

14,000

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6,000

2,000

Confirmed COVID-19 deaths globally
Rolling 7-day average as of Oct. 23rd 2022
Source: Our World In Data



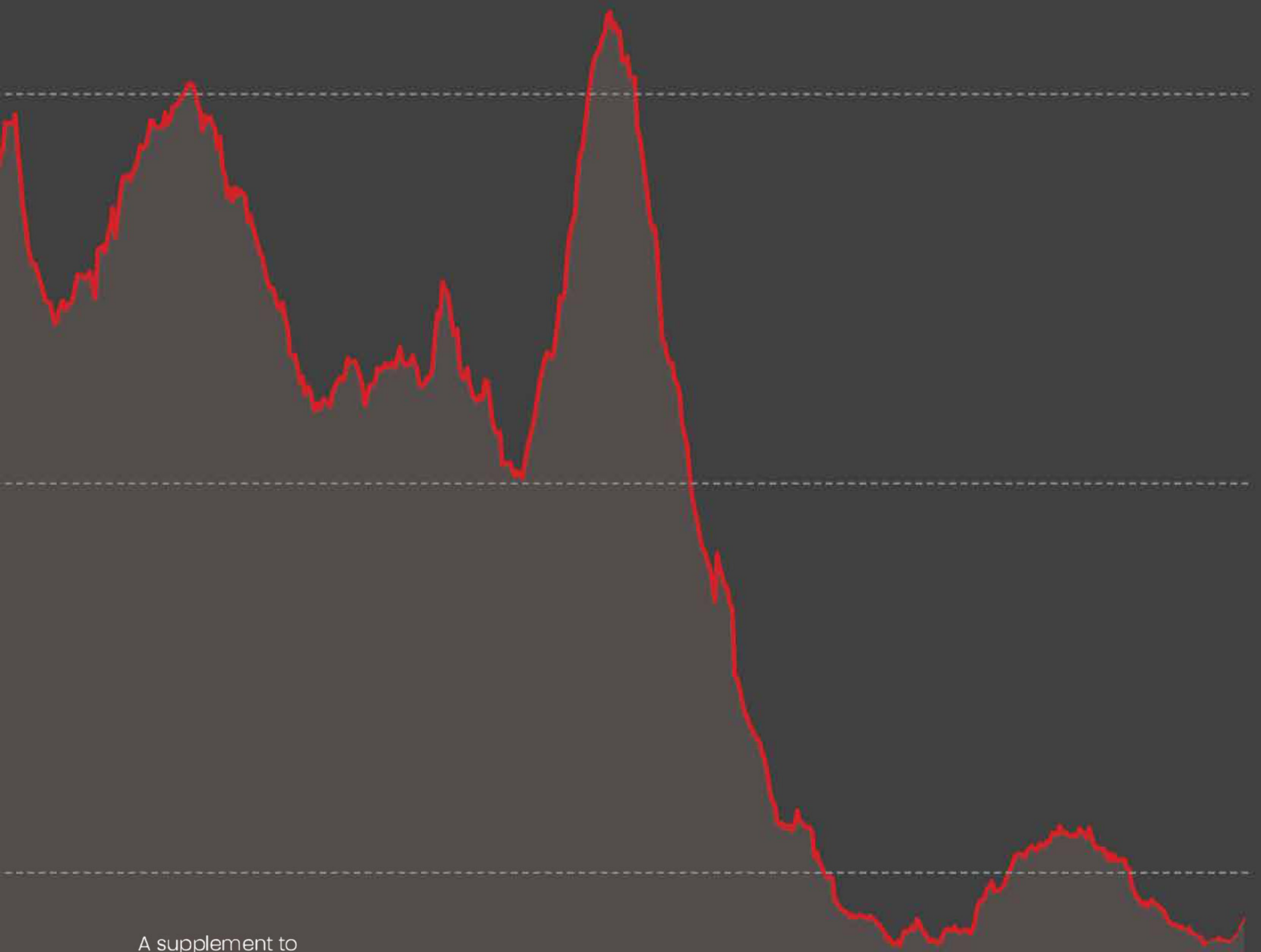
Unimaginable Death

Visualizations of COVID-19
Pandemic Milestones

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HUGH DUBBERLY

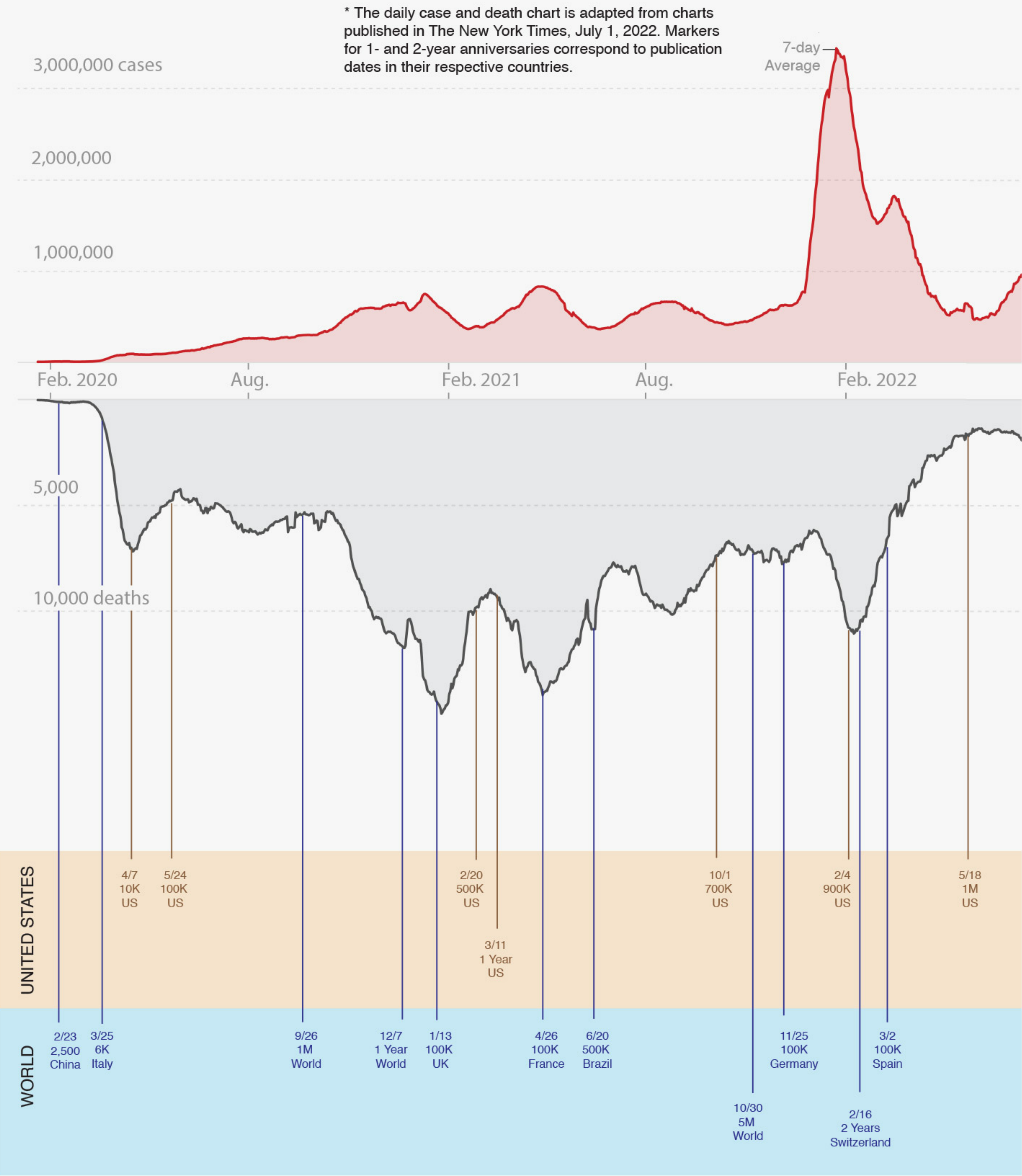
LIUHUAYING YANG



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1. World Cases Over Deaths Aligned with Milestones, January 2002 through May 2022*



Introduction

The Phenomenon of Death Milestones

A death milestone is a marker in the accumulation of loss. These markers for the people who have died during the COVID-19 pandemic — 100,000, 500,000, or 1 million deaths — are easy to recognize but difficult to conceptualize. The global pandemic has proven to be an event with a beginning that has resisted all our concepts and plans for how it will end. Our collective need to track the COVID-19 virus, measure the impact, and respond to it is the engine driving designers, data journalists, and programmers to visualize quantities we cannot see or easily comprehend.

Visualizations of COVID-19 death milestones are the most compelling examples of how design addresses this challenge. These designs are representations of the number of people who have died in a specific country or in the world. Each visualization milestone is a point of reflection rather than a daily report. We will discuss 40 of these, selected from news media published in 10 countries: the US, UK, France, Germany, Spain, Portugal, Switzerland, Singapore, China, and Brazil. All examples are collected in the COVID-19 Online Visualization Collection (COVIC)¹.

The tools and digital infrastructure to share, aggregate, and publish data sets online existed before the pandemic, but like so many other things, the pandemic strained our ability to use that infrastructure effectively and collecting daily figures was problematic from the outset. Nonetheless, the data published by the Johns Hopkins University Center for Systems Science and Engineering (CSSE) in January 2020 became the first of several sources of aggregated global statistics used to generate daily visualizations². The quality and consistency of the data gathered and published by this infrastructure has been controversial for many reasons. For example, there was no systematic collection of COVID-19 data at the national level in the United States during the early months of the pandemic. The COVID Tracking Project, a volunteer organization initiated by journalists at The Atlantic, became the most authoritative source of aggregated data from the 50 U.S. states³. After more than two years, the numbers published by different sources on a given day were statistically similar but have never been exactly the same. For example, the total number of U.S. deaths reported on May 23, 2022 was 999,254 (U.S. Center for Disease Control and Prevention), 1 million (Google), 1,000,577 (The New York Times), 1,001,000 (The Washington Post), and 1,002,173 (Johns Hopkins CSSE).

News media reports are based on these numbers, regardless of the imperfections. Governments respond to feedback based on these numbers with national policies for travel, testing, quarantine, and vaccination. These responses disrupt supply chains, recreation, travel, and all forms of education. All these factors — quantified, collected, visualized, and analyzed in the form of maps, charts, and indexes — have become part of our daily environment.

Within this context, death milestone visualizations, which have appeared during the period from January 2020 through May 2022, stand apart from the many daily data-driven charts. These visualizations exist on a boundary where data challenges our ability to combine objectivity and emotion. As a collection, they tell us a great deal about how we visualize numbers and loss.

¹ Kahn P, Dubberly H, Rodighiero D, COVIC: Collecting Visualizations of COVID-19 to Outline a Space of Possibilities. *Design Issues*. Vol. 38, No. 4, Fall 2022

² Dong E, Du H, Gardner L. An interactive web-based dashboard to track COVID-19 in real time. *Lancet Infect Dis*. 2020 May;20(5):533–534. doi: 10.1016/S1473-3099(20)30120-1. Epub 2020 Feb 19. Erratum in: *Lancet Infect Dis*. 2020 Sep;20(9):e215. PMID: 32087114; PMCID: PMC7159018.

³ Hall D., *Pandemic Tracking and the Future of Data*. 99% Invisible Episode 489, May 3, 2022 [<https://99percentinvisible.org/episode/pandemic-tracking-and-the-future-of-data/>]

The Tempo of Death

The COVID-19 pandemic, like the spread of any infectious disease, is commonly represented in the form of rising and falling “waves” of cases and deaths. The rise and fall of daily numbers do not communicate the accumulation of deaths, but they do represent the tempo of the pandemic, generating anxiety and the need for response throughout the world.

In Figure 1, we have located the death milestones that inspired our examples within the periodic rise and fall of COVID-19. This visualization is derived from global case and death numbers published by The New York Times and aligned the two charts along the shared time X-axis. To make the fluctuation in daily deaths visible, we reproduce the different Y-axis from the original chart because deaths represent approximately 1% of cases. We have separated and labeled death milestones into two bands: total figures for the United States, and for the other countries and the world. The date for each milestone is aligned with the pandemic’s global death count.

These significant number boundaries do not necessarily correspond to high points in global daily deaths. The days when 1 million people had died worldwide, half a million people had died in the United States, or 100,000 people had died in Germany did not occur during global peaks. Each milestone was a response to what was perceived at that time as a large number of deaths, even as this “large number” grew from a few thousand to more than 5 million. Later milestones mark the relentlessness of the pandemic.

Visualizations of these milestones were created to serve a range of purposes. In some cases, they present us with an appearance of objectivity — the neutral language of scientific visualization. In other cases, they challenge the reader to recognize catastrophe. While the purpose of all the visualizations is to inform, each of these examples has its own rhetoric. Some argue “this should not be happening; mistakes are being made.” Others say “grief must be shared to celebrate life.” These arguments reside below the veneer of objectivity. They look back at what happened, while also suggesting we look forward at what could happen if we do not change or adhere to some form of collective behavior.

In some cases, these visualizations are intended to instill fear. They fairly scream, “look at what is happening; you could be next.” They are a horror movie or train wreck from which we cannot look away. Some present us with a visual summary of what happened, while others argue, “this thing isn’t over yet!”

Most frequently, these visualizations call us to a collective mourning, to share our grief and shock. They call us to recognize the profound global, national, and personal dimensions of this tragic loss of life.

Visual Strategy

Any death milestone visualization is an answer to a fundamental design question: How might we show vastness of scale and still identify specific individuals? Sometimes this challenge is described as “seeing the forest and the trees.” Can we design a representation of a full forest that also allows us to see the trees that comprise it? How much of the forest do we have to trade off to see a selection of individual trees? How can we present an individual tree without obscuring the larger gestalt of the forest?

Each designer or design team charged with the task of visualizing the quantity of deaths accumulating during the pandemic is responding to all or part of this challenge. Data visualizations typically employ logos, the rational mode of argument, to communicate quantity. At the same time, many of the examples we will discuss also show designers using numbers representing unimaginable quantities to engender pathos, the emotional mode of argument.

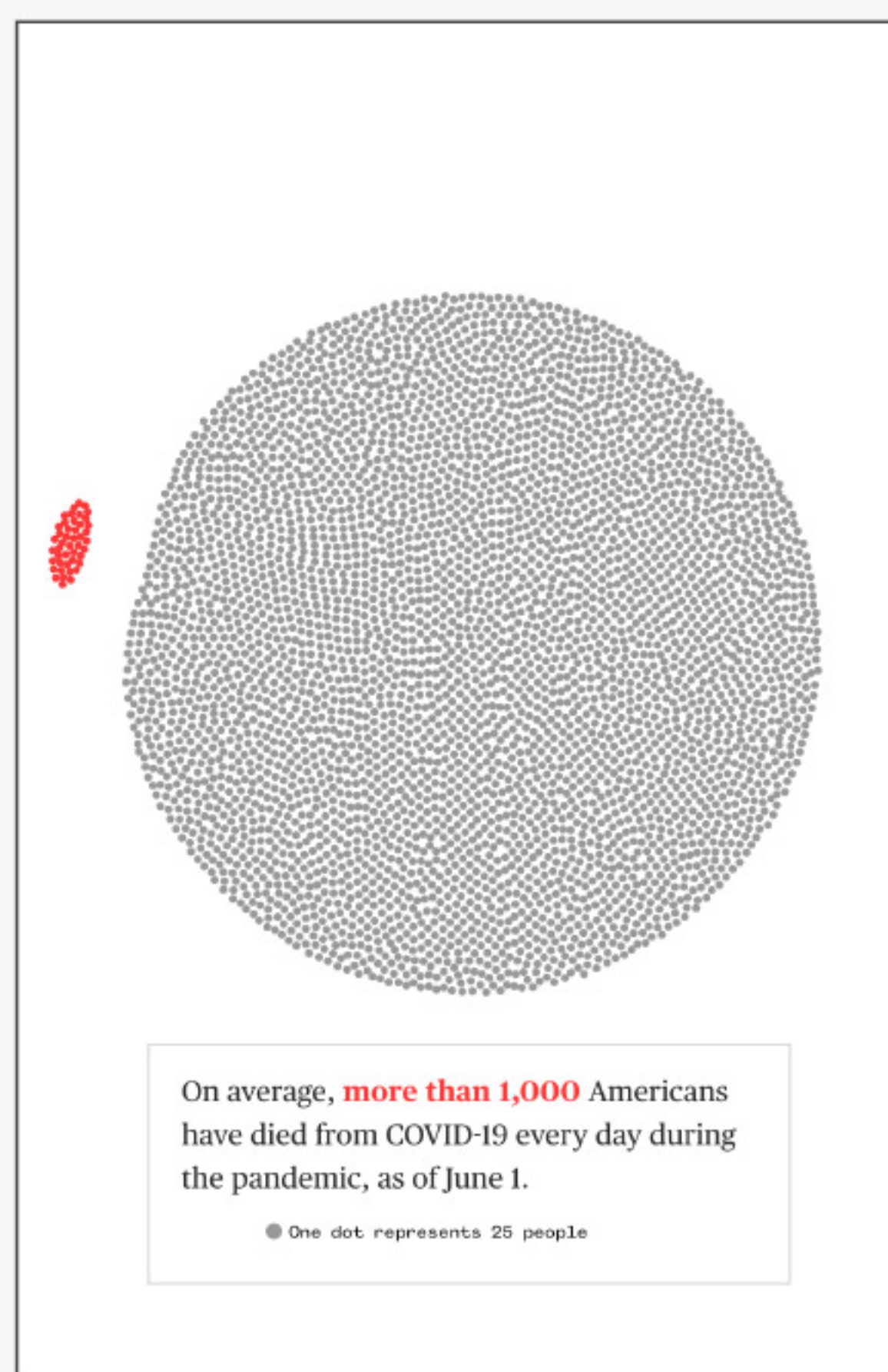
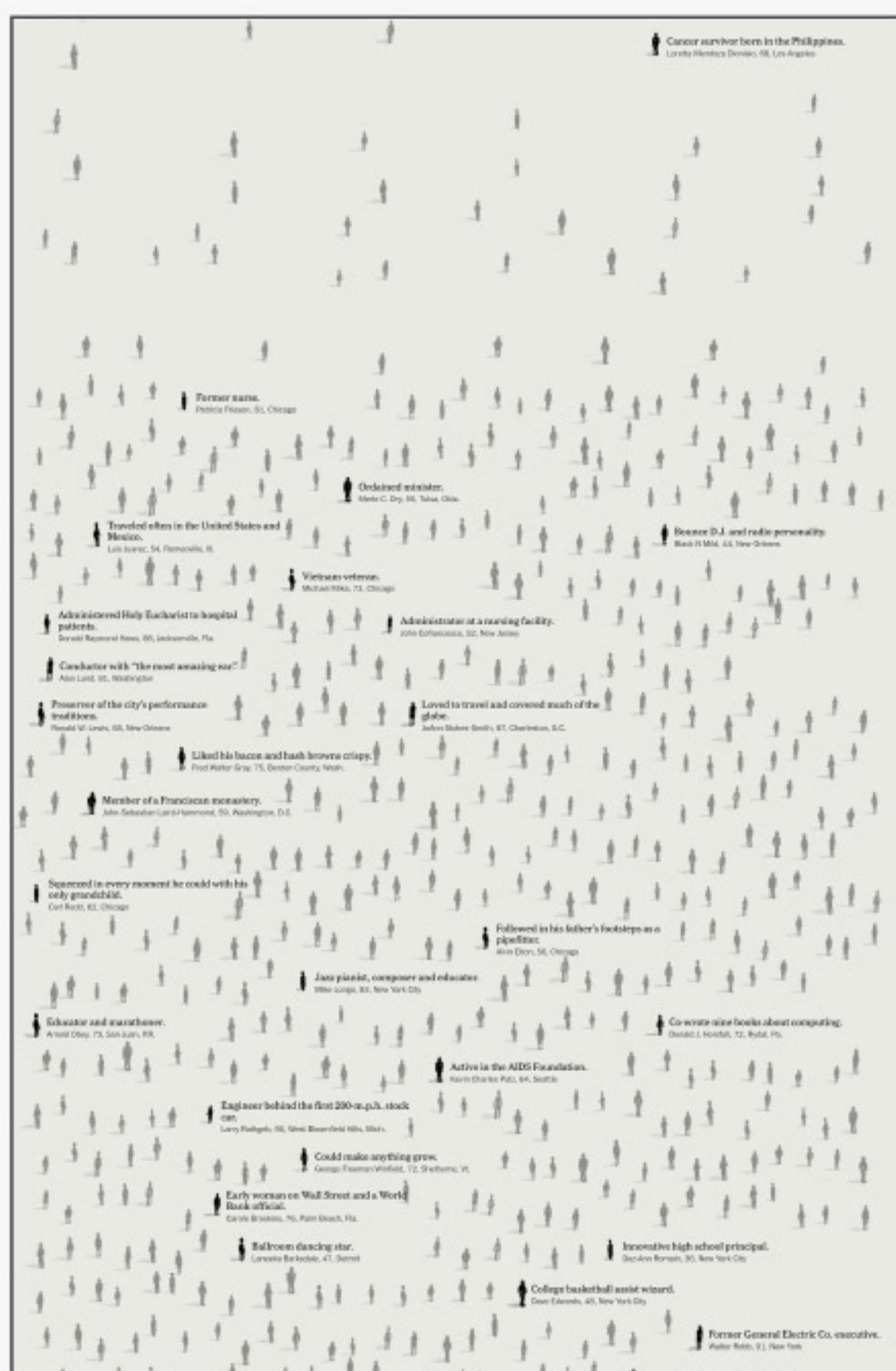
Many aspects of the pandemic have been described as “unprecedented.” The concept of 1 million or 5 million deaths is rational, yet these are quantities outside of our daily experience. What rational means can make them understandable to a general audience? At the same time, how can design communicate the pathos of the individual deaths contained in these large numbers? What is the appropriate way to communicate these milestones within a specific cultural frame? The context that frames each milestone — regional, national, or local — presents a third general design problem.

The examples we discuss are created by an international community that is highly connected and well informed about each other's work. We initially group these examples by the dominant visual strategy: names and faces, dots, streams, flowers, maps, comparisons, lines, and area charts. Then we look at similarities and differences in the way they represent numbers and the impact of death in specific countries.

Detail from 3.1 The New York Times

Detail from 3.2 NBC News

Detail from 7.1 South China
Morning Post



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Obituary pages in Union of Bergama

Sat, March 31

Compared to

Sat, February 28

[illegible]

Names and faces

The two earliest examples memorialize deaths during the first months of the pandemic.

“新冠逝者：数字之后不应被遗忘的人” (Covid-19 Dead: People Behind the Numbers who Shouldn't be Forgotten) (2.1), published in 财新 Caixin, a Chinese financial news website, combined two strategies: names and faces of the dead with dot patterns. By February 2020, the deaths caused by COVID-19 in China were recognized as a national tragedy. This presentation featured brief stories of 25 people who died, including illustrated portraits of six victims. The column represented the total deaths in China at that time: 2,346 in Wuhan and other parts of Hubei province (grey dots) and 96 in other provinces (blue dots). Red dots were medical workers, while white dots were other professional categories such as professors or businessmen.

“A deluge of death in northern Italy” (2.2) published in Reuters Graphics, was far more quantitative, employing several methods to emphasize the number of people dying from the virus in the Lombardy region of Italy in March 2020. The most striking method was a reproduction of obituary page miniatures from a local newspaper, L'Eco di Bergamo, separated by three weeks. In that time, the familiar pattern of a photo of the dead followed by a message had grown from two to 12 pages. While these faces and names are not recognizable, the pattern focused the memorial on the style of individual obituaries.

The front page of The New York Times print edition on May 24, 2020 (2.3) presented six columns of names chosen from obituary pages around the United States. Each name was followed by the person's age, hometown, and a descriptive phrase. For example, “Marion Krueger, 85, Kirkland, Wash., great-grandmother with an easy laugh.” This cascade of names below a single headline was used instead of the cover's usual multiple headline format to represent the milestone of 100,000 deaths, a number the United States surpassed before any other country. This style of visualization was chosen to focus more on the lives lived more than the number itself⁴. When the U.S. reached the 500,000-deaths milestone in late February 2021, The Washington Post published “Putting 500,000 covid-19 deaths into perspective” (2.4), a visualization that generates a column of 500,000 blurred facial images, separated by dates to represent the number of people who had died each day. The blurred images were generated by a software program to be entirely fictitious, but the effect of endlessly scrolling through columns of human faces was a radical approach. It was more about transforming the experience of scrolling through half a million faces into something beyond anyone's ability than visualizing a quantity.

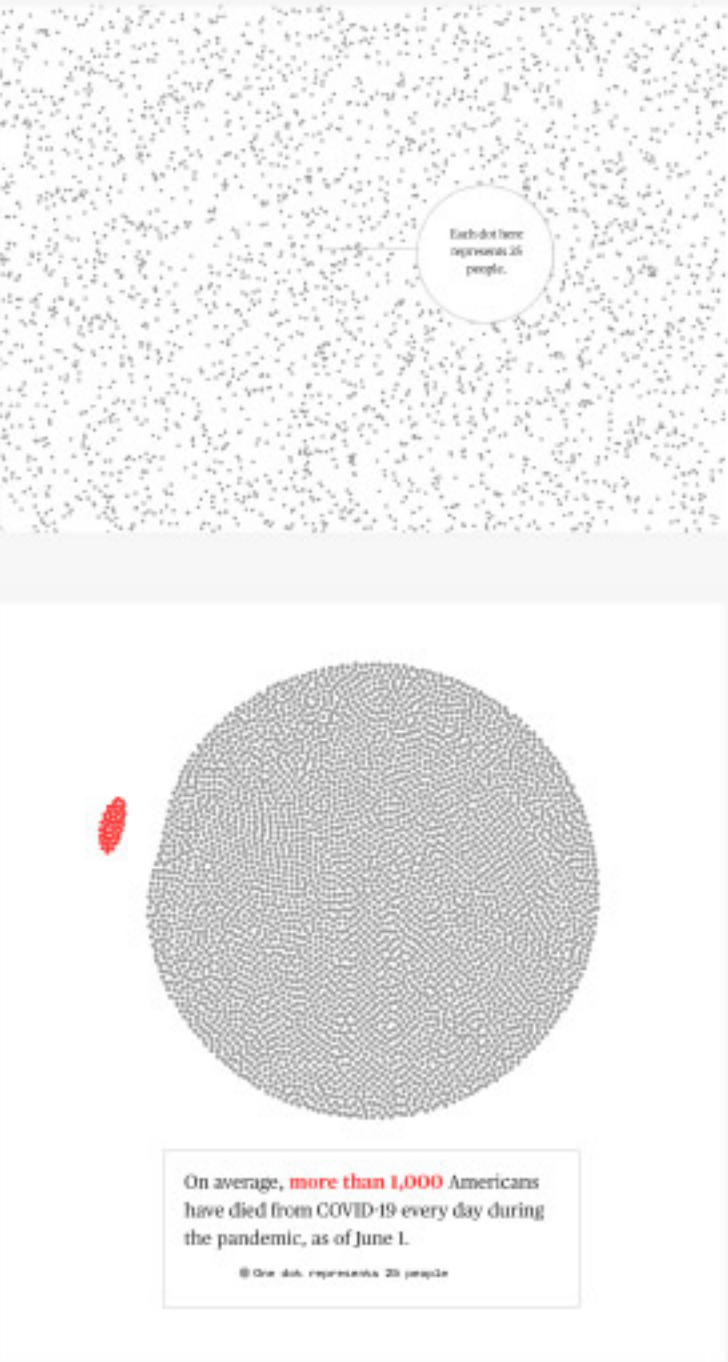
To mark the milestone of 1 million deaths in May 2022, The Washington Post selected one obituary from each of the 114 weeks the pandemic had lasted in the United States. “One million covid deaths: Visualizing 114 lives, cut short.” (2.5) presented the opening sentence of an obituary, clipping the text to represent the quantity of deaths that week. Each line is linked to an individual obituary. As the reader scrolls through the texts, an area graph of total deaths is drawn along the bottom of the screen. When the individual clipped text lines are viewed as a

4 The Project Behind a Front Page Full of Names, The New York Times. May 23, 2020. [<https://www.nytimes.com/2020/05/23/reader-center/coronavirus-new-york-times-front-page.html>]

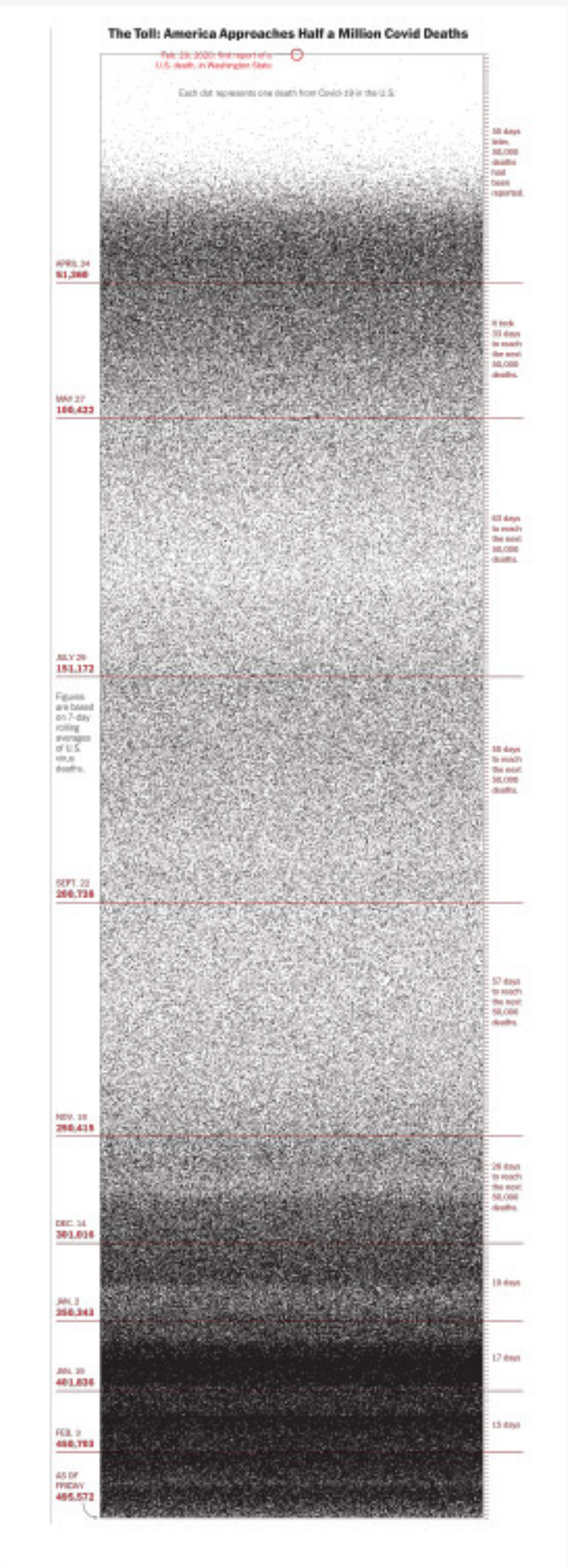
3.1 The New York Times, US, 100K, 5/27/20



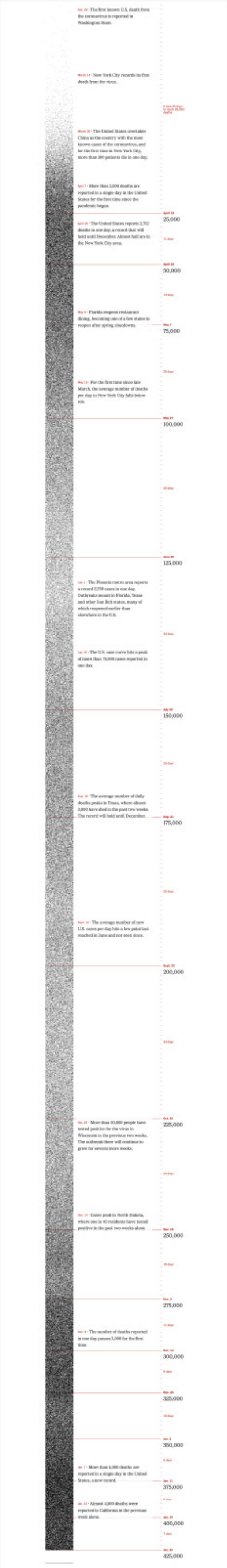
3.2 NBC News, US, 100K, 6/2/20



3.4 The New York Times, US, 500K, 2/21/21



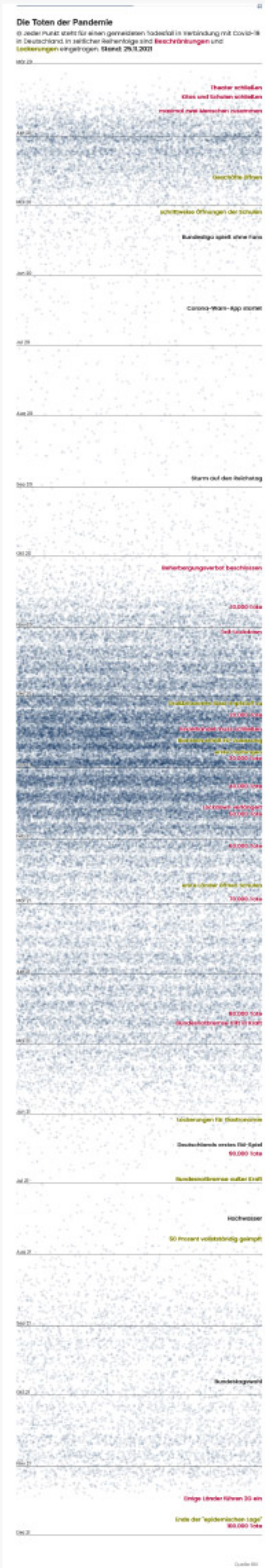
3.3 The New York Times, US, 450K, 1/27/21



3.5 Le Monde, France, 100K, 4/26/21



3.6 RND, Germany, 100K, 11/25/21



Dots

column, the length become a bar chart representing the variation of deaths over time. In this case, the visualization of the individual text lines become trees that build the forest of 1 million deaths.

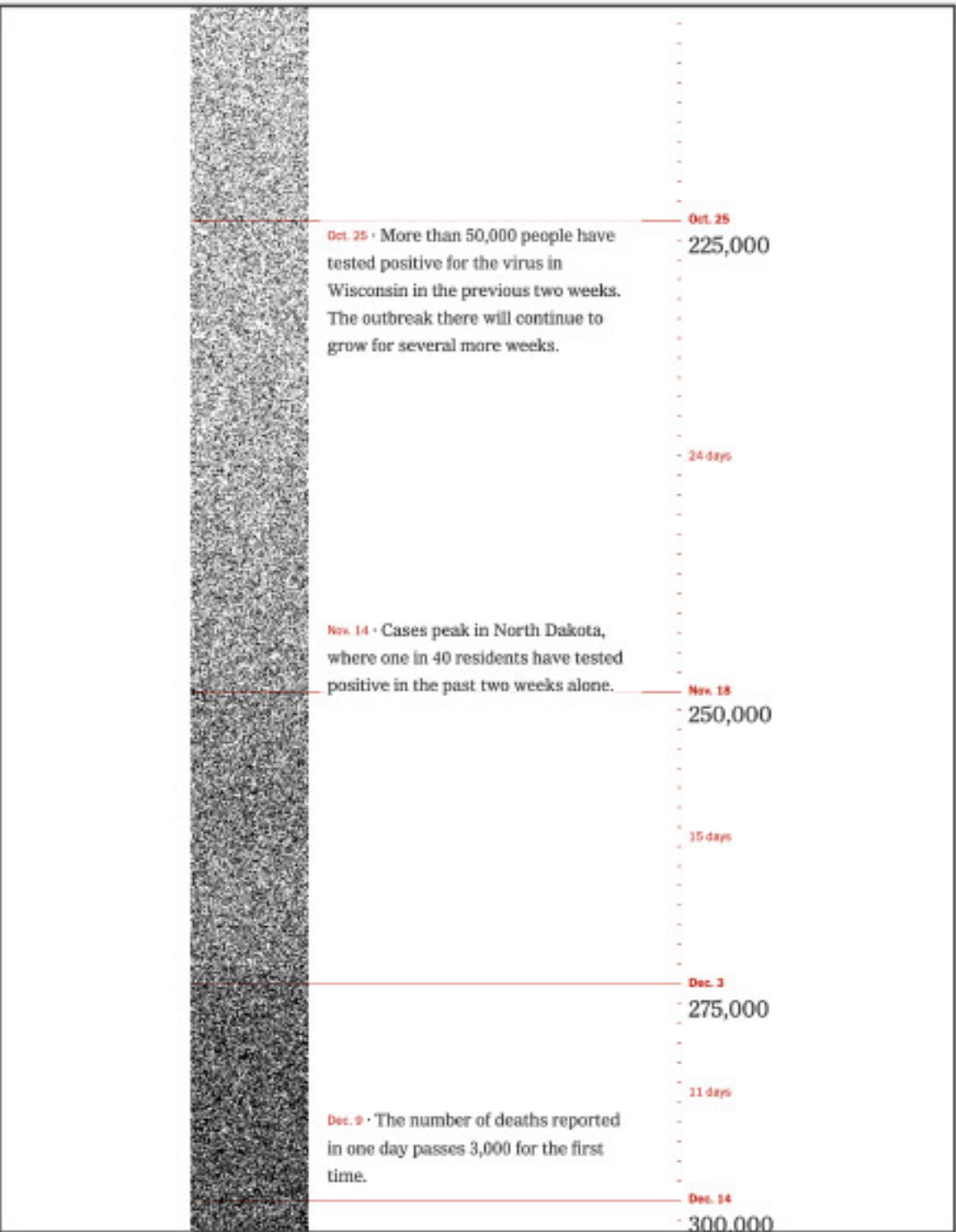
Alongside the all-text front page, the May 27, 2020 online edition of The New York Times presented the same content (3.1) in the form of a scrolling column filled with varied-yet-generic miniature figures, each casting a uniform shadow. The name, age, hometown, and descriptive phrase for the same examples found in the print edition were scattered among the matrix of figures. The presentation employed parallax scrolling to create two dramatic interactions. As the reader scrolls down the column, the date and total deaths accumulate in the lower right. At the same time, blocks of text describing individual deaths pass up and over the matrix of figures. The generic figures foreshadowed the dots that appeared in later visualizations, in The New York Times and elsewhere.

The following week, the same milestone was represented with animated dots in “Seeing the scale: Visualizing the 100,000 American coronavirus deaths” (3.2) on the NBC News website. Individual dots that each represented 25 deaths were randomly scattered on the page, though here the density of the dots did not correspond to a time sequence. Instead, as the reader scrolls the page, the dot pattern swarms into 14 stacks, each corresponding to the number of deaths in a single week.

In another dramatic print and online combination, The New York Times realized the literal connection between dots and death in January and February 2021. “How 450,000 Coronavirus Deaths Added Up” (3.3), an online story, anticipated the coming half-million-deaths milestone with a very long and narrow column of dots aligned to dates and accumulating numeric milestones. This visualization was generated by placing one dot aligned to a vertical time scale for each death. The result is a darkening and lightening of the column corresponding to increase and decrease of the death rate. When the 500,000 mark was reached several weeks later (3.4), half of the front page of the print edition presented a wider and shorter column of dots arranged in the same way. In both cases, the text focused entirely on the accumulating numbers, with no mention of individuals.

Similar visualizations appeared in national news media during the weeks that France and Germany crossed the 100,000-deaths milestone. When France reached this number in April 2021, Le Monde published a scrolling column (3.5) that was “une visualisation inspirée de celle du New York Times (a visualization inspired by The New York Times).” The visualization contained dots corresponding to individual deaths with a calendar date and running total that changed as the reader scrolled down the page. When Germany crossed this milestone in November 2021 (3.6), the story published by RND (RedaktionsNetzwerk Deutschland) featured a column of 100,000 dots representing deaths in Germany, aligned with text describing the imposition and lifting of restrictions.

Detail from 3.3 The New York Times



Streams

Representing chronological events as streams or rivers was a common visual strategy in the 19th century when timelines transformed cultural and political events into stream-like patterns⁵. Today, designers have access to algorithms that arrange sets of data points along a time axis resembling a stream⁶. Various forms of these streamgraph algorithms inspired and facilitated the visualizations in this group.

Streamgraphs begin to appear in September 2020 to visualize 1,000,000 deaths worldwide. While the total number of cases and deaths in specific countries had been the most common subject of visualizations during the first year of the pandemic, the crossing of 1 million deaths worldwide inspired major visualizations in the Singaporean, Portuguese, and Chinese press. “Coronavirus: How the world lost one million lives to Covid-19” in *The Straits Times* (4.1) featured a vertical streamgraph divided by continent. The global number of deaths was an area built out from a central axis, with the area representing each continent separated by color, and each country separated by waving lines. Interactive scrolling coordinates text with highlights of continents and countries. Deaths in China became a narrow oval atop a broad undulating column that shifted between peaks in Europe and the Americas. “Menos um milhão de vidas” (Less a million lives) (4.2), an article that appeared in *PÚBLICO* the same week, featured a horizontally aligned streamgraph. The location of deaths was not represented, and the interaction was limited to a mouseover display of totals and dates as the reader moved a cursor over the visualization. The impression here is of a wavy column with several spiky points. Another example employing a streamgraph is “Covid-19: The global crisis — in data”⁷ published in the *Financial Times* during the same time period. We have not reproduced this in our examples because among its many remarkable graphics, it does not contain a single visualization of 1 million deaths.

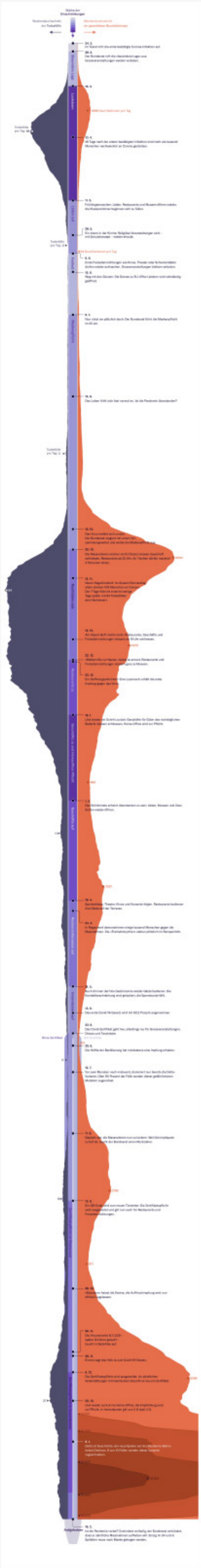
A strong contrast to this image is found in “500,000 lives lost” (4.3), published by Reuters Graphics to mark when the U.S. reached the half-million-death milestone in February 2021. This visualization combined the dot-density method, where each dot represented a death, with the streamgraph layout built around a central axis. The U.S. data produced a shape that was quite different from the world numbers. Weekend deaths being reported at the start of the following week created a constant growing and narrowing of the column, while other data reporting anomalies, like when states added previously unreported deaths, created broad spikes. Text boxes appear as the reader scrolls through the column, along with a running death total by date. On the right, growing death milestones are compared to war casualties. For example, we are told the total U.S. military casualties during the Vietnam War was surpassed in the first two months of the pandemic and the number of deaths on December 9, 2020 alone exceeded the death toll of the September 11, 2001 attacks. On the left side of the stream, summaries of 15 individual deaths are listed, with each name linked to a previously published obituary to connect this very abstract visualization to individual lives.

5 Rosenberg D, Grafton A. *Cartographies of Time*. Princeton Architecture Press, 2010

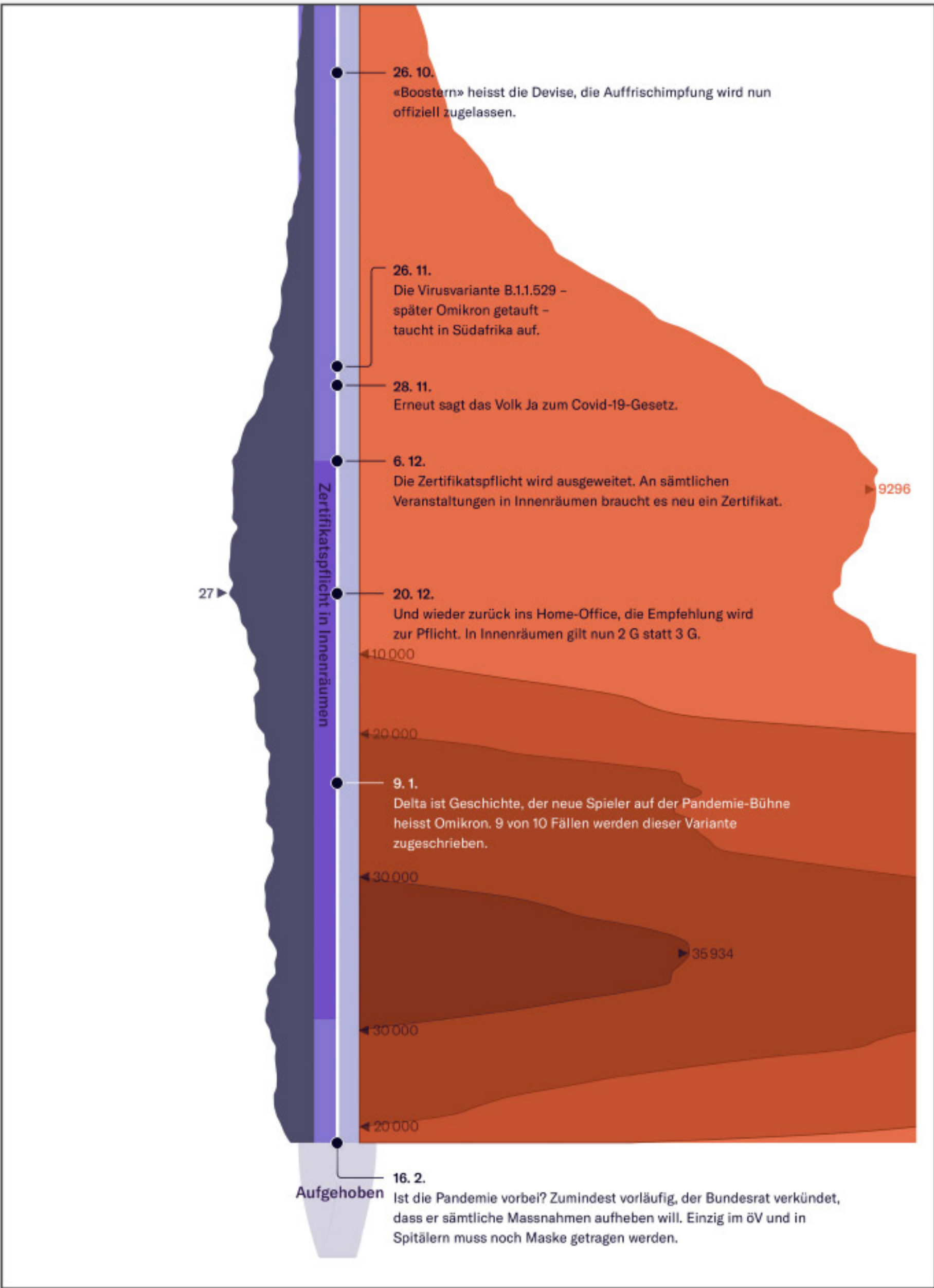
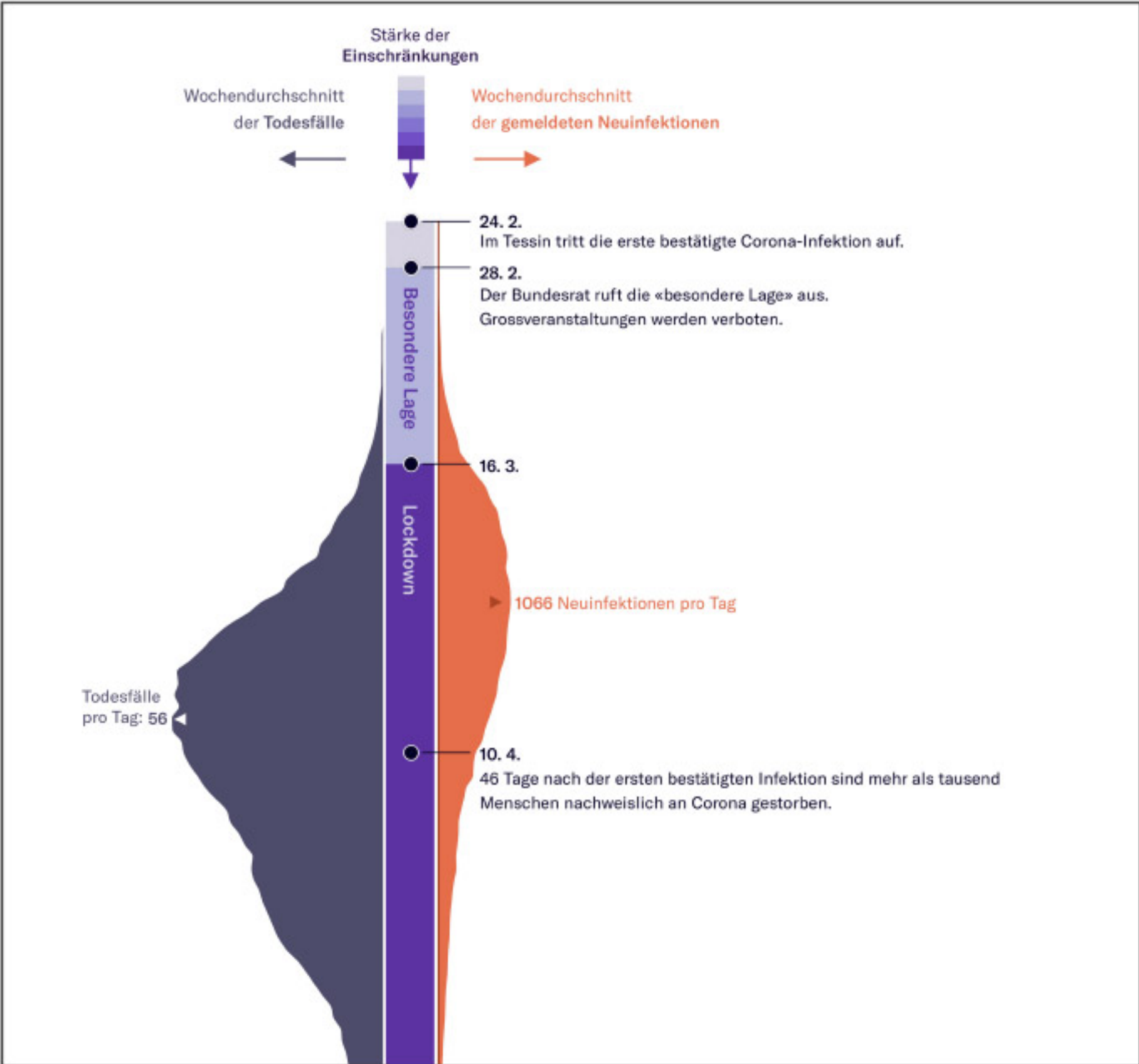
6 Byron L, Wattenberg M. Stacked Graphs – Geometry & Aesthetics. *IEEE Transactions on Visualization and Computer Graphics* (Volume: 14, Issue: 6, Nov.–Dec. 2008)

7 FT Visual & Data Journalism team, Covid-19: The global crisis — in data, Charts and maps show paradoxes of a pandemic that has claimed a million lives, *Financial Times*, October 18 2020, [<https://ig.ft.com/coronavirus-global-data/>]

4.5 Neue Zürcher Zeitung Switzerland,
2 years, 2/16/22



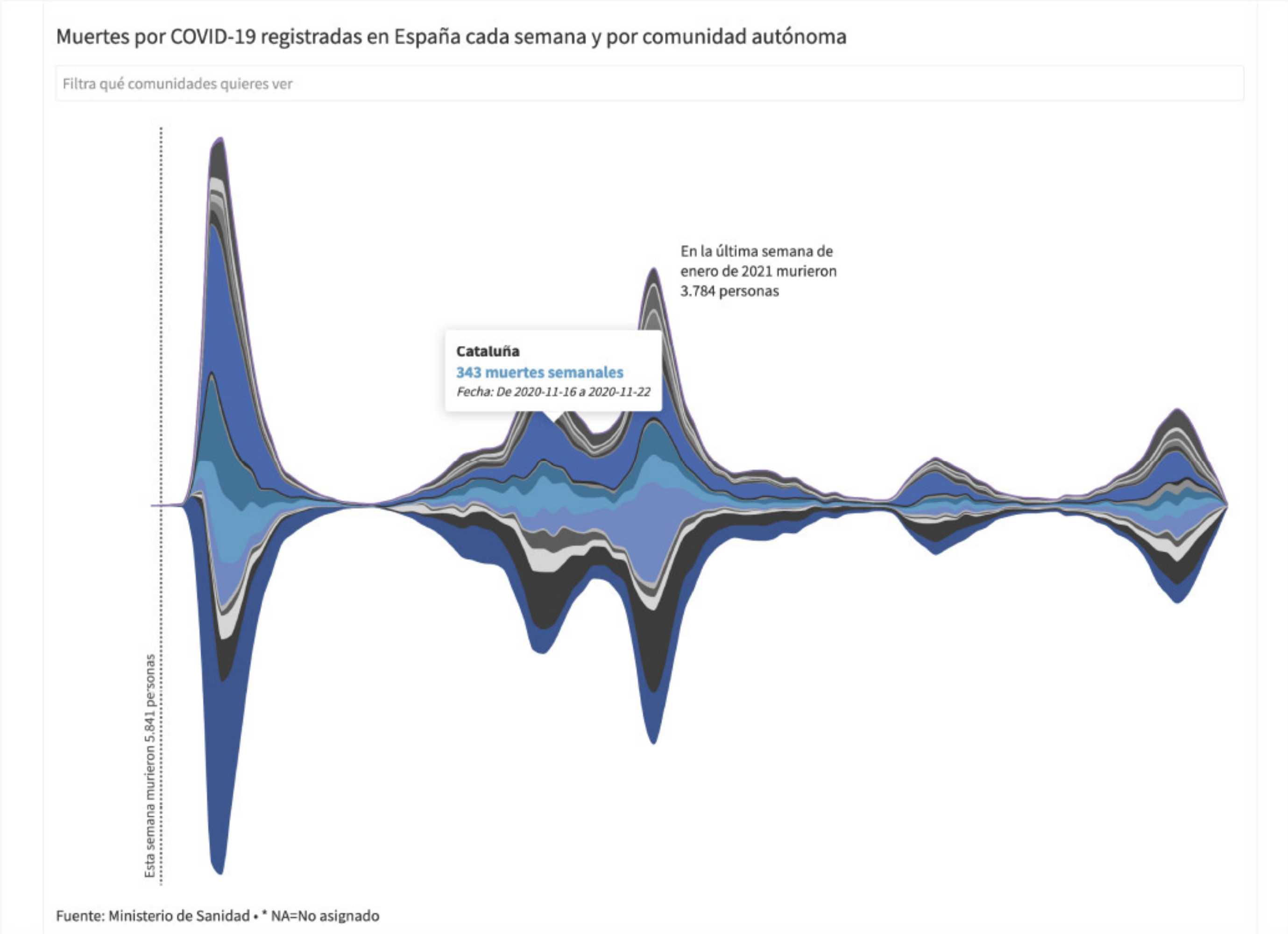
Details of Neue Zürcher Zeitung



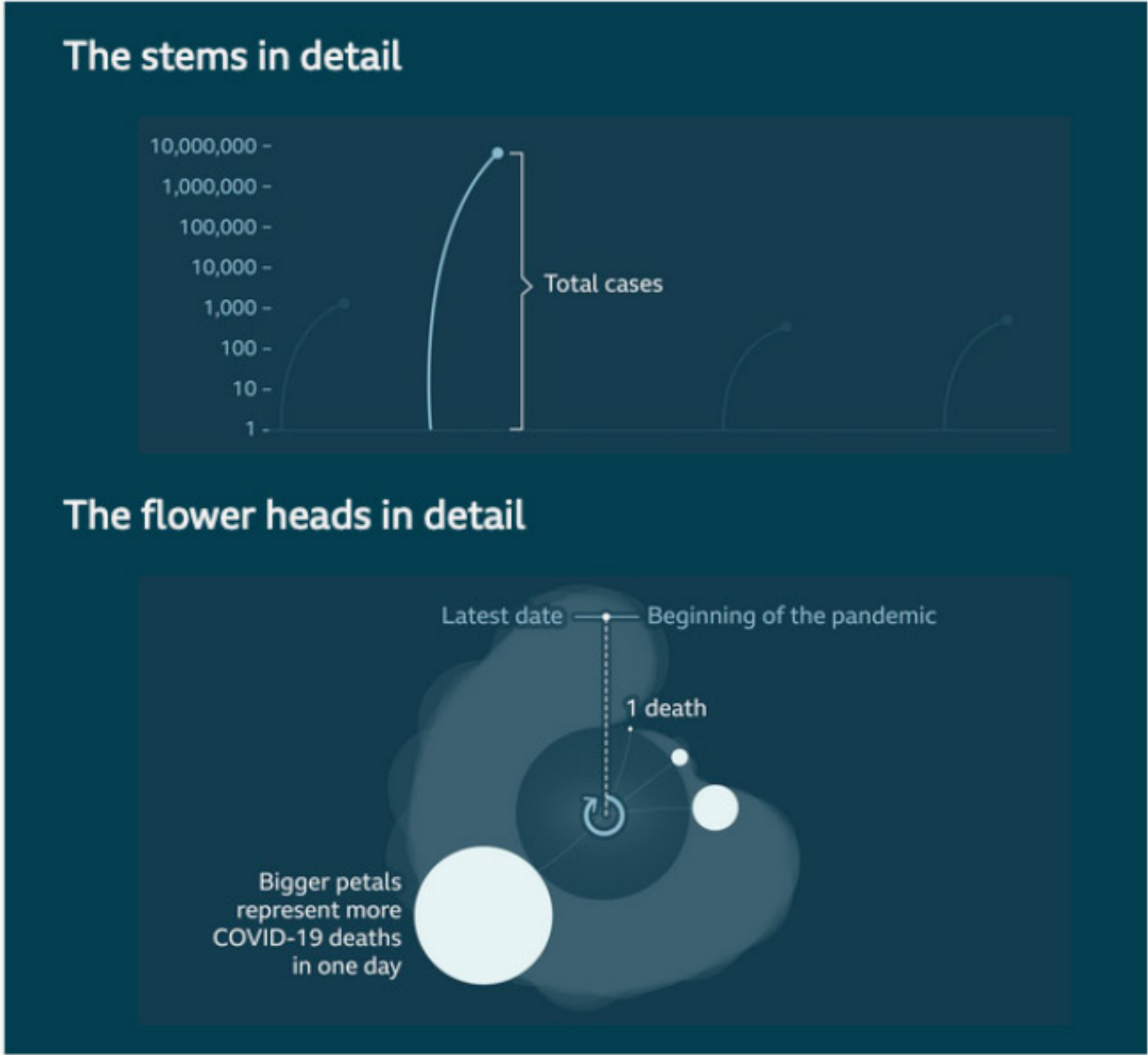
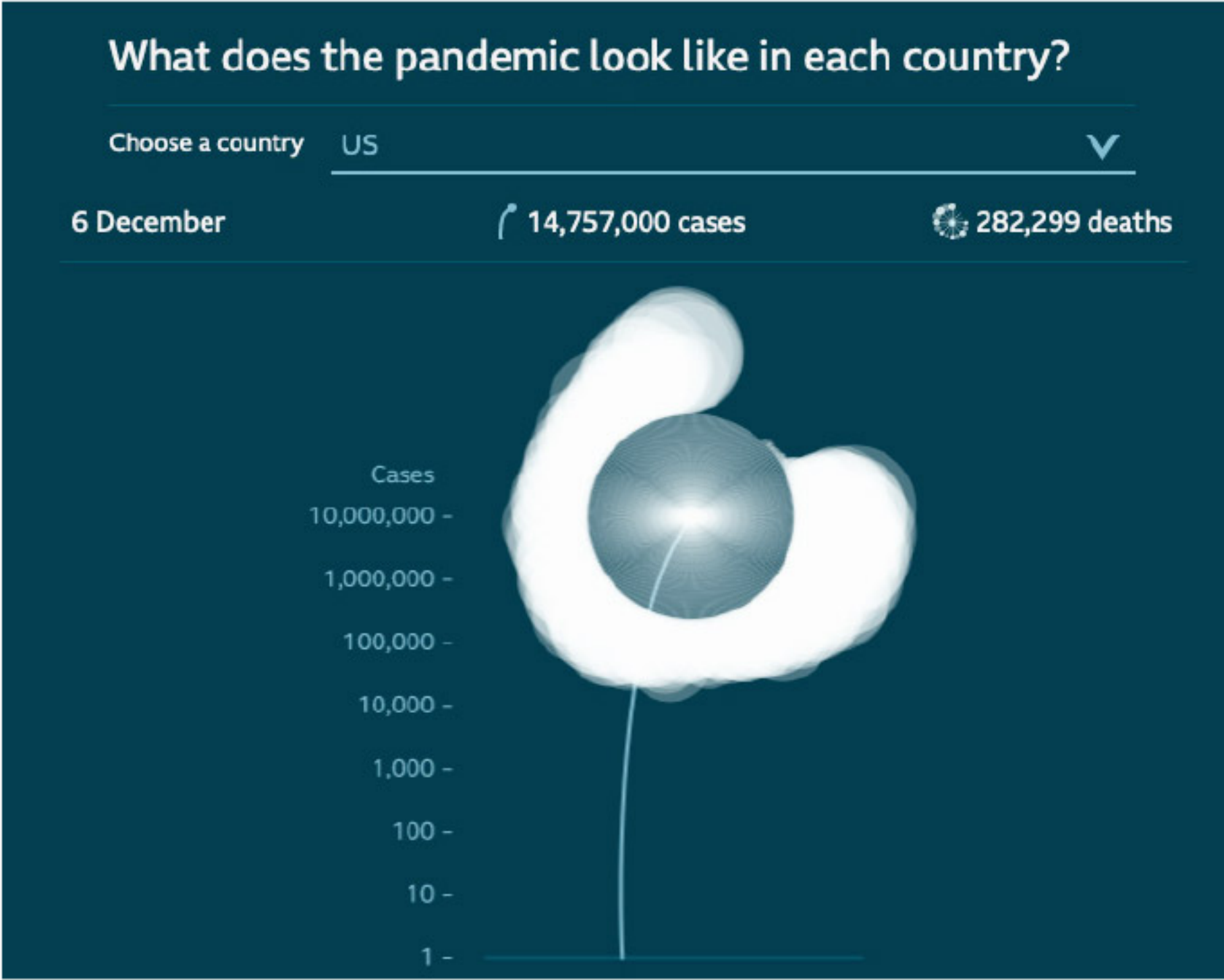
Streams were used to visualize milestones in Spain and Switzerland in 2022. Spain reached the 100,000-deaths milestone in May 2022, many months after the United Kingdom, France, and Germany. “Más de 100.000 muertos por COVID-19 en España” (More than 100,000 deaths from COVID-19 in Spain) (4.4), published by RTVE (Radiotelevisión Española), marked this milestone with a streamgraph presenting a very different shape. The graph displays colored segments for each region with controls for the reader to filter the display. The streams presented five distinct bulges where total deaths increased dramatically.

“Corona in der Schweiz: Zwei Jahre Pandemie in einer Grafik” (Corona in Switzerland: two years of pandemic in one graphic) (4.5), published a few weeks earlier in Neue Zürcher Zeitung, featured a long streamgraph column created by separate area charts for deaths and cases vertically aligned around a timeline of social and political events. The Y-axis scales for the area graphs are very different. For example, 56 deaths on the left are about three times higher than 1,066 cases on the right. As the reader scrolls through the column, there are periods where cases and deaths rise and fall together, and other times when cases rise but deaths do not. The message is one of randomness rather than correlation. The visualization ends with a presentation of cases attributed to the delta and omicron variations rising out of the column on the right and low death numbers on the left. The visualization marked the two-year milestone of the pandemic in Switzerland, a time when restrictions were being lifted while infection rates were high.

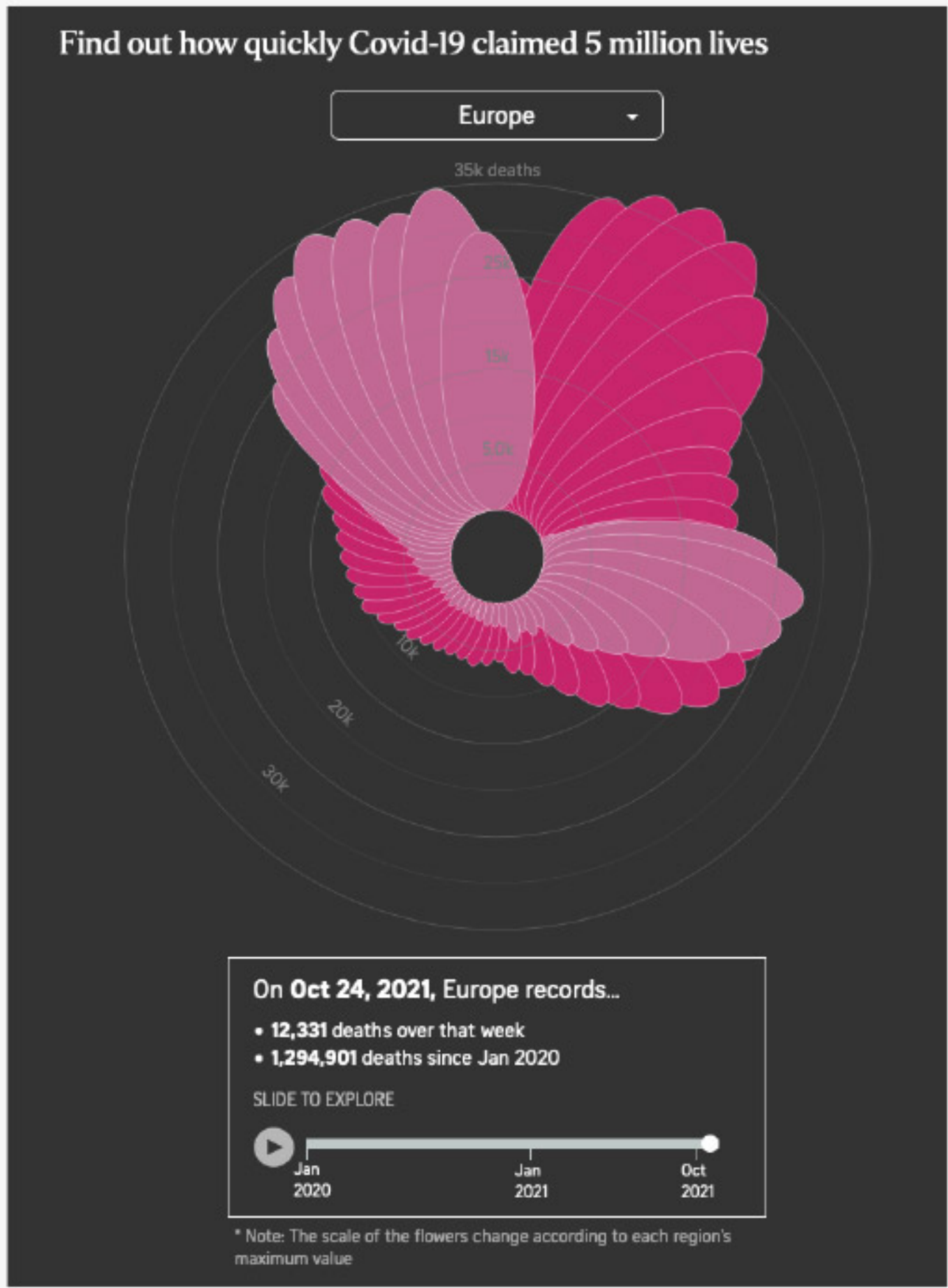
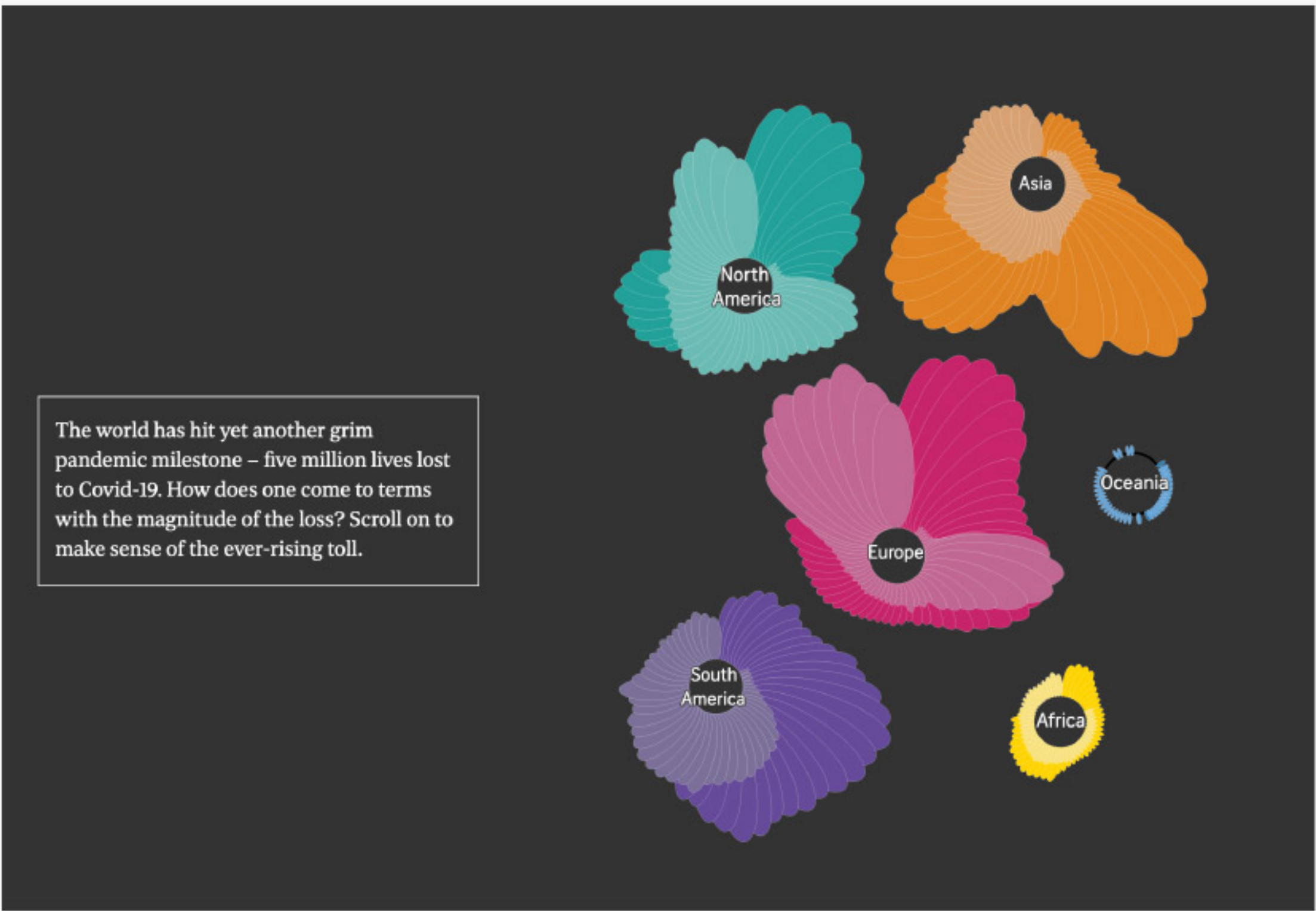
4.4 RTVE Spain, 100K,
3/2/22



5.2 BBC World, 1 year
12/7/20

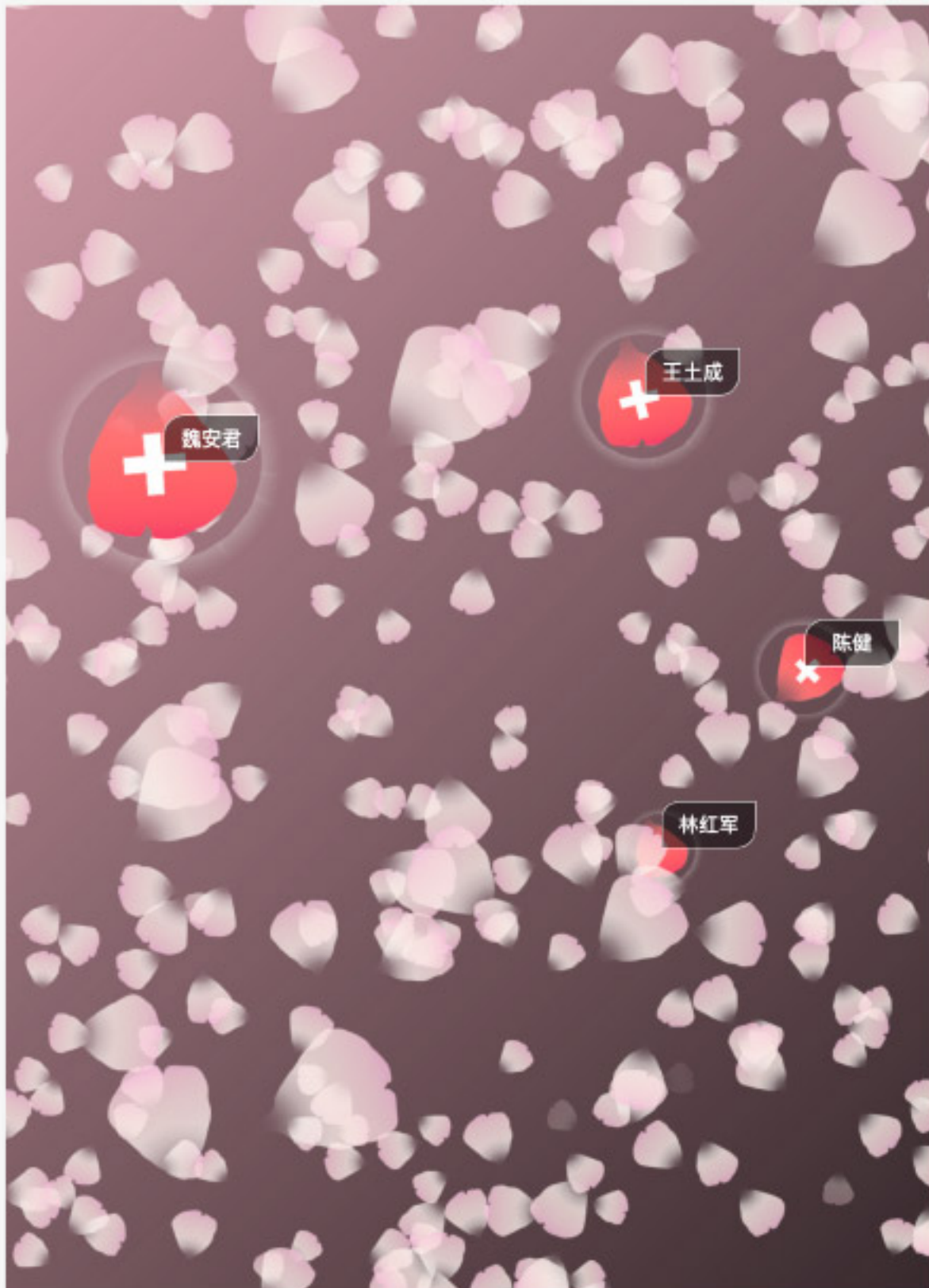


5.3 The Straits Times
World, 5M, 10/30/21



Flowers

5.1 Caixin, China, 3K
4/5/20



8 Poppy Field – Visualising War Fatalities
[<http://www.poppyfield.org/>]

Falling tree blossoms evoke the ephemeral nature of life and the flowering plants traditionally placed on graves to honor the dead. There were strong flower associations in the data visualization community before the pandemic. The visualization designed by Florence Nightingale in the 1850s to represent the monthly death toll of British soldiers during the Crimean War is well known today. Its appearance is often likened to a coxcomb, but the radial shape also resembles the uneven petals of a flower. More recently, Valentina D’Efilippo and Nicolas Pigelet designed “Poppy Fields”⁸, a visualization of 20th century war casualty statistics, created for the 2014 centennial of World War I. In this interactive website, the size of each stem represents the length of the war, and the size of each petal represents the number of dead.

The earliest flower visualization, “新冠逝者：献给疫情中离去的生命” (Novel Coronavirus deceased: dedicated to the lives lost in the epidemic) (5.1), appeared in Caixin as the initial peak of deaths centered in Wuhan began to fade in April 2020. The web page presents an animated set of flower petals falling towards the viewer. A tab at the bottom of the screen switches between deaths in China and overseas (i.e., the rest of the world). The approach was visually rich and interactive. The emphasis is quantitative only in the sense of evoking a specific large number of deaths.

The global situation was very different in December 2020 when the BBC marked the pandemic’s first year by publishing “Coronavirus: How can we imagine the scale of Covid’s death toll?” (5.2). The global death count was more than 1.5 million. The visualization of a blue and white flower on a black background transformed the case and death numbers into a pattern that animated as a time series, with an optional soundtrack of classical music crescendos related to the numbers. Text introducing the image said, “Imagine the pandemic as a flower. In the animation below, the stem grows as Covid-19 cases increase over time and the petals unfurl as more people die with the disease.” The stem representing the number of cases grew at a logarithmic scale, quickly at first and then very slowly. The quantity of the petal is represented by the diameter of overlapping circles. The white pattern of these circles around the edge of the flower displays the shape of deaths distributed around the year.

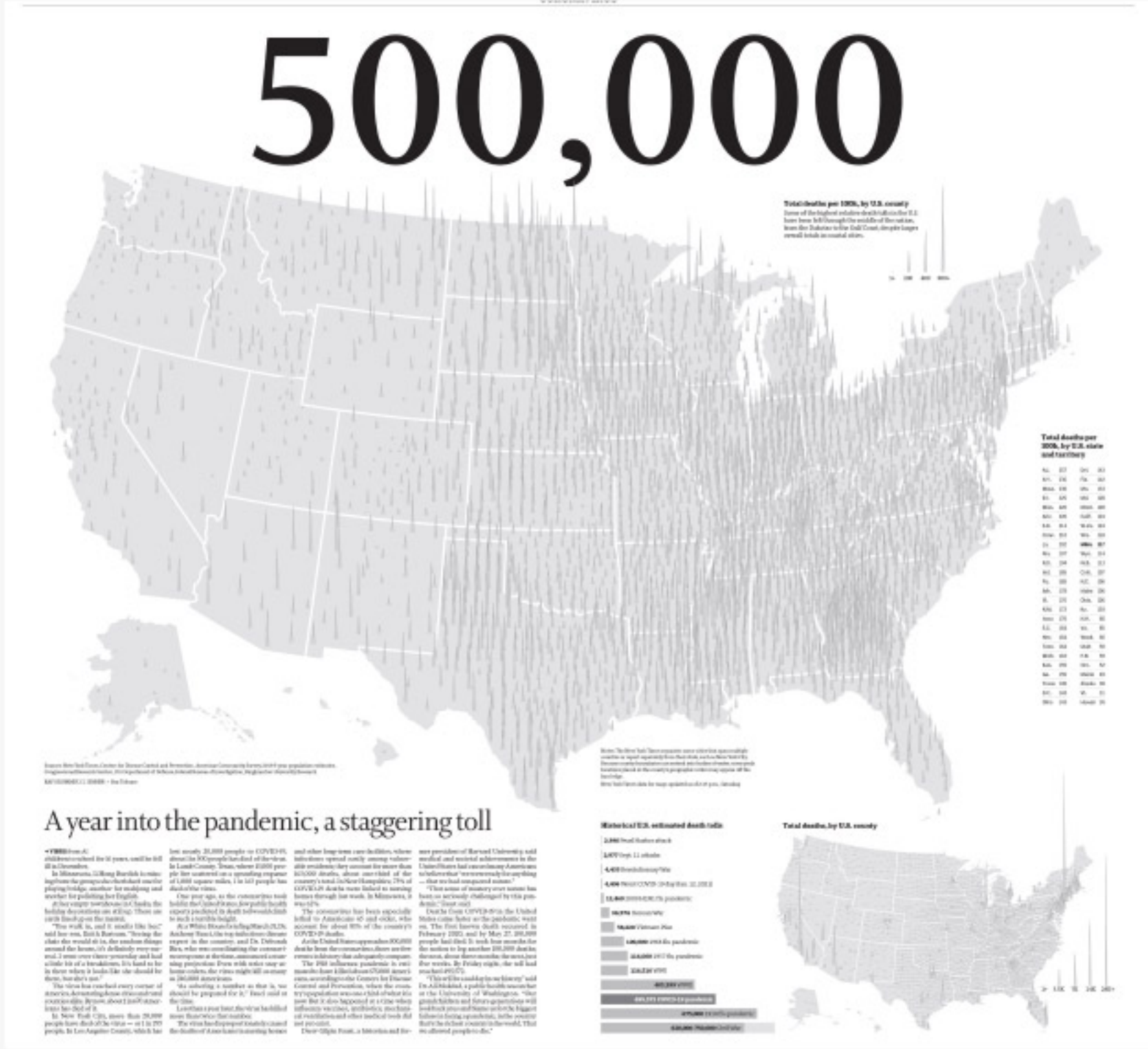
The Straits Times created floral icons, again using unfolding petals to represent the weekly deaths. “Remembering the 5 million lives lost to Covid-19” (5.3), published in October 2021, presented a colorful flower for each continent, set against a somber black background. The story used parallax scrolling to explain and familiarize the reader with the visualization. This controlled review was followed by static presentations of nearby Asian countries and time-series animations for each continent.

In all three examples, the flower strategy was used to communicate the unfolding of the death rate. The Caixin example used petals to present individual stories, while the BBC and The Straits Times examples contained no memorializing of individual deaths and instead focused entirely on the monthly death counts.

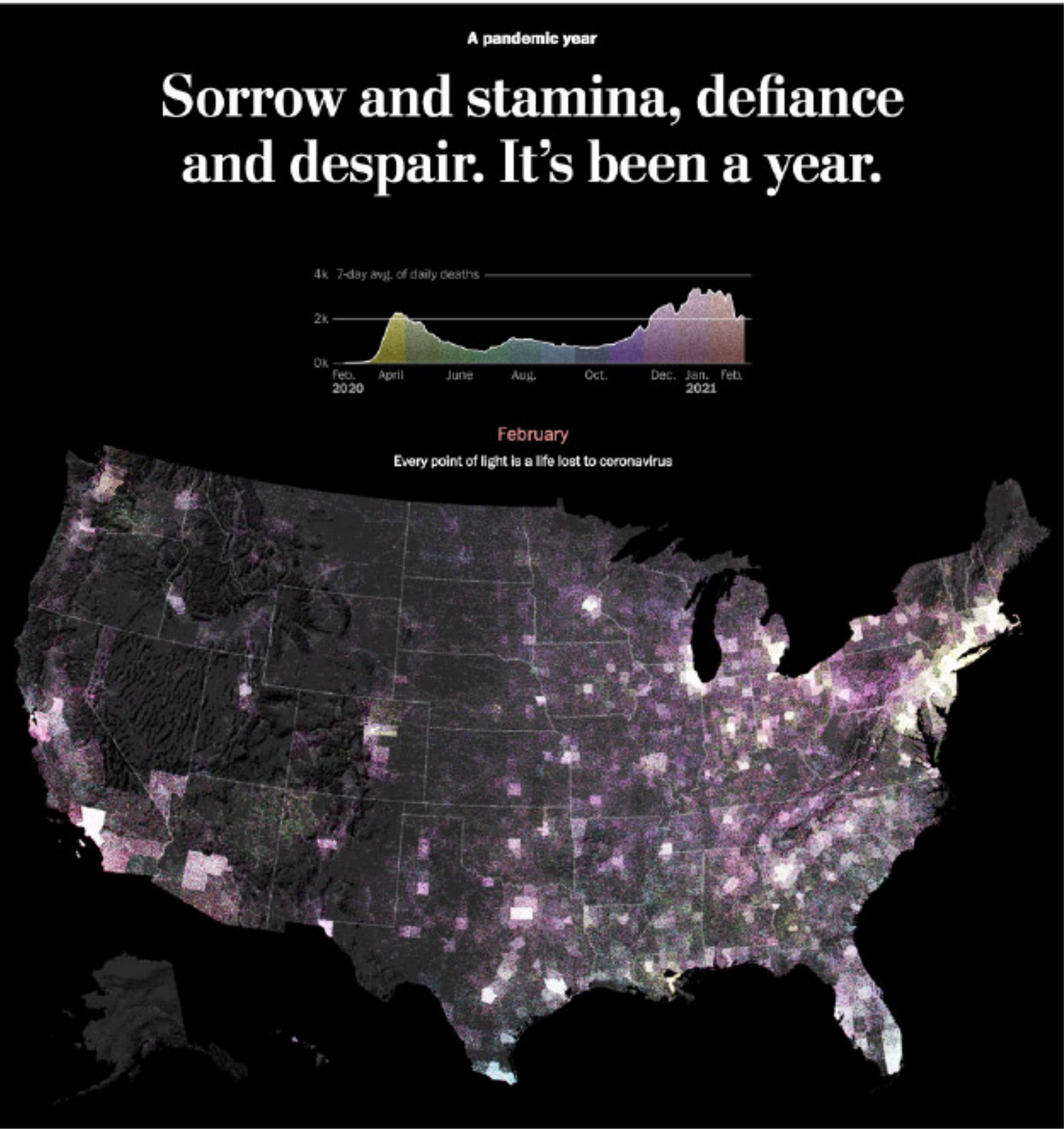
6.1 The New York Times
US, 11K, 4/7/20



6.2 Minneapolis Star Tribune,
US, 500K, 2/21/21



6.3 Washington Post, US, 1 year, 3/11/21



6.4 NPR, US, 700K, 4/3/21

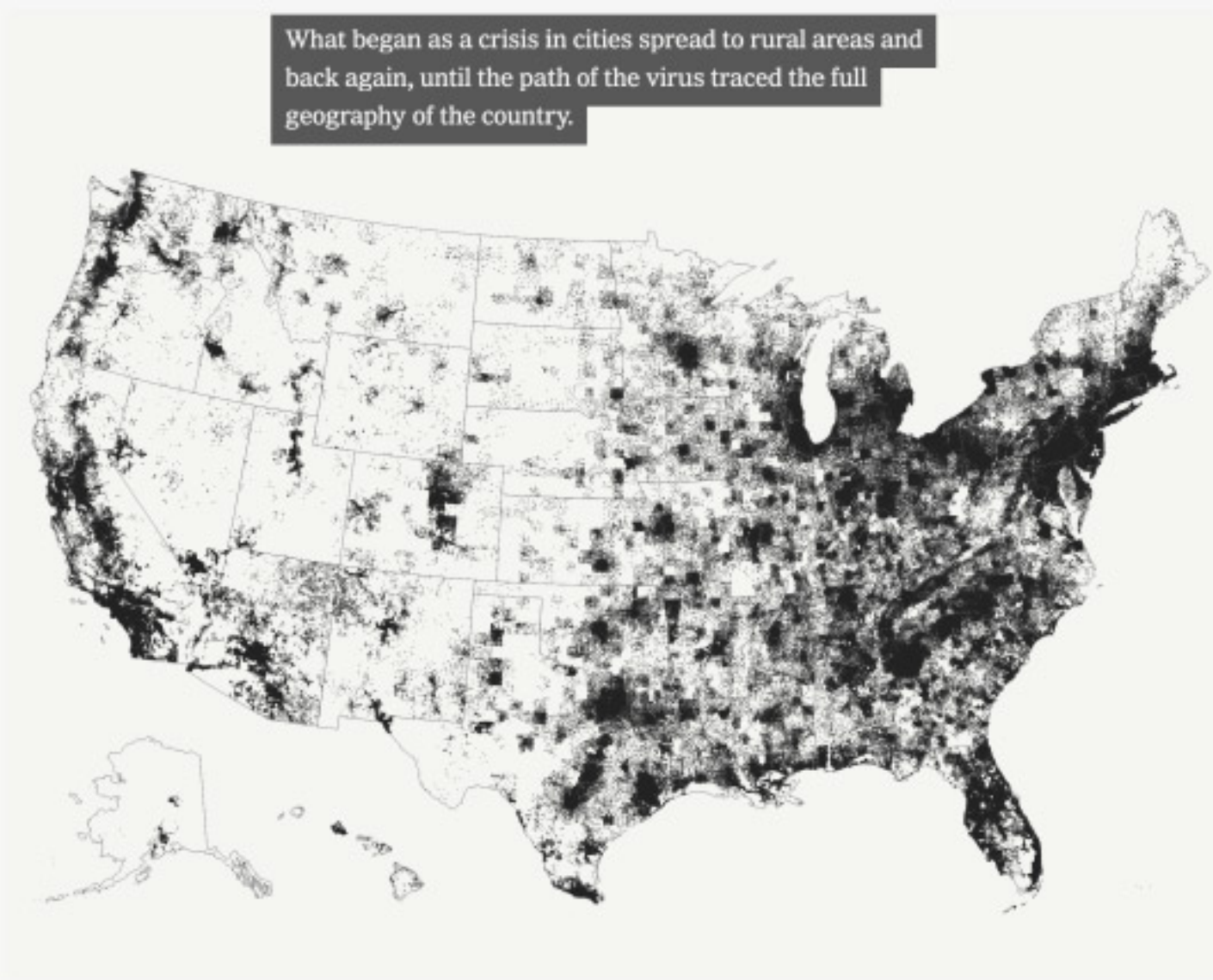


Maps

Detail of 6.2 Minneapolis Star Tribune



6.6 The New York Times
US, 1M, 5/13/22



Maps have been used far more often than names, faces, dots, or flower petals to visualize pandemic statistics. A projection of the world is familiar to a broad audience, and everyone recognizes the outline of their own country. In addition, or perhaps because of this, there are many software tools to render maps and translate country, state, or province data into scaled colors or circles. Therefore, it is not surprising that 13% of the 15,000 figures cataloged in COVIC contain maps in one form or another.

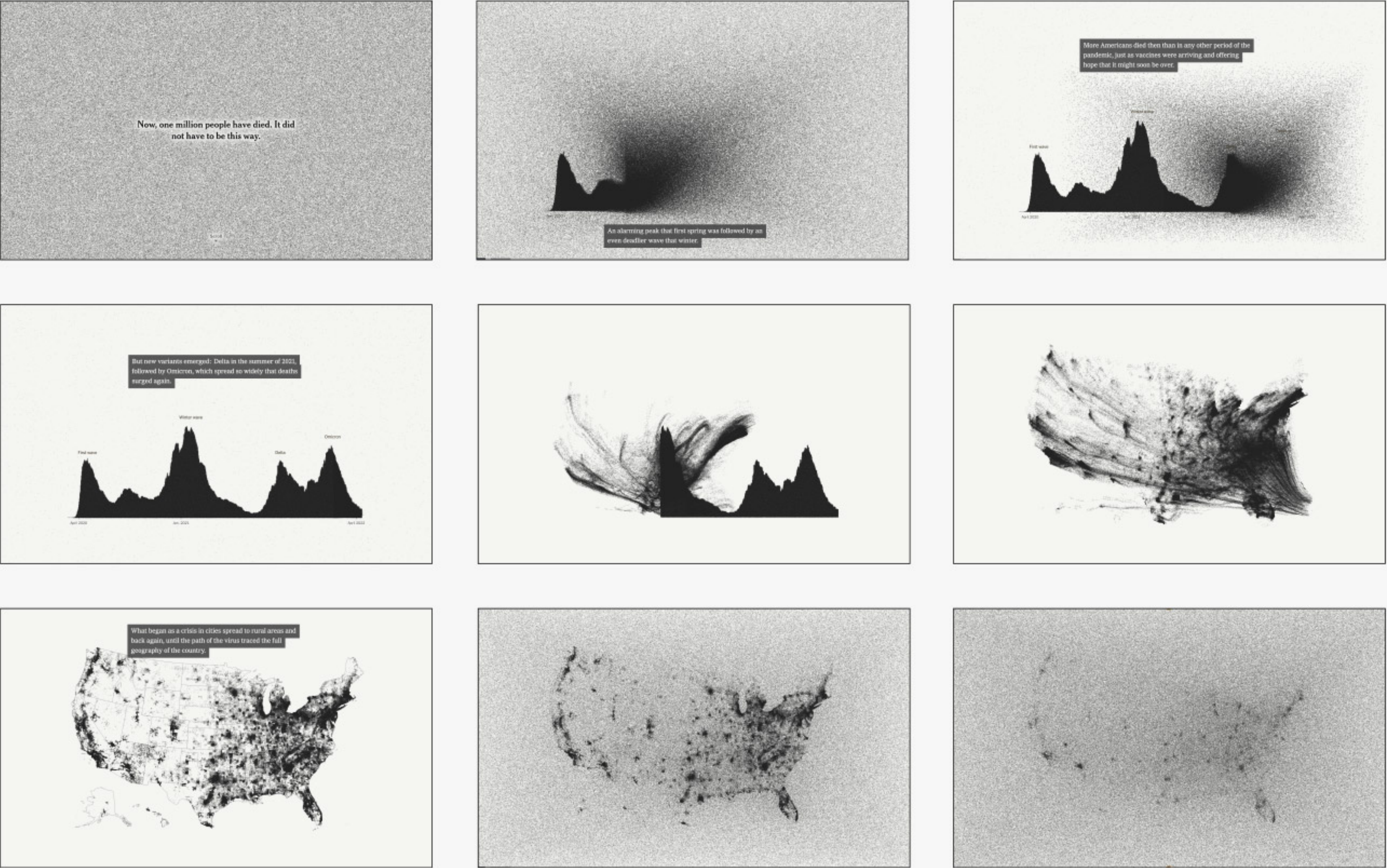
The most popular map formats used to represent case and death statistics are choropleth and bubble maps. From the first months of 2020, the Johns Hopkins University dashboard gave prime central position to a bubble map drawn by the ESRI software system. Red circles were used to locate case and death data on the map, with each circle centered on the white outline of countries drawn on a black world projection. In addition to the dashboard version, a compact widget version was available and added to the pages of many websites. Bubble maps using various world projections, color schemes, and interactive controls were published by hundreds of news organizations around the world.

As the numbers grew and the geographic granularity of the data increased, overlapping circles made the bubble map format less practical. Over time, choropleth maps became the most common method for locating case and death statistics on most country maps. However, most of the milestone examples vary from these two common formats in significant ways.

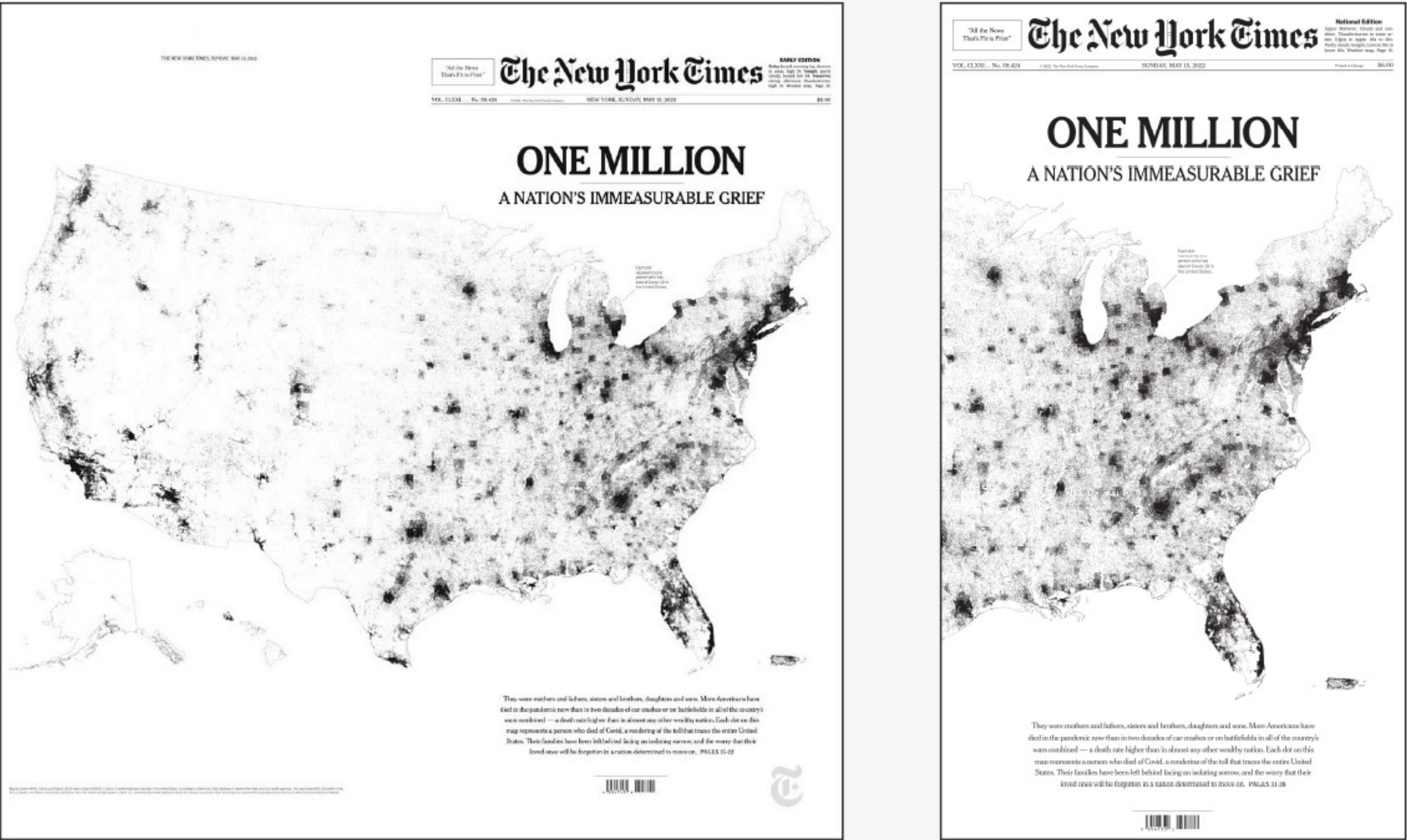
The earliest map in this group is another outstanding visualization from The New York Times. It was published in early April 2020, during the weeks when a sudden surge in deaths shocked New York City and several other U.S. urban areas. In print, “See How the Coronavirus Death Toll Grew Across the U.S.” (6.1) featured a set of four maps showing the growing death toll over three weeks from mid-March to early April. The same sequence of maps was presented online as a time series. While the death total at that time was about 11,000, nearly half of those deaths occurred in New York City alone. The resulting spike map format placed the base of a triangle broadly on a city’s location and scaled the top of the triangle to represent the number of deaths. The map dramatized the rapid growth in several cities and the enormous scale of the New York City death toll. In both the print and online versions, the top of New York City’s spike extended outside the space of the map itself, piercing the masthead of the front page and growing into the text column in the online version.

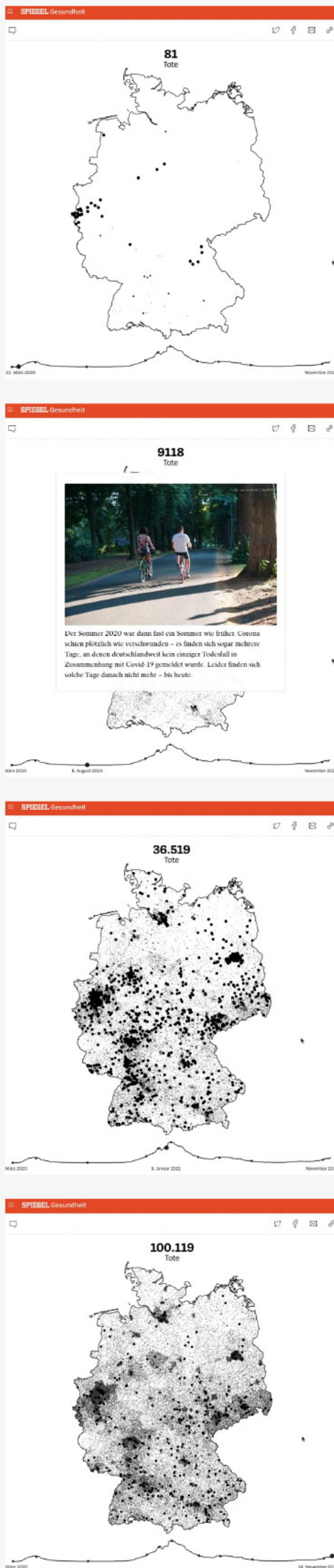
The spike map visualization works well, in part, because the distribution of the death tolls at that time was sparse. When the Minneapolis Star Tribune published “A Year into the Pandemic, A Staggering Toll” (6.2) in February 2021 featuring a similar visualization, the effect was far less impactful. This visualization of the U.S.’s 500,000-deaths milestone was scaled to normalize for population density, making the rising spikes look more like a forest than individual trees. A smaller map adjusted for the concentration of population visualized the dramatically high death tolls in New York, Chicago, and Los Angeles, but the result displayed a pattern very similar to the general population contours of the northeast corridor and other major urban areas.

6.6 The New York Times, US 5/13/22, 1M
How America Reached One Million Covid Deaths



Print edition cover and front page





In the spring of 2021, two major online memorials for the United States appeared reminiscent of images of the Earth at night, showing the glow of electric lighting in urban areas as seen from space. Both memorials displayed a dark map of the U.S. set on a black background. “A year of covid-19: Timeline of the pandemic in America” (6.3) in the Washington Post was published in March 2021, when the death toll was 525,000. The presentation began with a legend explaining that “every point of light is a life lost to coronavirus.” It memorialized the pandemic’s first year by alternating a map with colored lights highlighting the locations where deaths concentrated with scrolling text telling the story of that month’s events. The second example, “COVID-19 Memorial: Enduring Loss” (6.4), appeared on the NPR site in early April 2021 and continued to be updated for the next six months. On this map, a light is illuminated as each brief obituary notice scrolls by. The lights were connected to illuminated highway lines, with each light remaining on the map as the reader continued to scroll. The obituary notices were linked to individual stories similar to the method used in the Reuters Graphic dot-stream (4.3) and the Washington Post obituary name (2.5) examples.

“100.000 Corona-Tote in Deutschland: Die wir verloren haben” (100,000 corona deaths in Germany: those we lost) (6.5), published in Der Spiegel in November 2021, presents a visual negative of the Earth at night approach. The visualization presents time-series data on a white map of Germany on a white background. The country slowly fills with black dots representing death locations as the reader scrolls through the story, advancing a dot representing the date along a line graph of daily death statistics. The photos and stories that scroll over the map describe the general conditions in Germany over time rather than presenting individual obituaries.

There is a clear visual similarity between the previous Der Spiegel example and the map created to represent 1 million United States deaths in The New York Times. This map appeared in “How America Reached One Million Covid Deaths” (6.6) in May 2022 both online and in print. The print edition wrapped around the front and back pages of the newspaper, so the scale of the map covered the entire Sunday edition, the largest paper of the week. The eastern part of the map, representing more densely populated areas, took the entire front page, displaying large parts of the East Coast and upper Midwest entirely black. The online version of the map told the story by animating swarming dots into area graphs representing deaths over time. Scrolling the column then wipes or blows the dots into clouds that settle into the patterns on a map.

Information designer Richard Saul Wurman proposed that we can “only understand information relative to what [we] already understand.”⁹ He used

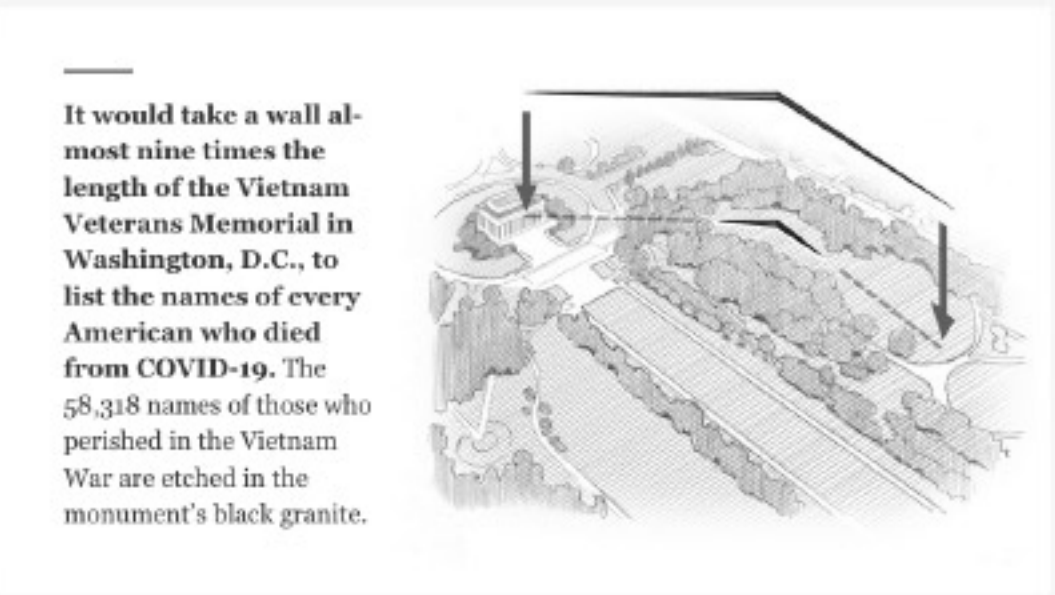
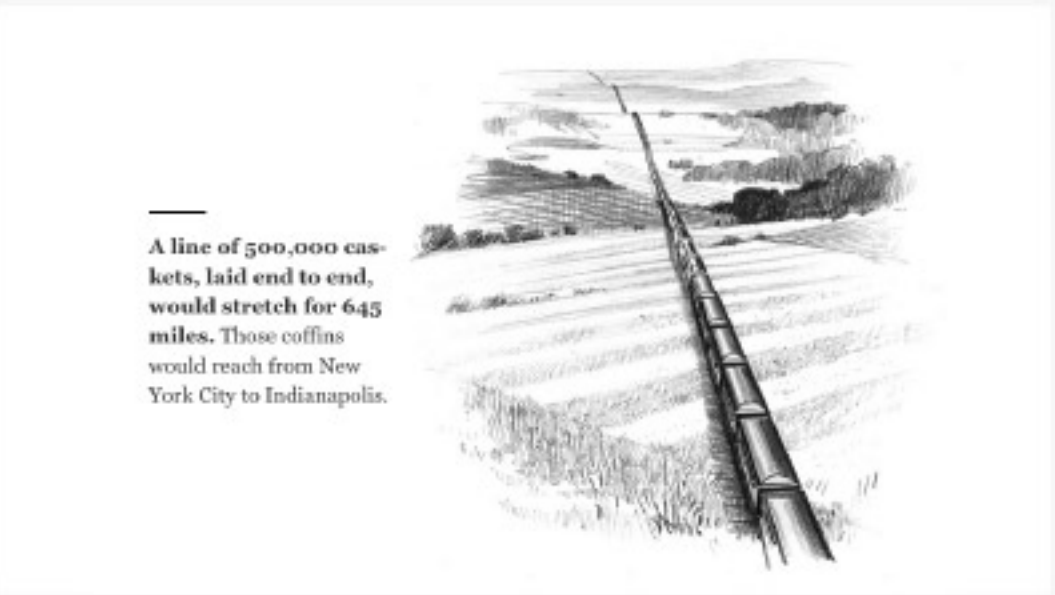
6.5 Der Spiegel, Germany, 100K, 11/25/21

100.000 Corona-Tote in Deutschland: Die wir verloren haben
100,000 corona deaths in Germany: the ones we lost

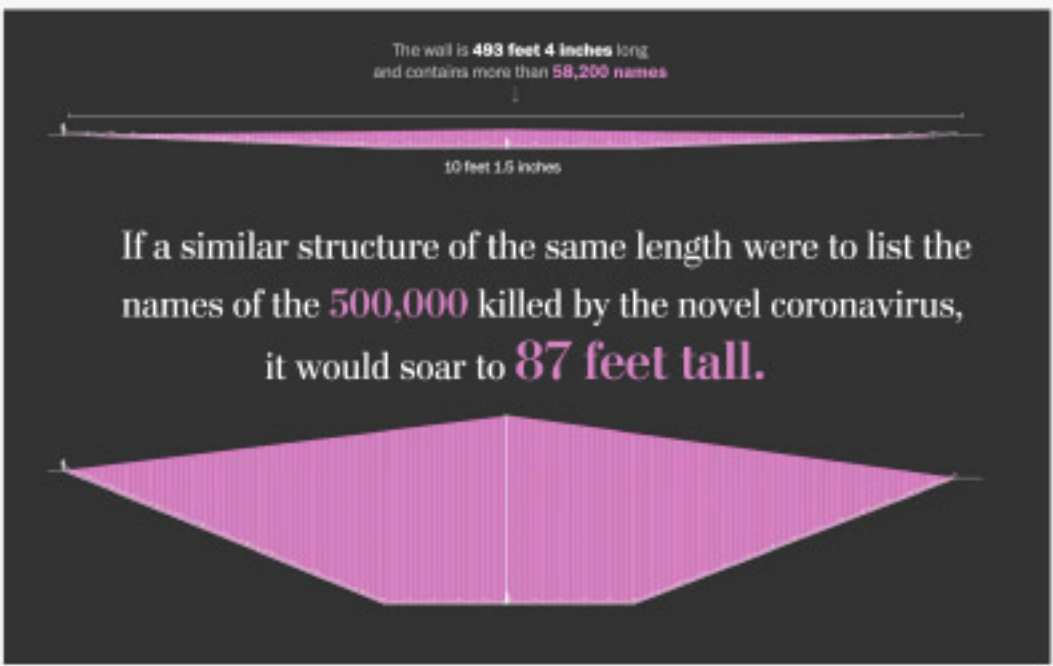
7.1 South China Morning Post
US, 100K, 5/28/20



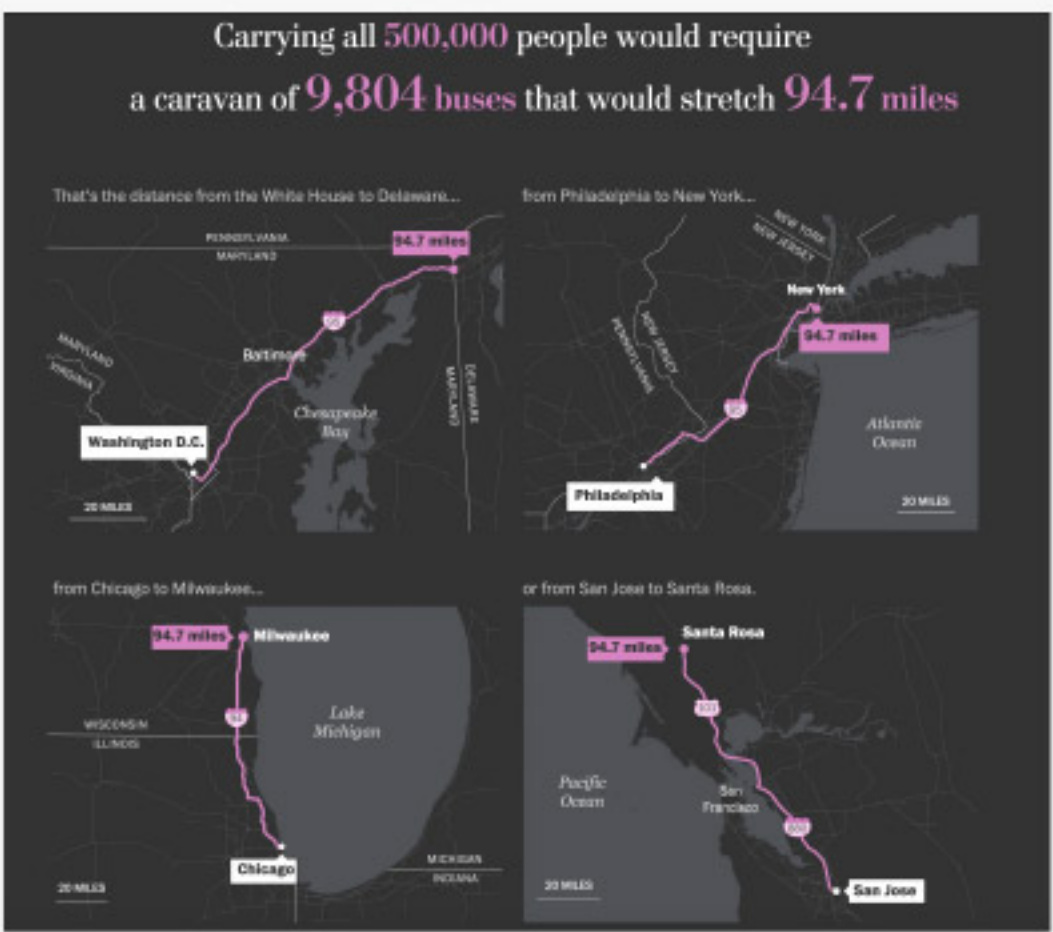
7.2 National Geographic US,
500K, 2/18/21



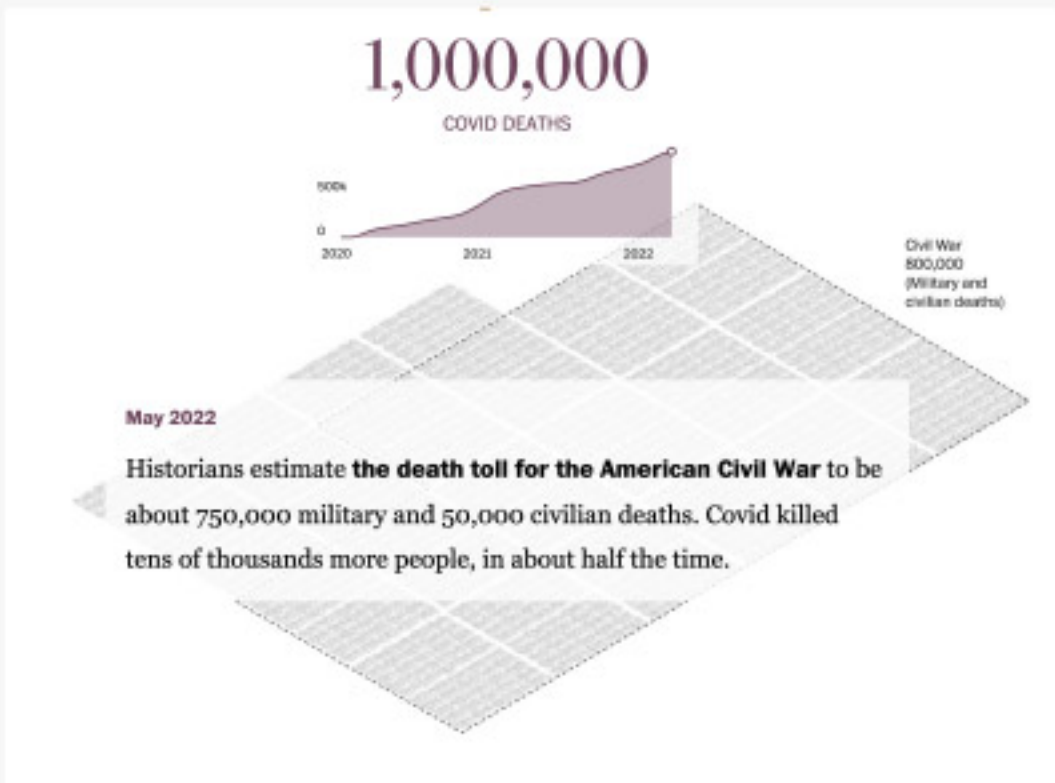
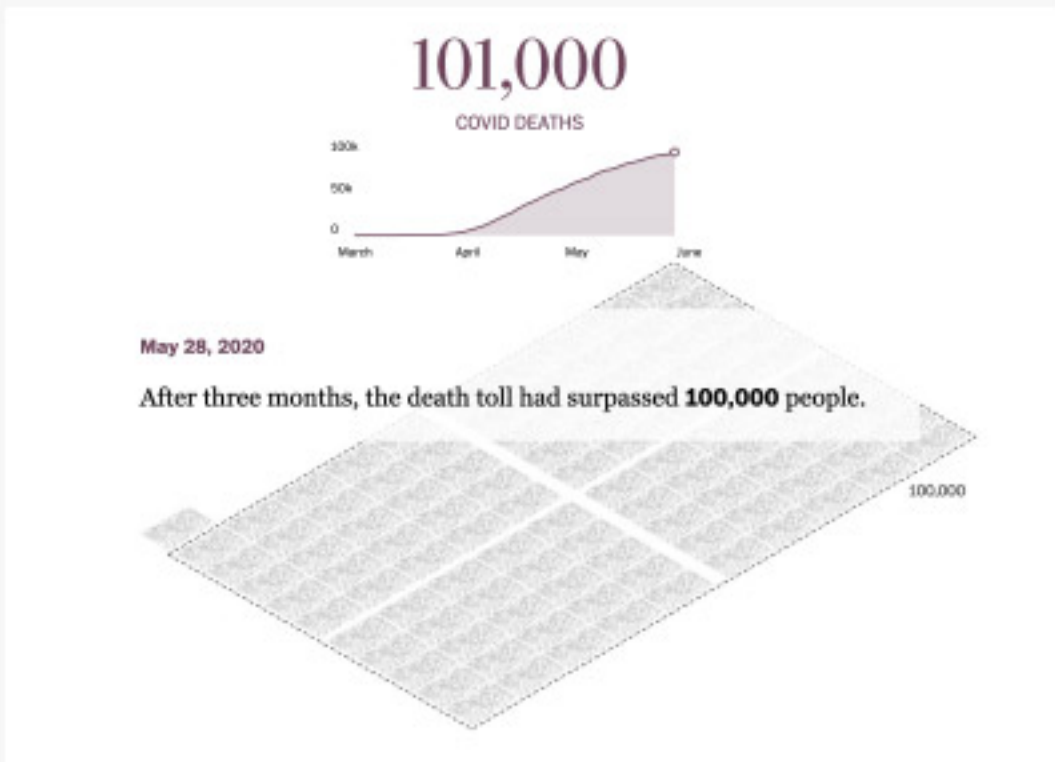
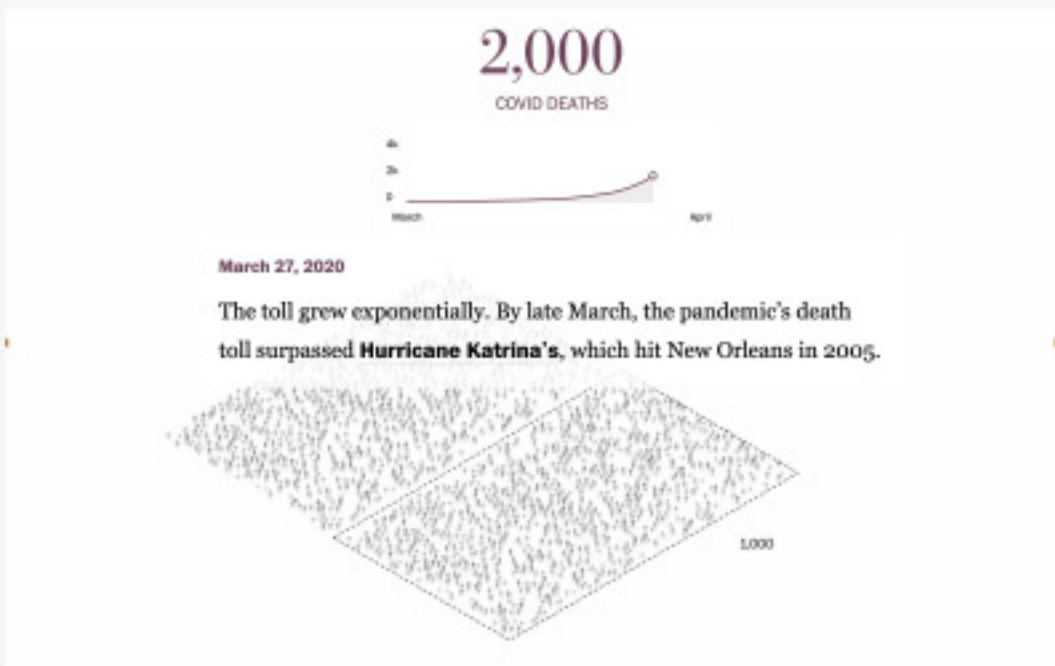
7.3 Washington Post
US, 500K, 2/21/21



7.4 Axios
US, 1M, 5/9/22



7.6 Washington Post
US, 1M, 5/12/22



Comparisons

the abstract concept of an acre of land to illustrate his point. An acre is 43,560 square feet, a concept that a land surveyor might understand through physical experience. But an acre is also similar to the size of an American football field, subtracting the end zones — a comparison that is more meaningful to American readers who spend time around football fields.

The first example of comparison is “United States passes 100,000 coronavirus deaths” (7.1) published in May 2020. Hong Kong’s South China Morning Post created a graphic story that depicted the U.S. 100,000-deaths milestone using striking comparisons. An animated bar chart compared the milestone to a list of U.S. war fatalities, a theme that would be repeated as later milestones exceeded them all. The most striking comparison is captioned “If New York was a graveyard” and used rectangular overlays on Central Park to quantify the U.S. and worldwide victims at that time.

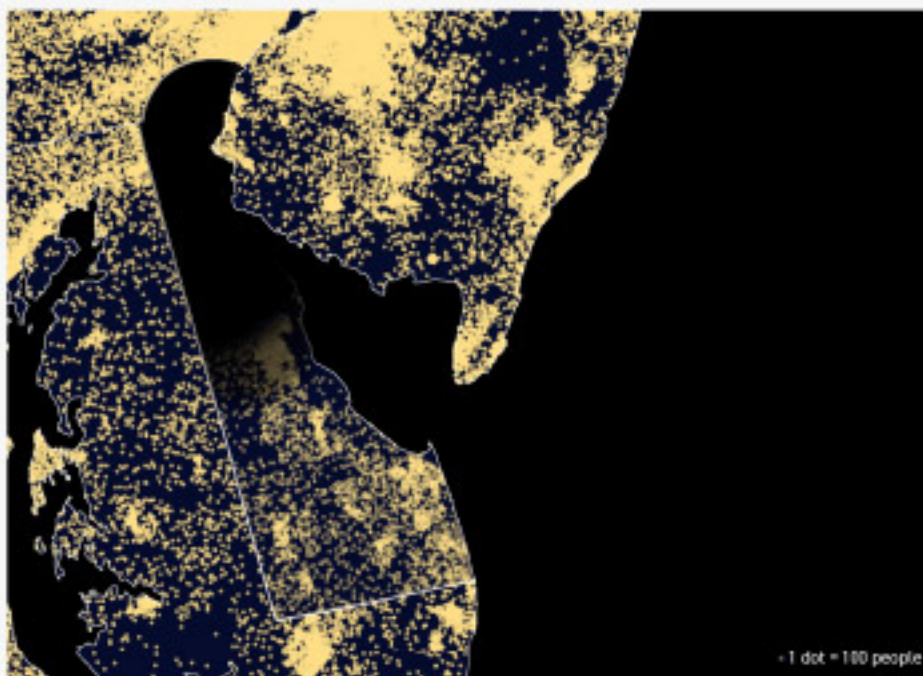
The comparison strategy was the basis of two memorials for the U.S. 500,000-deaths milestone in February 2021. Each of the black-and-white illustrations that made up “Visualizing 500,000 deaths from COVID-19 in the U.S.” (7.2) in National Geographic proposed some physical experience to represent the quantity of half a million. Examples included counting the stars visible in the night sky; the population of Atlanta, Georgia; and all the school bus drivers in America. Another used the quantity of caskets needed to cover the distance between New York City and Indianapolis.

That same week in The Washington Post, “500,000 coronavirus deaths visualized: A number almost too large to grasp” (7.3) used a somber color palette for a series of illustrations visualizing half a million deaths. This story used lines of buses rather than coffins for a similar purpose. The story included the experience of scrolling through many screens of buses filled with the average number of daily deaths from the previous month. This scrolling experience was followed by a map illustrating how the entire bus caravan would cover the distance between nearby cities such as Philadelphia and New York or Chicago and Milwaukee.

Both examples referred to the Vietnam Veterans Memorial on the National Mall¹⁰ designed by Maya Lin, a monument familiar to residents of Washington, DC, as well as tourists. Approaching and walking past the two granite walls provides a visceral experience of understanding the loss of life, with a name inscribed in stone in chronological order for each dead or missing-in-action soldier. To contain all the names, the panels increase to 10 feet toward the center and then taper at the end. The Washington Post story visualizes how a similar monument of the 500,000 names of those lost to COVID-19 would rise to a height of 87 feet. The National Geographic story also visualizes half a million as nine times the number of Vietnam War casualties, showing a similar monument stretching from the Lincoln Memorial into other parts of the National Mall.

Three more comparison examples appeared in May 2022 to mark the milestone of 1 million deaths in the United States. “1 million U.S. COVID-19

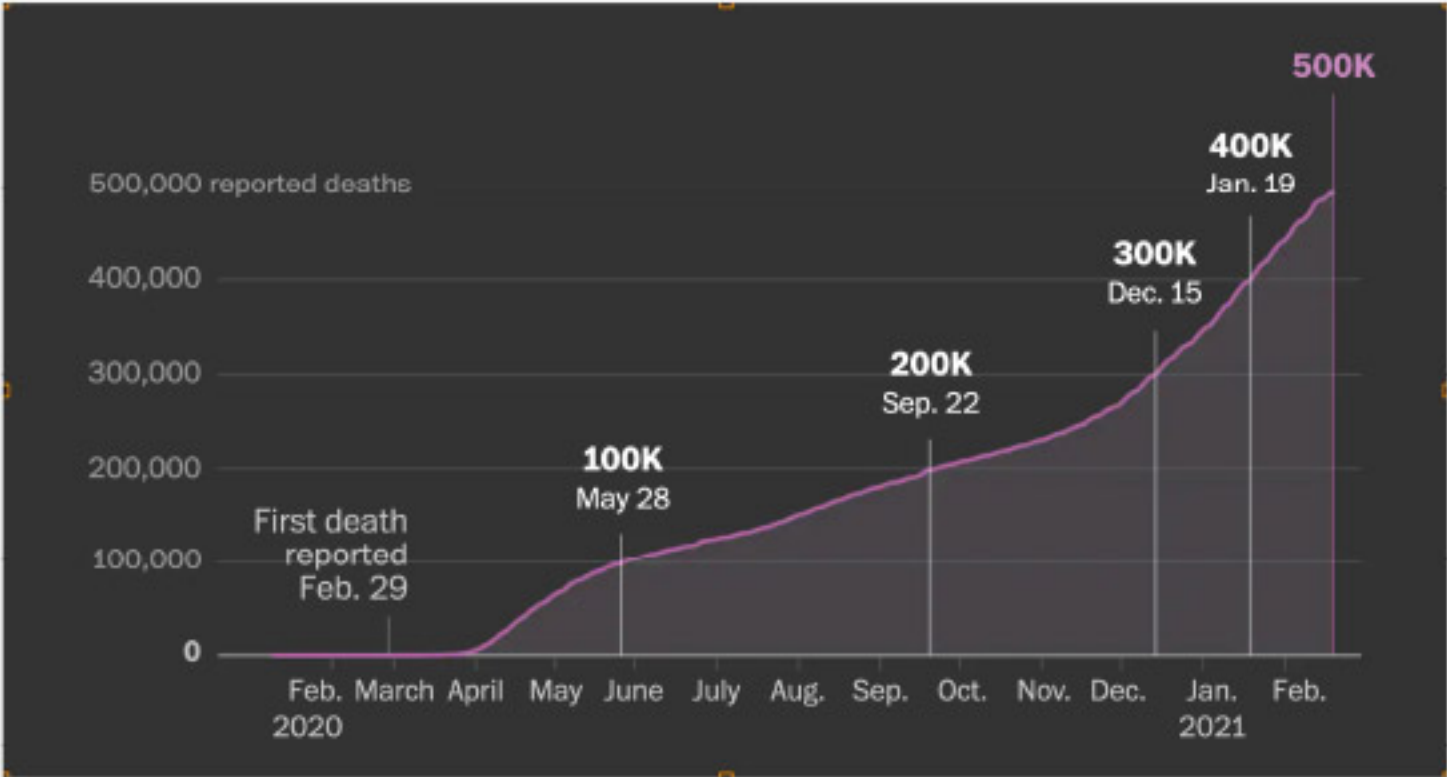
7.5 Politico
US, 1M, 5/11/22



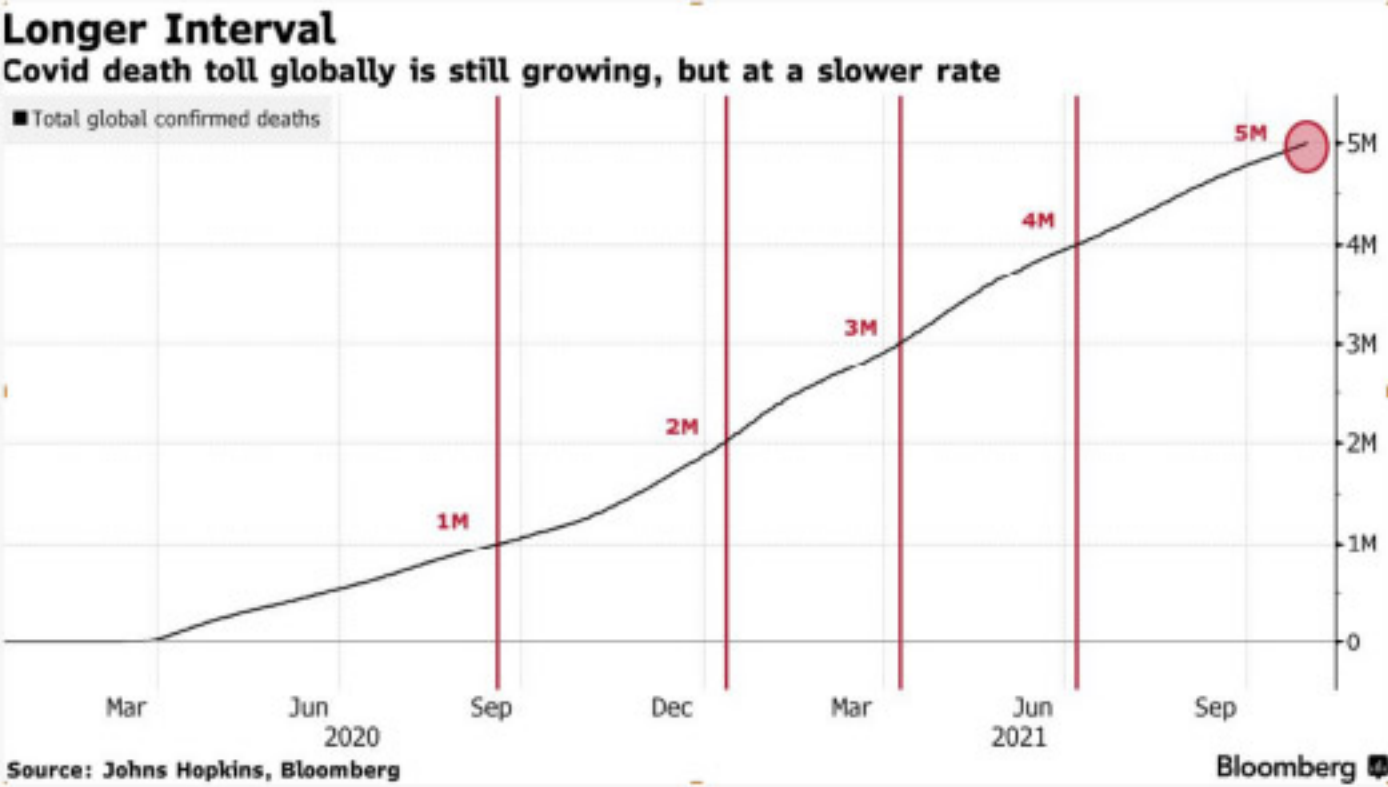
9 Wurman R. Information Anxiety 2. Que. 2001. P. 261.

10 See VIETNAM VETERANS MEMORIAL — MAYA LIN STUDIO [<https://www.mayalinstudio.com/memory-works/vietnam-veterans-memorial>]

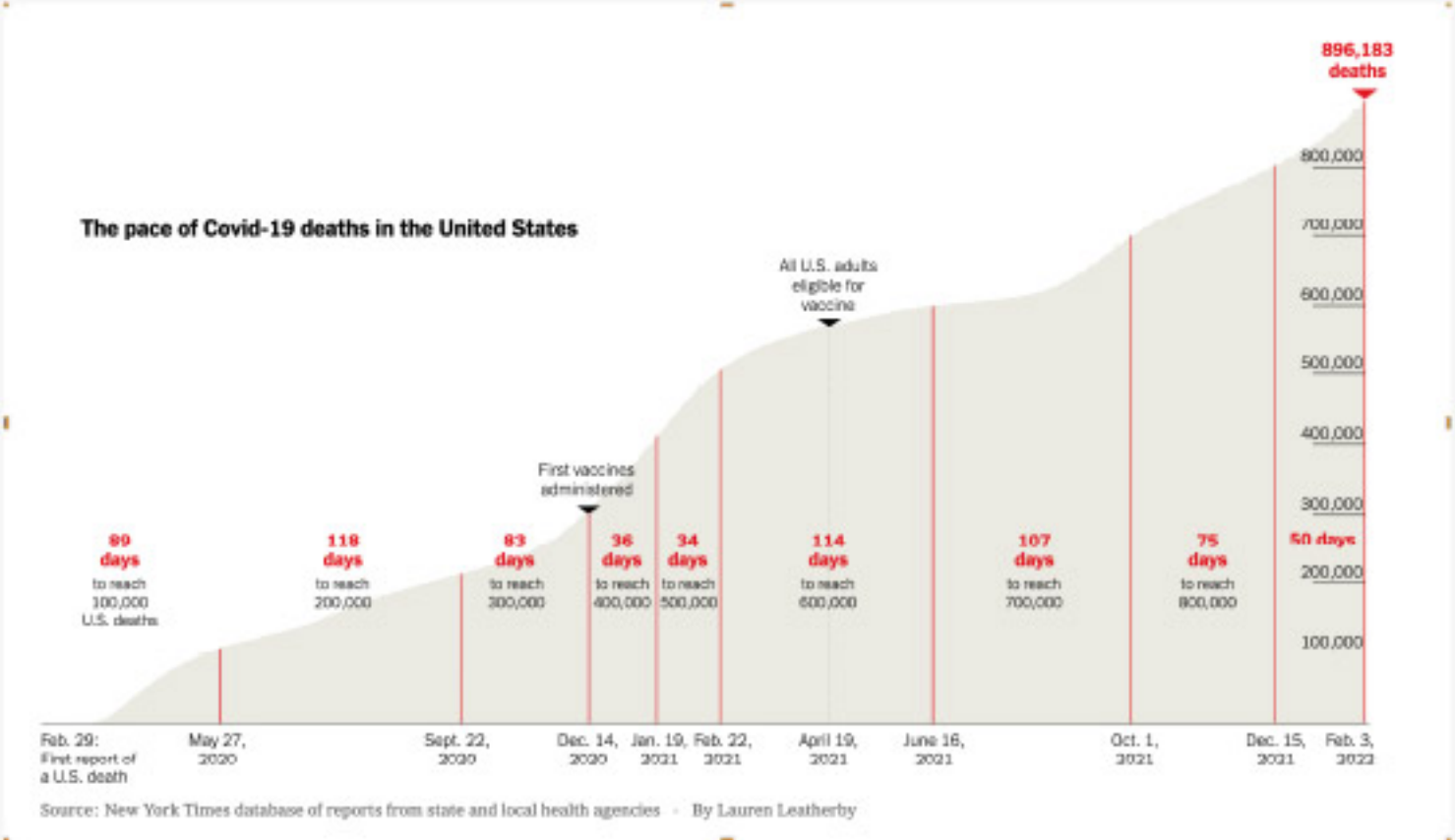
8.1 Washington Post
US, 500K, 2/21/21



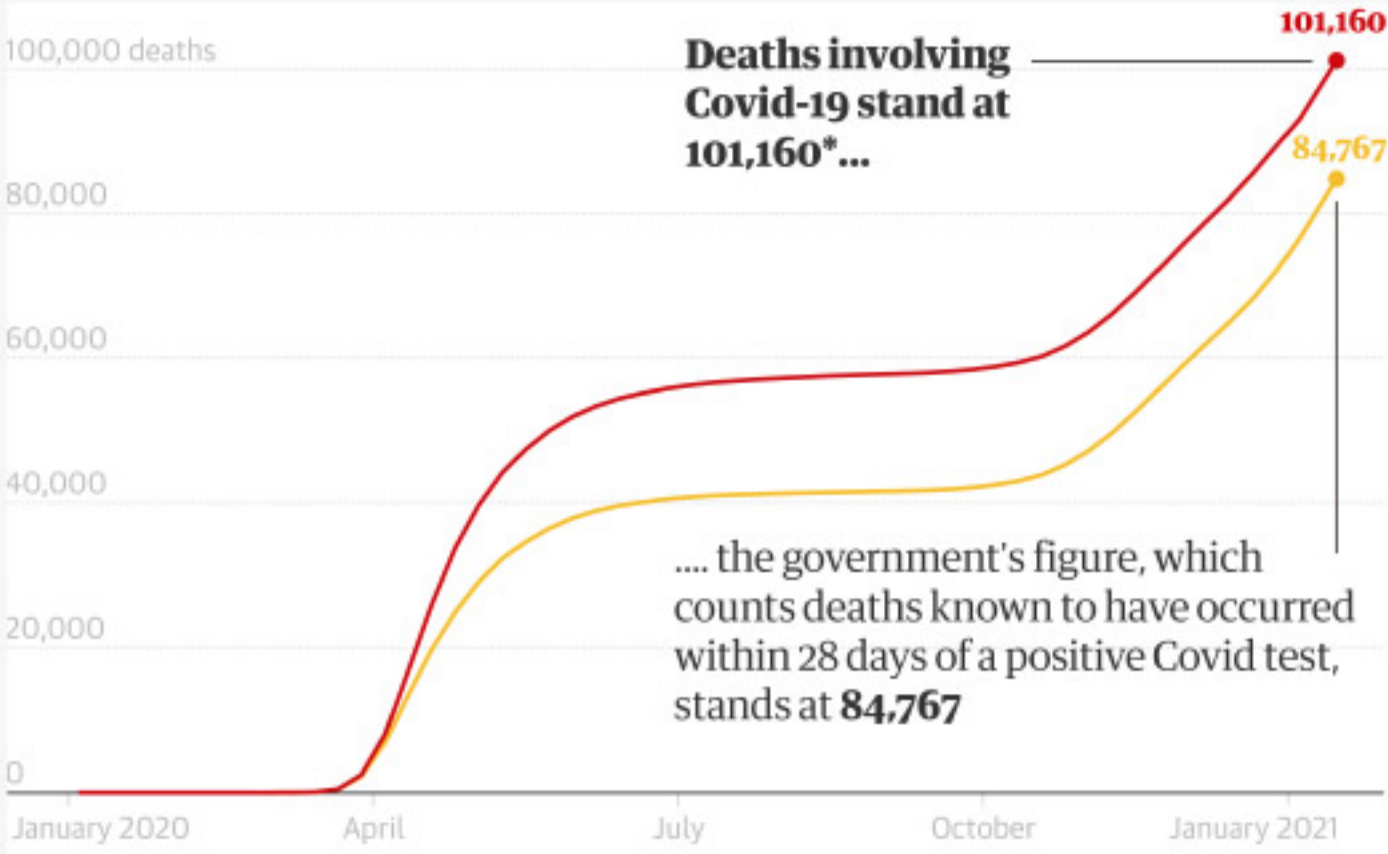
8.4 Bloomberg
World, 5M, 11/1/21



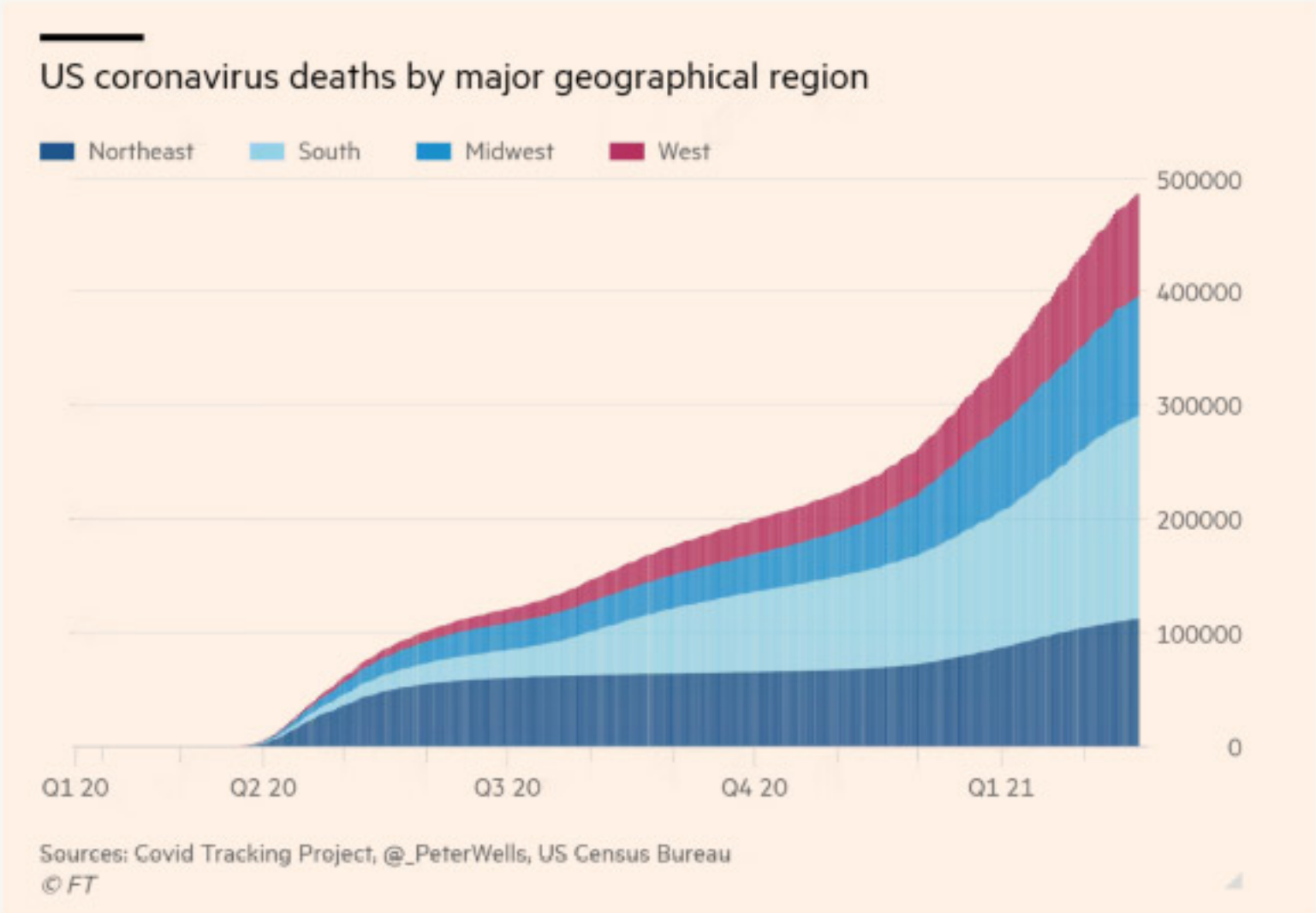
8.2 New York Times
US, 900K, 2/4/21



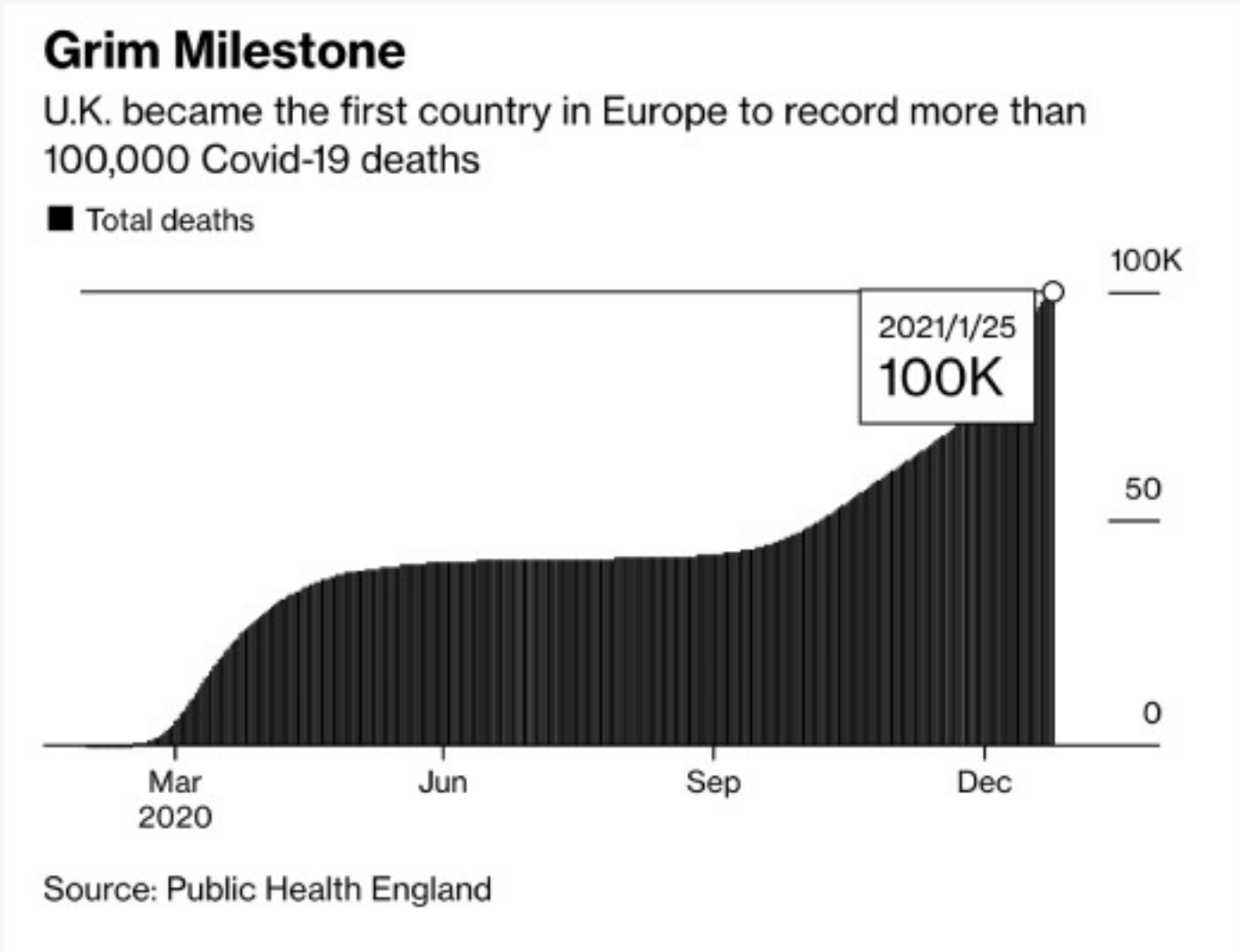
8.5 The Guardian
UK, 100K, 1/13/21



8.3 Financial Times
US, 500K, 2/23/21



8.6 Bloomberg
UK, 100K, 1/26/21



11 My City Was Gone, Wikipedia,
https://en.wikipedia.org/wiki/My_City_Was_Gone

Line and Area Charts

deaths” (7.4) in Axios uses a scrolling timeline of rotated squares, where each diamond shape is labeled with a statistic corresponding to the running total deaths on a specific day. The diamond labeled June 11, 2020 displays the total U.S. deaths in World War I. War casualties are intermixed with the number of deaths during other pandemics and populations of major cities like Atlanta, New Orleans, and San Francisco. The invocation of entire city populations brings to mind the lyric, “I went back to Ohio, but my city was gone,” by The Pretenders.¹¹ As the quantity of deaths grows past 200,000, the shape is clipped by any reasonable window size, making the visualization intentionally too large to display. The diamond shape allows the reader to see where each comparison begins and ends as the area itself becomes too large to see in its entirety.

The animated banner for “How we got to 1 million Covid deaths – in four charts” (7.5) in POLITICO opens with an ingenious visual to represent 1 million people. Dots representing the distributed population of three U.S. states — Delaware, Rhode Island, and Montana — are wiped clean, leaving only the state’s empty borders. The map animation is not one of the four charts featured in the story, but empty states provide a strong comparison to visualize the loss of a million citizens.

The third example, “U.S. covid death toll reaches 1 million. Here’s just how bad that is.” (7.6) published in the Washington Post, builds toward the concept of 1 million in a systematic way using multiple smaller comparisons. Scrolling through the story builds up dot patterns of 1,000 and 100,000 persons, arranged into regular isometric rectangles. The result is a space reminiscent of Wurman’s football field comparison that is combined into regular patterns. The person-marks building the rectangles grow smaller as the quantities grow larger to keep the patterns within the window. As the reader scrolls through the months of the pandemic, borders group the rectangles into quantities comparable to other national disasters. The transitions in the systematic pattern repeatedly demonstrate how COVID-19 deaths overwhelm figures such as Civil War deaths and the annual death toll from more familiar diseases such as diabetes.

The inventive strategies used to visualize a large number of deaths stand out in the memory of those who encountered them during the pandemic. Clearly, there was a need to produce something new during the daily rise and fall of statistics to point out the magnitude of loss, bring the seriousness of the pandemic to the forefront, and bring the story from an exercise in statistical visualization to speak about the lives of individuals and families.

At the same time, the vast majority of visualizations addressing the magnitude of death used conventional line and area charts. The New York Times and The Washington Post used both novel and conventional means in the same story to describe the milestones. To describe the changing frequency of each 100,000 deaths, an area chart appears in the same story where the size of the Vietnam Veterans Memorial was used to visualize half a million deaths (8.1). The New York Times published similar area charts on

8.7 Poder 360
Brazil, 500K, 6/19/21



several occasions, most notably in “U.S. Covid Death Toll Surpasses 900,000 as Omicron’s Spread Slows” (8.2) that appeared a year after The Washington Post’s chart. Both visualizations illustrate that the U.S. experienced periods when 100,000 deaths occurred over periods that ranged from as little as 34 to as many as 118 days. Both were published at a time when the death rate was increasing rapidly.

Financial Times and Bloomberg News, two leading financial news publications, relied entirely on line and area charts to memorialize major death milestones. Financial Times visualized the U.S. 500,000-deaths milestone in “US passes ‘unimaginable’ milestone of 500,000 Covid-19 deaths” (8.3) with a stacked area graph. This visualization separated the area into four regions, illustrating that more deaths had occurred in the South than any other region. “How Many People Have Died From Covid? More Than 5 Million Covid Deaths Worldwide” (8.4) in Bloomberg visualized the world milestone of 5 million deaths with a single line chart, adding vertical marks to show the interval between each million deaths. The chart’s caption, “Longer Interval, Covid death toll globally is still growing, but at a slower rate,” called attention to the longer time period between 4 and 5 million deaths, rather than the magnitude.

We have already noted that the 100,000-deaths milestone for the United States, France, and Germany were marked by dramatic visualizations in their respective national press. The COVIC collection also contains two undramatic visualizations that mark when the United Kingdom surpassed 100,000 deaths in January 2021. “UK coronavirus deaths pass 100,000 after 1,564 reported in one day” (8.5) in The Guardian featured a chart with diverging line. One line represented “latest statistical agency figures” while the other was “government figures,” emphasizing the problematic nature of the data as much as the significance of the milestone. “UK Covid Deaths: More Than 100,000 Died from Coronavirus” (8.6), published in Bloomberg the following week, visualized the milestone as an area chart of black bars. The caption subtitle notes dryly that “U.K. became the first country in Europe to record more than 100,000 Covid-19 deaths.” There appears to be no urgency to understand or evaluate this number in these line and area visualizations. When Brazil reached the 500,000-deaths milestone in June 2021, the Brazilian digital journal Poder 360 used the same approach. “Brasil chega a 500 mil mortes pela covid-19” (Brazil reaches 500,000 deaths from covid-19) (8.7) leads off with an area chart, marking each 50,000 deaths with a dot on the area graph and a date along the Y-axis. The shortening interval of dots corresponds to the increasing slope of the line. The “500 mil” endpoint is surrounded by a yellow circle, a visual gesture to set apart the present moment.

If we regroup these examples by the quantities they represent, we can see that there is no consistent relationship between the milestone quantity and visual strategy.

The Number and the Country

Reaching That Number...

Detail of 2.1 Caixin, China, 2K, 2/23/20. New coronavirus deceased people who should not be forgotten after the numbers



Representations of less than 100,000 are all quite different: faces, flowers, spike maps, and streams. While they each tell a compelling story about the impact of the pandemic in one country, they also share a negative attribute — none of these emphasize the total number of deaths. Instead, they emphasize individual victims or the peaks of deaths that occurred.

Representations of 100,000 are the first to emphasize the numerical quantity. In that sense, 100,000 is the first unimaginable number, a quantity too large to understand. While there are charts that use well-known, data-driven visualization strategies such as line charts, area charts, and streamgraphs, this is where the strategies that distribute information along scrolling columns come to the forefront. Representing the distribution of deaths over time becomes more significant in the examples from 2021 onward, after countries experienced several waves of the virus.

Several of these strategies approach a visual comprehension limit when the quantity represented reaches 500,000. The number of computer-generated faces in The Washington Post column is intentionally too large to get through. It is difficult to see any detail in the density of the dot patterns and the forest of spikes. The comparison examples challenge us to transfer our understanding of a familiar quantity to a number we cannot otherwise understand. The area charts display the rising profile of accumulated deaths as a neutral and round number.

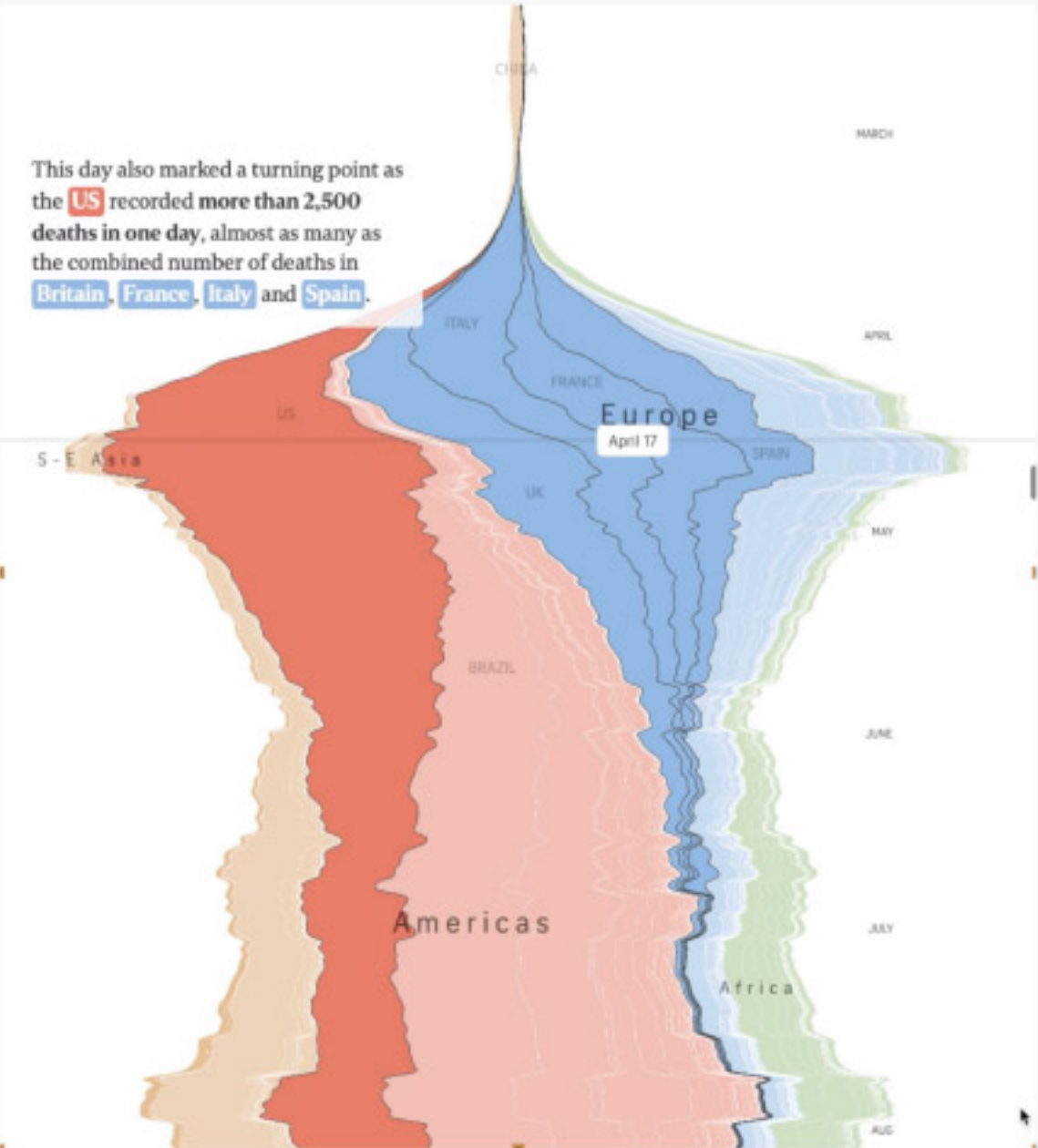
When, in September 2020, we reached 1 million deaths worldwide, designers visualized a quantity that is unevenly distributed over time and regional boundaries. We have two examples of 1 million data points arranged into relatively compressed streamgraphs. Their shapes communicate the daily variations more strongly than the total quantity. We also have examples that use strategies we have not previously discussed. “新冠百万逝者” (Coronavirus one million dead) (9.1), published in The Paper, consists of a stacked set of area graphs. The graph layers represent deaths in individual countries, arranged in a three-dimensional space. The charts, fading between light and dark grey, resemble the profile of mountain ranges, occluding one another and fading into a vanishing point distance.

The 1 million milestone reemerges in 2022 to mark the death toll in the United States. “One Million Deaths: The Hole the Pandemic Made in U.S. Society” (9.2), published in late January 2022 in The Wall Street Journal, appeared at a time when that milestone seemed imminent. The visualization represented 1 million deaths within a matrix of smudged circles, evoking a form of erasure, representing the total deaths since the pandemic began in the U.S. in March 2020. The emphasis of the visualization is the proportion of COVID-related deaths to all deaths, displaying a loss within a loss. After visualizing this number by highlighting a proportion of circles, the story shifts from proportional to personal, telling several individual family stories of relatives lost to the disease.

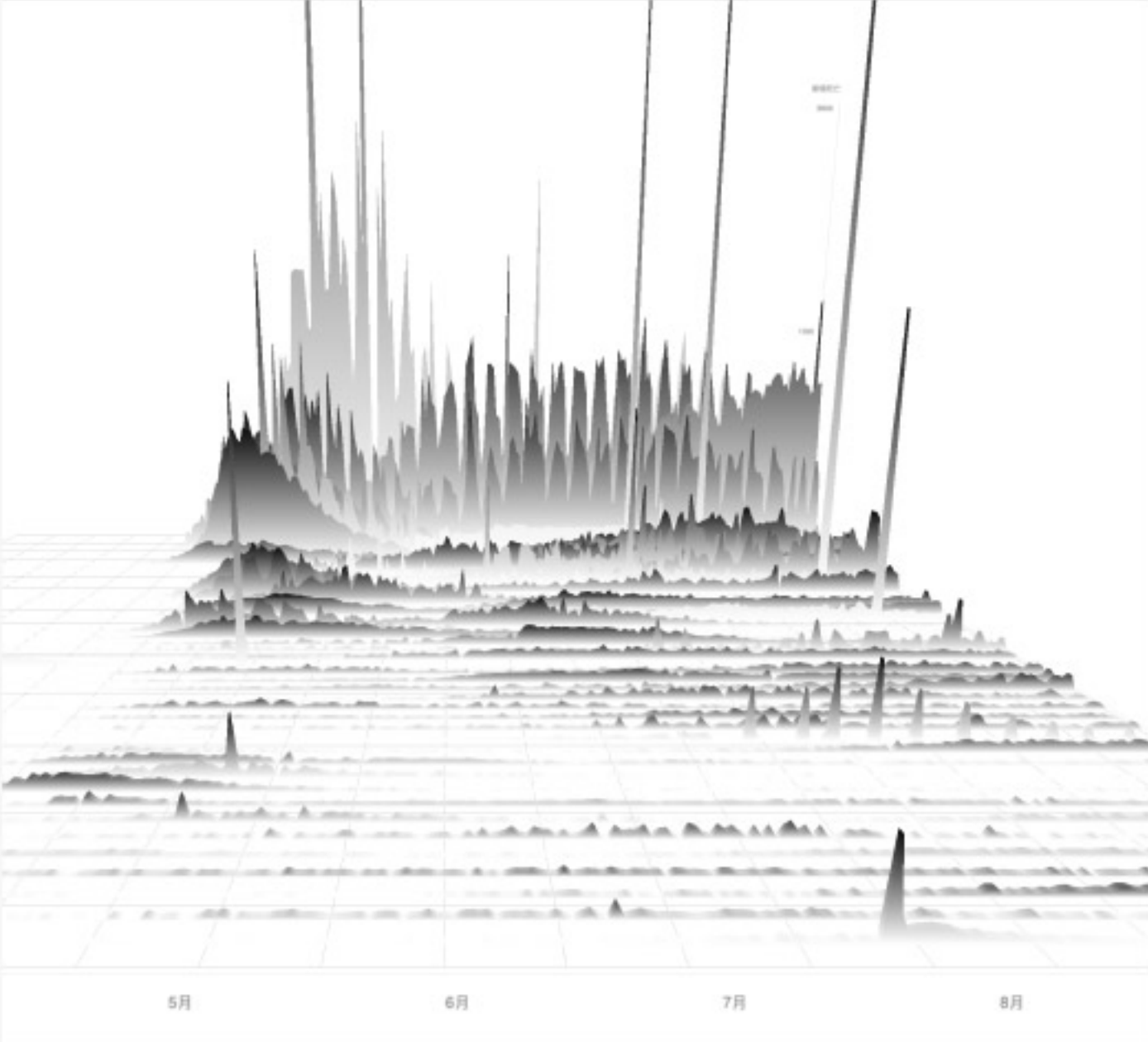
Nearly four months later, “U.S. covid death toll reaches 1 million. Here’s just how bad that is.” (7.6) in The Washington Post employed isometric rectangles rather than smudged circles in a similar fashion. The rectangles filled with rows of dots

Representations of 1,000,000

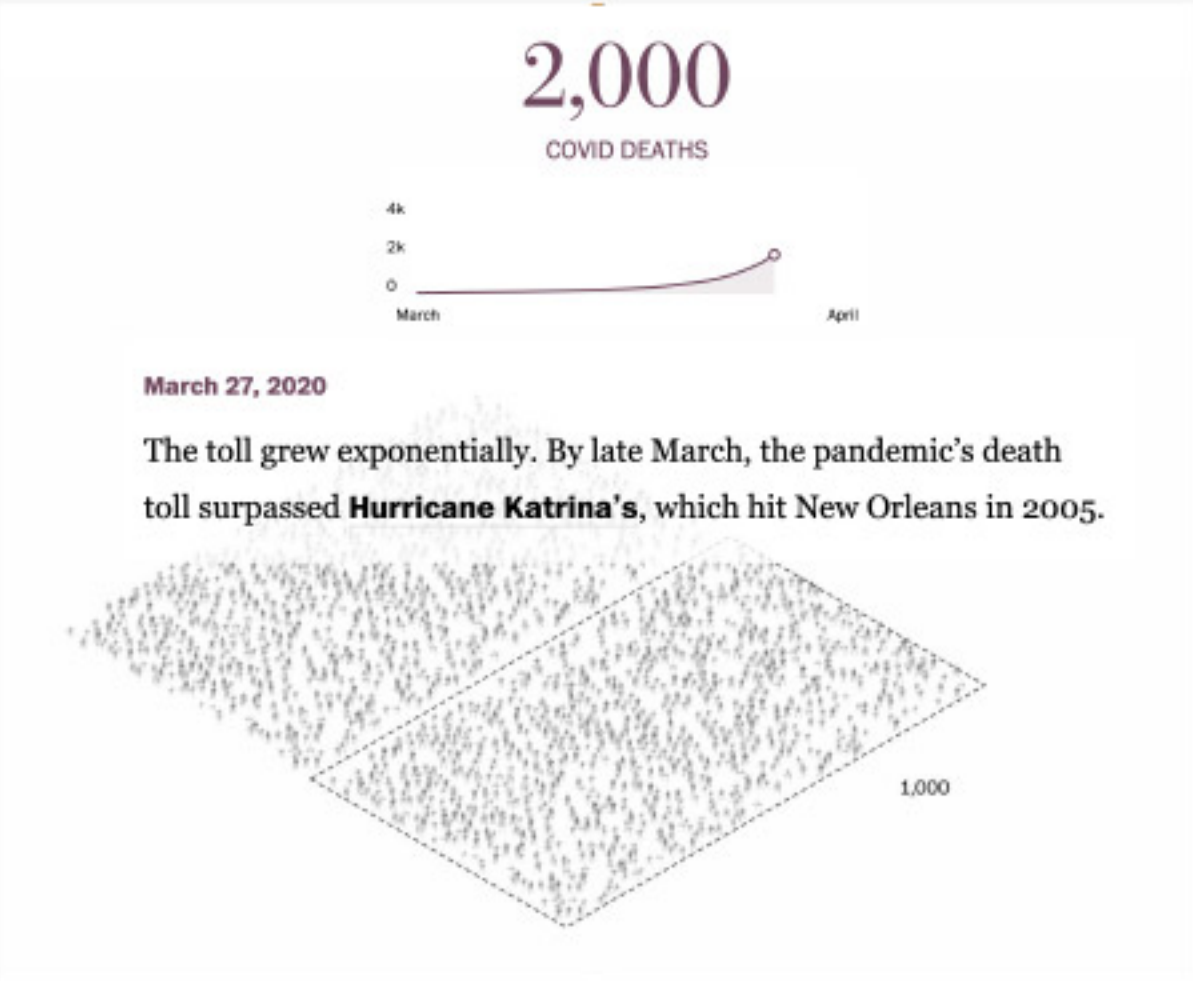
4.1 The Straits Times
World, 1M 9/26/20



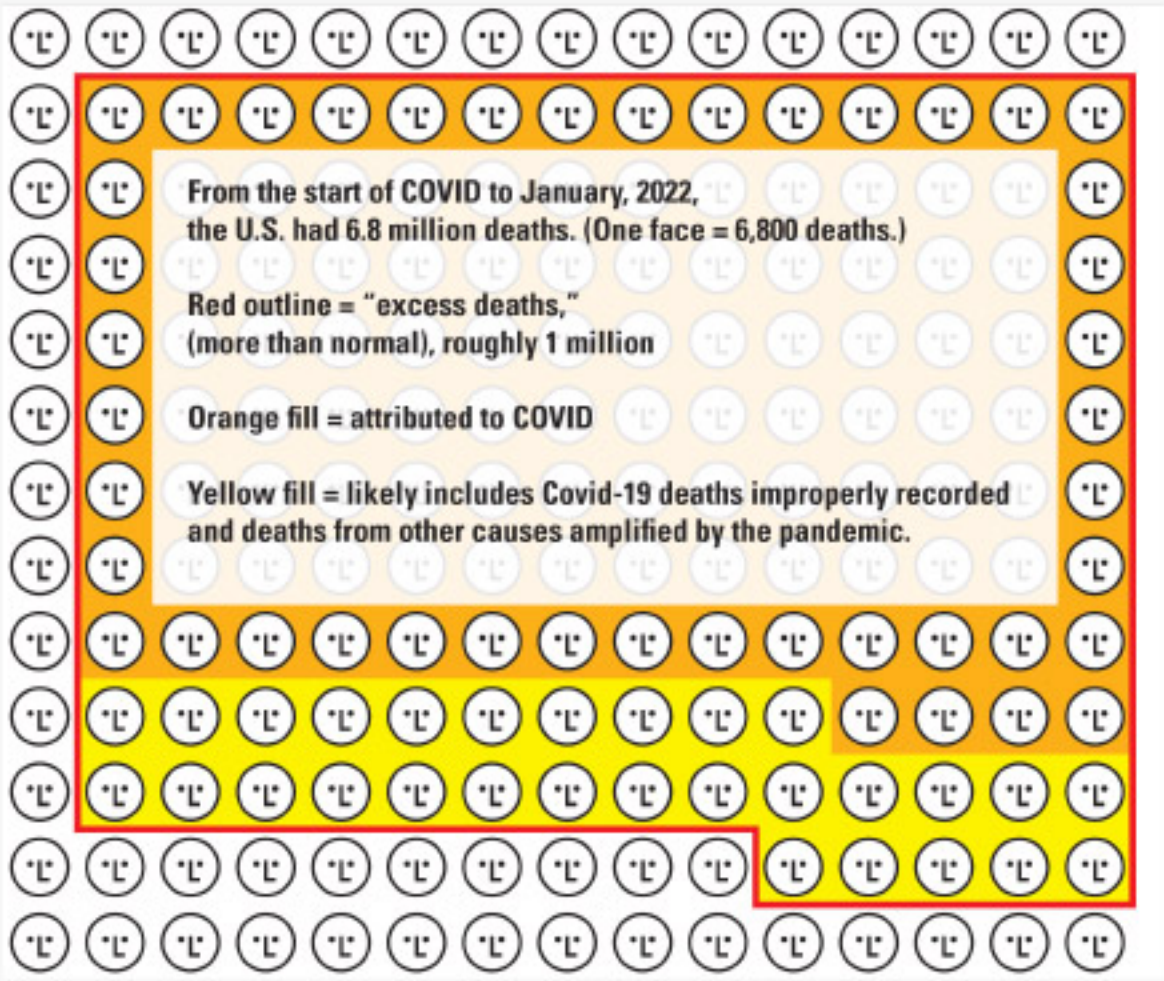
9.1 The Paper
World, 1M 9/26/20



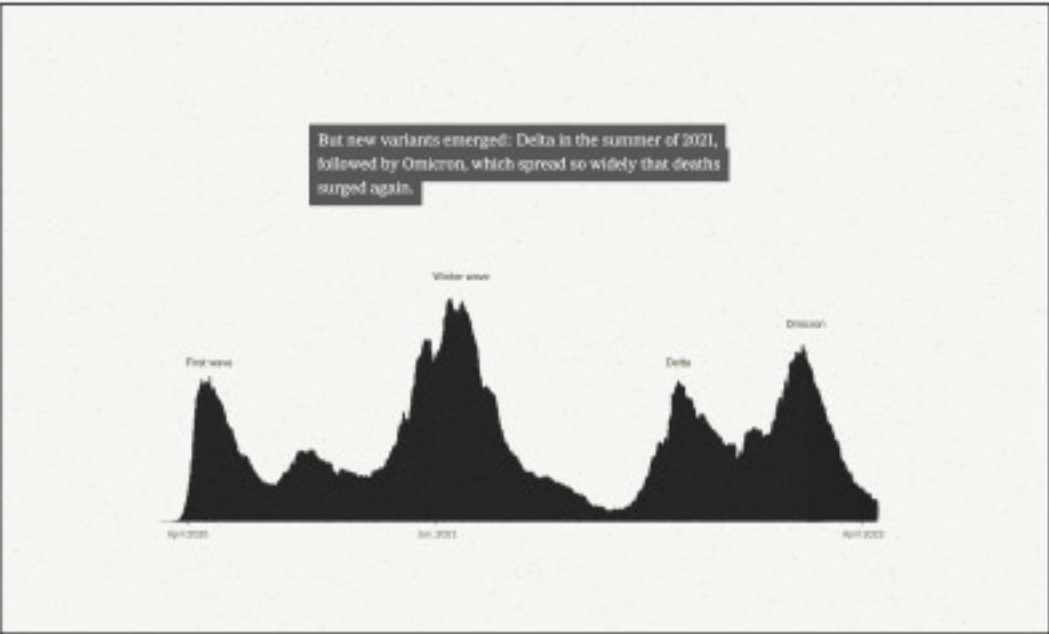
7.6 Washington Post
US, 1M 5/12/22



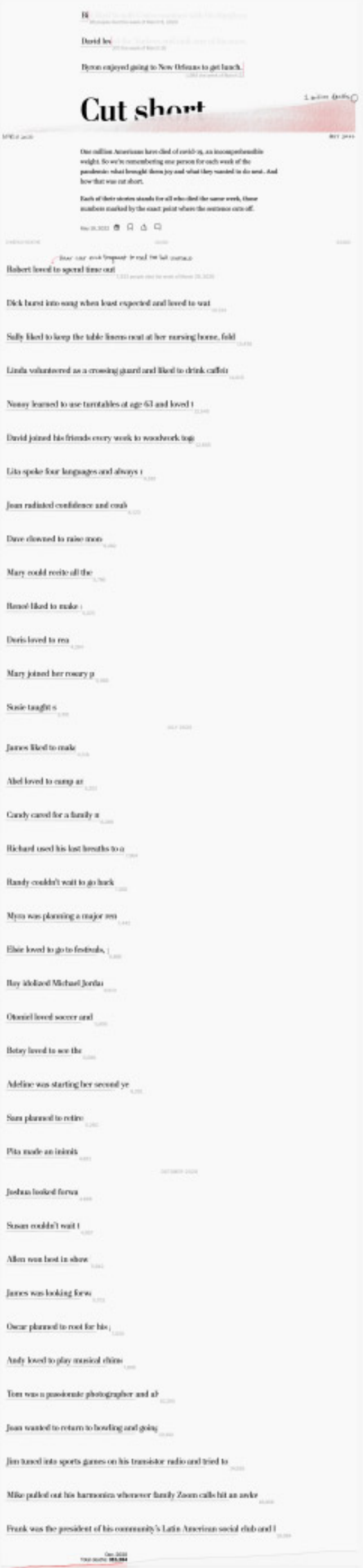
9.2 Wall Street Journal
US, 1M 1/31/22



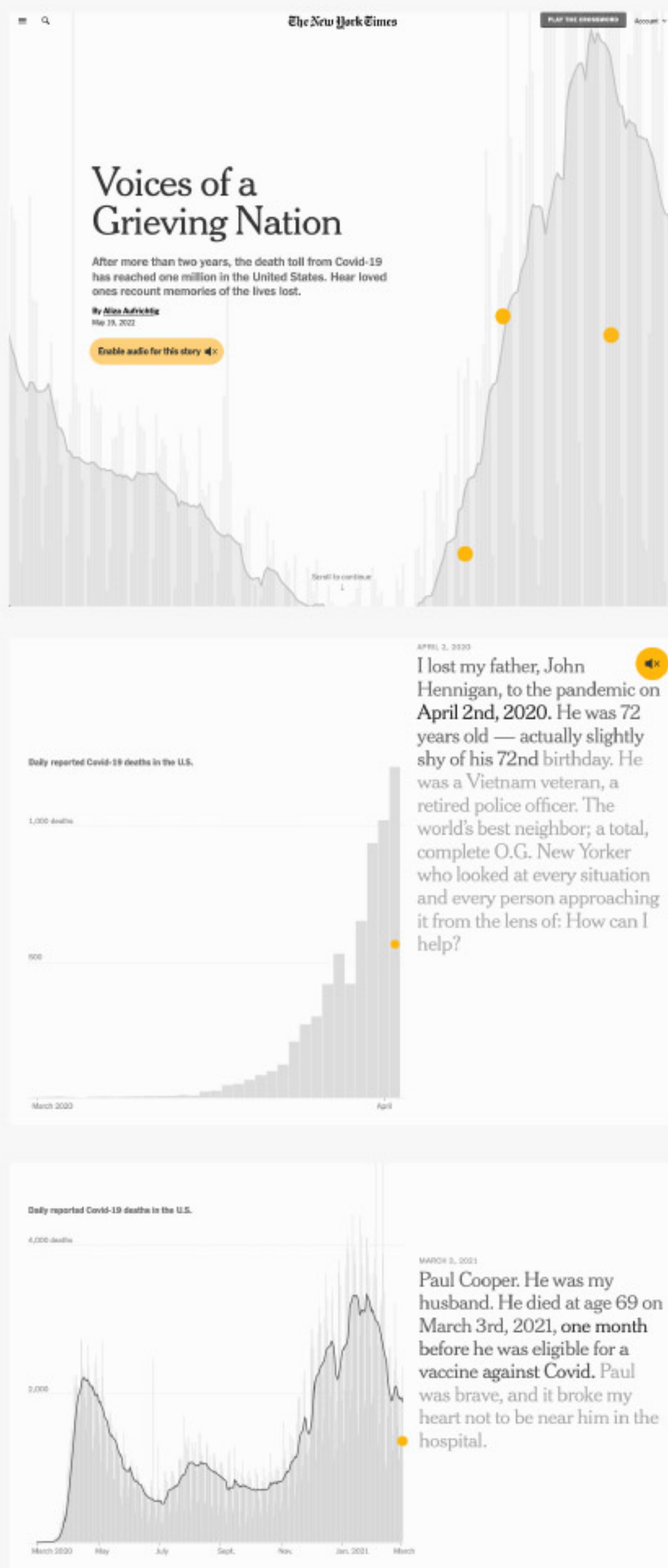
6.6 The New York Times, 1M, US 5/13/22



2.5 Washington Post
US, 1M 5/18/22



9.3 The New York Times US, IM 5/19/22



12 Davis W and Kelly C. The U.S. passed 1 million Covid-19 deaths. Here are songs to remember them by. NPR, May 18, 2022. [<https://apps.npr.org/covid-deaths-faces-songs-playlists/>]

13 Augugliaro F, Becker A, Ma J. 13 Final Texts From Loved Ones Lost to Covid. The New York Times. May 19, 2022. [<https://www.nytimes.com/interactive/2022/05/20/opinion/one-million-covid-deaths-texts.html>]

visualized the quantity within the unit. This story also employed scrolling text synchronized with outlines to relate the groups to quantities.

Visualizations in The Washington Post and The New York Times marking the milestone of 1 million deaths in the U.S. used animation controlled by scrolling to build up a sense of this enormous quantity. One area chart (2.5) is drawn vertically in the form of concrete poetry by clipped text from a selected obituary. The horizontal area chart of similar data (6.6) is built from a million dots that blow like dust off the screen and resettle to represent the distribution of death across the country map. (6.6 storyboard)

The 1 million-deaths milestone was also marked in stories that contain no visualization and rely entirely on text, photography, and, in some cases, audio. These stories mark the death milestone by focusing entirely on selected individual lives. Two of these relied on references to mobile media that has become a way we communicate and define ourselves, and a third emphasized the inability of data charts to communicate individual deaths.

The selected obituaries in “The U.S. passed 1 million Covid-19 deaths. Here are songs to remember them them by.”¹² published by NPR, featured a song for each individual story, invoking our current use of streaming audio to connect the memory of a loved one to a song. As the reader scrolls, the story displays a photo and sentence for each person, and plays a song chosen by survivors to represent that person’s life. In “13 Final Texts From Loved Ones Lost to Covid”¹³ in The New York Times, the reader is drawn into the final moments in a hospital room when last words were communicated by text messages. We see the individual death as a series of text messages exchanged between the person dying of COVID-19 and a family member.

The third example, “The Grief of One Million Lives Lost to Covid-19” (9.3), also in The New York Times, opens with a series of orange dots appearing and disappearing within a familiar histogram representing the national death count. Each dot is an individual recording describing a person lost to COVID-19. The recordings begin playing simultaneously as a “cacophony of grief,” then reappear individually on the histogram as the reader scrolls through time. The sound is reinforced by text appearing synchronized with the spoken words. The story, which begins and ends with the cacophony of people speaking, employs the visualization as a background and refers to the chart as “one way of measuring the toll of the pandemic. And within that chart are a million stories that can remind us of what we have lost.”

The global milestone of 5 million deaths inspired many news stories but few visual examples. In the line chart published in Bloomberg to visualize this milestone (8.4), the quantity represented could be any number. Only the numerals at the point where the curve touches the axis tell us this is 5 million. The Straits Times visualization (5.3) compares the impact between regions rather than the total number itself. By representing the weekly death toll as longer and shorter petals around a central circle, the different continents seem to be reaching or falling in different directions. We can immediately see how the death peaks varied between continents.

Two examples memorializing a one-year milestone — the BBC for deaths worldwide (5.2) and The Washington Post for deaths in the U.S. (6.3) — differ in almost every way. The BBC flower design displays the distribution of quantity over time for continents and countries, while The Washington Post story displays location and emphasizes individual stories rather than quantities.

... In Our Country

This contrast brings up how death milestones are represented for the world and for individual countries. COVIC collected the largest number of data visualizations of death milestones in a single country from the U.S. press. Death milestones in the United States, major numbers and close-to-major numbers, have been visualized with every strategy except flowers.

In the four European countries that reached the 100,000-deaths milestone, the local press used different strategies. The UK press was empirical and undramatic. While there were map representations of how many deaths occurred daily, none of the milestone examples showed how deaths were distributed across the United Kingdom.

The streamgraph of the 100,000-deaths milestone in Spain emphasized the number of deaths by province. The time-series map in Germany was entirely local, with no representation of state boundaries, placing dots within an otherwise unbroken national border. The dot-density timelines for the 100,000-deaths milestone in France and Germany, along with the two-year streamgraph milestone for Switzerland, do not communicate where in the country people died. Instead, each of these visualizations aligns the quantity of deaths with national policy and restrictions.

Milestones of the Past and Milestones of the Future

This review was conducted in the first half of 2022, during the third year of the pandemic. The daily accumulation of pandemic statistics has become a form of background noise to daily life. A space on the front page of a newspaper or the homepage of a news site that reports case and death numbers, infection hot spots, or measurements of the national vaccination program is as common as a weather report in the European and North American press. COVIC has recorded more than 500 websites with pandemic-related visualizations updated automatically from current data sources. The majority of these visualizations remain active in the pandemic's third year.

The death milestone examples we collected were published in 10 of the 70 countries in the collection. Six of these countries experienced more than 100,000 deaths. According to the numbers published by Johns Hopkins University, there are many other countries where the current death total has passed the 100,000 mark, including Italy, Iran, South Africa, Argentina, Peru, Mexico, Indonesia, and Poland. India has already surpassed half a million deaths. While we have collected pandemic visualizations published in each of these countries, none can be described as a graphic memorial to a specific number of deaths. The kind of visual memorials we have identified in the collection are not automatically produced when a country has counted a large round number of deaths.

We speculate that the examples we have found are produced by a combination of four factors:

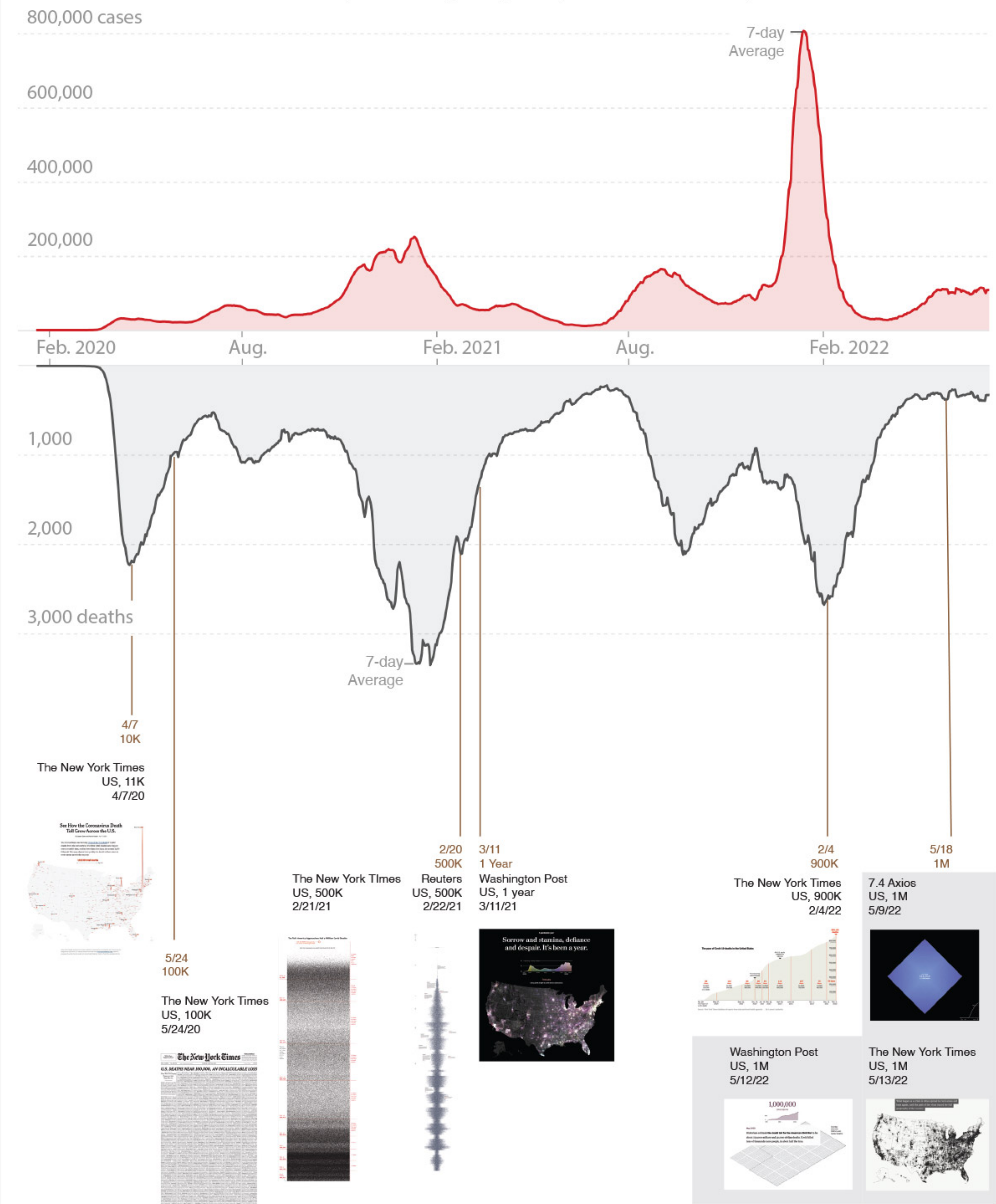
- ◇ empirical visual culture
- ◇ technological sophistication
- ◇ political motivation
- ◇ global awareness.

The global data culture had already produced a rich set of software tools for generating charts in the years leading up to the pandemic. The combination of technology and visual culture was already embedded in many news organizations in the countries represented in our examples.

To paraphrase a headline from Financial Times, a combination of these factors has motivated and enabled the creation of “unimaginable” milestones. Technological sophistication alone is not enough. Many countries that have this technological sophistication do not broadly share empirical visual culture. In addition, there are many political factors that inhibit or motivate the memorializing of a milestone. These milestone visualizations are a statement about a government and national self-concept. The milestone visualizations published by the BBC in the UK and The Straits Times in Singapore focusing on global impact are consistent with those countries' political self-image as both nations see themselves as the crossroad of global commerce. Of course, the designs are also a result of the visual and technological sophistication of their data journalism teams. In the same way, the visual invention among Chinese designers and journalists fits with their government's heroic narrative around

10. US Cases over Deaths, January 2002 through July 2022*

* The daily case and death chart is adapted from charts published in The New York Times, July 11, 2022. Markers for 1-year anniversary correspond to publication dates in their respective countries.



the containment of the Wuhan outbreak in 2020. The zero-COVID policy that followed has discouraged visualization and limited reporting within and about China to primarily text and photographs.

What can we make of the relentless production of visualizations by The New York Times, from the first months of the pandemic into this third year, highlighted by their dramatic front page and home page visualizations of 100,000, 500,000, and 1 million deaths? Why did this major newspaper make over its full front page several times and devote so much resource and space to this topic? What argument do these death milestones make? What actions are they calling for? These visualizations have clearly inspired, and perhaps been inspired by, other publications. Their dramatic use of graphic design has certainly spread awareness of the toll.

These visualizations, each in their own way, are about:

- ◇ understanding and comprehending a global or national tragedy
- ◇ recognizing the reality of this tragedy with data
- ◇ remembering, memorializing, marking, and acknowledging those who have died
- ◇ acknowledging our own shock and trauma at the massive scale of disruption of our lives and the very great fear and uncertainty we suffered
- ◇ representing and acknowledging the shared experience of this traumatic period we've collectively gone through and somehow survived

At the time this essay is being written, the pandemic has been overshadowed by other national and international events in most parts of the world. Endemic or pandemic, COVID-19 infections continue to spread. At the same time, there is a growing awareness that the number of COVID-related deaths has been grossly underreported in many countries. As unimaginable as 5 million deaths worldwide may have seemed in October 2021, a report from the World Health Organization calculates the true number may have been more than twice that quantity¹⁴.

The conclusion of Dhruv Khullar's recent essay, "Will the Coronavirus Pandemic Ever End?,"¹⁵ provides an interesting way to speculate on the function of these death milestones.

We often think that the covid-19 pandemic is unique because scientists were so quick to influence its biological end, by developing vaccines and therapeutics at an unprecedented pace. But it is also unique in its social dimensions. Never before have we tracked a pathogen's every mutation in real time, shared so much information and misinformation about it on social media, stalked its daily, even hourly, spread from one place to the next. The abundance of data has allowed different people to tell different stories about the pandemic. In the U.S., the pandemic is not the emergency it once was, but neither is it over. A subacute condition may be less dramatic, but no less damaging. It requires care, attention, and

14 Knutson V, Aleshin-Guendel S, Karlinsky A, Msemburi W, Wakefield J. Estimating global and country-specific excess mortality during the COVID-19 pandemic. World Health Organization. May 9, 2022. [<https://www.who.int/publications/i/item/estimating-global-and-country-specific-excess-mortality-during-the-covid-19-pandemic>]

15 Khullar D. Will The Coronavirus Pandemic Ever End? The New Yorker. May 23, 2022. [<https://www.newyorker.com/news/daily-comment/will-the-coronavirus-pandemic-ever-end>]

investment. If Americans decide too soon that the pandemic has come to a social end, we may risk pushing its biological end further away. Where we go from here depends on the narrative we construct next.

Visualizing death milestones has become a significant part of that narrative. The importance and frequency of COVID-19 visualization varies from country to country, but we know there will continue to be some form of visualization to memorialize pandemic death milestones in the future. It is likely that a combination of factors will generate future memorials in many countries to remember the dead and remind the living of the empirical facts.

Note on Spelling

We understand that the correct spelling for the pandemic disease is COVID-19. We use this spelling on our own text. We have reproduced without correction the way COVID-19 is written in the titles of all examples, as well as in any quotations.

Acknowledgments

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Kelsey Nowakowski, and Oscar A. Santamariña, National Geographic staff; illustrations by Joe McKendry; **7.3:** 500,000 coronavirus deaths visualized: A number almost too large to grasp by Artur Galocha and Bonnie Berkowitz was first published in The Washington Post on 2/23/21; **7.4:** Axios Data Visualization. Designed and developed by Jacque Schrag, Jared Whalen, and Kavya Beheraj. Illustrated by Maura Losch. Reported by Tina Reed. Edited by Danielle Alberti.; **7.5:** Data visualization by POLITICO; **7.6:** U.S. covid death toll reaches 1 million. Here's just how bad that is. by Sergio Peçanha, Yan Wu, and Chris Rukan was first published in The Washington Post on 5/12/22; **8.1:** 500,000 coronavirus deaths visualized: A number almost too large to grasp by Artur Galocha and Bonnie Berkowitz was first published in The Washington Post on 2/21/21; **8.2:** Julie Bosman and Mitch Smith © 2022 The New York Times Company; **8.3:** Source: Peter Wells, Hannah Kuchler, 2002, "US passes 'unimaginable' milestone of 500,000 Covid-19 deaths", Financial Times / FT.com, 2/23/21, Used under license from the Financial Times. All Rights Reserved.; **8.4:** Used with permission of Bloomberg L.P. Copyright© 2022. All rights reserved.; **8.5:** Copyright Guardian News & Media Ltd 2022; **8.6:** Used with permission of Bloomberg L.P. Copyright© 2022. All rights reserved.; **8.7:** Infografia/Poder360.; **9.1:** The Paper: Jiaxing Kong, Yasai Wang, Liangxian Chen, Yan Lu; **9.2:** Drawing by the authors based on a figure that appeared in "One Million Deaths: The Hole the Pandemic Made in U.S. Society", Wall Street Journal, 1/31/22; **9.3:** Aliza Aufrichtig © 2022 The New York Times Company; **10:** Paul Kahn

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Table 1. Death Milestone Examples

Figure	Milestone	Publisher	Date	Title
2.1	China peak	财新 Caixin	02/23/20	新冠逝者: 数字之后不应被遗忘的人
2.2	Italy peak	Reuters Graphics	03/25/20	A deluge of death in northern Italy
2.3	US 100K	The New York Times	05/24/20	U.S. DEATHS NEAR 100,000, AN INCALCULABLE LOSS
2.4	US 500K	Washington Post	02/23/21	Putting 500,000 covid-19 deaths into perspective
2.5	US 1M	Washington Post	05/18/22	One million covid deaths: Visualizing 114 lives, cut short
3.1	US 100K	The New York Times	05/27/20	Remembering the 100,000 Lives Lost to Coronavirus in America
3.2	US 100K	NBC News	06/02/20	Seeing the scale: Visualizing the 100,000 American coronavirus deaths
3.3	US 500K	The New York Times	02/03/21	How 450,000 Coronavirus Deaths Added Up
3.4	US 500K	The New York Times	02/21/21	The Toll: America Approaches Half a Million Covid Deaths
3.5	France 100K	Le Monde	04/26/21	Qui sont les 100 000 morts du Covid-19 en France ?
3.6	Germany 100K	RND	11/25/21	Corona: 100.000 Tote in Deutschland – eine Einordnung in Grafiken
4.1	World 1M	The Straits Times	09/26/20	Coronavirus: How the world lost one million lives to Covid-19
4.2	World 1M	PÚBLICO	09/29/20	Menos um milhão de vidas (Less a million lives)
4.3	US 500K	Reuters Graphics	02/22/21	500,000 lives lost
4.4	Spain 100K	RTVE	3/2/22	Más de 100.000 muertos por COVID-19 en España
4.5	Switzerland 2 years	Neue Zürcher Zeitung	2/16/22	Corona in der Schweiz: Zwei Jahre Pandemie in einer Grafik
5.1	China peak	财新 Caixin	04/05/20	新冠逝者: 献给疫情中离去的生命
5.2	World 1 year	BBC	12/07/20	Coronavirus: How can we imagine the scale of Covid's death toll?
5.3	World 5M	The Straits Times	10/30/21	Remembering the 5 million lives lost to Covid-19
6.1	US peak	The New York Times	04/07/20	See How the Coronavirus Death Toll Grew Across the U.S.
6.2	US 500K	Minneapolis Star Tribune	02/21/21	A year into the pandemic, a staggering toll
6.3	US 1 year	Washington Post	03/11/21	A year of covid-19: Timeline of the pandemic in America
6.4	US 700K	NPR	04/03/21	COVID-19 Memorial: Enduring Loss

Figure	Milestone	Publisher	Date	Title
6.5	Germany 100K	Der Spiegel	11/25/21	100.000 Corona-Tote in Deutschland: Die wir verloren haben
6.6	US 1M	The New York Times	05/13/22	How America Reached One Million Covid Deaths
7.1	US 100K	South China Morning Post	5/28/20	United States passes 100,000 coronavirus deaths
7.2	US 500K	National Geographic	02/18/21	Visualizing 500,000 deaths from COVID-19 in the U.S.
7.3	US 500K	Washington Post	02/21/21	500,000 coronavirus deaths visualized: A number almost too large to grasp
7.4	US 1M	Washington Post	5/12/22	U.S. covid death toll reaches 1 million. Here's just how bad that is.
7.5	US 1M	Axios	5/9/22	1 million U.S. COVID-19 deaths
7.6	US 1M	Politico	5/11/22	How we got to 1 million Covid deaths – in four charts
8.3	US 500K	Financial Times	02/23/21	US passes 'unimaginable' milestone of 500,000 Covid-19 deaths
8.4	World 5M	Bloomberg	11/01/21	How Many People Have Died From Covid? More Than 5 Million Covid Deaths Worldwide
8.5	UK 100K	The Guardian	01/13/21	UK coronavirus deaths pass 100,000 after 1,564 reported in one day
8.6	UK 100K	Bloomberg	01/26/21	UK Covid Deaths: More Than 100,000 Died from Coronavirus
8.7	Brazil 500K	Poder 360	06/19/21	Brasil chega a 500 mil mortes pela covid-19
9.1	World 1M	澎湃新闻 The Paper	09/26/20	新冠百万逝者
9.2	US 1M	Wall Street Journal	1/31/22	One Million Deaths: The Hole the Pandemic Made in U.S. Society
9.3	US 1M	The New York Times	5/19/22	The Grief of One Million Lives Lost to Covid-19