Designing better CHARTS & MAPS

Alberto Cairo, School of Communication, University of Miami
Hi #TurningTheTide, here are the slides I used today:
https://www.dropbox.com/s/l3fhh1szr6bcvrrp/ColumbiaTurningTheTide.pdf?dl=0

Who's in this photo?
A visualization is a representation designed to enable **exploration**, **discovery**, or **communication**.
It’s easier with a visualization

Michael E. Mann, Raymond S. Bradley, and Malcolm K. Hughes
Intergovernmental Panel on Climate Change (IPCC), Third Report, 2001

Alberto Cairo • University of Miami • www.thefunctionalart.com • Twitter: @albertocairo
VISUALIZATIONS ARE EVERYWHERE NOWADAYS...
To learn how to design better data visualizations, it’s necessary to understand what data visualizations are made of.
A FRAMEWORK

ONE OR MORE VISUAL ENCODINGS

ANNOTATIONS
MURDERS
Rate per 100,000 people (2015)
Source: FBI Uniform Crime Reports

MURDERS
Rate per 100,000 people
Source: FBI Uniform Crime Reports

Source: FBI Uniform Crime Reports
Hans Rosling  www.gapminder.org
FACTFULNESS

Ten Reasons We’re Wrong About the World—and Why Things Are Better Than You Think

Hans Rosling, with Ola Rosling and Anna Rosling Rönnlund

Copyrighted material
Visual encoding

**Length or height**

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**Position**

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**Angle/area**

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**Line weight**

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**Hue and shade**

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Figures represented in all these graphics: 22%, 25%, 34%, 29%, 32%
https://www.schemadesign.com/work/searching-for-health
http://www.searching-for-health.com/
Many tools—many of them free and easy to use
Hi #TurningTheTide, here are the slides I used today:
https://www.dropbox.com/s/l3fhh1szr6bcvxp/ColumbiaTurningTheTide.pdf?dl=0

Who's in this photo?

THANKS!
EXPLORATION

Alberto Cairo, School of Communication, University of Miami
Never trust summary statistics alone. Always visualize your data.
A little exercise with InZight

https://www.stat.auckland.ac.nz/~wild/iNZight/index.php
## Schools in Miami-Dade County

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Distribution of SchoolGrade

This looks fishy…
Why no students pass Math tests in these schools?

What about this school?

Why no students pass reading tests in these schools?
Potential interesting clues
More and more tools —many of them free and easy to use
CHOOSING THE RIGHT VISUALIZATION

Alberto Cairo, School of Communication, University of Miami
Length or height

Position

Area

Angle/area

Line weight

Hue and shade

Figures represented in all these graphics:
22%, 25%, 34%, 29%, 32%
What methods of encoding can you spot here?

The Diversity of US Newsrooms

The Newsroom Employment Diversity Survey measures the percentage of women and minorities working in newsrooms nationwide.

https://polygraph-cool.github.io/asne/dev/

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Always think about the purpose of a graphic

Figure 2 - Main nationalities of arriving migrants – 2016

Greece

- Syria 47%
- Afghanistan 24%
- Iraq 15%
- Pakistan 5%
- Iran 3%
- Palestine 1%
- Algeria 1%
- Others 4%
Always think about the purpose of a graphic

Syria: 47%
Afghanistan: 24%
Iraq: 15%
Pakistan: 5%
Iran: 3%
Palestine: 1%
Algeria: 1%
Others: 4%
### Visual vocabulary

**Designing with data**

There are so many ways to visualise data - how do we know which one to pick? Use the categories across the top to decide which data relationship is most important in your story, then look at the different types of chart within the category to form some initial ideas about what might work best. This list is not meant to be exhaustive, nor a wizard, but is a useful starting point for making informative and meaningful data visualisations.

[ft.com/vocabulary](https://ft.com/vocabulary)

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Based on Cleveland and Robert McGill (1984)

Position along a common scale

Position along identical, nonaligned scales

Length

Direction/slope

Angle

Area

Volume

Shading and saturation

Color hue

Enable accurate estimates

May enable general estimates
Based on Cleveland and Robert McGill (1984)

Enable accurate estimates

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Great for accurate judgments: Comparisons, relationships, etc.
Enable accurate estimates

Position along a common scale

Position along identical, nonaligned scales

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Color hue

Based on Cleveland and Robert McGill (1984)
In a Decisive Victory, Obama Reshapes the Electoral Map

Barack Obama's historic win, with at least 304 electoral votes to John McCain's 173, can be attributed to his victories in several high-profile industrial states, and high numbers of new voters helped flip key states from red to blue. Even where Mr. McCain beat Mr. Obama, he was able to do so only by a small margin, as voters cast their ballots--across age, race and income lines--moving toward the Democratic Party.

By Eric A. Auger, Joe Burgan, Bosco Capalbo, Matthew Eriksen, Hannah Fairfield, Ford Franson, Hanyuan Park and Aravinda Tse
Using graphic forms erroneously

Enable accurate estimates

Position along a common scale

Position along identical, nonaligned scales

Length

Direction/slope  Angle

Area

Volume

Shading and saturation

Color hue

May enable general estimates
How Music Preferences Have Changed in Two Decades

Music styles preferred by University of Miami students. Survey based on interviews with 1,000 students.

SOURCE: WishfulThinkingData Inc.

1994
- Hard Rock: 35%
- Country: 20%
- Hip-Hop: 25%
- Reggae: 10%
- Classic: 5%
- Samba: 5%

2014
- Hard Rock: 25%
- Hip-Hop: 5%
- Reggae: 10%
- Country: 20%
- Classic: 5%
- Samba: 35%
How Music Preferences Have Changed in Two Decades

Music styles preferred by University of Miami students. Survey based on interviews with 1,000 students.
SOURCE: WishfulThinkingData Inc.

Lesson: Choice of encoding depends on tasks you want to enable.

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Figure 2

Revenue-to-GDP ratio evolution 2007-2014

* Countries with DRM indicators.

Figure 2

Revenue-to-GDP ratio evolution 2007-2014

- Average
  - Sub-Saharan Africa
- Each country
- Other countries

* Countries with DRM indicators.

Whenever possible, integrate words and visuals.
Brazil's Demographic Opportunity

How Brazil can take advantage of a future with fewer children per couple.

Alberto Cairo, Francine Lima, Marco Vergoili

PRELIMINARY DATA FROM THE 2010 CENSUS create an interesting picture of the changes that the Brazilian population has gone through in the past ten years. Brazil's population grew, on average, 10% between 2000 and 2010, but the fertility rate is below 2.1 children per woman, the minimum to keep a population from shrinking. According to César Marques, a demographer from the University of Campinas, the main challenge Brazil will face in the future is how to maintain a healthy Social Security system if the number of older and retired people will likely be much larger than it is today.

Read on to learn about all the variables at play in this story.

1 BRAZIL'S POPULATION IS BIGGER

The 2010 Census has revealed a 9.4% population increase between 2000 and 2010. The differences between states, as you can see on the chart on the right, are noticeable. Most rich states, such as São Paulo and Rio, didn't grow as fast as the ones in the north east.

2000 169,799,170
2010 190,732,694

AVERAGE +9.4%
A study in 2004 estimated that in 2010, the fertility rate would be 2.4 children per woman, on average. But new data collected by the IBGE prove that the fertility rate is already 1.9, below the threshold called “replacement rate”. When the fertility rate drops below this number, the population of a country will eventually start to shrink and grow older.

Forecasts made in 2004 anticipated that Brazil’s population would stop growing in 2040. But the most recent data from the IBGE suggests that this could happen much earlier, in 2030.

How Brazil can transform the population challenge into an opportunity:

- As the population ages, the proportion of people of working age increases. The country will therefore have more people producing wealth (if the labor market can absorb them) and fewer children to consume investments. It is a window of opportunity, because in some cases the number of people of working age to fall back when older people are leaving the market.
- The population under 15 years of age is falling today. A smaller number of student in public schools will facilitate the quality of teaching, if the amount invested in education stays the same.
- Educational policy focused on low-income youth favors the formation of more skilled workforce and greater social mobility.
- In the future, Brazil will reach the stage of Europe and Japan, which struggle to support their elders. This is why it’s so important to prepare a more balanced retirement system, which will include retirement at a later age.
EXERCISE

Alberto Cairo, School of Communication, University of Miami
Scales

Non-zero baseline

Zero baseline

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Scales

These two may be problematic

These two may be better
Possible solution to those cases when you have data that diverge a lot
LIFE EXPECTANCY AT BIRTH (YEARS)

HIGH INCOME ECONOMIES

LOWER MIDDLE INCOME ECONOMIES

SOURCE: WHO, UN, WORLD BANK, IDC
THANKS!

Alberto Cairo, School of Communication, University of Miami