Looking from outside the goldfish bowl

What exactly can you show on a map of the world? Almost anything you want to, says Danny Dorling—as long as you are not too fussed about what shape your map ends up.

“What use are Mercator’s North Poles and Equators, Tropics, Zones and Meridian Lines?”
So the Bellman would cry: and the crew would reply,
“They are merely conventional signs!”
Lewis Carroll, *The Hunting of the Snark*, 1876

Just as in literacy there are grammarians, in cartography there are traditionalists who would have us retain our conventional signs and structures. A map is a map is a map, they say; we all know what shape Britain is, or France or America—and on any decent map they should stay that way.

However, there are occasions when conventions need breaking.

Imagine that you spent your life swimming round and round inside a spherical glass bowl looking out on the world. How would you imagine the world to be? In July 2004 Italian council official Giampietro Mosca of the city of Monza secured his place in history. He confirmed that local laws had been changed to outlaw keeping goldfish in curved bowls. “A fish kept in a bowl has a distorted view of reality...and suffers because of this,” Mr Mosca is reported to have said. Giampietro continued: “This story about the goldfish, which has gone around Italy, seems a little irrelevant and people have mocked it a bit, but it has a very specific educational sense, especially for the little ones.” It is the little ones who bother me too. What views of the world do we give them?

It was also concern for the little ones that led UNESCO, UNICEF, OXFAM and Action Aid among others to adopt the Peters projection world map in the late 1970s and early 1980s. The Peters projection is an area-accurate map: it shows the areas of each country in correct proportion. In this it differs from the standard Mercator projection, which shows countries far from the equator as much bigger than they really are. There is another difference between them: on the Peters map, the countries are the wrong shape (see Figure 1).

Personally I think it remains a work of beauty, although little else can raise the ire of cartographers so much as praising this map. It is a map that does not even slightly curve any of the conventional lines and, unlike Mercator’s projection, which usually has to leave them off, it actually has a place for the North and South poles. The Peters projection was deemed to be a radical world map because it showed so many schoolchildren how much land there was in each part of the world, an aspect that more conventional projections had severely distorted. On a Mercator map, Greenland looks as big as China; on a Peters map, it looks a quarter the size—as it should. In fact, Greenland occupies an area of 2.1 million km², China occupies 9.6 million km².

Suppose, though, that you were more interested in people than land? Then your world map would look like the one shown in Figure 2, as drawn by Mark Newman (this map was the prototype for map 366, which will appear in the *The Real World Atlas*, due for publication later this year). It is a conformal equal population world projection. Each square centimetre of landmass on the map contains the same number of people. (“Conformal” means that angles are preserved locally as the projection minimally distorts. A small circle on the map would be a small circle on the ground. Mercator’s is a conformal map; Peter’s is not.) The map may seem odd to you. To me this is the normal map of the world—it is how the
world is. For the last few years it has been the backdrop of my computer screen. It is made up of people, each one of whom is of equal value. When I travel it is across this landscape that I think I am moving, over and through people. A world atlas based on Newman’s projection would have as many pages devoted to India as to Africa, since their populations are the same. No insets would be needed for cities, which, thanks to their high population, would appear to be huge; but they could be provided for wilderness. You might need a magnifying glass to see the Sahara Desert.

There are, though, many other ways of reshaping the world. Different map projections, and different ways of graphing and scaling can show many different things. Figure 3 shows the world in four alternative shapes. The area of each country is sized according to the number of people in it: (a) who had access only to poor drinking water around the turn of the millennium: 1.1 billion people in all; (b) whose homes were connected to sewerage systems: 0.8 billion; (c) aged 15–49 and estimated to be infected with HIV in 2003: 29 million in total; (d) who lived on less than US$1 a day around 2002: 1 billion. All these maps and 580 more can be found at www.worldmapper.org where a group of us have been trying to map world distributions.

To understand the distributions drawn in Figure 3 you need to start with a little knowledge of world geography. The same colours are used to shade the country maps in every image so that if you can locate India on one map, you can find it easily on the others. It is always yellow. These worldmapper cartograms are, in effect, geographical pie charts. They tell you where most of something is. They do this in a way that is not possible with a conventional map. On a conventional map the proportion of people with access only to poor drinking water can be mapped. But to interpret that map to give numbers of people you need to imagine the population density in your head and be able to integrate across this pair of two dimensional surfaces, one of which is constructed only in your imagination. The map drawn in Figure 3a does the job for you. It shows that the greatest number of people with access only to poor water in 2000, in a single nation state, lived in China, the next most in Africa, then in the remainder of Asia, South America, Mexico (dark blue) and parts of Eastern Europe. How accurately you observe this depends on your ability to estimate areas of colour and the abilities of United Nations bodies to estimate the underlying statistics. But should you want quickly to see where most people live who have access to a sewerage system, or who are infected with HIV, or who survive on less than a dollar a day, you can.

Some 366 of these world maps are being published this autumn in a new Real World Atlas, complete with the equator, tropics, meridian lines, mountains and even ocean trenches stretched and superimposed. Why add such conventional signs? Well, they help you to see where you are looking, and reassure you that these are just map projections. They are projections like any other, just a little more complex.

Without a population cartogram it is very hard to draw an atlas of aspects of human geography that does not distort. Look at these...
patterns on a normal map and it is like looking at the world from the inside of a goldfish bowl.

Step outside the goldfish bowl and the world looks different. You can map subjects to your heart's content. You do not have to stick to people. You can map the countries containing most amphibians at risk (it turns out to be Columbia—see map 275 on our website); you can map the time it takes different nationalities to commute to work, on which Thailand appears huge: the average commuter there spends 2 hours a day travelling (map 141). On our map in Figure 3d, of the number of people living on less than a dollar a day, America is tiny. Europe has all but disappeared, but India is vast. You could, though, map carbon emissions instead, as shown in Figure 4 (map 295); in this map Africa is tiny and it is America that is vast.

Despite their differing shapes, all these maps are correct, in the sense that they tell a true story.

On a map scaled to world poverty, Europe disappears, but India is vast.

Information on the reliability of the data shown in Figures 3 and 4 is not included in the figures themselves, and when data was missing we had to estimate it. We have provided many hundreds of spreadsheets on the worldmapper website showing how we made estimations and from exactly where the data was drawn in each case. All social data is, almost by definition, estimated; that is true even for the most basic counts of the population in the most count obsessed countries (such as the UK). However, the effect on your perception of the underlying projection used is very much greater than the effect of any uncertainty in these statistics; it is projection that matters most. The most perfect data in the world is often rendered almost meaningless when plotted on a conventional map.

Area, after all, is not everything; neither is distance. A map of the solar system that showed the sun and planets orbiting the earth would not be accurate even if the distances were correct. You need to shift your viewpoint.

Looking at the worlds of humans using different lenses and projections allows you to see things differently. There is a Copernican difference in moving from seeing people as spaced upon the land, to seeing the land as made up of the people. The land is there and the land is real, but the land is not so important that its shape should remain sacrosanct while we try to squeeze the pictures of our lives into the small specks of space that we occupy.

Once you begin to start stretching space it is hard to know where to stop. All the maps shown here are projections of two dimensional surfaces (including the surface of the sphere). If you want to include history as well as geography you may need more dimensions.
The number living on US$1 a day around 2002, which is the latest date for the the data from which the map shown in Figure 3d was drawn, was 1.07 billion. It is a very rough estimate used by the United Nations Development Programme.

It is widely believed that this number is falling at the moment. However, it is also possible that it is increasingly becoming the case that the minimum subsistence level needed just to survive, given rising food prices, is approaching US$2 a day. These figures are what are known as PPP dollars—supposedly adjusted for purchasing power parity—although the adjustments are too crude to cope with rapid food price increases.

It is quite likely that in a year’s time the current decline in those living on less than a dollar a day is found to have reversed when the statistics come in on the price of rice etc.

The key point to note here is that the amounts being mapped are, in almost every case, much less than an actual US dollar. A real dollar would buy far more in most countries. What is being mapped is how many people are surviving on an income that is the equivalent to having to live on US$1 a day in the USA—i.e. on what you could buy for a dollar in the USA—hence it is really a below-subsistence amount.

You might think the way you currently view the world is fine. You might think that the map of Britain you have in your head is right, and if you happen to spend most of your time flying it is. But if you take the tube, you use a different map. And if you want to know what is happening in the world, or how people live, or how they die, then there are other maps that can be drawn. In the immortal words, first spoken by a fictional donkey exactly 80 years ago: If you think your outlook is fine, well:

“Being fine to-day doesn’t Mean Anything. It has no sig…—what’s that word? Well it has none of that”6.

References

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