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Choropleth map example

A choropleth map is one of the most effective ways to visualize data across geographic regions. By shading areas such as districts, states, or countries based on data values, these maps help reveal patterns and trends at a glance. With Atlas, creating a choropleth map is simple, even if you're new to GIS tools. Follow this step-by-step guide to learn how. What Is a Choropleth Map? A choropleth map displays data using shaded or colored regions to represent different values. The shading corresponds to a dataset, making it easy to compare values across geographic areas. Examples of Choropleth Maps: Population density by region. Average income by state. COVID-19 cases per country. Land use percentage in districts. Step 1: Prepare Your Data To create a choropleth map, you'll need: Geographic Data with Boundaries: If your dataset already includes boundaries (e.g., polygons representing districts or states), you're ready to go. These files may come in formats like GeoJSON or Shapefiles. Attribute Data: If your dataset doesn't already include boundaries, you'll need a separate boundary file (e.g., GeoJSON or Shapefile) and a dataset with the values you want to visualize. These two datasets can be joined based on a shared column, like region name or code. Step 2: Log In and Set Up Your Project Log In to Atlas: Open your web browser and log in to your Atlas account. Create a New Project: Click the New Project button to start your map. Name Your Project: Give it a descriptive title like "Choropleth Map of Population Density." Step 3: Add Data and Upload Files Go to Add Data: In the top-left corner, click the Add Data button. Upload Your Data: If your dataset already includes boundaries, simply upload the file (e.g., GeoJSON or Shapefile). If using separate files, upload both the boundary file and the attribute file containing the values you want to visualize. Step 4: Style Your Choropleth Map Select the Boundary Layer: In the Layers Panel, click on the boundary layer you uploaded. Go to Standard Styling: Open the styling options for the layer and navigate to the Standard Styling section. Choose Fill Style: In the fill settings, select Style by Field. Choose the field from your dataset that you want to use for styling (e.g., population, household income, or cases per region). Adjust the Color Palette: Select a color palette: Sequential: Best for ordered data (e.g., low to high population). Diverging: Ideal for datasets with a midpoint (e.g., income relative to the national average). Qualitative: Use for categorical data (e.g., land use types). Adjust the number of steps to control how many color ranges appear on the map (e.g., 5 for broad categories, 10 for detailed visualization). Refine the Fill: Adjust the opacity of the fill color to make the map more or less transparent. Customize the Outline: Set the outline style, such as a thin white border, to separate regions clearly without overwhelming the map. Step 5: Analyze the Map Interpret Patterns: Examine the shading to identify trends. For example, darker areas may show higher values (e.g., high population density or high income). Overlay Additional Data: Add layers for context, such as infrastructure, roads, or points of interest, to compare with the choropleth map. Step 6: Add Interactivity Make your map more engaging by adding interactivity, including filters in Builder mode: Enable Pop-Ups: Configure pop-ups to show details when clicking on a region. For example: Region name. Exact value (e.g., population density or income). Add Filters in Builder Mode: Switch to Builder Mode in Atlas. Add a Filter Widget to your project: Choose the field to filter (e.g., population, income, or category). Define filter options: Range Slider: For numeric values like population or density, allow users to set a minimum and maximum range. Dropdown Menu: For categorical data like land use or income groups, let users select specific categories. Style the filter widget and position it in the interface for easy user access. Test the filters to ensure they work as expected. Adjust settings if necessary to make the filtering smooth and intuitive. Step 7: Finalize and Share Your Map Style and Polish: Add a title, legend, and any necessary labels to ensure your map is clear and professional. Ensure the filters and pop-ups are working smoothly. Export Options: Export your map as a high-quality image, PDF, or an interactive web map. Share Your Map: Use Atlas' sharing options to make your map public with a link, share it with your workspace, or embed the map directly into a website. Practical Applications of Choropleth Maps Urban Planning: Analyze population density or infrastructure needs by district. Health Studies: Visualize the spread of diseases or healthcare access by region. Market Analysis: Compare customer demographics or income levels across locations. Environmental Studies: Show land use or pollution levels by area. Tips for Creating Effective Choropleth Maps Use Accurate Data: Double-check your data for errors or inconsistencies. Choose Clear Color Schemes: Avoid overly complex palettes. Use intuitive colors for better readability (e.g., blue for low values, red for high values). Simplify Where Possible: Focus on one variable at a time to avoid clutter. Test Your Map: Share the map with a small group for feedback before publishing. With Atlas, creating and sharing a choropleth map is a powerful way to turn data into actionable insights. Whether you're using interactive filters, styling by field, or highlighting trends, Atlas helps you tell a visual story that engages and informs. Start your choropleth map project in Atlas today and bring your data to life! Follow the prompts to connect your data and create your choropleth map. You can easily customize fonts, colors, backgrounds and sizes. You can use a choropleth maps when your data are (1) attached to enumeration units (e.g., counties, provinces, countries), (2) standardized to show rates or ratios (never use choropleth with raw data/counts), and (3) you have a continuous statistical surface, in other words, you could conceptually measure the phenomena anywhere in space (n.b. 'zero' is still a valid measurement). For example, number of people is a count and not appropriate for choropleth maps; number of people per square mile is a ratio and is a continuous statistical surface (even if it drops to zero over uninhabited places, every location has a data value) and, thus, is appropriate for choropleth maps.Example datasets appropriate for choropleth maps:world map of income tax rates by countrymap showing number of births per 100,000 in 2009, reported by U.S. countymap showing the percentage change in skin cancer from 1990 to 2010 by Australian state.world map of percentage of population under 18 years old, reported by countrymap showing the percentage increase in home value from 1980 to 1990 by Canadian provinceBackgroundChoropleth maps are extremely popular, probably the most common thematic map in use today. That's good because it means your audience is likely to understand them. One reason they're popular is that much of our geodata is reported by enumeration units, such as census data, and so we are accustomed to thinking of the world as divided into spatial units like census tracts, counties, and provinces. However, most cartographers would argue choropleth maps are over-used and commonly misused if the geographic phenomena being mapped aren't intrinsically tied to enumeration units: For example, communicable diseases, soil types, or age demographics don't care much about county lines or zip codes and rarely do they change abruptly at those human-created boundaries. By comparison, tax rates are very closely tied to enumeration units, do change abruptly, and make perfect sense as a choropleth map. The less the thing you are mapping is tied to enumeration units, the less sense a choropleth map makes.Not sure you should use a choropleth map? Good alternatives include dot density maps, graduated/proportional symbol maps, and cartograms: Furthermore, while choropleth maps require that your data are standardized (rates, ratios…e.g., X per square kilometer or Y per 100,000 people), these other 3 map types can all handle raw data (e.g., simple counts, totals).Example Classed Choropleth MapBelow is a 5-class choropleth map that uses a sequential color scheme (from light to dark) attached to an equal-interval classification scheme.With sequential color schemes, it is traditional to use darker/stronger colors for larger numbers. Note that the appearance of the choropleth colors will appear to change depending on what other colors are used on the map, such as blue water or black city labels. The colors of the enumeration unit borders (county and state lines here) also have a very large impact on the look of the map, so experiment with both fill and stroke color combinations. You may even decide to not draw those enumeration unit borders (no stroke, just fill). Note: it may be harder for your audience to locate places on the map without those borders. For a more complete discussion of color in thematic mapping, have a look ColorBrewer.Number of Data ClassesIf you want to be safe, make a map with 3–7 data classes. Of course, your goals and data should also play into this decision: For example, political maps in the United States often have only 2 classes (the well-known red state / blue state maps) or a map that wants to simply highlight places above and below a national average.The more classes you use, the less data generalization (which is good), but this comes at the expense of legibility and the associated risk of map reading errors since more colors are harder to see and print reliably (which is bad). The key question is how much generalization do you want? A map with 3 classes/colors (e.g., low, medium, high) will be easy to see and remember, but may gloss over some very important aspects of the data and create artificial geographic patterns by lumping together many places that are in fact quite different. There is no ideal number of classes for a map, so experiment.Not sure how many classes to use? Have a look at the distribution of your data in a histogram (see examples below): Are there obvious clusters within your data? Are there large gaps in your data range that suggest nice compact data classes? If so, pick that number of classes and place those class breaks around those clusters.Classification MethodJust as there is no single correct number of classes, there is no single best way to classify you data into ranges. Look at a histogram (or scatterplot) to determine the 'form' of your observations. Above all else the goal of data classification is to put places with similar rates in the same class, and separate places with very different rates into different classes.The form of this histogram suggests that 3 or 4 data classes seem most appropriate. Lacking any other insight, the "dips/gaps" suggest natural places to break the data.EQUAL INTERVAL divides the data into equal size classes (e.g., 0-10, 10-20, 20-30, etc.) and works best on data that is generally spread across the entire range. CAUTION: Avoid equal interval if your data are skewed to one end or if you have one or two really large outlier values. Outliers in that case will likely produce empty classes, wasting perfectly good classes with no observations in them. Since the hotel data above doesn't have really large outliers, this is a data distribution that works well with equal interval.QUANTILES will create attractive maps that place an equal number of observations in each class: If you have 30 counties and 6 data classes, you'll have 5 counties in each class. The problem with quantiles is that you can end up with classes that have very different numerical ranges (e.g., 1-4, 4-9, 9-250…the last class is huge). Quantiles can also separate locations with very similar rates and group together places that have very different rates, which is very undesirable, so use the histogram to see if this is happening. CAUTION: In the hotel room example above, the quantile produced a questionable class break by lumping a portion of the third cluster back into class 2, despite it being much closer (numerically) to the other observations in classNATURAL BREAKS is a kind of "optimal" classification scheme that finds class breaks that (for a given number of classes) will minimize within-class variance and maximize between-class differences. One drawback of this approach is each dataset generates a unique classification solution, and if you need to make comparison across maps, such as in an atlas or a series (e.g., one map each for 1980, 1990, 2000) you might want to use a single scheme that can be applied across all of the maps.MANUAL There are many times we need to manually set one or all of the class breaks. For example; Are there important break points that need to be "hardwired" into your class breaks? Does one of the class breaks need to be the mean? Is this map part of a series that needs the same classes across all of the maps (so that the colors always refer to the same numbers on any map)? Do any of the other methods get you close to a good solution that could be improved with a few slight adjustments those classes? If so, do not hesitate to set these class breaks yourself.Unclassed Choropleth MapsUnclassed choropleth maps are an attractive alternative to traditional classed choropleth maps, although their merits have been hotly debated within cartography and 30+ years of testing has revealed both their strengths and weaknesses. First proposed by Waldo Tobler in the early 1970s, proponents of these maps like that they avoid the messy (and nearly always imperfect) problem of having to lump our data into classes (e.g., 0-10, 11-20, .21-30, …). Critics of traditional, classed choropleth maps say that data classification is a very powerful form of data filtering that drowns out important details on the map, is easily abused to change what the map says, and is often taken for granted by map readers. Unclassed maps side-step this problem by "letting the data speak for itself" and allowing even subtle differences between places to emerge as subtle differences in color.With unclassed choropleth maps, each unique data value gets a unique color: For example, the unemployment figures for the 50 US states would be ranked from lowest to highest and placed along a continuous color ramp from low to high (see below). If, for example, there is a big numerical gap/jump from the state with the 3rd highest unemployment to the one with the 2nd, there'd be a correspondingly larger jump in color - the data are arranged proportionally along the color ramp.Example Unclassed Choropleth MapIn the map below, notice how you can easily see a large geographic pattern of unemployment rates, but it is very hard to compare or rank counties: try to accurately arrange the counties in California from lowest to highest…it's nearly impossible.LimitationsThere are at least three major drawbacks with unclassed choropleth maps. First, while the idea of letting our data speak for itself is appealing we often find it has too much to say. Cartographers have long relied on classification to suppress random noise or insignificant variations to highlight large, major differences. For example, a very simple 2-class map of unemployment (using only 2 colors) would quickly show whether a place is above or below the national average; more detail than that might be unnecessary. Second, extensive, careful user testing has shown that people have a very hard time matching colors on unclassed maps with colors in the legend since they may contain hundreds of subtly different colors that are easily confused with each other. This makes it very hard to estimate values or get specific numbers from the map (e.g., Is Belgium slightly darker or lighter than Syria?). Third, unclassed maps with their many subtly different colors often print very poorly, especially on low-end printers. Although the map may use 50 different shades of red, your printer (and possibly even your monitor) aren't up to that task. Sadly, thanks to simultaneous contrast, neither are your eyes.Our Recommendations Unclassed ChoroplethWe use unclassed choropleth maps whenever we want a less filtered view of our data, when we can't find a good classification scheme that does the data justice, and/or when we're making the map specifically to highlight overall geographic patterns. However, we don't use them if it is critical that folks be able to "get numbers off the map" or very carefully compare one location to another. If people need to get numbers off the map and your map is static/printed preventing people from clicking on it to retrieve rates (as they might on an interactive map), you might be better off using a classed choropleth map.Our Recommendations Classed ChoroplethWe use classed choropleth maps when we have data attached to enumeration units and want to show both overall geographic patterns and to make it relatively easy on our map readers to extract specific data rates from the map. While classification introduces subjectivity to our work (e.g., since there is no single best number of classes or way to create those classes) and eliminates some details because it groups data into classes, classed choropleth maps are nonetheless a very popular and reliable way to represent the world. In 1832, cholera broke out in Paris. Back then, there was not a single choropleth map in plain sight. Two years later, an official commission presented a report on the epidemic, including a shaded map. It used 5-6 shades to represent the number of losses out of every 1,000 people. This was the first officially used choropleth. It was immediately popular, bringing its inventor prominence and a permanent place in history. Choropleths remain useful in public health, economics, and politics. The onset of Covid-19 made them the foremost data visualization tool for informing the public. Choropleths can track everything from what sidewalk is safest to walk on to which stores have masks available. Choropleth Map: An Explainer A choropleth map is a data visualization tool that visually shows certain qualities within a defined geographic area. It uses colors, patterns, shading, or symbols proportionate to statistical variables. Choropleth maps are used to pair data with its geographic location. They only work when the data set includes location-specific data such as the zip code, county, state, or even country. Choropleth maps are a popular way of interacting with location-specific data. Users can use them to evaluate trends within one area or for regional comparisons. Regional patterns and themes are easily seen since the data is categorized and displayed in the correct map location. Crowd-sourced open data sets make building them more accessible. Choropleth maps have many use cases, particularly for visualizing socioeconomic or climate data. Common Use Cases for Choropleth Maps Population Data Population density is one of the most basic ways a choropleth map is used. This is a staple way to evaluate simple information quickly. Choropleth maps are incredibly useful for more complex socioeconomic factors. They're used to visualize issues like unemployment, crime, school performance, and religious affiliation. Politics Political information is often mapped out geographically. Political campaigns use it to strategize, and the media uses it for visual reporting. Development Indicators Choropleth maps provide an overview of location-specific economic data, such as per-capita income, household food levels, and wealth distribution. The World Food Programme uses a choropleth to track global undernourishment and chronic hunger levels. Public Health Public Health relies on choropleth maps as a core tool. Regional life expectancy, health outcomes, risk factors, health disparities, birth weight, and general conditions need to be mapped out. Currently, choropleth maps are heavily relied on for visualizing up-to-date Covid-19 information. Publicly available choropleths use machine learning to analyze real-time, globally sourced information. Research organizations, scientists, medical professionals, public health officials, journalists, and the public can access this for their purposes. When combined with cloud-connected medical devices, people can monitor real-time public health. Health tech companies use choropleths to display their user results. Medtech devices that monitor fevers create real-time hot spot choropleths. Alternatively, choropleths help manage medical overflow by showing areas of reduced activity. Weather, Climate, and Land Choropleth maps generate informative reports from statistics like rainfall distribution, soil condition, per capita crop production, forest cover, recreational land availability, plant biodiversity. They can also show the effects of weather across populations. Sentiment and Psychology We can geographically map out the sentiment thanks to artificial intelligence, machine learning, and public social media. This can enhance political campaigns, support marketing, and monitor for bots. Benefits of a Choropleth Map Choropleth maps have several benefits that stakeholders may find in handy for certain situations. Here are some of those advantages: User Friendly: Choropleth maps are easy to use, interactive, and fun. This makes them quite commonplace, and most people are already familiar with them. The information is generally clear. Comparing Area Differences. Choropleth maps excel when there are clear differences between areas. Contrasting Data: High impact contrasts in the overall data set can easily be seen. Summarizing: A choropleth map will give a concise overview of when large geographical swaths need to be evaluated. Disadvantages of a Choropleth Map Drawbacks of choropleth maps come from critical data evaluation to arbitrary boundaries, along with how variable the represented conclusions can be. Artificial Data Representations. The biggest limitation is how unrealistic it is to restrict data within set boundaries. When mapped results are artificially cut off, we can draw incorrect assumptions. We all know that we can't always represent age demographics well in choropleth maps. Misrepresented Impact. If a single color represents a single data value, larger areas can be perceived as more dominant than smaller areas with the same representation. Subjectivity: Data for choropleth maps can be classified in many ways. Each classification type will influence how the data is perceived. The person who prepares the map has a great deal of control over its interpretation. The mapmaker can easily create false data portrayals. Over-Generalization: These maps aren't great at showing small variable differences, distinguishing fluctuations, or providing total values. They also aren't good choices for conducting detailed analysis. Visual Difficulties. Choropleth maps can be hard to read if the colors and shades are too similar. The visually impaired may not be able to use them at all. How Can DashboardFox Help With Your Choropleth Map Needs? Here's the good news, DashboardFox includes the ability to create Choropleth maps! Example of a Choropleth map in DashboardFox Out of the box, DashboardFox includes many types of maps from all over the world, and if your region is not available, a simple message to our support team can typically get it added quickly. As with the rest of DashboardFox, the ability to create a Choropleth map is codeless. Via our config panel, you can define your colors, you can define value ranges to color codes if desired, and you can define hover reports to show users specific statistics when they hover over a portion of the map, as well as drill-down reports if a user clicks on a specific map. DashboardFox even supports country-level to state map drill-downs (for the US). Once created, maps can be included in dashboards, scheduled, shared via public view links, and all the other features included in DashboardFox apply. Compared to its counterparts in the market today, DashboardFox might have the shorter end of the stick when it comes to built-in visualizations. Still, we think this is a positive because we focus on a core set of graphs and charts that everyone in the industry can easily understand. DashboardFox's simple and no-frills approach is proven to be sustainable and efficient in the long run, as it helps save you time, money, and manpower. Feel free to reach out to us, or better yet, we can give you a free live demo to see what wonders we can contribute to your business without all the frills and fringes. After all, fringe is already out of fashion. Facebook X (Twitter) LinkedIn More Choropleth maps use shading to represent data values for different geographic areas, such as local authorities.They are the standard way to we show data values geographically.An example of a choropleth mapWhen to use a mapConsider a map if you have data values for geographic areas and the pattern in the data you want to show is primarily geographic, such as north versus south or urban versus rural.Having geographic data does not automatically mean a map is the best choice, if there is little geographic pattern in the data, the map may appear noisy and fail to help users interpret the data.Avoid using a map if you only have data for a few geographic areas, such as the four nations of the UK or the nine regions of England. In these cases, a bar chart or another chart type could allow for easier comparison of values.An example showing comparisons between values can be more easily made on a bar chart than a mapUse standardised ratesChoropleth maps should display data as standardised rates, not absolute values.For instance, use the unemployment rate (percentage of the population unemployed in each area) rather than the total number of unemployed people in each area. Using absolute values can be misleading because they are distorted by the size of the area.In most cases, data should be standardised by population. In some cases, data can be standardised by area. For example, the rate per square kilometre can be used for land use data.Showing change or differencesTo visualise changes between two time periods, consider calculating the rate of change and display it on a single map. This is generally easier to interpret than using two separate maps for different time periods.This is an example of a derived variable. See the What data to include guidance (opens in a new tab) for more information.An example of a choropleth map showing change between two time periodsGeographic levelGenerally, map data should be represented at the most detailed geographic level available, unless this level poses risks of disclosing sensitive information or has data quality issues.If your analysis focuses on a broader geographic level, such as local authorities, aggregate the more detailed data accordingly.Colour palettesChoropleth maps should use colour scales to represent data values.Depending on the data, use either a sequential palette (ranging from low to high values) or a diverging palette (with two contrasting colours diverging from a neutral midpoint).Number of colour bandsTypically, use a scale with five discrete colour bands for choropleth maps.A diverging colour scale can include up to six colours.Avoid using a fully continuous colour scale or too many bands as this can make it difficult for users to differentiate and interpret values.Setting breaksBreaks determine the range of values represented by each colour band. To enhance readability, you can round the break intervals to the nearest whole number or round number.The standard method we use for setting breaks is the Jenks natural breaks (opens in a new tab) , which creates an effective visualisation with most datasets.In specific situations, you can set breaks using different methods or define specific values, such as to differentiate areas above or below zero.AlternativesIf a map does not clearly show patterns in the data, consider alternative chart types.For example, use a scatter plot to show a relationship or a bee swarm chart to illustrate distributions.