does not fix the underlying labor shortage in the industry.

Conclusion and footnote details:

With the next pandemic invariably on the horizon, only time will tell if the lessons COVID-19 is offering stakeholders were learnt to produce a more sustainable healthcare workforce—or ignored. The stakes are high: not just for healthcare workers but also because they save lives as a natural outcome of their work.

Created by Noelle Fa-Kaji,
Daniela Perez, and Shahan
Shahid Nawaz for INFO247:
Information Visualization and
Presentation, Spring 2022

Code Sources:

- Scroll library [graph-scroll.js](#)
- Line animation helper by Pablo Gutierrez
- Sankey with particles

Information Sources:

- Aleccia, J. et al. (2021). [Lost on the frontline](#). The Guardian.
- Bureau of Labor Statistics. [Current employment statistics - CES \(national\)](#).
- Bureau of Labor Statistics. [Job openings and labor turnover survey \(JOLTS\)](#).
- Incredible Health. (2022). [Study: 34% of nurses plan to leave their current role by the end of 2022](#).
- Hilgers, L. (2022). [Nurses Have Finally Learned What They're Worth](#). New York Times.
- Turner, A. (2022). [Perspective: 2021 Health Employment—A Tale of Three Settings](#). Altarum.
- The White House. (2022). [FACT SHEET: Protecting Seniors by Improving Safety and Quality of Care in the Nation's Nursing Homes](#)

Text visualization:

We summarize actions proposed by the Biden administration to build a sustainable nursing workforce and present these in the form of text visualizations. From the narrative's standpoint, it made more sense to provide users with the exact language of policies for readers to appreciate the gravity of the problem and for them to gain insight into the relevance of proposed policy measures.

Text about measures implemented aided by text visualizations of the mentioned policies.

The Biden administration recently announced a set of reforms to mitigate some of the challenges faced by nurses.

Establish a Minimum Nursing Home Staffing Requirement
"...ensures that all nursing home residents are provided safe, quality care, and that workers have the support they need to provide high-quality care."

Ensure Nurse Aide Training is Affordable
"...strengthen and diversify the nursing home workforce."

Support State Efforts to Improve Staffing and Workforce Sustainability
"...assist and encourage States requesting to tie Medicaid payments to clinical staff wages and benefits"

Launch National Nursing Career Pathways Campaign
"...recruit, train, retain, and transition workers into long-term care careers, with pathways into health-care careers"

Data

U.S. Bureau of Labor Statistics (BLS)

- **Job openings and turnover survey (JOLTS):** Monthly data about openings, hires and separations in the US.
<https://www.bls.gov/ces>
- **Establishment survey:** Monthly data about employment hours and wages in the US.
<https://www.bls.gov/jlt>

Independent Surveys:

- **Galvin, B (2021) in Morning Consult:** Survey with data about healthcare workers resignations, including details by type of workers.
morningconsult.com/2021/10/04/health-care-workers-series-part-2-workforce/

- **Incredible Health (2022):** Survey about nurses intention to resign with details around reported reasons behind this.
<https://www.incrediblehealth.com/blog/nursing-report-covid-19-2022/>

Tools

Techniques

- Scrollytelling
- Progressive disclosure
- Animation
- Text Visualizations

Technologies

- HTML
- D3.js

Results

We think our design achieves its goal of providing compelling information about how the “great reshuffle” is unfolding in a certain industry and does so in a captivating manner through visuals, animation, text, and scrolling.

These results are drawn from a mid-project usability study–whose conclusions are included in the Appendix–and a final usability study through which we evaluated the effectiveness of our improved design.

Results - Final Usability Study:

Likerts:

Prompt	Average
Navigation simplicity (1 easy to 5 difficult)	1.2
Visualization understanding (1 easy to 5 difficult)	1.6
Website attractiveness (1 attractive to 5 unattractive)	2.2

Website interest (1 interesting to 5 boring)	1.6
Learning experience: "I learnt something new" (1 strongly agree to 5 strongly disagree)	1.2

Knowledge

Prompt	Prior to exploring the website (avg.)	After exploring the website (avg.)	Improvement
Rate your knowledge on the "Great Reshuffle" phenomenon. On a scale of 1) no knowledge to 5) expert	2.4	3.6	50%

Form the results above and the qualitative feedback received during our studies, we conclude:

- 100% of respondents of our first usability study who had no prior knowledge of the "great reshuffle" gained a new understanding of it after exploring our website. We also found a consistent improvement in their awareness of the topic in both studies.
- All users find the website's information compelling; readers found statistics such as 34% nurses wanting to leave their jobs in 2022 and the reasons motivating them to do so particularly interesting and surprising
- Users gain a better understanding of the impact of the pandemic on the healthcare workforce—in our first study they exhibited an overall 28% improvement in their understanding of this trend before and after reading our website. In our second study—based on the updated design—this improvement rises to 50%
- Our visualizations are easy to understand and the scrolling navigation is easy to explore; this was not always the case as we received comments about several graphs during our first study being busy and complicated
- Users find the combination of animation and scrolling interesting and visually compelling

Team Participation

Section	Noelle	Daniela	Shahan
Storyline	High	Medium	High
Web design	High	Medium	High
Web code	High	Medium	High
Visualizations (graphs)	High	High	High
Data gathering	Medium	High	High
Usability study design	Medium	High	Medium
Usability study	High	High	High
Usability study conclusions	Medium	High	High
Project write-up	Medium	High	High

Key: Level of contribution: **high**; **medium**

Sample interpretation: for "Usability study design", Noelle's contribution was medium, Daniela's was high, and Shahan's was medium

Appendices

Links and documents

Visualization website: <https://www.ocf.berkeley.edu/~nfk/scrollytelling/>

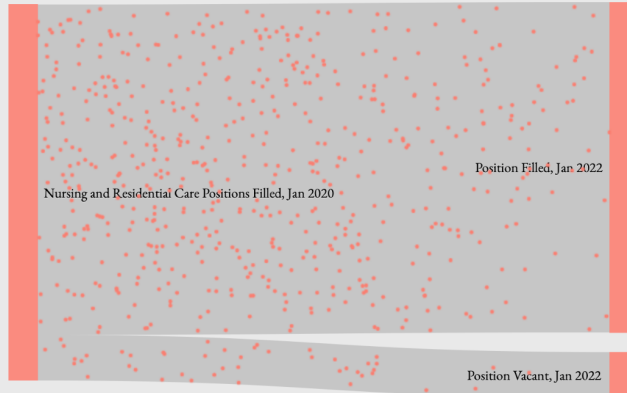
Code Repository: <https://github.com/noellekimiko/info247-final>

Screenshots

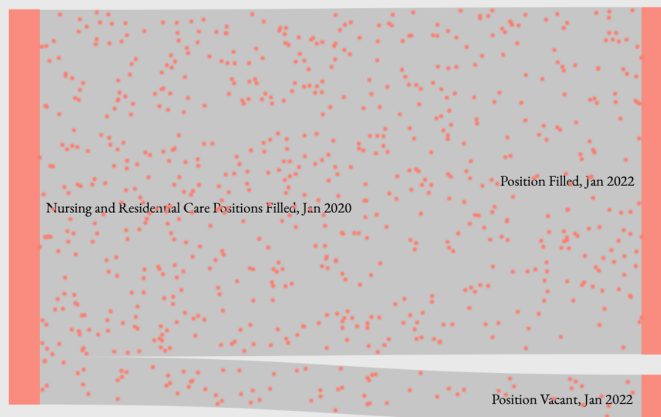
The Healthcare Industry's Ongoing Great Reshuffle

Nursing and residential care employment has shrunk by 12% since January 2020.

Keep scrolling. Using data about employment in the healthcare industry, we will show what has happened since early 2020.

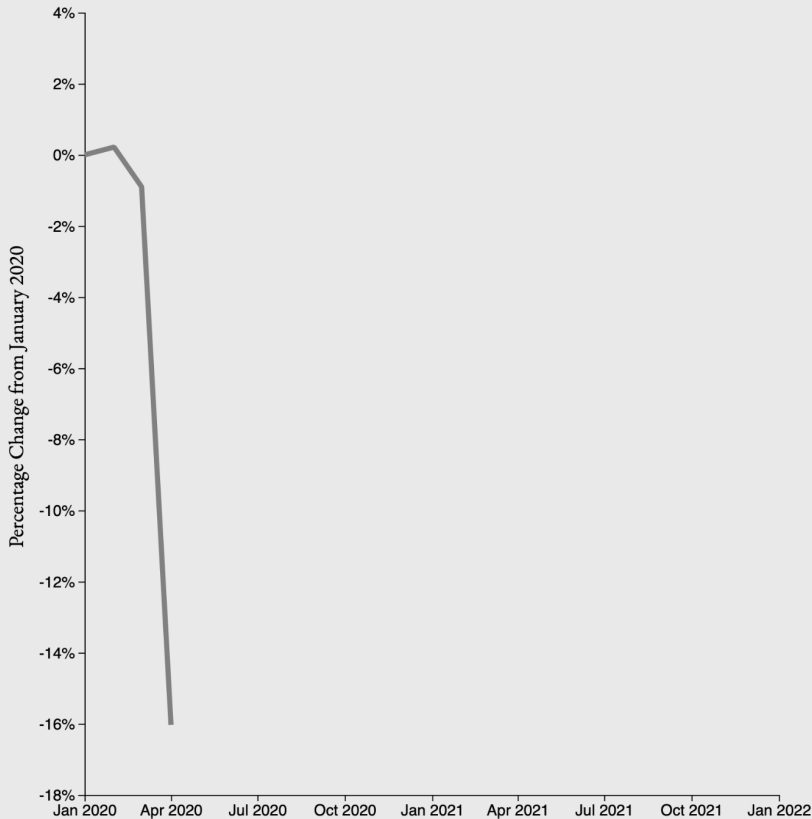


The declaration of a public health emergency on March 13th 2020 due to the fast-spreading COVID-19 pandemic reverberated across the United States. The economy received a jolt with the Dow Jones Index witnessing one of the largest one-day drops.



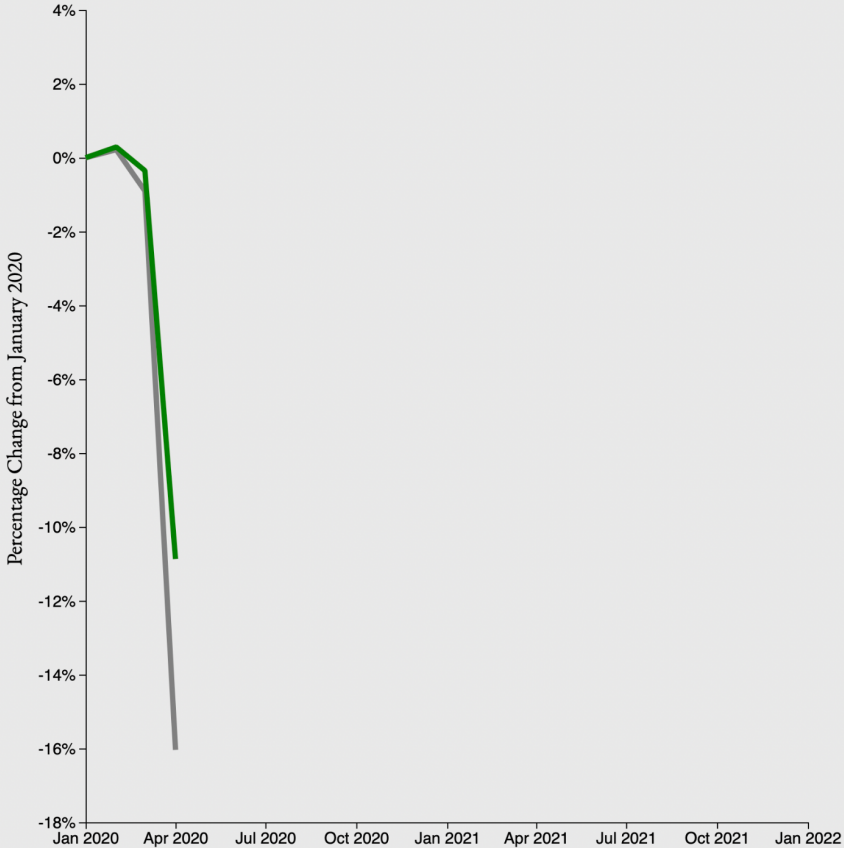
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Employment across the US economy was no different. Here we plot the percentage change in the total employment against time.



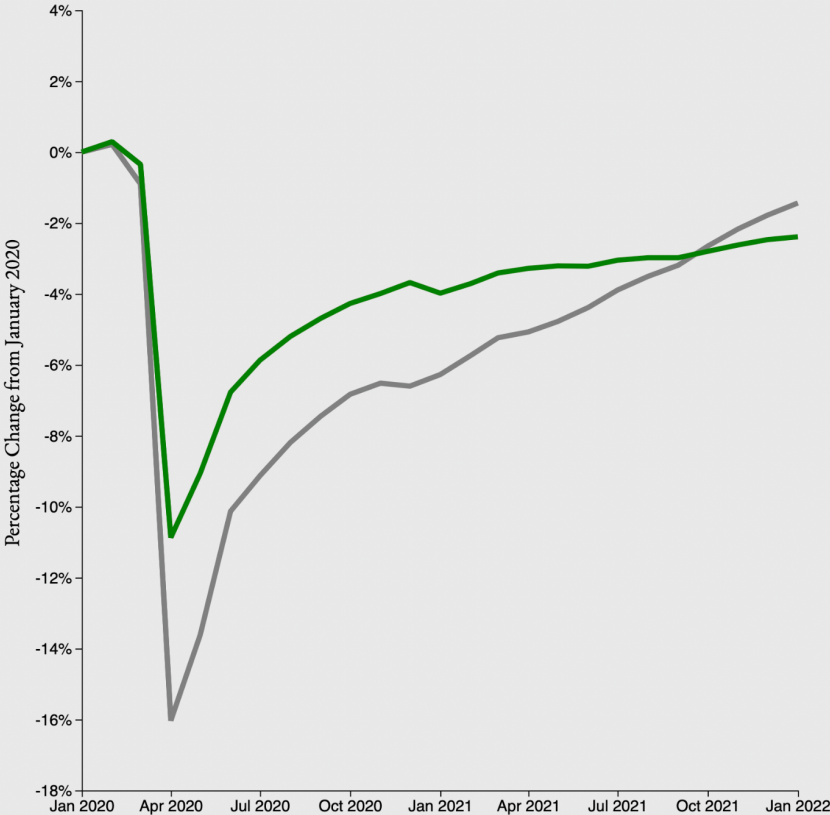
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A major employer, the **Health Care and Social Assistance** industry felt the shock too. Here we add healthcare employment data to our plot showing percentage change in employment against time.



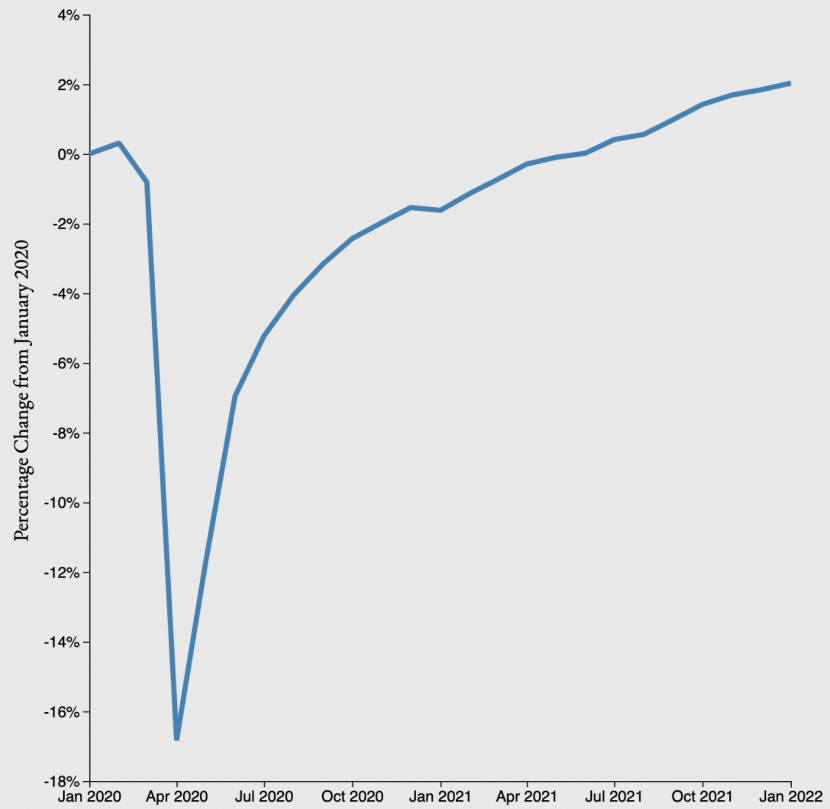
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But as COVID-19 progressed, the overall economy and employment in the **Health Care and Social Assistance** industry recovered.



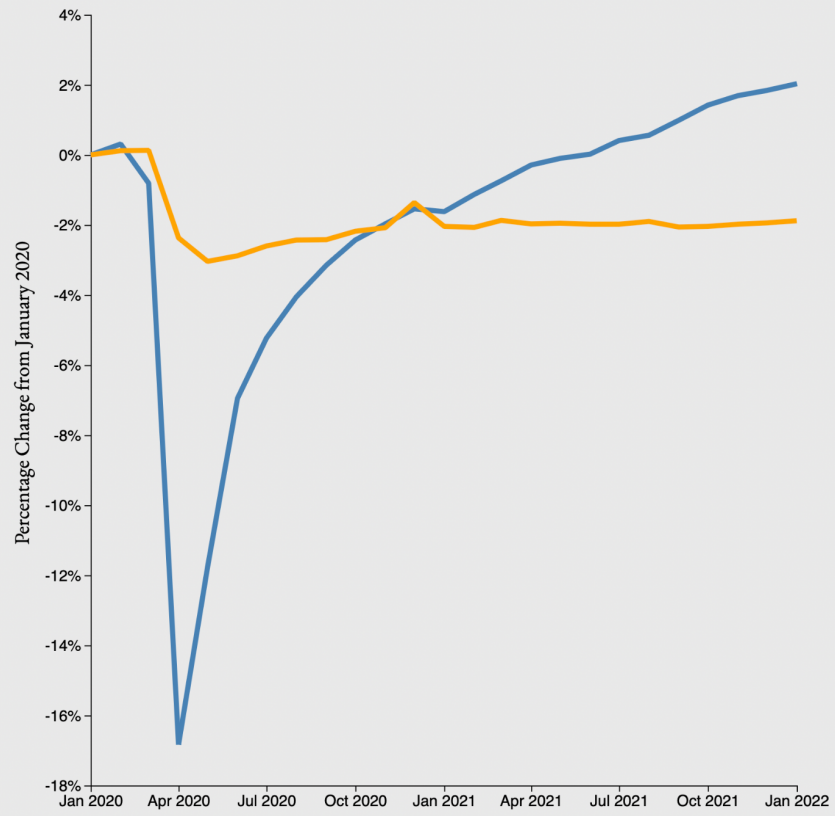
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Disaggregating the sector reveals more details. This line is for **Ambulatory Care** which includes doctor's offices, dentists, and optometrists. It still mirrors the general trend seen in the total US labor market.

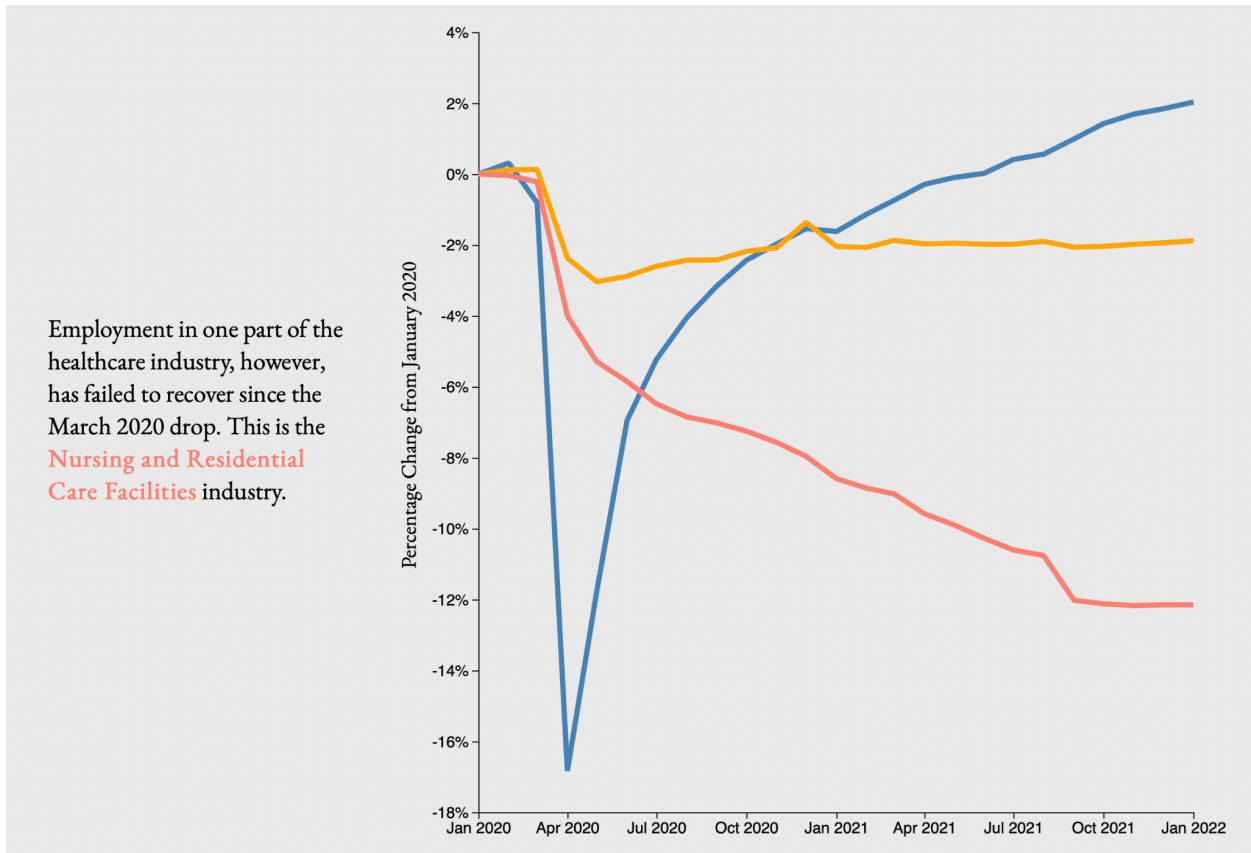


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In contrast, **Hospital** employment did not drop as dramatically between March and April 2020, but has decreased overall compared to January 2020.



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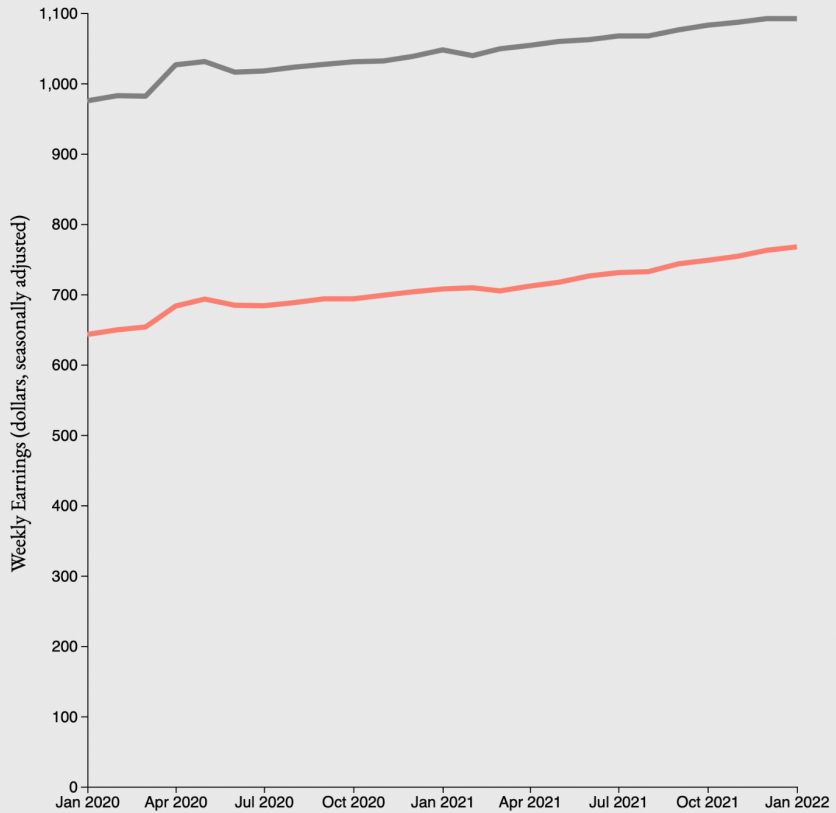
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This is one of the legacies of COVID-19—a "Great Reshuffle" away from low-paid, high-stress work. In fact, for the **Health Care and Social Assistance** industry, the ratio of openings over hires is among the highest in the economy—a proxy for employers having trouble filling openings due to rapidly rising demand and falling labor supply. Why is this the case?



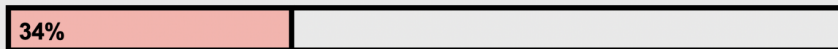
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COVID-19 led to a spike in demands made of healthcare workers: extended hours, uncomfortable protective gear, and a fatal risk of catching the virus. While facing these risks, healthcare workers have earned below-average pay. On average, since January 2020, wages in the **Nursing and Residential Care Facilities** industry have been \$335 lower than the economy's average.



In a recent survey, 34% of nurses said they were likely to quit their job by the end of 2022.

NURSES PLAN TO RESIGN BY 2022



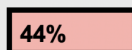
Of these, 44% cited burnout and high stress and 27% chose benefits and pay as reasons for the change.

- Causes of burnout included not being appreciated by the community, mental and physical abuse, and workplace discrimination and racism.
- Those citing pay and benefits mentioned the prospects of better pay, improved schedule, and career advancement.

NURSES PLAN TO RESIGN BY 2022



Burnout & High Stress



Pay & Benefits



With no sign of the "Great Reshuffle" abating or of labor shortages being mitigated, where does the Healthcare industry go from here?

The healthcare industry is counting on a few measures to attract labor: handsome pay and seeking freelance "traveling" nurses. For example, the [New York Times](#) reports:

"In New York, travelers could make \$10,000 or more. The average salary of a staff nurse in Texas is about \$75,000; a traveler could make that in months."

Despite momentary high earnings for some travelling nurses, the future is not bright because this freelance model is unsustainable—it places additional burdens on nursing staff and does not fix the underlying labor shortage in the industry.

The Biden administration recently announced a set of reforms to mitigate some of the challenges faced by nurses.

Establish a Minimum Nursing Home Staffing Requirement

"...ensures that all nursing home residents are provided safe, quality care, and that workers have the support they need to provide high-quality care."

Ensure Nurse Aide Training is Affordable

"...strengthen and diversify the nursing home workforce."

Support State Efforts to Improve Staffing and Workforce Sustainability

"...assist and encourage States requesting to tie Medicaid payments to clinical staff wages and benefits"

Launch National Nursing Career Pathways Campaign

"...recruit, train, retain, and transition workers into long-term care careers, with pathways into health-care careers"

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These measures hone in on nurses' working conditions, pay scales, training opportunities, and career pathways.

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The Centers for Medicare & Medicaid Services is currently working on operationalizing these recommendations and on making these actionable.

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Information Sources:

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- Bureau of Labor Statistics. [Job openings and labor turnover survey \(JOLTS\)](#).
- Incredible Health. (2022). [Study: 34% of nurses plan to leave their current role by the end of 2022](#).
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Mid- Project Usability Study

Main findings and related changes to the interface:

1. We successfully tell a story about the "Great Reshuffle" and its scope through the scroll-based flow and the text

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2. The scrolly-telly feels incomplete: add other artifacts such as quotes, images, and charts to visualize the story further
3. The line charts need titles and refinement: we will consider adding titles to charts but also want to be mindful of information redundancy.
4. Remove boxes around the text: we will experiment with the text box and its color and opacity.
5. Improve the bubble chart: we want to make sure that the links between the percentages are made clear
6. Some clarification questions pointed to the need for more context (e.g., ambulatory care). We will look at our graphs and text with a fresh lens to minimize the need for clarifications.

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