

Unit Charts Are For Kids

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Just as pie charts work well for teaching children the concept of fractions (but not for displaying parts of a whole in a discernible manner), unit charts might be useful for teaching children to count, but for anyone older than a 1st grader they're not particularly effective. What is a unit chart? The term might not be familiar, but you've probably seen them many times. Here's a typical example:



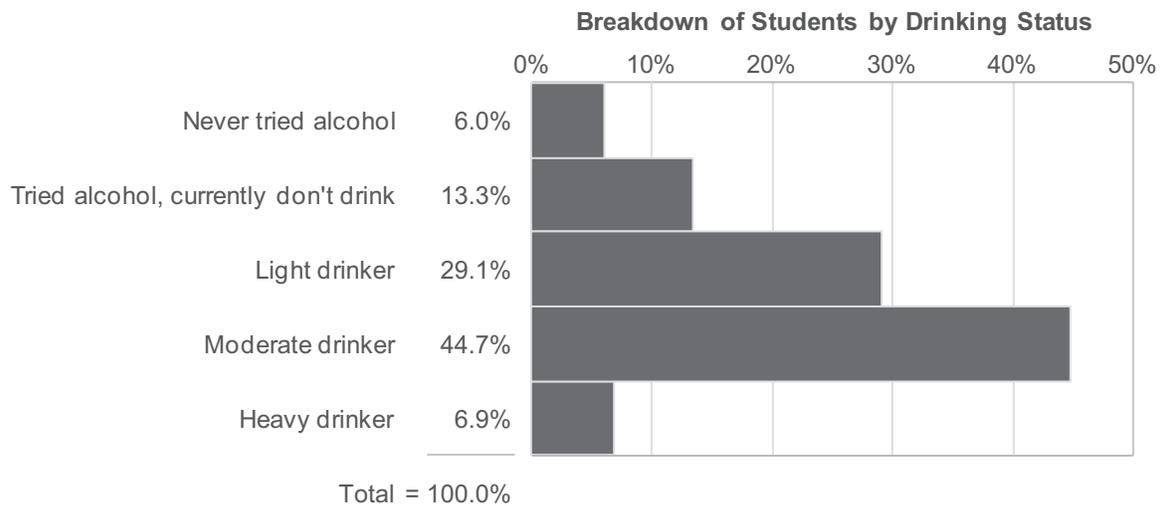
Source: E. J. Fox, from a larger infographic titled "#1 Party School", based on data from "The Partnership Campus & Community United Against Dangerous Drinking Annual Assessment Report 08-09"

According to Robert L. Harris in *Information Graphics: A Comprehensive Illustrated Reference*, a unit chart is defined as follows:

A chart used to communicate quantities of things by making the number of symbols on the chart proportional to the quantity of things being represented. For example, if one symbol represents ten cars and five symbols are shown, the viewer mentally multiplies ten times five and concludes that the group of symbols represented 50 actual cars. Simple geometric shapes or irregular shapes such as pictures and icons are generally used. Each provides basically the same degree of accuracy. When the symbols are geometric shapes, the chart is occasionally called a black chart. When pictures, sketches, or icons are used, the chart is often referred to as a pictorial unit chart. Unit charts are used almost exclusively in presentations and publications such as newspapers, magazines, and advertisements. (p. 427)

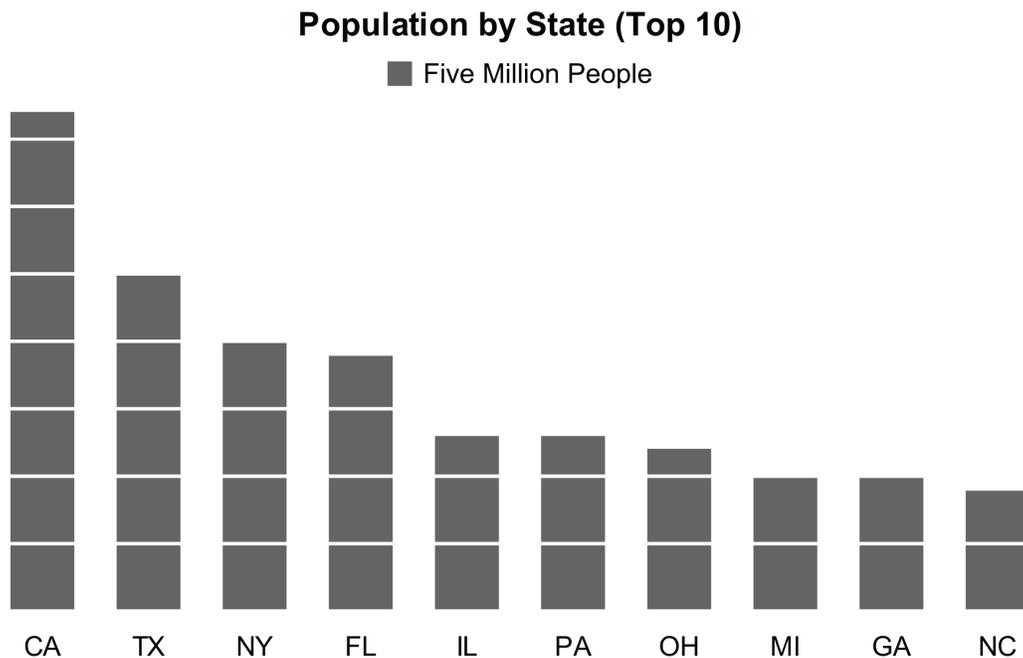
In the example above, a 10x10 matrix of dots with one missing, totaling 99, was used to display student self-reported drinking habits. Each dot represents 1% out of 100% of students. Although the numbers add up to 100% exactly, the designer chose to ignore the decimals in all cases but "Heavy Drinker," which he rounded up from 6.9% to 7%. Had the designer rounded all numbers either up or down, as appropriate, the number of dots would have totaled 100.

If you were a 1st grader who was interested in student drinking habits, this form of display would give you the chance to understand the data while practicing your counting skills. Of course, relatively few 1st graders are going to find this information useful. This chart was designed for adults—folks who don't usually need to practice counting. Here's the same data displayed as a bar graph.



Now, rather than counting, we can more easily and efficiently use our eyes to compare the lengths of the bars because visual perception is well-tuned to compare the lengths of objects that share a common baseline, such as these bars, with speed and precision. So why would we ever use unit charts to display quantitative data? For some reason journalists seem to love them. Something about their conceptual simplicity seems to appeal to them, perhaps due to a low opinion of their readers' intellectual skills.

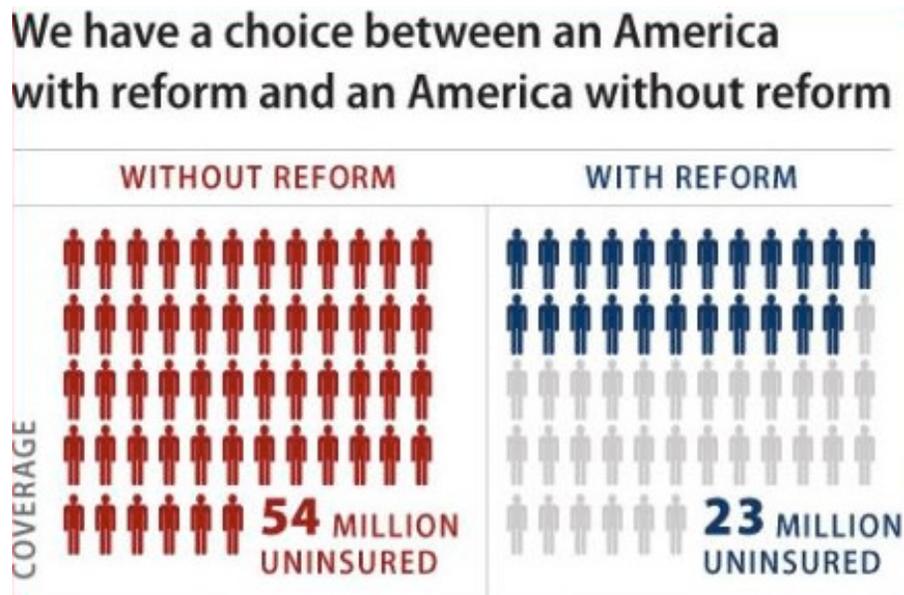
The simplest form of a unit chart displays a single row or column of units, rather than a matrix of both as we saw in the previous example. As you can see, a one-dimensional unit chart is simpler to read than a two-dimensional version.



Given improved ease of use, are one-dimensional unit charts worthwhile? We can read them much as we read bar graphs, with one minor difference—the segmentation of values into units inclines us to slow down and count, as opposed to the simpler, faster task of comparing their overall heights and then decoding their

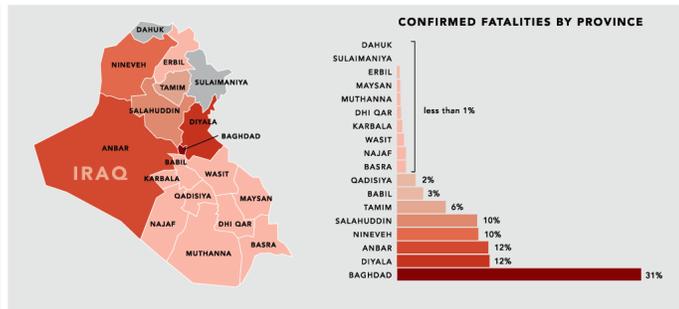
values in relation to a quantitative scale, which is missing. Not a big problem, some might argue, but significant enough to discourage their use when better means are available. This example illustrates the common practice of including partial units—in this case rectangles with less height than a full unit—to represent partial quantities. For example, in this chart state populations have been rounded to the nearest million people, reducing the heights of those uppermost rectangles that represent less than five million people.

As Harris pointed out in his definition, unit charts come in two basic types: those that use geometric shapes such as rectangles or circles, and those that use irregular shapes such as pictures or icons. Here's an example of the latter:



This simple icon that represents one or more people (in this case 1 million) is a staple of infographics. Although, by using this familiar icon the reader is instantly clued into the fact that people are the subject of the display, the values cannot be discerned without counting the icons or more simply reading the numbers (for example, 54 million uninsured). Because we cannot pre-attentively compare counts that exceed three or four objects at most, we're forced to abandon rapid visual perception and rely on slower methods of discernment—counting or reading.

Sometimes the icons and their arrangement are much too complex, such as the example on the next page of soldiers and fatalities in Iraq.



Source: *New York Times*, January 6, 2008

Unit charts are sometimes used to tell complex stories that could be more simply and effectively told using a variety of chart types. Notice how difficult and time-consuming it is to digest the following story about the homeless.

Getting to Know the Homeless



TRANSPARENCY Graphical explorations of the data that surrounds us
 A collaboration between GOOD and OFFICE BY CC

SOURCES National Coalition for the Homeless; The United States
 Conference of Mayors; U.S. Department of Housing and Urban
 Developments; University of Pennsylvania Health System

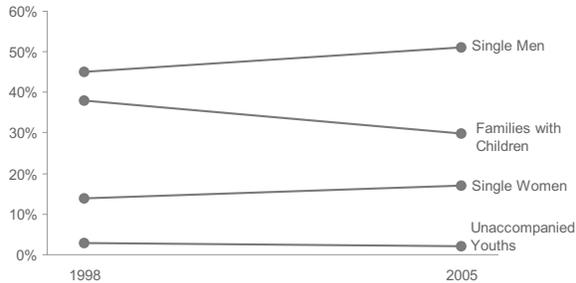
COST/BENEFIT Cost of one homeless person to taxpayers per year:
 \$40,500. Cost of supportive housing for one homeless person per year:
 \$41,494

A simple redesign of this infographic tells the story in terms that are much easier to read and digest, as shown on the following page.

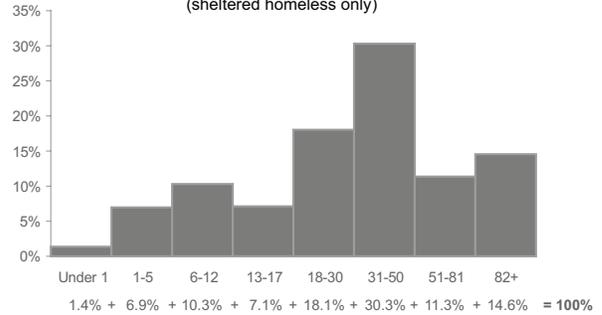
Getting to Know the Homeless

Over the course of one year, 3 million Americans (1% of the entire population) will be homeless for at least one night. On any given day, an average of 744,313 people are homeless.

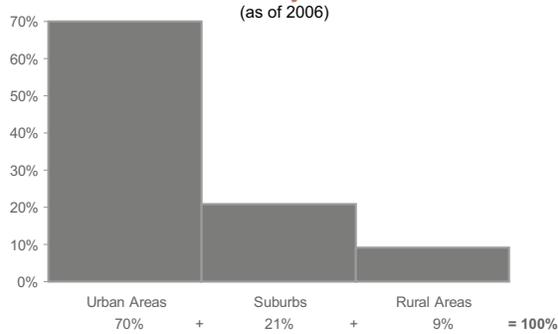
Changing Homeless Composition



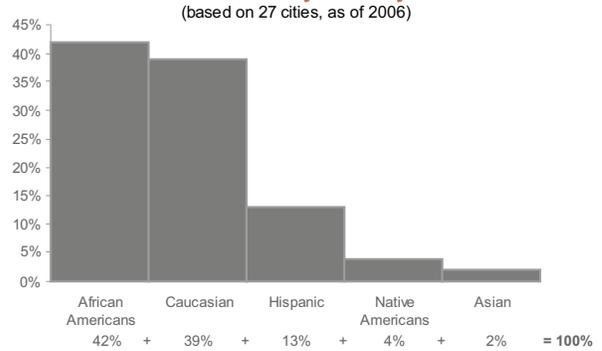
Homeless by Age (sheltered homeless only)



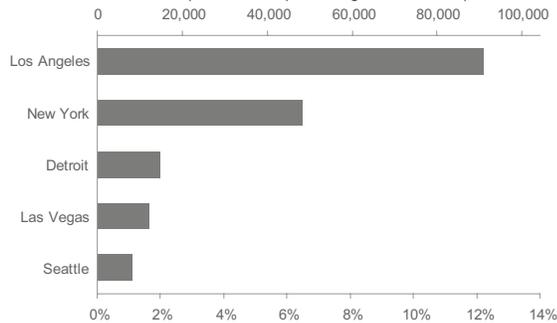
Homeless by Location (as of 2006)



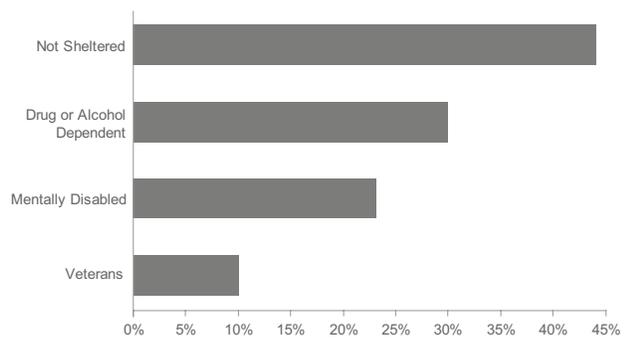
Homeless by Ethnicity (based on 27 cities, as of 2006)



Homeless in the Top 5 Cities (number and percentage of homeless)



Miscellaneous Facts About the Homeless



All percentages refer to a portion of the entire homeless population, except those corresponding to age groups, which represent only the sheltered homeless. All information is valid as of 2005, unless otherwise indicated.

Non-human icons can be used, of course, but they often get silly. Here's one that suggests simplicity by using icons that would appeal to primary school children, but it would be far from simple to get meaningful information from it.

The Best Way To Measure Student Performance

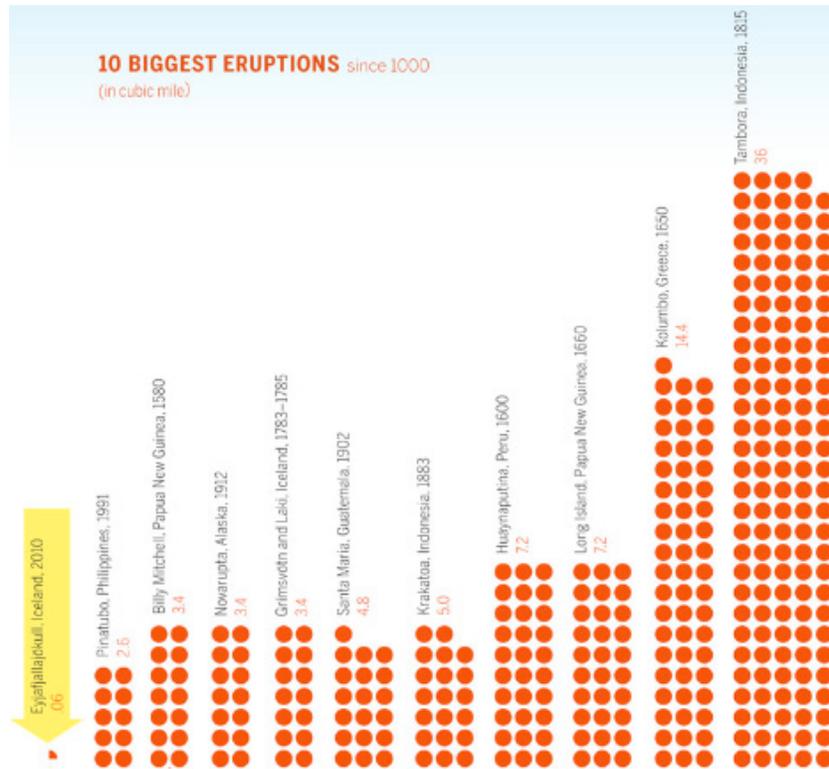
From standardized tests to graded homework, there are any number of ways to try to judge how students are performing academically. For teachers, who are often judged on their students' academic achievements, finding the best measurement is of especially great importance. These are teachers' responses to being asked which forms of student evaluation they feel are most useful.



A COLLABORATION BETWEEN GOOD AND KISS ME I'M POLISH, IN PARTNERSHIP WITH THE BILL & MELINDA GATES FOUNDATION. SOURCE: PRIMARY SOURCES: AMERICA'S TEACHERS ON AMERICA'S SCHOOLS



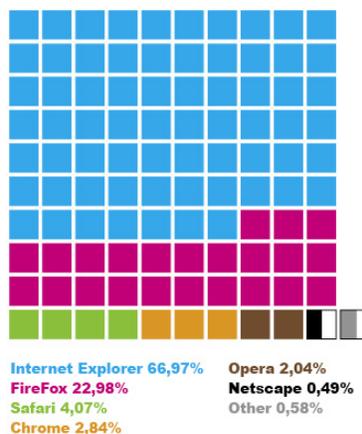
Unit charts are often complicated by the existence of irregular numbers of columns, rows, and items within them. The next example, from a larger infographic depicting volcanic eruptions illustrates this problem:



Source: Steven Dutch, Natural and Applied Sciences, University of Wisconsin – Green Bay; Geocodezip.com; Oxford Economics; United Nations Population Division; U.S. Geological Survey. A collaboration between GOOD and MGMT design.

The columns of units range from one for Iceland on the left to five for Indonesia on the right, and the number of units per row sometimes fill the columns (for example, Papua New Guinea) and sometimes fill only a portion of them (for example, Greece). This makes it impossible to compare the size of eruptions to get even a rough sense of the differences by comparing the heights of the separate series. This forces us to either count, read the numbers, or do our best to compare the areas formed by each, which we can do poorly at best.

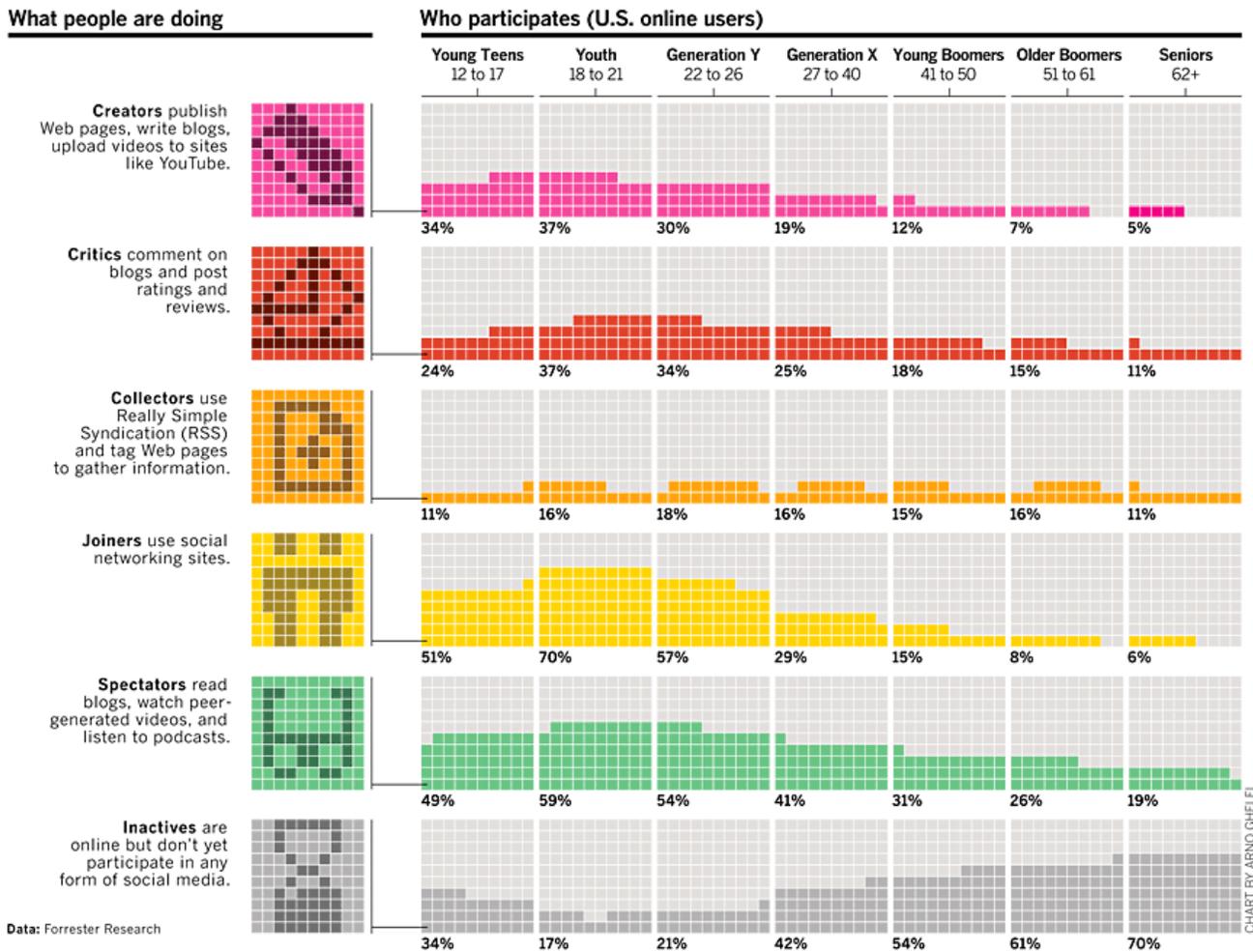
Although unit charts are often used to compare discrete items, such as the size of volcanic eruptions above, they are perhaps more often used to display part-to-whole relationships. Here's a relatively simple example of Web access by browser:



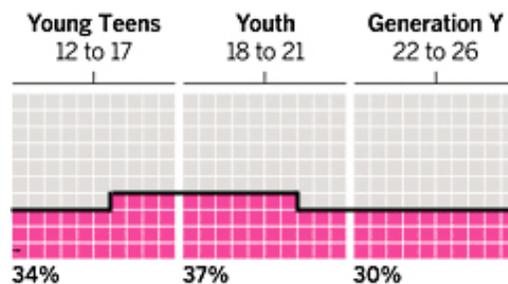
Source: <http://datavisualization.ch>

Once again, we're forced to count, read the numbers, or do our best to compare the areas, none of which can be done efficiently, and in the latter case cannot be done with precision.

Sometimes unit charts are used to display frequency distributions, designed to emulate histograms, as shown in the following example:



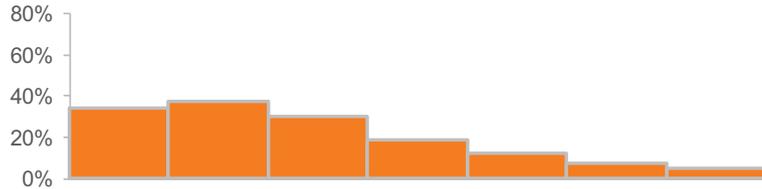
The first thing you probably noticed about this infographic is the column of useless icons that appear to the right of the labels (Creators, Critics, etc.). Pictures and diagrams can add value to an infographic, but these icons don't. The bigger problem, however, is caused by the fact that rows often differ in the number of units that they display, sometimes positioned to the left (for example, Inactive Young Teens, with four units), sometimes to the right (for example, Inactive Generation Y, with one unit), and even sometimes split between the left and right with a gap in the middle (for example, Inactive Youth, with eight units), which makes it hard to read this like we would read an actual histogram. It also presents patterns that don't actually exist when we try to read this as we would a normal histogram. For example, the following arrangement of units leads us to associate values between the Young Teens and Youth intervals that are four units high and values between the Youth and Generation Y intervals that are three units high (outlined in black)—seducing our eyes to see a pattern that is erroneous.



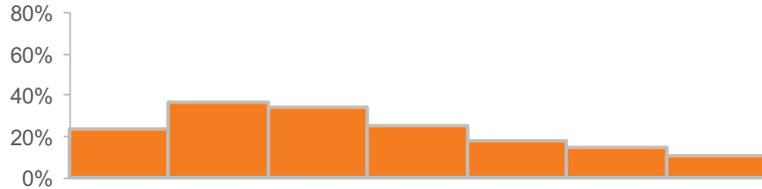
Notice how much easier it is to compare the frequency distributions when displayed as normal histograms.

How People Participate in Social Media by Age Group

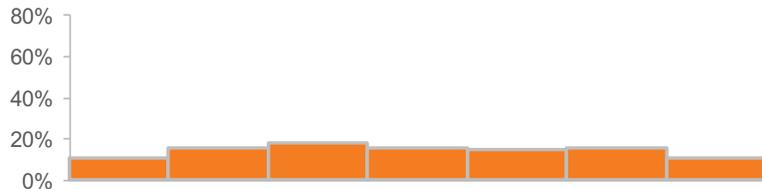
Creators publish Web pages, write blogs, upload videos to sites like YouTube.



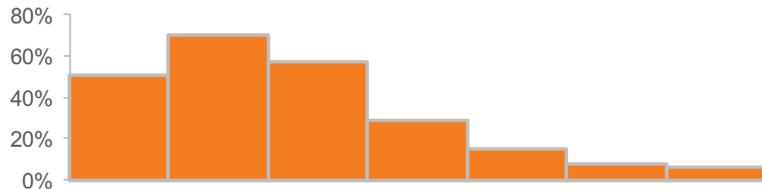
Critics comment on blogs and post ratings and reviews.



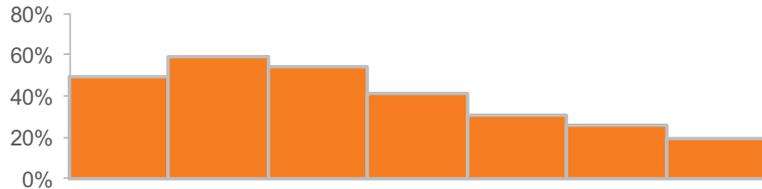
Collectors use Really Simple Syndication (RSS) and tag Web pages to gather information.



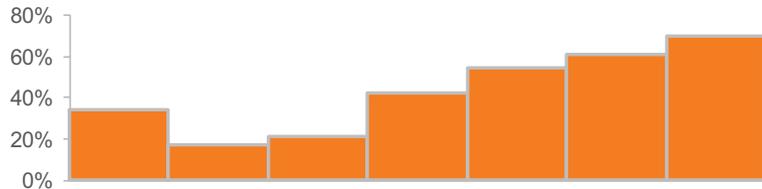
Joiners use social networking sites.



Spectators read blogs, watch peer-generated videos, and listen to podcasts.



Inactives are online but don't yet participate in any form of social media.



12-17 18-21 22-26 27-40 41-50 51-61 62+
 Young Youth Gen. Y Gen. X Young Older Seniors
 Teens Boomers Boomers

It's hard to imagine situations, other than charts for young children, when unit charts would offer an advantage over more standard forms of display, especially bar graphs. This critique will not discourage their use by infographic designers that care mostly for graphical appeal and little for meaningful communication, but I hope that those who focus on actually communicating information in meaningful ways will be inclined to eliminate them from their library of charts.

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About the Author

Stephen Few has worked for over 25 years as an IT innovator, consultant, and teacher. Today, as Principal of the consultancy Perceptual Edge, Stephen focuses on data visualization for analyzing and communicating quantitative business information. He provides training and consulting services, writes the quarterly *[Visual Business Intelligence Newsletter](#)*, and speaks frequently at conferences. He is the author of three books: *Show Me the Numbers: Designing Tables and Graphs to Enlighten*, *Information Dashboard Design: The Effective Visual Communication of Data*, and *Now You See It: Simple Visualization Techniques for Quantitative Analysis*. You can learn more about Stephen's work and access an entire [library](#) of articles at www.perceptualedge.com. Between articles, you can read Stephen's thoughts on the industry in his [blog](#).