

Commvis Interactive Blog Post



Learning objectives

After viewing my infographic, the viewer will be able to accomplish these three learning objectives:

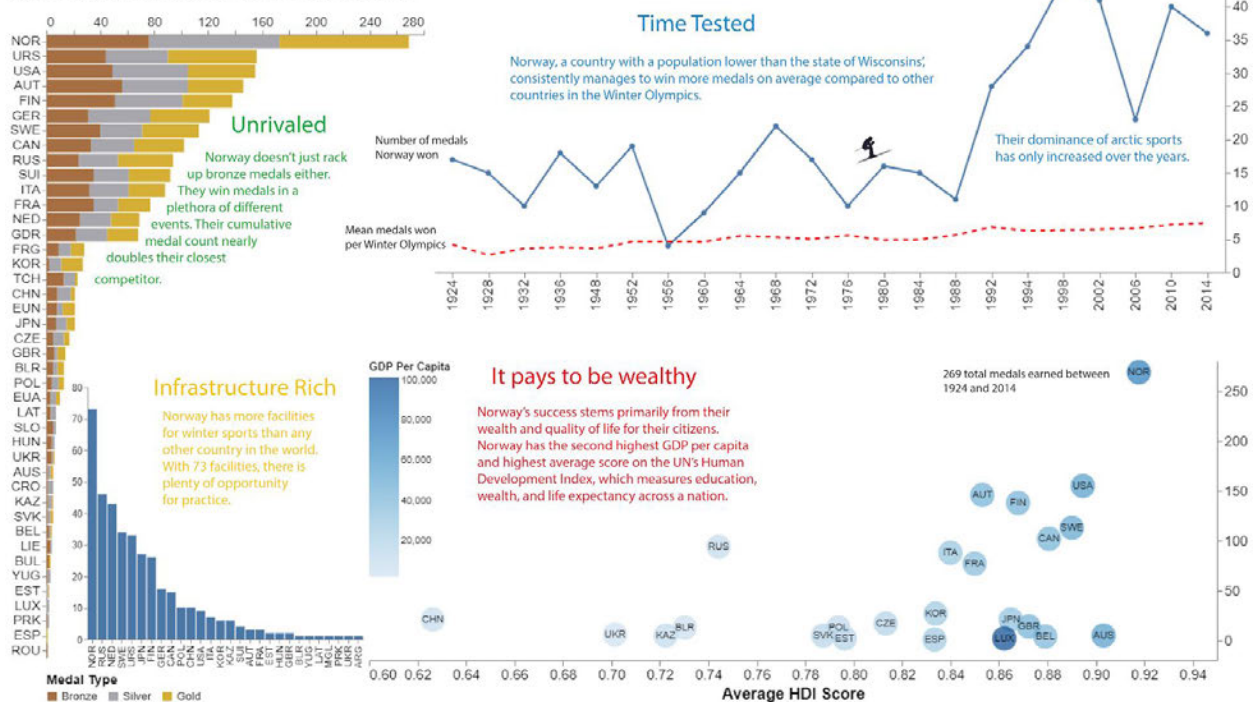
1. The viewer will be able to recall that Norway leads in the total number of Winter Olympic Games medals.
2. The viewer will be able to recall that Norway consistently beats the average in terms of medals won at Winter Olympics games.
3. The viewer will be able to explain the distribution of rink counts geographically and understand their relationship to success in the Winter Olympics.
4. The viewer will be able to explain the relationship between a country's GDP, Human Development Index (HDI), and Winter Olympics success.

Design Process

In designing for interactivity, I took an exploratory approach to develop my intuition as to what would be useful for users to accomplish the learning objectives stated above. Initially I had built my visualizations using Altair and I wanted to continue using that platform for my own development and because I had already laid lots of groundwork.

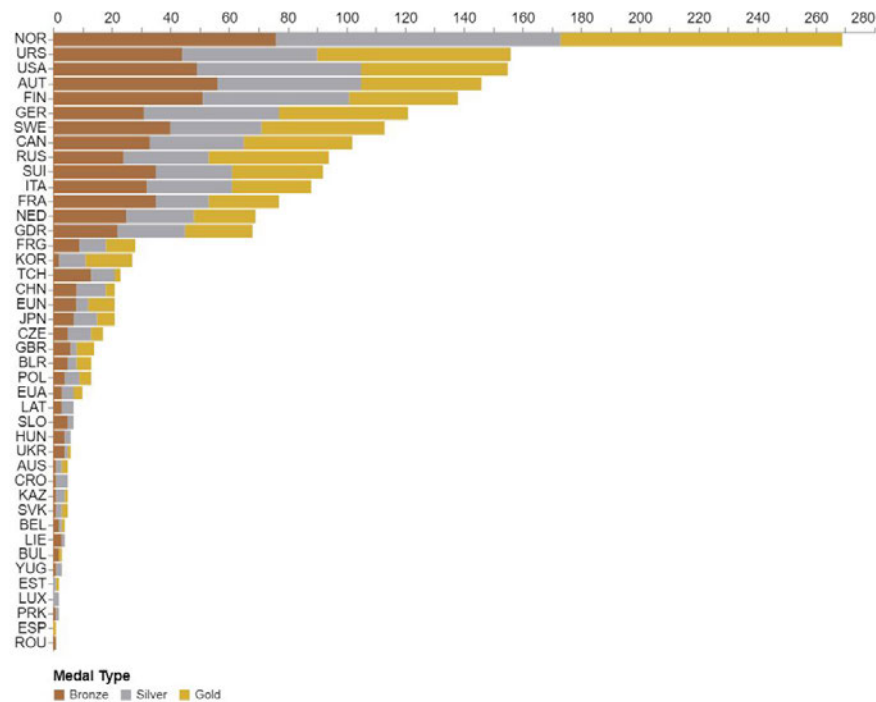
In hindsight, this may have been limiting as the documentation for Altair is relatively scarce, but in the end I'm really happy with how things turned out. For reference, my initial static visualization was this:

A Powerhouse in the North

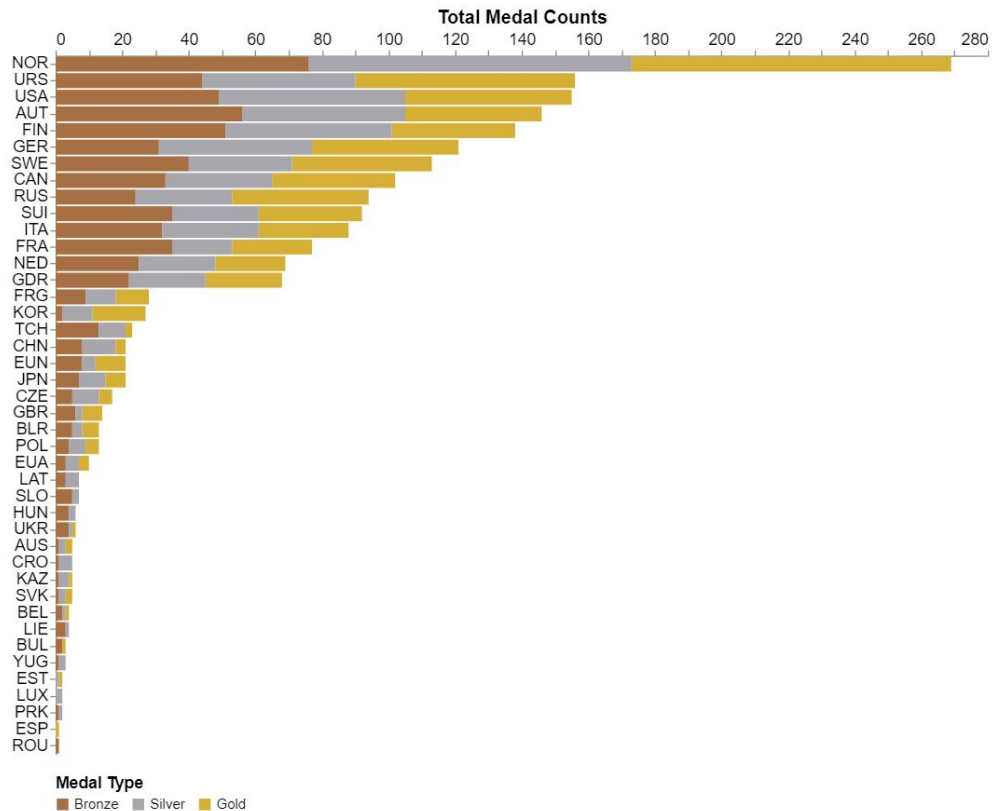


I wanted to keep a similar feeling to these. I think one part of this visualization that worked well was the storytelling nature of it. That said, I planned my interactivity knowing I would have text interspersed throughout each interaction.

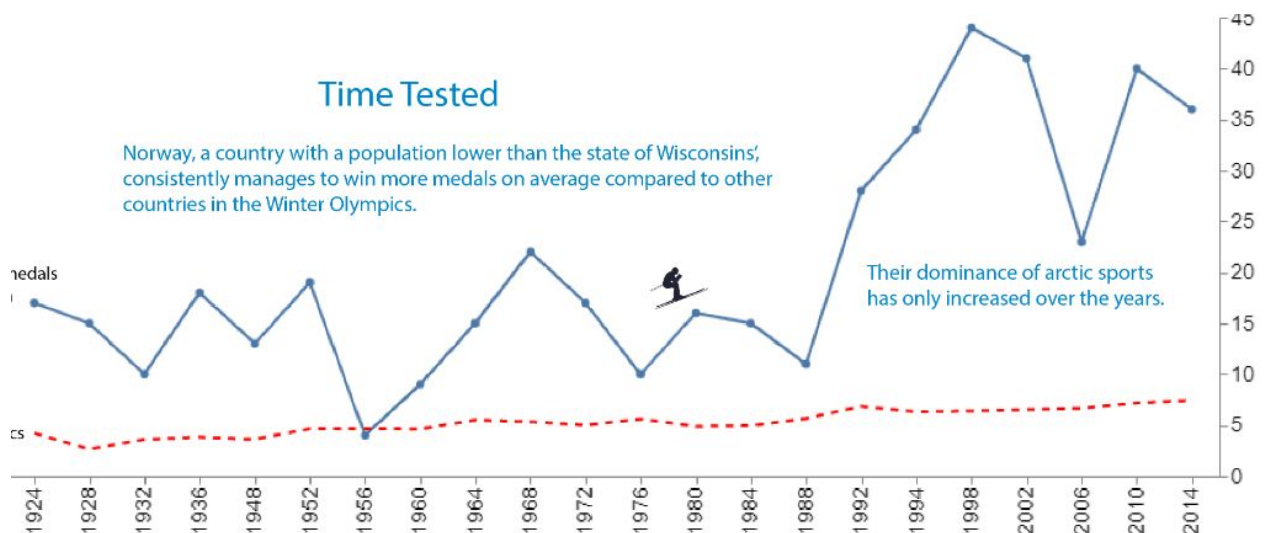
In order to accomplish my learning objectives, I thought about the story I wanted to tell. I wanted to give the viewer context about Norway as a powerhouse overall and then drill down to a more granular view of their performance over time relative to their peers. Once they have a general understanding of Norway's performance, it makes a lot more sense to dive into details of why Norway is successful. This framework allowed me to evaluate my current designs and see where they did and did not fit.



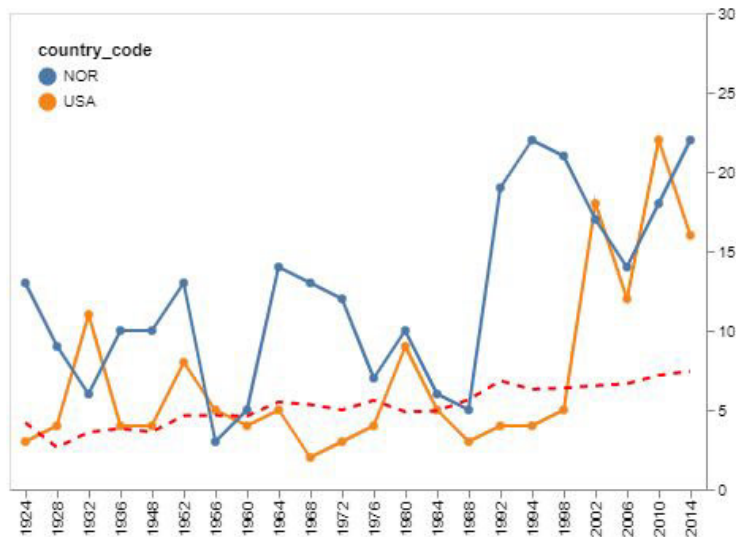
I think this first visualization serves as an effective way to indicate that Norway is dominant overall. It doesn't include a time component purposefully. I considered including interactivity to allow the user to filter the bars down so they could be compared more easily. I decided against this because I thought it would be better to include a variant of this further down. I opted only for a simple tooltip over the bars that displays the total count, but overall this graph remains mostly static but effective. However, I did opt to add axis labels as each of these visualizations would be distinct in a story format:



After priming the viewer, I thought it would be valuable to show Norway's success over time. This was accomplished with my prior version:

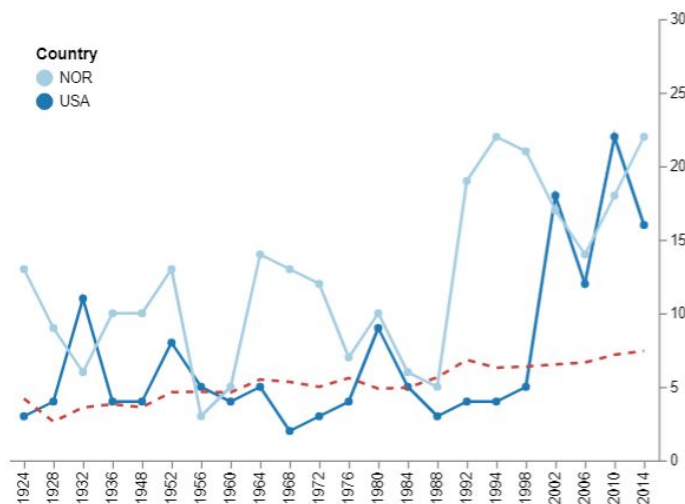


One big flaw of this visualization is that without axis labels it can't stand on its own very well. Also, it doesn't show Norway compared to others, which I thought was important enough to merit a change:



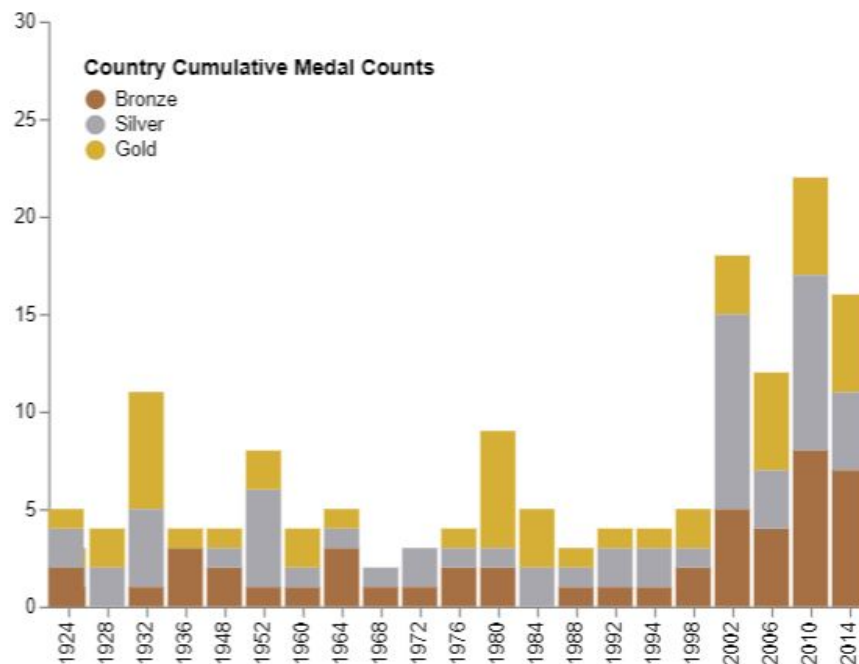
Select Country:

I liked this, but on its own it doesn't really tell the breakdown of medals for each individual country. What if a particular country won only bronze medals in one year? That's not included here. Also, the colors are kind of ugly:

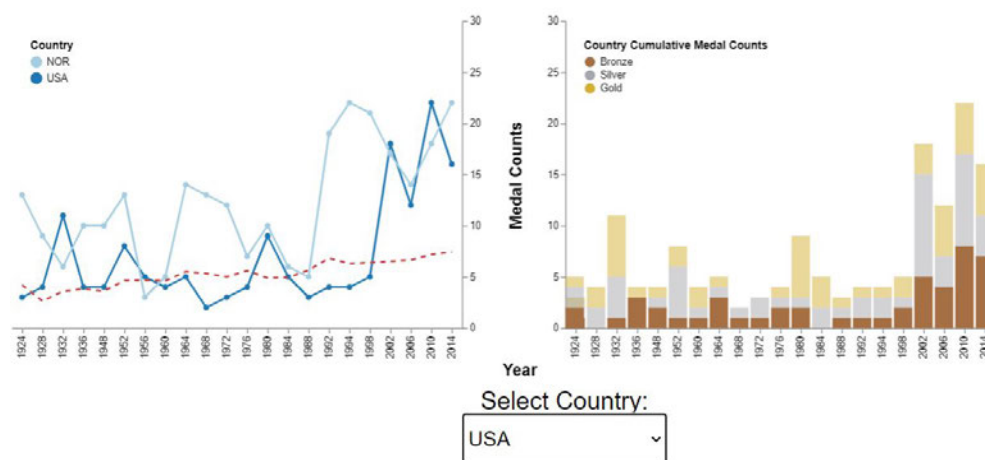


There we go! A little bit of icy coloring to help hammer home the idea of the winter olympics. Also, the dotted red median line stands out more against the blue. Unfortunately altair doesn't have a great way of doing annotations, so I need to describe the median line instead of including an annotation or legend item.

To complement this, I created this visualization of the same data, but in bar format:

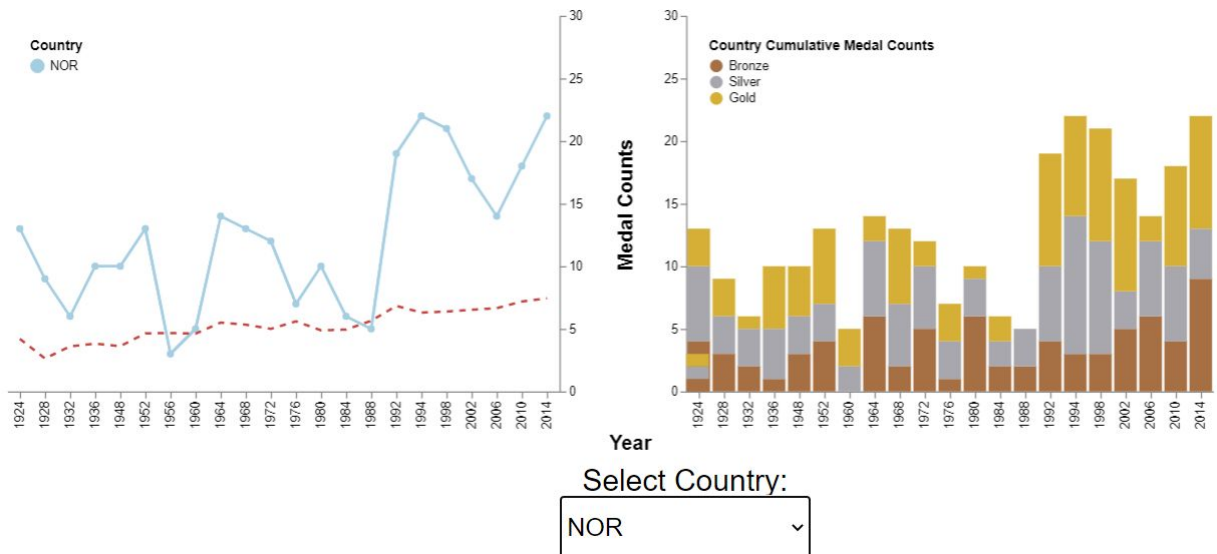


Ignore the legend there for now, it's included in another vis, but its placement was high impossible so I had to add it to this one. I tried making these visualizations vertical to one another, but it wasn't quite clear that they were supposed to be connected. I thought, why not tie them together and include the selection for both? Unfortunately I was deep into the weeds of altair at this point and forgot to take a bunch of screenshots, but here is what I came up with:

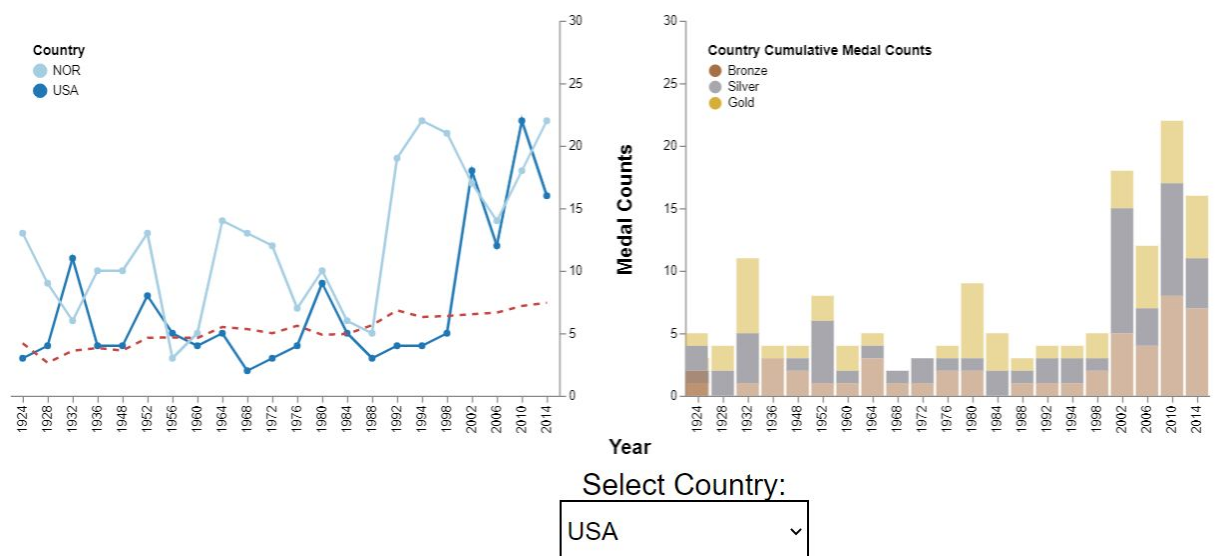


By sharing the same axis it is clear that they are measuring the same things, but in two different views. One thing that is a little confusing without seeing the interaction is which

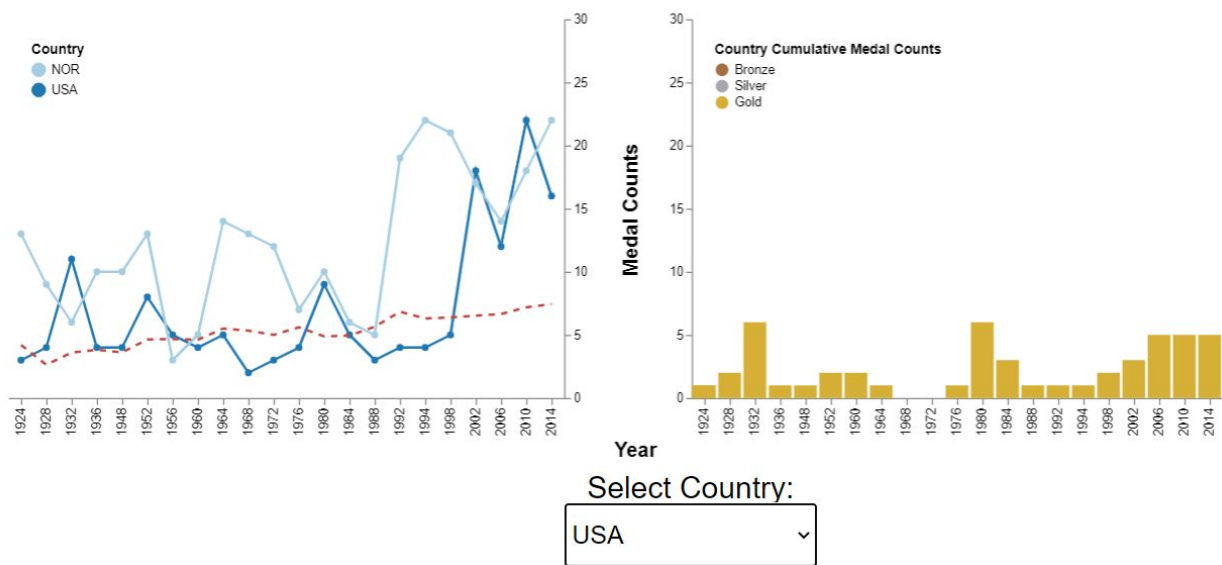
country is being measured. However, when actually using the select box it becomes clear that the country on the right is the one whose distribution is being shown. Norway here is only for reference and shows on its own when selected:



Additionally, I thought it would be helpful for users to be able to compare medals across years, so hovering a bar will select the group:



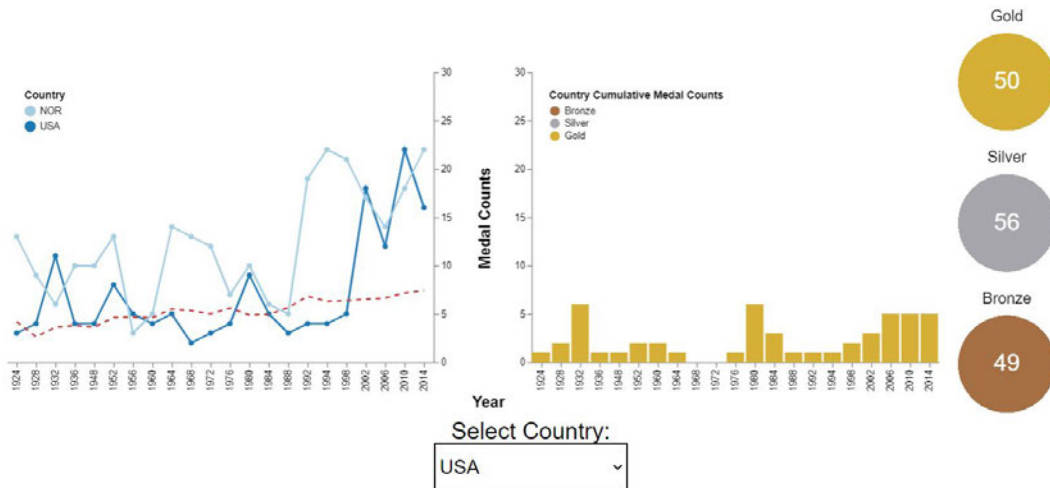
Clicking a bar will remove the others from the view:



One problem with this is context. How can they remember the total medal counts without scrolling up? To solve this, I added a simple set of circles showing the cumulative medal count (see the legend's connection now?):



Then I slapped all of these together:



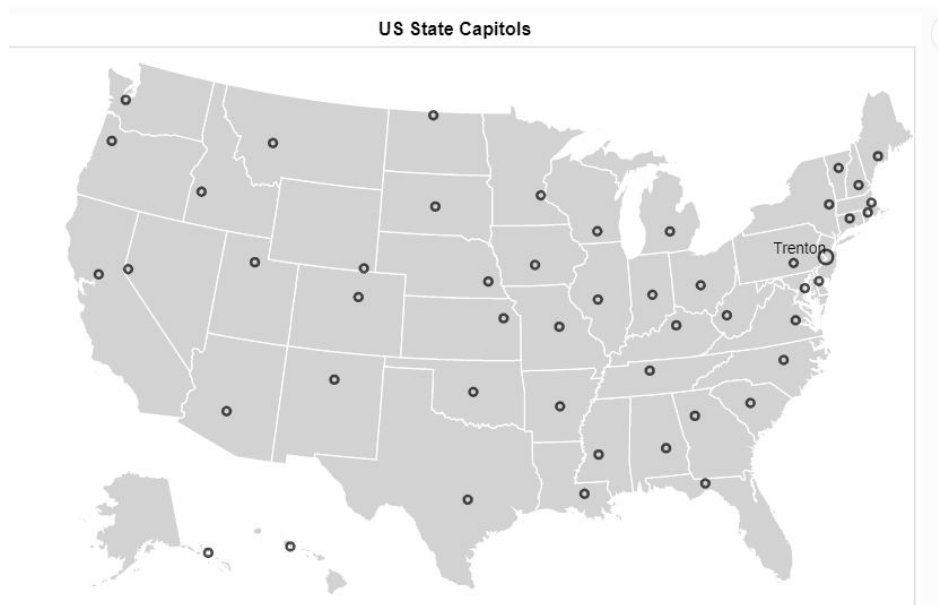
I think all of these combined really allow the user to explore on their own and get a feel for each country's performance over time. That said, let's see some visualizations for *why* Norway is so good.

Here was my first vis of the rink counts for each country:

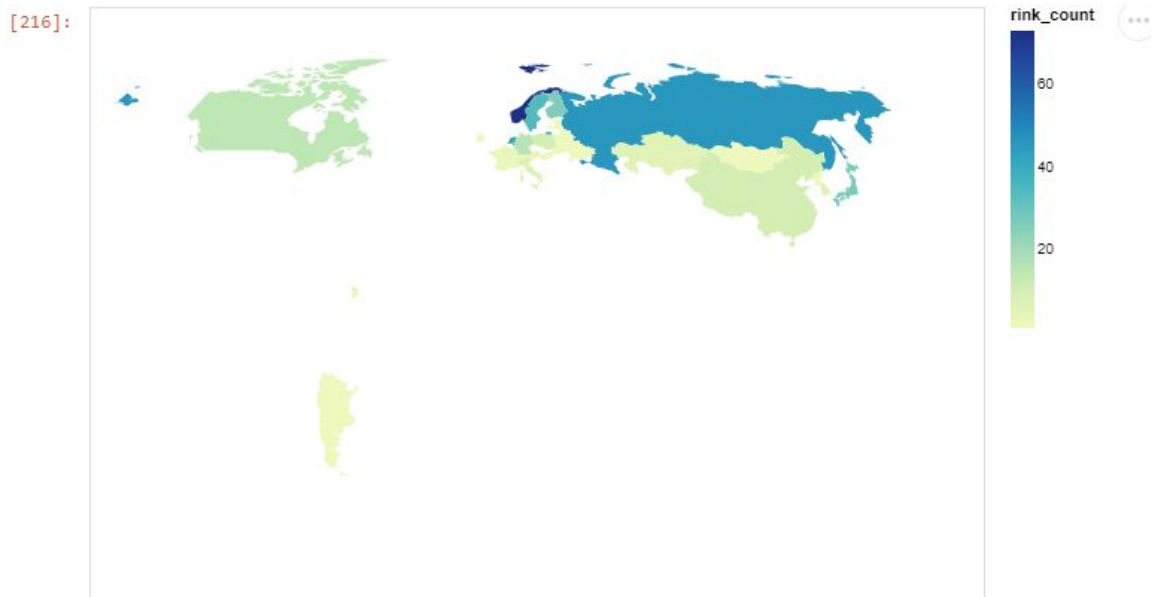


This was necessary for the prior vis because of space constraints, but with an interactive space there's a lot more room for labels and whatnot. I had the thought, "why just show the distribution when I could show geographically where the most rinks are?"

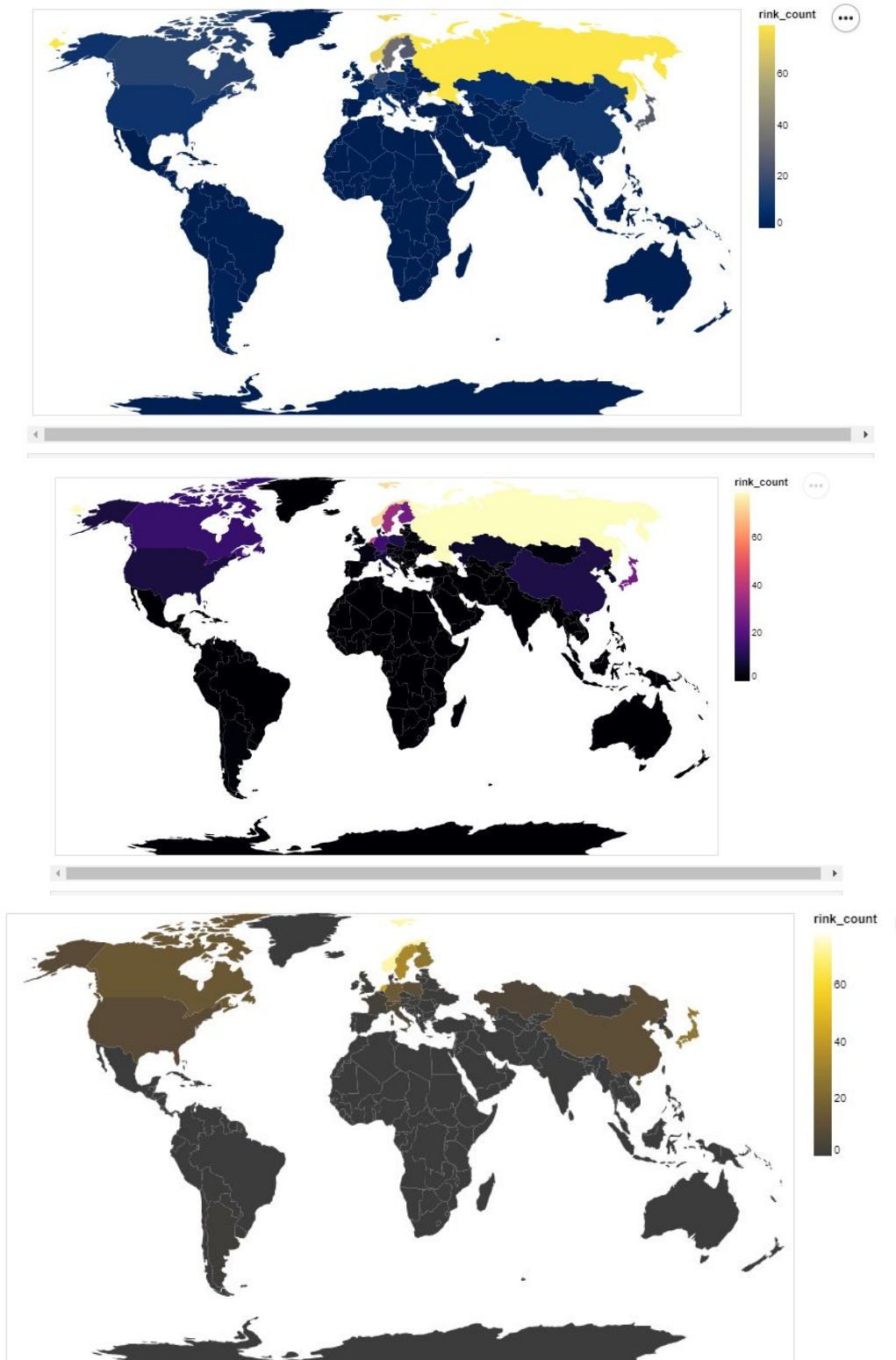
I considered doing a point map similar to this one in the altair docs:



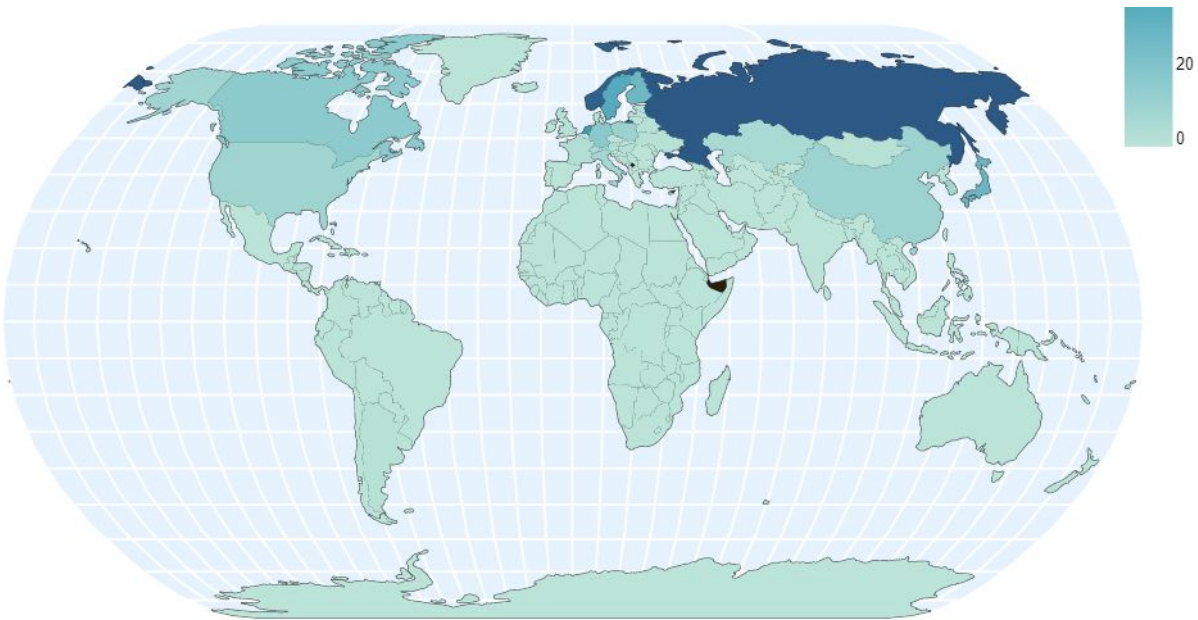
But I found it kind of hard to get all of the locations of the rinks. Plus, at a global scale the points would be too small anyways. Instead I opted for a heatmap:



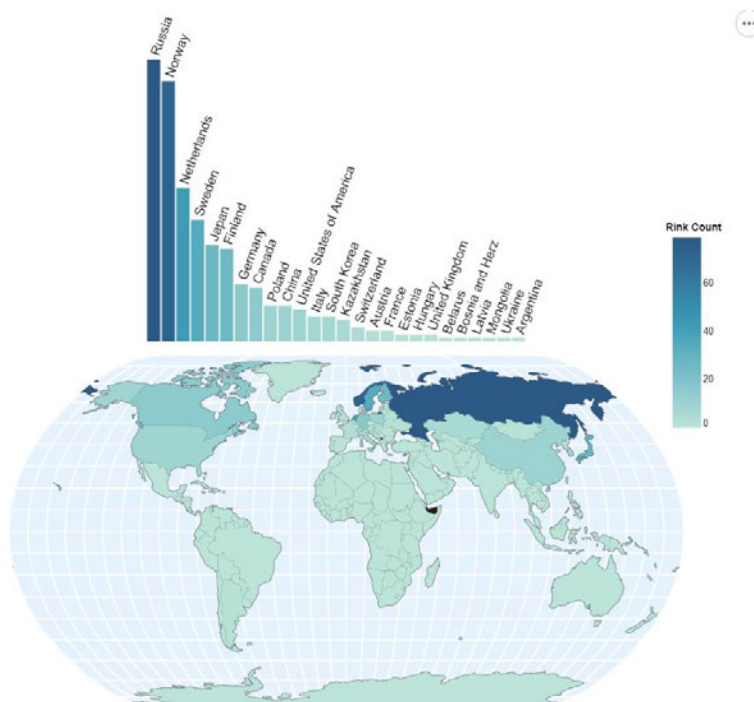
Whoops, looks like we need to include countries with 0 rinks as well. Also these colors seem a little weird for this. I tried all of these color schemes:



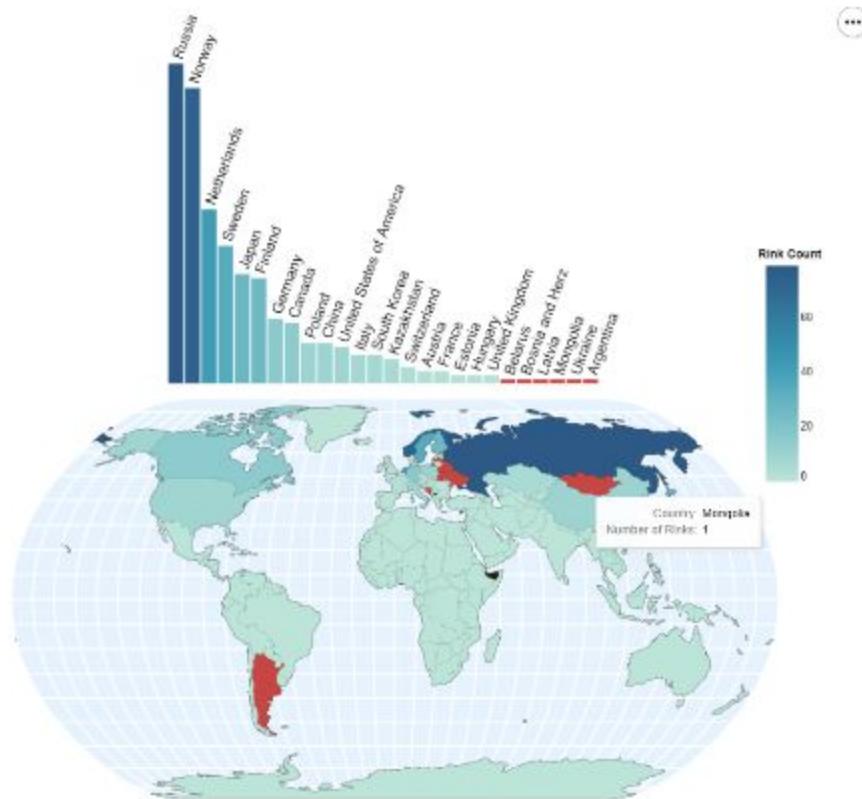
As partial as I am to the Michigan colors, it didn't feel right for these visualizations. All of these seemed kind of backwards for quick interpretation. I opted for a blue scale to go along with the theme:



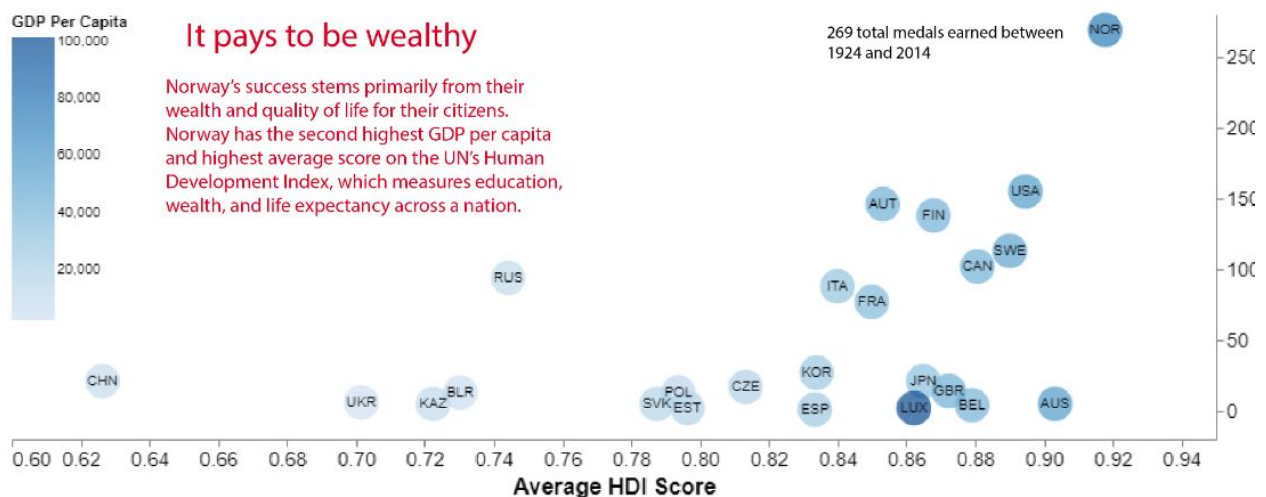
Also, the light blue grid under layer helps in distinguishing the colors. This made sense intuitively to me. I didn't want to just include the colors, so I opted to include the prior histogram with a double color encoding:



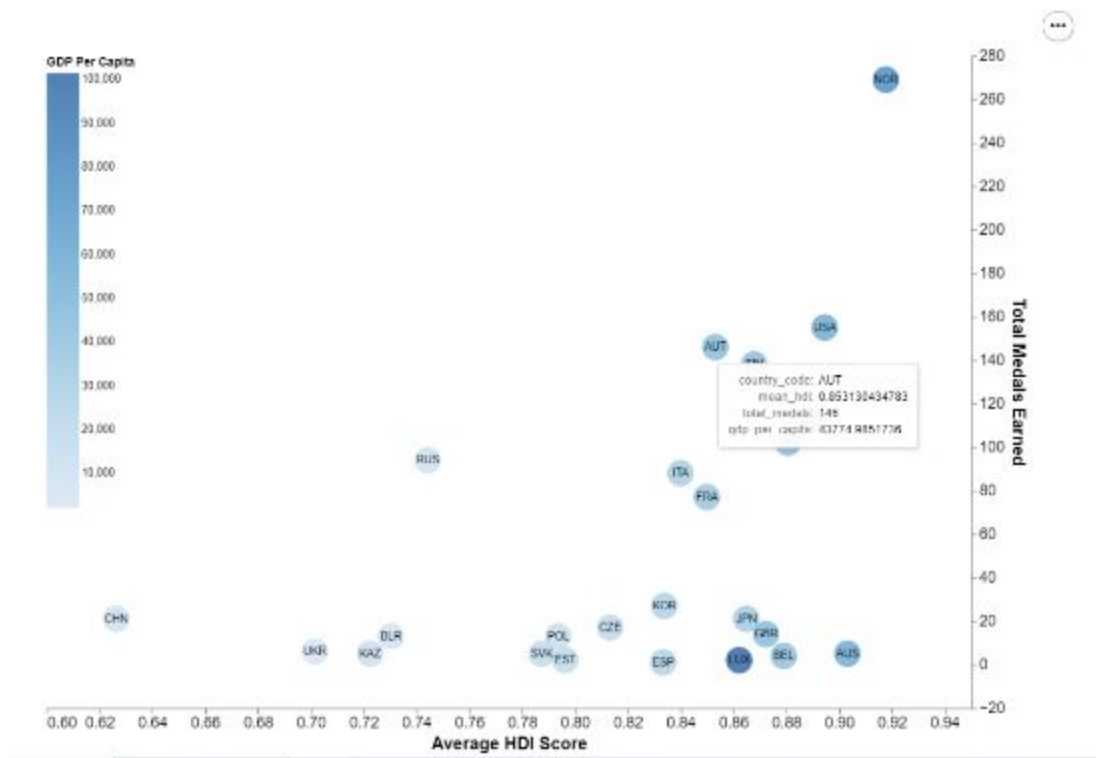
Also, axis labels weren't necessary with the legend on the right. In terms of interaction, hovering any particular country will tell you the country's name, number of rinks, and highlight all countries with the same number of rinks. I opted for a red color because it makes it preattentive to see similar countries:



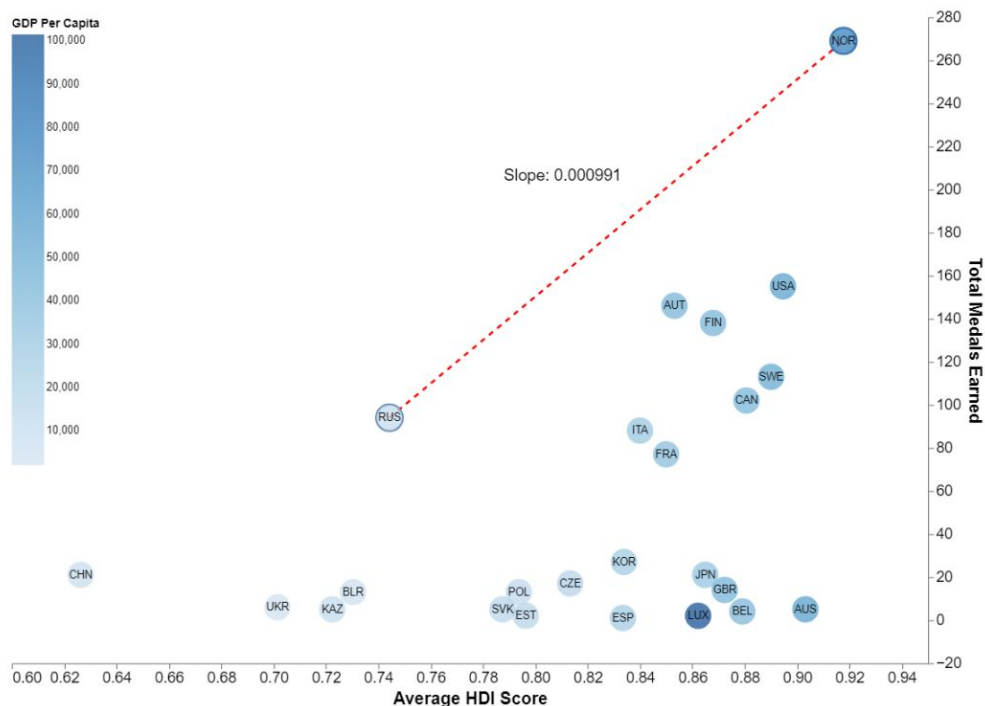
I really liked this. It seemed like a big improvement on the prior histogram. To finally hammer home that Norway is successful because of their wealth, I opted to use a modified version of my prior static vis:



Make it a little bigger, add some axis labels and a tooltip explaining each country's encoding:



To add a little more interaction, I made it so that you could click on each individual country and it shows that country's distance relative to Norway and annotates the slope with how many HDI points/medal they would need to reach Norway:



I stuck with the same blue theme and dotted red line for emphasis in comparison. With each vis in hand, I decided to make a small site. I didn't get a ton of screenshots, but my strategy is, tell a small story, have the user click a button to see the vis, then have the user interact with the vis, and repeat. This makes each interaction into a chunked format. Oh, and a little bit of color to hammer home Norway doesn't hurt either:

Norway: A Powerhouse in the North

Norway's combined medal count is higher than any other nation's. They aren't only winning bronze medals either. They win all medal types and have nearly double their closest competitor's medal count. Has their success been consistent over time?

Unrivaled

In fact, it has! Despite being a country with a population lower than the state of Wisconsin, Norway consistently manages to win more medals each year than most other countries. The dotted red line in the left time series below indicates the average number of medals earned by a country in that particular year. Selecting a country in the dropdown menu will show their performance compared to Norway and the breakdown of their medal counts over time. Why does such a small country perform so well compared to others across the globe?

Time Tested

One possible explanation is that Norway has the second highest number of facilities for winter sports in the world, second only to Russia. However, Russia has a population of 144.5 million compared to Norway's 5.3 million. With 73 facilities, Norway has a ratio of rinks to people of 71 thousand to 1, compared to Russia's 1.8 million to 1. The average Norwegian has a lot of opportunity to practice. Hovering the graph below will show you the number of rinks a country has and other countries with the same number of rinks.

Infrastructure Rich

Hovering each blue box prompts the user to click with a pointer and slight swell in box size:

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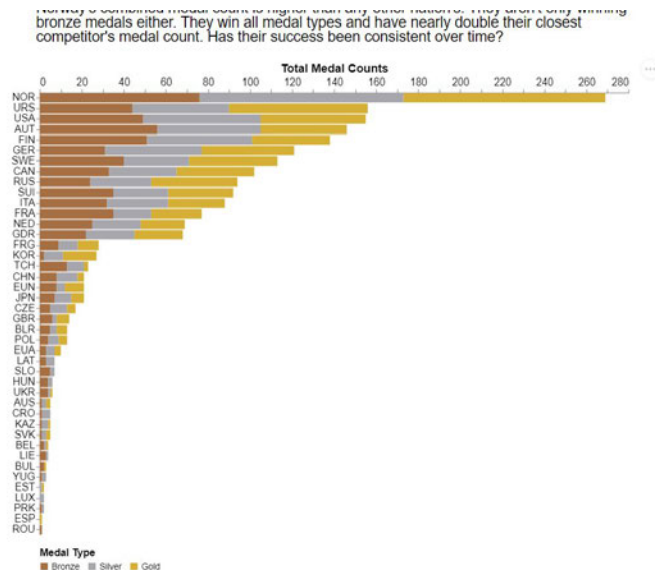
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One possible explanation is that Norway has the second highest number of facilities for winter sports in the world, second only to Russia. However, Russia has a population of 144.5 million compared to Norway's 5.3 million. With 73 facilities, Norway has a ratio of rinks to people of 7.1 thousand to 1, compared to Russia's 1.8 million to 1. The average Norwegian has a lot of opportunity to practice. Hovering the graph below will show you the number of rinks a country has and other countries with the same number of rinks.

Infrastructure Rich

Then on click the vis opens up:



I didn't capture a ton of screenshots in each test of the layout, but I eventually settled on this design. Clicking on each blue box keeps the user engaged all the way through.

Final Design

I arrived at [this](#) final design for several reasons. I believe the scrollytelling technique is very effective for hammering home my learning objectives. The consistent interaction keeps the user engaged. Although the interactions are often simple in nature, I think the series of 4 “martini” glass structured interactions encourages the user to get a deeper understanding with exploration.

I didn’t want the user to get too engrossed in any one particular visualization, so I continue the dialog instead of letting the user freely explore. Once each visualization is opened, then the user can play with each interaction to reconfigure the data as they see fit and draw their own conclusions. In addition to reconfigurations, each visualization includes elaboration of the individual points should there be any confusion with the user.

The colors of my current iteration are easy to read and all thematic in nature. Bronze silver and gold for some of the visualizations makes it easy for the user to understand in the context of the olympics. I removed any problematic areas where light on light or dark on dark text blended in with the background and chose to use red for any important highlighting in order to make that highlighting preattentive.

Finally, in terms of structure, I aligned equivalent axes and used the same scale to eliminate any confusion and removed gridlines on most visualizations in order to minimize data-ink ratio. I do think I could have done more to remove redundancy in double encoding, but where I do double encode it's to emphasize that portion of the data.

How I would evaluate my design

In the context of my four learning objectives:

1. The viewer will be able to recall that Norway leads in the total number of Winter Olympic Games medals.
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4. The viewer will be able to explain the relationship between a country’s GDP, Human Development Index (HDI), and Winter Olympics success.

I would test each of these in different ways. For learning objective 1, I would have the viewer spend a specified amount of time viewing the graphic, then take the graphic away. Then, I would ask the viewer to try to construct a ranked list of the top 3 performing countries across all years. This will test whether they were confused between the time series or barplot. I could compare those rankings across all study participants to see the average error in ranking.

For 2, I would have the viewer observe the plot and ask about Norway's performance over time. I would then ask the viewer to describe their performance on a five point scale (far below average - well above average). Then I may ask them about a few years in particular. The first question tests their overall grasp of the time series related to the mean whereas the other would test their comprehension of the distances for particular points in time.

For 3 I would ask participants about particular continents and ask them to approximate the number of rink counts for each country in that particular region as an average. Then I would measure their answer with the actual averages of each region. I would consider their understanding as pass/fail depending on a baseline measurement of accuracy.

For 4, I would give the user the set of countries represented and present them with the blank plot in the last vis. I would ask them to try and put some of those countries where they think they go and to color them according to their GDP rating. Alternatively, I could present them the plot with no labels and ask them what each axis/dimension represents. This would test the comprehension of the axes and their relationships to one another.