

# Free software for a world in motion

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## Abstract

*This paper focus the need for new educational software environments for exploration of global statistics. We present some concrete examples of highly interactive, non-linear, visual displays for explorative understanding of socioeconomic trends in the contemporary world.*

## 1. Introduction

On a daily basis the mass media and the Internet bring us insight into peoples lives from all over the world. It has never before existed such awareness of the great multitude of cultures and traditions on our planet. Never before have complete strangers known so much about each other. Maybe this increased understanding of lives of other people will bring us closer to each other, and serve as a platform for international collaborations. But what if the information we have about each other is not correct?

*“Getting the state of the world right is important because it defines humanity’s problems and shows us where our actions are most needed.”<sup>1</sup>*

## 2. Background

We see three main reasons for suspecting that a lot of commonsense knowledge about the state of the world may be of very weak quality.

### 2.1. Part of a rhetoric game

The global development data that people are exposed to is often selected by the media, politicians and organizations in order to make people act in certain ways (i.e. choose “the right” TV-channel, vote for “the right” party or give money for charity to “the right”

organizations). Facts about important global issues, often reach the broad audiences thru the mass media. Most frequently incorporated in smart rhetoric campaigns, where feelings and facts are indistinguishable confused in the reach for the audiences empathy and wallets. As audiences we often react in a similarly naive manner. If the presented facts are compatible with our ideologies and beliefs, we will trust the facts, but if the facts don’t fit they are refused as being exaggerated and unreliable.

### 2.2. The attraction of simple explanations

Optimists proclaim the end of history while pessimists say that doomsday is near. Both optimists and pessimists tend to present static and strictly dichotomized models of the world. In order to get attention they leave out contradictions and other “problematic” information. The world they present consist of: we/them, rich/poor, healthy/sick, peace/war, good/bad, etcetera.

To understand something as complex as the living conditions of all people in the World, simple models are required. But many of common simplifications of the World are too simple and far from representative. The most common type is the division of the world into two groups. “Developing and industrialized countries”, for example, is a popular simplification with very little (if any) meaning for understanding global socioeconomic disparities.

When people claim that “The gap between rich and poor is widening...” it gives the impression of a gap. In reality few societies have a gap between rich and poor<sup>2</sup>. In most countries 90 percent of the population live somewhere in-between the two groups called “rich and poor”.

### 2.3. Old-fashioned teaching

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<sup>1</sup> Lomborg, p. 3

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<sup>2</sup> See: 5.2. World Income Distribution

During the last 30 years most countries, societies and economies have changed dramatically. What teachers learnt about the state of the World 30 years ago, when they went to school, is no longer accurate.

In our attempts to make use of social statistic data in classrooms from K-12 to universities we have encountered some obstacles. There are always too few or too old computers often in a bad shape, usually locked up in separate rooms. Accessing the Internet is often restricted by fanatic firewalls. These technical things can be solved. The main obstacle has proven to be of an intellectual nature; people in general lack understanding of logarithm. That means they lack the basic tool to analyze exponential changes, which is a very common thing in social scientific data. To explore the distributions of health and wealth in the world a basic understanding of logarithms is necessary.

### 3. Understanding Data

*"...We need to use the best available information to join others in the common goal of making a better tomorrow."*<sup>3</sup>

From homepages of public institutes and agencies a lot of interesting data can be ordered as publications, books or CD-ROMs, and some times it can even be downloaded for free. Although huge amounts of data are more or less available, very few people actually use it. Without great interest in international development and/or impressing university degrees in statistics it can be hard to keep updated when the world is changing.

Data in spreadsheets are meaningless to most people. Many statisticians are like musicians standing up in front of the audience showing the sheet music instead of playing it. We believe the number of users of international development data could multiply by millions if the data was distributed as interactive explorative customized graphic interfaces. Much bigger and less skilled audiences could thereby understand more complex images of the world.

*"For information to become knowledge it must be interpreted, evaluated and put into a context. The ability to interpret is under valued in current educational curricula"*<sup>4</sup>

### 4. Learning by doing

*"For those who grew up in a world dominated by the technologies of print, writing and reading constituted*

*literacy. As the technologies of communication and information change, the requirements for literacy also change."*<sup>5</sup>

Visualization is an intuitive method for explanation of relationships and it is an excellent way of exhibiting patterns. We want to turn the already existing development data into meaningful knowledge.

After trying hard, we have concluded that it is not a simple task to get the adults of today to use computers to explore data in a graphic user interface, simply because most of them are not sufficiently computer literate. They just don't click anywhere. They often expect the computer to do the job, and in front of our nonlinear interfaces they sit and wait for the something to happen.

We now focus on a younger audience of highly computer literates. To change how the state of the world is understood, young generations need new tools that can give a more complex and relevant picture. The challenge is to find teachers capable of bringing these tools into the hands of their students.

### 5. Free software

Beneath follow short descriptions of some of our projects. The text format cannot give a fair picture of the interactive interfaces, why we recommend the reader to download prototypes at [www.gapminder.org](http://www.gapminder.org).

#### 5.1. Dollar Street

Dollar Street displays the world as a street. The street number is the family income and all people in the world live somewhere on this street, the poorest to the left and the richest to the right. All other people live in between on a continuous scale.

What does it look like in a household with a daily income of 1\$ per person per day, compared with a household with a daily income of 10\$ or 100\$? By clicking the houses on Dollar Street a smaller window opens and it is possible to make home visit and walk around in all rooms. It is possible to turn 360-degrees to get the full view. Some video documentation is also available. Vital functions of the households are focused (such as electricity, water supply and sanitation). If the word "Sofa" in the Menu is clicked all open windows will automatically display the sofa of the current households. Dollar Street was developed in collaboration with Save the Children Sweden.

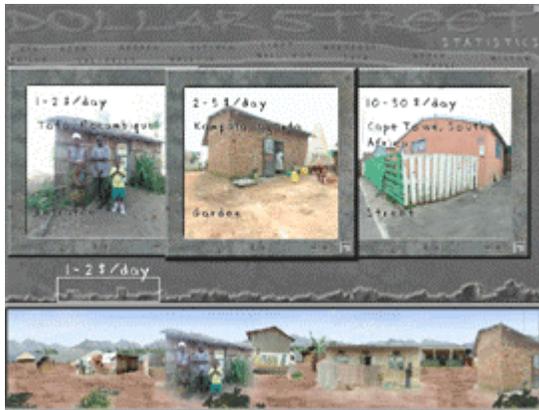
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<sup>3</sup> Lomborg, p.3

<sup>4</sup> Gårdenfors, p. 51

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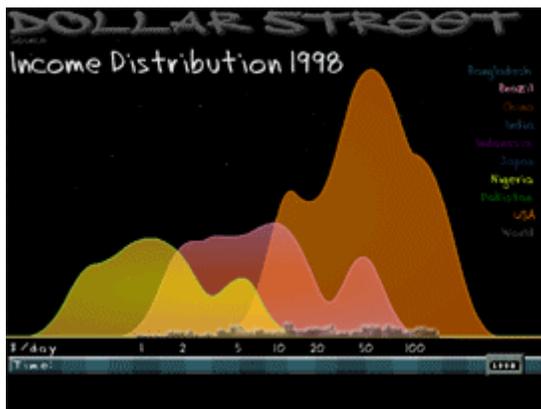
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**Figure 1:** Dollar Street. Three households are displayed above the street: 1-2 \$/person a day in Mozambique, 2-5 \$/person a day in Uganda, 10-50 \$/person a day in South Africa.

## 5.2. World Income Distribution

The World Income Distribution is an interactive display of statistics on income distribution for Bangladesh, Brazil, China, India, Indonesia, Japan, Nigeria, Pakistan and USA and the World 1970-1998. Each mountain represents a country. The shape shows how people are distributed on different income levels. Countries are selected/deselected by click on the country names to the right. Drag the time bar at the bottom to see how the shapes have changed between 1970-1998.<sup>6</sup>

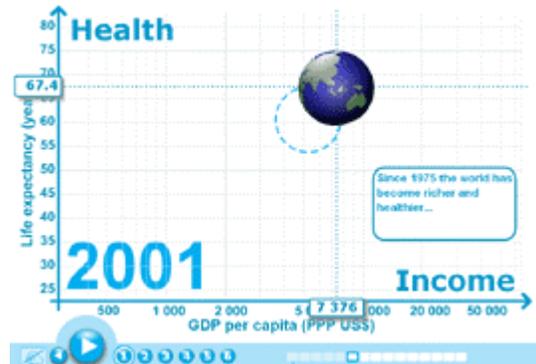


**Figure 2:** World Income Distribution. From left to right: Nigeria, Brazil and USA in 1998. The richest group of Nigeria's population overlaps the middle-income group in Brazil and the poorest group in USA.

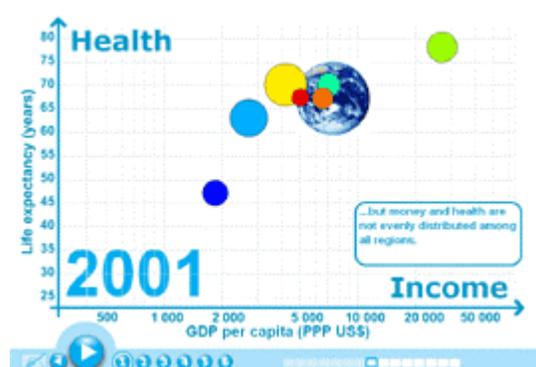
<sup>6</sup> Source of data: Xavier-Sala-i-Martin "The World Distribution of Income", 2002

## 5.3. Human Development Trends

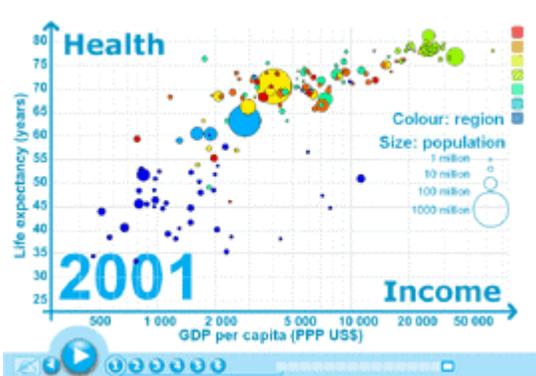
This linear presentation is developed together with United Nations Development Programme (UNDP) in 2003 for the release of their yearly Human Development Report. Some of the major conclusions of the report are displayed in animated charts, such as: Setbacks in income and health 1960-2001, Development crisis in the 1990's and Regional differences. ([www.undp.org/hdr2003/flash.html](http://www.undp.org/hdr2003/flash.html)).



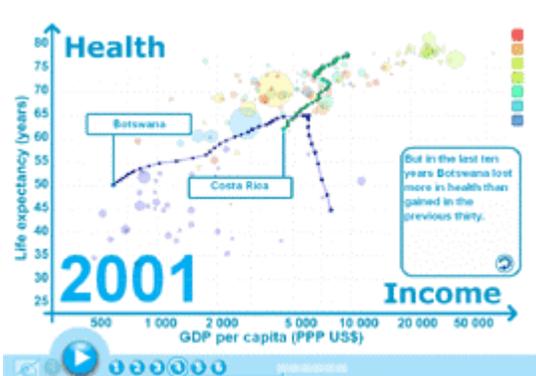
**Figure 3:** Human Development Trends. Since 1975 the World on average has become richer and healthier... The chart shows GDP per Capita on the x-axis and Life expectancy on the y-axis.



**Figure 4:** Human Development Trends. ...But money and health are not equally distributed among geographic regions.



**Figure 5:** Human Development Trends. And even regional averages conceal big differences within regions. Each bubble is a country. The size is due to population of the country. The color is due to region. We can see that there are countries on all income and health levels. There are obviously not two groups of countries.

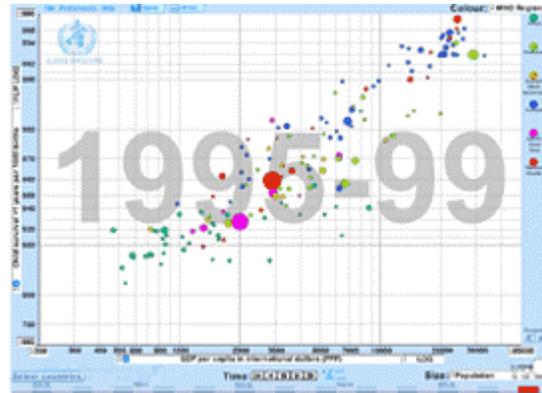


**Figure 6:** Human Development Trends. Botswana and Costa Rica makes remarkable progress during the 1960s, 70s and 80s. But in the last ten years, due to HIV/AIDS Botswana has lost more in health than gained the previous thirty.

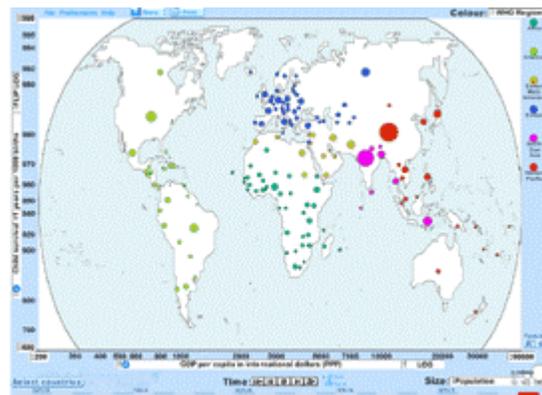
#### 5.4. World Health Chart

World Health Chart display 100 years of health development for all countries of the World. 35 indicators are included in World Health Chart. World Health Chart is developed in collaboration with World Health Organization (WHO), and the two Swedish universities Karolinska Institute and Lund University. The development was funded by Sida (Swedish International Development Cooperation Agency).

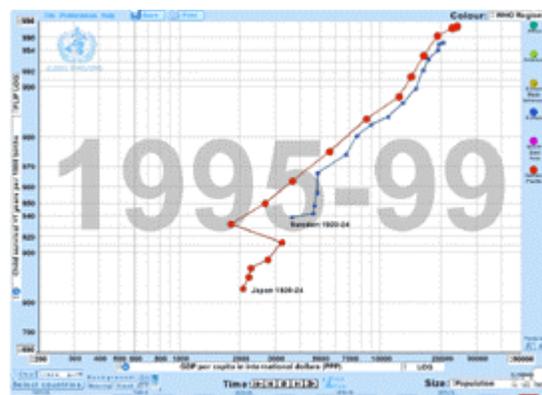
Time is movement and the historical development paths for the countries are animated by smooth tweening. The user can change any setting any time and get an animated change to the new position. Use the control panel, rewind and play to see the historical development.



**Figure 7:** World Health Chart. Start image. When the program is opened this chart is displayed automatically. X-axis: GDP per Capita, Y-axis: Child Survival up to 1 year per 1000 live births. Each bubble is a country. Size: population, Color: WHO-region. Each data point is an average of five years.



**Figure 8:** World Health Chart. Map. The sizes of the bubbles show population.



**Figure 9:** World Health Chart. A comparison between two countries with trails. GDP per Capita on the x-axis and Child Survival up to 1 year of 1000 live births at the y-axis. Japan (red) and Sweden (blue) 1920-2001.

## 5.5. World Development Chart

World Development Chart is an extended version of the World Health Chart concept with more functionality added:

- Filter data
- Export data
- Export animations to Powerpoint or Flash.
- Multiple languages
- Use shapes and flags instead of bubbles in the chart
- Color bubbles by time
- Set your own skin design
- Zoom

World Development Chart is under development, but the Beta Version is available for pilot testing. World Development Chart is funded by Sida (Swedish International Development Cooperation Agency).



**Figure 10:** World Development Chart. A comparison between two countries. Japan (red) and Sweden (blue). X-axis: GDP per Capita, Y-axis: Mobile phones per 1000 people. Time: 1988-2001. Color: Geographical region. Size: Population. Japan is richer than Sweden. Sweden has more mobile phones per 1000 people than Japan. Show all countries current position 2001.



**Figure 11:** World Development Chart. Development Show the same variable as in Figure 10, but with other view settings.

## 6. Gapminder

Gapminder is a non-profit company for development and provision of free software that visualize human development. This is done in collaboration with universities, UN organizations, public agencies and non-governmental organizations. Six software developers are presently working at Gapminder in Malmö, Sweden. It all started in 1998 from an idea to enhance the understanding of world health. We developed prototype software showing time series of health statistics as moving graphics and varying life conditions as 360° photo panoramas from homes, schools and health facilities. From the prototype emerged the Dollar Street project with Save the Children Fund in Sweden and the World Health Chart project with WHO. Within the later project Gapminder developed the free software Trendalyzer that turns boring time series of development statistics into attractive moving graphics. The software import data from excel and showing moving graphics on the screen, as exported Flash files or as images in PowerPoint and in other formats. Collaboration with United Nations Division of Statistic and UNDP, started in 2003 with the aim to visualize fulfillment of millennium development goals with a World Development Chart powered by Trendalyzer.

## 7. Our visions

We want to improve the understanding of development by providing a free software system that make the number of users of development statistics increase from thousands to millions!

We are also dedicated to adjust our tools to comprehensive curriculum and learning programs for K-12 education (by working close together with students, educators and parents).

## 8. References

- [1] P. Gärdenfors; "How to achieve understanding with the aid of e-learning", e-Learning 2<sup>nd</sup> WBLE Conference, Proceedings, Lund, Sweden, 2001, pp. 51
- [2] B. Lomborg, *The Skeptical Environmentalist: Measuring the Real State of the World*, Cambridge University Press, 2001
- [3] J. Manninen, "eMyths and eReality", e-Learning 2<sup>nd</sup> WBLE Conference, Proceedings, Lund, Sweden, 2001, pp. 111-120.

[4] M.S. Meadows, *Pause and Effect – the art of interactive narrative*, New Riders, Indianapolis, Indiana, 2003

[5] A. Naeve, “*The Concept Browser – A new form of knowledge management tool*”, e-Learning 2<sup>nd</sup> WBLE Conference, Proceedings, Lund, Sweden, 2001, pp. 151-161.

[6] S. Papert, *The connected family, bridging the digital generation gap*, Longstreet Press, Atlanta, Georgia, 1996

[7] S. Seiple, M. Lindkvist, “*Simulation based collaborative experiments for interactive learning in virtualized classroom environments*”, e-Learning 2<sup>nd</sup> WBLE Conference, Proceedings, Lund, Sweden, 2001, pp. 347-355.