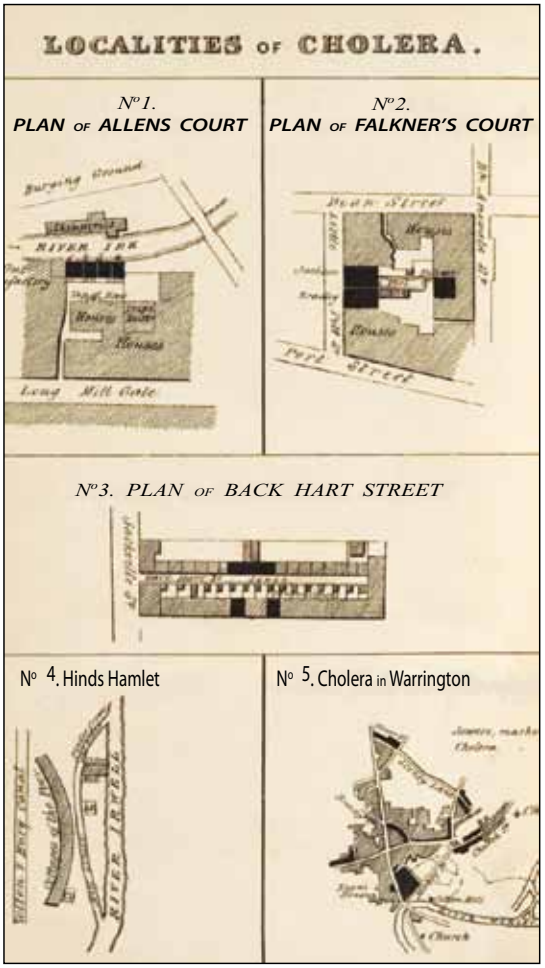
Figure 1.3: An example of airbrushing and what non-misleading advertising would look like


Source: http://socialinvestigations.blogspot.co.uk/2012/03/conservative-lords-and-their-financial.html

Figure 2.1: The localities of cholera, Manchester, 1832




Source: Gaulter, 1833, frontispiece.
www.archive.org/stream/originandprogre00gaulgoog#page/n10/mode/2up

Figure 2.4: Cholera in Leeds in 1832 (section of map)

Source: http://www.bl.uk/learning/images/makeanimpact/publichealth/ large 12727.html

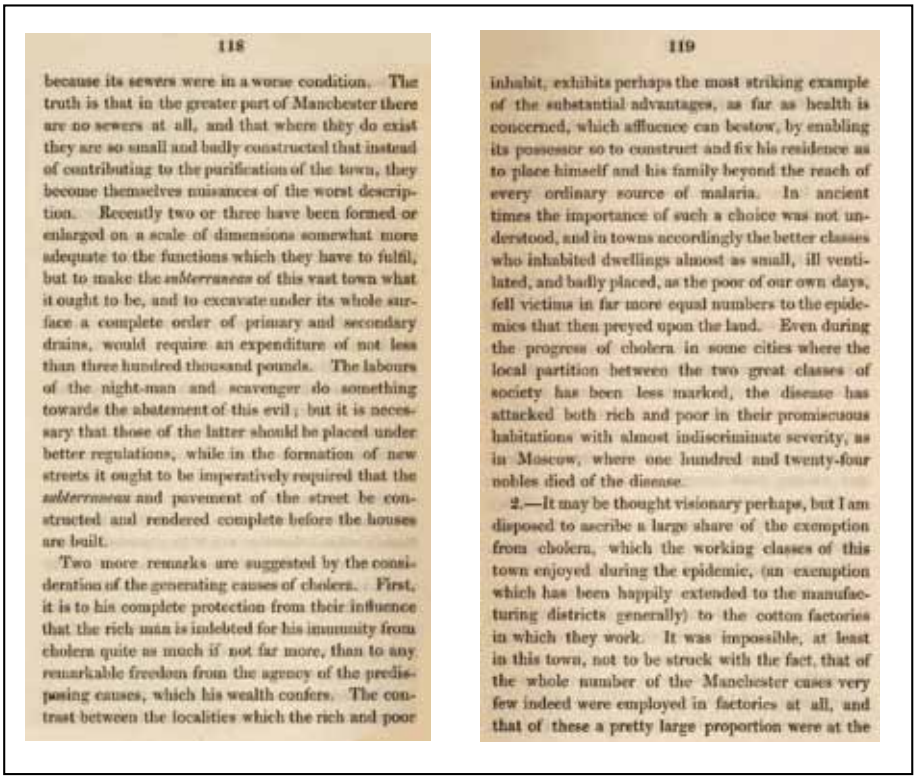
Figure 2.5: If pounds were pixels – one of many hundreds of images of dissent in 2012


Note: Image created by Duncan Rickelton
Source: http://zoom.it/yE58

Figure 2.7: Picture drawn in chalk by Joe Hill, Manchester Piccadilly

Source: BBC (2010): Temporary drawing made on the concourse floor. 'United Utilities say that Mancunians flush away thousands of incorrect items, such as make up wipes and ear buds, a year, causing sewers to block and toilets and drains to flood.' http://news.bbc.co.uk/local/manchester/hi/people_and_places/newsid_9135000/9135707.stm

Figure 2.8: Two pages from Gaulter's work on the 1832 Manchester cholera outbreak



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because its sewers were in a worse condition. The truth is that in the greater part of Manchester there are no sewers at all, and that where they do exist they are so small and badly constructed that instead of contributing to the purification of the town, they become themselves nuisances of the worst description. Recently two or three have been formed or enlarged on a scale of dimensions somewhat more adequate to the functions which they have to fulfil, but to make the *subterraneus* of this vast town what it ought to be, and to excavate under its whole surface a complete order of primary and secondary drains, would require an expenditure of not less than three hundred thousand pounds. The labours of the night-man and scavenger do something towards the abatement of this evil; but it is necessary that those of the latter should be placed under better regulations, while in the formation of new streets it ought to be imperatively required that the *subterraneus* and pavement of the street be constructed and rendered complete before the houses are built.

Two more remarks are suggested by the consideration of the generating causes of cholera. First, it is to his complete protection from their influence that the rich man is indebted for his immunity from cholera quite as much if not far more, than to any remarkable freedom from the agency of the predisposing causes, which his wealth confers. The contrast between the localities which the rich and poor

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inhabit, exhibits perhaps the most striking example of the substantial advantages, as far as health is concerned, which affluence can bestow, by enabling its possessor so to construct and fix his residence as to place himself and his family beyond the reach of every ordinary source of malaria. In ancient times the importance of such a choice was not understood, and in towns accordingly the better classes who inhabited dwellings almost as small, ill ventilated, and badly placed, as the poor of our own days, fell victims in far more equal numbers to the epidemics that then preyed upon the land. Even during the progress of cholera in some cities where the local partition between the two great classes of society has been less marked, the disease has attacked both rich and poor in their promiscuous habitations with almost indiscriminate severity, as in Moscow, where one hundred and twenty-four nobles died of the disease.

2.—It may be thought visionary perhaps, but I am disposed to ascribe a large share of the exemption from cholera, which the working classes of this town enjoyed during the epidemic, (an exemption which has been happily extended to the manufacturing districts generally) to the cotton factories in which they work. It was impossible, at least in this town, not to be struck with the fact, that of the whole number of the Manchester cases very few indeed were employed in factories at all, and that of these a pretty large proportion were at the

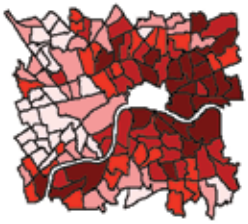
Source: www.archive.org/stream/originandprogre00gaulgoog#page/n128/mode/2up

Figure 3.1: Detail of *Charles Booth's descriptive map of London poverty 1889*


Note: Yellow indicates the highest social class, black the lowest.

Source: *Charles Booth's descriptive map of London poverty 1889*, with introduction by D.A. Reeder, Publication No 130, London: London Topographical Society, 1984.

Figure 3.3: London poverty (1896 and 1991) and mortality (1990s).

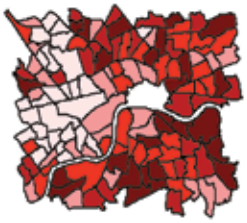


Booth-based Index of Poverty
Low (richest)
High (poorest)

**Map 1**

1991 Census based Poverty Index
Low (richest)
High (poorest)

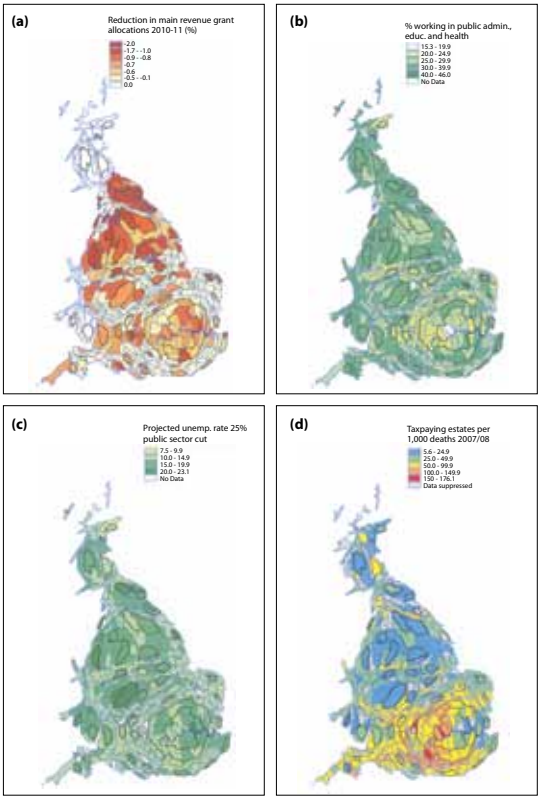
**Map 2**



All Cause SMR (1990s)
29 - 90
90 - 105
105 - 112
112 - 120
120 - 146

**Map 3**

Figure 17.1: **(a)** 2010–11 reduction in main revenue grant allocations (%), local authorities, England. **(b)** 2009 proportion of employees in the public sector (%), local authorities, Britain. **(c)** Projection of unemployment rates given a 25% cut in public sector employment, local authorities, Britain. **(d)** 2007/08 inheritance tax-paying estates per 1,000 persons dying, local authorities, Britain.

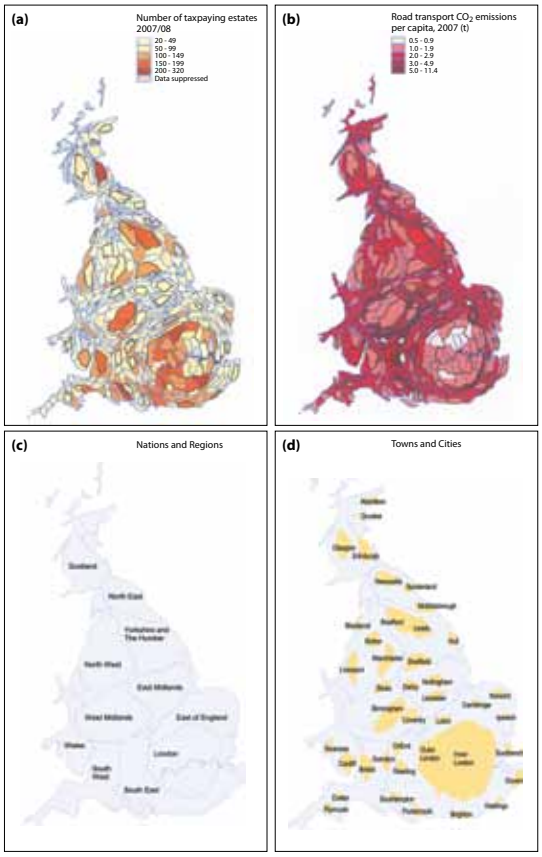



Source: Dorling and Thomas, 2011.

Figure 6.2: David Cameron and his Health Secretary, Andrew Lansley, meet nurses during a visit to the Royal Salford Hospital in Manchester on 6 January 2012.

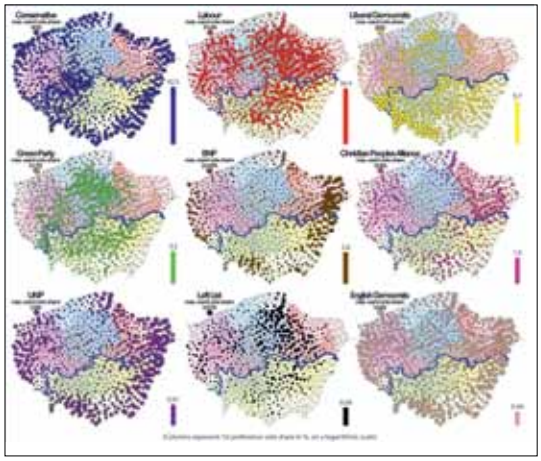
Source: Photograph: John Giles/Press Association (2012)

Figure 17.3: **(a)** 2007/08 inheritance tax-paying estates, numbers, local authorities, Britain. **(b)** 2007 $CO_2$ emissions due to road transport (tonnes per person), local authorities, Britain. **(c)** Nations and regions. **(d)** Major towns and cities.



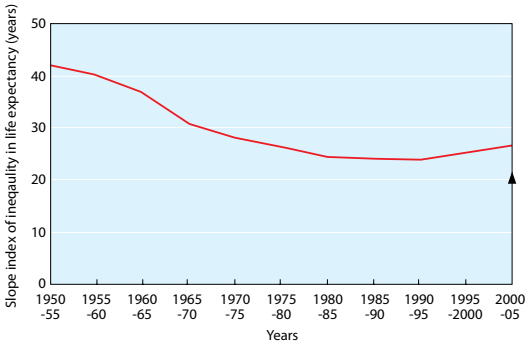

Source: Dorling and Thomas, 2011.

Figure 18.1: Vote shares in the 2008 London mayoral election



Source: Thanks to Michael Thrasher of the University of Plymouth for data used in these maps.

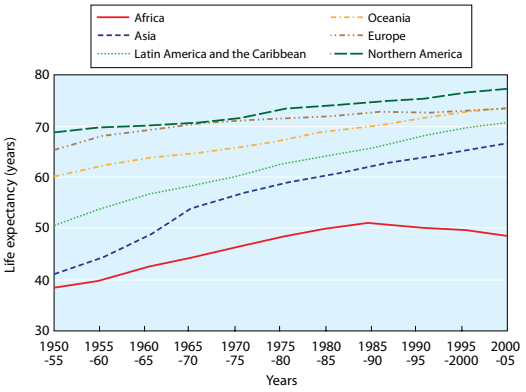
Figure 28.1: Global life expectancy slope index of inequality (in years)




Note: Black triangle shows estimated index in 2000-05 with impact of AIDS removed.

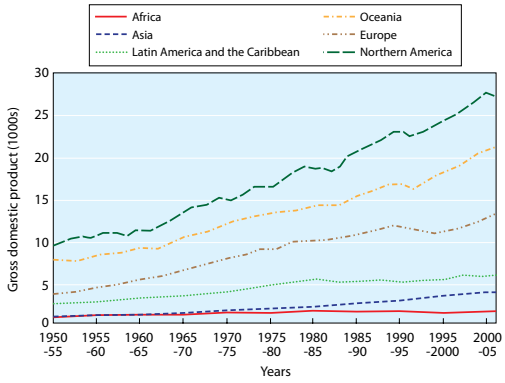
Source: Calculated for this paper from World Health Organisation routine data, and the United Nations population and HIV/AIDS wall chart 2005, www.un.org/esa/population/publications/POP_HIVAIDS2005/HIV_AIDSchart_2005.pdf

Figure 28.2: Life expectancy (in years) by continent 1950–2005, world




Source: Calculated for this paper from World Health Organisation routine data.

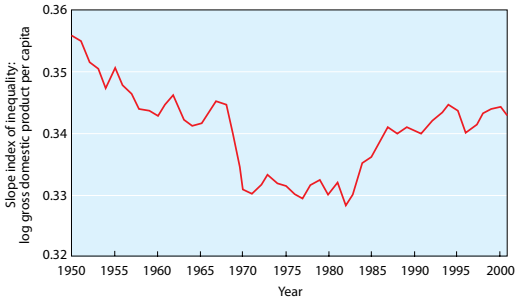
Figure 28.3: Average wealth per capita in dollars corrected for purchasing power parity ($PPP)




Note: Then: $1 = £0.6, €0.8

Source: UNDP data accessed via www.worldmapper.org.

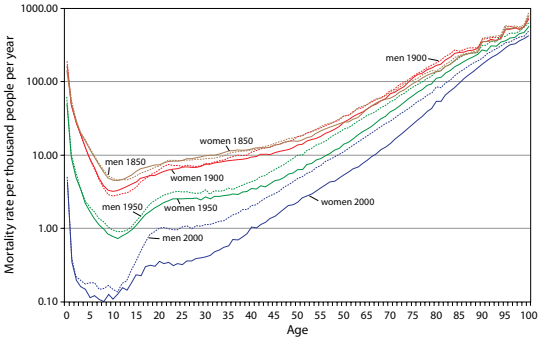
Figure 28.4: Slope index of inequality for global wealth in dollars corrected for purchasing power parity ($PPP)




Note: Then: $1 = £0.6, €0.8.

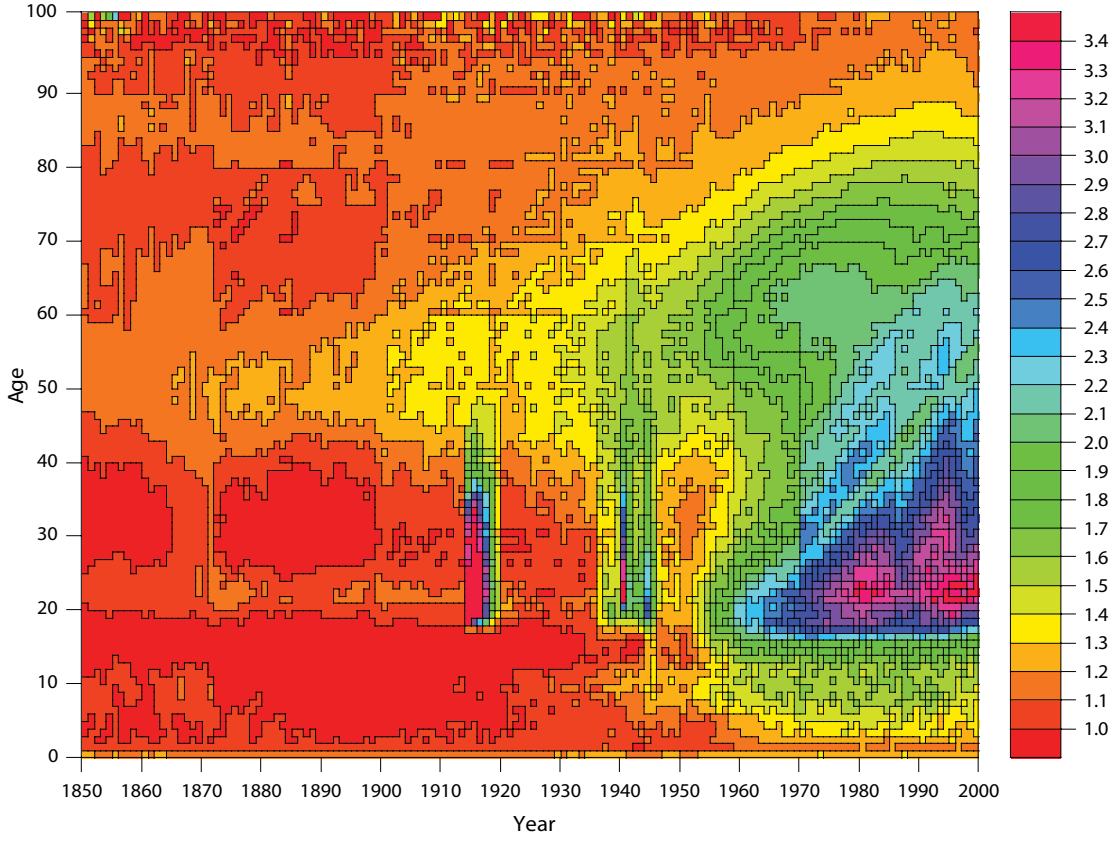
Source: UNDP data accessed via www.worldmapper.org.

Figure 29.1: Mortality rate by age, men and women in 1850, 1900, 1950 and 2000, all affluent countries of the world at each point in time



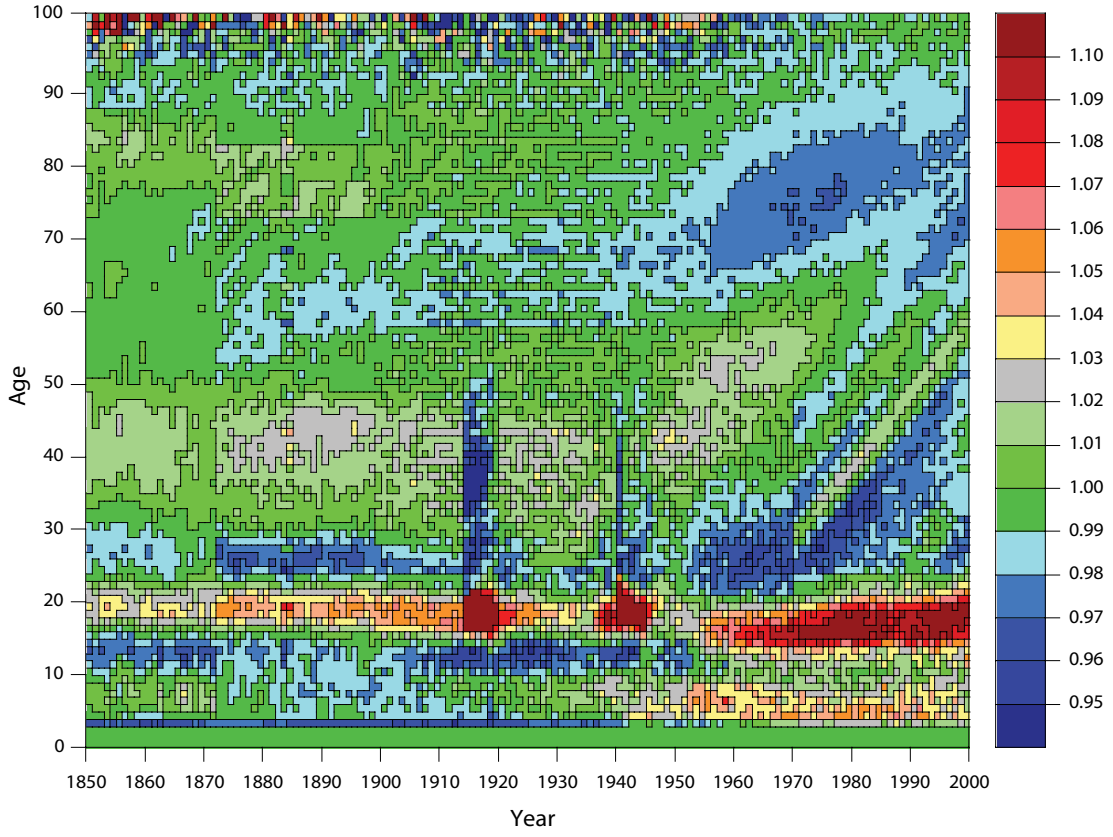

Source: The Human Mortality Database and calculations by the author, see: www.mortality.org/

Figure 30.1: Sex ratio of mortality (male/female rate) for the richer countries of the world, 1850–2000



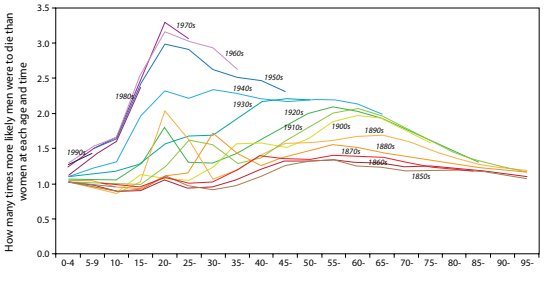

Source: The Human Mortality Database and calculations by the authors, see www.mortality.org/

Figure 30.2: First derivative of sex ratio of mortality, showing change in the ratio for the richer countries of the world, 1850–2000



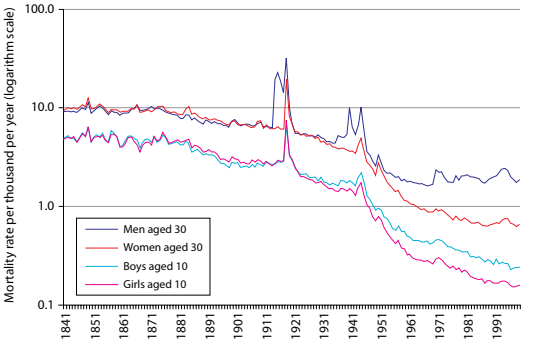

Source: The Human Mortality Database and calculations by the authors, see www.mortality.org/

Figure 30.3: Male : female mortality ratio by age in the rich world by 10-year cohort, 1850--1990



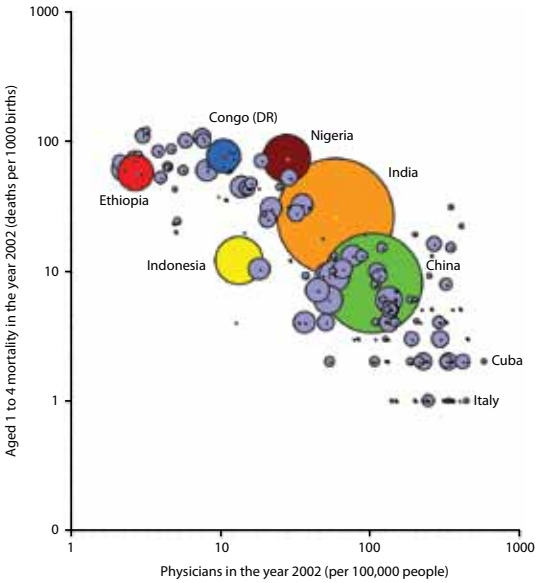

Source: The Human Mortality Database and calculations by the author, see: www.mortality.org/

Figure 30.4: Mortality rates in the 'affluent world', selected single years for ages 10 and 30, male and female, 1841–2000




Source: The Human Mortality Database and calculations by the authors, see: www.mortality.org/

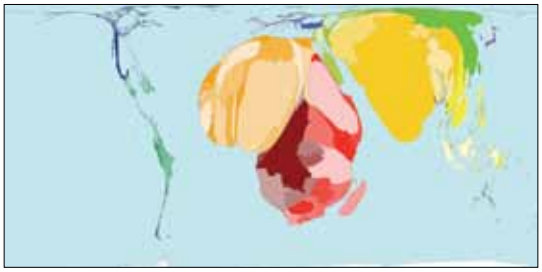
Figure 31.1: Physicians per head and child mortality (aged 1 to 4), countries of the world, 2002.




Note: Territories of the world drawn as circles with area in proportion to births. Both axes are drawn with a log scale here.

Source: www.worldmapper.org

Figure 31.2: Territories of the world drawn with area in proportion to deaths at ages 1–4, 2002



Note: This image is of the world as shaped when drawn in proportion to the more than 3 million children who die each year aged between 1 and 4 (inclusive) almost all from superficially easily preventable causes. In most cases their death is not simply due to the lack of intervention of a trained physician. However: 'There are more nurses from Malawi in Manchester than in Malawi and more Ethiopian doctors in Chicago than Ethiopia', G. Kinnock, 4 April 2006, Strasbourg: http://www.welshlabourmeps. org.uk/gk/gk_press/healthbudget04.04.06.htm.

Source: www.worldmapper.org

Figure 31.3: Territories of the world drawn with area in proportion to physicians, 2002

Note: There are more than two working physicians for every child that dies aged 1 to 4 worldwide each year. A traditional map in which territories are shaded according to the ratio of the population to physicians gives the reader little real impression of just how geographically concentrated physicians are: most into just a few territories worldwide.

The proof that a map of this kind could be drawn was made in 1975 when A.K. Sen published 'A theorem related to cartograms' (in *American Mathematics Monthly*, 82, 382-385). The first fully working practical realisation of that proof did not emerge until 30 years later and the latest version at time of writing is: Newman, M. (2006) Cart: Computer software for making cartograms [online]. University of Michigan. Available from: http://www-personal.umich.edu/%7Emejn/cart/ [accessed 5 July 2006].

Source: www.worldmapper.org

Figure 31.4: Territories of the world drawn with area in proportion to population, 2002.

Note: Some 200 territories of the world are ranked according to their populations' weighted average score on the United Nations Development Programme's Human Development Index for 2002. That ranking is then used to determine the original colours used in these maps, from the poorest in red, through the rainbow shades, to the country with the highest index, Japan, in violet. 2002 is also the year from which the world population is drawn that is used to scale each territory according to its area.

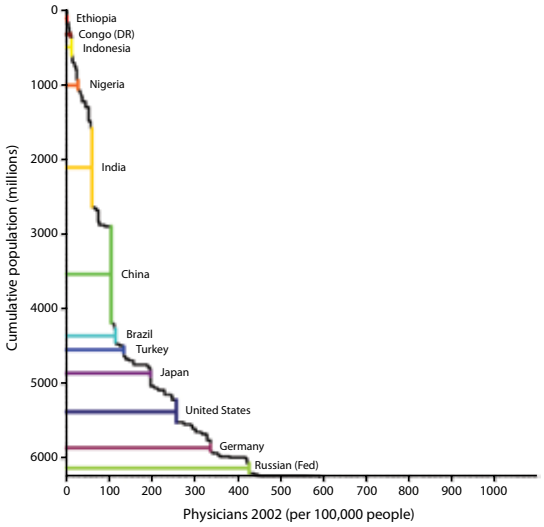
Source: www.worldmapper.org

Figure 31.5: Territories of the world drawn with area in proportion to land area

Note: This equal area projection appears very similar to that reproduced by Arno Peters and adopted by many parts of the United Nations as a more equitable projection than traditional world maps. However, this and Peter's projection, give most prominence to where there is most land – not most people. 'Africa's population density of 249 people per 1,000 hectares is well below the world average of 442 However, a great deal of the total destruction of the natural environment is occurring in the region. Poverty is a major cause and consequence. The area of Africa on the population cartogram is roughly half what the continent is on the equal land area map as a result of population density across Africa being almost half the world average.' (United Nations Population Fund, The State of the World Population 2001; Chapter 2: Environmental Trends: http://www.unfpa.org/swp/2001/english/ch02.html).

Source: www.worldmapper.org

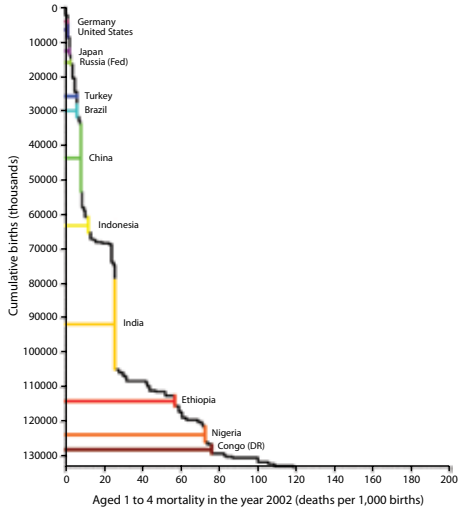
Figure 31.6: Territories of the world drawn with area in proportion to physicians, 2002.




Note: On this graph the area of each territory is proportional to the number of physicians who work there, as also in Figure 31.3 above, but here information on geographical location is lost so that territories can be ordered by rates. The area to the left of the line is thus proportional to absolute numbers. This image is another example of an anamorphis where area is drawn in proportion to a count, in this case numbers of physicians.

Source: www.worldmapper.org

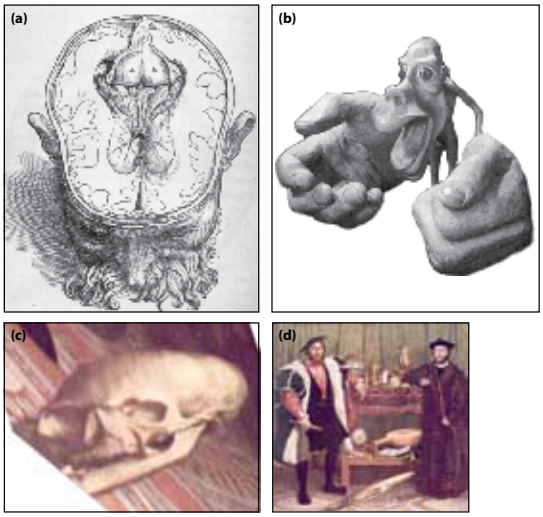
Figure 31.7: Territories of the world drawn withrectangular area on this graph in proportion to deaths at ages 1–4, 2002




Note: All territories of the world are shown in this image and thus there is a minute space to the left of the line to represent the death of each child aged 1 to 4 that occurred in this one year. Worldwide 3,200,000 are estimated to have died, give or take well over 100,000 as recording is so poor. Some dozen territories that are home to over half the world's population have been labelled as, unlike on a map, it is far from obvious where places are on a graph.

Source: www.worldmapper.org

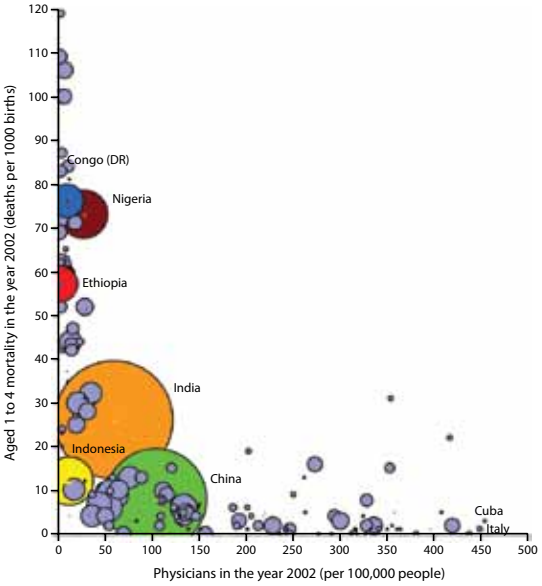
Figure 31.8: Anamorphosis in medicine and politics, from anatomy to subterfuge




Note: Ambassadors engage in diplomacy in the interest of their country but, not necessarily, in the interest of others.

Sources: (a) Dissecting the cortex: taken from Vesalius' De humani corporis fabrica, 1543 [On the Fabric of the Human Body] now published online: http://vesalius.northwestern.edu/. This image sourced from: http://pages.slc.edu/~ebj/iminds01/notes/L1-Descartes-bats/s8-vesalius.html
(b) Homunculus; taken from http://wwwppeda.free.fr/progressions/3/homunc_sens_grand.jpg
(c) Detail of skull, transformed with photo software and derived from Holbein's 'The Ambassadors'
(d) From http://www.dodedans.com/Eholbein.htm (accessed 26 October 2006)

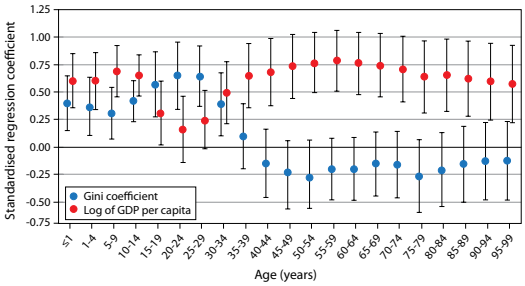
Figure 31.9: Physicians per head and child mortality (aged 1 to 4), countries of the world, 2002.




Note: Cuba is the most easterly circle, Sierra Leone the most northerly, and the most prominent circle to the south west extreme of the distribution is Malaysia. Here the territories of the world drawn as circles with area in proportion to births. Both axes are draw with a linear scale.

Source: www.worldmapper.org.

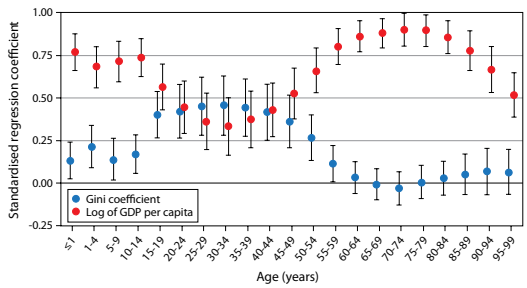
Figure 32.1: Association of income inequality and affluence with mortality in the 30 countries of the OECD, around the year 2000.




Note: Income inequality measured as the Gini coefficient, and affluence as the log of gross domestic product (GDP) per capita adjusted to ensure purchasing power parity. A higher regression coefficient indicates a closer correlation with mortality rates of either log GDP or Gini at those particular ages. Only data for 30 affluent countries are used here and GDP alone only comes to have a significantly greater effect than inequality after age 40. A higher correlation implies that the possible link is stronger, and that the influence of the factor is greater at those ages.

Source: Calculated by the authors from data provided by: Lopez, A., Ahmad, O., Guillot, M., Inoue, M., Ferguson, B. (2000) *Life tables for 191 countries for 2000: data, methods, results.* Geneva: World Health Organization, 2001 (GPE discussion paper No 40) and United Nations Development Programme. Table 14 (Gini index of income inequality) in: *Human development report 2004*. Geneva: UNDP, 2004.

Figure 32.2: Association of income inequality and affluence with mortality in all countries worldwide, around the year 2000.




Note: Income inequality measured as the Gini coefficient, and affluence as the log of gross domestic product (GDP) per capita adjusted to ensure purchasing power parity. A higher regression coefficient indicates a closer correlation with mortality rates of either log GDP or Gini at those particular ages. Data for almost 200 countries areused here and GDP is seen to matter more at younger and older ages, but even with so many poor countries included inequality has a clear influence between ages 15 and 50.

Source: Calculated by authors from data provided by: Lopez, A., Ahmad, O., Guillot, M., Inoue, M., Ferguson, B. (2000) *Life tables for 191 countries for 2000: data, methods, results*. Geneva: World Health Organization, 2001 (GPE discussion paper No 40) and United Nations Development Programme. Table 14 (Gini index of income inequality). In: *Human development report 2004*. Geneva: UNDP, 2004.

Figure 32.3: The world's countries drawn with area in proportion to the number of people living on ≤$10 a day, 2002.

Note: In 2002, some 3.5 billion people, then more than half the world population, survived on the equivalent, or less, of what $10 in the United States of America would buy a day.

Source: From Worldmapper, www.worldmapper.org/display.php?selected=153

Figure 32.4: The world's countries drawnwith area in proportion to the gross domestic product per capita of people adjusted for purchasing power parity, 2002

Note: In 2002 roughly $50 trillion was 'earned' a year worldwide, $7800 per person, or $21 on average a day, as measured in dollars, given what a dollar then bought in the United States of America.

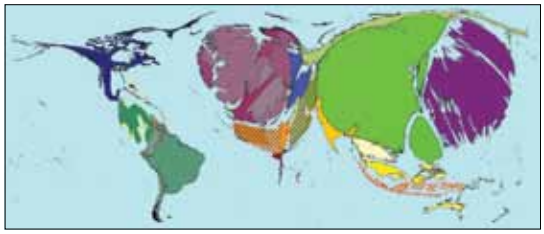
Source: Worldmapper, www.worldmapper.org/display.php?selected=170.

Figure 32.5: The world's countries drawn with area in proportion to the deaths of adults aged 25-29 years inclusive, 2001

[Editorial Note: Some 1.5 million adults of these ages die every year. The original version of this figure had shown the map for children aged 1 to 4, but 4, but that map was shown earlier in this book as Figure 31.2 on p xxx of Chapter 31, so an older age group is shown here.]

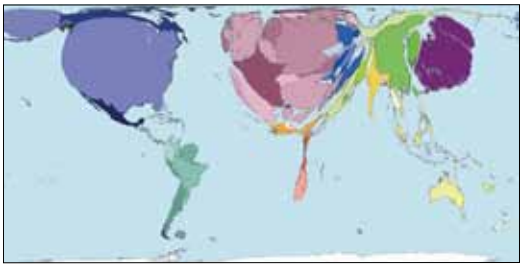
Source: Worldmapper, http://www.worldmapper.org/display_extra.php?selected=535

Figure 35.1: Map of the world with countries resized according to the total amount of US treasury securities that were held in each place, July 2011.



Source: Figures published by the US Treasury. Map created by Ben Hennig. See text for why some parts are dotted and some shaded with a criss-cross pattern.

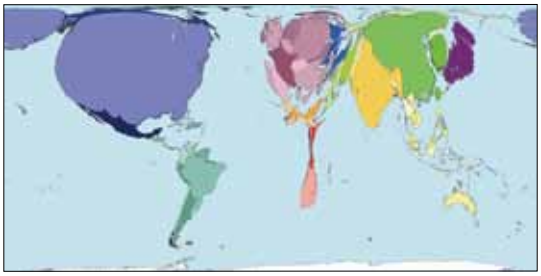
Figure 37.1: Public Health Spending: Worldmapper Poster 213.



Note: The figure shows a cartogram in which territories are drawn with their area in proportion to the values being mapped. Territories are shaded identically on all cartograms here to aid comparison with the world cartograms shown in Figures 32.2 to 32.6 which employ identical shading. For detail on shading see http://www.worldmapper.org.

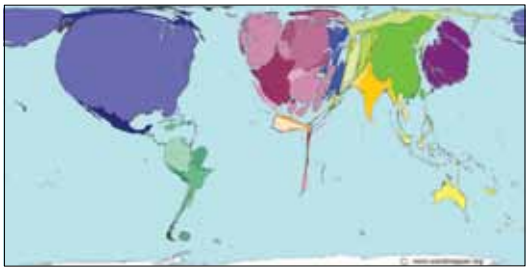
Source of data used to create map: United Nations Development Programme, Human Development Report 2004.

Figure 37.2: Private Health Spending: Worldmapper Poster 214.



Source of data used to create map: United Nations Development Programme, Human Development Report 2004.

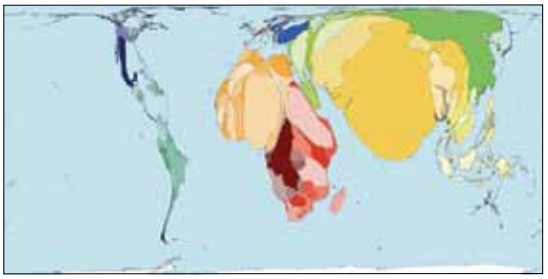
Figure 37.3: People dying over age 100: Worldmapper Map.



Note: The map shows the number of all 100-year-olds who died in 2001. The estimates come from the World Health Organization's Burden of Disease Estimates, published in 2006.
For further information on these mortality estimates (first made for 1999), see http://whqlibdoc.who.int/hq/2001/a78629.pdf

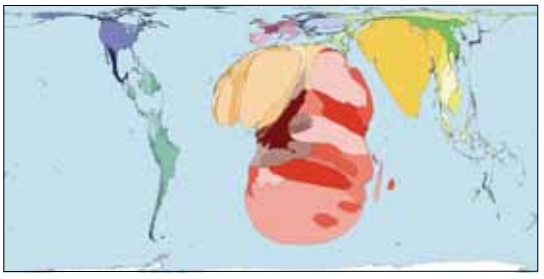
Source of data used to create map: Lopez, A., Ahmad, O., Guillot, M., Inoue, M. and Ferguson, B. (2000) *Life tables for 191 countries for 2000: data, methods, results*. Geneva: World Health Organization (GPE discussion paper No 40).

Figure 37.4: Early Neonatal Mortality: Worldmapper Poster 260.



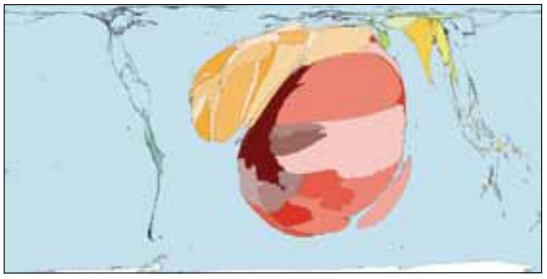
Source of data used to create map: World Health Organization, 2005, World Health Report, Basic data.

Figure 37.5: HIV/AIDS Prevalence: Worldmapper Poster 227.



Source of data used to create map: United Nations Development Programme, Human Development Report 2004.

Figure 37.6: Malaria Cases: Worldmapper Poster 229.

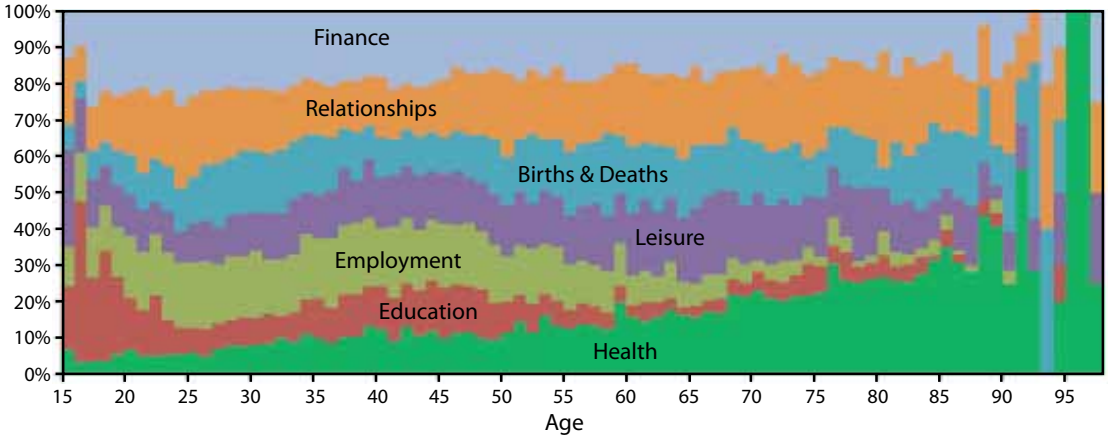


Source of data used to create map: World Health Organization and UNICEF, World Malaria Report 2005.

Figure 41.1: The survivors and deceased lists by social class, RMS Titanic, 1912, viewed in Singapore in 2012

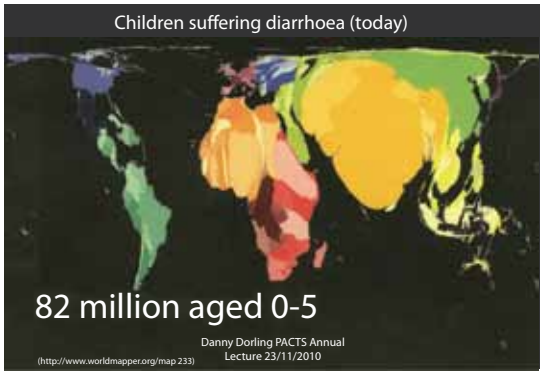
Source: Image included in *The Guardian* newspaper, 11 April 2012, of people at an exhibition in Singapore (the world's most unequal rich country) looking at the RMS Titanic survivor lists

Figure 42.1: Major life themes by age in Britain (aged 15–97), frequency of reporting events in the last year concerning subject.




Source: British Household Panel Study questions asked between September 1992 and December 1992 on what happened of significance to all study members or to a a member of their family.

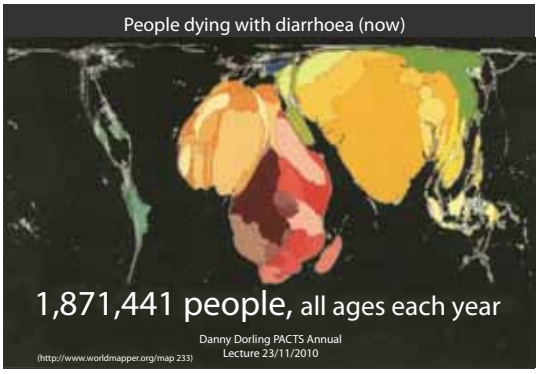
Figure 43.2: Childhood cases of diarrhoea in the world today.




Note: Area of each country proportional to numbers suffering (total area is equal to 82 million children aged under six).

Source: World Bank's 2005 World Development Indicators, from the series named Diarrhoea prevalence (% of children under 5) (SH.STA.DIRH.ZS). The underlying source that the World Bank cites is the United Nations Fund for Children's (UNICEF) publication, *The State of the World's Children*.

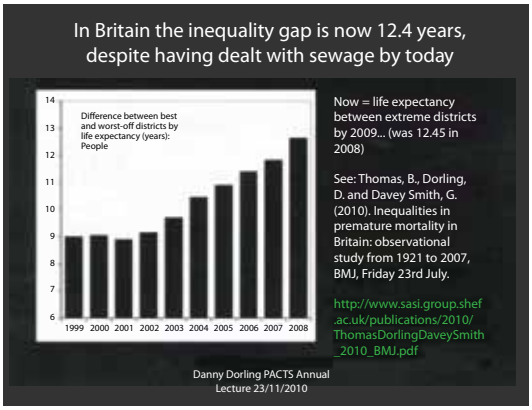
Figure 43.3: Deaths due to diarrhoea in the world today.




Note: Area proportional to number of deaths.

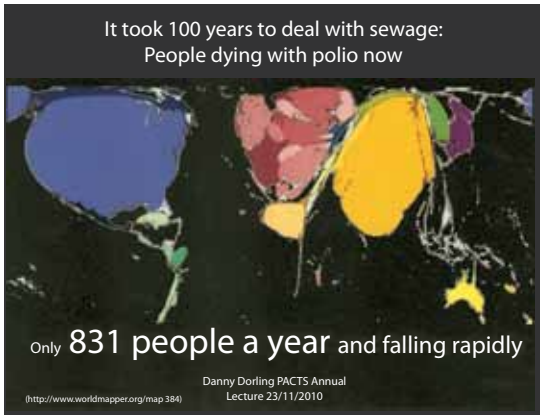
Source: The data used here are from the World Health Organisation's (WHO) Global Burden of Disease (GBD) statistics on death and disability worldwide as measured in 2002. Diarrhoeal diseases, ICD U010, (causing 17% of deaths worldwide included in the category: Infectious and parasitic diseases)..

Figure 43.4: The life expectancy gap between the extreme districts of Britain



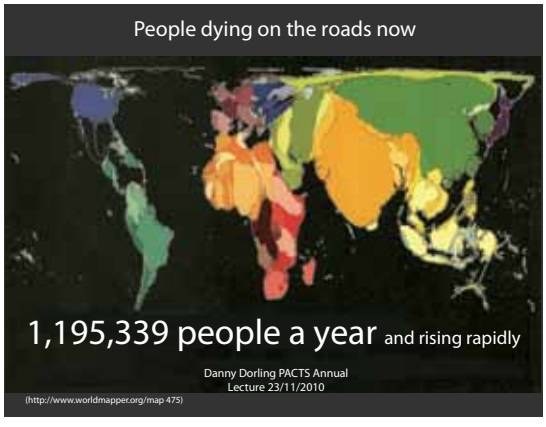

Source: Office for National Statistics and General Registrar Office (Scotland) estimates of life expectancy by local authority, three-year moving averages.
By 2008-10 the gap had grown to 12.65 years: http://www.guardian.co.uk/news/datablog/interactive/2011/oct/20/life-expectancy-map-local-authority-uk.

Figure 43.5: Deaths in the world today with polio as underlying cause



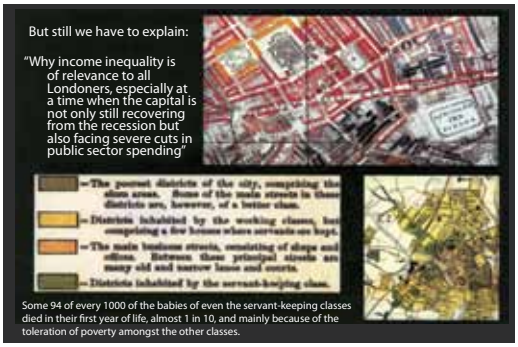

Source: WWorld Health Organisation's (WHO) statistics for 2002, as reported in Worldmapper. Most of the polio deaths that year were of people who had been severely disabled by polio years before who eventually died because of polio's long-term effects. Poliomyelitis caused 0.0015% of all deaths worldwide in 2002

Figure 43.6: Deaths in the world today due to road traffic collisions



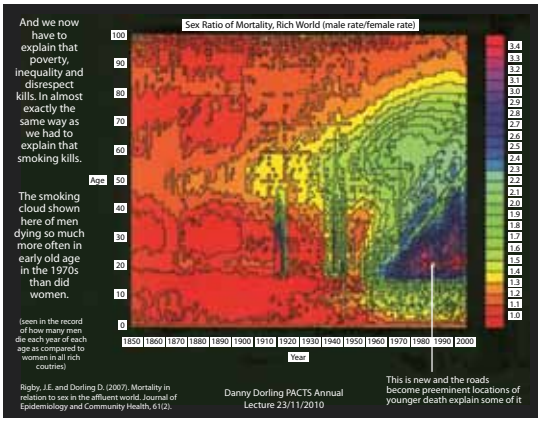

Source: World Health Organisation's (WHO) Global Burden of Disease (GBD) statistics on death and disability worldwide in 2002. In 2002 road traffic accidents (now more commonly labelled 'crashes') caused 2.1% of all deaths worldwide in 2002, an average of 191 deaths per million people per year. This number is rising rapidly.

Figure 43.8: Some early maps of social divisions which influenced public health



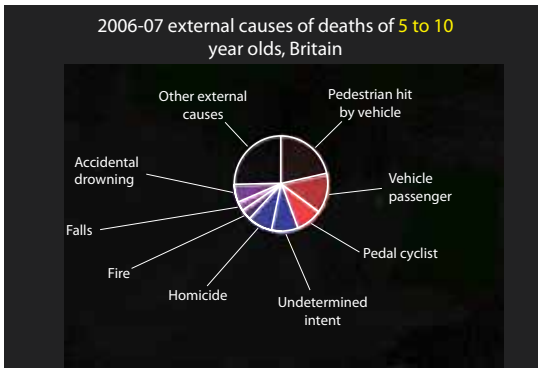

Source: Dorling, D. (2012) *Fair play: A Daniel Dorling reader on social justice*, Bristol: The Policy Press, reproducing figures in turn produced under the direction of Charles Booth and Benjamin Seebohm Rowntree, but drafted by others with data collected by yet others that they employed.

Figure 43.9: Two world wars, the smoking cloud, emanicipation and repeated recessions



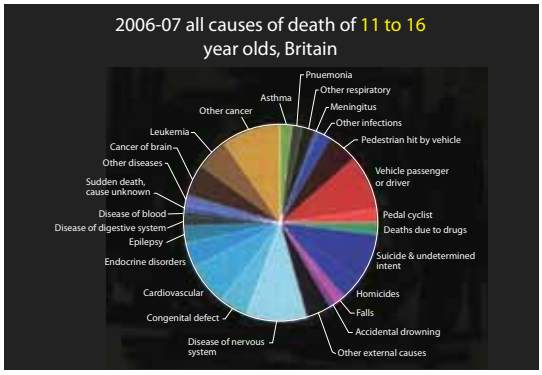

Source: The data used here were drawn from the Human Mortality Database collated by John R. Wilmoth (Director, University of California, Berkeley) and Vladimir Shkolnikov (Co-Director Max Planck Institute for Demographic Research). Access is free and may be found here: http://www.mortality.org/

Figure 43.10: Deaths of children aged 5 to 10 in Britain not attributed to disease (2006–07)



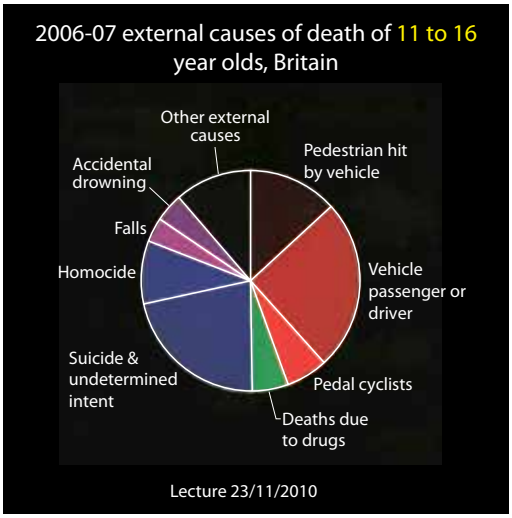

Source: Shaw, M., Davey Smith, G., Thomas, B., and Dorling, D. (2008) *The Grim Reaper's road map: an atlas of mortality in Britain*, Bristol: The Policy Press, relying in turn on data supplied by the Office for National Statistics and General Registrar Office (Scotland).

Figure 43.11: Underlying cause of deaths of children aged 11 to 16 in Britain (2006–07).



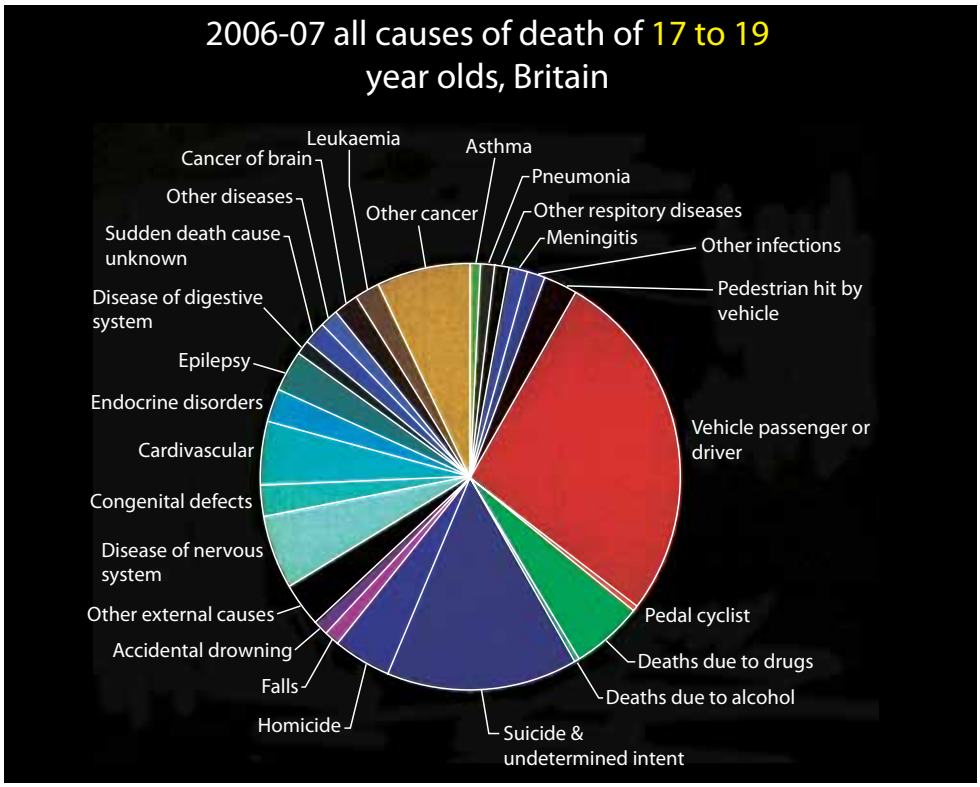

Source: Shaw, M., Davey Smith, G., Thomas, B., and Dorling, D. (2008) *The Grim Reaper's road map: an atlas of mortality in Britain*, Bristol: The Policy Press, relying in turn on data supplied by the O ce for National Statistics and General Registrar O ce (Scotland).

Figure 43.12: Deaths of children aged 11 to 16 in Britain not attributed to disease (2006–07)



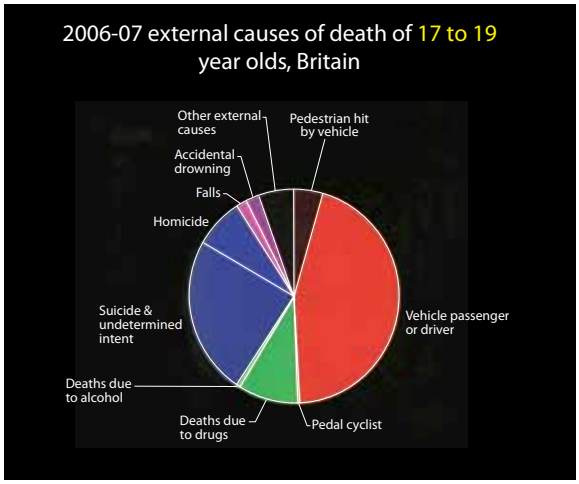

Source: Shaw, M., Davey Smith, G., Thomas, B., and Dorling, D. (2008) *The Grim Reaper's road map: an atlas of mortality in Britain*, Bristol: The Policy Press, relying in turn on data supplied by the Office for National Statistics and General Registrar Office (Scotland).

Figure 43.13: Underlying cause of all deaths of people aged 17 to 19 in Britain (2006–07).



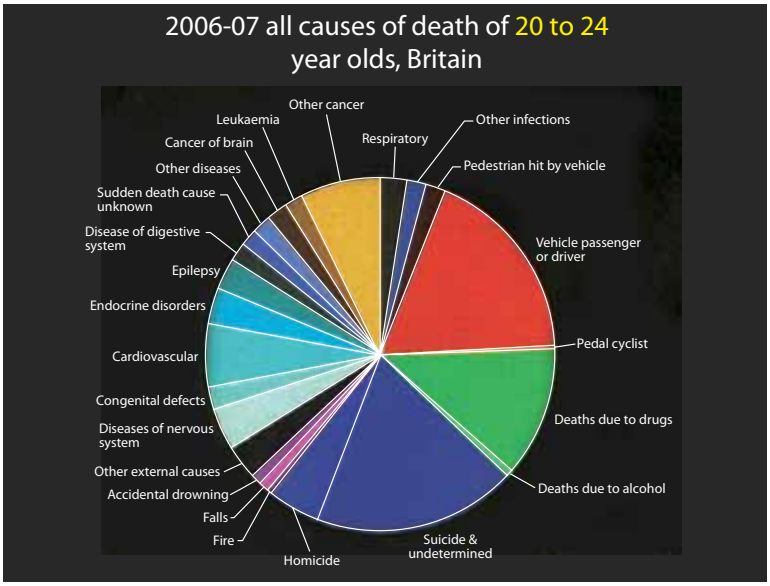

Source: Shaw, M., Davey Smith, G., Thomas, B. and Dorling, D. (2008) *The Grim Reaper's road map: An atlas of mortality in Britain*, Bristol: The Policy Press. relying in turn on data supplied by the Office for National Statistics and General Register Office (Scotland).

Figure 43.14: Deaths of people aged 17 to 19 in Britain not attributed to disease (2006–07)




Source: Shaw, M., Davey Smith, G., Thomas, B., and Dorling, D. (2008) *The Grim Reaper's road map: An atlas of mortality in Britain*, Bristol: The Policy Press, relying in turn on data supplied by the Office for National Statistics and General Registrar Office (Scotland).

Figure 43.15: Underlying cause of all deaths of people aged 20 to 24 in Britain (2006–07)

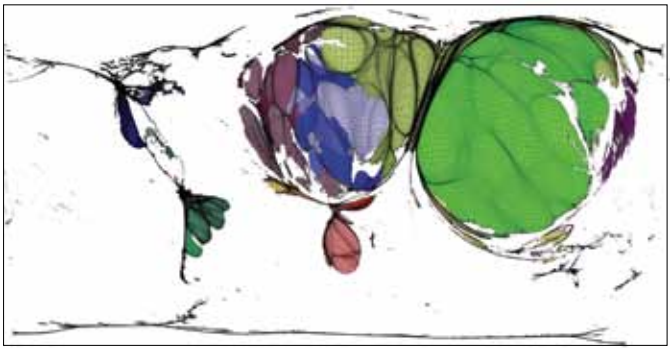



Source: Shaw, M., Davey Smith, G., Thomas, B., and Dorling, D. (2008) *The Grim Reaper's road map: An atlas of mortality in Britain*, Bristol: The Policy Press, relying in turn on data supplied by the Office for National Statistics and General Registrar Office (Scotland).

Figure 47.1: Population growth 1990–2015 – total change projected on a gridded cartogram.

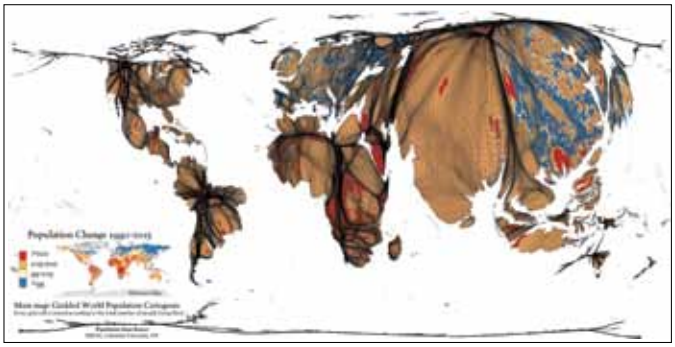
Source: Map drawn by Ben Hennig, using SEDAC data, the GPWv3 gridded population of the world, from Columbia University.

Figure 47.2: Population decline 1990–2015 – total change projected on a gridded cartogram



Source: Map drawn by Ben Hennig, using SEDAC data, the GPWv3 gridded population of the world, from Columbia University.

Figure 47.3: Population growth and decline 1990–2015 – areas of population increase or decrease shaded on an equal population gridded cartogram



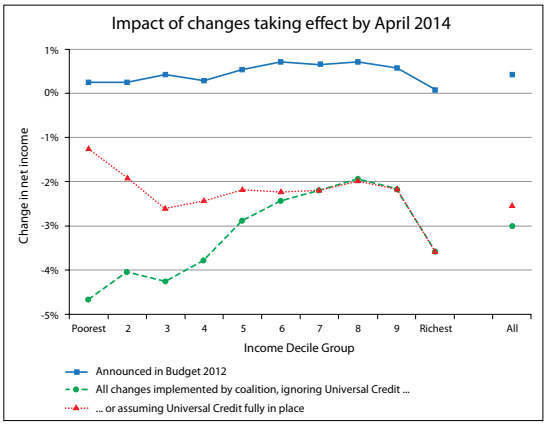
Note: Red areas are experiencing most population growth, blue areas most decline.

Source: Map drawn by Ben Hennig, using SEDAC data, the GPWv3 gridded population of the world, from Columbia University.

Figure 48.1: Upper-class individuals are more likely to engage in unethical behaviour

Source: Thinkstock, http://www.nsf.gov/news/news_summ.jsp?cntn_id=123301

Figure 48.2: Impact of the taxation and benefit changes, 2010 to 2014




Note: The original graph was produced by the IFS and ignores measures affecting mainly the very rich. These budget measures included changes to taxation law proposed in the budget to prevent very rich people pretending they are giving money to charity, but giving it to something they have set up to look like a charity, to avoid paying tax. That proposal was not implemented, the reason given being that it would apparently affect genuine large charitable donations.

Source: Joyce (2012, slide 12)