



Creating Information Graphics

A large part of the infographic's intrinsic appeal seems to lie in its visual reductionism of complex information. Reductionism itself is not inherently bad—in fact, it's an essential part of any kind of synthesis, be it mapmaking, journalism, particle physics, or statistical analysis. The problem arises when the act of reduction—in this case rendering data into an aesthetically elegant graphic—actually begins to unintentionally oversimplify, obscure, or warp the author's intended narrative, instead of bringing it into focus.

—Reif Larsen, from “This Chart Is a Lonely Hunter:
The Narrative Eros of the Infographic”

Good content reasoners and presenters are rare, designers are not.

—Edward Tufte, from an *AdAgeStat* blog

I'm often asked in workshops and seminars how I develop my own projects. Specifically, people want to know if I have a particular method for designing graphics that inform and attract readers. As a journalist, my approach is infused with lessons learned in the newsroom:

Start with a strong focus, do as much research as you can, organize, summarize, and then deliver your conclusions in a structured and visually appealing manner.

At first glance, there's nothing strikingly original about this. The real lessons come as the graphic is created, in the problems that must be solved and the decisions made along the way. My goal in this chapter is to walk you through my thought process for several projects developed with my team at Brazil's *Época* magazine (see the Acknowledgments to learn more about Marco Vergotti, Gerson Mora, Rodrigo Cunha, Luiz Salomão, Gerardo Rodríguez, Erik Scaranello, and Pedro Schimidt), where I worked as infographics director between 2010 and 2011. As you'll see, the following cases share a common creative methodology:

1. Define the focus of the graphic, what story you want to tell, and the key points to be made. Have a clear idea of how the infographic will be useful to your readers, and what they will be able to accomplish with it.
2. Gather as much information as you can about the topic you are covering. Interview sources, look for datasets, and write or storyboard ideas in quick form.
3. Choose the best graphic form. What shapes should your data adopt? What kind of charts, maps, and diagrams will best fit the goals you set in the first step?
4. Complete your research. Flesh out your sketches and storyboards.
5. Think about the visual style. Choose typefaces, color palettes, etc.
6. If you've been sketching offline, move the design to the computer. Complete the graphic using the appropriate software tools.

Many designers I know skip the preliminaries and jump directly to steps 5 and 6. Big mistake. **Before you think about style, you must think about structure.**

Let me show you how.

Brazilian Saints

Brazil is a land of sometimes shocking paradoxes, a reality that Brazilians face with a sense of humor as well as concern. These paradoxes make the country a paradise for journalists.

For example, Brazil has the largest number of Catholics in the world. Yet, among the many hundreds of saints that the Catholic Church has canonized, **only two are of Brazilian origin**. Meanwhile, almost 70 people are on the church's waiting list to be considered for sainthood.

Now, review the paragraph I just wrote in the context of the infographics production process I outlined, and you will see that we've completed step 1: Define the focus. The idea for this focus came from a former intern at *Época*, Eliseu Barreira Júnior, who was a journalism student at Universidade de São Paulo (USP). He became curious about Catholic saints after talking to a couple of sources and thought it would make an interesting visual story. It did indeed: Not many people in Brazil are aware of the sanctity paradox.

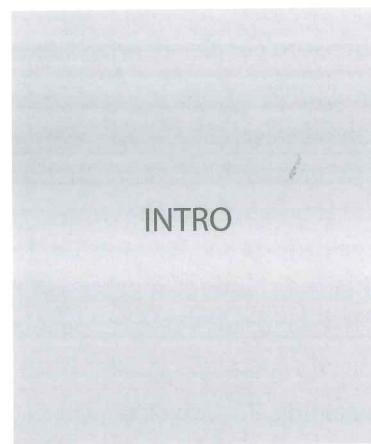
The story was approved in an editorial meeting. The next step was to gather all the data, a big challenge, because the Catholic Church has no centralized, online database of all candidates for canonization. Eliseu first had to phone several local dioceses to ask if they had proposed anyone for sanctification in the past. He learned that all candidates were funneled through a retired Brazilian nun who is in charge of reviewing the proposals and sending them to the Vatican. Eliseu used her as a source as well. It took him four days to compile a list of Brazilian candidates for canonization and to gather portraits of 36 of them. That was more than half of the time we invested in completing the entire project!

While Eliseu was doing his research, the rest of the department and I were collecting background information. We wanted to show how many saints were named by each Pope in the past two centuries, explain how someone becomes a saint, and highlight the fact that, despite Latin America's standing as the most deeply Catholic region in the world, it has pushed a relatively small number of people through canonization. In fact, most of the saints made during John Paul II's and Benedict XVI's papacies come from Europe and Asia, apparently in an effort to promote Catholicism in those regions.

Figure 8.1 shows one of our first sketches for the project. I designed the layout in Adobe Illustrator. If you compare it to the final project in **Figure 8.2**, you will notice that the structure survived, but the look is entirely different.

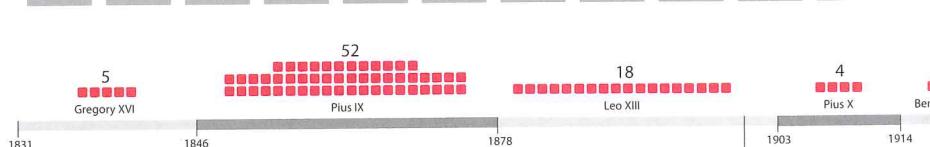
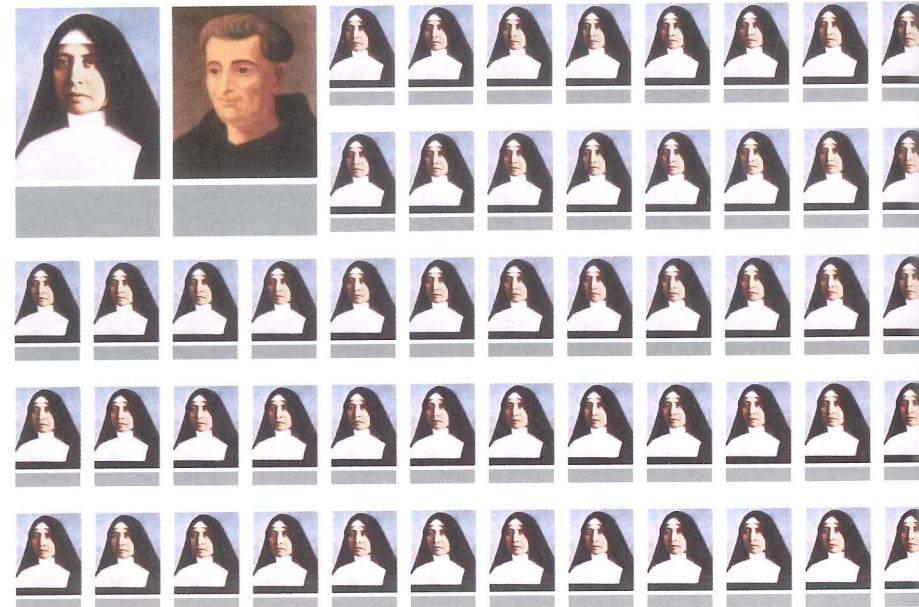
This illustrates the point I made at the outset: You need to build a solid backbone for your information, a reading path, an order, and a hierarchy, before you lock yourself into a style for your display. The structure is the skeleton and muscles of your graphic; the visual style is the skin. With no bones to support it, the skin of your project will collapse.

SAINTS OF BRAZIL



WHO THE BRAZILIAN SAINTS ARE

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THE CANONIZATION PROCESS

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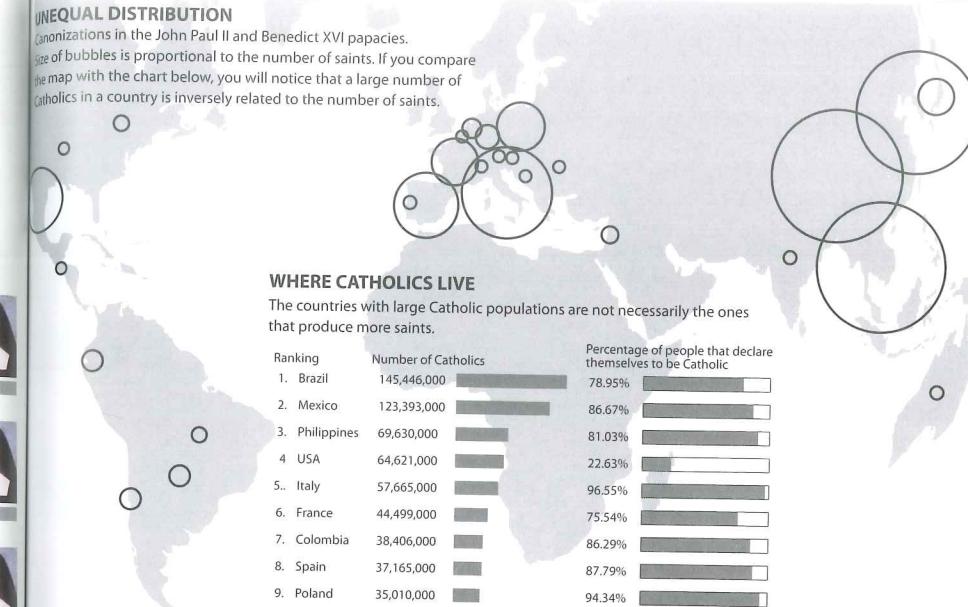
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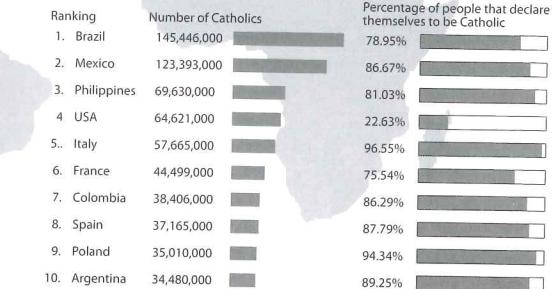
UNEQUAL DISTRIBUTION

Canonizations in the John Paul II and Benedict XVI papacies.
Size of bubbles is proportional to the number of saints. If you compare the map with the chart below, you will notice that a large number of Catholics in a country is inversely related to the number of saints.



WHERE CATHOLICS LIVE

The countries with large Catholic populations are not necessarily the ones that produce more saints.



HOLY INFLATION

Number of saints made by each Pope since 1831.
Large box corresponds to John Paul II.

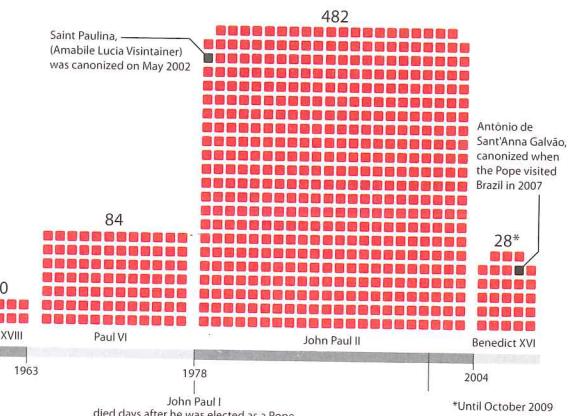


Figure 8.1 First layout for the Brazilian Saints project.

Diagram

NEWS IN PERSPECTIVE

ROAD TO SANCTITY

How the canonization process works

Sources Sister Célia Cadorin,
Catholic - Hierarchy.org

1 Diocesan phase

A postulator is appointed to organize the required documentary evidence and witnesses. To become a saint, a person must have died at least five years before the opening of proceedings. At this point, the candidate is regarded as a Servant of God.

2 Roman Phase

A commission of cardinals and bishops analyze the documents. If approved, the candidate is declared Venerable by the Pope.

To become a beatus

(someone worshiped by a particular group of believers), a venerable must have a miraculous cure proven. A martyr doesn't need to have a proven miracle to be beatified. It is just necessary to demonstrate that he or she died in the name of the faith.

The canonization occurs when a second miracle is proven. It must happen after beatification. The Pope issues a decree that the candidate must be worshiped by the entire Catholic Church.

Waiting For Sanctity

Why Brazil, even as the country with the largest Catholic population, has so few saints.

Eliseu Barreirinha Júnior,
Alberto Cairo, and Marco Vergotti

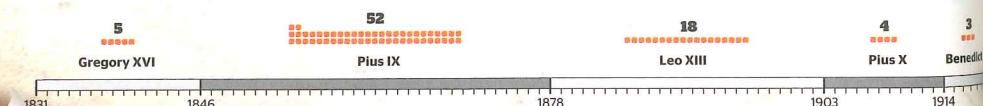
IN HIS THIRD VISIT to Brazil, in 1991, Pope John Paul II said that the country needed a lot of saints. Since then, there have been only two: Mother Paulina, in 2002, and Frei Galvão, in 2007. But the number of candidates has not stopped growing. There are nearly 70 Brazilian candidates for canonization on the waiting list, sent to the Vatican by local dioceses. The list below includes the 36 most well-known cases, along with their state of origin.⁽¹⁾



(1) In the list, there are candidates who were born outside of Brazil, but who spent their lives in the country.

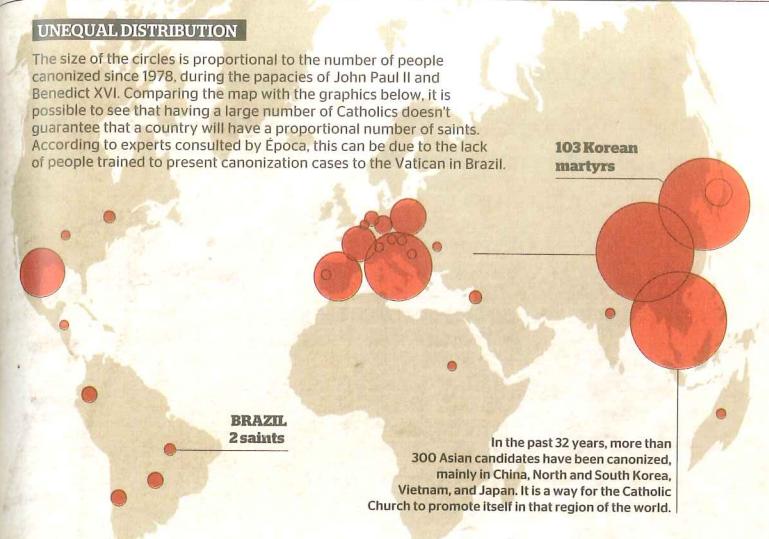
SAINTS PER POPE

Pope John Paul II canonized twice the number of saints than did the nine previous Popes together. He canonized more people than any other Pope in the last 400 years.



UNEQUAL DISTRIBUTION

The size of the circles is proportional to the number of people canonized since 1978, during the papacies of John Paul II and Benedict XVI. Comparing the map with the graphics below, it is possible to see that having a large number of Catholics doesn't guarantee that a country will have a proportional number of saints. According to experts consulted by Época, this can be due to the lack of people trained to present canonization cases to the Vatican in Brazil.



Countries with largest Catholic populations (Millions of adherents).

BRAZIL	145
Mexico	123
Philippines	70
USA	65
Italy	58
France	44
Colombia	38
Spain	37
Poland	35
Argentina	34

Percentage that declare themselves Catholic

79%	BRAZIL
79%	Mexico
87%	Philippines
81%	USA
23%	Italy
97%	France
76%	Colombia
86%	Spain
88%	Poland
94%	Argentina
89%	

79%

of Brazilians say they are Catholics. In the world, there are 50 nations whose populations are at least 50% Catholic.

Number of priests per country. (Thousands of people).

Italy	50
USA	45
Poland	28
Spain	25
France	22
India	20
Germany	18
Brazil	17
Mexico	15
Canada	8

Saint Paulina, (Amabile Lucía Visintainer) was canonized on May 2002

Antônio de Sant'Anna Galvão, canonized when the Pope visited Brazil in 2007

482

84

10

32

34

52

5

18

4

3

28⁽³⁾

(2) Ruled the Catholic Church for just one month before dying (3) Up to October 2009

Figure 8.2 Brazilian Saints project, as published by Época, São Paulo, Brazil. Translated

The Changing Face of Brazil's Population

Sometimes it is not the story that leads you to search for a particular kind of data. Sometimes, it is data that leads you to a story.

Maybe you remember the example on fertility that opened Chapter 1. I made that graphic while working on a real project for *Época* about how Brazilian population trends have changed in the past half-century.

In November 2010, the Brazilian Institute of Geography and Statistics (IBGE) was about to release the data for the latest census, conducted every 10 years. *Época* is a weekly magazine, so it cannot limit itself to summarizing what daily publications have already published during the week. One of my responsibilities as infographics director was to think up unexpected angles for stories that newspapers cover in detail. The fertility graphic was one of those. We knew that all kinds of media would echo IBGE's press releases. Would it be possible to go beyond what we predicted our competitors would do? It was no easy task. Brazilian media, particularly infographics desks, are extremely creative.

I was feeling a bit desperate when I remembered that a few days before, I had seen a story citing preliminary figures disclosed by the IBGE that indicated that the **Brazilian fertility rate** (the average number of children per woman) **was already below 1.9**. The statistic was counterintuitive. I was intrigued. In the minds of many foreigners—and I was one of them, having been there only a few months—Brazil is still an underdeveloped country where women tend to nurture huge families with four or five children, at least.

But **experience tells you not to trust intuition when you can rely on data**. I went to the World Bank databases and downloaded the fertility figures from all countries. Then, I plotted them in a line chart and highlighted Brazil. **Figure 8.3** might look familiar. It's very similar to one of the charts I designed for Chapter 1 when I was trying to find out if the hypotheses in Matt Ridley's *The Rational Optimist* made sense.

Impressive, isn't it? On average, in 1950, Brazilian women had more than six children. But that number has dropped below the replacement rate of 2.1—the minimum number of children couples must have to keep the population stable in the long term. Any country that scores below that will either face an older and

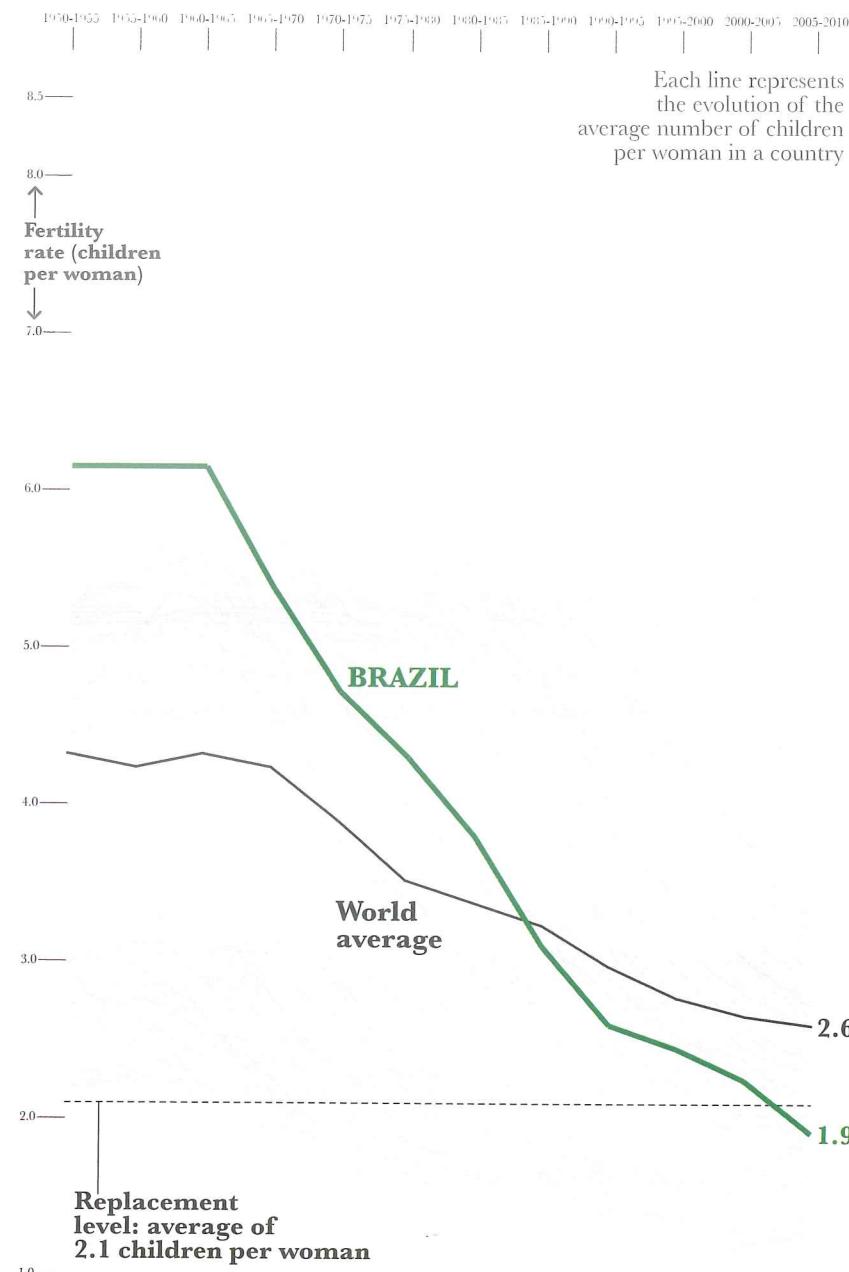


Figure 8.3 The shrinking Brazilian fertility rate, compared to other countries.

smaller population in the future, or will have to open its borders to more young immigrants hungry for opportunities.

All of this was pretty interesting, but it was not enough to be considered a proper journalistic story. I needed a narrative that tied the data together and was compelling enough to be read. Fortunately for me, *Época*'s managing editor, Helio Gurovitz, holds a B.A. in computer science, which he got years before he decided to become a journalist, so he knows numbers. He proposed a headline for the double-page infographic we were planning: "*Brazil's Demographic Opportunity*." Then he outlined a possible narrative:

1. Start with the news: the data from the new Brazilian census. We already knew it would show that Brazil experienced healthy population growth between 2000 and 2010.
2. At the same time, the fertility rate is down compared with other countries and regions.
3. The dramatic loss of fertility will eventually lead to a smaller and older population.
4. In spite of how dire that sounds, Brazil can take advantage of the situation by investing in education now.

I liked Helio's idea so much that I rushed back to my computer and started putting together a layout. I wanted to publish the story as soon as possible. The only catch was that the IBGE had not officially released the census data. But, digging into its website, I had seen that it had published a shaded map with the new numbers. So they did have the figures, although they had not yet told the press.

I phoned the IBGE press department and requested access to the organization's database. I wanted to use it with a software program I had recently become acquainted with, called Estatcart, which was developed by the IBGE itself.

Estatcart is a Geographic Information System, or *GIS tool*. Simply speaking, in any *GIS tool*, you start with an empty map such as the one in Figure 8.4 (that is Estatcart's interface). Then, you link the map to a Microsoft Excel spreadsheet or to a database. The colors of the regions change depending on the numbers in the dataset. You can imagine that if you are faced with the task of mapping the variation in population in the more than 5,000 municipalities of Brazil, such a tool is invaluable. If you don't have access to one, you will have to painstakingly color those regions *one by one*.

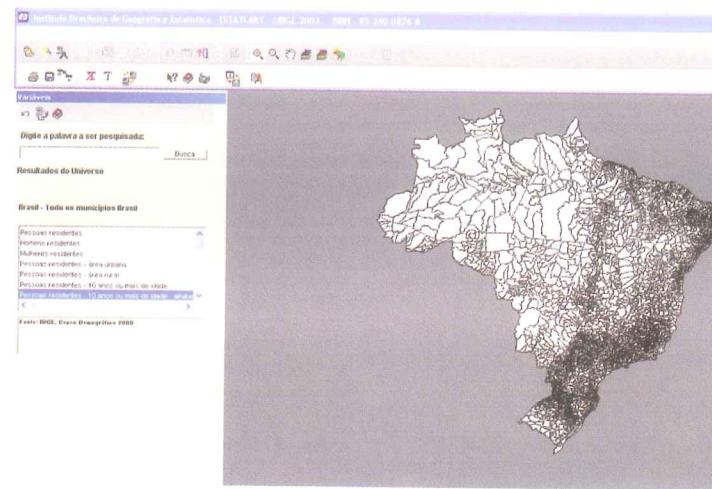


Figure 8.4 Estatcart's interface.

Unfortunately, the IBGE decided to make me wait until it released the data to all newspapers and magazines, my urgency notwithstanding. I still wanted our story to run before they released the official numbers, so I copied the figures from the interactive map. You could call it manual hacking.

I then formatted the data to Estatcart's requirements, which resulted in the map you see in Figure 8.5. The green regions had the higher increase in population between 2000 and 2010, while the regions in orange and red suffered declines.

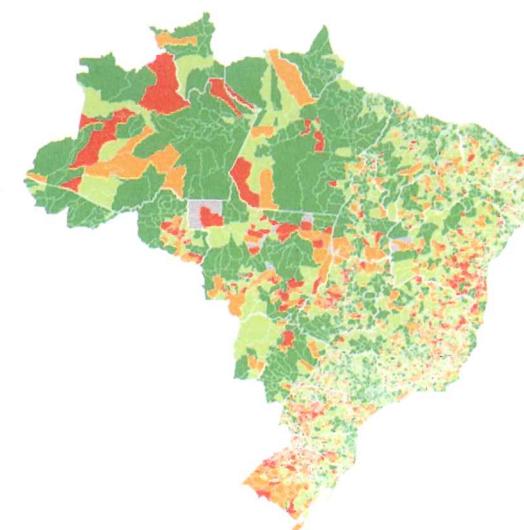


Figure 8.5 A map designed with Estatcart and then styled in Adobe Illustrator.

Brazil's Demographic Opportunity

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

Alberto Cairo and Francine Lima

Brazil's population grew in the last decade—

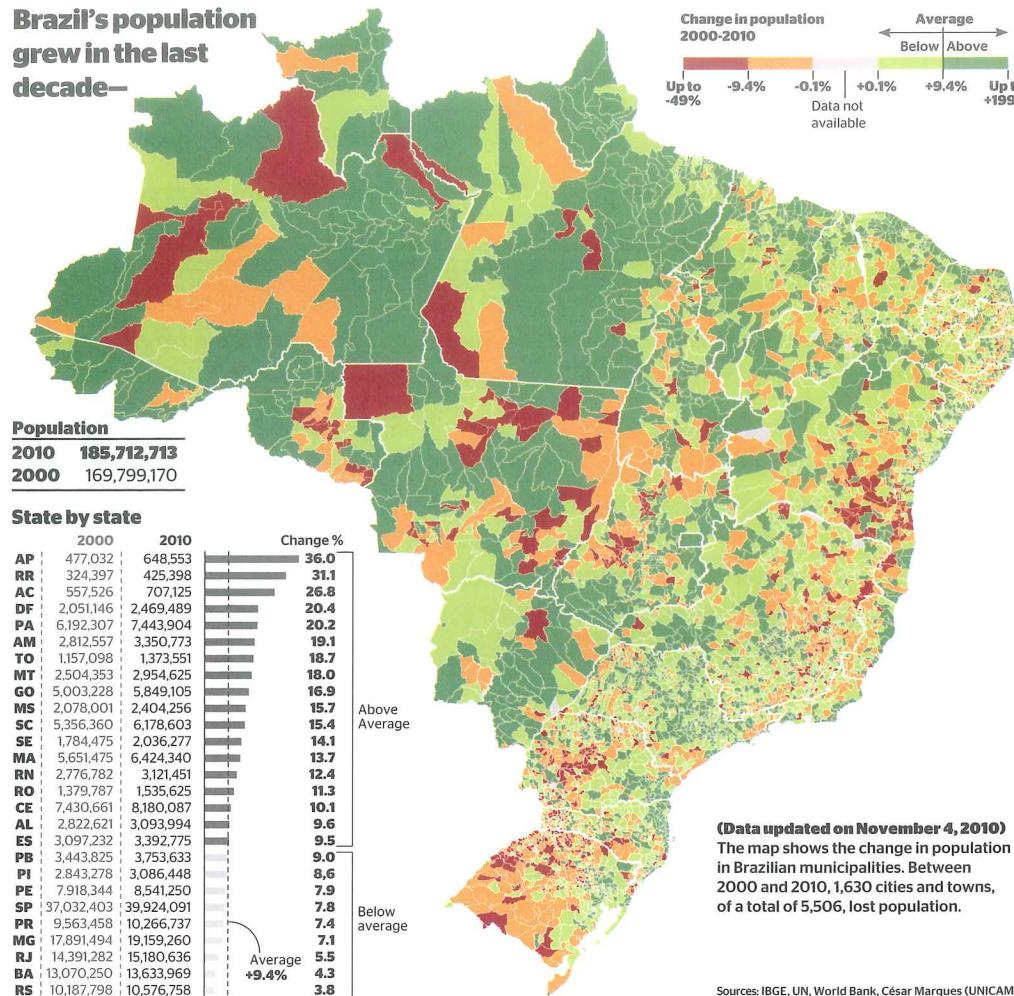
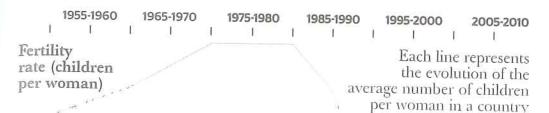


Figure 8.6 One of the first drafts for the Brazilian population infographic.
Translated from Portuguese.

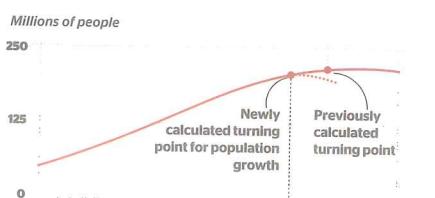
—but fertility rate is below what was expected—

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.



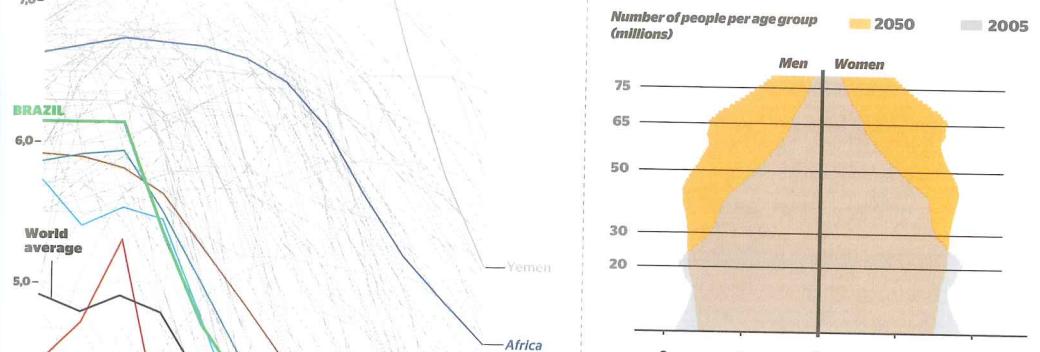
—and population will be smaller—

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.



—and older—

Comparing the current population pyramid with the one predicted for 2050



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 tends to decline when older people are leaving the market.

The population under 15 years of age is falling today. A smaller number of students 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 a 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.

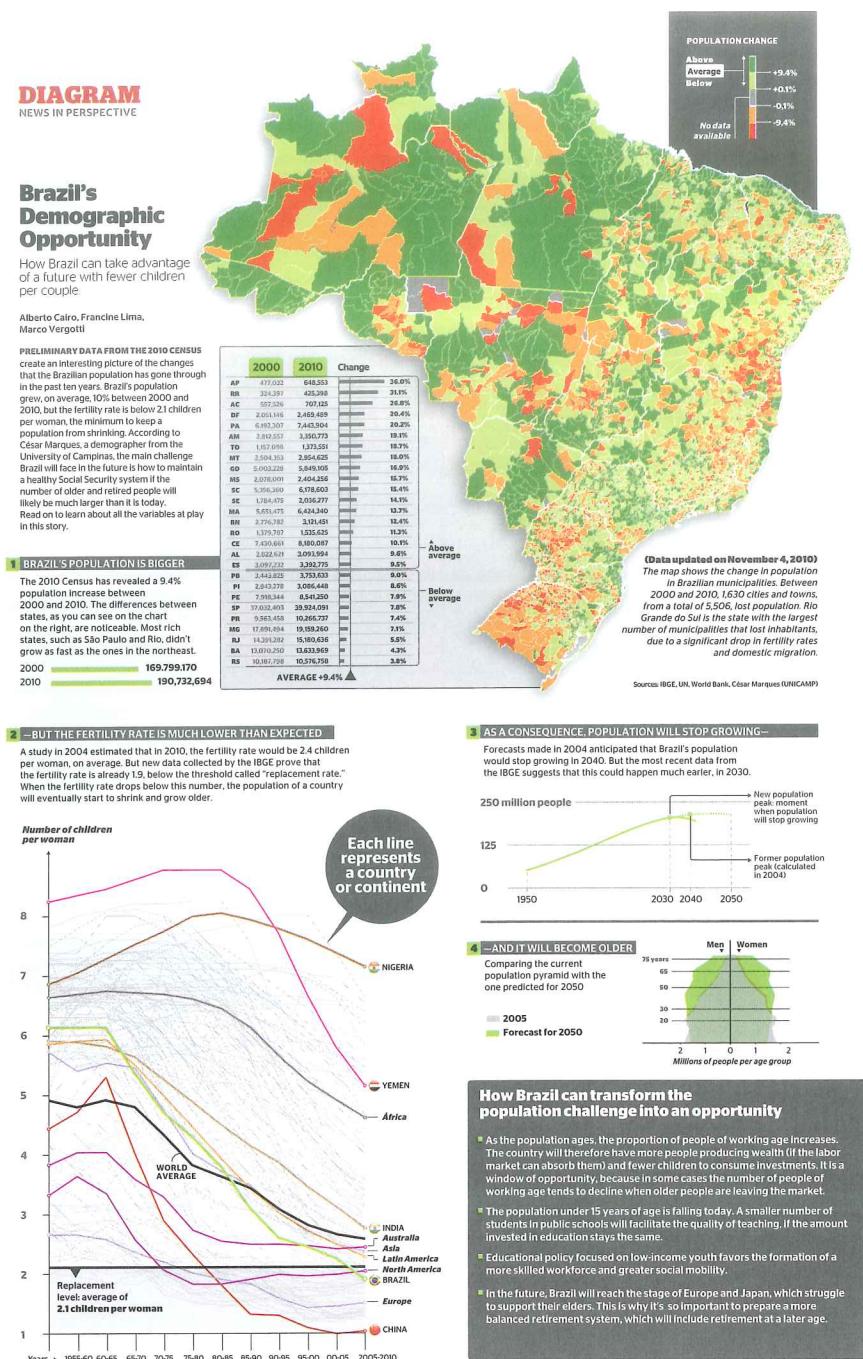


Figure 8.7 Brazil's Demographic Opportunity. Published by Época, São Paulo, Brazil. Translated from Portuguese.

While I was taking care of the nerdy stuff, one of our reporters, Francine Lima, interviewed a well-known demographer to give context to the data and provide insights into how a challenge can be transformed into an opportunity. In brief: Brazil could support an older population in the future if it starts preparing right now. The next 20 years will see a swell in numbers of people between 16 and 60 years old. They will be eager to work. If Brazil manages to give them the right education in the present, they will transform the country's economy for the better. They will generate not only more taxes, but also more internal and foreign investment. We decided to make those points in the last part of the graphic.

With all the material in hand, I put together the layout you see in Figure 8.6.

As my layout was quite rough (I am not a good designer, lacking an eye for color and font choices), Marco Vergotti, the head of Época's print infographics, transformed it into the gorgeous display that was finally published in the magazine (Figure 8.7). You could say that this project is an example of low-tech data journalism and highly effective teamwork.

Inequality and the Economy

I am not ashamed to admit that I copy from the people I admire. You should not be either. As Austin Kleon reminds us in his inspiring *Steal Like an Artist* (2012), "Every new idea is just a mashup or a remix of one or more previous ideas." The thin red line between elegant theft and plagiarism is defined by how much you can pay homage to someone else's ideas by adding something that is truly yours.

In May 2010, *The New York Times* published a chart titled "Driving Shifts Into Reverse," made by Hannah Fairfield. It was a most uncommon kind of scatter-plot (Figure 8.8). You will learn more about Hannah in the Profiles section.

Remember that a scatter-plot allows you to see the relationship between two variables, one on the horizontal axis and the other on the vertical axis. What was surprising about Hannah's graphic was that the points on the line were years, so her scatter-plot had to be read as if you were following a path marked by years instead of miles. The position of each dot-year depends on the average miles driven per capita (horizontal axis) and the price of a gallon of gasoline (vertical axis). In other words, the farther to the right a dot is, the more miles Americans drove, and the higher the dot on the vertical scale, the more expensive gasoline was.

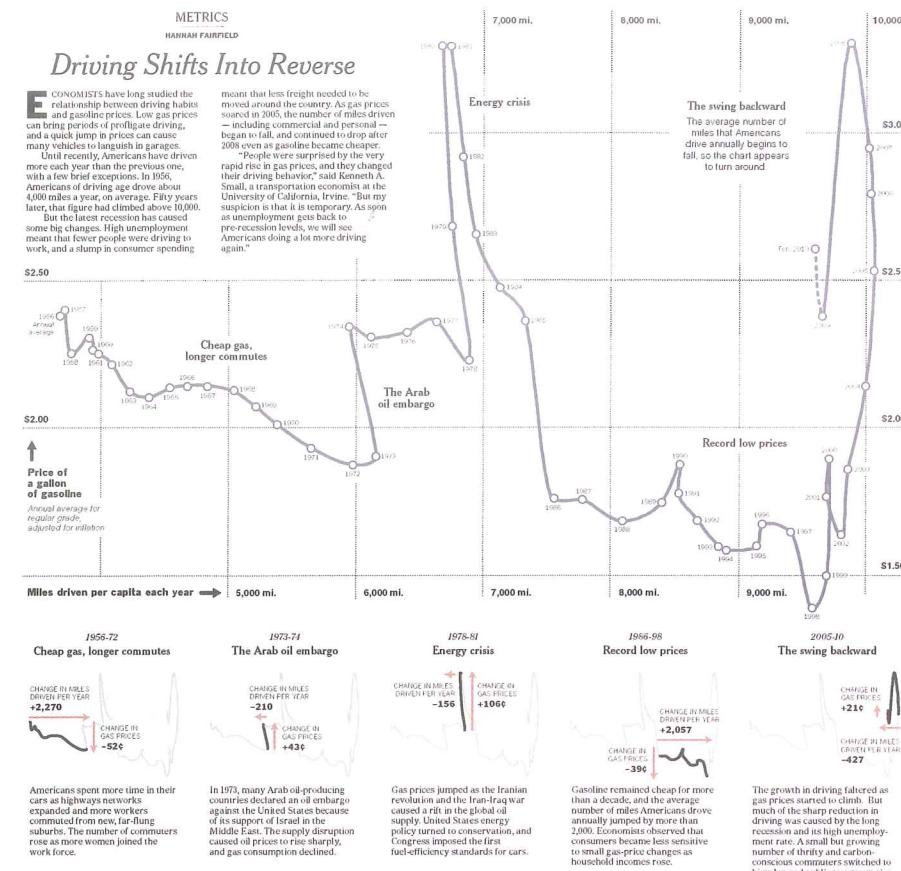


Figure 8.8 “Driving Shifts Into Reverse,” a graphic by Hannah Fairfield for *The New York Times*.

The chart is not intuitive at first, but, once you understand how it works, it's illuminating. See, for instance, the Arab oil embargo between 1973 and 1974: Oil prices spiked, and the line turns backward (left to right), meaning that the miles driven per capita that year went from around 6,150 to nearly 5,900. During the energy crisis at the beginning of the 1980s, oil prices soared, and Americans tended to keep their driving to a minimum. If you go back in time to the period from 1956 to 1972, you will notice that oil prices were stable, and the population tended to increase commutes. I considered this graphic a masterpiece at the time, and still do.

I was so inspired by Hannah's project that I used it as a template for a graphic I was working on at the time, mentioned in the introduction to this book.

In February 2011, Letícia Sorg, a reporter for *Época*, recommended I read *The Spirit Level: Why Greater Equality Makes Societies Stronger* (2009), by Richard Wilkinson and Kate Pickett. Letícia was planning to interview Wilkinson, a professor at the University of Nottingham. She wanted to enrich the interview with some graphics.

The Spirit Level itself includes plenty of charts. The book uncovers the tight connection between inequality (measured with an index called GINI, developed by Italian sociologist Corrado Gini) and several negative social indicators, such as the number of people in prison, the rate of teenage pregnancy, the prevalence of obesity, and the impact of mental diseases. But we wanted to go a bit beyond the book, and discuss the problem of inequality in Brazil.

Historically, Brazil has been one of the most unbalanced countries in the world. After democracy was reinstated in the 1980s, Brazil experienced spurts of rapid economic development, interspersed with periods of stagnation and hyperinflation. The chronic economic instability was accompanied by unpredictable variations in inequality. In good times, most of the benefits of growth accrued to the rich portion of the population. In bad times, it was the poor who suffered the most, as the rich were able to shelter their money from crisis and inflation using varied investment tricks.

Brazil stabilized during Fernando Henrique Cardoso's (FHC) tenures, first as finance minister (1993–1994), and later as president of the Republic (1995–2002). Cardoso got inflation under control, transformed Brazil's economy, and laid the groundwork for Luiz Inácio “Lula” da Silva's presidency (2003–2011), who was the most successful in raising the quality of life for millions of Brazil's poor people. Under Lula, continued economic growth was accompanied by a steady drop in income inequality, thanks in part to many income distribution and social advancement programs.

For this project, inspired by Fairfield's scatter-plot, I put my data in an Excel spreadsheet (Figure 8.9). Note the columns highlighted in yellow. The first is GDP in billions of dollars; the second is inequality, measured with the GINI Index. The higher the score, the higher the inequality.

Next, I selected the two columns and told Excel to create a scatter-plot. I also told it to connect the dots (which, remember, represent years) with a line. Figure 8.10 shows the result. Notice the slow economic growth between 1981 (first dot) and 1993 (twelfth dot); they are not that far apart in the horizontal axis. Also note the huge vertical variations of the line in between those years, visual evidence of the wild changes in inequality.

	A	B	C	D	E	F	G	H	I
		GDP Change		GDP index	GINI math		GDP FINAL	GINI FINAL	
1				100					
2	1980	-4.4		95.6	57.5		463 767	57.5	
3	1981	0.6		96 1736	58.2		494 988	58.2	
4	82	-3.4		92 9037	58.4		497 067	58.4	
5	83	5.3		97 82759	58.4		543 113	58.4	
6	84	8		105 6538	59		603 761	59	
7	85	8		114 1061	58.1		663 664	58.1	
8	86	3.6		118 2139	59.3		707 519	59.3	
9	87	-0.1		118 0957	61		733 756	61	
10	88	3.3		121 9929	63		785 830	63	
11	89	-4.3		116 7472	60.6		782 132	60.6	
12	90	1.5		118 4984	59		818 213	59	
13	91	-0.5		117 9059	57.4		833 052	57.4	
14	92	4.7		123 4475	59.7		893 402	59.7	
15	93	5.3		129 9902	59.5		965 612	59.5	
16	94	4.4		135 7098	59.2		1 027 327	59.2	
17	95	2.2		138 6954	59.2		1 069 400	59.2	
18	96	3.4		143 4111	59.3		1 125 009	59.3	
19	97	0		143 411	59.2		1 138 123	59.2	
20	98	0.3		143 8412	58.6		1 157 791	58.6	
21	99	4.3		150 0264	58.6		1 233 817	58.6	
22	2000	1.3		151 9768	58.7		1 278 254	58.7	
23	1	2.7		156 0801	58.2		1 333 480	58.2	
24	2	1.1		157 797	57.6		1 377 810	57.6	
25	3	5.7		166 7914	57		1 494 694	57	
26	4	3.2		172 1288	56.4		1 584 604	56.4	
27	5			176 0120			1 760 657		

Figure 8.9 A screenshot of the Excel spreadsheet I used to compare GDP growth with income inequality.

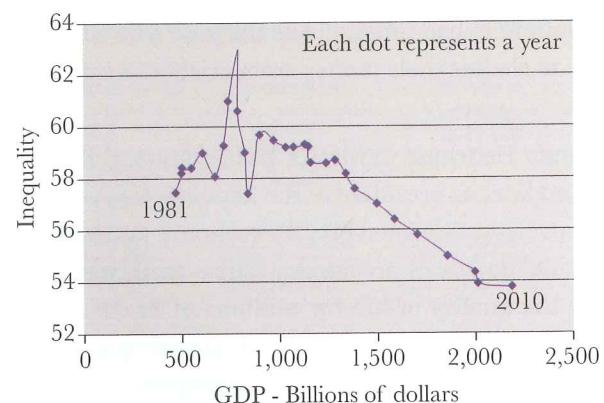


Figure 8.10 Excel's default options could be improved. I am not very fond of blue lines over gray backgrounds.

The chart made in Excel didn't look very good. By default, Excel creates graphics with strange-looking gray backgrounds and seemingly random color choices. So I switched to Adobe Illustrator, refining the style and adding the copy and explainers (Figure 8.11). To those familiar with Brazil's recent history, the visual impression is shocking: Prior to 1993–1994, the line goes up and down. Once you get to Itamar Franco's and FHC's presidencies, the line stabilizes and stretches out. **The pace of economic growth increases, and inequality plunges non-stop.**

When the Brazilian Economy Improves, Inequality Doesn't Drop

The graphic below shows the correlation between Brazilian GDP (horizontal axis) and inequality (vertical axis) between 1981 and 2010. The position of the points, each representing a year, depends on how high GDP and inequality were. You can notice, for instance, that the economy grew between 1986 and 1989 because the line tends to move to the right, but inequality also grew, as the point representing 1989 is much higher than the ones before. You can also see that, during Lula da Silva's government, the economy expanded almost as much as during the terms of the other presidents who preceded him combined.

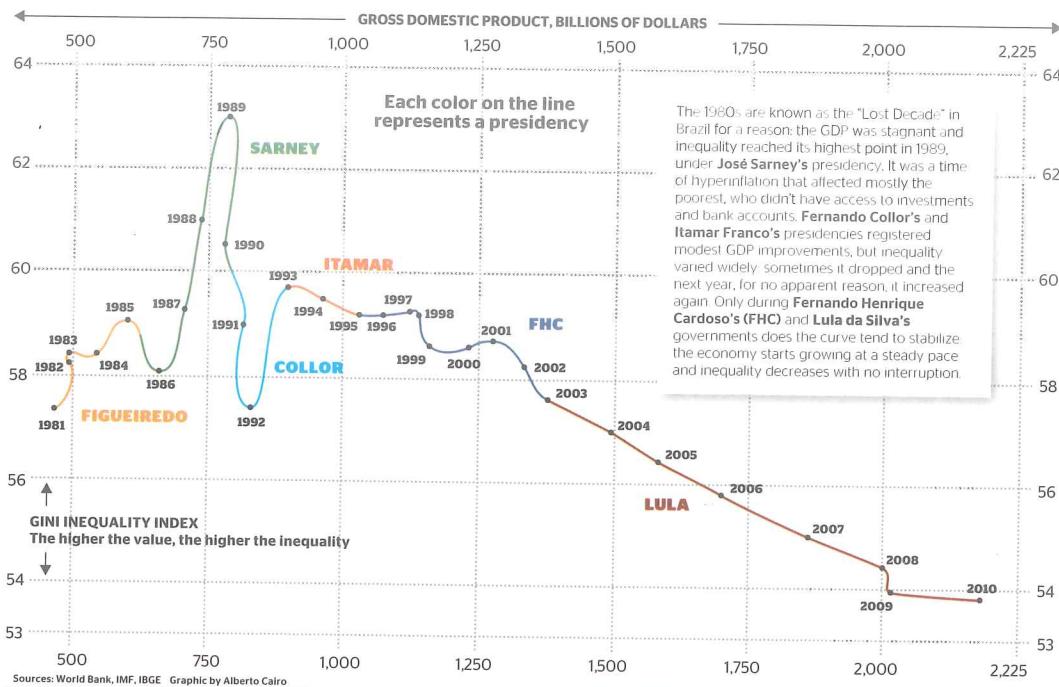


Figure 8.11 Income inequality and GDP in Brazil.

A Word on Structure, Color, and Type

To end this chapter, I would like to show you some infographics that illustrate two lessons I've learned through the years on how to design effective information graphics:

Keep type and color under control, and

Create a solid layout by imagining your graphics as if they were groups of rectangles.